A Feasibility Study for the Procurement of Support, Service and Utility Vessels for Mongla Port

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Abstract

Mongla is the 2nd largest seaport of Bangladesh and the gateway of south-western part of the country. Though Mongla Port had the only 10% share of handling of the total export-import throughput of the country only few years back, the prospects of cargo as well as container handling of the port is increasing gradually and consequently it is anticipated that Mongla Port Authority will handle a significant share of the total export-import volume. In order to cope up with the increasing demand as well to develop MPA Authority as a regional hub, a number of development projects have been taken. However, the number of support, service and utility vessels procured so far is not adequate to provide the intended service by the port. In view of the same, a study has been carried out to find out the necessary numbers, sizes and types of support, service and utility vessels for Mongla Port to meet future demand. The study also encompasses technical, commercial and financial viability of the same with respect required investment, operation and maintenance as well as manpower costs. The sensitivity analysis shows that the investment will be feasible one and enhance the capacity and standard of the port to serve as a modern regional port.

Introduction

Maritime ports are main gateways for essential trading among countries (Mongla Port Authority Ordinance 1976). Currently, there is an enormous gap between available capacities of Ports and the demand for necessary services in Bangladesh. Mongla Port, once commercial nerve-center in the south-western region of Bangladesh after the Chittagong port, was stagnant in last decade up to 2008, which is mainly because of inadequate draft in Passur channel, its years-old infrastructure, insufficient docking, storage and delivery capacity, insufficient support, service and utility vessels and lack of appropriate modernization.

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However, due to the Government initiatives to overcome the dire situation, the activity of the port is in increasing trend. With the concept of only eco-friendly port in Bangladesh from its inception, it was built at the confluence of Pussur River and Mongla Nulla, approximately 71 nautical miles upstream of the Bay of Bengal. The port is well protected by the largest mangrove forest the Sunderbans. Due to the recent development, the port is again going to be an important economic hub for the south-west region of Bangladesh as well regional co-operation.

To meet up the future demands efficiently and effectively, Mongla port has to undertake different types of strategic plans which will play a vital role in the national economy facilitating sea borne import & export trade of the country and the region as well (CRTS, 2015). After completion of Padma bridge it is expected that Mongla Port will get a new turn in handling of Dhaka bound export-import cargo in promoting international trade and business of the country and the region as well. In the study report entitled "Bangladesh: Port and Logistics Efficiency Improvement" conducted by ADB (ADB, 2011), a projection of the utilization of port facilities have been conducted where it is shown that even though in case of the maritime trade the share of Chittagong port is about 90% and Mongla is about 10% at present, however, it would be like about 50% share of Chittagong and about 40% that of Mongla in 2040.

It is, therefore, seen that to cope up with the growing demand of cargo handling at Mongla Port, further development is a dire necessity. In view of the same in order to improve the performance of the port and to meet the increasing demand, different projects for development of the port as well as procurement of different types of Support, Service and Utility vessels for carrying out the mandated responsibilities of Mongla port as an international maritime port under IMO guidelines (IMO website) as well as providing required marine services to incoming and outgoing vessels in the port are being studied (IMO, 2014).

Assessment of the Support, Service and Utility Vessel Requirement

The specific services rendered by a Mongla Port Authority depend largely on the scope of the port's marine responsibilities and jurisdiction (MCA, 2016). As mentioned before, the scope of the port's marine jurisdictions does not follow a general rule, and there exists no international legislation or standard practice that defines the responsibilities of port authorities. It has been learnt that from the beginning of its activities, 32 (thirty two) numbers of different types of Support, Service and Utility vessels were procured by MPA at different time from which 6 (six) vessels are obsolete now. The types of vessels are; tugboat, mooring boat, pilot boat, dispatch launch, survey vessel, water barge, dredger, workboat, crane boat, house boat, inspection launch, buoy laying vessel, Oil Spill Management vessel and fire-fighting tug.

Table 1 gives a summary of different types of vessels of Mongla Port Authority categorized based on their ages. It is seen from the same table that the age of the oldest vessel is 74 (seventy four) years and there are 8 (eight) number of vessels from 49 to 50 years old and few are more than 30 years old.

Table 1: Summary of Different Types of Support, Service and Utility Vessels of Mongla Port Authority

Sl No.	Type of Support, Service and Utility Vessels of MPA	Existing Vessels (Nos.)	Existing Non-operating Vessels (Nos.)	Vessels with more than 30 years old (Nos.)	Existing Vessels to be replaced (Nos.)	Existing Vessels to be used (Nos.)
1	Escort, Towing and Ship Handling Tug	5	2	4	4	1
2	Fire-fighting Tug	1	-	1	1	-
3	Buoy Laying Vessel	1	-	1	1	-
4	Survey & Research Vessel	1	-	-	1 (20 years old)	-
5	Oil Spill Management Vessel	1				1
6	Mooring Boat	4	-	3	3	1
7	Pilot Boat	5	1	3	3	2
8	Self-propelled Water Supply Vessel	2	1	1	1	1
9	Inspection Vessel/ Launch	1	-	1	1	-
10	Dispatch Launch	2	-	2	2	-
11	Cutter Suction Dredger	2	-	-	-	2
12	Work Boat	5	2	3	3	2
13	Crane boat	1	-	-	-	1
14	House Boat	1	-	-	-	1
	Total	**32**	**6**	**19**	**20**	**12**

It is seen from Table 1 that out of 32 (thirty two) vessels, 19 (nineteen) vessels are more than 30 years old, 12 (twelve) vessels are less than 15 years of age and only one vessel is between 15 to 30 years. Therefore, it is very much necessary to replace the 20 (twenty) numbers of old vessels since it seems that using these vessels might cause adversity any time.

It is to be mentioned that in order to implement a proper port planning procedure, different types of Support, Service and Utility vessels are necessary, which are the parts of port operational infrastructure as well as port equipment (The World Bank, 2017). In view of the same, Table 2 has furnished a list of different Support, Service and Utility vessels needed by a modern maritime port to provide safe and efficient marine services as per IMO and UNCLOS requirement as well as the existing vessels of MPA.

From Table 2, it is seen that MPA is far behind from the required type of Support, Service and Utility vessels to become a modern port and to provide necessary marine services to incoming and outgoing ships in the port. MPA needs adequate numbers of tugboat including fire-fighting tug, buoy laying vessel, search and rescue vessel, security patrol vessel, survey and research vessel, waste collection vessel, wreck removal or salvage ship, trailing suction hopper dredger, pilot mother vessel/dispatch vessel and Ambulance Vessel.

Assessment of the Required Number of Support, Service and Utility Vessels

We have already seen that cargo throughput, container throughput and the ships call at Mongla port is increasing gradually (Jessica, 2016). Therefore, in order to provide necessary marine services the number of Support, Service and Utility vessels should also be increased simultaneously with the number of ships call as well as cargo and container throughput.

Figure 1 shows the future prediction of total ship call at MPA and also the prediction of Support, Service and Utility vessel requirements at same rate of increase of total ship call. It is assumed that the number of Support, Service and Utility vessel at 2015 is 25, which are providing services at present though 12 vessels are more than 30 years old and need replacement. It is seen that the number of Support, Service and Utility vessel requirements in 2020 are 42 and 33 respectively with assumption of same rate of increase of Support, Service and Utility vessels the increase of total ship call and the rate of increase of Support, Service and Utility vessel as about 50% rate of increase of total ship call. Therefore, if we assume the rate of increase of Support, Service and Utility vessel as the 50% rate of increase of total ship call, MPA needs 8 more new vessels and 13 replacements within 2020.The numbers of Support, Service and Utility vessel requirements in 2030 are 81 and 45 respectively with assumption of same rate of increase of Support, Service and Utility vessel as the increase of total ship call and the rate of increase of Support, Service and Utility vessel as about 50% rate of increase of total ship call.

Table 2: Required and Existing Different Support, Service and Utility Vessels of MPA, which can be used further

Sl No.	Type of Support, Service and Utility Vessels	Existing Useable Vessels (Nos.)	Sl No.	Type of Support, Service and Utility Vessels	Existing Usable Vessels (Nos.)
1	Escort, Towing and Ship Handling Tug	1	13	Pilot Mother/ Dispatch Vessel	-
2	Fire-fighting Tug	-	14	Pilot boat	2
3	Oil Spill Management Vessel	1	15	Self-propelled Water Supply Vessel	1
4	Search and Rescue Vessel	-	16	Ambulance Vessel	-
5	Security Patrol Boat	-	17	Dispatch Launch	-
6	Survey & Research Vessel	-	18	Inspection Vessel/Launch	-
7	Buoy Laying Vessel	-	19	Training Vessel	-
8	Waste Collection Vessel & Reception facilities		20	Cutter Suction Dredger	2
9	Wreck Removal/ Floating Crane ship	-	21	Trailing Suction Hopper Dredger	-
10	Work Boat	2	22	Crane boat	1
11	Sand Carrier		23	House Boat	1
12	Mooring Boat	1	24	**Total**	**12**

Note: Support, Service and Utility Vessels of more than 15 (fifteen) years of age have not been considered.

Hence, if we assume the rate of increase of Support, Service and Utility vessel as the about 50% rate of increase of total ship call, MPA needs 10 more Support, Service and Utility Vessels within 2020 and MPA needs 12 more Support, Service and Utility Vessels within 2030. Moreover, 13 numbers of old vessels to be replaced as before gradually. Therefore, total number of new Support, Service and Utility vessels requirement is 23 by 2020 and 12 more by 2030.

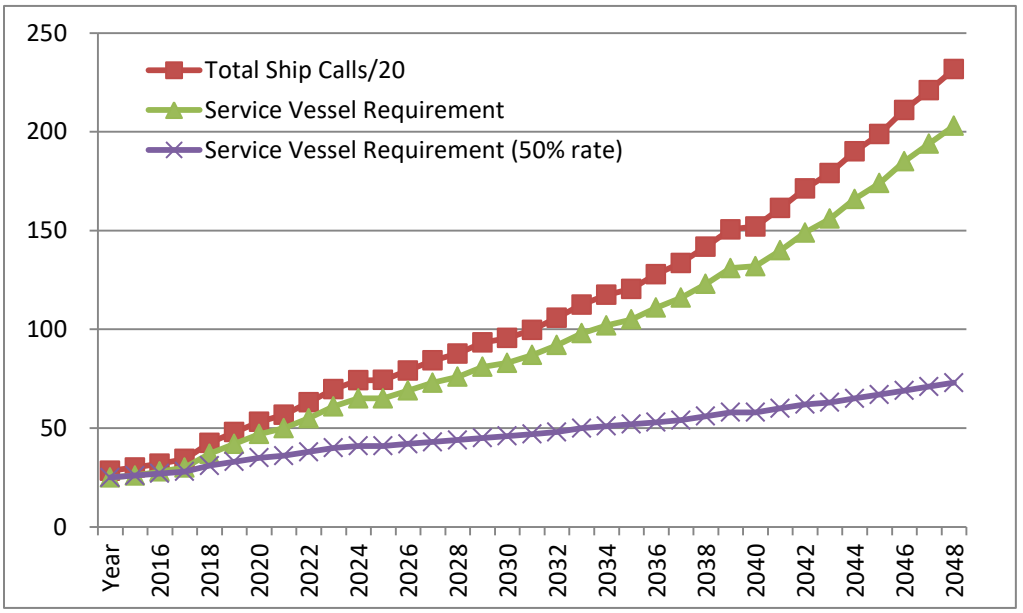

Figure 1: Requirement of Support, Service and Utility Vessels with Total Ship forecast

It is to be mentioned that since the Support, Service and Utility vessels will provide services to the incoming and outgoing ships not the containers, it is wise to assess the future requirement based on the total ship call not the total cargo or container throughput. In view of the same, the necessary Support, Service and Utility Vessels to be procured by MPA within 2020 and 2030 have been presented in Table 3, which needs to be procured immediately.

Table 3: List of the Existing Usable and Required Number of Service Vessels according to IMO & UNCLOS Requirement

Sl. No.	Type of Support, Service and Utility Vessels	Existing Usable Vessels (Nos.)	New Vessel Requirement By (Nos.)	
			2020	2030
1	Escort, Towing and Ship Handling Tug	1	2	1
2	Ship Handling Small tug	-	1	1
3	Buoy Laying Vessel	-	1	1
4	Search and Rescue Vessel	-	1	-
5	Security Patrol Boat	-	2	-
6	Survey & Research Vessel	-	1	1
7	Oil Spill Management Vessel	1	2	-
8	Waste Collection Vessel & Reception facilities	-	1	1
9	Wreck Removal/ Floating Crane ship	-	1	-
10	Trailing Suction Hopper Dredger	-	1	1
11	Sand Carrier		2	1
12	Mooring Boat	1	1	1
13	Pilot Boat	2	1	2
14	Pilot Mother/ Dispatch Vessel	-	1	1
15	Self-propelled Water Supply Vessel	1	2	-
16	Ambulance Vessel	-	1	-
17	Training Vessel	-	1	-
18	Dispatch Launch	-	-	-
19	Inspection Vessel	-	1	-
20	Cutter Suction Dredger	2	-	-
21	Work Boat	2	-	1
22	Crane boat	1		-
23	House Boat	1		-
	Total	**12**	**23**	**12**

Note: Vessels of more than 15 (fifteen) years old has not been considered, since these needs replacement.

Evaluation of the Procurement, Operation and Maintenance Costs

Procurement Cost

When estimating the cost of a Support, Service and Utility vessel, it is important to consider the overall costs throughout live of the vessel, which is related to both the initial and the operational costs. The resale value of the vessel should also be considered when its service is no longer required.

For the cost estimation method, the costs of the support, Support, Service and Utility vessels are broken down into 12 categories: General object cost, Hull, Propulsion & maneuvering, Electrical system, Bilge & ballast systems, Pumps & piping, Accommodation, Mooring gear, Hatch covers, Outfitting, Miscellaneous equipment, and Margin.

General object costs include acquisition, overhead and engineering. It is stated that in shipbuilding the cost of engineering, including procurement and ship management equals roughly 20-35% of a shipyard's labor hours. The main aspect of the cost of the hull, being the cost of the purchased materials, is directly related to the amount of material that is used to build the hull structure. Propulsion and maneuvering costs include the cost of the engines, propulsion system, steering gear, etc. The cost of electrical system is hard to estimate, especially since it interacts with virtually all other systems and is, therefore, very ship-specific. Bilge & ballast systems are related to vessel length and are estimated to cost per meter of vessel length, based on several quotations. For the accommodation, an estimated rate per square meter of floor space is used, based on several quotations or from yard standard. The cost of mooring gear is estimated at a standard rate of LBT, based on a quotation and the reasoning that L, B and T of the vessel all affect the forces on the anchors. The hatch cover price depends linearly on length and to the power 1.6 on width. As a result, the cost of hatch covers is estimated at Unit Rate$XL_{hold}X\ B_{hold}^{1.6}$ of the vessel, again based on the quotations that were used above. Outfitting cost is determined as a function of outfitting weight to the 2/3 power. Cost for miscellaneous non-ship size related equipment (wheelhouse, navigation masts, etc.) may vary from case to case but is hardly dependent on ship size, apart from anchor winches. Since the price for which a ship owner buys a ship will include a risk margin for the yard, a 5% margin for the yard is included in the cost of the ship.

Considering the above aspects including the material, structure, machinery, equipment, facilities, services, operation and maintenance, the cost estimates of the selected vessels for procurement by MPA have been furnished as follows;

Table 4: Estimated Procurement Cost of the Required Support, Service and Utility Vessels for MPA by 2030

Sl. No.	Name of Vessel	Nos.	Cost (Million TK.)	CD, VAT & Tax (37%)	Total Cost (Million, Tk)
1	Estimated Procurement Cost of the Required Support, Service and Utility Vessels for MPA by 2020	23	22430.585	8299.316	30729.901
2	Estimated Procurement Cost of the Required Support, Service and Utility Vessels for MPA by 2030	12	12215.585	4519.766	16735.351

Operation and Maintenance Costs

Operating costs of a Support, Service and Utility vessel like tug, SAR, or any other include on-board crew, fuel and lubricant, maintenance, insurance, marketing, overhead and management. Crew costs represent a larger portion of the operating costs for Support, Service and Utility vessels because larger vessels have similar crew requirements, but can carry more payloads. On the other hand, fuel and insurance costs represent a larger share of operating costs for all type of vessels.

Total expenses for this category include the cost of wages and benefits for the crew. The default value for the labor benefits and overhead can be estimated to be 15% of base wages. Labor hours include vessel operating hours and some additional time added to account for labor time required for vessel preparation and vessel turnaround activities. The default value for the amount of additional time is estimated as 25% of ship operating hours. Considering all the above factors, an average salary for all the crews has been estimated, though there will be different categories of crews in each vessel.

Ship fuel and lubricant expenses represent the costs associated with the provision of fuel and refueling services, including fuel taxes. For the specific ship type, total annual fuel and lubricant expense is a function of:

1. Vessel time by operating mode (e.g., speed, intermediate speed, slow speed, idle, etc.),
2. Fuel consumption rate by operating mode and
3. Current and future unit fuel and lubricant cost

Maintenance expenses represent the cost of vessels hull and engine repairs and preventative maintenance, including periodic replacement of engines and related

systems. Total annual maintenance expense per ship is hypothesized to be partially dependent upon total vessel hours per year, especially for engine maintenance. Based on the observed data, total annual maintenance expense for a new ship is estimated to be equal to 3.5% of the purchase price of the vessel, for a ship operating a nominal 1,000 hours annually. To account for variation in total annual maintenance expense resulting from different levels of annual ship operating hours and different ship ages, the following formula (John A, 2011) is then used to estimate total annual maintenance expenses for a ship:

$$[M * F * P] + [(M * V * P) * (H_a / H_n)]$$

M = estimated total annual maintenance cost for new ship, expressed as a percentage of the new ship purchase price

F = percent of maintenance cost that is fixed (does not vary with vessel hours)

P = new ship purchase price

V = percent of maintenance cost that varies with vessel hours

H_a = actual annual ship hours operated

H_n = nominal annual ship hours (1,000 hours)

In view of the above, the annual operating costs, manpower costs, repair and maintenance costs of the selected Support, Service and Utility ships have been furnished in the following;

Table 5: Estimated Annual Operation and Maintenance Costs

Sl No.	Item	Total Cost by 2020 (Million Tk)	Total Cost by 2030 (Million Tk)
1	Annual Operation Cost	1103.727	815.271
2	Annual Manpower Cost	129.360	60.760
3	Annual Repair & Maintenance Cost	560.765	305.390
	Annual O & M Cost	**17,93.852**	**11,81.420**

Financial and Economic Analysis

In case of a new project, financial and economic viability can be judged on the following parameters:

- Total estimated cost of the project
- Financing of the project in terms of its capital structure, debt to equity ratio and promoter's share of total cost
- Existing investment by the promoter in any other business
- Projected cash flow and profitability

The financial and economic viability of a project should provide the following information:

- Full details of the assets to be financed and how liquid those assets are.
- Rate of conversion to cash-liquidity
- Project's funding potential and repayment terms
- Sensitivity in the repayments capability

In order to carry out the above mentioned financial and economic analysis, the revenue as has been estimated from the existing data and prevailing market value have been furnished in the following;

Table 6: Estimated Annual Earnings from proposed support, Support, Service and Utility and utility vessels by 2030

Sl. No.	Name of Vessel	Total Revenue (Million Tk.)
1	From proposed 23 (twenty three) number of Support, Service and Utility vessels by 2020	4116.250
2	From proposed 12 (twelve) number of Support, Service and Utility vessels by 2030	3471.275

Financial Aspects of procurement of the vessels includes examining the procurement costs, operating and maintenance costs of various types of Support, Service and Utility vessels including probable output of the vessels facilitating more revenue earning from providing adequate and efficient marine services to incoming and outgoing ships to the port.

Economic feasibility assessment has been carried out to determine the positive economic benefits of the procurement of the Support, Service and Utility vessels to the organization that the proposed vessels, equipment and system will provide. It will also include quantification and identification of all the benefits expected. For this particular case, it has been considered that procurement of the vessels would enhance the port revenue by 2.5% as it would facilitate the reduction in cost as bigger ship could call the

port resulting economics of scale as well as operational efficiency. Both the financial and economic assessment typically involves a cost/ benefits analysis, determination of Net Present Value, Internal rate of Return, etc. and the results of the analysis with a discount factor of 12% are as follows;

Table 7: Financial and Economic Indices

Sl	Item	Financial	Economic
1	Benefit Cost Ratio	1.02	1.17
2	Present Value (in lakh Tk)	7714.86	61483.69
3	Internal Rate of Return	13.46%	14.33%

The financial analysis reveals that the project will be a feasible concern. The b/c ratios are also satisfactory and the project will have sufficient liquidity to pay the capital repayment. The break-even analysis shows sound position and survivability of the project in sensitive market situation for the same cases. The project is capable to afford a maximum financial cost of capital of 13.46% and economic cost of 14.33% as indicated by Internal Rate of Return (IRR). The project will be contributive to National Economy throughout the facilitation of smooth services of maritime transport throughout the country, especially, cheaper cost of services for export and import for south-western part of the country and will open door for regional cooperation in respect of providing connectivity to Nepal and Bhutan. In view of the above facts it is found that the project is technically sound, financially feasible and economically viable.

Sensitivity Analysis

Sensitivity analysis is the study of how the uncertainty in the output of a mathematical model or system (numerical or otherwise) can be apportioned to different sources of uncertainty in its inputs. Sensitivity in the repayments capability depends on the following factors:

- Mild slowing of revenue earnings.
- Acute reduction/slowing of sales or revenue.
- Small increase in procurement, operation, repair & maintenance costs.
- Large increase in procurement, operation, repair & maintenance costs.
- Adverse financial/economic conditions.
- Project disruption in adverse natural/weather conditions

The process of recalculating outcomes of the execution and procurement of Support, Service and Utility vessels for MPA under alternative assumptions, i.e. cost variations to determine the impact of a variables, such as, NPV, IRR, B/C Ratio can be useful for a range of purposes. The results of the sensitivity analysis as has been carried out based on the above assumptions and criteria have been furnished as follows:

Table 8: Results of the Sensitivity Analysis

Variables	Variance	EIRR	NPV (Lakh Tk.)	B/C Ratio
Base Case	-	14%	61483.69	1.17
Procurement Cost increased	10%	14%	46049.60	1.12
O & M Cost increased	10%	14%	40137.99	1.10
Both Procurement and O & M Cost increased	10%	13%	24703.90	1.06
Benefit decreased	10%	13%	22458.09	1.06
Both Procurement and O & M Cost increased and Benefit decreased	10%	11%	-14321.70	0.96

The sensitivity analysis carried out, results of which show that the project is still economically feasible for all the cases except in case of the worst situation of both 10% increase in Total Cost and 10% decrease in Revenue.

Conclusions and Recommendations:

Mongla Port is one of the principal maritime ports of Bangladesh. Even if, in theory, there should be a ratio of 60 – 40 % between Chittagong and Mongla, the reality is far from that with Chittagong currently totalizing 90% of the country's international trade. In the year 2019-20, 11,037,209 M. tons of cargo and 60,000 TEUS of container were handled.

In Bangladesh, the industries are located in and around Dhaka-Chittagong. The business community of Dhaka and its surrounding areas is less interested to import and export their cargo through Mongla Port because of lack of fair roads and bridges connection. The present government has given emphasis for the development of Mongla Port and pushes the construction of the Padma Bridge at Mawa point. When Padma Bridge will be operational, the distance from Dhaka to Mongla will be 170 km. So, the business community of Dhaka and its surrounding areas will be more interested to use Mongla Port for importing and exporting cargos as the transportation distance from Dhaka to Mongla will be shorter than Dhaka to Chittagong.

The financial analysis reveals that the project will be a feasible concern. The b/c ratios are also satisfactory and the project will have sufficient liquidity to pay the capital repayment. The break-even analysis shows sound position and survivability of the project in sensitive market situation for the same cases. The project is capable to afford a maximum financial cost of capital of 13.46% and economic cost of 14.33% as indicated by Internal Rate of Return (IRR).

The project will be contributive to National Economy throughout the facilitation of smooth services of maritime transport throughout the country, especially, cheaper cost of services for export and import for south-western part of the country and will open door for regional cooperation in respect of providing connectivity to Nepal and Bhutan. In view of the above facts it is found that the project is technically sound, financially feasible and economically viable.

It is seen from the sensitivity analysis that the project is still economically feasible for all the cases except in case of the worst situation of both 10% increase in Total Cost and 10% decrease in Revenue.

It is to be recommended that the year old 20 (twenty) nos. of vessels of MPA need to be replaced gradually with good quality support, service and utility vessels of international standards. Some of the vessels have to be replaced immediately. Otherwise, the gradual increase of the container and cargo handling of MPA will be interrupted seriously.

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