Republic of the Union of Myanmar
Ministry of Transport and Communications

No: PaSa-5/ AhPaYa(JICA)/ 2017(　)
Date: 20th March, 2017

Mr. Nobuo IWAI
Acting Chief Representative
JICA Myanmar Office

Subject: **Confirmation for Location of Mandalay Port Development Project**

Dear Mr. Nobuo IWAI,

First of all, on behalf of Ministry of Transport and Communications and on my own behalf, we would like to extend our appreciation for all your continuous supports and considerations to be sustainable development of our country, particularly in the areas of transport and communications.

In connection with the transport sector development, MOTC and JICA Team conducted the meeting on 21st - 22nd, February 2017 in Nay Pyi Taw to decide the location and continue the follow-up actions for the establishment of the Mandalay Port. So, we are very pleased to inform you that our MOTC and Mandalay Region Government (MRG) have selected the location (1) as the most suitable place to establish Mandalay Port.

Thank you once again and please accept the assurance of our highest consideration.

Sincerely Yours,

Win Khant
Permanent Secretary
Ministry of Transport and Communications
Nay Pyi Taw

June 19, 2017

Ref. No. 635R6710/DOD/006

Attn. Director General
Directorate of Water Resources and Improvement of River System (DWIR)

Sub: Request for Updated Information of AIRBN Project and AUDP
Re: The Preparatory Survey on the Project for Development of Mandalay Port Technical Coordination Meeting held on June 12, 2017

Dear Sir,

Thank you very much for your kind cooperation for our survey on the above captioned Project.

Also, we would express appreciation on your invitation for the Technical Coordination Meeting held on June 12, 2017 at your office.

This is for our further clarifications on the explanation in the Technical Coordination Meeting.

1. AIRBN Project (Ayeyarwady Integrated River Basin Management Project)

On the AIRBN Project, we understand that DWIR will make a decision for river improvement method taking into account the outputs of the study made by RHDHV and hearing relevant authorities' opinion.

The presentation made by RHDHV showed 4 options (Scenario 1 ~ 4). On the other hand, DWIR introduced an option of "Subproject 1" in your presentation, which includes installation of a guide-bund at upstream and series of groynes at downstream of Mandalay waterways.

As we requested in the meeting, we would like to request DWIR to provide us your decision scenario as soon as you made it. We would like to consider influence of AIRBN to JICA project for our obligation of the study.

2. AUDP (Amarapura Urban Development Project)

This was a new information to us. We found the news article regarding AUDP as attached herewith, which says the AUDP project includes jetty development at the same area of JICA port development project.

DWIR stated in the meeting that JICA project shall have the priority to the AUDP for the port development, and AUDP has not received official approval by the government. However, we think this issue relates to the essential objective on the provision of Japan's Grant Aids.

Therefore, we would request DWIR to provide our Study Team more detailed information of the project very soon. As the issue might be very critical for us to proceed our study, please send us

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the following information on AUDP by 28th of June 2017.

- Facility plot plan for Phase 1 development (20 acres area at the same place of JICA project area)
- Purpose of Jetty for AUDP (cargo or tourism passenger?)
- Drawings of jetty/port facilities
- Assumed implementation schedule

We would be very much appreciated if you could understand our sincere concern to your project coordination.

Yours Faithfully,

Masahiko Koshimizu
Chief Consultant
Joint Venture of
Oriental Consultants Global Co., Ltd.
Pacific Consultants Co., Ltd.
Fukken Co., Ltd.
on behalf of JICA Study Team

Attachment: News article

CC
1: Ministry of Transport and Communication, MOTC
2: Inland Water Transport, IWT
3: JICA headquarters
4: JICA Myanmar Office
5: OCG Yangon Office
6: File

The Republic of the Union of Myanmar

Ministry of Transport and Communications

Directorate of Water Resources and Improvement of River Systems

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Letter No: 146 /AhKhaNa/AhKha-13(1)/2017

Date: 27th June, 2017

To:

Mr. Masahiko Koshimizu

Chief Consultant

Joint Venture of Oriental Consultants Global Co., Ltd

Re: **Updated information of AIRBM Project and AUDP Project**

Dear Mr. Masahiko Koshimizu,

As discussed with your JICA study team headed by Mr. Kotaro NISHIGATA, Senior Representative and member, Ms. Mayumi SHOJI, Project Formulation Advisor and U Win Ko Ko, Program Officer, on 10:00am, 27th June 2017 at DWIR office, I would like to reflect information of AIRBMP and AUDP project, concerning with your questionaries letter dated June 19, 2017, Ref No. 635R6710/DOD/006.

We already explained in the meeting about the Inland Port Development Plan, which DWIR would like to create the development of port construction with updated facilities to enhance river cargo transportation and containerization of transport facilities.

1. Ayeyarwady Integrated River Basin Management Project- dealing with World Bank credit US$ 100 million loan for 5 years, 2015-2020 and that Project Management Unit (PMU) hired RHDHV to provide " design and supervision" for Mandalay waterway improvement works by identifying of Hydraulic Mathematical Modeling Analysis. The meeting on 12 June, aim to include major stakeholders, to be consider their development plans which will be effected to the water systems of the Mandalay waterway. The decision making is not finalizing yet at the current status and we will include every infrastructure development project, which influences on the river flow regime of the water systems at this Sub-Project-1 area.

   For more details, please see World Banks website, DWIR page and http://www.myanmarinsider.com/category/insider/insider-review/page/2/ currently established in the Myanmar Insider News about the AIRBM project.

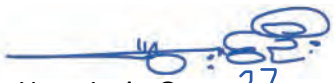
2. Amarapura Urban Development Project (AUDP)- This project has been formulated by the Mandalay Region Government since previous government period. AUDP will develop extension of urban area near river bank of southern part, has been permitted 20 acres from Region Government recently, and any of port development plan has permitted by Region Government and DWIR up to now, according to "The Conservation of Water Resources and Rivers Law 2006 and Regulation 2013". We reply this letter based on Minutes of discussion done by Region Government and our department in Mandalay.

Regarding with the Mandalay Inland Port Development Project assistant by Japanese Government through JICA, we DWIR would like to recommend as followed;

1. Mandalay Inland Port Development is G to G project, which will be treated 1st priority of our Department as National Project. Hence; Grant aids.
2. AUDP is urban development project and cannot be measured the conflict of interest to the Port Development plan with Container Facility by JICA. MDY Region government has permitted 20 acres for the project unit on the island.

However, DWIR is committed to develop Inland Port development along the Ayeyarwady and Chindwin River and Mandalay Inland Port Development is our 1st Priority Project with the assistant of Japanese Government.

Yours Sincerely,



Htun Lwin Oo
Director General
Directorate of Water Resources and Improvement of River Systems
Ministry of Transport and Communications
Republic of the Union of Myanmar

July 5, 2017

Ref. No. 635R6710/DOD/007

Attn. Director General
Directorate of Water Resources and Improvement of River System (DWIR)

Sub: Acknowledgement of your Updated Information of AIRBN Project and AUDP
Re: The Preparatory Survey on the Project for Development of Mandalay Port Technical Coordination Meeting held on June 12, 2017

Dear Sir,

Thank you very much for your kind cooperation for our survey on the above captioned Project.

We acknowledged your letter for "Updated information of AIRBM Project and AUDP Project" on June 27, 2017 (Your Ref. No. 146/AhKhaNa/AhKha-13(1)/2017), and we would like to express our appreciation of your clarification about AIRBN and AUDP Projects.

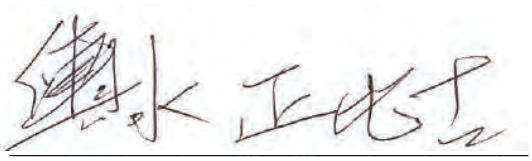
Based on your commitment on the river port development plan, we, the Consultant Team would continue to conduct the study of Mandalay Port Project.

However, we are considering that we have to pay attention to and to know the latest conditions of both Projects under conducting of the preparatory survey works of the Project.

For this purpose, we have plan to dispatch our Project Coordinator (Myanmar staff), from time to time according to the needs, to Mandalay and/or Nay Phi Taw to survey the latest situations and other necessary information about the Projects.

We would highly appreciate, if you could support for our survey, which may conduct by our Project coordinator for the above-mentioned purpose.

Yours Faithfully,



Masahiko Koshimizu
Chief Consultant
Joint Venture of
Oriental Consultants Global Co., Ltd.
Pacific Consultants Co., Ltd.
Fukken Co., Ltd.
on behalf of JICA Study Team

CC 1: Ministry of Transport and Communication, MOTC
2: Inland Water Transport, IWT
3: JICA headquarters
4: JICA Myanmar Office
5: OCG Yangon Office
6: File

The Republic of the Union of Myanmar
Ministry of Transport and Communications
Directorate of Water Resources and Improvement of River Systems

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Letter No. 222(a) /Ah Kha Na/Ah Kha-13(1)/2017
Date : 7th June , 2017

To

Mr. Katsuichi Yabunaka
Executive Technical Advisor to the Director General
Infrastructure and Peacebuilding Department
Japan International Cooperation Agency

Subject : **"Tool Port" for Management and Operation of Mandalay Port**

Dear Mr. Katsuichi Yabunaka,

We had discussion between our Myanmar Team and your Japan International Cooperation Agency Team on Second Preparatory Survey for the second outline design of the Project for Development of Mandalay Port in May, 2017 and sign Minute of Meetings.

Regarding with the Management and Operation of Mandalay Port, Myanmar Team mentioned its preference to "Tool Port" and stated that Myanmar side will finalize the port management and operation option and inform JICA in writing by the end of August, 2017.

So we'd like to inform officially about Myanmar's preference to "Tool Port" for port management and operation. However, we'd like to welcome advice from JICA to update during the time of implementation phase.

Sincerely,

Htun Lwin Oo
Director General
Directorate of Water Resources and Improvement of River Systems

The Republic of the Union of Myanmar
Ministry of Transport and Communications
DWIR Directorate of Water Resources and Improvement of River Systems

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Letter No. 222(b) /Ah Kha Na/Ah Kha-13(1)/2017
Date : 20th September , 2017

To

Mr. Katsuichi Yabunaka
Executive Technical Advisor to the Director General
Infrastructure and Peacebuilding Department
Japan International Cooperation Agency

Subject : **Management and Operation of Mandalay Port**

Dear Mr. Katsuichi Yabunaka,

We have send the letter which stated Myanmar's preference to "Tool Port" for port management and operation and thank you for your reply.

Regarding with the meeting in May 25, 2017 related to the Port Operation and Management, I'd like to confirm about our updated information of preference on the following four (4) points;

1. **Counterpart**
   DWIR (implementation phase) and IWT (operation phase)
2. **Management Committee**
   The committee will be organized later and member will be from DWIR, IWT, DMA and part time member from Mandalay Regional Government.
3. **Role of DWIR for Mandalay port operation and management**
   DWIR is the owner of the port.
4. **Role of IWT for Mandalay port operation and management**
   IWT is the port operator for port operation and management.

We hope this will be useful for your consideration on the Port Operation and Management.

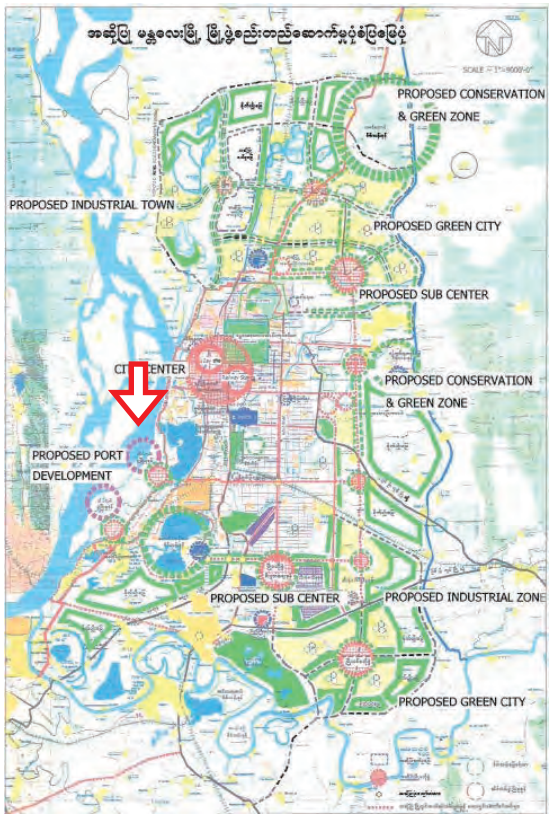
Sincerely,

Htun Lwin Oo
Director General
Directorate of Water Resources and Improvement of River Systems

資料6　候補地選定プロセスに係る資料

6-1　都市計画と候補地

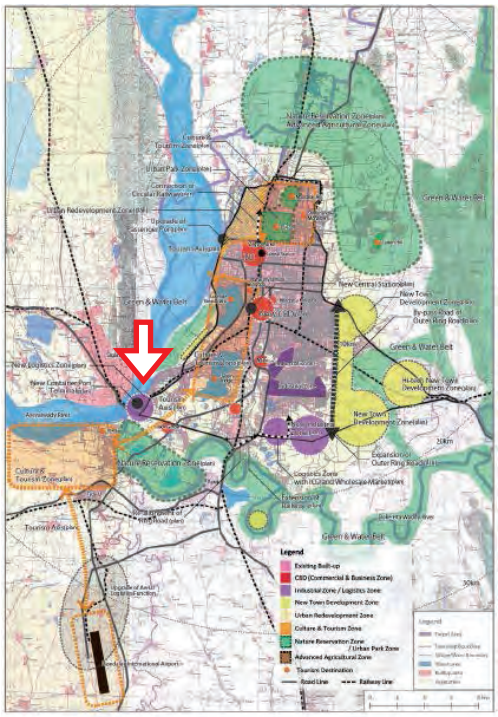
1. Urban Development Plans and Discussed Port Locations



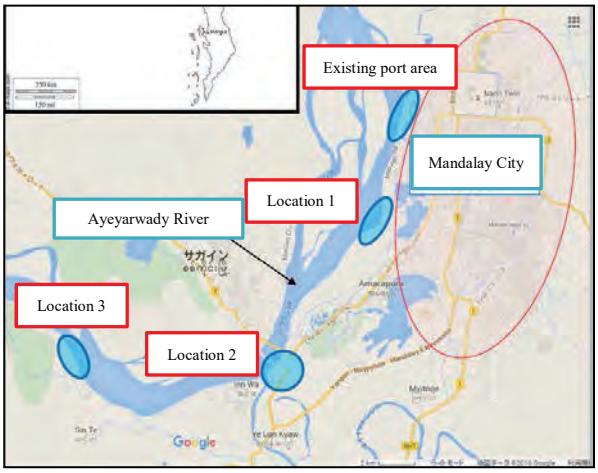
Mandalay Urban Development Conceptual Plan
MOC Myanmar, 2013

Feasibility Study on Inland Water Transport Facilities Improvement and Development Project
JICA 2014

Note: Option 3 (At Proposed Port Development location of Mandalay Urban Development Conceptual Plan) was selected during Feasibility Study



Proposed Spatial Plan of Mandalay
JICA, 2016



Development Project Accountability Committee
MOF Japan, 2016

Note: Location 1 ~ 3 will be compared in this survey and one location will be selected.

2. Descriptions of Candidate Port Locations

Location 1

Description

- **General:** This location was proposed in the Feasibility Study (JICA 2014).
- **Water Depth:** Jetty was proposed at the location -2.0m below lowest water level
- **Ground Condition:** Soil borings at 3 points were conducted. Soil condition is generally good.
- **Sedimentation Risk:** Relatively low.
- **Consistency to City Plan:** Consistent to the Mandalay Urban Development Conceptual Plan MOC Myanmar, 2013.
- **Future Expansion Area:** Wide space on dry river bed is available.
- **Influence to City Traffic:** Generally low. (access to Myo Patt Rd. proposed outer ring rd. by Conceptual City Plan 2016)
- **Social Environment:** There are a few seasonal farmers cultivating dry river bed during low-water season.
- **Land ownership:** Owned by government and under DWIR's administration. There is cultivated land for only dry season.
- **Construction Cost:** Feasibility Study estimated 3 ~ 4 Billion. JPY (30 ~ 40 Million USD)
- **Others:** EIA report had already been submitted to MONREC (to be confirmed).

Location 2

Description

- **General:** This location was proposed in the Urban Development Plan for Mandalay 2040 (JICA 2016). The port area is proposed to be between Yadanabon Bridge and Inwa Bridge.
- **Water Depth:** To be confirmed. It seems generally deep.
- **Ground Condition:** Availability of soil investigation to be confirmed.
- **Sedimentation Risk:** Low.
- **Consistency to City Plan:** Consistent to the Urban Development Plan for Mandalay 2040 (JICA 2016).
- **Future Expansion Area:** Limited between Yadanabon Bridge and Inwa Bridge. (350m x 700m; 24ha)
- **Influence to City Traffic:** Generally low. (access to proposed outer ring rd. by Conceptual City Plan 2016)
- **Social Environment:** There are many houses and cultivated land. Re-settlement will be required.
- **Land ownership:** Outside the land under DWIR's administration. There are houses and cultivated land for all seasons.
- **Construction Cost:** Lower than Location 1 (to be confirmed)
- **Others:** New bridge law should be confirmed. (the limitation of facility installation near to bridge foundation)

Location 3

Description

- **General:** This location is located approximate 30 ~ 40 km distant from Mandalay City Center.
- **Water Depth:** To be confirmed. It seems generally deep.
- **Ground Condition:** Availability of soil investigation to be confirmed.
- **Sedimentation Risk:** Low.
- **Consistency to City Plan:** Location is out of Mandalay City. Not mentioned in the City Plan.
- **Future Expansion Area:** Wide space in cultivated land is available.
- **Influence to City Traffic:** Generally low.
- **Social Environment:** Land area is the permanent cultivated land. Re-settlement will be required.
- **Land ownership:** Outside the land under DWIR's administration. There is cultivated land for all seasons.
- **Construction Cost:** Higher than Location 1 (to be confirmed). The cost for access road will be higher. (approximately 20 km of road improvement will be required)
- **Others:**

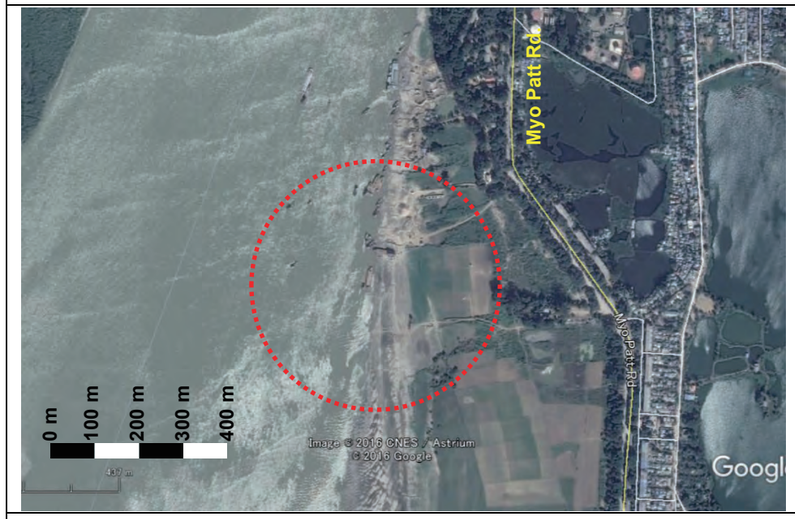
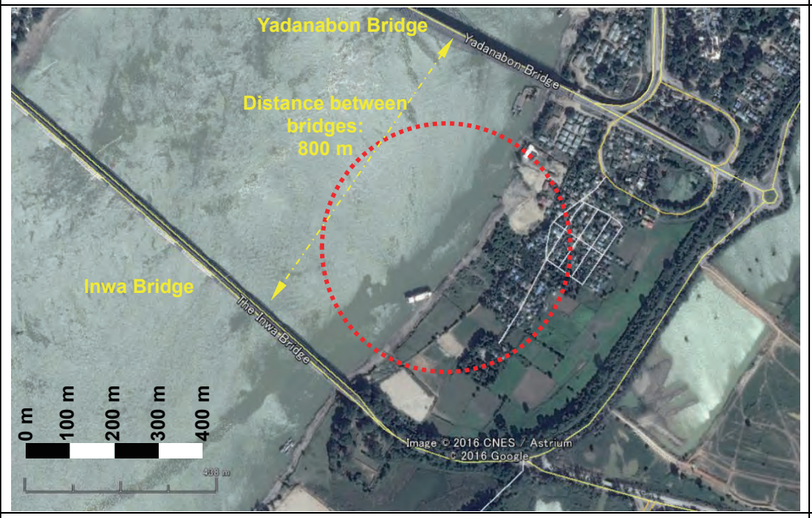
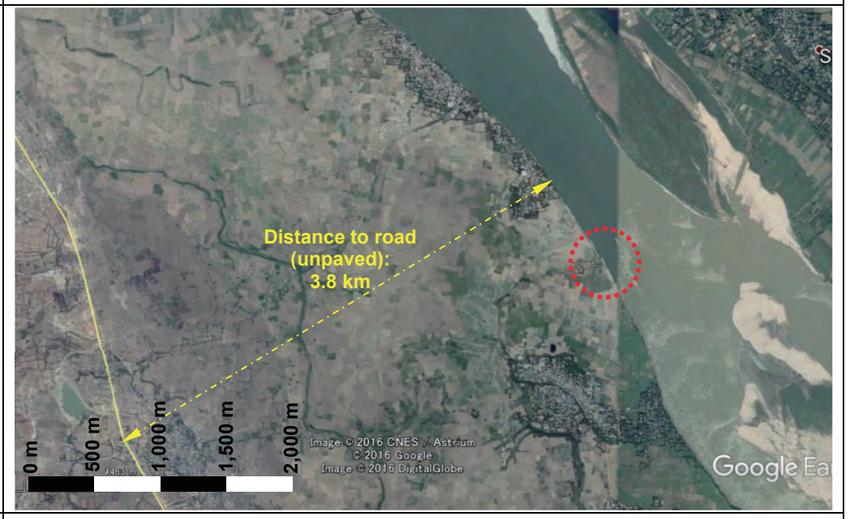
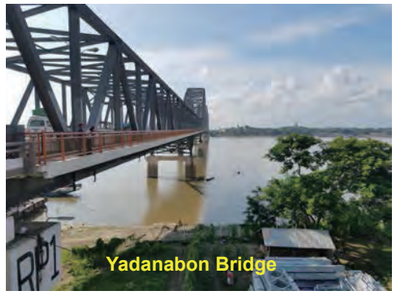
3. What are important criteria for decision making?

Following criteria and ratings will be discussed with DWIR/IWT and decision will be made by counterpart authorities.

(Example)

	Criteria		Sub-criteria	Location 1	Location 2	Location 3
1	Natural Condition	1-1	Water Depth	(rating)	(rating)	(rating)
		1-2	Sedimentation Risk	(rating)	(rating)	(rating)
2	Consistency to City Plan	2-1	Access to Industrial/Commercial Area	(rating)	(rating)	(rating)
		2-2	Influence to Traffic Congestion	(rating)	(rating)	(rating)
3	Future Expansion Area	3-1	Open Space Around the Location	(rating)	(rating)	(rating)
4	Construction Cost	4-1	Additional Cost Bared By Myanmar Side	(rating)	(rating)	(rating)
5	Environmental Impact	5-1	Resettlement	(rating)	(rating)	(rating)
6	Others	6-1	Legal Restriction, etc.	(rating)	(rating)	(rating)
Judgment				(A/B/C)	(A/B/C)	(A/B/C)

Outline of Candidate Locations

Location 1	Location 2	Location 3
		
		
		

Description		Description		Description	
General	F/S 2014 JICA	General	Urban Development Plan for Mandalay 2040 (JICA 2016)	General	-
Water Depth	-2.0m (rather shallow)	Water Depth	Shallow (less than -1.0m, advised by DWIR)	Water Depth	It may be deep enough (subject to survey)
Sedimentation Risk	Some risk but acceptable	Sedimentation Risk	There is some risk (advised by DWIR)	Sedimentation Risk	It may be less risk (subject to survey)
City Plan	Consistent to masterplan 2013 (MOC, MCDC)	City Plan	Consistent to Urban Development Plan (JICA 2016)	City Plan	Outside Mandalay City
Future Expansion	Wide dry riverbed exists behind port	Future Expansion	Rather small	Future Expansion	Wide farm field exists behind port
City Traffic	Connect to Myo Patt Rd. (Outer Ring of Mandalay)	City Traffic	Connect to Southern Outer Ring of Mandalay	City Traffic	Less influence
Resettlement	A few seasonal farmers	Resettlement	There are houses and farm field	Resettlement	There is permanent farm field at the port area
Land Owner	Government (DWIR)	Land Owner	Private owned (to be surveyed)	Land Owner	Private owned (to be surveyed)
Const. Cost	30 – 40 Million US$ (F/S 2014)	Const. Cost	Less than Location 1 (less access bridge/access road)	Const. Cost	High (long access road shall be constructed: 20km approx..)
Others	EIA report had already been submitted to MONREC (to be confirmed)	Others	The limitation of facility installation near to bridge foundation should be confirmed	Others	

6-3　候補地選定に係る比較検討

Preliminary Assessment of Port Location

1. Rating Table

The JICA Study Team has conducted the preliminary assessment based on the request by DWIR/IWT discussed in the meeting held on 16th February 2017 between JICA Study Team and DWIR/IWT officers. This assessment was prepared for the purpose to enhance further discussions in the Counterpart authorities lead by MOTC and for final decision of the port location.

No	Criteria	Location 1	Location 2	Location 3
1.	Natural Condition			
1.1	Water Depth	B	C	A
1.2	Sedimentation Risk/Maintenance Dredging	B	C	A
2.	Consistency to City Plan			
2.1	Access to Industrial/Commercial Areas	A	A	C
2.2	Influence to Traffic City Congestion	B	A	A
3.	Social Environment (Resettlement) & Implementation Schedule	B	B (-) ?	B (-) ?
4.	Future Expansion Area	A	B	A
5.	Construction Cost	B	A	C
6.	Safety of Ship Maneuvering	A	B	A
7.	Competitiveness against Rail/Road Transport	A	A	C
8	Legal Restriction	○	×	○
	Assessment (Preliminary)	A	C	B

Remark: A: suitable
B: fairly suitable
C: poorly suitable

2. Descriptions of Each Rating

1	1.1	(Water Depth) Location 1. : Rather shallow (-2.0m) ⇒ "B" Location 2. : Water depth become shallower in recent years based on the survey results. Location 3. : It is estimated the depth would be deep enough from river configuration (more than 2.0m) ⇒ "A"
	1.2	(Sedimentation Risk) Location 1.: There is a slight risk of sedimentation from the result of river-bed deformation analysis ⇒ "B" Location 2. : There are rather high risk for sediment. Location 3. : It is estimated the risk of sedimentation would be less than Location 1. from river configuration (river flow speed would be higher than location 1) ⇒ "A"
2	2.1	（Access to Industrial / Commercial Areas）

		Location 1.: The port is located southern center of city, where city commercial area is closed. It has access to southern industrial/logistic area by Myo Patt Rd. (assumed outer ring load of the city) ⇒ "A" Location 2.: The port is located closed to the future industrial/logistic area. The location is the proposed port area in the updated city development plan. ⇒ "A" Location 3.: The port is far from the city center (40km by roadway to commercial center, 17km to Tada-U junction of expressway) ⇒ "C"
	2.2	(Influence to Traffic City Congestion) Location 1.: The port is located along Myo Patt Rd. (assumed outer ring load of the city). The traffic of this road will be increased. ⇒ "B" Location2.: The port is located outside of high density traffic routes. Influence to the city traffic is rather small. ⇒ "A" Location 3.: The port is located far from the congested city roads. ⇒ "A"
3		**(Social Environment (Resettlement)) (Critical Factor; See Item 3)** **Location 1.: There are seasonal farmers in the port area. Though the area is state-owned, there are illegal private groups involving farmers by exchanging land with money, where total solution seems not easy at present. ⇒ "B"** **Location 2.: Part of the land is owned by the government authorities (MOC and MOTC), but the rest of the area is owned by local people. The requirement of 'resettlement' exists as Location 1. ⇒ "B"** **Location 3.: The port area is private-owned farmland, where land acquisition from farmers for port and access roads is necessary. ⇒ "B"**
4.		(Future Expansion Area) Location1.: Wide expansion area is available at dry riverbed behind the port. ⇒ "A" Location 2: Rather smaller expansion land space. Berth expansion will be limited as two bridges exist. ⇒ "B" Location 3.: Wide expansion area is available behind the port. ⇒ "A"
5.		(Construction Cost) Location 1.: The former F/S estimated 30 - 40 million US$ for construction, in which the cost for access road and jetty access bridges was required. ⇒ "B" Location 2.: From land configuration and water depth of the water front, the construction cost is expected to be less than Location 1. ⇒ "A" Location 3.: Port construction cost is estimated to be the similar level to Location 2. But the cost of access road will be big burden to the project. (approx. 4km new road construction, approx. 8km widening and road pavement, etc. will be required) ⇒ "C"
6.		(Safety of Ship Maneuvering) Location 1.: Easy ship berthing & de-berthing in the wide front water area. ⇒ "A" Location 2.: The possible risk for maneuvering and accidental damage to bridge pier should be carefully considered. It seems the maneuvering water area would be sufficient. ⇒ "B" Location 3.: Easy ship berthing & de-berthing in the wide front water area. ⇒ "A"

3. Preliminary Assessment by JICA Study Team

The counterpart authorities (DWIR and IWT) particularly emphasized the following points with respect to the port location.

1) Early implementation of the project is one of the highest required factors for the project. The target time frame is to be commencing operation of the port in the middle of 2020.
2) In order to minimize the negative impact to the local communities, the risks of social environmental impacts should be reduced as much as possible. It also enables to reduce the implementation cost burden to the Myanmar government side (land acquisition and compensation to the households, etc.) and to accomplish early

implementation of the project.

In this context, all the candidate locations seem to have similar challenges to be solved.
JICA Study Team assesses that Myanmar government should carefully survey the land ownership of the project site to clarify the requirement of the land acquisition and resettlement. If the involuntary resettlement and/or land ownership transfer will be necessary, A/RAP (agreement for resettlement of the local inhabitants) and land transfer shall be completed by the date of draft outline design scheduled on middle of November, 2017 and/or agreed deadline to be stated on the minutes of discussions.
The land shall be ready to use for the Project on or before the Tender Notice of the Project if the project is approved to implement by the Grant by the Japanese Government. The JICA Study Team would like to confirm the critical issues for decision making for port location during this initial site survey period as follows,

1) Time limit:
   Port location shall be decided by the end of March 2017, considering the time frame.
2) The most critical criteria:
   The most critical criterion to make decision is deemed to be the "Social Environment", which requires the budget and time for land acquisition and for resettlement.
3) Decision maker for port location:
   Decision maker is assumed to be DWIR (or MOTC as its governing authority), i.e., implementation authority for the project.
4) Decision making procedure:
   Decision maker is required to coordinate opinions of the relevant parties/authorities (such as MCDC, MRG and MOC) and to formulate the final decision of the port location.
5) Budget issue:
   If the land acquisition or compensation for resettlement of households will be necessary, the implementation authority is required to make a budget for such purpose.

JICA Study Team would like to discuss and confirm the concrete time-frame, task and responsibility to reach the final decision for the port location by Myanmar side by February 23, 2017, during the JICA Study Team stay in Nay Pyi Taw, based on the above confirmations.

Support by the JICA Team after the decision making
The decision making of the port location shall be made by the Government of Myanmar. The JICA Study Team will assist the counterpart authority for implementation of the social environmental solution by making a draft of A/RAP and a draft of IEE/EIA report to achieve the project be completed according to the timeframe.

4. Division of role with Development of Si Mee Khon Port (SMP) at Myo Tha Industrial Park City (MIPC)

Si Mee Khon Port (SMP) is being developed by Myo Tha Industrial Park City (MIPC) project and currently starting operation. This port will be open to public use. The port has the capacity to handle container/general cargo and transport route to Mandalay city is under development. The distance between SMP and Tada U expressway junction is approximately 70km.

The JICA Study Team has the opinion that the Mandalay Port should be required to contribute the future development of the city. The following points were obtained through the site visit survey and hearing opinions of the port users.

1) SMP is located far distant from Mandalay City (approximately 70km), where the road transportation cost will be burdened onto the inland water transportation cost. The price of transportation will not be competitive against the rail/road transportation. (opinion raised by Freight Forwarders Association)
2) The existing access road toward Mandalay City is not good condition. Access to the City or express way should need more investment for improvement. (from site visit survey)
3) SMP was mainly developed for MIPC, while it is open to public in order to raise the income from port operation. Mandalay Port will be solely developed as a public port for the Mandalay citizens to handle consumer related cargos to contribute the growth of regional economic growth. Two ports will have the different aims but the division of roles will be suitable for achieving total regional development. (from discussions with Mandalay Myotha Industrial Development Public Co., Ltd. (MMID))
4) The existing SMP facility is a floating jetty, which is still under improvement from engineering viewpoint regarding solution against river sedimentation. (from site visit survey)

資料7　大使館説明資料

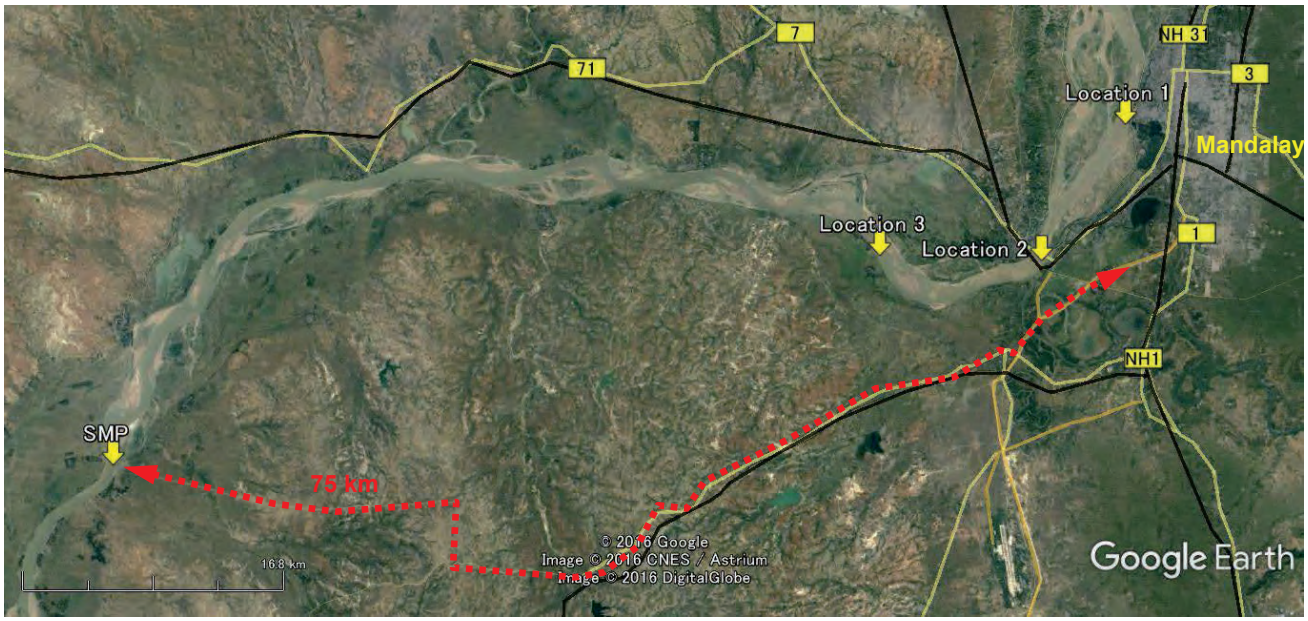
7-1 シミコン港に関する概略分析

1. 4 つの候補地の位置づけについて

港湾位置選定に関する論点は以下の通り 2 点に分かれる。本資料では、この内**「論点１」**について分析する。

論点1
- ●新規港湾を建設する → 論点2 場所の選定
  - ●候補地1（Location 1）
  - ●候補地2（Location 2）
  - ●候補地3（Location 3）
- ●新規港湾を建設しない（シミコン港を活用）

検討すべき港湾位置を下図に示す。シミコン港（SMP）はマンダレーからエーヤワディー川下流約 75km 付近に位置する。



2. 港湾間の距離について（事例から）

既存のシミコン港に加えて、マンダレーに新港を建設すべきか、という論点に関して、世界の河川港湾の事例を、①港湾と市街地との距離、②主要港湾が複数ある場合の港湾間の距離、の 2 点について検討した。

● ミャンマー、ティラワ地区とヤンゴン地区

ヤンゴンの港湾はヤンゴン市外に隣接しているものの、拡張余地の制限とモンキーポイントの通過に喫水制限があること等から新規港湾を約 16km 下流のティラワ地区に展開中である。しかし、道路事情の悪さとティラワ～ヤンゴンの陸上輸送費による輸送コストの増加の点で、コンテナ輸送がなかなかティラワ地区にシフトできていない状況である。

道路整備の必要性と陸上輸送による輸送コストの増加という点は、マンダレー港とシミコン港に類似する面がある。

● メコン川沿いの港湾

カンボジア・プノンペン港では、初期の港湾は市街地に建設され、1) 拡張余地が制限されるため、2) 市街地の交通量緩和のため、の 2 点の理由から、約 20km 下流に新港を建設した。

ラオス・ビエンチャン港は、メコン川沿い市街地に隣接する複数の荷役施設で貨物を処理している。

ベトナム・カントー、ロンスエン、ホングでは、いずれも市街地に隣接する位置に港湾が建設されている。カントー・ロンスエン間、ロンスエン・ホング間の水路距離はいずれも約 50km である。

● ライン川のコンテナ輸送

ライン川沿いの内陸 1,200km に位置するバーゼルまでの主要コンテナターミナルは 18 港であり、いずれのターミナルも都市に隣接して建設されている。

主要コンテナターミナル間の距離は約 70km である。

● マンダレー港の場合

これら事例から、以下の点が指摘できる。

① 港湾と市街地との距離

大都市の河川港湾を都心部からマンダレー・シミコンのような 70㎞ 以上遠隔地に設ける事例は見当たらない。プノンペン港のように 20km 程度ならば事例があるが、同港はメコン川沿いでプノンペンに繋がる国道 1 号線に隣接した交通アクセスが既に存在する立地条件である。ヤンゴン港とティラワ港は約 16km の距離である。**マンダレー港候補地 1 のように拡張余地があり道路整備が最小限ですむ市街地に近い位置に港湾を建設するのが事例から一般的**と言える。

② 主要港湾が複数ある場合の港湾間の距離

マンダレー・シミコンの 75㎞ の距離は、事例から主要港湾どうしの距離と同等である。

ミョータ工業団地専用港としてのシミコン港と、都市圏の公共港湾としてのマンダレー港は、両港が競合することなく役割分担することが相応と考えられる。

3. MMID シミコン港視察からの調査団の技術的評価・見解

● 試験的な浮桟橋の側面

シミコン港の浮体桟橋は、昨年雨季前に設置され、1 シーズンの雨季を経て斜路が土砂堆積により使用困難となり、現在係留方式を改善工事中である。埋没の主な原因は、自然河岸を掘り込んで斜路を建設した事と MMID が分析している。改善工事は、2 か所の擁壁を設置し、土砂の進入を抑制するとともに浮体の位置を固定させる方式に変更するためのものである。

こうした改善が効果を発揮するか否かは、今後の雨季の堆積状況をモニターしつつ**さらに改善していく必要がある**と考えられ、**岸壁を良好な状態で稼働させるには 2～3 年の期間を要する**とみられる。

自然河岸を掘り込んで斜路を建設した浮桟橋（シミコン港パンフレット）

シミコン港改善工事の状況（2 か所の擁壁を設置）2017/2/18 撮影

● 荷役効率の側面

浮桟橋のスペースが狭く、荷役車両を桟橋上に展開することができない構造になっている。従って、本格的に**高効率な機械荷役を行うには適切とは言えない規模**である。

斜路の勾配も急勾配で、迅速な車両輸送が難しいと言える。また、渡橋と斜路が逆勾配（＼／の形）になっており、**大型車の通行に難**がある。

MMID によれば、岸壁の拡張は今後の需要次第で建設するとのことだが、新規に建設する場合は本格的荷役を可能とする固定式の桟橋を建設したいと述べている。現在の浮体構造は建設費が安価だが、固定式桟橋の建設には JICA で計画している岸壁と同等のコストを要すると考えられる。

シミコン港の浮体構造と渡橋

● マンダレー市街地までのアクセス

MMID によれば、シミコン港からミョータ工業団地までのアクセス道路は工業団地民間投資で建設中である。一方、ミョータからマンダレーまでのアクセスは、現在二車線舗装道路でつながっているものの、**コンテナ輸送に供するには舗装改善、拡幅、一部小規模橋梁建設等が必要**である。

MMID は、工業団地と空港とのアクセス改善のため、新規道路建設（約 38km）を計画し、MRG と協議中である。空港アクセスが完成すれば、ヤンゴン・マンダレー高速道路との連結が容易で、マンダレー市街地へのアクセスが改善される。ただし、**空港アクセス建設費約 30~40 億円（MMID 試算）に加えて、現行の高速道路（特に空港からマンダレーまでの約 20km）をコンテナ輸送用に改善する必要**があり、**資金調達の目途は立っていない**。

こうした状況から、港湾施設が現存しこれに対する投資は将来にわたり民間 MMID が負担すると仮定しても、**アクセス道路改善に係る公共投資が今後必要**であり、公共側の必要投資額は市街地に近接する港湾建設と同規模の初期投資が必要となるものと推察される。

● シミコン港とマンダレー港の役割分担に関する見解

シミコン港は、ミョータ工業団地の企業群の貨物輸送を本来の目的とする民間資金により建設された港湾であるが故、今後**工業団地の稼働が本格化すれば、取扱貨物は工業団地顧客が優先される**ものと考えられる。

MMID の経営方針は、港湾貨物需要があり貨物取扱のみで利益が得られるならば、港湾を公共貨物にも開放し、稼働率を上げたいと考えているようである。

こうした民間運営の港湾と公共運営の港湾の重要な相違は、**内陸水運全体の活性化を目的とした適切な料金体系の維持ができるか否か**と考えられる。**シミコン港の荷役料金や貨物保管料を公共機関が関与しないと、道路輸送、鉄道輸送、水運輸送のバランスの取れた発展は難しい**と考えられる。

役割分担のシナリオ１．

① 工業団地の貨物を優先し公共輸送にも開放する民間運営港湾（シミコン港）と、
② 都市の一般貨物（消費財等）を主に扱う公共運営の港湾（マンダレー港）
という役割分担

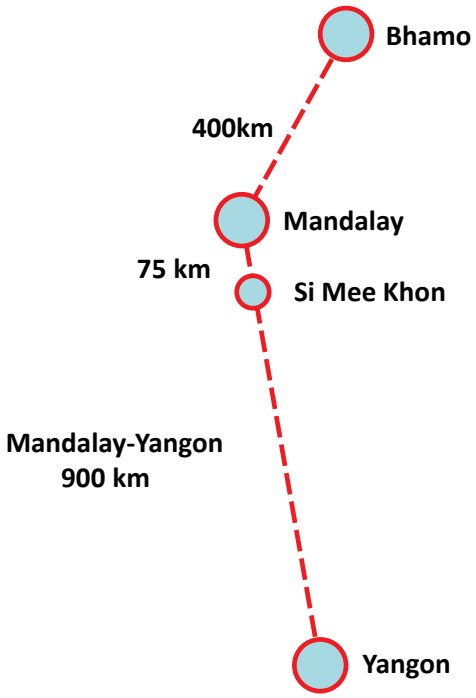
シミコン港の岸壁は季節水位差に追随する浮体式構造である。浮体式構造は、通常のクレーン荷役の他 RoRo バージ船による車両・自走式建設機械等の揚げ降ろしに適している。

仮に新設マンダレー港の岸壁構造を固定式の本格的荷役施設とした場合、次のような役割分担も考えられる。

役割分担のシナリオ２．

① 輸入車両・建設機械の陸揚げ基地としての港湾（シミコン港）と、
② コンテナを含む一般貨物の荷役基地としての港湾（マンダレー港）
という役割分担

4. シミコン港とマンダレー港の位置関係とマンダレー都市圏の貨物輸送量



マンダレーの貨物輸送量概況(t/day)

輸送量	ヤンゴン～マンダレー	マンダレー～北部ミャンマー
道路輸送	15,000	2,000
鉄道輸送	1,500	1,300
水運輸送	800	1,200

マンダレーを中心とした南北ミャンマーの内陸水運輸送の模式図を左に、概略輸送量の規模を上表に示した。マンダレーを中心とする水陸の貨物輸送量は以下の特徴を持つ。

●北部ミャンマーの貨物

北部ミャンマーを仕向け・仕出しとする貨物は、マンダレー発着の全貨物量の約 2 割程度である。マンダレーより北の地域では道路網が発達していないため、水運輸送の占める割合が比較的多く（約 3 割)、これは、道路状態が悪化する雨季に比重が多くなると推察できる。

●　南部ミャンマーの貨物

南部ミャンマー（特にヤンゴン）を仕向け・仕出しとする貨物は、マンダレー発着の全貨物量の約 8 割程度である。マンダレーより南の地域では、国道や高速道路が整備されているため、水運輸送に占める割合は低く（5%程度)、ほとんどの貨物は道路または鉄道により輸送されている。水運による輸送比率が低い理由は、主として水運荷揚げ設備がなく人力による貨物のみが水運輸送されるからと考えられる。内陸水運港湾が整備されれば、水運輸送比率はある程度上がると予想される。

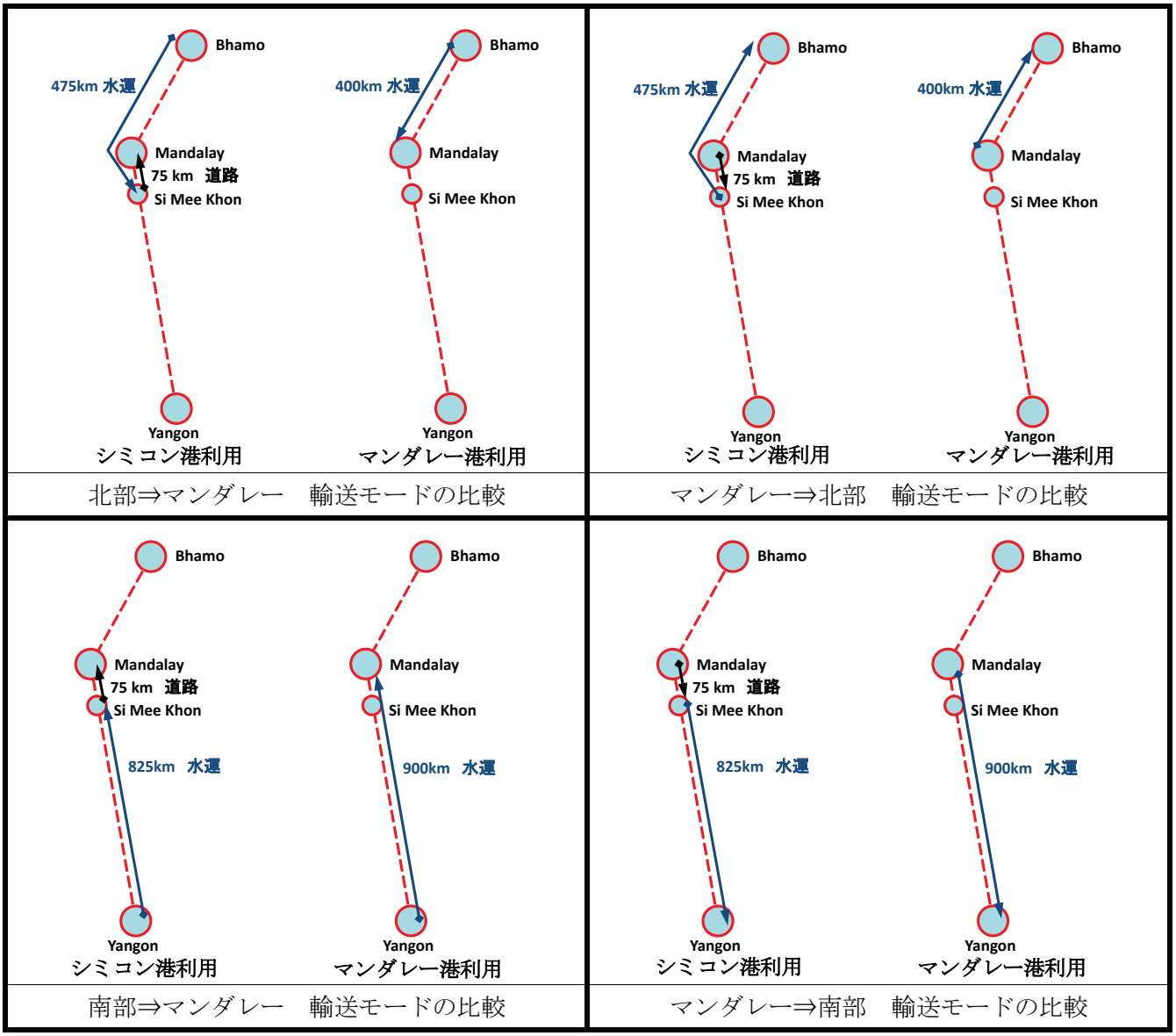
●輸送モードの比較（シミコン港とマンダレー港の比較)

次ページにマンダレー都市圏発着の貨物輸送の概念図を、道路・水運のモード別に示した。

1) 北部ミャンマー発の貨物をマンダレー都市圏へ輸送するには、シミコン港を利用する場合はマンダレー港を利用する場合に比べ、**約 75km の距離を水運及び道路輸送で往復する時間とコストがかかり、水運でマンダレー港を利用する方が圧倒的に有利**である。

2) 南部ミャンマー発の貨物をマンダレー都市圏へ輸送するには、シミコン港を利用する場合はマンダレー港を利用する場合に比べ **75km の距離を道路輸送するコストが割高となり、これも水運輸送が有利**になると言える。

以上の輸送モードの比較考察をもとに、次項で輸送コストについて概算比較する。



5. 「シミコン港利用の場合」と「マンダレー港利用の場合」の輸送コスト比較

● 輸送コスト単価概算

まず、調査済みのヤンゴン・マンダレー間の輸送コストから、道路輸送と水運輸送の 1km 当たりの輸送コストは以下の表の通りとなる。

マンダレー･ヤンゴンの輸送費

	料金 (Kyat/t)	距離 (km)	1km 当たり料金 (Kyat/t･km)
道路輸送	36,000	900	40.0
水運輸送	13,000	900	14.4

● 「シミコン港利用の場合」と「マンダレー港利用の場合」の輸送コスト比較

上記の概算単価をもとに「北部貨物」「南部貨物」のカテゴリー別に輸送コストを比較すると、以下の表の通りとなる。

マンダレー・ヤンゴンの輸送費を基にした概略輸送費の比較

輸送モード	輸送距離 (km)		料金 (Kyat/ton)				料金増加率 (%)
	道路	水運	道路	水運	積替	合計	
北部・マンダレー港利用	10	400	400	5,760	4,000	10,160	40%
北部・シミコン港利用	85	475	3,400	6,840	4,000	14,240	
南部・マンダレー港利用	10	900	400	12,960	4,000	17,360	11%
南部・シミコン港利用	85	825	3,400	11,880	4,000	19,280	

マンダレー港を建設した場合、北部地域・マンダレー都市圏間の貨物輸送コストはシミコン港を利用すると**40%料金が上がる**ため、**ほとんど全ての貨物はマンダレー港を利用する**と考えられる。
同様に、**南部地域・マンダレー都市圏間の貨物輸送コスト**もシミコン港を利用すると**11%料金が上がる**ため、**マンダレー港を利用する荷主が多くを占める**と予想できる。

● ミャンマー・フォワーダー協会の意見

ミャンマー・フォワーダー協会の意見では、こうした**マンダレー市外からの道路輸送コスト増を避けるため、マンダレー港はできる限り市街地に近い位置に建設すべき**であるとのことであった。上記のコスト比較はそれを裏付けている。

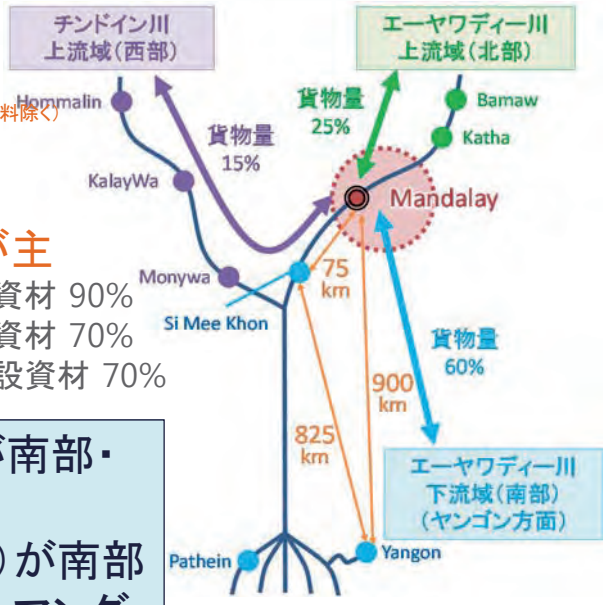
● 内陸水運事業と道路輸送との競合・水運事業の振興について

一般的に、水運輸送は、道路輸送に比べて輸送時間が長く、トラック輸送のようなドア・ツー・ドアのサービスがない点で敬遠される場合が多い。これが、道路事情の良いヤンゴン・マンダレー間で水運が他のモードと比べて利用されにくい理由の一つである。その半面、輸送貨物規模が大きい場合は輸送コストが下がり、社会経済活動に貢献できる利点を有している。
ミャンマー国は、同国経済発展のための重要な輸送モードの一つとして内陸水運事業の活性化を目標としており、機械荷役が可能な近代的な港の全国展開へのさきがけとして、大都市マンダレーの港湾を**パイロット事業として早急に建設したい**と望んでいる。
こうした観点から、**水運事業をより円滑に発展させるため、マンダレー港を介する水運輸送コストをできるだけ低くする施策は重要**であり、喫緊の課題である。この点において、**マンダレー港を市街地に隣接した位置に早期に建設すべき**と考えられる。

（1）マンダレー港の取扱貨物

■取扱貨物量の状況

- マンダレーを発着する内陸水運貨物は年間約80万トン（砂、液体燃料除く）
- 方面別では、南部方面が多い
  - ✓ 南部60%、北部25%、西部15%
- 品目別では、建設資材、農産品が主
  - ✓ 【南部】移入：農産品 50% / 移出：建設資材 90%
  - ✓ 【北部】移入：農産品 60% / 移出：建設資材 70%
  - ✓ 【西部】移入：建設資材 60% / 移出：建設資材 70%



特徴①：農産品（米・豆・砂糖黍等）が南部・北部からマンダレーへ
特徴②：建設資材（セメントや鉄筋等）が南部からマンダレーへ / 一部は、マンダレーを拠点として北部や西部へ

マンダレーは国内第二位の商業都市として、ハブ的な機能を担う

（2）マンダレー新港とシミコン港の役割

■マンダレー新港とシミコン港の役割

- マンダレー新港とシミコン港では、役割が異なる。

マンダレー新港
【市民生活を支える港湾】

・主な貨物：
- 市民生活を支える「食料」
- 背後産業のための「建設資材」

・背後需要（マンダレー都市圏）：
- 年間80万トン（砂、液体燃料除く）

・港湾施設：
- 取扱能力 24万トン/年（対象施設）
- 延長180m（2バース）
- 固定式桟橋（予定）
- コンテナ荷役機械（40ft対応）,等

・旅客輸送：
- 旅客ターミナルを整備

シミコン港
【工業団地のための産業港湾】

・主な貨物：
- 工業団地立地企業の貨物
- 「原材料」の移入、「製品」の移出

・背後需要：
- 工業団地（MIP）発生・集中貨物

・港湾施設：
- 取扱能力 5万トン/年
- 延長50m（1バース）
- 付帯式桟橋
- コンテナ荷役機械、等

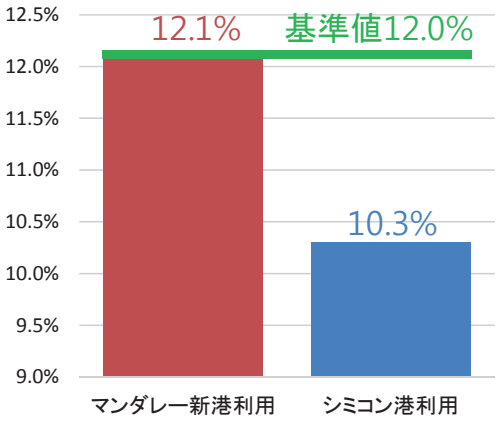
・旅客輸送：
- なし

(3)プロジェクト実施による効果

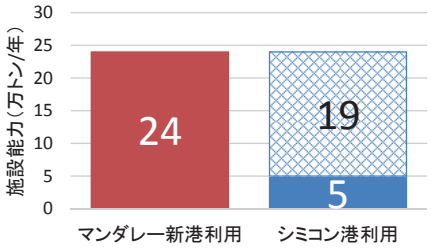
■経済分析による比較

- 年間取扱能力(需要)を同等と設定
  - ✓ マンダレー新港:計画取扱能力24万t
  - ✓ シミコン港:計画取扱能力5万t+α
- 整備費用は、同等と設定
  - ✓ シミコン港からマンダレー市街地までのアクセス道路整備費用を除外
- 整備による効果(便益)は、整備前後の差分より算出(without-with)
- 供用期間は30年間と設定
  - ✓ 荷役機械の維持管理費も考慮

◆マンダレー新港利用:
EIRR=12.1%>12.0%
◆シミコン港利用:
EIRR=10.3%<12.0%



EIRRの比較



年間取扱能力の設定

(4)マンダレー新港開発への日系企業の関心

運送・荷役事業者

■マンダレーは北部のハブ的機能を有す(マンダレーでも倉庫事業を展開)
■ミャンマー国内の陸上輸送費用>水運輸送費用の2~3倍と割高
■内陸水運は、「コンテナ輸送」、「長尺貨物」、「重量貨物」等の輸送に最適
■特に、時間価値の低い貨物に優位
▼税関機能があれば、将来的に発展
■マンダレー新港の開発に期待

水運事業者

●マンダレー港でのコンテナ航路事業の参入に意欲
●船舶の安全な係留、定時性の確保のため、マンダレー新港の開発に期待
★税関・輸出入手続きの実現に期待

港湾利用者

▲マンダレーは、北部ミャンマーのハブ(物流、人流の結節点)
◆陸上インフラが脆弱、非効率な物流
▲生活産業・食のバリューチェーンを展開
▲食材関連貨物、車両、バイク、部品の輸送モードとして水運機能強化に期待
▲水運の強化、貨物の保管機能の強化が課題(ヤンゴンと比べて物資が割高)
◆輸送モードの転換、新規需要の喚起に期待(重量物だけでなく、振動に弱い貨物等)
◆港湾の運営以外の事業の展開が必要
◆港湾運営は、各種リスク回避が課題(政府保証、現地通貨の海外送金等)
◎原材料の90%が輸入。マンダレー新港開発による輸送改善に期待

※日系企業ヒアリング結果に基づき整理(■A社、▼B社、●C社、★D社、▲E社、◆F社、◎G社)

資料8　構造形式選定にかかる説明文書

Explanatory Note
for
Selection of Structure Type of Jetty
on
the Preparatory Survey
for
the Project for Development of Mandalay Port

1. Introduction

This explanatory note was prepared by the JICA Study Team to obtain understanding of counterpart authorities of Myanmar on the issue of selection of structure type of jetty for Mandalay Port. JICA study team would like to receive the final consent of the counterpart authorities on the type of jetty structure during the 2nd Field Survey scheduled in the end of April 2017.

2. Brief Explanation of the Past Study (FS 2014)

In the feasibility study on the project for development of Mandalay Port completed in 2014, two types of jetty structures (Floating type and Fixed type) were discussed.

The report described the advantage of floating jetty considering initial river port development which aims to introduce equipment cargo handling operation. The main advantage of the floating type is that the manual cargo handling is very easy because the height of ship's deck and surface of jetty top could be adjusted to the same elevation for all seasons. This discussion was derived from the existing circumstance that main type of the ships running inland waterway were "passenger-cum cargo ships" which has rooftop and were not suitable for equipment operation by using lifting crane. The Study Team of the feasibility study assumed that numbers of existing type of ships will not disappear very soon, and the large sized floating jetty was designed (L 90 m x W 25 m) so that lifting crane (100 tons capacity) should be workable with less sway and movement of floating jetty, while conventional worker's manual cargo handling should also be very easy.

However, the feasibility study pointed out the serious risk of the floating type jetty that river siltation might cause damage on the floating body. If the water depth under the large floating jetty would become shallower than the draft of the floating jetty, the jetty bottom will touch to the riverbed, which causes uneven bending moment in the floating body and may cause damage. It is not easy to repair the large floating body if this risk occurs.

The feasibility study conducted a numerical analysis (preliminary level) of riverbed movement around the planned jetty location for flood season in order to estimate the risk of siltation. The result of the analysis implied some risk of siltation though the risk was not crucial.

Feasibility study had not reached a conclusion, recommending further accurate analysis and continuous observation of riverbed movement at the jetty location to finalize the type of jetty structure.

Fig.1 Floating Type Jetty

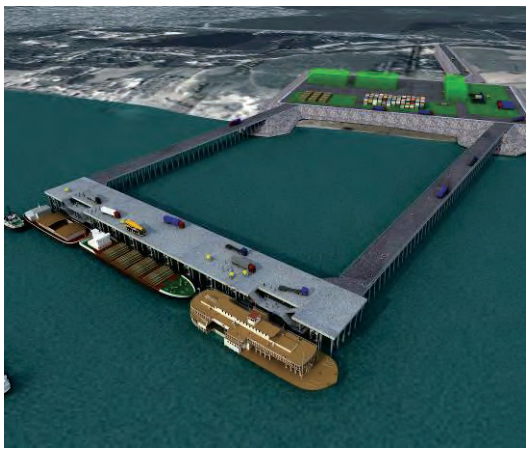


Fig.2 Fixed Type Jetty

3. Updated Recommendation by JICA Study Team

JICA Study Team of this Preparatory Survey reviewed the updated data and information for the assessment on the selection for the type of jetty structure. They would recommend that the jetty for Mandalay Port should be designed as the fixed type, considering the following points are the most critical factor.

1) Future demand of container handling should be considered. Fixed type jetty will achieve better handling efficiency than floating type jetty.
2) The risk of damage for floating jetty due to siltation of the riverbed is crucial, observing yearly change of riverbed during flood seasons.
3) Because the Mandalay Port is a pilot project for further application to the other river ports, the structure should be designed with less maintenance and repairing. In this viewpoint, fixed type jetty is thought to be more suitable for Mandalay Port.

4. Comparison Table and Evaluation Criteria

(1) Comparison Table

Followings are the evaluated comparison table of floating type and fixed type structures.

Table 1. Comparison Table

Criteria		Floating Structure	Fixed Structure
Applicability to Cargo Type	Container	B	A
	General Cargo	A	A
	Passenger	A	B
Applicability for River Bed Deformation		C	B
Ease of Maintenance & Repairing		B	A
Duplicability to Other River Port		A	A
Construction Cost		(under re-estimate)	A

Remark: A: suitable
B: fairly suitable
C: poorly suitable
Items with high priority

(2) Explanation of Criteria

Outlines of the evaluation criteria in Table 1 are as explained in below. Reasons and viewpoints to determine the Suitability (A, B or C) are explained in Item 5 below in detail.

1) Applicability to Cargo Type

a) Container **(high priority)**

From current trend of cargo transportation as well as recent rapid economic growth of Myanmar, the demand for container cargo transportation will be raised very soon[1]. Therefore, it is considered the priority of container handling facility in Mandalay Port should be high.

b) General Cargo **(high priority)**

Existing major cargoes are bagged cargo (rice, beans or cement). These cargoes shall be handled by new jetty.

c) Passenger

It is pointed that the jetty is designed primarily for cargo handling. It is noted that passenger will face a danger of accident if both operations (passenger and cargo) are carried out at the same time. In addition, passenger operation has less revenue benefit for the port operator's side.

2) Applicability for River Bed Deformation **(high priority)**

Floating structure will have the serious risk of damage if the body of jetty touches on the riverbed ground during dry season.

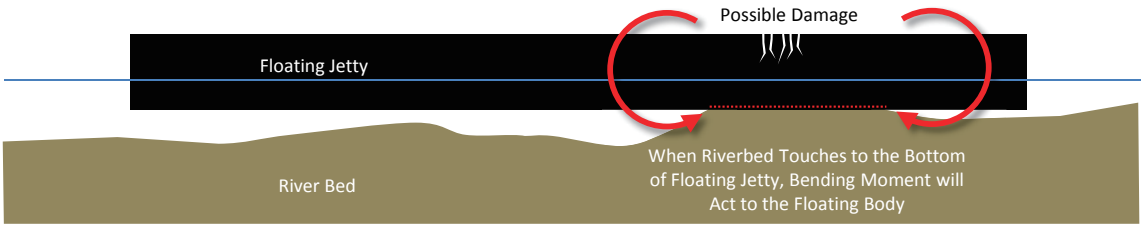


Fig. 3. Image of Damage to the Floating Jetty due to Siltation

Fig. 4. shows the image of damage to the jetty structure. When riverbed touches to the floating jetty, strong bending moment will act to the body which causes damage. When it is damaged, repairing will should be made in the dry docks. The dredging of the riverbed shall be made after the floating jetty moved from the place.

[1] The following facts were confirmed during 1st Field Survey.

- Myanmar Industrial Development Visions (MIDV: METI Japan) proposes to develop inland waterway network to strengthen the function of national transportation which will support the growth of industries. In practice, it will be important to develop waterways, inland ports and inland logistic bases (such as ICD; Inland Container Depot), etc.
- One of the on-going projects "Rehabilitation and Modernization of Yangon - Mandalay Railway" (JICA project) will make the rail carry containers from Yangon to Mandalay, which will be completed in the middle of 2020's. The project is to fulfil the future demand of container transportation between Yangon and Mandalay. Inland waterway will also be able to lead such demand of transportation.
- SA Marine Co. started container transport service by river barge from Thilawa MMIT to the Industrial estate located north Yangon, cooperated with IWT. SA Marine Co. expresses its intention to work for container barge transportation between Yangon and Mandalay when Mandalay Port was constructed.

3) Ease of Maintenance & Repairing **(high priority)**

The maintenance of the structure is important for both types of jetty structure. However, the easy-maintenance structure will be suitable for this project from the following points of view.

- IWT and DWIR are not used to manage maintenance & repairing of jetty structures
- If it is assumed that the similar type of structure would be applied to the future smaller inland ports, the structure should be designed for maintenance-free as much as possible.

4) Duplicability to Other River Port

Mandalay Port Project has the aim of a pilot project for inland waterways in Myanmar. The similar type of structure will be referred to other river ports in future. Therefore, the structure type should be easily applied to the other ports under the similar design conditions.

5) Construction Cost

Under the assumption that the floating deck was to be fabricated outside Myanmar, estimated the construction cost of floating type jetty higher than fixed type jetty[2]. However, the facility of manufacturing in Myanmar has been much developed recently, domestic fabrication will be possible at present.

It is assumed both fixed type and floating type will be constructed in similar cost burden within the project budget.

5. Detailed Explanation on Comparison Table

1) Applicability to Cargo Type

a) Container

✓ Suitability:

Floating (C): If the lifting equipment was designed for 40 ft container handling, 200 ton class capacity will be required. The Fig. 3 shows the image of 200 ton class crane is equipped on the floating jetty. From theoretical stability calculation of floating body, crane boom mounted on the floating jetty will sway approx. 50 cm when it lifts a 30.4 tons 40 ft container, which will cause the reduction of cargo handling efficiency.

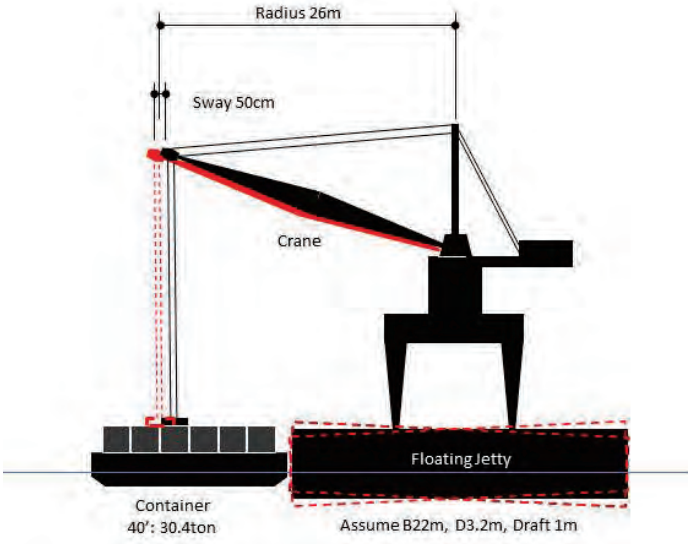


Fig. 4 Image of Sway for Floating Type Jetty

It is roughly estimated that 15~30% of cycle time will be extended due to the time required for

[2] In the FS study 2013, the floating deck was assumed to be fabricated outside Myanmar, which was the reason of high cost estimate.

stabilization of the jetty for handling next container.

Fixed (A): Fixed structure supports the lifting crane without swaying, the cargo handling efficiency will be higher than floating type jetty.

b) General Cargo

✓ Suitability:

Floating (A): Manual cargo handling is very easy and cargo handling.

Floating jetty is easy for cargo handling of currently operating "passenger-cum cargo ships" which has rooftop type.

Fixed (A): There are no risks for handling general cargo for both types of jetty.

c) Passenger

✓ Suitability:

Floating (A): Floating jetty can accommodate passengers easily.

Fixed (B): Passengers will have to climb up staircase to about 10 m higher deck level from passenger ship during dry season.

2) Applicability for River Bed Deformation

✓ Suitability:

Floating (C): Observing the annual movement of riverbed configuration from survey data (by DWIR), the riverbed is continuously moving, where high spots are moving downstream to some hundreds meters during every rainy season. For the candidate area (Location 1) as an example, approximately 2 m change in the depth was observed referred to the bathymetric data from 2012 to 2016 (minimum -2.0 m, maximum -4.0 m) . There is the risk of damage to floating jetty in the candidate area.

Fixed (A): Fixed jetty will have less risk of damage due to riverbed movement. Deck structure is supported by piles, where no unexpected force will act to the jetty.

3) Ease of Maintenance & Repairing

✓ Suitability:

Floating (B): Floating-type jetty contains movable joints between access-bridge and floating jetty. Berthing force of cargo barge will cause a risk of damages to these movable joints. Frequent inspections, maintenances and repairing works will be required.

Fixed (A): Fixed jetty will have less risk of damage because it has no movable joint.

4) Duplicability to Other River Port

✓ Suitability:

Floating (A): Floating jetty is suitable for applying to the other ports, where the port has a small to medium scale of cargo handling volume. Medium size of lifting equipment (approximately 100 ton

capacity crane or less) could be applied for equipment cargo handlings.

Fixed (A): Fixed jetty is suitable for applying to the other ports, where cargo volume is large. In such ports, heavy equipment with high efficiency will be required. Considering container handlings, more than 200 t capacity crane will be required.

5) Construction Cost

- ✓ Suitability: Floating (A), Fixed (A): Both types are assumed to be constructed within the budget. (A)

6. Study from Past Projects

1) General

Here, several projects were described to be referred to the decision of structural type of the jetty for Mandalay Port. Typical river ports are selected with the similar natural conditions. Two domestic ports were also described in along Ayeyarwady River.

2) Projects in Overseas

2)-1 Phnom Penh Port Cambodia - Fixed Type Jetty

Fig. 5 Old Port (Phnom Penh Port)

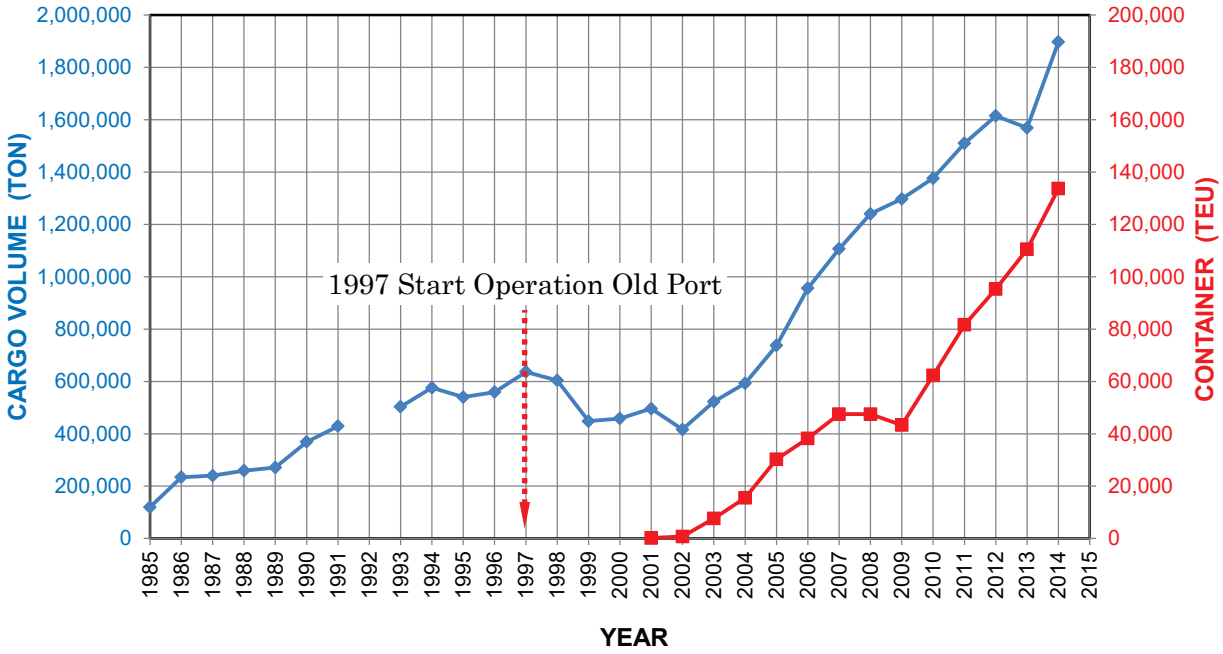
Fig. 6 New Port (Phnom Penh Port)

The Port of Phnom Penh was built in 1990's by Japan's Grant-Aid project. Considering the scale of the city (Phnom Penh has approx. 2 million population) and the fact that the port was designed for the initial introduction of equipment cargo handling to the existing manual operations before building port, the project of Mandalay Port is similar to the Phnom Penh Port in terms of its scale and purpose of the project.

In the case of Phnom Penh Port, the total cargo volume during the opening of the port (Old Port, end of 1996 start operation) was approximately 600,000 tons/year. Before opening this port, all cargoes were handled by labors without equipment, which is similar to the condition of the present Mandalay Port.

After installation of crane equipment, the cargo volume has been rapidly increased, particularly the port became to handle containers. The containerization has been rapidly spread taking the event of this project, as shown in the Fig.7 below, the latest handling volume is approximately 130,000TEU/year (2014).

Taking into account the rapid increase of the cargo volume, Port Authority has built a new port facilities at 30km downstream of Mekong River in 2013 (New Port). New Port is equipped with the rail-mounted quay gantry cranes which can handle both container and general cargoes.



2)-2 Jambi Port, Indonesia - Floating Type Jetty

Fig 7. Jambi Port

Jetty of Jambi Port was designed as floating type in initial phase to accommodate 1,000 DWT barge (approx. L 40 m B 16 m D 2.5 m). Since initial opening of the port, there have been frequent damage and repairing at movable joints between bridge and floating jetty. In order to deal with the increasing cargo volume, the port constructed fixed type jetty to accommodate large vessels, while the initial floating type jetty is currently used for smaller vessels (up to 200 DWT).

3) Projects in Myanmar

3)-1 Semeikhon Port, Myanmar - Floating Type Jetty

Fig 8. Semeikhon Port

Fig 9. Semeikhon Port (Movable Bridge)

The floating jetty was installed at the port in 2016. During flood season in 2016, the surrounding area of jetty was suffered from river siltation. A remedial measure against future siltation is under construction at present. It is needed to see the effect of remedial measure until full operation will be achieved.

3)-2 Takaung Port, Myanmar - Fixed Type Jetty)

Fig. 9 Takaung Port

Takaung jetty was built for private nickel factory. The jetty is used for loading container cargoes enclosing nickel mine products. (Takaun jetty will be surveyed during the 2nd Field Survey scheduled in the end of April)

4) Summary and Recommendation from the past projects

Looking through the aforesaid typical river port projects, the following points are raised.

- In order to achieve convenience in cargo handling under the conditions of large change in water levels of river port, floating type jetties were installed such as Jambi Port and Semeikhon Port. However, Jambi was required to carry out frequent repairing, while Semeikhon is still conducting remedial measures against siltation of the river. Both floating type jetty projects needed much effort for practical operation.
- Phnom Penh Port is one of the similar projects of Mandalay Port, where fixed type jetty was installed during transition period between primitive manual cargo handling and utilization of heavy equipment.

Fixed type jetty is useful for heavy equipment because the jetty is not moving or swaying caused by wave, current or operation of equipment on the top of jetty, in which higher rate of operation could be achieved. It is thought to be a successful project where fixed type jetty was installed in the initial development stage of river port development.

- In Ayeyarwady River, both floating and fixed type jetties are in operation. Floating jetty in Semeikhon faces troubles by unforeseen river siltation affects and is still under construction of remedial measure at present. Takaung jetty seems in normal operation by using gantry cranes for container handling (to be confirmed in 2nd Field Survey).

From these observations, JICA Study Team would like to recommend to adopt the fixed type jetty for Mandalay Port, considering the scale of existing cargo volume, size of the city and natural river conditions regarding siltation of Ayeyarwady river.

資料9　維持管理・運営に係る説明文書

9-1　港湾の維持管理・運用に関する協議用文書

Discussion Paper
on
Management and Operation of Mandalay Port

1. Basic Description on Port Management and Port Operation

(1) Port Management

Port management means to undertake public functions on the port activities, usually undertaken by Port Authority, such as;

1) own infrastructure including major equipment
2) allow vessels to berth and collect port charge for berthing
3) undertake maintenance and repairing (M&R) for the infrastructure
4) future port planning, port statistics monitoring
5) authorize port rule/regulation and port tariff
6) manage/control private operators under the contract.

Activities of port management, except for 2) and 6), do not create any income, and thus are usually undertaken by public sector.

(2) Port Operation

Port operation refers to the actual cargo handling operation employing port workers and investing required equipment.

Port operation can be done either by the public sector or by the private sector as it creates cash flow.

2. Options of Port Management Model for IWT

2.1 Port Management Models

(1) Basic Port Management Models

Style of port management is classified into four categories as shown in Table 1.

Table 1. Basic Port Management Model

Type of Management	Infrastructure	Equipment	Port Labor	Example
Public Service Port	Public	Public	Public	Colombo, JN, Dar es Salam
Tool Port	Public	Public	Private	Chittagong
Landload Port	Public	Private	Private	Rotterdam, Antwerp, New York, Singapore (MITT Yangon)
Private Service Port	Private	Private	Private	Ports in UK, New Zealand (Semeikhon)

(2) Public Service Ports

Service ports have a predominantly public character. The port authority offers the complete range of services required for the functioning of the port system. The port owns, maintains, and operates every available assets (fixed and mobile) and cargo handling activities are executed by labor employed directly by the port authority. Service port are usually controlled by (or even part of) the ministry of transport (or communications) and the chairman (or director general) is a civil servant appointed by or directly reporting to, the minister concerned.

(3) Tool Ports

In the tool port model, the port authority owns, develops, and maintains the port infrastructure as well as the superstructure, including cargo handling equipment such as quay cranes and forklift trucks. Port authority staff usually operates all equipment owned by the port authority. Other cargo handling on board vessels as well as on the apron and on the quay is usually carried out by private cargo handling firms contracted by the shipping agents or other principals.

(4) Landlord Ports

The landlord port is characterized by its mixed public-private orientation. Under this model, the port authority acts as regulatory body and as landlord, while port operations (especially cargo handling) are carried out by private companies.

(5) Private Ports

Fully privatized ports (which often take the form of a private service port) are few in number, and can be found mainly in the United Kingdom (U.K.) and New Zealand. Semeikhon port is categorized private port. Full privatization is considered by many as an extreme form of port reform. It suggests that the state no longer has any meaningful involvement or involvement or public policy interest in the port sector. In fully privatized ports, port land is privately owned, unlike the situation in other port management models. This requires the transfer of ownership of such land from the public to the private section. In addition, along with the sale of port land to private interests, some governments may simultaneously transfer the regulatory functions to private successor companies. In the absence of a port regulator in the U.K., for example, privatized ports are essentially self-regulating.

2.2 Option Models for IWT

2.2.1 Focus

Under this Project, port facilities and cargo handling equipment are planned to be implemented and procured by the Japanese Grant Aid, and IWT is the responsible organization of the operation and maintenance of the port facilities and cargo handling equipment after completion of the Project.

In this stand point, “Public Service Port” or “Tool Port” management models are suitable and recommendable for port operation by IWT.

If the port operation is made by “Land Load Port”, equipment operation (equipment procurement itself in some case) and terminal operation are conducted by private sector. In such a case, port service tariffs are generally expensive because the costs for operation and maintenance, initial investment (equipment procurement cost as an example) will be add on the service tariffs such as cargo handling service charges, cargo storage service charges and so on.

Mandalay port is a domestic port and domestic port services generally stands on the policy of more accessibility to the public and less profitability, since conservation of domestic industries, public service fees are commonly set in the very cheap range compere with those of international ports.

Additionally, waterway transportation will face hard competition against road transportation services. If river port service set high tariff rates, the cargo demand will go to road transport.

Because of these conditions, to provide inexpensive service tariffs is important role of Mandalay port. Therefore, “Public Service Port” or “Tool Port” are suitable models to operate under the less profitability policy.

2.2.2 Options

(1) Option-1 Public Service Port

Model Description: IWT owns infrastructure, cargo handling equipment and cargo handling operation is done by IWT staffs or IWT employed port workers.

Merits: ・All management and operation activities are the responsibility of the same organization (IWT's unity of command).

Demerits: ・There is a risk of lacking of internal competition, leading to inefficiency
・Operations are not user or market oriented
・Operation and maintenance works may conduct less innovation

(2) Option-2 Tool Port

Model Description: IWT owns infrastructure, cargo handling equipment, and makes contract with private company to supply port workers.

Merits: ・All investments of port infrastructure and equipment are decided by the public sector (IWT), thus avoiding duplication of facilities.

Demerits: ・The port administration and private company jointly share the cargo handling services. This operation (split operation) may lead to conflict situations.
・Private operators do not own major equipment, and thus are unconcerned about future expansion of services.
・There are similar risks as Option-1, operations not being market oriented and lack of innovation.

2.2.3 Necessary Preparations and Actions by IWT Prior to the Port Operation

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.
In this regard, Myanmar side is requested to ensure and to commit for the operation and to take proper actions and preparations for the operation and maintenance.

To start the port operation and management, IWT shall be prepared the following items.

- ✓ To establish organizations for port operation and management,
- ✓ To reserve and train human resources, and if the port will be managed by tool port, it is necessary to hire of operators/labors for cargo handling works from private firm(s),
- ✓ To manage finances such as budget allocations and executions, to collect service fees etc.,
- ✓ To confirm and/or establish applicable laws and/or regulations

- ✓ To establish operation, maintenance manuals, equipment manuals and other necessary manuals and/or guidelines,
- ✓ To conduct port, equipment and other necessary operations such as cargo handling, port and terminal operations,
- ✓ To conduct periodical inspections and maintenance of port infrastructures, equipment and other assets in the port, and
- ✓ To conduct other necessary port administrative works such as personnel affairs, general affairs, port statistical affairs and so on.

Whichever the port operation will be conducted by "Public Service Port" or "Tool Port", above mentioned matters shall be ready to perform prior to the port operation which is expected middle of August, 2020.

3. Points to be Discussed

(1) What is the important role of IWT for Mandalay Port management ?

With respect to discuss the type of management organization, it is quite important to consider the following role of the management body of Mandalay port.

1) Primary role of Mandalay Port project is to introduce modern cargo handling system and equipment to the existing primitive way of labor force cargo handling.
2) The second role of the project is to be a pilot project of the river port management system for other river ports to be developed in future.

These roles are purely public (governmental) considerations, thus port management and operation should be led by the public sector (such as IWT) with limited private sector involvement.

(2) Is initial operation of Mandalay Port profitable ?

In the beginning term of port operation, it will not be easy to obtain enough profit from operating revenue. The following reasons are pointed out.

1) Service fees will be less than those of international ports

   From the point of conservation of domestic industries, public service fees are commonly set in the very cheap range compared to those of international port terminals in other countries. In the feasibility study in 2014, the berthing fee and port charges were assumed to be set at 50% of international ports. Therefore domestic port services stands on the policy of more accessibility to the public and less profit ability.

   Whilst international port terminal can obtain revenue in foreign currency (usually in US$), domestic port service can obtain only local currency (MMK) for revenue.

   These factors might decrease the interest on port operation business for private sectors.
2) Competition against other transport mode

   The major benefit of waterway transport is the cheap unit cost by enabling large volume of cargo transport

using barges. However, it has the weakness of longer transportation time and lack of door-to-door services like truck transportation (road transport). Waterway transportation will face hard competition against road transportation services. If river port service set high tariff rates, the cargo demand will go to road transport. In order to keep the sustainable growth of the waterway business in accordance with the government policy, port service fee should be set in the low range, i.e., port operation could face less profit.

The port operation business of domestic river port may not always be attractive for the private sector, particularly for major foreign operators.

It is necessary for governmental authority to control river port management setting lower port fees under the circumstance with less competition of domestic market, which is different from the international port always facing to competition with other international ports.

(3) What kind of organization is needed ?

In the practice of the port management and operation, the management body should have the public functions, while the operation body should concentrate on cargo handling efficiency and earning revenue/saving expenditure. For example, the organization should have the following scale of employment. For the case of Option 1 (Public Service Port), IWT directly employs all staffs & workers. For the case of Option 2 (Tool Port), equipment operators and workers should be outsourced by employing through an employment agency. For the case of Option 2' (Tool Port operated by JV including IWT), the operation body will be undertaken by Joint Venture between IWT and private operator.

Example of Organization

●Management Body

Function	Staffs
- Management organization	2
- Legal/contract	1
- Tariff/port regulation	1
- Finance/accounting	3
- Port planning	3
- Port statistics	3
- Maintenance facilities	3
- Safety management	2
- Environmental protection	2
(Total)	20

●Operation Body

Function	Staffs
- Management organization	2
- Administration/cargo document	5
- Accounting	5
- Operation control (office)	10
- Equipment operators	15
- Foremen & workers	100
- Warehouse control	5
- Warehouse workers	20
- Workshop workers	10
(Total)	172

4. Next Step

(1) Selections of Port Management Option

Considering the public role of Mandalay Port development project and that the scale of the initial development is not large enough for privatization, Option 1 (Public Service Port) or Option 2 (Tool Port) seem to be the most suitable options. However, the final decision could be made by IWT.

(2) Preparation for Port Operations

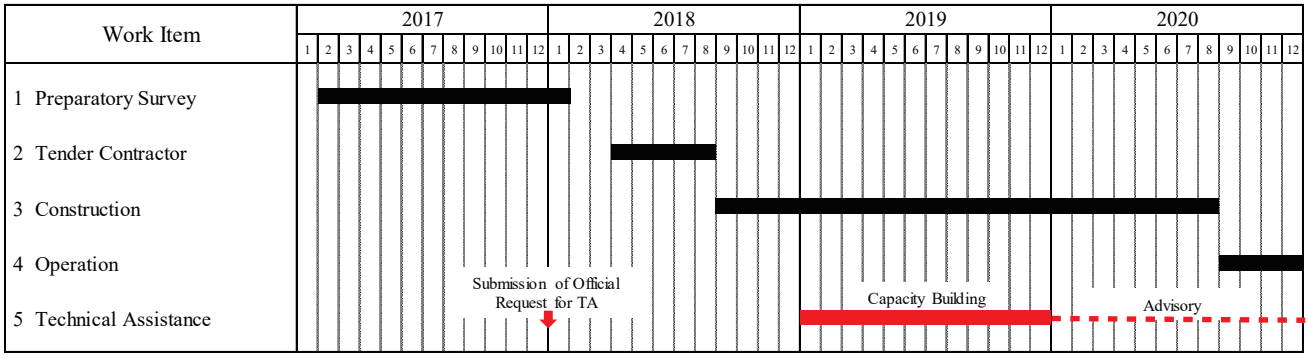
After the decision of the port management option, it is necessary to establish the port management system including i) to establish organization, ii) to reserve human resources and budget allocations, iii) to establish the rules and regulations, guidelines and manuals for operation and maintenance (including ship allocations, cargo handling, passenger traffic management, asset management, port administration, port statistical recordings, etc.) and others accordingly. Based on these preparations, the port operation and maintenance works shall be ready before opening the Mandalay port which is expected middle of August in 2020.

(3) Capacity Building by JICA Technical Assistance

Taking into account the present capability of IWT for port management and operation, where IWT has no experience in such activities, therefore, it is very tough to develop the port management system by IWT by themselves. Therefore the consultant team pointed out that to receive technical assistance by JICA is one of the option to start with the capacity development of the port management by IWT.

To receive the technical assistance by JICA, official request from the government of Myanmar is necessary and the request shall be adopted by the Japanese side. The proposed schedule of the technical assistance is shown below.

Proposed Schedule of Technical Assistance (Preliminary Idea)



5. Items to be Confirmed during Second Field Survey Mission

(1) Financial Records of IWT

For the purpose of investigating the financial capability of the executing organization, JICA Study Team requests IWT to provide financial records for 10 years. An example format of the financial record is attached to this document.

(2) Laws and Regulations to implement the Port Management and Operation

JICA Study Team needs to confirm whether each type of management structure is consistent with Myanmar's national law. If any insufficient laws/regulations for the port management and operation were found, it would be necessary to prepare them before commencing the port operation.

Table 2. Check List for Legal Consistency

Type of Management Structure	Common Item	For Each Structure
Option 1. Public Service Port	✓ Legal document for the establishment of IWT ✓ Legal restrictions for IWT to be port management body ✓ Legal restrictions for IWT to become owner of port facility and equipment ✓ Legal restrictions for establishing port regulation (if any conflict against DWIR regulation)	✓ Legal restrictions for IWT to be the port operator by direct employment of staffs/workers
Option 2. Tool Port		✓ Legal restrictions for tendering labor supplier or port operator

Attachment

1. Copy of “Port Reform Toolkit” Module 3
2. A sample form of financial records of IWT

Attachment 2: A sample form of financial records of IWT

Revenue	2013	2014	2015	2016	2017
Deferred revenue/Authorized income					
Rental income					
Interest income					
Income from operation					
Tag boat					
Cargo transport					
Passenger					
Sand income					
Equipment hired					
Slipway					
Floating restaurant					
Other income					
Gain/Loss on sales of fixed assets					
Total Revenue					

Expenditure	2013	2014	2015	2016	2017
Operational expenditure					
Audit fees					
Board expenditure					
Salaries and wedges					
Employees benefit					
Staff bonus					
Finance costs					
Other professional fees					
Loss on disposal of fixed assets					
Loss on foreign exchange					
Total operational Expenses					

Note: above items are example purpose only.

October 24, 2017
Ref. No. 635R6710/DOD/013

Attn. Director General
Directorate of Water Resources and Improvement of River System (DWIR)
Attn. Managing Director
Inland Water Transport (IWT)

Sub: Recommendation on the Port Management and Operation
Re: The Preparatory Survey on the Project for Development of Mandalay Port

Thank you for your continued and unwavering support for the Preparatory Survey on the Project for Development of Mandalay Port.

In reply to your letter subjected "Tool Port for Management and Operation of Mandalay Port" on June 7, 2017 (Your Letter No. 222(a)/Ah Kha Na/Ah Kha-13(1)/2017) and "Management and Operation of Mandalay Port" on September 20, 2017 (Your Letter No. 222(b) / Ah Kha Na/Ah Kha-13(1)/2017), we would like to recommend you to prepare your staff and budget allocations as our paper "Proposed Initial Organization and Budget Estimate for Operation of Mandalay Port" as attached in this letter.

In our proposal, it is expected that the port operation will start from August/September in 2020. In the first year's operation, it will be necessary 100% financial support by the Myanmar government, but from the second year, operational revenue will be obtained by proving port services, accordingly, such financial support will be able to reduce, where it is estimated 50% support for second year, and 25% in third year. The final goal is to establish the self-supporting management system of the port.

In parallel with the construction works which is expected to start from December 2018, we would propose you to start your preparation works from July/August 2018, including Technical Assistance that you are currently requesting to JICA. To make sure the preparation works, we would like to point out the following important points for your considerations;

1. Staff allocations

   Referring to the Employment Plan in the Proposed Initial Organization and Budget Estimate for Operation of Mandalay Port as attached in this letter, please assign core staff members who are preferably going to work in the new department "River Port Operational Department" and to involve for preparation of the organizations for management and operation of Mandalay port, so that we can make discussions with your core staff members how to develop the port management and operation of Mandalay Port.

2. Budget allocations

   As we were notified that your draft budget making should be by the end of October, please make sure to add your budget (2018-19) for the activities of preparation of opening Mandalay Port. As indicated on our paper, the estimated budget required for 2018-19 is US$ 28,500 (MMK 39,000,000, US$ 1.00 = MMK 1,371).

For further breakdown details of the estimated budget, please refer to our paper as attached herewith.

Joint Venture of Oriental Consultants Global Co., Ltd., Pacific Consultants Co., Ltd., and Fukken Co., Ltd.
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We would like to make further discussions in our next visit to Myanmar in coming November, 2017, or earlier to the visit through by e-mails and/or phone calls, or other appropriate method.

Thank you very much in advance for your kind attention.
Please do not hesitate to contact us if you have any queries on this matter.

Yours Faithfully,

Masahiko Koshimizu
Chief Consultant
Oriental Consultants Global Co., Ltd.
on Behalf of the Preparatory Survey Team

Attachment 1: Proposed Initial Organization and Budget Estimate for Operation of Mandalay Port
2: Your Letter on June 7, 2017, "Tool Port for Management and Operation of Mandalay Port" (Your Letter No. 222(a)/Ah Kha Na/Ah Kha-13(1)/2017)
3: Your Letter on September 20, 2017, "Management and Operation of Mandalay Port" (Your Letter No. 222(b) / Ah Kha Na/Ah Kha-13(1)/2017)

CC: 1: Minister of Transport and Communications
2: Permanent Secretary, Ministry of Transport and Communications
3: JICA Myanmar Office
4: JICA headquarters
5: OCG, Myanmar Office
6: File

Proposed Initial Organization and Budget Estimate

for

Operation of Mandalay Port

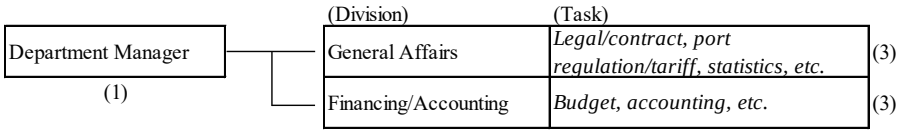
1. Organization

The following chart shows the proposed organization for initial operation of Mandalay Port assuming IWT will be the port operator under the management style of "Tool Port".

- ✓ IWT H.Q. will make a new department "River Port Operational Department" which covers regional river ports including Mandalay port and future developed river ports. Number of staffs required for the new department is estimated at 7.
- ✓ IWT will place "Mandalay Port Office" at Mandalay port. Number of staffs required for the port office is estimated at 32.
- ✓ Equipment operators, foremen, workers, workshop technicians and their management staffs are recommended to outsource such as Worker's Association or local labor-supply company. It is recommended to employ workers form existing riverbank workers in order to reduce the risk of labor dispute due to new port opening.

IWT H.Q. Yangon Total staffs = (7)

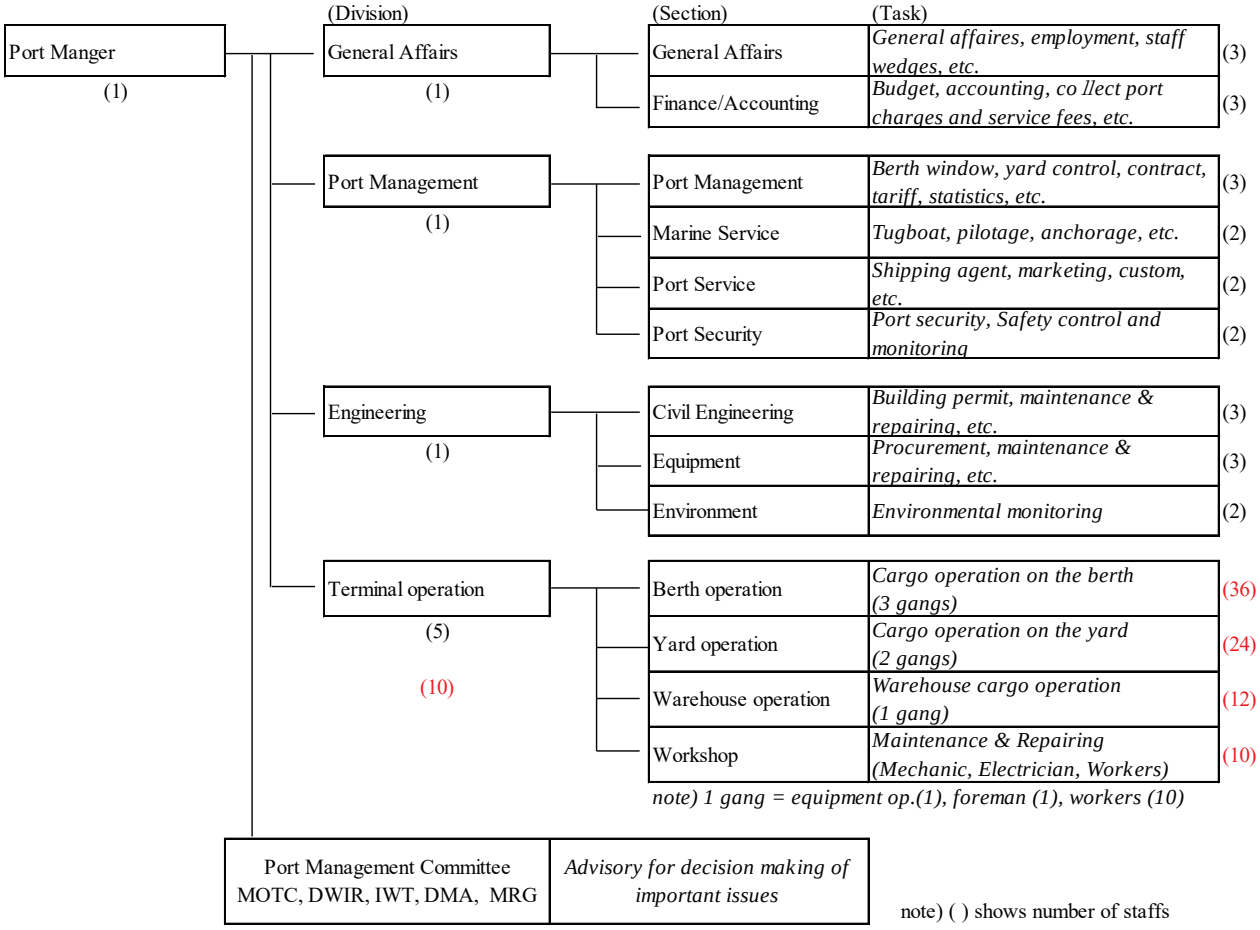
River Port Operational Management Department



Total staffs (direct employment) = (32)

(contract terminal operation)= (92)

IWT Mandalay Port Office



note) 1 gang = equipment op.(1), foreman (1), workers (10)

Port Management Committee MOTC, DWIR, IWT, DMA, MRG	*Advisory for decision making of important issues*

note) ( ) shows number of staffs

2. Budget Estimate

The following tables show the estimated initial government budget required for starting Mandalay Port operation. Basic assumptions are as follows.

- ✓ Exchange rate of MMK is assumed at 1 USD = 1,371 MMK.
- ✓ The government will support for preparation stage mainly staff employment, initial procurement and operational expenses for the first year of operation. In the following years (2022-), Mandalay Port Office will run the operation covering the expenses by earning revenues while government budget will be reduced.
- ✓ For FY2018~2020, government will employ core staffs and train for opening Mandalay Port. The numbers of staffs will be started with 7 members (see attached employment plan), and it will be increased to 39 members until the middle of 2021.
- ✓ Cargo volume is assumed to be started with approximately 100,000 tons/year in the first operation year, then it is assumed to be increased by 50,000 tons for the following years. Initial phase will be started with only daytime operation. The night works will be started when the cargo volume will exceed approximately 200,000 tons per year..
- ✓ Initial Procurement budget covers required office furniture, small equipment for workshop, a 2t-truck for maintenance works, and 2,300 pieces of pallet for warehouse.
- ✓ As an option, if the government intends to stimulate containerization for inland waterway, it is recommended to procure container boxes in the initial phase of operation. Initial required numbers of container and its budgetary cost are estimated;

  Numbers of 20' container = 150 containers (Full loaded on 2,000T barge) x 2 units = 300 containers.

  Estimated cost of procurement containers = 300 x 1,500USD = 450,000 USD (612,000,000 MMK)

Budget Estimate (USD)

F Year	Staff Employment	Initial Procurement	Cargo Operation	Total	Gov. Share	Mandalay Port Share	Government Budget
	USD	USD	USD	USD	%	%	USD
2018-19	28,411			28,411	100%	0%	28,500
2019-20	75,761			75,761	100%	0%	75,800
2020-21	137,994	147,324	168,648	453,966	100%	0%	454,000
2021-22	186,698		404,755	591,453	50%	50%	295,800
2022-23	211,050		539,674	750,723	25%	75%	187,700

Budget Estimate (MMK)

F Year	Staff Employment	Initial Procurement	Cargo Operation	Total	Gov. Share	Mandalay Port Share	Government Budget
	MMK	MMK	MMK	MMK	%	%	MMK
2018-19	38,953,133			38,953,133	100%	0%	39,000,000
2019-20	103,875,021			103,875,021	100%	0%	103,900,000
2020-21	189,200,930	201,993,462	231,230,174	622,424,567	100%	0%	622,500,000
2021-22	255,977,729		554,952,419	810,930,148	50%	50%	405,500,000
2022-23	289,366,129		739,936,558	1,029,302,687	25%	75%	257,400,000

REFERENCE: breakdown of budget estimate

1) Time Schedule and Budget

Schedule and Budget Estimate for Mandalay Port Opening

Event\Time	2018				2019				2020				2021				2022			
	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3
Construction																				
Operation																				
Training																				
Direct employment (Staff no.)		7	7	7	14	14	14	14	21	21	30	30	30	30	39	39	39	39	39	39
Direct employment (%)		18%	18%	18%	36%	36%	36%	36%	54%	54%	77%	77%	77%	77%	100%	100%	100%	100%	100%	100%
Operation contract (%)											50%	50%	50%	50%	70%	70%	70%	70%	90%	90%
Cargo volume (ton)											25,000	25,000	25,000	25,000	37,500	37,500	37,500	37,500	50,000	50,000
Cargo volume (ton/year)									50,000				125,000				175,000			
Initial gov. budget (%)		100%				100%				100%				50%				25%		
Cost direct employment (USD)		9,470	9,470	9,470	18,940	18,940	18,940	18,940	28,411	28,411	40,586	40,586	40,586	40,586	52,762	52,762	52,762	52,762	52,762	52,762
Total (USD)		28,411				75,761				137,994				186,698				211,050		
Cost operation (USD)											84,324	84,324	84,324	84,324	118,054	118,054	118,054	118,054	151,783	151,783
Total (USD)		0				0				168,648				404,755				539,674		
Total operation (USD)		28,411				75,761				306,642				591,453				750,723		
Initial Cost (USD)										147,324										
Total government budget (USD)		28,411				75,761				453,966				295,726				187,681		
Total government budget (Kyat)		38,953,133				103,875,021				622,424,567				405,465,074				257,325,672		

2) Employment Plan

No	Staff	Wedge		2018				2019				2020				2021				2022			
		USD	MMK	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3
1	Department Manager	357	490,000		1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071
2	General Affairs 1	322	441,000		966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966
3	General Affairs 2	268	367,500					804	804	804	804	804	804	804	804	804	804	804	804	804	804	804	804
4	General Affairs 3	268	367,500															804	804	804	804	804	804
5	Financing/Accounting 1	322	441,000		966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966
6	Financing/Accounting 2	268	367,500											804	804	804	804	804	804	804	804	804	804
7	Financing/Accounting 3	268	367,500															804	804	804	804	804	804
8	Port Manger	357	490,000		1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071	1,071
9	General Affairs Manager	322	441,000					966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966
10	General Affairs 1	268	367,500											804	804	804	804	804	804	804	804	804	804
11	General Affairs 2	268	367,500											804	804	804	804	804	804	804	804	804	804
12	General Affairs 3	268	367,500															804	804	804	804	804	804
13	Finance/Accounting 1	268	367,500									804	804	804	804	804	804	804	804	804	804	804	804
14	Finance/Accounting 2	268	367,500											804	804	804	804	804	804	804	804	804	804
15	Finance/Accounting 3	268	367,500											804	804	804	804	804	804	804	804	804	804
16	Port Management Manager	322	441,000		966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966
17	Port Management 1	268	367,500					804	804	804	804	804	804	804	804	804	804	804	804	804	804	804	804
18	Port Management 2	268	367,500									804	804	804	804	804	804	804	804	804	804	804	804
19	Port Management 3	268	367,500									804	804	804	804	804	804	804	804	804	804	804	804
20	Marine Service 1	268	367,500											804	804	804	804	804	804	804	804	804	804
21	Marine Service 2	268	367,500															804	804	804	804	804	804
22	Port Service 1	268	367,500									804	804	804	804	804	804	804	804	804	804	804	804
23	Port Service 2	268	367,500															804	804	804	804	804	804
24	Port Security 1	268	367,500									804	804	804	804	804	804	804	804	804	804	804	804
25	Port Security 2	268	367,500															804	804	804	804	804	804
26	Engineering Manager	322	441,000		966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966
27	Civil Engineering 1	268	367,500					804	804	804	804	804	804	804	804	804	804	804	804	804	804	804	804
28	Civil Engineering 2	268	367,500					804	804	804	804	804	804	804	804	804	804	804	804	804	804	804	804
29	Civil Engineering 3	268	367,500															804	804	804	804	804	804
30	Equipment 1	268	367,500					804	804	804	804	804	804	804	804	804	804	804	804	804	804	804	804
31	Equipment 2	268	367,500									804	804	804	804	804	804	804	804	804	804	804	804
32	Equipment 3	268	367,500											804	804	804	804	804	804	804	804	804	804
33	Environment 1	268	367,500					804	804	804	804	804	804	804	804	804	804	804	804	804	804	804	804
34	Environment 2	268	367,500															804	804	804	804	804	804
35	Terminal operation Manager	322	441,000		966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966	966
36	Terminal operation 1	268	367,500									804	804	804	804	804	804	804	804	804	804	804	804
37	Terminal operation 2	268	367,500											804	804	804	804	804	804	804	804	804	804
38	Terminal operation 3	268	367,500											804	804	804	804	804	804	804	804	804	804
39	Terminal operation 4	268	367,500															804	804	804	804	804	804
No. of staffs		Nos			7	7	7	14	14	14	14	21	21	30	30	30	30	39	39	39	39	39	39
		%			18%	18%	18%	36%	36%	36%	36%	54%	54%	77%	77%	77%	77%	100%	100%	100%	100%	100%	100%
Wedge Total		Wedge			6,972	6,972	6,972	12,762	12,762	12,762	12,762	18,390	18,390	25,626	25,626	25,626	25,626	32,862	32,862	32,862	32,862	32,862	32,862
		%			21%	21%	21%	39%	39%	39%	39%	56%	56%	78%	78%	78%	78%	100%	100%	100%	100%	100%	100%
Total (USD)					20,916				51,048				88,032				116,976				131,448		

3) Budget for Operational Cost Estimate

Operation Cost Estimate

Per Month (base: 245,520Ton/Year)

Item			Unit	Qty	MMK		USD	
					U.C.	Amount	U.C.	Amount
1	Wedges	Department Manager	no	1	490,000	490,000	357	357
		Port Manager	no	1	490,000	490,000	357	357
		Department Staff	no	6	367,500	2,205,000	268	1,608
		Division Manager	no	6	490,000	2,940,000	357	2,144
		Section Staffs	no	25	367,500	9,187,500	268	6,701
	Social Security (7%)		ls	1		1,071,875		782
2	Transportation of Staffs		trip	16	411,324	6,581,191	300	4,800
3	Miscellaneous expence (5%)		%	5		1,148,278		837
Subtotal						24,113,844		17,587
4	Operation Contract		mon	1	51,686,450	51,686,450	37,697	37,698
5	Fuel Cost (Assume 200,000ton/year)		mon	1	3,427,704	3,427,704	2,500	2,500
6	Equipment Maintenance		mon	1	16,098,521	16,098,521	11,741	11,741
7	Water & Electricity		mon	1	2,193,730	2,193,730	1,600	1,600
8	Miscellaneous expence (5%)		%	5		3,670,320		2,677
Subtotal						77,076,725		56,216
Cost per ton						3,767		2.7

4) Budget for Operation Contract

Breakdown of operation contract

Item	Unit	Qty	MMK		USD		Remark
			U.P.	Amount	U.P.	Amount	
(Fixed: Per Month)							
Manager	no	2	441,000	882,000	322	643	
Staff	no	8	367,500	2,940,000	268	2,144	
Workshop	no	10	367,500	3,675,000	268	2,680	
Eq. Operator	no	6	342,770	2,056,622	250	1,500	6 gangs
Foreman	no	6	342,770	2,056,622	250	1,500	6 gangs
Social Security (7%)	ls			812,717		593	
Subtotal				12,422,961	0	9,060	
O.H. 20%	ls	1		2,484,592	0	1,812	
Total				14,907,554	0	10,872	
(At Cost per Month) assume 200,000ton/year							
Worker	ton	20,460	700	14,322,000	0.511	10,446	Jetty
Worker	ton	20,460	700	14,322,000	0.511	10,446	Yard/warehouse
Social Security (7%)	ls			2,005,080		1,462	
Subtotal				30,649,080	0	22,354	
O.H. 20%	ls	1		6,129,816	0	4,471	
Total				36,778,896	0	26,825	
Grand Total				51,686,450		37,697	
Cost per ton				2,526		1.84	

5) Breakdown of Budget for Initial Procurement

Initial Procurement Cost for Operation

Office

	Item	Unit	Qty	MMK		USD	
				U.C.	Amount	U.C.	Amount
1	PC (incl. software)	no	27	2,056,622	55,528,797	1,500	40,500
2	Printer	no	2	6,855,407	13,710,814	5,000	10,000
3	Telephones	no	20	68,554	1,371,081	50	1,000
4	Desk & Chair	ls	40	180,000	7,200,000	131	5,251
5	Meeting Table & Chair	set	2	460,000	920,000	336	671
6	Bookshelf	set	15	140,000	2,100,000	102	1,532
7	Guest room furniture	set	1	450,000	450,000	328	328
8	Frige	set	2	335,000	670,000	244	489
9	TV/DVD	set	1	350,000	350,000	255	255
10	Stationary	ls	1	4,113,244	4,113,244	3,000	3,000
11	Miscellaneous expence (5%)	ls	1		4,320,697		3,151
	Total				90,734,634		66,177

Workshop

	Item	Unit	Qty	MMK		USD	
				U.C.	Amount	U.C.	Amount
1	Truck 2t	no	1	47,987,849	47,987,849	35,000	35,000
2	Welding machine	no	3	2,742,163	8,226,488	2,000	6,000
3	Gas cutting tool	no	5	137,108	685,541	100	500
4	Ceiling mini crane	no	1	6,855,407	6,855,407	5,000	5,000
5	Chain block	no	3	1,096,865	3,290,595	800	2,400
6	Desk & Chair	ls	5	180,000	900,000	131	656
7	Bookshelf	set	3	140,000	420,000	102	306
8	Other apparatus and materials (10%)	ls					4,956
	Total				68,365,881		54,818

Warehouse

	Item	Unit	Qty	MMK		USD	
				U.C.	Amount	U.C.	Amount
1	Pallet	no	2300	13,711	31,534,872	10	23,000
2	Desk & Chair	ls	5	180,000	900,000	131	656
3	Bookshelf	set	3	140,000	420,000	102	306
4	Other apparatus and materials (10%)	ls					2,366
	Total				32,854,872		26,328

The Republic of the Union of Myanmar
Ministry of Transport and Communications
Directorate of Water Resources and Improvement of River Systems

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Letter No. 222(a) /Ah Kha Na/Ah Kha-13(1)/2017
Date : 7th June , 2017

To

Mr. Katsuichi Yabunaka
Executive Technical Advisor to the Director General
Infrastructure and Peacebuilding Department
Japan International Cooperation Agency

Subject : **"Tool Port" for Management and Operation of Mandalay Port**

Dear Mr. Katsuichi Yabunaka,

We had discussion between our Myanmar Team and your Japan International Cooperation Agency Team on Second Preparatory Survey for the second outline design of the Project for Development of Mandalay Port in May, 2017 and sign Minute of Meetings.

Regarding with the Management and Operation of Mandalay Port, Myanmar Team mentioned its preference to "Tool Port" and stated that Myanmar side will finalize the port management and operation option and inform JICA in writing by the end of August, 2017.

So we'd like to inform officially about Myanmar's preference to "Tool Port" for port management and operation. However, we'd like to welcome advice from JICA to update during the time of implementation phase.

Sincerely,

Htun Lwin Oo
Director General
Directorate of Water Resources and Improvement of River Systems

The Republic of the Union of Myanmar
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Letter No. 222(b) /Ah Kha Na/Ah Kha-13(1)/2017
Date : 20th September , 2017

To

Mr. Katsuichi Yabunaka
Executive Technical Advisor to the Director General
Infrastructure and Peacebuilding Department
Japan International Cooperation Agency

Subject : **Management and Operation of Mandalay Port**

Dear Mr. Katsuichi Yabunaka,

We have send the letter which stated Myanmar's preference to "Tool Port" for port management and operation and thank you for your reply.

Regarding with the meeting in May 25, 2017 related to the Port Operation and Management, I'd like to confirm about our updated information of preference on the following four (4) points;

1. **Counterpart**
   DWIR (implementation phase) and IWT (operation phase)
2. **Management Committee**
   The committee will be organized later and member will be from DWIR, IWT, DMA and part time member from Mandalay Regional Government.
3. **Role of DWIR for Mandalay port operation and management**
   DWIR is the owner of the port.
4. **Role of IWT for Mandalay port operation and management**
   IWT is the port operator for port operation and management.

We hope this will be useful for your consideration on the Port Operation and Management.

Sincerely,

Htun Lwin Oo
Director General
Directorate of Water Resources and Improvement of River Systems

9-3　　クレーンの点検項目（参考）

(1)　日常点検

日常点検

点検時期	区分	No	点検項目	点検方法
作業開始前	走行周り	1	前日の生じた不具合カ所の修復状況は良いか	目視
		2	走行路及びクレーン移動範囲内に障害物はないか	目視
		3	減速機および油圧ユニット等からの油漏れはないか	目視
	機械室	4	各ドラム上のワイヤロープの状態は良いか	目視
		5	減速機からの油漏れはないか	目視
	運転室	6	給電ケーブルの状態は良いか	目視
		7	各マスターコントローラの作動は正常か	目視
		8	操作盤上の操作器具類の作動は正常か	作動
		9	各ブレーキ、レールクランプの作動は正常か	作動
		10	巻上、上限リミットスイッチの作動は正常か	作動
		11	その他各リミットスイッチの作動は正常か	作動
		12	警報装置の作動は正常か	作動
作業中	運転室	13	異音、異臭、異振動はないか	感覚
		14	各ブレーキの作動に異常はないか	作動
	運転室	15	各種スイッチを「切」にしたか	目視
		16	各コントローラーは全て停止位置に戻したか	目視
	機械室	17	電源スイッチは遮断したか	目視
		18	各機器に異熱はないか	触手
	走行	19	レールクランプ、逸走防止装置は完全に掛かっているか	目視
	その他	20	施錠はしたか（運転室、機械室、昇降口）	目視
		21	作業日誌、申し送り等の記入はしたか	目視

(2) 定期点検

ジブクレーン点検検査表(月例・年次検査)
Ⅰ 機械設備関係
1.1 基礎関係

区分		No	点検項目	月例	年次	測定方法	測定具	判定基準	測定値	判定	措置・備考
走行レール関係	基礎コンクリート	1	亀裂	○	○	目視		亀裂・損傷がないこと			
		2	基礎の沈下	○	○	目視		クレーン走行に支障がないこと			
	レール及び継目板	1	レールの左右高低差		○	目視・計測	トランシット・鋼尺	(スパン)×1/1000以下			
		2	レールの上下方向曲がり		○	目視・計測	トランシット・鋼尺	10mにつき5mm以下			
		3	レールの左右方向曲がり		○	目視・計測	トランシット・鋼尺	10mにつき5mm以下			
		4	レールの勾配		○	目視・計測	トランシット・鋼尺	1/2500以下			
		5	レール継目の食い違い		○	目視・計測	鋼尺	1mm以下			
		6	レール継目の隙間		○	目視・計測	鋼尺	5mm以下(夏でも接触せず)			
		7	レール東部のへたり、だれ		○	目視・計測	ノギス	原寸の10%以内、原寸幅100m			
		8	レールスパン		○	目視・計測	巻き尺	(スパン)25m未満:±10mm 25～40m:±15mm			
		9	金物類の緩み、脱落	○	○	目視・打診	テストハンマ	緩み、脱落がないこと			
		10	金物類の損傷、腐食	○	○	目視・打診	テストハンマ	損傷、腐食がないこと			
		11	ボルト・ナットの緩み・脱落	○	○	目視・打診	テストハンマ	緩み、脱落がないこと			
固定装置	エンドストッパ及びアンカー金物	1	部材の亀裂、損傷、変形	○	○	目視・打診	テストハンマ	亀裂・損傷、変形がないこと			
		2	腐食	○	○	目視		著しい錆・腐食がないこと			
		3	塗装の剥離	○	○	目視		著しい塗装の剥離がないこと			
		4	ボルト・ナットの緩み・脱落	○	○	目視・打診	テストハンマ	損傷・変形がないこと			

1.2 構造関係

区分		No	点検項目	月例	年次	測定方法	測定具	判定基準	測定値	判定	措置・備考
主構造	ポータルフレーム、旋回フレーム、上部ポスト、ジブ	1	部材の亀裂、損傷、変形	○	○	目視・打診	テストハンマ	亀裂・損傷、変形がないこと			
		2	部材の錆、腐食		○	目視・打診	テストハンマ	規定値以内のこと			
		3	塗装の剥離		○	目視		規定値以内のこと			
		4	構造ピン軸受けの摩耗		○	目視		グリスの汚れ、金属粉がないこと			
		5	構造ピンの給油	○	○	目視		油ぎれのないこと			
		6	ボルト・ナットのゆるみ、脱落	○	○	目視・打診	テストハンマ	緩み、脱落がないこと			
付属施設	歩道、階段、踊場、手摺、梯子、トロリ用ストッパ	1	清掃、整理、整頓	○	○	目視		整理、整頓されていること			
		2	溶接部の亀裂		○	目視		亀裂がないこと			
		3	部材の変形	○	○	目視		変形がないこと			
		4	部材の錆、腐食	○	○	目視		著しい錆、腐食がないこと			
		5	塗装の剥離		○	目視		著しい塗装の剥離がないこと			
		6	ボルト、ナットの緩み脱落	○	○	目視・打診	テストハンマ	緩み、脱落がないこと			
機械室	本体 扉 窓枠ガラス 修理用ホイスト	1	外壁の損傷、腐食、塗装剥離	○	○	目視		損傷、著しい腐食、塗装剥離がないこと			
		2	雨漏り	○	○	目視		雨漏りの痕跡がないこと			
		3	扉の動き	○	○	目視・作動		スムーズに作動すること			
		4	窓枠、ガラス	○	○	目視		損傷がないこと			
		5	修理用ホイストレール		○	目視		異常がないこと			
		6	修理用ホイストストッパ		○	目視		異常がないこと			
		7	ボルト・ナットの緩み、脱落	○	○	目視・打診	テストハンマ	緩み、脱落がないこと			
運転室	本体 扉 窓枠 ガラス 椅子 操作盤	1	外壁の損傷、腐食、塗装剥離	○	○	目視		損傷、著しい腐食、塗装剥離がないこと			
		2	雨漏り	○	○	目視		雨漏りの痕跡がないこと			
		3	扉の動き	○	○	目視・作動		スムーズに作動すること			
		4	窓枠、ガラス	○	○	目視・作動		スムーズに作動すること			
		5	椅子	○	○	目視・作動		異常がないこと			
		6	ボルト、ナットの緩み、脱落	○	○	目視・打診	テストハンマ	緩み、脱落がないこと			
		7	機器の振動	○	○	目視・作動		異常がないこと			
		8	操作性、作動状態	○	○	目視・作動		異常がないこと			

ジブクレーン点検検査表(月例・年次検査)

Ⅰ 機械設備関係

1.3 巻上関係、起伏関係、走行関係、吊具関係

区分	No	点検項目	月例	年次	測定方法	測定具	判定基準	測定値	判定	措置・備考
ワイヤーロープ	1	素線の断線	○	○	目視・計測		素線断線が10%以内/(1よりの間)			
	2	摩耗及び損傷	○	○	目視・計測	ﾉｷｽ	直径の減少が公称径の7%以内			
	3	キンク	○	○	目視		キンクがないこと			
	4	形くずれ、よりもどし	○	○	目視		形くずれ、よりもどしがないこと			
	5	油脂の塗油状態	○	○	目視		油ぎれがないこと			
	6	さび、腐食	○	○	目視		著しい錆、腐食がないこと			
	7	ロープ端部固定状態	○	○	目視		正常であること			
減速機	1	異音、異熱、異振動		○	目視・聴音		異音・異熱、異振動がないこと			巻上装置 起伏装置 走行装置
	2	歯車の摩耗、バックラッシュ		○	目視		異音・異振動がないこと			
	3	かみ合い歯車の状態		○	目視		異常がないこと(歯の折損、歯面のかじり、ピッチング、変色などで、摩耗限界は規定値以内のこと)			
	4	歯車、ﾍﾞｱﾘﾝｸﾞの潤滑、塗油状態	○	○	目視		油切れがないこと			
	5	ｹｰｼﾝｸﾞ内の油量、油漏れ		○	目視		ﾚﾍﾞﾙｹﾞｰｼﾞの規定値以内とし、油漏れがないこと。軸貫通部のシールの摩耗がないこと。空気抜きの損傷、ﾌｨﾙﾀｰの目詰まりがないこと			
	6	油の汚れ、劣化		○	目視		油の汚れ、劣化がないこと 油の取替時期が守られていること			
	7	軸、ｹｰｼﾝｸﾞの亀裂		○	目視		亀裂がないこと			
	8	ボルト、ナットの緩み、脱落	○	○	目視・打診		緩み、脱落がないこと			
コモンベース	1	本体の亀裂		○	目視		亀裂がないこと			巻上装置 起伏装置
	2	ボルト、ナットの緩み、脱落	○	○	目視、打診	テストハンマ	緩み、脱落がないこと			
シーブ	1	回転状態	○	○	目視		正常に回転していること ﾛｰﾌﾟｸﾞﾘｯﾌﾟ、ｼｬｯｸﾙ等の使用の場合は、それらの緩み・摩耗損傷がなく、正しく取り付けられること			巻上装置 起伏装置
	2	本体の亀裂	○	○	目視		亀裂が無いこと			
	3	ロープ溝部の摩耗	○	○	目視・計測	溝ｹﾞｰｼﾞ、ﾉｷｽ	ワイヤーロープ径の25%以内			
	4	ロープ外留めの損傷	○	○	目視		損傷がないこと			
	5	異音、異熱、異振動	○	○	聴音、触手、感覚		異音、異熱、異振動がないこと			
	6	ﾍﾞｱﾘﾝｸﾞの潤油、塗油状態	○	○	目視		油ぎれがないこと			
	7	ピンの固定状態	○	○	目視		正常であること			
軸継手(ギアカップリング	1	異音、異振動	○	○	目視		異音・異振動がないこと			巻上装置 (含む、ギアカップリング装置) 起伏装置
	2	摩耗、亀裂、損傷		○	目視		摩耗、亀裂、損傷がないこと			
	3	軸心の通り		○	目視・聴音		異音・異振動がないこと			
	4	バックラッシュ		○	目視・聴音		異音・異振動がないこと			
	5	潤滑、塗油状態	○	○	目視		油切れがないこと			
	6	油量	○	○	目視		グリス切れがないこと			
	7	油漏れ	○	○	目視		油漏れがないこと			
	8	ボルト、ナットの緩み、脱落	○	○	目視・打診	テストハンマ	緩み、脱落がないこと			
車輪	1	車輪の回転状態	○	○	目視		異常がないこと			走行装置 ﾚｰﾙｸﾗﾝﾌﾟ
	2	車輪フランジの摩耗、倒れ		○	目視、計測	ノギス	摩耗:原寸寸法の50%以内 倒れ:垂直位置から20%以内			
	3	車輪踏面の摩耗		○	目視、計測	ノギス	摩耗:原直径の3%以内 直径差:駆動輪:直径の0.2%以内 直径差:従動輪:直径の0.5%以内			
	4	車輪の亀裂、損傷	○	○	目視		亀裂、損傷のないこと			
	5	車輪部の異音	○	○	聴音		異音がないこと			
	6	軸の固定状態	○	○	目視		異常がないこと			
	7	ﾍﾞｱﾘﾝｸﾞの異音、異熱、異振動	○	○	聴音、感覚		異音、異熱、異振動がないこと			
	8	ﾍﾞｱﾘﾝｸﾞの潤油状態	○	○	目視		油切れがないこと			
ドラム ギア カップリング	1	異音、異振動	○	○	聴音、感覚		異音、異振動がないこと			巻上装置 起伏装置
	2	潤滑、塗油状態		○	目視		油ぎれがないこと			
	3	軸心の通り		○	目視、聴音		異音、異振動がないこと			
	4	歯形の亀裂、損傷、摩耗	○	○	目視		異常摩耗、金属粉がないこと (ポンチマークの範囲内のこと)			
ドラム 軸受	1	ｹｰｼﾝｸﾞの亀裂		○	目視		亀裂が無いこと			巻上装置 起伏装置
	2	ﾍﾞｱﾘﾝｸﾞの潤油、塗油状態	○	○	目視		油ぎれがないこと			
	3	異音、異熱、異振動	○	○	聴音、触手、感覚		異音、異熱、異振動がないこと			
	4	ボルト、ナットの緩み、脱落	○	○	目視、打診	テストハンマ	緩み、脱落がないこと			
非常ブレーキ	1	可動部の作動状態	○	○	目視		正常に稼働すること			起伏装置 走行装置
	2	ライニングの摩耗	○	○	目視、計測	摩耗限界ｹﾞｰｼﾞ	摩耗代3mm(片側)			
	3	ﾃﾞｨｽｸとライニングの隙間	○	○	目視、計測	隙間ｹﾞｰｼﾞ	ｴｱｷﾞｬｯﾌﾟ1.5mm以内(片側)			
	1	ディスクの摩耗	○	○	目視、計測	ノギス	表面に傷が生じたら修理する ﾗｲﾆﾝｸﾞの摩耗は厚さの5mm以内			
	2	ディスクの荒れ、変色、異熱	○	○	目視、触手		荒れ、変色、異熱がないこと			
	3	ボスの亀裂	○	○	目視		亀裂がないこと			
	4	キー及びキー溝の変形		○	目視、作動		変形のないこと			
	5	キーの緩み、抜け出し		○	目視、作動		緩み、抜け出しのないこと			
	6	ボルト・ナットの緩み、脱落	○	○	目視、打診	テストハンマ	緩み、脱落がないこと			
	7	回転状態	○	○	目視		正常に回転すること			
ピン	1	潤油、塗油状態	○	○	目視		油切れのないこと			走行装置 ﾚｰﾙｸﾗﾝﾌﾟ
	2	固定状態	○	○	目視、打診	テストハンマ	軸の固定が確実なこと			
	3	異音	○	○	聴音、感覚		異音がないこと			
	4	作動状態	○	○	目視、作動		正常に作動していること			

ブレーキディスク		1	ﾃﾞｨｽｸの摩耗、切れる	○	○	目視・計測	ノギス	表面傷は直ぐに修整する ディスクの摩耗は原寸の5mm以内	左mm 右mm			巻上装置 起伏装置
		2	ディスクの荒れ、変色、異熱	○	○	目視・触手		荒れ、変色、異熱がないこと				
		3	ボスの亀裂	○	○	目視		亀裂がないこと				
		4	ボルト、ナットの緩み、脱落	○	○	目視・打診	テストハンマ	緩み、脱落がないこと				
		5	回転状態	○	○	聴音・感覚		正常に回転すること				
フレーム		1	亀裂、損傷	○	○	目視		亀裂、損傷のないこと				レールクランプ 固定装置
		2	部材のさび、腐食		○	目視		著しいさび、腐食がないこと				
		3	塗膜の剥離	○	○	目視		著しい塗膜の剥離がないこと				
		4	作動状態	○	○	目視、作動		正常に作動していること				
ボギー ロッカ ビーム		1	亀裂、損傷	○	○	目視		亀裂、損傷のないこと				走行装置 固定装置
		2	部材のさび、腐食		○	目視		規定値以内であること				
		3	塗膜の剥離		○	目視		規定値以内であること				
		4	異音	○	○	目視		異音がないこと				
		5	軸の潤油状態	○	○	目視、聴音		油切れのないこと				
ボルト、ナット		1	緩み、脱落	○	○	目視、打診	テストハンマ	緩み、脱落がないこと				走行/固定装置
リンク		1	潤油、塗油状態	○	○	目視		油切れのないこと				レールクランプ 固定装置
		2	作動状態	○	○	目視、作動		正常に作動していること				
		3	変形	○	○	目視		変形がないこと				
固定装置	連結ピン	1	損傷	○	○	目視		損傷がないこと				
		2	曲がり	○	○	目視		曲がりがないこと				
	ウェイト	1	固定状態	○	○	目視		固定が確実であること				
	リミットスイッチ ストライカー	1	作動位置	○	○	目視		正常に作動していること				
		2	変形、腐食	○	○	目視		著しい変形、腐食がないこと				
	短冊状 金物	1	損傷	○	○	目視		損傷がないこと				
		2	さび、腐食	○	○	目視		著しいさび、腐食がないこと				
		3	作動状態	○	○	目視、作動		正常に作動していること				
レール ブレーキ	ブレーキ パッド	1	パッドの厚さ	○	○	計測	鋼尺、ノギス	規定値以内であること				
		2	ﾗｲﾆﾝｸﾞとレールの間隔	○	○	計測	鋼尺、ノギス	規定値以内であること				
		3	ﾗｲﾆﾝｸﾞの状態		○	目視		変色していないこと				
		4	取付ﾎﾞﾙﾄのゆるみ、脱落	○	○	目視、打診	テストハンマ	緩み、脱落がないこと				
	ブレーキ 本体	1	ﾌﾞﾚｰｷの作動確認	○	○	目視、作動		正常に作動していること				
		2	ｼﾘﾝﾀﾞﾛｯﾄﾞの状態	○	○	目視		汚れ、発錆がないこと				
		3	近接ｽｲｯﾁの作動状況	○	○	目視		検出板との距離が規定値以内であること				
		4	部品の装備状態	○	○	目視		部品の欠落がないこと				
		5	ボルト・ナットの緩み、脱落	○	○	目視、打診	テストハンマ	緩み、脱落がないこと				
吊り ビーム	吊り ビーム	1	本体の亀裂、損傷、変形	○	○	目視		亀裂、損傷、変形がないこと				
		2	塗装の剥離		○	目視		著しい塗膜の剥離がないこと				
		3	フレームのさび、腐食		○	目視		著しいさび、腐食がないこと				
		4	ボルト、ナットの緩み、脱落	○	○	目視、打診	テストハンマ	緩み、脱落がないこと				
	フック	1	ﾌｯｸの亀裂		○	目視		亀裂がないこと				
		2	口の開き		○	計測	ノギス	規定値以内であること				
		3	局部摩耗		○	計測	ノギス	規定値以内であること				
		4	ﾌｯｸの変形	○	○	目視		変形がないこと				
		5	ﾍﾟｱﾘﾝｸﾞの潤油塗油状態	○	○	目視		油切れがないこと				
		6	ﾛｰﾌﾟ外れ止めの損傷	○	○	目視		損傷がないこと				
		7	ボルト、ナットの緩み、脱落	○	○	目視、打診	テストハンマ	緩み、脱落がないこと				
巻上 装置	ﾛｰﾌﾟｶﾞｲﾄﾞ	1	回転状態	○	○	目視		正常に回転していること				
		2	ｶﾞｲﾌｫﾛｰﾗの損傷	○	○	目視		損傷がないこと				
		3	ｶﾞｲﾌｫﾛｰﾗの摩耗	○	○	目視・計測	ノギス	規定値以内であること				
		4	ﾍﾟｱﾘﾝｸﾞの異音、異熱、異振動	○	○	聴音、触手、感覚		異音、異熱、異振動がないこと				
		5	ピンの固定状態	○	○	目視		正常であること				
走行 装置	緩衝器 (ﾊﾞｯﾌｧｰ)	1	損傷、変形	○	○	目視		損傷、変形がないこと				
		2	ボルト・ナットの緩み、脱落	○	○	目視、打診	テストハンマ	緩み、脱落がないこと				
レール クランプ	クランプ 金物	1	摩耗、損傷、変形	○	○	目視	インジケータ	摩耗、損傷、変形がないこと				
		2	作動状態	○	○	目視、作動		正常に作動していること				
起伏 装置	ブレーキ	1	可動部の作動状態	○	○	目視		正常に稼働すること				
		2	油圧押上機の油漏れ	○	○	目視		油漏れがないこと				
		3	油圧押上機の油量及び油の劣化	○	○	目視		油量が適量で油の劣化がないこと				
レール クランプ	油圧 シリンダ	1	損傷、変形	○	○	目視		損傷、変形がないこと				
		2	油漏れ	○	○	目視		油漏れがないこと				
		3	さび、腐食	○	○	目視		さび、腐食がないこと				
		4	作動状態	○	○	目視、作動		正常に作動していること				
	油圧 配管	1	損傷	○	○	目視		損傷がないこと				
		2	油漏れ	○	○	目視		油漏れがないこと				
		3	固定状態	○	○	目視		確実に固定していること				
	油圧 ユニット	1	油量	○	○	目視	ｵｲﾙﾚﾍﾞﾙｹﾞｰｼﾞ	規定値以内であること				
		2	油の汚れ、劣化	○	○	目視		油の汚れ、劣化がないこと。油の取替時期が守られていること				
		3	油漏れ	○	○	目視		油漏れがないこと				
		4	さび、腐食	○	○	目視		さび、腐食がないこと				
		5	作動状態	○	○	目視、作動		正常に作動していること				

ジブクレーン点検検査表(月例・年次検査)
Ⅱ　電気設備関係

区分		No	点検項目	月例	年次	測定方法	測定具	判定基準	測定値	判定	措置・備考
電動機		1	異音、異熱、異臭、異振動	○	○	聴音・触手・感覚		異常がないこと			巻上装置 起伏装置 走行装置
		2	本体取付ﾎﾞﾙﾄの緩み、発錆	○	○	目視、打診	ﾃｽﾄﾊﾝﾏ	緩み、発錆がないこと			
		3	軸受の潤油状態	○	○	目視		油切れがないこと			
		4	絶縁抵抗		○	計測	ﾒｶﾞｰ	規定値以上			
		5	ｽﾍﾟｰｽﾋｰﾀの導通		○	計測	ﾃｽﾀｰ	断線がないこと			
		6	ｻｰﾓｽﾀｯﾄ回路の導通		○	計測	ﾃｽﾀｰ	断線がないこと			
ディスク ブレーキ		1	ﾗｲﾆﾝｸﾞの摩耗、変色	○	○	目視、計測	鋼尺。ﾉｷﾞｽ	変色がないこと、摩耗限界5mm			巻上装置 起伏装置 走行装置 (内蔵ﾌﾞﾚｰｷ)
		2	ﾗｲﾆﾝｸﾞとﾃﾞｨｽｸの隙間	○	○	目視、計測	鋼尺、隙間ｹﾞｰｼﾞ	隙間がほぼ均等であること			
		3	ﾃﾞｨｽｸの摩耗、荒れ	○	○	目視、計測	鋼尺。ﾉｷﾞｽ	表面に傷が生じたら修正する ﾃﾞｨｽｸの摩耗は原寸の5mm以内			
		4	ﾃﾞｨｽｸの亀裂、油付着	○	○	目視		亀裂、油付着がないこと			
		5	各ﾚﾊﾞｰのﾋﾟﾝ部の潤油状態	○	○	目視		油切れがないこと			
		6	制動ﾄﾙｸ(ｽﾌﾟﾘﾝｸﾞの寸法)	○	○	目視、計測	鋼尺	ｽｹｰﾙ目盛り設定値が銘板通りであること	目盛 確認		
		7	本体ﾚﾊﾞｰ、ロッド、ﾗｲﾆﾝｸﾞ取付ﾎﾞﾙﾄ、ﾋﾟﾝ、ﾋﾞｽ等の緩み、損傷	○	○	目視、打診	ﾃｽﾄﾊﾝﾏ	緩み、損傷がないこと			
		8	異音、異熱、異臭、異振動	○	○	聴音・触手・感覚		異常がないこと			
		9	ﾌﾞﾚｰｷﾗｲﾆﾝｸﾞの加熱、変色	○	○	目視		変色のないこと			
		10	塵埃の堆積	○	○	目視		塵埃の堆積がないこと			
		11	電動油圧押上機の油漏れ	○	○	目視		油漏れがないこと			
		12	電動油圧押上機の油量及び劣化	○	○	目視		油量が適量で油の劣化がないこと			
速度検出器 (電動機外付けの場合)		1	結合部の状態	○	○	目視		正常なこと			巻上装置 起伏装置
		2	取付ﾎﾞﾙﾄの緩み	○	○	打診	ﾃｽﾄﾊﾝﾏ	緩みがないこと			
		3	結合部の潤滑状態		○	目視		油切れがないこと			
		4	絶縁抵抗		○	計測	ﾃｽﾀｰ	規定値以上であること			
盤共通		1	盤外面及び周囲の状態	○	○	目視		汚れがないこと			変圧器盤 主電動機盤
		2	盤内面各部の状態	○	○	目視		塵埃付着がないこと、結露がないこと			
		3	器具、部品等の状態	○	○	目視		破損がないこと			
		4	器具接点の状態	○	○	目視		損傷、摩耗がないこと			
		5	配線の状態	○	○	目視		汚れ、損傷がないこと			
		6	ｺﾈｸﾀ接合状態		○	目視		緩みがないこと			
		7	絶縁材の状態		○	目視		汚損、損傷、不足のないこと			
		8	構造組立上の締結状態		○	目視、触手		緩みがないこと			
		9	導線各部の締付状態		○	目視、触手		緩みがないこと			
		10	過熱損傷の痕跡		○	目視		痕跡がないこと			
MCCB 漏電遮断器		1	定格容量の確認	○	○	目視		設計値とおりであること			主電動機盤 主幹盤 補器盤 制御機器
		2	絶縁物の亀裂、損傷	○	○	目視		亀裂、損傷がないこと			
		3	開閉動作確認	○	○	作動		正常なこと			
		4	ﾓｰﾙﾄﾞの破損	○	○	作動		破損がないこと			
		5	取付けﾎﾞﾙﾄのゆるみ	○	○	触手		緩みがないこと			
盤内配線		1	ﾎﾞｯｸｽ等取付部のゆるみ	○	○	触手		緩みがないこと			主幹盤 補器盤
		2	端子部のゆるみ	○	○	触手		緩みがないこと			
		3	配線の外傷		○	目視		外傷がないこと			
		4	盤内配線の素線切れ		○	目視・触手		素線切れがないこと			
		5	端子ﾊﾘｱ等の破損		○	目視		破損がないこと			
		6	圧着端子の亀裂		○	目視		亀裂がないこと			
		7	ﾜｲﾔｰﾏｰｸの脱落、破損、汚れ		○	目視		脱落、破損、汚れがないこと			
		8	屋外用接続箱への雨水の浸入	○	○	目視		雨水の浸入がないこと			
		9	各回路の絶縁抵抗		○	計測	ﾒｶﾞｰ	規定値以上であること			
		10	配線への塵埃の堆積		○	目視		塵埃の堆積がないこと			
		11	配線ﾊﾞｲﾝﾄﾞの緩み		○	触手		緩みがないこと			
電磁接触器 継電器		1	接触子の接触状態(くい違い)	○	○	目視		正常であること			主電動機盤 主幹盤 補器盤
		2	電磁ｺｲﾙのうなり	○	○	聴音		正常であること			
		3	可動鉄心吸着面、ｺｲﾙ表面の状態	○	○	目視		正常であること			
		4	作動確認	○	○	作動		正常であること			
		5	取付ﾎﾞﾙﾄのゆるみ	○	○	触手		緩みのあること			
		6	ﾘｰﾄﾞ線の素線切れ		○	目視		素線切れがないこと			
		7	接点の締付状態		○	目視		緩みがないこと			
		8	電磁ｺｲﾙ用抵抗器の抵抗値		○	目視		正常なこと			
		9	構造部、電磁ｺｲﾙへの塵埃の堆積		○	目視		塵埃がないこと			
		10	可動鉄心のｽﾄｯﾊﾟの異常		○	目視		正常であること			
		11	過電流継電器の設定の確認		○	目視		正常であること			
変圧器	コイル	1	塵埃の堆積	○	○	目視		塵埃の堆積がないこと			
		2	過熱、変色	○	○	目視		異常な変色がないこと			
		3	損傷	○	○	目視		損傷がないこと			
		4	締付部の状態		○	目視、触手		ｶﾞﾀ、緩みがないこと			
		5	絶縁抵抗		○	計測	ﾒｶﾞｰ	規定値以上であること			
	ﾀｯﾌﾟ切替台	1	塵埃	○	○	目視		損傷がないこと			
		2	損傷	○	○	目視					
	接続銅帯	1	過熱、変色	○	○	目視		異常な変色がないこと			
		2	締付部の状態		○	目視、触手		ｶﾞﾀ、緩みがないこと			
	各種支持金物	1	損傷	○	○	目視、触手		損傷がないこと			
		2	振動	○	○	目視、触手		異常な振動がないこと			
	ﾀﾞｲﾔﾙ温度計	1	温度の指示	○	○	目視		異常がないこと			
		2	ｶﾞﾗｽの曇り、結露の有無	○	○	目視		曇り、結露がないこと			
		3	導管の取付状況		○	目視		異常がないこと			
		4	取付状況(防振ｺﾞﾑ等)		○	目視		異常がないこと			
		5	警報接点動作の確認		○	作動		異常がないこと			
		6	絶縁抵抗		○	計測	ﾒｶﾞｰ	規定値以上であること			

インバータ盤 コンバータ盤	制御ユニット	1	プリント基盤の塵埃	○	○	目視		過度の塵埃がないこと			
		2	規定入力による規定出力の確認		○	計測	テスタ・シンクロスコープ	設計値とおりであること			
		3	設定パラメータの確認		○	計測	テスタ・プログラミングツール	設計値とおりであること			
		4	制御電圧の確認		○	計測	テスタ	AC440V±10%			
		5	バックアップ用バッテリ		○	目視	プログラミングツール	使用限度内であること			
	冷却ファン	1	振動	○	○	触手		過度の振動がないこと			
		2	回転確認	○	○	目視		正しい回転方向であること			
		3	インペラ損傷	○	○	目視		変形、損傷がないこと			
	通風口	4	フィルタの目詰り		○	目視		目詰りがないこと			
制御機器操作ディスク	コントローラ	1	コントロールハンドルのセンター、垂直性	○	○	目視		異常がないこと			
		2	円滑な操作	○	○	作動		異常がない（特にギア、ピン、軸受等の摩耗による遊びがないこと）			
		3	軸受の潤油	○	○	目視		油切れがないこと			
		4	接触子の接触状態	○	○	回路確認		正常なこと			
		5	取付ボルトのゆるみ	○	○	触手		緩みがないこと			
		6	ゼロノッチストッパの動作	○	○	作動		正常なこと（特に摩耗による遊びがないこと）			
	押釦・切替スイッチ	1	接触子の接触状態と動作	○	○	目視・作動		円滑に作動すること			
		2	取付ボルトのゆるみ	○	○	触手		緩みがないこと			
	信号灯表示灯	1	ランプ切れ	○	○	目視		緩みがないこと			
		2	取付ボルトのゆるみ	○	○	触手		緩みがないこと			
制御機器計器盤	計器その他	1	計器類の指示の確認	○	○	目視		正常なこと			
		2	計器用変成器の加熱変色、亀裂	○	○	目視		変色、亀裂がないこと			
		3	盤内の露滴の有無	○	○	目視		露滴がないこと			
		4	取付ボルトのゆるみ	○	○	触手		緩みがないこと			
		5	各種計器類の誤差の確認		○	目視		規定値以内であること			
		6	盤の腐食、汚損等		○	目視		腐食、汚損がないこと			
計測機器（エンコーダ/シンクロ）	発信器	1	取付状態の確認	○	○	目視・触手		正常であること			
		2	カップリング取付状態の確認	○	○	目視・触手		正常であること			
		3	ケーブルコネクタの接続状態、損傷の有無	○	○	目視・触手		緩み、損傷がないこと			
		4	ケーブルの断線、短絡状況の確認		○	計測	テスタ	正常であること			
		5	ベアリング部の点検、給油	○	○	目視		正常で、油切れがないこと			
		6	ギア部の点検、給油	○	○	目視		正常で、油切れがないこと			
	受信器（変換器）	1	取付状態の確認	○	○	目視・触手		正常であること			
		2	ケーブルコネクタの接続状態、損傷の有無	○	○	目視・触手		緩み、損傷がないこと			
		3	ランプ、スイッチ類の動作確認	○	○	目視・作動		正常であること			
	指示器	1	取付状態の確認	○	○	目視・触手		正常であること			
		2	ケーブルコネクタの接続状態、損傷の有無	○	○	目視・触手		緩み、損傷がないこと			
		3	ランプ、スイッチ類の動作確認	○	○	目視・作動		正常であること			
計測機器（荷重計）	検出器	1	取付状態の確認	○	○	目視・触手		正常であること			
		2	ケーブルコネクタの接続状態、損傷の有無	○	○	目視・触手		緩み、損傷がないこと			
	変換器	1	取付状態の確認	○	○	目視・触手		正常であること			
		2	ケーブルコネクタの接続状態、損傷の有無	○	○	目視・触手		緩み、損傷がないこと			
		3	ランプ、スイッチ類の動作確認	○	○	目視・作動		正常であること			
	表示盤	1	取付状態の確認	○	○	目視・触手		正常であること			
		2	ケーブルコネクタの接続状態、損傷の有無	○	○	目視・触手		緩み、損傷がないこと			
		3	ランプ、スイッチ類の動作確認	○	○	目視・作動		正常であること			
風向風速計	発信器	1	本体の外観、取付状況、方向の確認	○	○	目視・触手		正常であること 緩みがないこと			
		2	ケーブルコネクタの接続状態、損傷の有無	○	○	目視・触手		緩み、損傷がないこと			
		3	ケーブルの断線、短絡状況の確認		○	計測	テスタ	正常であること			
		4	風杯の回転、動作状況の確認	○	○	目視・触手		正常であること			
		5	動作確認	○	○	目視・作動		正常であること			
	受信器	1	本体の取付状況の確認	○	○	目視・触手		正常であること			
		2	ケーブルコネクタの接続状態、損傷の有無	○	○	目視・触手		緩み、損傷がないこと			
		3	電源電圧の確認		○	計測	テスタ	規定値以内であること			
		4	ランプ、スイッチ類の動作確認	○	○	目視・作動		正常であること			
		5	設定値の確認	○	○	目視		設計値とおりであること			
		6	動作確認	○	○	目視・作動		正常であること			
安全装置	非常停止装置	1	動作確認	○	○	作動		正常であること			
		2	取付ボルトの確認	○	○	触手		緩みがないこと			
	リミットスイッチ	1	動作確認	○	○	作動		正常であること			
		2	取付ボルトの確認	○	○	触手		緩みがないこと			
	衝突防止装置	1	動作確認	○	○	作動		正常であること			
		2	取付ボルトの確認	○	○	触手		緩みがないこと			
	速度開閉器	1	ネジ締め部分の確認	○	○	目視		緩みがないこと			
		2	軸連結部の確認	○	○	目視		粉塵の付着がないこと			

資料10　環境調査添付資料

10-1　　環境調査添付資料

(1)　水質分析の結果

水質分析結果（P-1／乾季）

ISO TECH LABORATORY

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

TRACE CERTIFIED

WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 1 of 1

M0517 014

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client	E-Guard
Nature of Water	River Water (1)
Location	Mandalay Township
Date and Time of collection	17.5.2017 (12:30 PM)
Date and Time of arrival at Laboratory	18.5.2017
Date and Time of commencing examination	18.5.2017
Date and Time of completing	19.5.2017

Results of Water Analysis			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	18	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	8	CFU/100ml	Not detected
pH	7.3		6.5 - 8.5
Turbidity	92	NTU	5 NTU
Colour (True)	60	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

Remark : Unsatisfactory for drinking purpose.
: This certificate is issued only for the receipt of the test sample.
: < - Less than

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)
No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-73242162, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ANALYSIS REPORT

ORIGINAL

Job Ref: 3691/2017
Date : 12 May, 2017

Sample Described as	:	**ENVIRONMENTAL WATER**
Client Name	:	**E GUARD ENVIRONMENTAL SERVICES CO., LTD.**
		No. 11, Air Port Street, Insein Township, Yangon, Myanmar
Sample Brought By	:	Client
Sample Marks	:	1
Location	:	MDY
Sample Received Date	:	08.05.2017
Analysed Date	:	09.05.2017
Lab Code No.	:	107/17

No.	Test Parameter	Unit	Result	Method	LOQ
1.	Oil & Grease	mg/l	<5	Standard methods for the examination of water & waste water APHA ,AWWA & WEF,22nd ed, 2012;5520B	5

End Of Report

SGS (Myanmar) Limited
(Nu Nu Yi)
Manager

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Member of SGS Group (SGS SA)

SUPREME GROUP OF COMPANIES
SUPREME WATER DOCTOR GROUP
No.19-C, Nawaday Garden, Yangon-Pathein Road,
Hlaing Tharyar Township, Yangon, Republic of the Union of Myanmar
Tel : 01-689376, 689377, 689378, 689718, 689719. Fax : 01-685237

WATER ANALYSIS RESULT

Result Form No.	0341/ R&D / SWDG / 17
Client	Eguard
Location	မန္တလေး။ ဧရာဝတီမြစ်ရေ ။
Nature of Water	မြစ်ရေ - Point(1)
Date of Sample Received	8.5.2017
Tested on	8.5.2017

	UNIT	ANALYSIS RESULT	WHO GUIDELINE
Total Nitrogen	mg/L	0.9	-
Total Phosphorus	mg/L	0.4	-

Remark :

Approved By

Tin Moh Moh Hlaing
M.Sc (Chem:), M.S (Biotech:)
Head of R&D Dept;
Supreme Water Doctor Group
Supreme Group of Companies

MANDALAY CITY DEVELOPMENT COMMITTEE
WATER AND SANITATION DEPARTMENT
WATER LAB ORATORY

Your reference Development of Mandalay Port Project (ဧရာဝတီမြစ်ရေ) .....

Our reference .....

Report on ..... One (Number) ..... Sample of Water

Brought by ..... ဦးပြည်ဖြိုးကျော် ..... at ..... (Time) ..... on ..... 5-5-2017 (Date)

Tested on ..... 5-5-2017 (Date) ..... at ..... (Time)

Sampling Points		Point 1	W.H.O Standard	
Sampling Time and Date			Desirable	Imperative
Physical Examination	**Unit**			
- P^H Value	Scale	6.8	7-8.5	6.5-9.2
- Colour	Units	>50	5	50
- Turbidity	N.T.U	91.2	5	25
- Conductivity	(micromhos/cm)	73.2		
- Total Dissolved Solids	mg/l	38.4		
- Total Suspended Solids	mg/l	69		
Chemical Analysis				
- Calcium as Ca	mg/l	8	75	200
- Hardness, Total as $CaCo_3$	mg/l	28	100	500
- Magnesium as Mg	mg/l	1	30	150
- Chloride as CL	mg/l	5	200	600
- Total Alkalinity as $CaCo_3$	mg/l	40	200	500
- Iron, Total as Fe	mg/l	>0.2	0.1	1.0
- Manganese as Mn	mg/l	0.03	0.05	0.5
- Sulphate as So_4	mg/l	<200	200	400
- Nitrogen Nitrate ($N\text{-}NO_3$)	mg/l	8.8		45

Remark ---------- Chemically Potable ----------

Tested by .....

Approved by .....

MANDALAY CITY DEVELOPMENT COMMITTEE
WATR AND SANITATION DEPARTMENT
WATER LABORATORY

Your reference - Development of Mandalay Port Project (ဧရာဝတီမြစ်ရေ Point-1)

Brought by - ဦးပြည့်ဖြိုးကျော် at ..... (Time) on 5-5-2017 (Date)

Test on - 5-5-2017 (Date) at ..... (Time)

D.O (mg/l)	-	6.86
B.O.D (mg/l)	-	3.90
C.O.D (mg/l)	-	9.75
P^H vlue	-	6.8
Salinity	-	0.1
T.S.S (mg/l)	-	69

Tested by .....

Approved by .....

Project: MDY Port	Date: 5.5.2017 (1)
Client:	Surveyor: Pyae Phyo Kyaw / Khin Zaw Min
Location: MDY	Time: 11:00 Am
Lat: 21° 57' 9.72" N	Long: 96° 02' 46.17" E
Evaluation:	Barometer Pressure:
Weather:	Sample/Location ID: GPS Waypoint no: Temperature: 27.6°C Time: 11:10 Am
Turbidity by Sechi Depth (cm):	
NTU converted from chart:	

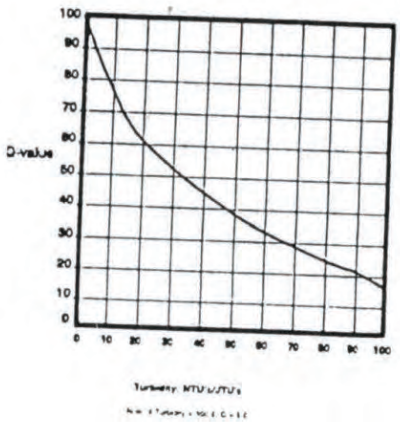
Surface/Ground/Effluent Water

Sr. No.	pH	Electrical Conductivity			DO (ppm)	Flow Rate (m/sec)	Depth (m)	Remark
		EC (µS/cm)	TDS (ppm)	Salinity (ppt)				
P1.	8.110	53.2	53mg/L	0.0	7.72			

Length to Turbidity Conversion Chart

cm	NTU
< 6	> 240
6 to 7	240
7 to 8	185
8 to 9	150
9 to 10	120
10 to 12	100
12 to 14	84
14 to 16	60
16 to 19	48
19 to 21	40
21 to 24	35
24 to 26	30
26 to 29	27
29 to 31	24

cm	NTU
31 to 34	21
34 to 36	19
36 to 39	17
39 to 41	15
41 to 44	14
44 to 46	13
46 to 49	12
49 to 51	11
51 to 54	10
54 to 57	9
57 to 60	8
60 to 70	7
70 to 85	6
> 85	< 5



Kyaw
Pyae Phyo Kyaw
EQ Team Leader

水質分析結果（P-1／雨季）

ISO TECH LABORATORY

TRACE CERTIFIED

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001
Issue Date - 01-12-2012
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Issue No - 1.0/Page 1 of 1

M0717 016

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client	E-Guard
Nature of Water	River Water
Location	Mandalay Township (Point - 1)
Date and Time of collection	22.7.2017
Date and Time of arrival at Laboratory	24.7.2017
Date and Time of commencing examination	24.7.2017
Date and Time of completing	25.7.2017

Results of Water Analysis			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	30	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	12	CFU/100ml	Not detected
pH	7.1		6.5 - 8.5
Turbidity	110	NTU	5 NTU
Colour (True)	70	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

Remark : Unsatisfactory for drinking purpose.
: This certificate is issued only for the receipt of the test sample.
: < - Less than

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thir
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)
No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-73242162, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ANALYSIS REPORT

ORIGINAL

Job Ref: 5817/2017
Date : 31 July 2017

Sample Described as	:	**ENVIRONMENTAL WATER**
Client Name	:	**E GUARD ENVIRONMENTAL SERVICES CO., LTD.**
		No. 11, Air Port Street, Insein Township, Yangon, Myanmar
Project Name	:	-
Sample Brought By	:	Client
Sample Marks	:	1
Location	:	MANDALAY PORT
Sample Received Date	:	24.07.2017
Analysed Date	:	25.07.2017
Lab Code No.	:	154/2017

No.	Test Parameter	Unit	Result	Method	LOQ
1.	Total Nitrogen(organic)	mg/l	<1	Standard methods for the examination of water & waste water APHA ,AWWA & WEF,22nd ed, 2012; 4500-N_{org} B.Macro Kjeldahl Method	1
2.	Total Phosphorus	mg/l	0.020	Standard methods for the examination of water & waste water APHA ,AWWA & WEF,22nd ed, 2012;4500-P E.Ascorbic Acid Method	0.01
3.	Oil & Grease	mg/l	<5	Standard methods for the examination of water & waste water APHA ,AWWA & WEF,22nd ed, 2012;5520B	5

End Of Report

SGS (Myanmar) Limited

(Nu Nu Yi)
Manager

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t : +95 (1) 654795, 654796 e : sgs.myanmar@sgs.com
Member of SGS Group(SGS SA)

MANDALAY CITY DEVELOPMENT COMMITTEE
WATR AND SANITATION DEPARTMENT
WATER LABORATORY

Your reference	-	Development of Mandalay Port Project (ဧရာဝတီမြစ်ရေ Point-1)
Brought by	-	ဦးပြည့်ဖြိုးကျော် at ..... (Time) on 20-7-2017 (Date)
Test on	-	20-7-2017 (Date) at ..... (Time)
D.O (mg/l)	-	5.67
B.O.D (mg/l)	-	3.60
C.O.D (mg/l)	-	9.00
P^{H} vlue	-	6.8
Salinity	-	0.1
T.S.S (mg/l)	-	49

Tested by .....

Approved by .....
ဌာနဒိပတိ
ရေဖြန်ဖြူးရေးဌာနခွဲ

MANDALAY CITY DEVELOPMENT COMMITTEE
WATER AND SANITATION DEPARTMENT
WATER LAB ORATORY

Your reference Development of Mandalay Port Project (ဧရာဝတီမြစ်ရေ) .....

Our reference .....

Report on ..... One (Number) ..... Sample of Water

Brought by ..... ဦးပြည့်ဖြိုးကျော် ..... at ..... (Time) on ..... 20-7-2017 (Date)

Tested on ..... 20-7-2017 (Date) ..... at ..... (Time)

Sampling Points		Point 1	W.H.O Standard	
Sampling Time and Date			Desirable	Imperative
Physical Examination	**Unit**			
- P^H Value	Scale	6.8	7-8.5	6.5-9.2
- Colour	Units	>50	5	50
- Turbidity	N.T.U	53.8	5	25
- Conductivity	(micromhos/cm)	72.8		
- Total Dissolved Solids	mg/l	38.5		
- Total Suspended Solids	mg/l	49		
Chemical Analysis				
- Calcium as Ca	mg/l	11	75	200
- Hardness, Total as $CaCo_3$	mg/l	40	100	500
- Magnesium as Mg	mg/l	3	30	150
- Chloride as CL	mg/l	5	200	600
- Total Alkalinity as $CaCo_3$	mg/l	40	200	500
- Iron, Total as Fe	mg/l	>0.2	0.1	1.0
- Manganese as Mn	mg/l	0.03	0.05	0.5
- Sulphate as So_4	mg/l	<200	200	400
- Nitrogen Nitrate ($N\text{-}NO_3$)	mg/l	8.8		45

Chemically Potable

Remark .....

Tested by .....

Approved by .....

ဌာနဆိုင်ရာ
ရေဖြန့်ဖြူးရေးဌာနခွဲ

Project: Mandalay Port	Date: 20.7.2017
Client:	Surveyor: Pyae Phyo Kyaw
Location: Mandalay	Time: 10:30 AM
Lat: 21° 57' 9.72" N	Long: 96° 02' 46.17" E
Evaluation:	Barometer Pressure:
Weather:	Sample/Location ID: GPS Waypoint no: Temperature: 26°C Time: 10:40 AM
Turbidity by Sechi Depth (cm):	
NTU converted from chart:	

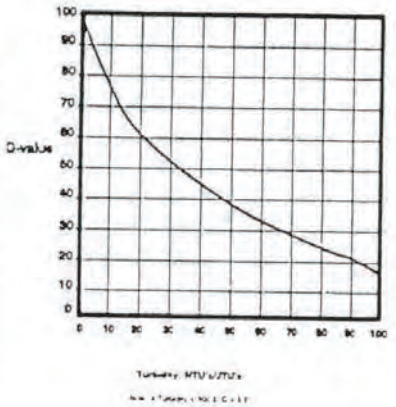
Surface/Ground/Effluent Water

Sr. No.	pH	Electrical Conductivity			DO (ppm)	Flow Rate (m/sec)	Depth (m)	Remark
		EC (µS/cm)	TDS (ppm)	Salinity (ppt)				
P.1	7.5	52	43mg/L	0	5.2			

Length to Turbidity Conversion Chart

cm	NTU
< 6	> 240
6 to 7	240
7 to 8	185
8 to 9	150
9 to 10	120
10 to 12	100
12 to 14	84
14 to 16	60
16 to 19	48
19 to 21	40
21 to 24	35
24 to 26	30
26 to 29	27
29 to 31	24

cm	NTU
31 to 34	21
34 to 36	19
36 to 39	17
39 to 41	15
41 to 44	14
44 to 46	13
46 to 49	12
49 to 51	11
51 to 54	10
54 to 57	9
57 to 60	8
60 to 70	7
70 to 85	6
> 85	< 5



Pyae Phyo Kyaw

水質分析結果（P-2／乾季）

ISO TECH LABORATORY

TRACE CERTIFIED

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 1 of 1

M0517 015

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client	E-Guard
Nature of Water	River Water (2)
Location	Mandalay Township
Date and Time of collection	17.5.2017 (12:30 PM)
Date and Time of arrival at Laboratory	18.5.2017
Date and Time of commencing examination	18.5.2017
Date and Time of completing	19.5.2017

Results of Water Analysis

			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	22	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	10	CFU/100ml	Not detected
pH	7.1		6.5 - 8.5
Turbidity	110	NTU	5 NTU
Colour (True)	70	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

Remark : Unsatisfactory for drinking purpose.
: This certificate is issued only for the receipt of the test sample.
: < - Less than

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)

No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-73242162, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

SGS

ANALYSIS REPORT

ORIGINAL

Job Ref: 3691/2017
Date : 12 May, 2017

Sample Described as	:	**ENVIRONMENTAL WATER**
Client Name	:	**E GUARD ENVIRONMENTAL SERVICES CO., LTD.**
		No. 11, Air Port Street, Insein Township, Yangon, Myanmar
Sample Brought By	:	Client
Sample Marks	:	2
Location	:	MDY
Sample Received Date	:	08.05.2017
Analysed Date	:	09.05.2017
Lab Code No.	:	108/17

No.	Test Parameter	Unit	Result	Method	LOQ
1.	Oil & Grease	mg/l	<5	Standard methods for the examination of water & waste water APHA ,AWWA & WEF,22nd ed, 2012;5520B	5

End Of Report

SGS (Myanmar) Limited

(Nu Nu Yi)
Manager

SGS (Myanmar) Limited | Agriculture, Food and Life (AFL) 79/80, Bahosi Housing Complex, Wardan Street, Lanmadaw Tsp, Yangon, Myanmar
t +95(1)211562, 211537, 211538, 211547 f +95(1)211549, 2317049 e sgs.myanmar@sgs.com
Member of SGS Group (SGS SA)

SUPREME GROUP OF COMPANIES
SUPREME WATER DOCTOR GROUP
No.19-C, Nawaday Garden, Yangon-Pathein Road,
Hlaing Tharyar Township, Yangon, Republic of the Union of Myanmar
Tel : 01-689376, 689377, 689378, 689718, 689719. Fax : 01-685237

WATER ANALYSIS RESULT

Result Form No.	0342/ R&D / SWDG / 17
Client	Eguard
Location	မန္တလေး ဧရာဝတီမြစ်ရေ ။
Nature of Water	မြစ်ရေ - Point(2)
Date of Sample Received	8.5.2017
Tested on	8.5.2017

	UNIT	ANALYSIS RESULT	WHO GUIDELINE
Total Nitrogen	mg/L	1.4	-
Total Phosphorus	mg/L	0.6	-

Remark :

Approved By

Tin Moh Moh Hlaing
M.Sc (Chem:), M.S (Biotech:)
Head of R&D Dept;
Supreme Water Doctor Group
Supreme Group of Companies

MANDALAY CITY DEVELOPMENT COMMITTEE
WATER AND SANITATION DEPARTMENT
WATER LAB ORATORY

Your reference Development of Mandalay Port Project (ဧရာဝတီမြစ်ရေ) .....

Our reference .....

Report on ..... One (Number) ..... Sample of Water

Brought by ဦးပြည့်ဖြိုးကျော် ..... at ..... (Time) on 5-5-2017 (Date)

Tested on 5-5-2017 (Date) ..... at ..... (Time)

Sampling Points		Point 2	W.H.O Standard	
Sampling Time and Date			Desirable	Imperative
Physical Examination	**Unit**			
- P^H Value	Scale	6.8	7-8.5	6.5-9.2
- Colour	Units	>50	5	50
- Turbidity	N.T.U	97.4	5	25
- Conductivity	(micromhos/cm)	73.8		
- Total Dissolved Solids	mg/l	38.6		
- Total Suspended Solids	mg/l	72		
Chemical Analysis				
- Calcium as Ca	mg/l	8	75	200
- Hardness, Total as $CaCo_3$	mg/l	28	100	500
- Magnesium as Mg	mg/l	1	30	150
- Chloride as CL	mg/l	5	200	600
- Total Alkalinity as $CaCo_3$	mg/l	40	200	500
- Iron, Total as Fe	mg/l	>0.2	0.1	1.0
- Manganese as Mn	mg/l	0.03	0.05	0.5
- Sulphate as So_4	mg/l	<200	200	400
- Nitrogen Nitrate ($N\text{-}NO_3$)	mg/l	8.8		45

Remark ----------

Tested by .....

Approved by .....

MANDALAY CITY DEVELOPMENT COMMITTEE
WATR AND SANITATION DEPARTMENT
WATER LABORATORY

Your reference - Development of Mandalay Port Project (ဧရာဝတီမြစ်ရေ Point-2)

Brought by - ဦးပြည့်ဖြိုးကျော် at ..... (Time) on 5-5-2017 (Date)

Test on - 5-5-2017 (Date) at ..... (Time)

D.O (mg/l)	-	6.64
B.O.D (mg/l)	-	3.80
C.O.D (mg/l)	-	9.50
P^{H} vlue	-	6.8
Salinity	-	0.1
T.S.S (mg/l)	-	72

Tested by .....

Approved by .....

Project: MOY Port	Date: 5.5.2017 (2)
Client:	Surveyor: Pyae Phyo Kyaw/Khin Zaw Min
Location: MOY	Time: 11:15 Am
Lat: 21° 56′ 50.00″ N	Long: 96° 02′ 39.07″ E
Evaluation:	Barometer Pressure:
Weather:	Sample/Location ID: GPS Waypoint no: Temperature: 27°C Time: 11:30 Am
Turbidity by Sechi Depth (cm):	
NTU converted from chart:	

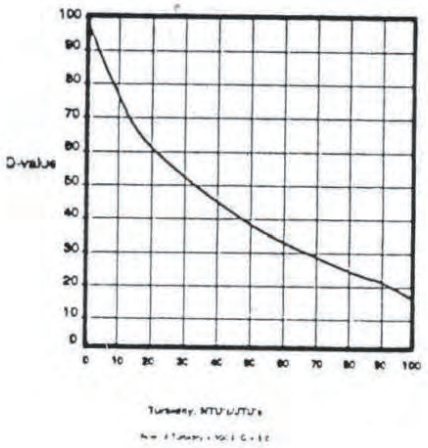
Surface/Ground/Effluent Water

Sr. No.	pH	Electrical Conductivity			DO (ppm)	Flow Rate (m/sec)	Depth (m)	Remark
		EC (µS/cm)	TDS (ppm)	Salinity (ppt)				
	8.09	50.8	51 mg/L	0.0	7.79		4m	

Length to Turbidity Conversion Chart

cm	NTU
< 6	> 240
6 to 7	240
7 to 8	185
8 to 9	150
9 to 10	120
10 to 12	100
12 to 14	84
14 to 16	60
16 to 19	48
19 to 21	40
21 to 24	35
24 to 26	30
26 to 29	27
29 to 31	24

cm	NTU
31 to 34	21
34 to 36	19
36 to 39	17
39 to 41	15
41 to 44	14
44 to 46	13
46 to 49	12
49 to 51	11
51 to 54	10
54 to 57	9
57 to 60	8
60 to 70	7
70 to 85	6
> 85	< 5



Pyae Phyo Kyaw
EQ Team Leader

水質分析結果（P-2／雨季）

ISO TECH LABORATORY

TRACE CERTIFIED

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip.S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 1 of 1

M0717 017

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client	E-Guard
Nature of Water	River Water
Location	Mandalay Township (Point - 2)
Date and Time of collection	22.7.2017
Date and Time of arrival at Laboratory	24.7.2017
Date and Time of commencing examination	24.7.2017
Date and Time of completing	25.7.2017

Results of Water Analysis			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	42	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	20	CFU/100ml	Not detected
pH	6.9		6.5 - 8.5
Turbidity	158	NTU	5 NTU
Colour (True)	80	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

Remark : Unsatisfactory for drinking purpose.
: This certificate is issued only for the receipt of the test sample.
: < - Less than

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)
No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-73242162, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ANALYSIS REPORT

ORIGINAL

Job Ref: 5817/2017
Date : 31 July 2017

Sample Described as	:	**ENVIRONMENTAL WATER**
Client Name	:	**E GUARD ENVIRONMENTAL SERVICES CO., LTD.**
		No. 11, Air Port Street, Insein Township, Yangon, Myanmar
Project Name	:	-
Sample Brought By	:	Client
Sample Marks	:	2
Location	:	MANDALAY PORT
Sample Received Date	:	24.07.2017
Analysed Date	:	25.07.2017
Lab Code No.	:	155/2017

No.	Test Parameter	Unit	Result	Method	LOQ
1.	Total Nitrogen(organic)	mg/l	<1	Standard methods for the examination of water & waste water APHA ,AWWA & WEF,22nd ed, 2012; 4500-N_{org} B.Macro Kjeldahl Method	1
2.	Total Phosphorus	mg/l	0.026	Standard methods for the examination of water & waste water APHA ,AWWA & WEF,22nd ed, 2012;4500-P E.Ascorbic Acid Method	0.01
3.	Oil & Grease	mg/l	<5	Standard methods for the examination of water & waste water APHA ,AWWA & WEF,22nd ed, 2012;5520B	5

End Of Report

SGS (Myanmar) Limited

(Nu Nu Yi)
Manager

MANDALAY CITY DEVELOPMENT COMMITTEE
WATER AND SANITATION DEPARTMENT
WATER LAB ORATORY

Your reference Development of Mandalay Port Project (ဧရာဝတီမြစ်ရေ) .....

Our reference .....

Report on ..... One ..... Sample of Water
(Number)

Brought by ..... ဦးပြည့်ဖြိုးကျော် ..... at ..... (Time) on ..... 20-7-2017 ..... (Date)

Tested on ..... 20-7-2017 ..... (Date) at ..... (Time)

Sampling Points		Point 2	W.H.O Standard	
Sampling Time and Date			Desirable	Imperative
Physical Examination	**Unit**			
- P^H Value	Scale	6.8	7-8.5	6.5-9.2
- Colour	Units	>50	5	50
- Turbidity	N.T.U	51.2	5	25
- Conductivity	(micromhos/cm)	72.2		
- Total Dissolved Solids	mg/l	37.7		
- Total Suspended Solids	mg/l	44		
Chemical Analysis				
- Calcium as Ca	mg/l	10	75	200
- Hardness, Total as $CaCo_3$	mg/l	40	100	500
- Magnesium as Mg	mg/l	4	30	150
- Chloride as CL	mg/l	5	200	600
- Total Alkalinity as $CaCo_3$	mg/l	40	200	500
- Iron, Total as Fe	mg/l	>0.2	0.1	1.0
- Manganese as Mn	mg/l	0.03	0.05	0.5
- Sulphate as So_4	mg/l	<200	200	400
- Nitrogen Nitrate ($N\text{-}NO_3$)	mg/l	8.8		45

Remark ---------- Chemically Potable ----------

Tested by .....

Approved by .....

MANDALAY CITY DEVELOPMENT COMMITTEE
WATR AND SANITATION DEPARTMENT
WATER LABORATORY

Your reference - Development of Mandalay Port Project (ရော်တီမြစ်ရေ Point-2)

Brought by - ဦးပြည့်ဖြိုးကျော် at ..... (Time) on 20-7-2017 (Date)

Test on - 20-7-2017 (Date) at ..... (Time)

D.O (mg/l)	-	5.07
B.O.D (mg/l)	-	3.50
C.O.D (mg/l)	-	9.00
P^{H} vlue	-	6.8
Salinity	-	0.1
T.S.S (mg/l)	-	44

Tested by .....

Approved by .....

Project: Mandalay Port	Date: 20.7.2017
Client:	Surveyor: Pyae Phyo Kyaw
Location: Mandalay	Time: 11:00 AM
Lat: 21° 56' 50.00" N	Long: 96° 02' 39.07" E
Evaluation:	Barometer Pressure:
Weather:	Sample/Location ID: GPS Waypoint no: Temperature: 25.6°C Time: 11:10 AM
Turbidity by Sechi Depth (cm):	
NTU converted from chart:	

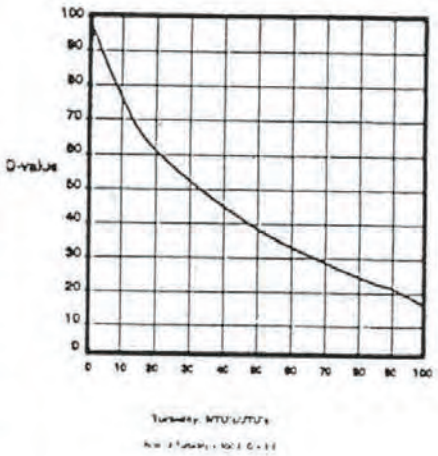
Surface/Ground/Effluent Water

Sr. No.	pH	Electrical Conductivity			DO (ppm)	Flow Rate (m/sec)	Depth (m)	Remark
		EC (µS/cm)	TDS (ppm)	Salinity (ppt)				
A2	7.9	51.2	45 mg/L	0	6.2			

Length to Turbidity Conversion Chart

cm	NTU
< 6	> 240
6 to 7	240
7 to 8	185
8 to 9	150
9 to 10	120
10 to 12	100
12 to 14	84
14 to 16	60
16 to 19	48
19 to 21	40
21 to 24	35
24 to 26	30
26 to 29	27
29 to 31	24

cm	NTU
31 to 34	21
34 to 36	19
36 to 39	17
39 to 41	15
41 to 44	14
44 to 46	13
46 to 49	12
49 to 51	11
51 to 54	10
54 to 57	9
57 to 60	8
60 to 70	7
70 to 85	6
> 85	< 5



Kyaw

(Pyae Phyo Kyaw)

(2) Ayeyarwady 川で確認された水生生物（F/S 時）

Sr.	Family	Scientific Name	English Name	Myanmar Name	IUCN Red List Category
1	Anabantidae	Anabas testudineus	Climbing perch	ငါးချေပမ	DD
2	Anguillidae	Anguilla bengalensis	Indian long finned eel	ငါးလင်ပန်းဆူးတောင်ရွည်	LC
3	Ariidae	Nemapteryx caelata		ငါးရောင်	Not assessed
4	Bagridae	Mystus leucophasis	Topsy Turvy fish	ငါးနောက်သစ်ပြ	LC
		Mystus cavasius	Small river cat fish	ငါးဓင်ရိုင်းကဖဲပြ	LC
		Sperata seenghala	River cat fish	ငါးယေကောင်း/ကော်ငး	LC
		Mystus gulio	Large river cat fish	ငါးရေပြ	LC
		Hemibagrus menoda	River cat fish	ငါးအိုက်	LC
		Mystus microphthalmus	River cat fish	ငါးအိုက်/ငါးငိုက်	LC
		Mystus tengara		ငါးဓင်ရိုင်း (ဖောကကြွခေး)	LC
		Rita sacerdotum	Giant river cat fish	ငါးထေပြ	LC
		Leiocassis siamensis	Bumble bee catfish		LC
5	Belonidae	Xenentodon cancila	Freshwater garfish	ငါးဖောင်ရိုး	LC
		Trichogaster trichopterus	gourami	ဂ်ပန်	LC
6	Channidae	Channa striata	Striped snake head fish	ငါးရံ့အောက်	LC
		Channa marulius	Giant snake head fish	ငါးရံ့ဒိုင်း	LC
		Channa punctata	Spotted snake head fish	ငါးပနော	LC
		Channa har (Channa harcourtbutleri)	Burmese snakehead	ငါးရံ့ဒိုင်း	NT
		Channa gachua	Dwarf snakehead	ငါးရံ့ခေါင်းတို	LC
7	Cichlidae	Oreochromis niloticus	Nile tilapia	နိုင်းတီလားပီးယား	Not assessed
8	Clupeidae	Ilisha megaloptera	Big eye ilisha	ငါးဓင်ဖြား	Not assessed
		Tenualosa ilisha	Hilsa shad	ငါးသလောက်	Not assessed
		Gudusia variegate	Burmese river shad	ငါးလပိ	LC
		Coilia	Gold	ငါးစမီးတံသပြ	Not assessed

Sr.	Family	Scientific Name	English Name	Myanmar Name	IUCN Red List Category
		dussumieri	spotted grenadier anchovy		
9	Cobitidae	Syncrossus beauforti	Chameleon Loach	ငါးသလဲထိုး	NT
		Syncrossus helodes	Banded Tiger Loach	ငါးသလဲထိုး	LC
		Botia histrionica	Burmese loach	ရေးစာရေး	LC
		Syncrossus berdmorei	Tiger botia	ငါးသလဲထိုး	NT
		Acanthopsoides hapalias		ငါးသလဲထိုး	LC
10	Cyprinidae	Amblypharyngodon atkinsonii	Small carp	ငါးဘဲဖ	LC
		Cirrhinus mrigala	Mrigala carp	ငါးၾကင်းျဖ	LC
		Labeo rohita	Rohu carp	ငါးျမစ္စခ်င္း	LC
		Catla catla	Catla carp	ငါးသိုင်းခေါင်းပြ	Not assessed
		Labeo calbasu	Black carp	ငါးနကျဟ	LC
		Labeo nandina	Nandina carp	ငါးအုံတုံ	NT
		Salmophasia sardinella	flying barb	ရင်ဘောင်ဇာ	LC
		Salmophasia sladoni	flying barb		LC
		Salmophasia bacaila	flying barb		LC
		Laubuca laubuca	flying barb		LC
		Raiamas bola	Barb	ငါးခုံးမ	LC
		Puntius amphibius	Barb	ငါးခုံးမ	DD
11	Gobiidae	Glossogobius callidus	River goby	ကပ်သပိုး	LC
		Brachygobius nunus	Bumblebee goby	ကပ်သပိုး	Not assessed
12	Mastacembelidae	Macrognathus aral	Peacock eel	ငါးစေမထြီးချေဟင်ခော	LC
		Macrognathus zebrinus	Zebrinus spiny eel	ငါးစေမထြီးခကံဆစ်	LC
		Mastacembelus armatus	Zig-zag-spiny eel	ငါးစေမထြီးကား/စေမန်ဂါး	LC
		Mastacembelus dayi	Spotted spiny eel	ငါးစေမထြီးဇာချေဟက်	LC
13	Macruridae	Coelorinchus parallelus	Spiny-rat-tail	ငါးစမီးသယ်	Not assessed
14	Notopteridae	Notopterus notopterus	Bronz feather back	ငါးဖယ်	LC
15	Sciaenidae	Johnius coitor	coitar croaker	ငါးပုတ်သင်	LC

Sr.	Family	Scientific Name	English Name	Myanmar Name	IUCN Red List Category
		Boesemania microlepis	Smallscale croaker	ငါးဗ်က့်	NT
16	Schilbeidae	Eutropiichthys vacha	Batchwa cat fish	ငါးမြင်းအုပ်ဖား	LC
		Neotropius acutirostris	Dwarf catfish	ငါးသံခဲတ့်	LC
		Pseudotropius acutirostris	Dwarf catfish	ငါးသံခဲတ့်	
		Silonia silondia	Giant butter cat fish	ငါးမြင်း	LC
17	Siluridae	Ompok bimaculatus	Butter cat fish	ငါးငန်းသန့်း	NT
		Ompok hypophthalmus		ငါးငန်းသန့်း	Not assessed
		Wallago attu	Fresh water shark	ငါးဘတ့်	NT
18	Sisoridae	Gagata cenia	Indian gagata	ငါးတင်ဂုတ့်	LC
		Bagarius yarrelli	Giant yellow cat fish	ငါးမောင်းမ	NT
		Bagarius bagarius	Yellow cat fish	ငါးမောင်းမ	NT
19	Tetraodontidae	Chelonodon biocellatus	Trey kam pot	ငါးဆီပူ	LC

*DD = Data Deficient; LC = Least Concerned; NT = Near Threatened

Source: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. <www.iucnredlist.org>. Downloaded on 23

(3) ステークホルダー協議の記録

E Guard Environmental Services Co., Ltd. Meeting Minutes	
Subject: Stakeholder Meeting for Initial Environmental Examination of Mandalay Port Development Plan	**Date:** 27th June 2017
Venue: Yanmyolone Pawtawmuu Pagoda, Dammha Hall,	**Time:** 10:00 AM to 12:00 AM
Attendees: Total: 74 (Government Department: 24 Local People: 17 Media: 17 Parliament members : 4 NGO & : 5 Private Company : 7)	

Agenda:

1) Opening Ceremony.

2) Presentation of Project Introduction by U Aung Myo Khaing, Deputy Director, Directorate of Water Resources and Improvement of River Systems

3) Presentation of Environmental and Social Considerations in Project by U Aye Thiha, Managing Director, E Guard Environmental Services Co., Ltd.

4) Presentation of Project Cut-off Date by U Aung Myo Khaing, Deputy Director, Directorate of Water Resources and Improvement of River Systems

5) Recommendations and suggestions by Attendees.

6) Closing Remark by U Toe Aung Lin, Deputy Director, Directorate of Water Resources and Improvement of River Systems

7) Closing Ceremony

Presentation of Project Introduction by U Aung Myo Khaing, Deputy Director, Directorate of Water Resources and Improvement of River Systems

U Aung Myo Khaing said that he will explain about the main situations.

According to the order of Environmental Conservation Department, we are doing Initial Environmental Examination for this project. If a new inland water port alongside Ayeyarwady River is constructed, cargo transportation and economy will improve. The purpose of this project is needing modern port for Mandalay and Mandalay port located alongside Ayeyarwady river accommodates passengers and cargoes that are transported from more or less all major cities in the country. The project proponent is Directorate of Water Resources and Improvement of River Systems. Location of this project is less than 1 km west of Kantawagyi Lake that lies next to and west of Mandalay city and west of Shwe Hlan Bo Monastery and Myo Patt Road. In this project area, there will be include container yard and ware houses. Moreover, it is planned for two berths. The area of this project is about 20 acres. The project design is now doing with support from Japan and the dead line is 2017, November. Construction period will be from 2018, November to 2020, September. In the period before project, Public Consultation will be held to solve project affected land area.

Presentation of Environmental and Social Considerations in Project by U Aye Thiha, Managing Director, E Guard Environmental Services Co., Ltd.

U Aye Thiha said that E Guard Environmental Services Co., Ltd analysed positive and negative impacts on environmental and social at the project area.

Environmental Conservation Department ordered to report Initial Environmental Examination because this project area is less than 25 hectare. We collected social survey, data collection and interviewed with local people.

We will do this project according to the related laws and regulation. We measured environmental base line conditions such as air quality, water quality, noise, rainfall, biodiversity and we also considered waste disposal, vibration and odour around the project site. We collected the social economic profile of the local people for land acquisition. The project site area is now used for planting seasonal crops. Air pollution and water pollution results are a little out of National Environmental Quality (Emission) Guidelines. We studied gender ratio, education level, occupation of the local people. Income and outcome range is not different but no excess. Three quarter of respondents think this port project will give them advantages but 10% of respondents are not interested in this project. Three households and one company occupy this project area. There are 7 huts in this area. Butter bean and peanuts are planted by this three households. The important matter is the resettlement plan and compensation. We report mitigation plan to reduce accidents in the construction site to the DWIR. We announced this Stakeholder Meeting in the newspaper and invited relevant government departments and parliament members.

Recommendations and suggestions by Attendees.

(1) U Myo Zaw Htun

Question: I want to know about compensation. How do the land outside the project area affect or benefit?

Answer: We will pay the compensation in accordance with the laws and regulations in Myanmar. We will report the list of farmers working in the land to Department. The Department of Regional Committee will make the final decision how much should he paid. The land outside the project area will be hired temporarily for the materials used in the construction project. If the land was affected or if you want to ask any questions, please contact.

(2) U Tin Soe

Question: We have problems with the Great Wall Company. We want to know how to protect the farmers.

Answer: We have the list of lands which are owned by the farmers. Great Wall company also owns. If you own your land, we will arrange to give the compensation. We cannot decide who the owner is. We can only say we will compensate the owners.

(3) U Pyaung

Question: I have owned the land since 20 years ago. I want to know about compensation. Is the port owned by government or company?

Answer: The port is owned by the Ministry of Transport and Communications so it is public. The port is constructed by the help of JICA. Compensation will be made by DWIR/MOTC.

U Myint Swe (Parliament member, Amarapura constituency, Mandalay Division)

I am the president of agriculture and livestock committee and also a farmer. I have 50 acres land and it is national land. If our country needs this land area, I will give it. Government should compensate to the project affected persons (PAPs). It is a good project for our country. So the farmers should not disturb this project. If project proponent has any problem, we will be able to help them.

Closing Remark by U Toe Aung Lin, Deputy Director, Directorate of Water Resources and Improvement of River Systems

U Toe Aung Lin said that he will associate for this project because it is located in Mandalay.

Many local people should attend and ask many questions in this meeting. The project proponent is Directorate of Water Resources and Improvement of River Systems and the user is citizen. Taxes obtained from this port will be national funds. The case of land owner does not concern with third party.

Compensation problems will be explained by the decisions of parliament and government department. Although the Japanese Government will help for this project, our government will compensate to PAPs. The present Mandalay Port is not modernized, so new port is required. We ask local people to support for this project.

Attendance List of Stakeholder Meeting

Parliament Members

No	Name	Occupation	Organization/Department
1	U Myint Swe	Member of Parliament	Hluttaw, Mandalay Division
2	U Zaw Zaw Aung	Member of Parliament	Hluttaw, Mandalay Division
3	U Win Bo	NLD (Maharaungmyay Township)	Maharaungmyay NLD Office
4	U Sein Min	NLD (MaharAung Myay Township)	Maharaungmyay NLD Office

Government Department

No	Name	Occupation	Organization/Department
1	U Aung Myo Khaing	Deputy Director	DWIR
2	U Toe Aung Lin	Deputy Director	DWIR
3	U Tin Soe	DYCE	IWT
4	U Khin Maung Aye	Manager	IWT
5	Daw Khin Sandar Win	Deputy Staff Officer	Department of Rural Development
6	Daw Mar Mar Htwe	Upper Division Clerk	Department of Rural Development
7	Daw Thin Thin Ohn	Staff Officer	Metrology and Hydrology Department
8	U Kyaw San Lin	Deputy Director	Fisheries Dapartment
9	U Aung Tin	Staff Officer	Metrology and Hydrology Department (Mandalay)
10	U Thaw Zin		Bureau of Special Investigation
11	Daw Phyo Ma Ma	Deputy Police Officer	Amarapura Township Police Station
12	U Shwe	Assistant Staff Officer	Amarapura
13	U Than Soe Win	Deputy Staff Officer	Amarapura
14	U Aung Aung	Department Head	MCDC
15	U Aung Kyi	Surveyor	MCDC

16	U Aung Myo Thant	Deputy Township Administrator	Mahaaungmyay Township
17	Daw Pa Pa Oo	Staff Officer	Planning Department
18	U Nyi Nyi Htun	Ward Administrator	Tan layat Maw (South)
19	Daw San San Mu	Clerk	Tan layat Maw (South)
20	Daw Win Win Aye	Store Keeper	Department of Electricity
21	U Tin Swe	Ward Administrator	Shan Kalay Kyun, Amarapura Town
22	U Thein Win	Hundred Household Head	Chaw Seik (405, B)
23	U Min Gyi	Hundred Household Head	Chaw Seik (405, B)
24	U Aung Toe	Hundred Household Head	Zaw Min Ward

Non-Government Organization

No	Name	Occupation	Organization
1	U Aung Thu		NLD
2	U Hla Htun	C.S.O	Port Stevedore
3	U Wai Lwin Oo	Member	Port Stevedore
4	U Saw Lin	Chairman	Port Stevedore
5	U Kyaw Than	Vice Chairman	Chan Mya Tharzi Township, NLD

Private Company

No	Name	Occupation	Company Name
1	U Naing Naing Lin	Director	JLPC
2	U Naing Win	Director	Myanmar Infinity Power
3	U Thet Htun Oo	Director	VISS (Myanmar)
4	U Than Kyaing	Consultant	Great Wall Group
5	U Aung Than		
6	U Htet Naung Oo	Manager	JLPC
7	U Myo Thant	GM	JLPC

Media

No	Name	Occupation	Media
1	Daw Aye Thida Su Lwin	Reporter	MRTV
2	Daw Theint Tneint Thu Win	Reporter	MRTV

3	U Myo Nyunt Aung	Reporter	MRTV
4	U Wai Yan Phyo	Reporter	MRTV
5	Daw Khin Mon Thein Tan	Reporter	MRTV
6	U Kyaw Htoo	Reporter	Mandalay News
7	Daw Phyo Phyo Thet	Reporter	7 Day News
8	U Aung Thant Khaing	Reporter	Myanmar Times Daily
9	U Eain Khaing Myae	DVB Reporter	Myanmar Times Daily
10	Daw Myat Thit Khaing	DVB Reporter	Democracy Today
11	U Aung Min Oo		Mandala Daily
12	U Kyaw Ko Ko	Reporter	The Myanmar Times
13	U Ko Myo Kyaw	Reporter	Mandalay News
14	U Min Than	Reporter	MHM Media
15	Daw Khaing Thazin	Reporter	Mandalay Khit
16	U Yan Moe Naing	Reporter	The Voice Daily
17	Daw Lae Lae Aung	Reporter	Daily Eleven

No	Name	Occupation	Address
1	U Than Htike Aung	Business Man	Amarapura
2	U Tin Htut	Farmer	Shankalay Kyun
3	U Myo Zaw Htun	Farmer	Amarapura
4	U Myint Maung	Farmer	(457), Than Layat Maw (South)
5	Daw Hla Than	Farmer	(457), Than Layat Maw (South)
6	Daw San San Htwe	Farmer	(457), Than Layat Maw (South)
7	U Tin Myaing	Farmer	(457), Than Layat Maw (South)
8	Daw Tin Tin Khaing	Farmer	(457), Than Layat Maw (South)
9	Daw Than Than Myint	Farmer	(457)
10	U Tin Hlaing	Farmer	Shan Kalay Kyun, Amarapura Township
11	U Kyaw Htet Aung	Farmer	Lae Yway
12	U Tin Soe	Farmer	Nay Puu Village
13	Daw Than Oo	Farmer	Shwe Lan Bo
14	U Saw Maung	Farmer	Nay Puu Village
15	U Myint Wai	Farmer	Shan Kalay Kyun, Amarapura Township
16	U Kyaw Swe Win	Local	Amarapura Township
17	U Win Htay Kywal	Local	Amarapura Township

(4) 影響を受ける小屋の補償費積算内訳

小屋 - 1

Size - 15 ft x 25 ft (Height – 7 ft)

No.	Particular	Size	Rate (MMK)	Quantity	Amount (MMK)
1	Column (wood)	10 ft	7,000	2	14,000
2	Bamboo for Beam	12 ft	5,000	3	15,000
3	Bamboo for roof, wall and floor	20 ft	700	7	4,900
4	Palm for roof	sq-ft	80	375	30,000
5	Zinc roof	sheet	1,500	-	-
6	Attap dwelling	sq-ft	120	-	-
7	Worker	day	5,000	1	5,000
				Total	68,900

小屋 - 2

Size - 7 ft x 6 ft (Height – 6 ft)

No.	Particular	Size	Rate (MMK)	Quantity	Amount (MMK)
1	Column (wood)	10 ft	7,000	-	-
2	Bamboo for Beam	12 ft	5,000	1	5,000
3	Bamboo for roof, wall and floor	20 ft	700	5	3,500
4	Palm for roof	sq-ft	80	42	3,360
5	Zinc roof	sheet	1,500	-	-
6	Attap dwelling	sq-ft	120	-	-
7	Worker	day	5,000	1	5,000
				Total	16,860

小屋 - 3

Size - 8 ft x 7ft (Height – 7 ft)

No.	Particular	Size	Rate (MMK)	Quantity	Amount (MMK)
1	Column (wood)	10 ft	7,000	2	14,000
2	Bamboo for Beam	12 ft	5,000	2	10,000
3	Bamboo for roof, wall and floor	20 ft	700	8	5,600
4	Palm for roof	sq-ft	80	-	
5	Zinc roof	sheet	1,500	-	
6	Attap dwelling	sq-ft	120	65	7,800
7	Worker	day	5,000	1	5,000
				Total	42,400

小屋 - 4

Size - 10 ft x 7 ft (Height – 6 ft)

No.	Particular	Size	Rate (MMK)	Quantity	Amount (MMK)
1	Column (wood)	10 ft	7,000	1	7,000
2	Bamboo for Beam	12 ft	5,000	2	10,000
3	Bamboo for roof, wall and floor	20 ft	700	10	7,000
4	Palm for roof	sq-ft	80	90	7,200
5	Zinc roof	sheet	1,500	-	-
6	Attap dwelling	sq-ft	120	-	-
7	Worker	day	5,000	1	5,000
				Total	36,200

小屋 - 5

Size - 7 ft x 7ft (Height 7 ft)

No.	Particular	Size	Rate (MMK)	Quantity	Amount (MMK)
1	Column (wood)	10 ft	7,000	-	-
2	Bamboo for Beam	12 ft	5,000	2	10,000
3	Bamboo for roof, wall and floor	20 ft	700	5	3,500
4	Palm for roof	sq-ft	80	68	5,440
5	Zinc roof	sheet	1,500	-	-
6	Attap dwelling	sq-ft	120	-	-
7	Worker	day	5,000	1	5,000
				Total	23,940

小屋 – 6

Size - 7 ft x 7ft (Height 7 ft)

No.	Particular	Size	Rate (MMK)	Quantity	Amount (MMK)
1	Column (wood)	10 ft	7,000	-	-
2	Bamboo for Beam	12 ft	5,000	2	10,000
3	Bamboo for roof, wall and floor	20 ft	700	5	3,500
4	Palm for roof	sq-ft	80	68	5,440
5	Zinc roof	sheet	1,500	-	-
6	Attap dwelling	sq-ft	120	-	-
7	Worker	day	5,000	1	5,000
				Total	23,940

小屋 – 7

Size - 10 ft x 12 ft (Height 7 ft)

No.	Particular	Size	Rate (MMK)	Quantity	Amount (MMK)
1	Column (wood)	10 ft	7,000	2	14,000
2	Bamboo for Beam	12 ft	5,000	3	15,000
3	Bamboo for roof, wall and floor	20 ft	700	9	6,300
4	Palm for roof	sq-ft	80	-	-
5	Zinc roof	sheet	1,500	28	42,000
6	Attap dwelling	sq-ft	120	-	-
7	Worker	day	5,000	2	10,000
				Total	87,300

(5) 用地取得、住民協議に係るモニタリングフォーム（案）

<Monitoring Form for Land Acquisition>

No.	Activity	Progress	Description of the Situation (incl. any necessary actions)	CD (plan)	CD	RD	Recorded by
1.	Formation of Farmland Management Committee	%					
		%					
		%					
		%					
2.	Formation of Grievance Committee	%					
		%					
		%					
		%					
3.	Supplementary Survey (if required)	%					
		%					
		%					
		%					
4.	Finalization of Compensation and Support	%					
		%					
		%					
		%					
5.	Agreement with PAPs	HH/ HH					
		HH/ HH					
		HH/ HH					
		HH/ HH					
6.	Provision of Compensation and Support to PAPs	HH/ HH					
		HH/ HH					
		HH/ HH					
		HH/ HH					
7.	Securement of Land (e.g. removal of structures)	acres/ acres					
		acres/ acres					
		acres/ acres					
		acres/ acres					

*CD: completion date; RD: recorded date; HH: household

<Monitoring Form for Public Consultation>

No.	Time and Date	Venue	Participants	Content including Q&A
1				
2				
3				

(6) 写真

Lost Asset Inventory Survey

Lost Asset Inventory Survey

PAPs Survey and Interview

PAPs Survey and Interview

Project-affected Unit (crop)

Flooded Area during Rainy Season

Interview with Local People

Interview with Local People

Interview with Local People

Air Quality Survey

Water Quality Survey

Water Quality Survey




Participants' Registration at Stakeholder Meeting


Presentation by IEE Consultant

Presentation by DWIR


Question and Answers with Local People

Response by IEE Consultant

Opinion from the Floor

Closing Remarks by DWIR

Media Interviewing DWIR

Media Interviewing IEE Consulta

DWIR Explaining Compensation Policy

(7) 環境チェックリスト

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) Y (b) N (c) N (d) N	(a) Since the project is categorized to be an IEE Type Project in accordance with EIA Procedure (2015) in Myanmar, an initial environmental examination (IEE) report has been prepared and submitted by DWIR to the Ministry of Natural Resources and Environmental Conservation (MONREC) through MOTC by a letter dated Sep 4, 2017. (b) The Environmental Conservation Department (ECD)/MONREC is expected to complete its review on the IEE report within 60 working days in accordance with EIA Procedure (2015), which is early Dec, 2017. (c) Refer to (b) above. (d) There is no other environmental permit required for implementation of the project.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) A notification in both English and Burmese was put up at the township and ward GAD offices and related department offices as well as DWIR's webpage (http://dwir.gov.mm/index.php/news-events/advertisement) in June, 2017 upon commencement of the IEE. In addition, a stakeholder meeting was carried out and particpants views' reflected to the project through a stakeholder meeting held on June 27, 2017. The stakeholder meeting was attended by the people potentially affected by the project (i.e. project-affected persons/PAPs) in addition to relevant government organizations including ECD/MONREC and regional governments, community-based and social organizations and the media, 74 in total. Contents of the project and the potential impacts been adequately explained here and no voices against the project was heard. (b) Comments from the stakeholders, including those from the local residents, have been reflected to, inter alia, finalizing the impact evaluation, environmental mitigation measures including means of compensation, and environmental monitoring plans..
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Project alternatives were compared with each other in different stages of the project. During the F/S carried out in 2014, three different locations were compared against each other reaching a conclusion that the current location was most suitable primarily as no involuntary resettlement was expected in the area. In the basic design stage, a comparison was made in terms of the jetty structure and access road design. Similarly, a conclusion was made in consideration of the environmental and social impacts that are expected to be generated by each option.
2 Pollution Control	(1) Air Quality	(a) Do air pollutants, such as sulfur oxides (SOx), nitrogen oxides (NOx), and soot and dust emitted from ships, vehicles and project equipments comply with the country's emission standards? Are any mitigating measures taken?	(a) N/Y	(a) Ambient (i.e. pre-project) air quaity for PM 2.5, PM 10 and SO2 was in excess of the National Environmental Quality (NEQ) Guidelines of Myanmar. That for NO2 and ozone was within the guideline values. Mobilization and operation of heavy equipment, construction machinery and trucks is expected to generate exhaust gas and dust from construction activities possibly causing air pollution in the construction stage and minor level of air quality degradation is expected in the O&M stage. From a broader perspective, on the other hand, modal shift from trucks to ships in cargo transportation is expected to contribute to reduction of greenhouse gases such as carbon dioxide. Mitigation measures will be taken in both stages (e.g. spraying water on the ground, proper storage of construction materials such as covering sand and gravel, limiting maximum speed of vehicle to 20km/h within the project area, and air quality measurement/monitoring).
	(2) Water Quality	(a) Do effluents from the project facilities comply with the country's effluent and environmental standards? (b) Do effluents from the ships and other project equipments comply with the country's effluent and environmental standards? (c) Does the project prepare any measures to prevent leakages of oils and toxicants? (d) Does the project cause any alterations in coastal lines and disappearance/appearance of surface water to change water temperature or quality by decrease of water exchange or changes in flow regimes? (e) Does the project prepare any measures to prevent polluting surface, sea or underground water by the penetration from reclaimed lands?	(a) Y (b) Y (c) Y (d) N (e) Y	(a) Domestic waste and sewage from passenger and port worker as well as wastewater used after cleaning cargoes can cause water pollution. There is also a possibility of oil spill and leakage of other substances. By adopting countermeasures (e.g. proper storage and collection of used oil and lubrication using a drum, development of closed drainage canal, installation of sanitary facilities such as temporary toilets or septic tanks), the environmental standards in Myanmar are expected to be met. By the way, the level of total suspended solids was higher than the NEQ Guidline value of Myanmar. (b) Effluents from the ships and other project equipments are not expected to be significant enough to exceed the environmental standards in Myanmar. (c) Refer to (a) above. (d) Such impact is not expected. (e) In addition to measures mentioned in (a) above, rules for waste management will be developed and training will be provided to workers to follow them, construction equipment will be well-maintained and a contingency plan against risk of unexpected leakage will be prepared.
	(3) Wastes	(a) Are wastes generated from the ships and other project facilities properly treated and disposed of in accordance with the country's regulations? (b) Is offshore dumping of dredged soil properly disposed in accordance with the country's regulations? (c) Does the project prepare any measures to avoid dumping or discharge toxicants?	(a) Y (b) NA (c) Y	(a) Wastes willl be properly collected and disposed with reference to, and in consultation with, MCDC and its rules. (b) Dredging is not expected to take place under this project. Necessary sand will be purchased from a river sand collection company operating nearby. (c) The following measures are planned to be adopted to avoid dumping or discharge toxicants: preparation of a temporary waste dumping site during storage; prohibition of dumping into the river or any other place unless approved by the consultant; appropriate storage of oil residue including used lubricant; reuse of material in proper ways; and development of rules for waste management and training workers to follow them.
2 Pollution Control	(4) Noise and Vibration	(a) Do noise and vibrations from the vehicle and train traffic comply with the country's standards?	(a) Y	(a) Impact of noise and vibration is expected from construction machinery and equipment but only temporarily and at an insignificant level during construction. In the O&M stage, loading machines and moving vehicles during port operation are expected to generate some level of noise and vibration. However, the impact is expected to be limited given the size and scale of vehicles used and proximity to the sensitive receptors. The ambient noise level was within the NEQ Guideline value.
	(5) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) N	(a) The project is not expected to involve extraction of a large volume of underground water that can cause ground subsidence.
	(6) Odor	(a) Are there any odor sources? Are adequate odor control measures taken?	(a) N	(a) No specific source of offensive odor is expected in the project. Waste will be properly collected and disposed.
	(7) Sediment	(a) Are adequate measures taken to prevent contamination of sediments by discharges or dumping of hazardous materials from the ships and related facilities?	(a) Y	(a) Activities that directly contaminate bottom sediment is not expected. Refer to '(2) Water Quality' for measures to prevent impact on sediment quality degradation caused via water quality degradation.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) N/A
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that the project will adversely affect aquatic organisms? Are adequate measures taken to reduce negative impacts on aquatic organisms? (e) Is there a possibility that the project will adversely affect vegetation or wildlife of coastal zones? If any negative impacts are anticipated, are adequate measures taken to reduce the impacts on vegetation and wildlife?	(a) N (b) N (c) N/A (d) Y (e) Y	(a) N/A (b) There is no protected habitats of endangered species designated by the country's laws or international treaties and conventions. According to the 'Feasibility study for the Inland Water Transport Facilities Improvement and Development Project Final Report (2014)', Ayeyarwady dolphins rarely come to the area. (c) No significant ecological impacts are anticipated. (d) (e) According to the 'Feasibility study for the Inland Water Transport Facilities Improvement and Development Project Final Report (2014)', none of the fish species in the study area are listed in the IUCN Red List category of endangered fish species for Myanmar and all species around the project site are composed of common species. Turbid water due to construction works may affect those species, however, its intensity is expected to be limited. Refer to '(2) Water Quality' for measures taken to reduce negative impacts on aquatic organisms. No plant species that require special care has been identified near the project site either. The project site is not located in or near a coastal zone.
	(3) Hydrology	(a) Do the project facilities affect adversely flow regimes, waves, tides, currents of rivers and etc if the project facilities are constructed on/by the seas?	(a) N	(a) According to the 'Feasibility study for the Inland Water Transport Facilities Improvement and Development Project Final Report (2014)', river flow and speed is expected to decrease under and near the project site yet no significant change is expected to the river flow. The project site is not located in or near the sea.
	(4) Topography and Geology	(a) Does the project require any large scale changes of topographic/geographic features or cause disappearance of the natural seashore?	(a) N	(a) N/A

Environmental Checklist: . 10.Ports and Harbors （1）

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) Y (b) N (c) N (d) N	(a) Since the project is categorized to be an IEE Type Project in accordance with EIA Procedure (2015) in Myanmar, an initial environmental examination (IEE) report has been prepared and submitted by DWIR to the Ministry of Natural Resources and Environmental Conservation (MONREC) through MOTC by a letter dated Sep 4, 2017. (b) The Environmental Conservation Department (ECD)/MONREC is expected to complete its review on the IEE report within 60 working days in accordance with EIA Procedure (2015), which is early Dec, 2017. (c) Refer to (b) above. (d) There is no other environmental permit required for implementation of the project.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) A notification in both English and Burmese was put up at the township and ward GAD offices and related department offices as well as DWIR's webpage (http://dwir.gov.mm/index.php/news-events/advertisement) in June, 2017 upon commencement of the IEE. In addition, a stakeholder meeting was carried out and particpants views' reflected to the project through a stakeholder meeting held on June 27, 2017. The stakeholder meeting was attended by the people potentially affected by the project (i.e. project-affected persons/PAPs) in addition to relevant government organizations including ECD/MONREC and regional governments, community-based and social organizations and the media, 74 in total. Contents of the project and the potential impacts been adequately explained here and no voices against the project was heard. (b) Comments from the stakeholders, including those from the local residents, have been reflected to, inter alia, finalizing the impact evaluation, environmental mitigation measures including means of compensation, and environmental monitoring plans..
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Project alternatives were compared with each other in different stages of the project. During the F/S carried out in 2014, three different locations were compared against each other reaching a conclusion that the current location was most suitable primarily as no involuntary resettlement was expected in the area. In the basic design stage, a comparison was made in terms of the jetty structure and access road design. Similarly, a conclusion was made in consideration of the environmental and social impacts that are expected to be generated by each option.

Environmental Checklist: . 10.Ports and Harbors （2）

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
2 Pollution Control	(1) Air Quality	(a) Do air pollutants, such as sulfur oxides (SOx), nitrogen oxides (NOx), and soot and dust emitted from ships, vehicles and project equipments comply with the country's emission standards? Are any mitigating measures taken?	(a) N/Y	(a) Ambient (i.e. pre-project) air quaity for PM 2.5, PM 10 and SO2 was in excess of the National Environmental Quality (NEQ) Guidelines of Myanmar. That for NO2 and ozone was within the guideline values. Mobilization and operation of heavy equipment, construction machinery and trucks is expected to generate exhaust gas and dust from construction activities possibly causing air pollution in the construction stage and minor level of air quality degradation is expected in the O&M stage. From a broader perspective, on the other hand, modal shift from trucks to ships in cargo transportation is expected to contribute to reduction of greenhouse gases such as carbon dioxide. Mitigation measures will be taken in both stages (e.g. spraying water on the ground, proper storage of construction materials such as covering sand and gravel, limiting maximum speed of vehicle to 20km/h within the project area, and air quality measurement/monitoring).
	(2) Water Quality	(a) Do effluents from the project facilities comply with the country's effluent and environmental standards? (b) Do effluents from the ships and other project equipments comply with the country's effluent and environmental standards? (c) Does the project prepare any measures to prevent leakages of oils and toxicants? (d) Does the project cause any alterations in coastal lines and disappearance/appearance of surface water to change water temperature or quality by decrease of water exchange or changes in flow regimes? (e) Does the project prepare any measures to prevent polluting surface, sea or underground water by the penetration from reclaimed lands?	(a) Y (b) Y (c) Y (d) N (e) Y	(a) Domestic waste and sewage from passenger and port worker as well as wastewater used after cleaning cargoes can cause water pollution. There is also a possibility of oil spill and leakage of other substances. By adopting countermeasures (e.g. proper storage and collection of used oil and lubrication using a drum, development of closed drainage canal, installation of sanitary facilities such as temporary toilets or septic tanks), the environmental standards in Myanmar are expected to be met. By the way, the level of total suspended solids was higher than the NEQ Guidline value of Myanmar. (b) Effluents from the ships and other project equipments are not expected to be significant enough to exceed the environmental standards in Myanmar. (c) Refer to (a) above. (d) Such impact is not expected. (e) In addition to measures mentioned in (a) above, rules for waste management will be developed and training will be provided to workers to follow them, construction equipment will be well-maintained and a contingency plan against risk of unexpected leakage will be prepared.
	(3) Wastes	(a) Are wastes generated from the ships and other project facilities properly treated and disposed of in accordance with the country's regulations? (b) Is offshore dumping of dredged soil properly disposed in accordance with the country's regulations? (c) Does the project prepare any measures to avoid dumping or discharge toxicants?	(a) Y (b) NA (c) Y	(a) Wastes willl be properly collected and disposed with reference to, and in consultation with, MCDC and its rules. (b) Dredging is not expected to take place under this project. Necessary sand will be purchased from a river sand collection company operating nearby. (c) The following measures are planned to be adopted to avoid dumping or discharge toxicants: preparation of a temporary waste dumping site during storage; prohibition of dumping into the river or any other place unless approved by the consultant; appropriate storage of oil residue including used lubricant; reuse of material in proper ways; and development of rules for waste management and training workers to follow them.

Environmental Checklist: . 10.Ports and Harbors (3)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
2 Pollution Control	(4) Noise and Vibration	(a) Do noise and vibrations from the vehicle and train traffic comply with the country's standards?	(a) Y	(a) Impact of noise and vibration is expected from construction machinery and equipment but only temporarily and at an insignificant level during construction. In the O&M stage, loading machines and moving vehicles during port operation are expected to generate some level of noise and vibration. However, the impact is expected to be limited given the size and scale of vehicles used and proximity to the sensitive receptors. The ambient noise level was within the NEQ Guideline value.
	(5) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) N	(a) The project is not expected to involve extraction of a large volume of underground water that can cause ground subsidence.
	(6) Odor	(a) Are there any odor sources? Are adequate odor control measures taken?	(a) N	(a) No specific source of offensive odor is expected in the project. Waste will be properly collected and disposed.
	(7) Sediment	(a) Are adequate measures taken to prevent contamination of sediments by discharges or dumping of hazardous materials from the ships and related facilities?	(a) Y	(a) Activities that directly contaminate bottom sediment is not expected. Refer to '(2) Water Quality' for measures to prevent impact on sediment quality degradation caused via water quality degradation.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) N/A
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that the project will adversely affect aquatic organisms? Are adequate measures taken to reduce negative impacts on aquatic organisms? (e) Is there a possibility that the project will adversely affect vegetation or wildlife of coastal zones? If any negative impacts are anticipated, are adequate measures taken to reduce the impacts on vegetation and wildlife?	(a) N (b) N (c) N/A (d) Y (e) Y	(a) N/A (b) There is no protected habitats of endangered species designated by the country's laws or international treaties and conventions. According to the 'Feasibility study for the Inland Water Transport Facilities Improvement and Development Project Final Report (2014)', Ayeyarwady dolphins rarely come to the area. (c) No significant ecological impacts are anticipated. (d) (e) According to the 'Feasibility study for the Inland Water Transport Facilities Improvement and Development Project Final Report (2014)', none of the fish species in the study area are listed in the IUCN Red List category of endangered fish species for Myanmar and all species around the project site are composed of common species. Turbid water due to construction works may affect those species, however, its intensity is expected to be limited. Refer to '(2) Water Quality' for measures taken to reduce negative impacts on aquatic organisms. No plant species that require special care has been identified near the project site either. The project site is not located in or near a coastal zone.
	(3) Hydrology	(a) Do the project facilities affect adversely flow regimes, waves, tides, currents of rivers and etc if the project facilities are constructed on/by the seas?	(a) N	(a) According to the 'Feasibility study for the Inland Water Transport Facilities Improvement and Development Project Final Report (2014)', river flow and speed is expected to decrease under and near the project site yet no significant change is expected to the river flow. The project site is not located in or near the sea.
	(4) Topography and Geology	(a) Does the project require any large scale changes of topographic/geographic features or cause disappearance of the natural seashore?	(a) N	(a) N/A

Environmental Checklist: . 10.Ports and Harbors （4）

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) N (b) Y (c) Y (d) Y (e) Y (f) Y (g) N (h) Y/N (i) Y (j) Y	(a) No involuntary resettlement is expected in this project but only land acquisition. Efforts have been made to minimize the adverse socio-economic impacts. (b) No involuntary resettlement is expected in this project but only land acquisition. A stakeholder meeting has been held with the PAPs and other stakeholders in Burmese and with visual aids where compensation policy had been explained to the PAPs. (c) While no involuntary resettlement is expected, an ARAP has been prepared including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socio-economic studies. (d) Yes. (e) It has been documented in the ARAP. (f) The project pays particular attention to vulnerable groups. But no particular vulnerable groups that require special support have been identified in this project. (g) Agreements with the affected people will be obtained prior to securing of land (i.e. project site). (h) Organizational framework has been established. Necessary budget will be secured after the IEE report has been approved by ECD/MONREC. (i) Plans have been developed to monitor the impacts on land acquisition in both the implementation and O&M stages. No involuntary resettlement is expected to take place under this project but only land acquisition. (j) It has been established and depicted in the IEE report.
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that changes in water uses (including fisheries and recreational uses) in the surrounding areas due to project will adversely affect the livelihoods of inhabitants? (c) Is there a possibility that port and harbor facilities will adversely affect the existing water traffic and road traffic in the surrounding areas? (d) Is there a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are considerations given to public health, if necessary?	(a) Y (b) N (c) Y (d) Y	(a) There is no inhabitant in the project site. Adequate measures are considered to reduce the impacts on PAPs' living and livelihood. (b) Changes in water uses is not expected by the project. No fishing activity has been identified as a result of the study. (c) Water traffic and road traffic in the surrounding areas may increase to some extent as a result of the project. (d) An influx of construction/immigrant workers into the project area is expected especially during the construction phase, which can heighten the risk of transmission of infectious diseases. Education and awareness-raising will be carried out of construction workers (and local people as necessary) about prevention of infectious diseases such as HIV/AIDS.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) There is only one monastery near the project site and one pagoda north of the site but no impact is expected to either of them.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) There is no special landscape within and near the project area and the extent of change to the existing landscape can be considered negligible.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a) There is no ethnic minorities and indigenous people in or near the project site. (b) N/A

Environmental Checklist: . 10.Ports and Harbors （5）

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) N (b) Y (c) Y (d) Y	(a) DWIR is not violating any laws and ordinances associated with the working conditions of the country. (b) The following measures are planned to be taken to ensure safety: development of, and compliance with, traffic regulation and rules; prevention of outsiders entering construction sites by installing fence and sign boards and arranging guards; preparation of security boats, life jackets, medical box and so on; preparation of proper personal protective equipment and provision to workers; proper record and analysis of the cases and causes of accidents; and proper lightening of construction sites. (c) In addition to '(b) above', education and awareness-raising will be carried out of construction workers (and local people as necessary) about prevention of infectious diseases. (d) Training will be provided to security guards prior to their assignment.
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y	(a) Adequate measures are considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust exhaust gases, and wastes). Refer to the environmental management plan in the IEE report for more details. (b) Ecoystem that may be affected by the project is considered to be primarily the aquatic ecosystem. Preventive measures will be adopted as shown in '2. (2) Water Quality' above. In addition, water quality monitoring will be carried out during consutruction and in the O&M stage and appropriate measures considered and taken based on an analysis of the results of such monitoring. Species around the project site is composed of common species. (c) Adequate measures will be considered to reduce impacts generated during construction.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) N/A (c) Y (d) Y	(a) DWIR has developed and is prepared to implement monitoring program for the environmental items that are considered to have potential impacts. (b) Refer to the environmental monitoring plan in the IEE report for details of the monitoring program. (c) DWIR will establish an adequate monitoring framework and carry out monitoring with support from other actors (e.g. consultant) (d) EIA Procedure (2015) states that 'The Project Proponent shall submit monitoring reports to the Ministry not less frequently than every six (6) months, as provided in a schedule in the EMP, or periodically as prescribed by the Ministry' (Art. 108).
6 Note	Note on Using Environmental Checklist	(a) Where necessary, impacts on groundwater hydrology (groundwater level drawdown and salinization) that may be caused by alteration of topography, such as land reclamation and canal excavation should be considered, and impacts, such as land subsidence that may be caused by groundwater uses should be considered. If significant impacts are anticipated, adequate mitigation measures should be taken. (b) If necessary, the impacts to transboundary or global issues should be confirmed, if necessary (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N/A (b) N/A	(a) Noted. (b) Noted.

1) Regarding the term “Country's Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards appropriate environmental considerations are required to be made.
In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).
2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

Environmental Management Plan (draft)

No.	Impacts	Mitigation Measures	Implementation Organization	Management Organization	Cost (USD)
Planning Phase					
1.	Land Acquisition	1. Compensation for all affected land, structures and crops in accordance with the ARAP 2. Information disclosure and public consultation to understand the concerns and needs of the PAPs and to relieve their stress 3. Installation of notification board concerning the project at the project site in order to prevent any occupation or use in the project site	DWIR	DWIR	1. USD 1,700,000 *refer to EMOP for cost of consultation meetings.
Construction Phase					
1.	Air Pollution	1. Spraying water to suppress dust generated from construction work and site and vehicles carrying construction materials 2. Proper storage of construction materials such as covering sand and gravel that are easily diffused into the atmosphere at construction site and during their transportation 3. Limiting a maximum speed of vehicle to 20km/h within the project area 4. Air quality measurement/monitoring	contractor	consultant/DWIR	refer to EMOP for cost of air quality monitoring
2.	Water Pollution	1. Proper storage and collection of used oil and lubrication using a drum 2. Development of rules for waste management and training workers to follow them 3. Development of closed drainage canal to avoid wastewater spreading to river and farmland 4. Installation of sanitary facilities such as temporary toilets or septic tanks at the construction sites 5. Selection of appropriate construction methods which generates less turbidity during pile driving 6. Good maintenance of construction equipment 7. Preparation of a contingency plan against risk of unexpected leakage 8. Water quality measurement/monitoring especially during disposal of dredging material and collection of landfilling material	contractor	consultant/DWIR	to be included in construction cost *refer to EMOP for cost of water quality monitoring

No.	Impacts	Mitigation Measures	Implementation Organization	Management Organization	Cost (USD)
3.	Waste Disposal	1. Preparation of a temporary waste dumping site during storage and prohibition of waste dumping into the river or any other place unless approved by the consultant 2. Appropriate storage of oil residue including used lubricant 3. Reuse of material in proper ways 4. Proper collection and final disposal of wastes with reference to, and in consultation with, MCDC and its system 5. Development of rules for waste management and training workers to follow them	contractor	consultant/DWIR	to be included in construction cost
4.	Noise and Vibration	1. Development of working rules (e.g. avoid unnecessary use of air horns, keep the speed limit, turn off engines when not in operation) and training to drivers and construction workers to follow the rules 2. Avoidance of construction activities that generate high level of noise and vibration during night time 3. Selection of low-noise emission machines and/or installation of silencers and temporary noise barrier (when required) 4. Appropriate maintenance of construction equipment 5. Noise level measurement/monitoring	contractor	consultant/DWIR	to be included in construction cost *refer to EMOP for cost of monitoring of noise level
5.	Ecosystem	Monitoring of turbidity and water pollution in the river during disposal of dredging material and collection of landfilling material (refer to '2. Water Pollution')	contractor	consultant/DWIR	to be included in construction cost
6.	Bottom Sediment	Monitoring of sediment quality before and after filling	contractor	consultant/DWIR	refer to '2. Water Pollution'
7.	Land Acquisition	Information disclosure and public consultation to understand the socio-economic status, concerns and needs of the PAPs and to relieve their stress	DWIR/consultant/ contractor	Mandalay Region Government, MOTC and local authorities	refer to EMOP for cost of holding consultation meetings
8.	Existing Social Infrastructure and Services	1. Post traffic warning signs for road users notifying that the 'construction site is ahead' and to make people aware of the movement of heavy machines 2. Notification of contents and schedule of construction work 3. Assign flagman for assisting 'entry' to the construction site and 'exit' from the construction site to reduce traffic load	contractor	consultant/DWIR	to be included in construction cost
9.	Sanitary	1. Installation of sanitary facilities such as temporary toilets or	contractor	consultant/DWIR	to be included in

No.	Impacts	Mitigation Measures	Implementation Organization	Management Organization	Cost (USD)
	Condition	septic tanks at the construction sites and operate those appropriately 2. Consultation with MCDC for final disposal of sludge at their sewage disposal facilities			construction cost
10.	Infectious Diseases such as HIV/AIDS	Education and awareness-raising of construction workers (and local people as necessary) about prevention of infectious diseases such as HIV/AIDS	contractor	consultant/DWIR	to be included in construction cost
11.	Accidents	1. Development of, and compliance with, traffic regulation and rules 2. Prevention of outsiders entering construction sites by installing fence and sign boards and arranging guards 3. Preparation of security boats, life jackets, medical box and so on 4. Preparation of proper personal protective equipment (PPE) and provision to workers 5. Proper record and analysis of the cases and causes of accidents 6. Proper lightening of construction sites	contractor	consultant/DWIR	to be included in construction cost
Operation Phase					
1.	Air Pollution	1. Limiting a maximum speed of vehicle to 20km/h within the project site 2. Air quality measurement/monitoring	port operator	consultant/DWIR	refer to EMOP for cost of air quality monitoring
2.	Water Pollution	1. Development of closed drainage canal to avoid wastewater spreading to river 2. Development of a contained storage area for oil, chemicals, and others 3. Consultation with MCDC for final disposal of sludge at their sewage disposal facilities 4. Installation of adequate sanitation system with proper treatment facilities for toilet, canteen and so on 5. Training of workers so that they follow waste management rules (e.g. do not throw waste into the river) 6. Water quality measurement/monitoring	port operator	consultant/DWIR	to be included in operation cost *refer to EMOP for cost of water quality monitoring
3.	Waste Disposal	1. Periodic disposal of waste in cooperation with MCDC 2. Training of workers so that they follow waste management rules (e.g. do not throw waste into the river)	port operator	consultant/DWIR	to be included in operation cost

No.	Impacts	Mitigation Measures	Implementation Organization	Management Organization	Cost (USD)
4.	Ecosystem	Refer to '2. Water Pollution'.	port operator	consultant/DWIR	to be included in operation cost
5.	Hydrology	Monitoring and regular dredging to prevent sedimentation and to maintain smooth river flow	port operator	consultant/DWIR	to be included in operation cost
6.	Bottom Sediment	Refer to '2. Water Pollution' and '5. Hydrology'.	port operator	consultant/DWIR	to be included in operation cost
7.	Sanitary Condition	1. Consultation with MCDC for final disposal of sludge at their sewage disposal facilities 2. Installation of adequate sanitation system with proper treatment facilities for toilet, canteen and so on 3. Training of workers so that they follow waste management rules	port operator	consultant/DWIR	to be included in operation cost
8.	Accidents	1. Development of, and compliance with, working rules, traffic regulation and rules through education. 2. Enforcement of workers' use of PPE 3. Installation of proper signboard for safety and security 4. Preparation of security boats, life jackets, medical box and so on 5. Proper record and analysis of the cases and causes of accidents	port operator	consultant/DWIR	to be included in operation cost

Source: JICA Study Team

Environmental Monitoring Plan (draft)

No.	Category	Monitoring Item	Location	Frequency	Implementation Organization	Management Organization	Cost (USD) per year
Planning Phase							
1.	Land Acquisition	1. progress of provision/payment of compensation and social assistance 2. level of information disclosure and public involvement 3. voices and complaints from PAPs 4. state of project site	project site and surrounding area	biweekly during ARAP implementation stage	DWIR	Mandalay Region Government, MOTC and local authorities	to be included in operation cost
Construction Phase							
1.	Air Pollution	NO2, SO2, PM (PM10 and PM2.5) and Ozone, Micro climate (temperature, humidity, wind speed and direction etc. for reference)	2 points (same places as the baseline survey, in principle)	biannually	contractor	consultant/DWIR	USD 4,000 (USD 1,000*2points*2times)
2.	Water Pollution	1. BOD, COD, oil & grease, pH, Total coliform, Total nitrogen, Total phosphorus and TSS 2. turbidity during filling by visual observation	2 points (same places as the baseline survey, in principle) downstream of filling area	1. biannually 2. every day during filling	contractor	consultant/DWIR	USD 4,000 (USD 1,000*2points*2times) to be included in construction cost
3.	Waste Disposal	1. Volume, type and place of disposal of domestic and industrial waste 2. Voices and complaints from local community	project site and surrounding area	monthly and whenever complaints are heard in this regard	contractor	consultant/DWIR	to be included in construction cost
4.	Noise and Vibration	1. LAeq *Measurement is considered necessary for noise only. 2. Voices and complaints from local community	2 points (same places as the baseline survey, in principle) project site and	biannually and whenever complaints are heard in this regard	contractor	consultant/DWIR	USD 4,000 (USD 1,000*2points*2times) to be included in construction cost

No.	Category	Monitoring Item	Location	Frequency	Implementation Organization	Management Organization	Cost (USD) per year
			surrounding area				
5.	Ecosystem	Refer to '2. Water Pollution' above.					
6.	Bottom Sediment	sediment quality before and after filling	downstream of filling area	every day during filling	contractor	DWIR	to be included in construction cost
7.	Land Acquisition	1. extent of livelihood and income restoration 2. level of information disclosure and public involvement 3. level of satisfaction of the PAPs	project site and surrounding area	biannually and whenever complaints are heard in this regard	DWIR/consultant/contractor	Mandalay Region Government, MOTC and local authorities	USD 2,000 (USD 1,000*2 times) for public consultation
8.	Existing Social Infrastructure and Services	voices and complaints from local community	project site and surrounding area	biannually and whenever complaints are heard in this regard	DWIR/consultant/contractor	Mandalay Region Government, MOTC and local authorities	
9.	Sanitary Condition	1. state of sanitary facilities (e.g. toilets, septic tanks and rubbish bins) 2. voices and complaints from local community	project site and surrounding area	monthly and whenever complaints are heard in this regard	contractor	consultant/DWIR	to be included in construction cost
10.	Infectious Diseases such as HIV/AIDS	1. number of infected patients 2. voices and complaints from local community	project site and surrounding area	biannually and whenever complaints are heard in this regard	contractor	consultant/DWIR, MOTC, MOH, Mandalay Region Government and local authorities	to be included in construction cost
11.	Accidents	1. record of number and type of accidents 2. record of safety awareness training and campaigns 3. state of use of PPE 4. state of safety equipment (e.g. fence, sign board, guards, security boats, life jackets, medical box etc.)	project site and surrounding area	monthly	contractor	consultant/DWIR	to be included in construction cost

No.	Category	Monitoring Item	Location	Frequency	Implementation Organization	Management Organization	Cost (USD) per year
Operation Phase							
1.	Air Pollution	NO2, SO2, PM (PM10 and PM2.5) and Ozone, Micro climate (temperature, humidity, wind speed and direction etc. for reference)	2 points (same places as the baseline survey, in principle)	annually for the first two years	port operator	consultant/DWIR	USD 2,000 (USD 1,000*2points)
2.	Water Pollution	BOD, COD, oil & grease, pH, Total coliform, Total nitrogen, Total phosphorus and TSS	2 points (same places as the baseline survey, in principle)	biannually for the first two years	port operator	consultant/DWIR	USD 4,000 (USD 1,000*2points*2times)
3.	Waste Disposal	1. Volume, type and place of disposal of domestic and industrial waste 2. Voices and complaints from local community	project site and surrounding area	annually and whenever complaints are heard in this regard	port operator	consultant/DWIR	to be included in operation cost
4.	Ecosystem	Refer to '2. Water Pollution'.					
5.	Hydrology	dredging schedule and work	project site and surrounding area	during and before dredging	port operator	consultant/DWIR	to be included in operation cost
6.	Bottom Sediment	Refer to '2. Water Pollution' and '6. Hydrology'.					
7.	Sanitary Condition	1. state of sanitary facilities (e.g. toilets, septic tanks and rubbish bins) 2. voices and complaints from local community	project site and surrounding area	annually and whenever complaints are heard in this regard	port operator	consultant/DWIR	to be included in operation cost
8.	Accidents	1. record of number and type of accidents 2. state of use of PPE 3. state of safety equipment (e.g. fence, sign board, guards, security boats, life jackets, medical box etc.)	project site and surrounding area	biannually	port operator	consultant/DWIR	to be included in operation cost

Source: JICA Study Team

Environmental Monitoring Form (planning stage/draft)

No.	Category	Monitoring Item	Method	Location	Frequency	Results of Monitoring		
						Date	Result	Actions to be Taken
1	Land Acquisition	Refer to the form for land acquisition below.						

Environmental Monitoring Form (construction stage/draft)

1. Pollution and Nuisance

No.	Category	Monitoring Item	Method	Location	Frequency	Results of Monitoring				
						Date	Result		NEQ GL Value	Remarks/Actions
1	Air Pollution	NO2, SO2, PM (PM10 and PM2.5) and ozone, micro climate (temperature, humidity, wind speed and direction etc. for reference)	one weekday for 24 consecutive hours per location	2 points (same places as the baseline survey, in principle)	biannually		NO2	µg/m^3	200µg/m^3	
							SO2,	µg/m^3	20µg/m^3	
							PM10	µg/m^3	50µg/m^3	
							PM2.5	µg/m^3	25µg/m^3	
							ozone	µg/m^3	100µg/m^3	
							temperature		-	
							humidity		-	
							wind speed/ direction		-	
2	Water Pollution	BOD, COD, oil & grease, pH, total coliform, total nitrogen, total phosphorus and TSS	sampling and measurement using field equipment and laboratory analyses	2 points (same places as the baseline survey, in principle)	biannually (*once during dry season and once during rainy season)		BOD	mg/l	30mg/l	
							COD	mg/l	125mg/l	
							oil & grease	mg/l	10mg/l	
							pH		6-9	
							total coliform	/100ml	400/ 100ml	
							total nitrogen	mg/l	10mg/l	
							total phosphorus	mg/l	2mg/l	
							TSS	mg/l	50mg/l	
3	Noise	LAeq	one weekday for 24 consecutive hours per location	2 points (same places as the baseline survey, in principle)	biannually			dBA	70dBA	

2. Social and Natural Environment

No.	Category	Monitoring Item	Method	Location	Frequency	Results of Monitoring		
						Date	Result	Actions to be Taken
1	Waste Disposal	- volume, type and place of disposal of domestic and industrial waste - voices and complaints from local community	- confirmation of records of waste generated - confirmation of voices and complaints - visual observation	project site and surrounding area	monthly and whenever complaints are heard in this regard			
2	Ecosystem	Refer to '1.2. Water Pollution' above.						
3	Bottom Sediment	sediment quality before and after filling	visual observation	downstream of filling area	every day during filling			
4	Land Acquisition	Refer to the form for land acquisition below.						
5	Existing Social Infrastructure and Services	voices and complaints from the local community	- confirmation of voices and complaints - visual observation	project site and surrounding area	biannually and whenever complaints are heard in this regard			
6	Sanitary Condition	- state of sanitary facilities (e.g. toilets, septic tanks and rubbish bins) - voices and complaints from local community	- confirmation of voices and complaints - visual observation	project site and surrounding area	monthly and whenever complaints are heard in this regard			
7	Infectious Diseases such as HIV/AIDS	- number of infected patients - voices and complaints from the local community	- confirmation of health check list of workers (and preferably of local community)	project site and surrounding area	biannually and whenever complaints are heard in this regard			

No.	Category	Monitoring Item	Method	Location	Frequency	Results of Monitoring		
						Date	Result	Actions to be Taken
			- confirmation of voices and complaints					
8	Accidents	- record of number and type of accidents - record of safety awareness training and campaigns - state of use of PPE - state of safety equipment (e.g. fence, sign board, guards, security boats, life jackets, medical box etc.)	- confirmation of records - visual observation	project site and surrounding area	monthly			

Environmental Monitoring Form (operation stage/draft)

1. Pollution and Nuisance

No.	Category	Monitoring Item	Method	Location	Frequency	Results of Monitoring				
						Date	Result		NEQ GL Value	Remarks/Actions
1	Air Pollution	NO2, SO2, PM (PM10 and PM2.5) and ozone, micro climate (temperature, humidity, wind speed and direction etc. for reference)	same as baseline survey	2 points (same places as the baseline survey, in principle)	annually for the first two years		NO2	µg/m^3	200µg/m^3	
							SO2,	µg/m^3	20µg/m^3	
							PM10	µg/m^3	50µg/m^3	
							PM2.5	µg/m^3	25µg/m^3	
							ozone	µg/m^3	100µg/m^3	
							temperature		-	
							humidity		-	
							wind speed/ direction		-	
2	Water Pollution	BOD, COD, oil & grease, pH, total coliform, total nitrogen, total phosphorus and TSS	same as baseline survey	2 points (same places as the baseline survey, in principle)	biannually for the first two years (*once during dry season and once during rainy season)		BOD	mg/l	30mg/l	
							COD	mg/l	125mg/l	
							oil & grease	mg/l	10mg/l	
							pH		6-9	
							total coliform	per 100ml	400 per 100ml	
							total nitrogen	mg/l	10mg/l	
							total phosphorus	mg/l	2mg/l	
							TSS	mg/l	50mg/l	

2. Social and Natural Environment

No.	Category	Monitoring Item	Method	Location	Frequency	Results of Monitoring		
						Date	Result	Actions to be Taken
1	Waste Disposal	- volume, type and place of disposal of domestic and industrial waste - voices and complaints from local community	- confirmation of voices and complaints - visual observation	project site and surrounding area	annually and whenever complaints are heard in this regard			
2	Hydrology	dredging schedule and work	visual observation	project site and surrounding area	during and before dredging			
3	Bottom Sediment	Refer to '1.2. Water Pollution' and '2.2. Hydrology' above.						
4	Sanitary Condition	- state of sanitary facilities (e.g. toilets, septic tanks and rubbish bins) - voices and complaints from the local community	- confirmation of voices and complaints - visual observation	project site and surrounding area	annually and whenever complaints are heard in this regard			
5	Accidents	- record of number and type of accidents - state of use of PPE - state of safety equipment (e.g. fence, sign board, guards, security boats, life jackets, medical box etc.)	- confirmation of records - visual observation	project site and surrounding area	biannually			

Environmental Monitoring Form (land acquisition)

No.	Activity	Progress (tasks completed)	Description of the Situation (incl. any necessary actions)	CD (plan)	CD	RD	Recorded by
1.	Formation of Farmland Management Committee	%					
		%					
		%					
		%					
2.	Formation of Grievance Committee	%					
		%					
		%					
		%					
3.	Supplementary Survey (if required)	%					
		%					
		%					
		%					
4.	Finalization of Compensation and Support	%					
		%					
		%					
		%					
5.	Agreement with PAPs	HH/ HH					
		HH/ HH					
		HH/ HH					
		HH/ HH					
6.	Provision of Compensation and Support to PAPs	HH/ HH					
		HH/ HH					
		HH/ HH					
		HH/ HH					
7.	Securement of Land (e.g. removal of structures)	acres/ acres					
		acres/ acres					
		acres/ acres					
		acres/ acres					

*CD: completion date; RD: recorded date; HH: household

Environmental Monitoring Form (public consultation)

No.	Time and Date	Venue	Participants	Content including Q&A
1				
2				
3				