PREPARATORY SURVEY REPORT
ON
THE PROJECT FOR
PROVISION OF A DREDGER
FOR
THE DEMOCRATIC SOCIALIST REPUBLIC
OF SRI LANKA

February 2013

JAPAN INTERNATIONAL COOPERATION AGENCY

SHIPBUILDING RESEARCH CENTRE OF JAPAN

PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to Shipbuilding Research Centre of Japan.

The survey team held a series of discussions with the officials concerned of the Government of Sri Lanka, and conducted a field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Sri Lanka for their close cooperation extended to the survey team.

February, 2013

Kazunori Miura

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SUMMARY

(1) Present Situation in Sri Lanka

The Democratic Socialist Republic of Sri Lanka (hereinafter called as Sri Lanka) located south-southeast of India, in the Indian Ocean has the total land area of 65,690 km^2 (equivalent to about 80% of Hokkaido) while having an exclusive economic zone of about 517,000 km^2. Sri Lanka is an island nation of approximately 20.27 million people (Census and Statistics Office survey in 2012) .

Sri Lanka belongs to the tropical monsoon climatic zone. Under the influence of the south-west monsoon which blows from the equator, and the north-east monsoon which blows from the Bay of Bengal, dry and rainy season visited alternately. As a result, from May to September, the climate in the south-west monsoon zone is rainy season while the north-east zone is dry season. On the contrary, from November to February, the north-east monsoon zone is rainy season while the south-west zone is dry season.

Sri Lanka has been the traditional economy dependent agriculture with a focus on rice and three (3) major plantation crops; i.e. tea, rubber and coconut. Then, with economic development, manufacturing, wholesale and retail industry have expanded. Recently, clothing products have become the largest export item.

Sri Lanka's economy in the year 2010 achieved the highest real growth rate of 8.0% over the last 30 years, thanks to activation of economic activities by the end of the civil war. In response to the expansion of the economy, employment opportunities were expanded, and the unemployment rate was reduced to 4.9% while it was 5.8% in 2009. The inflation rate stayed in the mid-single digit through 2010, and recorded 5.9% at the end of the year, because of the improvement of domestic supply system, and suppression of the domestic price for imported goods and subsidies. Nominal GDP of the year 2011 amounted to 59,175 million US Dollars, and Nominal GDP per capita was 2,880 US Dollars which is on the 2nd rank next to Maldives in the South Asia.

(2) Background of the Project

In Sri Lanka, the fishery sector is recognized as the very important sector for the development of the country, since the sector supplies 50 % to 60 % of the animal protein requirement of the people and contributes to the employment for about 250,000 people directly and more than 700,000 people in case adding the indirect, and produces the valuable export production for earning the foreign currency amounting about Rp.20 billion equivalent to about 2 % of the total exports.

In the National Development Program “Mahinda Chintana (2007 – 2016)” - Vision of New Sri Lanka, the development and improvement of the various infrastructures along the coastal areas are enlisted in relation to alleviation of the poverty and the revival of the northern area.

Furthermore, in the Ministry of Fisheries and Aquatic Resources Development (hereafter called as MFARD) which is in charge of this Project, the development and maintenance of the fishery harbors are treated as one of the important items in Ten Years Development Policy Framework of the Fisheries and Aquatic Resources Sector (2007 to 2016) and in Accelerated Fisheries Sector Development Plan for the Northern Province in Sri Lanka.

At present, nineteen (19) fishery harbors are in operation and one (1) more harbor will be added soon. In addition, about ten (10) harbors, which are still on the stage of planning and designing after the conflict, are scheduled to be operational in the northern area. All such fishery harbors are under the management and control of Ceylon Fishery Harbours Cooperation (hereafter called as CFHC).

Since almost all fishery harbors in Sri Lanka are located in such places as either faced to the ocean or in lagoons, under monsoon climate, severe siltation has occurred so far, and the annual sedimentation is estimated as about 173,000 m^3 through this grant aid preparatory survey on the basis of the result of the investigation by CFHC on the siltation pattern of the each fishery harbor for the past three (3) years.

CFHC has undertaken to dredge the sedimentation with four (4) dredgers i.e. one (1) grab hopper dredger named Ruhunuputha (hereafter called as GHD “R”) mainly which was supplied in 1989 as the Japan’s Grant Aid and three (3) cutter suction dredgers (named “Weligouwa” (CSD ”W”) , “Nildiyawara” (CSD “N”)and “Sarapura Kinduri (CSD “S”)) of the annual total dredging capability of about 95,000m^3 , which is insufficient by about 78,000 m^3 against the sedimentation mentioned above and makes the water depth of navigation channels and harbor basins shallow to disturb the safety navigation of the fishing boats. Further more, as mentioned above, GHD ”R” is so old that the repair and maintenance works are increasing year by year.

In such circumstances, the procurement of a dredger has become an emerging item for CFHC、and Government of Sri Lanka made a grant aid request for provision of a self-propelled grab hopper dredger,

(3) Contents of the Project

In response to the request mentioned above, the Government of Japan decided to conduct a preparatory survey, JICA sent to Sri Lanka the survey team from 27th June to 31st July, 2012. After the team returned to Japan, further studies were made and the draft report of preparatory survey explanation team was sent to Sri Lanka from 9th to 15th December, 2012 and held discussions and confirmation on the contents of the outline design , the items undertaken by the recipient country and both sides mutually agreed.

1)The fishery harbors for the maintenance dredging are 20 harbors including one (1) harbor of opening near future.

2) The type of dredger is of self-propelled grab hopper dredger as requested by CFHC, through the investigation from the view point of the dredging capability in the rough weather condition, un-necessity of the dumping space on land and the flexibility for dredging material.

3) The hopper capacity of the new dredger shall be designed on the same operation conditions as those of GHD "R".

4) Taking the dredging works in shallow water area into consideration, the draft of the new dredger shall be so designed as being able to dredge in the area of 3 m deep with full loading in case of smooth sea condition.

5) In principle, the specifications of the new dredger shall be according to those of GHD "R" except the items regarding the capacity and size of the dredger and the items mentioned below,

- Items requested by CFHC so far
- Items of which change are relevant from the technical point of view

The following are the specifications mutually agreed.

Item	Specifications
Dredger	No. of Set : 1 Type :300m^3 Self-propelled Grab Hopper Dredger Principal Particulars： Dimensions Length (over all) abt. 49.9 m Length 48.0 m Breadth 11.5 m Depth 3.4 m Designed Draft abt. 2.3 m Service Speed abt. 8.0 knots Endurance abt. 1,400 nautical miles Dead Weight abt.560 tons Hopper Capacity 300 m^3 Complement 18 Equipment： Main Engine 800 PS 2sets Propeller/Shaft/Rudder each 2sets Generator 100 kW 2sets Dredging Crane Hoisting 11 tons 1set Bottom Door Handling Equipment Hydraulic Cylinder 1set Mooring, Navigation, Communication Equipment

(4) Implementation Schedule and Project Cost of the Project

Detailed design work for the new dredger will be completed in about 3 months. The shipbuilding contract will be signed after about 2.5 months from completion of the detailed design. About 15 months will be required for the construction, and further about 1.5 months will be necessary for transportation from Japan to Colombo Port in Sri Lanka and its delivery.

The project cost to be borne by Sri Lankan side is roughly estimated as follows:

1) Transportation cost of the new dredger from Colombo Port to the mooring site (Dikkovita) — about Rs..0.04 million
2) Commission of banking services — about Rs..1.23 million

Total about Rs. 1.27 million

(5) Relevance of the Project

Implementation of this project with Japan grant aid is considered relevant from the view points as follows.

a) Implementation of the project will promote the productivity and profitability of fishery activities in the fishery villages where are a lot of poor people and will contribute alleviation of poverty stated in the National Development Plan in Sri Lanka and benefit the stability of the socio-economic situation.
b) The implementation Agency (CFHC) has had the similar grab hopper dredger "R" and operated well so far and there is no problem for them to carry out the proper operation and maintenance of the new dredger.
c) The required depth of the fishery harbors will be maintained to secure the smooth operation and safe anchorage for the fishery boats in the harbors, which will promote the productivity and profitability of fishery industry
d) Since there is little environmental and social problems in conducting the dredging works and the project is treated as Category :C of the JICA Guideline
e) Since the new dredger will be built in Japanese shipyard in the Japan Grant Aid Scheme, there is no particular difficulty in implementation of the project.

Furthermore, in the assistant plan of Japan for each country, " Assistance for the improvement of capability for earning the foreign currency." is indicated for Sri Lanka. Since this project aims to increase the fish catch and to promote the export through maintenance dredging for the fishery harbors, it will fit the assistant policy of our country.

(6) Effectiveness

1) Quantitative Effectiveness

Index	Base Line (Result in 2011)	Target(2018)（3 years after completion of the Project）
Prevention of the accidents due to the sedimentation of in the fishery harbors area	Annual number of accidents：144 Registered Boats ：4,280 Annual number per boat ：0.03	Annual number of accidents per boat: About 0.03 or less

2) Qualitative Effectiveness

To contribute to the improvement of productivity and profitability of fishery industry through maintaining the required water depth to secure the smooth operation and safe anchorage for the fishing boats in the fishery harbors.

As mentioned above, it is considered that the implementation of this project has high relevance and effectiveness to be expected.

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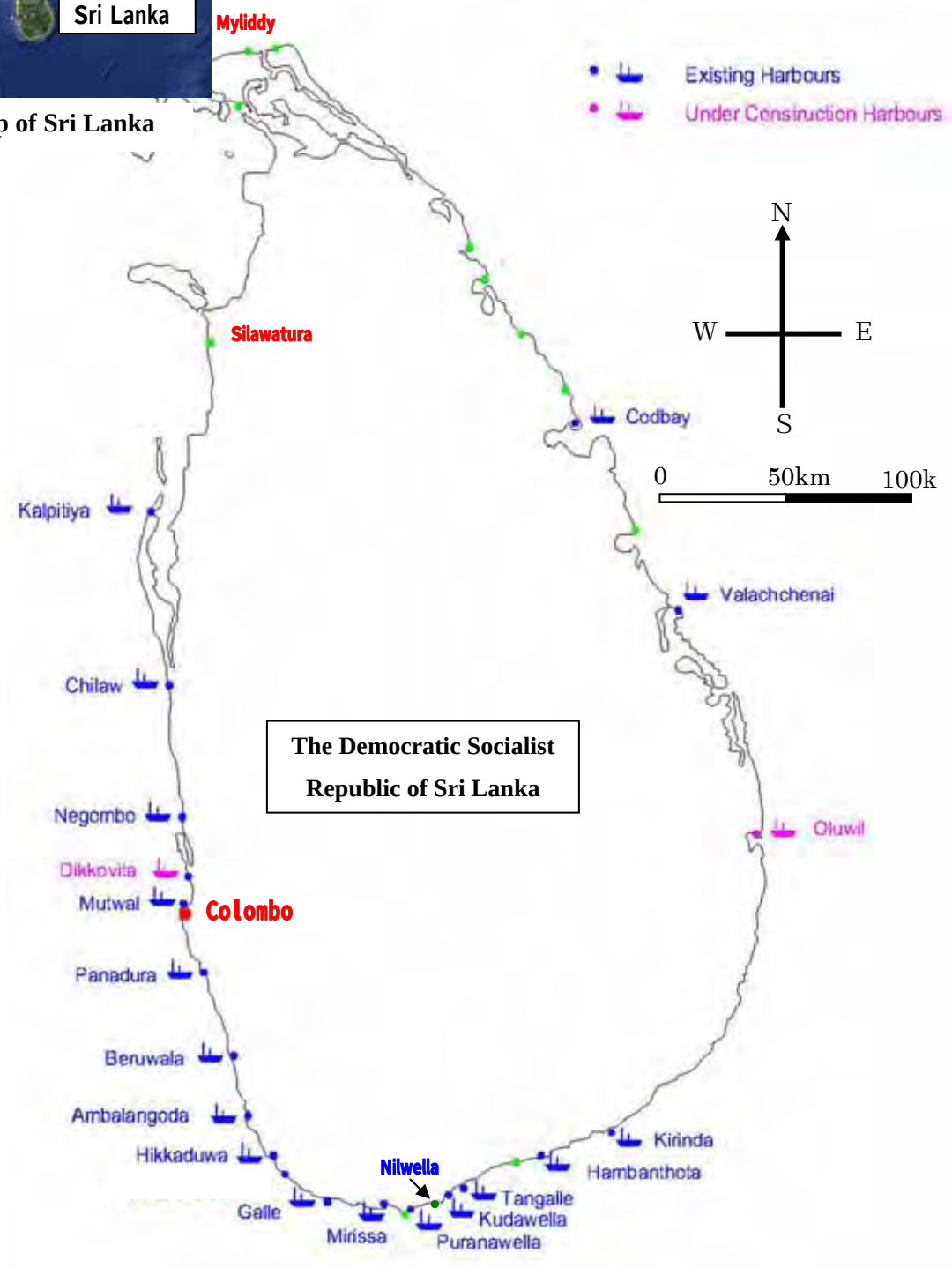
Location Map of Sri Lanka



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Abbreviations

ADB	Asian Development Bank
CCD	Coastal Conservation Department
CEA	Central Environment Authority
CFHC	Ceylon Fishery Harbours Corporation
CSD	Cutter Suction Dredger
DGPS	Differential Global Position System
GHD	Grab Hopper Dredger
HWL	High Water Level
IMUL	Inboard engine Multi Day (Boat)
JSQS	Japanese Shipbuilding Quality Standard
LWL	Low Water Level
MSL	Mean Sea Level
MEPA	Marine Environment Protection Authority
MFARD	Ministry of Fisheries & Aquatic Resources Development
NARA	National Aquatic Resources Research and Development Agency
NK	Nippon Kaiji Kyokai (Classification Society)
OFRP	Outboard engine FRP (Boat)
1DAY	One day (Boat)
TBT	Tri Butyl Tin

Chapter 1 Background of the Project

1-1 Background and Overview of Grant Aid

In the Democratic Socialist Republic of Sri Lanka (hereafter called as Sri Lanka), the fishery sector is recognized as the very important sector for the development of the country, since the sector supplies 50 % to 60 % of the animal protein requirement of the people and contributes to the employment for about 250,000 people directly and more than 700,000 people in case adding the indirect, and produces the valuable export production for earning the foreign currency amounting about Rp.20 billion equivalent to about 2 % of the total exports.

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Furthermore, in the Ministry of Fisheries and Aquatic Resources Development (hereafter called as MFARD) which is in charge of this Project, the development and maintenance of the fishery harbors are treated as one of the important items in Ten Years Development Policy Framework of the Fisheries and Aquatic Resources Sector (2007 to 2016) and in Accelerated Fisheries Sector Development Plan for the Northern Province in Sri Lanka.

At present, nineteen (19) fishery harbors are in operation and one (1) more harbor will be added soon. In addition, about ten (10) harbors, which are still on the stage of planning and designing after the conflict, are scheduled to be operational in the northern area. All such fishery harbors are under the management and control of Ceylon Fishery Harbours Cooperation (hereafter called as CFHC).

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Needless to say, should this situation continue long time in future, the accidents of fishing boats due to the sedimentation would increase significantly. The number of accidents of fishing boats in the fishery harbors is shown on Table 1-1

Table 1-1 Accidents *of Fishing Boat Due to Sedimentation

Fishery Harbor	2010	2011	2012 (upto November)	Registered ** Fishing Boats (2011)
1.Kalpitiya	3	5	4	125
2.Chilaw	13	15	14	41
3.Negombo	4	6	3	1,001
4.Dikkovita	Not open	Not open	Not open	
5.Mutuwal	1	0	0	47
6.Panadura	15	17	16	578
7.Beruwala	4	7	5	
8.Ambalangoda	10	9	7	303
9.Hikkaduwa	15	17	18	
10.Galle	1	2	3	
11.Mirissa	5	4	3	695
12.Purunawella	4	6	5	
13.Nilwalla	Not open	Not open	Opened July, 2012	
14.Kudawella	0	0	0	539
15.Tangalle	7	6	5	
16.Hambantota	14	16	12	
17.Kirinda	31	26	23	
18.Oulvil	Not open	Not open	Not open	
19.Valachchinai	10	8	7	392
20.Cod Bay	0	0	0	559
Total	137	144	125	4,280

* Almost all accidents are not so serious but like deformation or damage of hull, propellers, rudders etc. caused by grounding or touching the bottom of the sea.

** Multi-day Boat and One day Boat

In such circumstances, the procurement of a dredger has become an emerging item for CFHC, and Government of Sri Lanka made a grant aid request for provision of a self-propelled grab hopper dredger.

1-2 Environmental and Social Consideration

(1) Marine Environment Related Regulation

Regarding environmental concern, interview with the following relevant offices were performed.

Marine Environment Protection Authority (MEPA)

Central Environment Authority (CEA)

Coastal Conservation Department (CCD)

National Aquatic Resources Research and Development Agency (NARA)

As the result, the followings were found.

1) Marine Pollution Prevention Act, No.35 of 2008 is the currently effective marine environment related regulation. In this act, any rules regarding maintenance dredging and soil disposal are not provided. When coastal facilities and structures are newly developed, developers should make application for permission to the following relevant offices. Relevant offices should call for Environment Impact Assessment and maybe subject to EIA committee's monitoring during the development project.

MEPA: From 300m landward of coastline to seaward (upto the border of EEZ)
CEA: From coastline to landward except the area under the control of CCD
CCD: From 300m landward of coastline to 2km seaward of coastline

2) The above act is under amendment procedure at present, and dredged material should be added to the items of ship disposal, which requires permission, thus it should be regulated that dredging activity need prior permission from the relevant offices (MEPA in case of harbor dredging), and study of dredged material (disposal) be required for it, however, the turbidity of the water during dredging operation should not be regulated.

As mentioned above, no rule is established for maintenance dredging at present, no analytical data regarding sea bottom quality and water quality were not obtained, however, the permission procedure of MEPA requires sampling analysis of sea bottom, thus, our study was limited to estimate the quality of sea bottom/sea water from the situations of location and utilization of fishing harbors.

(2) Sea Bottom・Sea Water Pollution

1) Industrial disposal is considered as the primary source of the pollution of sea bottom and water, however, since no heavy chemical industries exist around fishing harbors in Sri Lanka yet, and since maintenance dredging is comparatively frequently performed, it is not considered that the sea bottom of fishing harbors seriously polluted with heavy metal and bio-chemical points of views.

Anti-fouling paint for ships containing TBT (Tributyltin) etc. is one of pollution source of fishing harbors, however, anti-fouling paint is not normally applied to the fishing boats in Sri Lanka except a part of large fishing vessels (over 50 feet) due to its high cost regardless of toxic or non-toxic, according to MEPA. (98.5% of registered fishing boats are less than 50 feet in Sri Lanka according to the data of CFHC)

Regarding the above, the Survey Team interviewed owners of fishing boats at the time of visiting fishing harbors and found that any of owners interviewed did not use anti-fouling paint and instead they frequently clean bottom of ships.

In addition, the Survey Team investigated ship builders and found that they did not use TBT anti-fouling paint after 2008 when the international agreement (International Convention on the Control of Harmful Anti-fouling Systems on Ship) became effective (and such a paint could not be obtained before that time) and owners of fishing boats rarely request anti-fouling paint.

From the above, sea bottom pollution due to TBT is considered negligible even if it exists.

2) Although industrial pollution is small, siltation of eroded soil from landside of harbors, disposal, waste water exist to a certain extent in front of quays, thus it is dispensable that the turbidity increases around grab dredging work. Since turbidity monitoring is performed during construction of new ports, performance of turbidity monitoring for maintenance dredging is predicted to be legislated in future. The Survey Team wishes periodical monitoring of sea bottom and water quality. When monitoring result requires environmental countermeasures, countermeasures such as follows may be considered.

① to use sealed type grab bucket
② to use silt fence during grab dredging

Since the planned grab dredger is self-propelled type having own hopper in board, the silt fence surrounding the dredger should be open when it will leave the dredging area for disposal, and at this time turbidity will spread out from the enclosed water area, thus the effect of silt fence becomes decreased. To avoid this, the dredger should locate out of the silt fence which is fixed to the floating frame and the dredger should dredge inside of the floating frame.

The hopper dredger is designed so that the water above sediment in hopper is discharged. The panned grab hopper dredger is designed in the same way. The water discharge is made from the bottom of the ship where the water is lead from the top of hopper.

(3) Influence on Fishing Boats during Dredging Operation

The number of fishing boats locating in the harbor basin varies in harbors and in the seasons. Generally fishing boats are less in harbors because many fishing boats are out on fishing trip in the busy fishing season, which is thus considered appropriate for dredging operation. Therefore execution of dredging should be planned considering the deep sea wave and fishing season. Dredging plan is informed to the fishermen cooperative of each fishing harbor for cooperation of fishing boat relocation etc.

From the interviews with fishermen cooperatives, the Survey Team found that all of the fishermen cooperatives are willing to cooperate with CFHC about relocation of fishing boats for dredging operation, and also found that the floating discharge pipe line of cutter suction dredger tends to obstruct the navigation of fishing boats, thus fishermen cooperatives prefer dredging by a grab hopper dredger.

However, since the cutter suction dredger has great role in maintenance dredging, the Survey Team advised that the discharge pipe line could be installed on the basin bed to avoid obstruction to navigation of fishing boats. In this case it should be noted that the basin bottom where the pipes are installed be deep enough and the location of the sunken discharge pipe be identified with floating buoys.

Chapter 2　Contents of the Project

2-1 Basic Concept of the Project

2-1-1 Development Plan (National Program)

In the National Development Program “Mahinda Chintana (2007 – 2016)” - Vision of New Sri Lanka, the development and improvement of the various infrastructures along the coastal areas are enlisted in relation to alleviation of the poverty and the revival of the northern area.

Furthermore, in the Ministry of Fisheries and Aquatic Resources Development (hereafter called as MFARD) which is in charge of this Project, the development and maintenance of the fishery harbors are treated as one of the important items in Ten Years Development Policy Framework of the Fisheries and Aquatic Resources Sector (2007 to 2016) and in Accelerated Fisheries Sector Development Plan for the Northern Province in Sri Lanka.

In the Ten Years Development Policy Framework the policy measure of 「8.2 Strengthen facilities of the CFHC for proper maintenance of harbours」 is enlisted to cope with one of the major issues of MFARD of「[Issue 8]　Inadequate and poorly managed and maintained fishery infrastructure」

[Overall Goal]	：The productivity and profitability of the fishery activities in the fishery villages in Sri Lanka to be promoted.
[Project Purpose]	：The function of the fishery harbors in Sri Lanka to be maintained to secure the smooth operation of fishery boats

2-1-2 Outline of the Project

In order to achieve the purpose mentioned above this project is for the construction of one (1) self-propelled grab hopper dredger with which maintenance dredging is carried out together with the existing dredgers of CFHC to maintain the required water depth in the fishery harbors of nineteen (19) existing and one (1) opening in near future and will contribute to prevent the accidents due to the sedimentation and to secure the smooth operation of the fishery boats in the harbors, which consequently is expected to contribute to the promotion of productivity and profitability of fishery activities and for increasing employment, earning foreign currency and securing animal protein to the people of Sri Lanka.

2-2 Outline Design of the Japanese Assistance

2-2-1 Design Policy

2-2-1-1 Basic Policy

(1) Fishery Harbors Dredged

The maintenance dredging sites of the new dredger are twenty (20) fishery harbors located in the south, west and east of Sri Lanka as follows:

Kalpytia, Chilaw, Negombo, Dikkovita, Mutuwal, panadura, Beruwara, Ambarangoda, Hikkadua, Galle, Mirrisa, Purunawella, Nilwara, Kudawala, Tangala, Hambantota, Kirinda, Oluvil (opening near future), Valachchinai and Cod Bay.

In the northern area, about ten (10) fishery harbors are on the stage of conception or planning, which, however, are not included in the objects of this survey, since it is assumed to take considerably long time for them to be developed and at present the reliable data of sedimentation for designing the new dredger can not be obtained.

(2) Analysis of Maintenance Dredging Volume

1) Situation of Water Depth Monitoring of CFHC

CFHC maintains the survey unit under Civil Engineering Division, having the following personnel for execution of topographic and bathymetric survey:

- 1 - Senior Hydrographic Surveyor
- 1 - Hydrographic Surveyor
- 1 - Coxwain
- 3 - Survey Helpers
- 1 - Auto CAD Draftman

Echo Sounder and DGPS (Differential Global Positioning System) positioning system are integrated to the data acquisition system HYDROpro software. For the performance of bathymetric survey, the echo sounding device, the receiver of DGPS and the laptop PC installed with the data acquisition system is installed on a small boat. The small boat is maneuvered along the designated survey lines with monitoring control by the data acquisition software. The survey devices are listed as below:

・Survey Boat : Shallow drafted Dinghy boat with outboard engine
・Positioning System : DGPS system Trimble DSM 212/DGPS
・Echo Sounder : Hydrotrac (Single beam portable echo sounder)
Teledyne ODOM HYDROGRAPHIC, USA
・Data Acquisition Software : Trimble HYDROpro

Where the boat access is difficult, survey is carried out by lead survey. It is informed that the tidal level is measured every 15 minutes during survey for tidal correction of the survey data. It is also informed that the bathymetric survey data are recorded as plan drawings of water depth survey result in Auto CAD file system. Our Survey Team also received the updated data of the plan drawings of water depth survey result. CFHC informed that CFHC had performed bathymetric survey with the above set of survey equipment two times a year from 2002. The contents of the survey method shown above were considered appropriate as water depth monitoring system in the fishing harbors. The plan drawings of water depth survey result looked adequate too.

2) Estimation Method on CFHC Request Application

Annual required volume of maintenance dredging, which should be equal to the average volume of sedimentation per year, can be calculated from the difference of the volume between 2 survey results of different times, which should be some year after 2005 and the newest. The year before 2004 cannot be used because the Tsunami disaster in 2004 might have made a great change of bathymetry.

However, the Survey Team found that the estimation in the CFHC Request Application was made by the area of basin subjected to dredging multiplied by the annual sedimentation thickness, which is estimated without clear evidence.

3) Review of Estimation of Maintenance Dredging Volume

Therefore, the Team requested the data to CFHC for the new estimation of maintenance dredging:

a) The difference of volume is calculated between the survey results of water depth of two different times. Then, the yearly average is calculated by dividing the difference of volume with the number of years of the difference of two times.

a') For the basins where rehabilitation was made after Tsunami in 2004, the assumption was made that the design depth was secured at the time of the rehabilitation.

b) For the new harbors, where no sedimentation data are available, the sedimation volume should be referred to the design report of the harbors.

c) For the harbors, where sedimentation is small, 1,000m^3 is counted as the maintenance dredging volume.
d) For the harbors not categorized above, the sedimentation volume is estimated following the harbors in the similar natural conditions in the vicinity.
e) For the location, where the sedimentation volume can be somehow estimated by the field observation (ex. Chilaw Lagoon Mouth), the estimation is done by this way.

Consequently, for 8 harbors the estimation was done by the method a), although the period of the difference of survey times is not long enough. For Ambalangoda and Kudawella, it is assumed that the design was maintained in the basins at the time of rehabilitation after Tsunami disaster. For the other harbors, the estimation was performed by the methods b) to e). Due to the circumstance, the accuracy of estimation is subject to discussion. However, from our opinion the result of the estimation is good enough for the purpose of this study, which is for reviewing of the required capacity of the dredger. The result of the estimation is shown in Table 3-1, where the estimation methods are also indicated. The calculation sheet (including the data received from CFHC) is shown in Table 2-1, besides the estimated volume of the sedimentation, the following figures are indicated:

- Volume of Long Time Sedimentation：
  This is volume of sedimentation for long time due to the shortage of dredging capability. In order to secure the design depth, this volume should be dredged intensively.

- Prediction of Future Capital Dredging：
  Capital dredging for increasing water depth etc. is planned for the followings. CFHC is planning to make -5m basins for the following 7 fishing harbors, in order to accommodate foreign fishing boats:
  Cod Bay
  Dikkovita
  Berwala
  Mirissa
  Purunawela
  Kudawella
  Hiddaduwa

In addition, the depth of navigation channel of Valachchenai is planned to increase from -3m of major channel and -2m of branch channel to -3.5m and -2.5m respectively.

Grab hopper dredging or cutter suction dredging was selected for each fishing harbor and for each part of fishing harbor. Then, the dredging volume was estimated for types of dredging method. The selection of dredging type was done by the following guidelines:

- For the area where dredged soil is sandy soil and the land deposit area of soil is available and the wave condition is calm, cutter suction dredging should be applied as much as possible so that the dredged soil can be reused as construction material.
- For the area where the land deposit area of dredged material is not available, grab hopper dredging should be applied
- For the area where the sea condition is rough such as harbor mouth, grab hopper dredger is applied
- For the area where cutter suction dredging is generally applied but garbage, wrecks, debris, wires etc. is found on the sea bottom grab hopper dredging should be used before starting of cutter suction dredging
- For the special area where rocks locate within a dredging area, grab hopper dredging should be applied.
- For the harbors where many vessel make the basin congested so that discharging pipes become serious obstacle for fishing boats to maneuver.

Consequently, the annual sedimentation volume, which should be same as the annual maintenance dredging volume, was estimated as 173,000m^3. Then, the volume preferably dredged by a grab hopper dredger was estimated as 93,000m^3 and the volume preferably dredged by a cutter suction dredger was estimated as 80,000m^3.

Table 2-1 Required Dredging Volume

	Name of Harbour	Harbor Basin Area (ha)	Designed Water Depth (m)	Area of Dredging (m^2)	Required Dredge Volume (m^3/y)	Required Dredge Volume Estimated by CFHC (m^3/y)	Dredge Vol. Preferred by GHD (m^3)	Dredge Vol. Preferred by CSD (m^3)	Long Term Sedimented Vol. (m^3)	Dredge Vol. Preferred by GHD in ⑧ (m^3)	Dredge Vol. Preferred by CSD in ⑧ (m^3)	Future Capital Dredging Forecast (m^3)	Dredge Vol. Preferred by GHD in ⑪ (m^3)	Dredge Vol. Preferred by CSD in ⑪ (m^3)	Availability of Land Disposal Area	Water Calmness	Subjected Monsson	Estimation Method
		①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰
1	Kalpitiya	2.00	4.0-6.0	9,985	2,000	6,000	6,000								X	○	SW	a
2	Chilaw		2.5	37,833	11,000	11,000	4,000	7,000	28,000	4,000	24,000				○	○(△)	SW	e
3	Negombo	2.00		8,315	10,000	1,000	1,000								X	○	SW	c
4	Dikkovita	11.70	3.0-5.0	106,703	10,000	18,000	5,000	13,000							○	○(△)	SW	b
5	Mutuwal	2.15	4.0-6.0	16,960	3,500	1,000	1,000								X	○	SW	c
6	Panadura	2.80	2.5-3.0	57,767	5,000	7,000	4,000	3,000							○	○(△)	SW	e
7	Beruwala	11.99	2.5-3.0	133,400	5,500	8,000	3,000	5,000	43,000		43,000	150,000	20,000	130,000	○	△	SW	a
8	Ambalangoda	6.40	3.5	56,737	1,000	9,000	3,000	6,000	32,000	15,000	17,000				△	△	SW	a'
9	Hikkaduwa	6.90	2.5-3.0	45,190	10,500	12,000	12,000		25,000	10,000	15,000	60,000	20,000	40,000	△	△	SW	a
10	Galle	5.00	3.0-4.0	31,900	1,500	1,000	1,000								△(X)	○	SW	c
11	Mirissa	7.00	2.5-3.0	62,433	2,500	1,000	1,000					120,000	120,000		X	○	SW	c
12	Purunawella	11.00	2.5-3.0	50,360	4,500	5,000	5,000		30,000	10,000	20,000	100,000	20,000	80,000	△	○	SW	a
13	Nilwalla	5.00	3.0	80,000		3,000	3,000								△	○	SW	d
14	Kudawella	10.10	2.5-3.0	95,650	1,000	3,000		3,000	20,000		20,000	150,000		150,000	○	○	SW	a'
15	Tangalle	2.18	2.5-3.0	21,090	2,500	4,000	4,000		2,000	2,000					○	△	SW	a
16	Hambantota	5.80	3.5	42,446	8,000	27,000	27,000		7,000	7,000					○(△)	○	SW	a
17	Kirinda	2.54	2.5-3.0	26,581	30,000	35,000	8,000	27,000	1,000	1,000					○	○(△)	SW/NE	a
18	Oulivil1)	6.00	3.0	60,000	15,000	12,000		12,000							○	○	NE	b
19	Valachchinai		3.0	141,640	20,000	8,000	5,000	3,000	67,000	10,000	57,000	71,000		71,000	△	○	NE	a
20	Cod Bay	20.00	3.0-6.0	90,827	1,500	1,000		1,000	3,000			60,000		60,000	△	○	NE	c
	Total	20.00			145,000	173,000	93,000	80,000	258,000	59,000	196,000	711,000	180,000	531,000				

GHD means Grab Hopper Dredger
CSD means Cutter Suction Dredger

: Easthern Port

(3) Dredging Plan

1) Estimation of Capability of Dredger Fleet

Based on the actual dredging activity record of the existing dredgers of CFHC in 2010 and 2011, the capability of each dredger was modeled as shown in Table 2-2. Modeling was done by analyzing the actual dredging activity record with the following guidelines:

- The theoretical maximum capability of a dredger is reduced by the local factors such as climate, sea condition, congestion of harbors, idling due to repairing. However, precise estimation of effect of such factors is not easy. In this study, the actual capability after consideration of such effect can be estimated since the actual record exists.
- A cutter suction dredger can be operated with constant efficiency whole a year because it is applied in the calm area inside of the harbors.
- A grab hopper dredger hauls dredged material to deep sea, applied to harbor basin and mouth. Therefore, this dredging is highly subjected to the wave condition of the sea out of harbors. Since the wave condition of the sea is dominantly due to monsoon. Thus, the fishing harbors on SW coast is dredged by a grab hopper dredger out of SW monsoon season. SW monsoon season is approximately from April to September, but April, August, September is on the border zone of the season.
- A grab hopper dredger can dredge fishing harbors on East Coast during SW monsoon season, since East Coast is out of NE monsoon season. However, since only 2 harbors locate on East Coast, maintenance dredging was not performed in 2010, and 2011.
- Actual capability of the existing grab hopper dredger (Ruhunuputha) was modeled as shown in Table 2-2, from the actual dredging activity record given by CFHC for 2010 and 2011, although it did not show monthly volume of dredging:

October to March（6 months）	：	5,000m^3/month
April, August, September（3 months）	：	4,000m^3 /month
Total	：	42,000m^3

Table 2-2 Dredging Capability of Existing Dredgers and the New Dredger

	CFHC Actual		CFHC Plan	Modeling			
	2010	2011	2012	Anuual Total (m^3/y)	Oct.～ March (m^3/mo)	Apr. Aug. Sept. (m^3/mo)	May～ July (m^3/mo)
					Out of SW Monsoon Season	Border of SW Monsoon Season	During SW Monsoon Season
					6 months	3 months	3 months
Grab Hopper Dredger							
1. Ruhunuputa	46000	42,500	42,500	57,000	5,000	4,000	5,000
2. New Dredger				85,500	7,500	6,000	7,500
Cutter Suction Dredger							
1. Nidiyawara	20000	11,500	17,000	17,000	1,420		
2. Salapura Kinduri	15000	21,000	16,000	16,000	1,330		
3. Weligouwa	14500	13,500	15,000	15,000	1,250		
					99,000	42,000	49,500
Total	95,500	88,500	90,500	190,500	190,500		

2) Dredging Volume Required to the New Dredger

As shown in Table 2-2, the actual recorded dredged volume of the existing grab hopper dredger (GHD) Ruhunuputa was 42,500～46,000m^3/year. From this, the capability of Ruhunuputha was simplified to the total volume of 42,000m^3/year. This annual capability does not consider the operation from May to Jul during SW monsoon season. For the annual dredging volume of modeled capability, the possible dredging on the East coast during above 3 months was added. However, actually the area where grab hopper dredging is preferable is only the part of Valachichinai channel with the volume of 5,000m^3, therefore, the total became to 47,000 m^3 after adding 5,000m^3 to 42,000m^3. On the other hand, the total volume preferably dredged by a grab hopper dredger becomes 93,000 m^3 as shown in Table 2-1. Therefore, the shortage of the dredging volume by a grab hopper dredge is 93,000-47,000=46,000 $m^{3.}$

The actual recorded dredged volume by cutter suction dredgers (CSD) was 48,000 $m^{3.}$. Since cutter suction dredging does not have Monsoon influence, the shortage of the cutter suction dredging is calculated as 80,000-48,000= 32,000 m^3.

Therefore, it is ideal to provide grab hopper dredgers and cutter suction dredgers to cover the shortage of corresponding dredging capability. But, planning to cover the shortage by one dredger, a grab hopper dredger is chosen to provide since it can cover the area preferably dredged by cutter suction dredger.

By this, a new dredger is required to dredge the total shortage 46,000 + 32,000 = 78,000 $m^{3.}$ Since grab hopper dredging is affected by monsoon, dredging volume should be studied for SW Coast and East

Coast separately for considering the required capability of the new dredger. Then, dredging capability on SW coast out of SW monsoon season becomes critical since the harbors on SW coast are dominant. Dredging volume required on SW coast is 78,000－16,000 = 62,000 m^3, considering also the shortage of cutter suction dredger. The above volume 16,000m^3 is the volume preferably dredged by cutter suction dredger on East coast i.e. Cod Bay 1,000m^3, Oulvil 12,000m^3, Valachchinaic channel 3,000m^3. Therefore, 62,000m^3 is the shortage of the dredging volume on SW coast including grab hopper and cutter suction dredging. Thus, the new dredger should cover this dredging capability.

Table 2-3 Dredging Capability Required to a New Grab Hopper Dredger

			Aug.-Apr. (9month)	May-July (3Month)	Total
1.1	Dredged Vol. to be done by GHD (m^3)	①	88,000	5,000	93,000
1.2	Actual Capacity of R-GHD (m^3)	②	42,000	5,000	47,000
1.3	Shortage of GHD capacity (m^3)	③＝①-②	46,000	0	46,000
2.1	Dredged Vol. to be done by CSD (m^3)	④	80,000		80,000
2.2	Actual Capacity of Exist. CSD	⑤=⑥+⑦+⑧	48,000		48,000
	Nidiyawara	⑥	17,000		17,000
	Salapura Kinduri	⑦	16,000		16,000
	Weligouwa (Kirinda)	⑧	15,000		15,000
2.3	Shortage of CSD Capacity (m^3)	⑨=④-⑤	32,000		32,000
	Supplemented by GHD		16,000	16,000	
3.1	Capacity required to new (GHD)		62,000	16,000	78,000

GHD: Grab Hopper Dredger
CSD: Cutter Suction Dredger
R-GHD: Ruhunuputa

Reasonably assuming the operation rate of the new dredger is as same as Ruhunuputa;

when A (m^3/month): Dredging Capability of New Dredger during out of SW monsoon season,

$$A \times (1.0 \times 6 + 0.8 \times 3) = 62{,}000\ m^3$$

and then,

$$A = 7{,}381\ m^3/\text{month}$$

This figure is approximately 1.5 times of 5,000 m^3/month of the capability of Ruhunuputha. From this, the capability of the new dredger should be at least 1.5 times of the capability of Ruhunuputha i.e. 7,500 m^3/ month and hopper capacity 300m^3. In this case the figure of A x (1.0 x 6 + 0.8 x 3) can be

recalculated as 63,000m^3. The capacity of the dredging fleet including the new dredger is also shown in Table2-4

Table 2-4 Summary of Capability of New Grab Hopper Dredger

Dredging Capability	New Dredger		GHD "R"	
1.Hopper Capacity (m3)	300		200	
2.Actual Dredging Capability	(m^3/mon)	(m^3)	(m^3/mon)	(m^3)
(1) Off SW Monsoon（Oct to Mar（6 mon））	7,500	45,000	5,000	30,000
(2) Transit SW Monsoon（Apr・Aug・Sep（3 mon））	6,000	18,000	4,000	12,000
Dredging Capability in SW Coast	63,000		42,000	
(3) SW Monsoon（May to JUl（3mon）） East Coast Dr.	7,500	22,500	5,000	15,000

The capability of the dredging fleet including the new dredger was also shown in Table 2-2.

3) Maintenance Dredging Plan of Dredging Fleet including New Dredger

In this section, the maintenance dredging plan of the dredging fleet including the new dredger is made as an example. The planning approach process is as follows:

a) Grab hopper dredging fleet

The volume preferably dredged by a cutter suction dredger is 80,000m^3 in Table 2-1. On the other hand, the capability of the existing cutter suction dredgers is 48,000m^3. This shortage 32,000m^3 should be dredged by a grab hopper dredger. Accordingly the following areas within the area originally preferably dredged by a cutter suction dredger were added to the areas dredged by a grab hopper dredger.

- Chilaw Lagoon Mouth（the lagoon side of Mouth Sand berm） 1,000m^3
- Chilaw Harbor Baisn 1,000m^3
- Beruwala Basin 5,000m^3
- Ambalangoda Basin 6,000m^3
- Kudawella 3,000m^3
- Oulvil 12,000m^3
- Valachchinai Navigation Channel 3,000m^3
- Cod Bay 1,000m^3

Total 32,000m^3

The total volume dredged by grab hopper dredgers 125,000m^3 （93,000m^3+32,000m^3）, which comes from 93,000m^3 in Table 2-1 with 32,000m^3 above. Then, considering the annual average thickness of sedimentation, the harbors are categorized to the harbor need to be dredged annually and the harbors need to be dredged every 3 years. is divided to SW Coast area and East Coast area. On the

other hand, the total dredging capability of the grab hopper fleet including the new dredger is 105,000m^3 (R-dredger 42,000+New dredger 63,000) in 9 months from August to April, when South West coast can be dredged and 12,500m^3 / month in 3 months from May to July, when East coast can be dredged as shown in Table 2-2

Table 2-5 shows the Grab Hopper dredging plan of 3 year duration.

b) Cutter Suction Dredger Fleet

The plan of cutter suction dredging is considered to be basically same as the current condition. The annual dredging capacity (actual) is 48,000m^3 (as same) and the dredging areas should be the areas which are excluded the areas above (32,000m^3) from the whole areas shown in Table 2-1. Planned cycle of cutter suction dredging is considered as same in the case of the plan of grab hopper dredging. Table 2-6 shows the cutter suction dredging plan of 3 year duration.

c) Maintenance Dredging Time Schedule including New Dredger

By this approach process, the dredging schedule for 3 year duration was planned in Table 2-7, trying to minimize hauling of dredgers and also the monsoon seasons. Please note that this schedule was made in the base that the minimum elements are harbors. However, on the other hand, actually it is possible to dredge partially a harbor in a season and continuously to dredge the harbor in the next season. And also it should be noted that the sedimentation volume should have annual range of difference. Therefore, this plan can still be considered only a modeled example. It should be also noted that the start time of one year is made August considering the separation of the monsoon seasons.

Table 2-5 3-year dredging plan (Grab Hopper Dredging)

				Planned Vol. Dredged by GHD (m3/y)	Cycle Time of Dredging (y)	Dredged Vol. (m3/Time)	Example of Dredging Plan		
							1st year	2nd year	3rd year
SW Coast Region	1	Kalpytia		6,000	3	18,000	18,000		
	2	Chilaw	Sand Bank at Lagoon Mouth (Sea Side)	5,000	1	5,000	5,000	5,000	5,000
			Sand Bank at Lagoon Mouth (Lagoon Side)						
			Harbor Basin	1,000	3	3,000	3,000		
	3	Negombo		1,000	3	3,000	3,000		
	4	Dikkovita	Port Mouth	5,000	1	5,000	5,000	5,000	5,000
			Basin						
	5	Mutuwal		1,000	3	3,000	3,000		
	6	Panadura	Port Mouth	4,000	3	12,000	12,000		
			Basin			0			
	7	Beruwala	Port Mouth	3,000	1	3,000	3,000	3,000	3,000
			Basin	5,000	3	15,000		15,000	
	8	Ambarangoda	Port Mouth	3,000	1	3,000	3,000	3,000	3,000
			Basin	6,000	3	18,000			18,000
	9	Hikkadua		12,000	3	36,000		36,000	
	10	Galle		1,000	3	3,000	3,000		
	11	Mirrisa		1,000	3	3,000	3,000		
	12	Purunawella		5,000	3	15,000			15,000
	13	Nilwara		3,000	3	9,000	9,000		
	14	Kudawela		3,000	3	9,000			9,000
	15	Tagala		4,000	3	12,000			12,000
	16	Hambantota		27,000	1	27,000	27,000	27,000	27,000
	17	Kirinda	Port Mouth	8,000	1	8,000	8,000	8,000	8,000
			Basin						
		SW Coast Fishing Harbor Total					**105,000**	**102,000**	**105,000**
East Coast Region	18	Oulvil		12,000	3	36,000	18,000	18,000	
	19	Valachchinai	around port	5,000	1	5,000	5,000	5,000	5,000
			navigation channel	3,000	3	9,000			9,000
	20	Cod Bay		1,000	3	3,000			3,000
							23,000	**23,000**	**17,000**
		East Coast Fishing Harbor Total		**125,000**			**128,000**	**125,000**	**122,000**

Ruhunuputha

New Dredger

Table 2-6　3-year dredging plan（Cutter Suction Dredging）

				Planned Vol. Dredged by CSD (m3/Y)	Cycle Time of Dredging (Y)	Dredged Vol. (m3/Time)	Example of Dredging Plan		
							1st Year	2nd Year	3rd Year
SW Coast Region	1	Kalpytia		0					
	2	Chilaw	Sand Bank at Lagoon Mouth (Sea Side)	(1,000)					
			Sand Bank at Lagoon Mouth（Lagoon Side)	5,000	1	5,000	5,000	5,000	5,000
			Harbor Basin	(1,000)					
	3	Negombo		0					
	4	Dikkovita	Port Mouth	0		0			
			Basin	13,000	3	39,000	16,000	16,000	7,000
	5	Mutuwal		0		0			
	6	Panadura	Port Mouth	0		0			
			Basin	3,000	3	9,000			9,000
	7	Beruwala	Port Mouth						
			Basin	(5,000)					
	8	Ambalangoda	Port Mouth						
			Basin	(6,000)					
	9	Hikkaduwa		0					
	10	Galle		0					
	11	Mirrisa		0					
	12	Purunawella		0					
	13	Nilwalla		0					
	14	Kudawella		(3,000)					
	15	Tangalle		0					
	16	Hambantota		0					
	17	Kirinda	Port Mouth	0					
			Basin	27,000	1	27,000	15,000	15,000	15,000
		SW Coast Fishing Harbor Total					12,000	12,000	12,000
East Coast Region	18	Oulvil							
	19	Valachchinai	around port	(12,000)					
			navigation channel						
	20	Cod Bay		(3,000)					
				(1,000)					
		East Coast Fishing Boat Total		**48,000**			**48,000**	**48,000**	**48,000**
		supplemented by GHD due to CSD shortage		(32,000)					

CSD1: Nidiyawara

CSD2: Salapura Kinduri

CSD3: Weligouwa

Table 2-7 3-year Dredging Schedule

Name of Dredger		1st Year											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GHD1(Ruhunuputha)	Capacity (m3)	5,000	5,000	5,000	4,000	5,000	5,000	5,000	4,000	4,000	5,000	5,000	5,000
		Hambantota							3,000 Chilaw	3,000 Negombo	9,000 Nilwara		27,000 Hambantota
GHD2(New Dredger)	Capacity (m3)	7,500	7,500	7,500	6,000	7,500	7,500	7,500	6,000	6,000	7,500	7,500	7,500
		9,000 Kudawela	8,000 Kirinda	12,000 Tangalle		14,000 Valachchinai		3,000 Cod Bay	5,000 Chilaw	18,000 Kalpitiya		5,000 Dikkovita	3,000 3,000 Mutuwal Berwala
CSD1(Nidiyawara)	Capacity (m3)	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420
			Kirinda				5,000 Chilaw				12,000 Kirinda		
CSD2(Salapura Kinduri)	Capacity (m3)	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330
					16,000 Dikkovita								
CSD3(Weligouwa)	Capacity (m3)	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250
					15,000 Krinda								

Name of Dredger		2nd Year											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GHD1(Ruhunuputha)	Capacity (m3)	5,000	5,000	5,000	4,000	5,000	5,000	5,000	4,000	4,000	5,000	5,000	5,000
		Hambantota								15,000 Beruwala			27,000 Hambantota
GHD2(New Dredger)	Capacity (m3)	7,500	7,500	7,500	6,000	7,500	7,500	7,500	6,000	6,000	7,500	7,500	7,500
		12,000 Panadura	3,000 Ambalangoda	8,000 Kirinda	Galle Mirissa		18,000 Oulvil	5,000 Valachchina	5,000 Chilaw	5,000 Dikkovita	3,000 3,000 Beruwala Ambalangoda		36,000 Hikkaduwa
CSD1(Nidiyawara)	Capacity (m3)	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420
			Kirinda				5,000 Chilaw				12,000 Kirinda		
CSD2(Salapura Kinduri)	Capacity (m3)	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330
					16,000 Dikkovita								
CSD3(Weligouwa)	Capacity (m3)	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250
					15,000 Kirinda								

Name of Dredger		3rd Year											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GHD1(Ruhunuputha)	Capacity (m3)	5,000	5,000	5,000	4,000	5,000	5,000	5,000	4,000	4,000	5,000	5,000	5,000
		Hambantota								15,000 Purunawella			27,000 Hambantota
GHD2(New Dredger)	Capacity (m3)	7,500	7,500	7,500	6,000	7,500	7,500	7,500	6,000	6,000	7,500	7,500	7,500
		Hikkaduwa		8,000 Kirinda			18,000 Oulvil	5,000 Valachchina	5,000 Chilaw	5,000 Dikkovita	3,000 Beruwala	21,000 Ambalangoda	
CSD1(Nidiyawara)	Capacity (m3)	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420	1,420
			Kirinda				5,000 Chilaw				12,000 Kirinda		
CSD2(Salapura Kinduri)	Capacity (m3)	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330
				7,000 Dikkovtia						9,000 Panadura			
CSD3(Weligouwa)	Capacity (m3)	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250
					15,000 Kirinda								

(4) Suggestions for Dredging Plan

In this section, suggestions regarding dredging plan for CFHC are presented:

- As shown in the section before the volume preferably dredged by a cutter suction dredger is beyond the capability of the existing cutter suction dredger fleet. In this project, the shortage of the capability of cutter suction dredgers is planned to be covered by grab hopper dredgers. Grab hopper dredgers dispose dredged material into deep water currently. Oh the other hand, the dredged material by cutter suction dredging is landed at disposal area. Since the dredged material is generally good quality sand, the dredged material is reused as construction material. Since supply of sand is short as the demand of construction material, the dredged sand is considered as valuable source of supply. From the point of coastal conservation, the dredged sand from the harbors should be returned to the original location of the coast where the sand came by erosion. Considering this, it is suggested that the capability of cutter suction dredging should be enhanced in future.

- At the same time, where possible, the soil dredged by a grab hopper dredger should be landed at an appropriate wharf and should be reused.

- In the dredging plan in the previous section the dredging capability was calculated to cover the annual sedimentation volume. However, the volume of long time sedimentation amounts 258,000m^3 as shown in Table 2-1. In order to accomplish design water depth intensive dredging of the long time sedimentation should be executed in addition to dredging of the annual sedimentation.

- It is suggested as short term plan, that the operation hours of the dredgers should be extended. Currently, the cutter suction dredger, Weligouwa works in Kirinda Harbor is operated 7 days a week, on the other hand, the other dredgers are operated 5 days a week. For example, grab hopper dredgers Ruhunuputha and the planned new dredger can dredge 5,000m^3/mo and 7,500m^3/mo out of SW monsoon season respectively. If they are operated7 days a week, their capability can be 40% higher and become then 7,000m^3/mo. and 10,500m^3 respectively. Also with the safety measures for night work such as provision of appropriate working light, if they are operated by 2 shift 16 hours a day, the capability can be increased by 100%. This kind of measures and the effect is summarized in Table 2-8. By performing Model 2 of Table2-8 i.e. 7 days-a-week operation, the increase of annual capability of dredging is calculated to 70,000m^3. Practically considering the deficiency by monsoon season effect, still the increase of 50,000m^3 may be possible. In this case, the long time sedimentation can be completed in approximately 5 years.

- In addition, the mid and long term plan has capital dredging predicted as 711,000m^3. This capital dredging needs further enhancement of the dredging capability.

・ When this capital dredging is planned to be dredged by the dredging fleet including the new dredger, Model 3 of Table 2-8 should be required. In this case, since dredging volume becomes remarkably larger, more burdens(move of fishing boats) come out, thus it is predicted that the efficiency drops and the result cannot be like calculation. In addition, the request application mentions the future development of the fishing harbors in the northern region may need 50,000m^3 of annual dredging. Considering these circumstances, the enhancement of cutter suction dredger should be also considered as mid term plan, in addition to the provision of a grab hopper dredger.

Table 2-8 Increase of Dredging Capability by Increase of Operation Hours

	Model-1 (Normal Shift 5days/week)				Model-2 (Normal Shift 7days/week)				Model-3 (2 Shifts 5days/week)			
	Anuual Total (m^3/y)	Oct.～ March (m^3/mo)	Apr. Aug. Sept. (m^3/mo)	May～ July (m^3/mo)	Anuual Total (m^3/y)	Oct.～ March (m^3/mo)	Apr. Aug. Sept. (m^3/mo)	May～ July (m^3/mo)	Anuual Total (m^3/y)	Oct.～ March (m^3/mo)	Apr. Aug. Sept. (m^3/mo)	May～ July (m^3/mo)
		Out of SW Monsoon Season	Border of SW Monsoon	During SW Monsoon Season		Out of SW Monsoon Season	Border of SW Monsoon	During SW Monsoon Season		Out of SW Monsoon Season	Border of SW Monsoon	During SW Monsoon Season
		6 months	3 months	3 months		6 months	3 months	3 months		6 months	3 months	3 months
Grab Hopper Dredger												
1. Ruhunuputa	57,000	5,000	4,000	5,000	79,800	7,000	5,600	7,000	114,000	10,000	8,000	10,000
2. New Dredger	85,500	7,500	6,000	7,500	119,700	10,500	8,400	10,500	171,000	15,000	12,000	15,000
Cutter Suction Dredger												
1. Nidiyawara	17,000	1,420			23,760	1,980			34,080	2,840		
2. Salapura Kinduri	16,000	1330			22,320	1,860			31,920	2,660		
3. Weligouwa	15,000	1250			15,000	1,250			15,000	1,250		
Total		83,520	34,260	41,760		135,540	57,270	67,770		190,500	80,250	95,250
	190,500				260,580				366,000			
Increase (per year)	0				70,080				105,420			

2-2-1-2 Policy for the Natural Conditions

(1) Climatic and Oceanic Conditions

As for the wind condition, according to the data obtained from the Meteorological Agency of Sri Lanka, the wind speed is about 7 m/s in Mannar of the West Coast and about 7.6 m/s in Hambanthota of South Coast even in the South West Monsoon Season and in Batticaloa of East Coast is about 3.2 m. Therefore, the design condition of wind forth is set as 12 m/s with some allowance included, which level of wind is not considered to affect substantially to the design and operation of the new dredger.

As for the wave height, according to the information of the captain of GHD "R", it is dangerous for the dredger to be operated in the wave condition more than 1 m, since the dredged material is blown out of the hopper by the up and down motion of the hull caused by the wave when the bottom doors are opened at the dumping operation in such wave condition and the design condition of the significant wave height for the operation of the new dredger is set as less than 1 m.

In accordance with the data of CCD of Sri Lanka, the wave height even in the South Coast where the oceanic conditions are very severe is less than 1 m in the season other than the monsoon, when the new dredger can be operated in such condition.

The design condition of the range of tidal level is set as +0.7 m and 0.43 m to the average level according to the CFHC's design condition for the fishery harbors

(2) Dredged Material

The almost all material of sea bed is of silt and sand, however there are clay, hard sand and soft rock. The design condition on the dredged material is set as soft and hard material same as those of GHD "R".

In addition, there are a lot of disposals of polyethylene products, fishing nets, wires, solid material, etc. in the sea, which shall be considered in the design of the new dredger.

2-2-2 Basic Plan (Construction Plan/ Basic Plan)

2-2-2-1 Decision of the Principal Particulars

According to the design policy mentioned above, the basic design has been carried out taking the requirement of CFHC and the result of the field survey into consideration.

The required specifications are shown in the Table2-9.

Table 2-9 Required Specifications of New Dredger

	Required Specifications
Type of the dredger	Self-propelled Grab Hopper Dredger one (1)
Length	about 45 m
Breadth	about 11 m
Draft (full)	less than 2.5 m
Hopper capacity	more than 300 m^3
Grab backet capacity	more than 2.0 m^3
Dredging depth	more than 15 m
CFHC Requirement at Preparatory survey	In principle the specifications other than the capacity and size of the dredger and the items below to be in accordance with those of GHD “R” ・Rudders to be of shoe piece type。 ・Each side of void space to be separated into two (2) ・Air conditioning system to be provided in accommodation ・Indication panel for operation of hopper doors in wheelhouse ・Portable echo sounder with DGPS to be provided

(1) Type of the New Dredger

According to the request of CFHC of provision of the same type of dredger as GHD “R”, which is of self propelled grab hopper dredger, from the view points of their familiarity to such type of the dredger and compatibility of the equipment and the parts, the Team examined the purpose of the use and the operation of the new dredger and investigated the appropriateness of adoption of the same type in the Preparatory Survey as follows.

There are various kinds of dredgers equipped with various dredging systems suitable for the situation of dredging areas and the material of sea beds and upon the selection of the type of a dredger,

it is important to adopt the proper type for the purpose and condition of the Project after taking each function and characteristic into consideration.

Since the dredging sites of the new dredger are not large-scale commercial harbors but fishery harbors, where are rather narrow and a lot of fishing boats are navigating or moored every day, the dredger which does not occupy the large area in the harbors by movement itself or by floating pipes as the obstruction to the navigation of fishing boats at the time of dredging works, shall be selected and the dredging works shall be performed without disturbing the navigation of fishing boats.

There are many fishery harbors in Sri Lanka, where it is difficult to secure the dumping areas near on the land, and the dredged material shall be dumped out at the sea more than 6 nautical miles distant from the shore.

Furthermore, although the material of the sea bed in the harbors is mainly sand and silt, since the material of the sea bed at access channels and mouths of basins is sometimes of hard material and since there are some garbage of polyethylene bags, fishing nets, wires, solids etc.in the harbors, the dredger which can dredge soft to hard materials and garbage shall be better to be selected.

Since in Sri Lanka the wave at the mouths and the access channels of the fishery harbors becomes frequently such high level as exceeding the allowable significant wave height for using spuds at dredging works, a type of a dredger without using spuds at the dredging works shall be selected.

In order to satisfy these demands mentioned above, the new dredger is designed to have a main engine, a propeller and a rudder at each side of the hull to be of 2 engines/ 2 propellers/ 2 rudders for easy operation in the basin of the fishery harbors and to have a hopper for storing dredged material and to be of self-propelled for transportation to the dumping area located far from the dredging site.

In such circumstances a self-propelled grab hopper dredger which can keep the position by extension of anchors and chain, does not need floating discharge pipes of disturbance to the navigation of fishing boats and which performs dredging by the grab bucket crane is considered best to adopt to the Project

Needless to say, there are a lot of advantages in adopting similar type of dredger to GHD “R”, in view of the familiarity to the operation and maintenance of the staff and crew members of CFHC, the procurement of the material and parts, the periodical inspection, the compatibility and the operation and maintenance of the new dredger.

(2) Hopper Capacity

The estimated required dredging volume is about 7,400 m^3/Mon as mentioned in 2-1-2(2).
On this condition the hopper capacity is calculated as follows;

Loading percentage in the hopper = 80 % (The data of GHD "R" is 80 to 90%, 80% taken)
Dumping cycle = 2 times / day (as the data of GHD "R")
Operation days= 16 days/ Mon (as the data of GHD "R")

The required hopper capacity (HC m^3) is calculated as follows;
7,400 m^3/ Mon = HC m^3 x 0.8 x 2 cycle/ day x 16 days/ Mon
HC = 289 m^3 ----- Say 300 m^3

In case HC = 300 m^3, the dredging capability is calculated as follows:
DC = 300 m^3 x 0.8 x 2 cycles / day x 16 days/ Mon = 7,680 m^3/ Mon
In 2-1-2(1) the dredging capability is modeled to be 7,500 m^3/ Mon

Besides, in case of DC = 7,500 m^3/ Mon, the dredging capability during off- SW monsoon season (6 months) and the transition period (3 months) is calculated to be 63,000 m^3 as shown in Table 2-4.

(3) Grab Bucket Capacity

The garb bucket capacity (GC m^3) is calculated as follows;

Hopper capacity = 300 m^3
Loading percentage in the hopper = 80 %
Required time for dredging = 2.5 hr (The data of GHD "R" is 2.5 to 3 hr, 2.5 hr taken)
Cycle time of dredging by a grab bucket = 1.5 min (as the data of GHD "R")
300 m^3 x 0.8 = GC x 2.5 x 60 min/ 1,5 min
GC = 2.4 m^3 ------- 2.5 m^3 as standard

(4) Principal Dimensions

(Length)

The hopper capacity of the new dredger is 1.5 times of that of GHD "R".

In order to minimize the draft within the practicable range of the hull dimensions, the length is designed to be 48 m, which is 10 m longer than that of GHD "R", which will not cause any inconvenience to the operation of the new dredger in consideration with the scale of the harbors and the utilization of the new dredger. In addition, the length of the quay of Dikkovita where the new dredger will be moored is enough and the Colombo Dockyard where the new dredger will have the periodical inspection every two years has enough facilities for these size of the dredger.

(Breadth)

The breadth is increased by 1.5 m from GHD "R" and to be 11.5 m, in order to make the length of the hull within the reasonable range when the draft is minimized as shown below as well as to keep

the inclination and the stability at the same level as GHD “R” even lifting the grab bucket with dredged material total weight of which is about 1.5 times to that of GHD “R”.

The increase of the breadth in this range will not cause any inconvenience in the maneuverability of the new dredger since the ratio of length to breadth is nearly same as GHD “R”, and will not be any problem in the mooring place and the facilities of Colombo Dockyard.

(Draft)

Most of the designed draft of the fishery harbors dredged by the new dredger is 3.0 m to 3.5 m, which is the depth from the average water level, and in the harbors with large range of tide, the water depth is about 0.4 m less than the average at the lowest tide.

In case of the designed draft of 2.5 m requested by CFHC, in the harbors of the designed depth of 3.0m, the gap of the bottom of the hull and the sea bed is about 0.1 m (3.0m- 2.5m-0.4 m = 0.1m), where it is difficult to carry out dredging works at full load condition.

Therefore, the draft at the full load condition is designed to be 2.3 m and the dredging works can be done at the full load condition with paying attention to the water depth carefully.

Still now, there are some locations of water depth about 2.0 m due to the sedimentation where even GHD “R” of the designed draft of 2.0 m can not perform the dredging works at full load.

According to the information of the captain of GHD “R”, at the shallow area GHD “R” dredges from the deep position and goes ahead with making the access channel by itself.

The new dredger is designed on the same operation with GHD “R”.

(5) Hull Structure and Machinery / Equipment

In view of the operation of the new dredger at shallow water depth where the gap between the bottom of hull and the sea bed is so small that consideration shall be given so that the dredger can be kept even in its heel and trim as much as possible and has a hull form smoother the flow of water into the propellers.

As for the structure of the hull, consideration shall be given to such special structure as having large ratio of the breadth to the depth and having large openings at the bottom and to its robustness with particular attention to anti-corrosion measures for the outer shell of the bottom and the sides.

In selection of the manufacturers of machinery and equipment, due attention shall be given to the convenience of the maintenance and repair works, the compatibility to GHD “R,” and easy

procurement of the spare parts as far as without causing disadvantages in respect of the quality, delivery time and the price.

2-2-2-2 Decision of the Basic Specifications

(1) General and Hull Part

The Vessel shall be a grab hopper dredger with a hopper capacity of 300 m^3.

The Vessel shall be of steel construction, of single continuous deck and from forward provided with a fore peak tank, a crew's room, a mud hold (Hopper), fuel oil tanks, an engine room, fresh water tanks, water ballast tanks and a steering gear room under the upper deck.

The Vessel shall be of two (2) engines-two(2) shafts type, which consists of two (2) marine diesel engines in the engine room and two (2) fixed pitch propellers driven by the each engine through a shaft and a reduction gear and shall be provided with two (2) rudders.

The Vessel shall be provided with a grab crane on fore part of the upper deck and shall be able to dredge from 15m below the water level. The dredged soil stored in the hopper shall be dumped out into the sea through the bottom doors.

The superstructure, where accommodation space and wheelhouse are located, shall be provided aft part.

The Vessel shall be built in accordance with the regulations of Nippon Kaiji Kyokai (NK) under the inspection of NK.

The manufacturers' standard spare parts for two (2) years shall be provided for each machinery and equipment.

The Outline Designing Arrangement is shown in Fig 2-1

1) Classification

NK, NS*, MNS * Grab Hopper Dredger, Specified coastal service.

2) Principal Dimension

Length, o. a.	abt.	49.9 m
Length, b. p.		48.0 m
Breadth, mld		11.5 m
Depth, mld		3.4 m

Designed draught, mld 2.3 m

3) Speed

Service speed on fully loaded condition abt. 8.0 knots
at normal output of main engines

Trial speed on light condition Not less than 9.0 knots
at maximum output of main engines

4) Endurance

At navigations abt.1,400 nautical miles

5) Deadweight

Deadweight at the designed draught abt. 560 ton

6) Mud hold and Tank Capacity

Mud hold abt. 300 m^3
Fuel oil tank abt. 50 m^3
Fresh water ta abt. 20 m^3

7) Complement

Captain	:	1 person
Chief Engineer	:	1 person
Officer	:	1 person
Crew	:	15 persons
Total		18 persons

8) Public Space

Officer's Mess Room : 1
Galley/ Crew's Mess Room : 1
Wheelhouse : 1

9) Forward Windlass

Type : Electric or Electro- hydraulic driven with 2-gypsy wheels & 2-warping ends
Capacity : 4.2 ton x 9m/min.
No. of set : 1 set

10) Aft Windlass

Type : Electric or Electro-hydraulic driven with 2-gypsy wheels &

2-warping ends

Capacity : 3 ton x 9m/min.

No. of set : 1 set

11) Steering Gear

Type : Electro-hydraulically driven ram cylinder type

Capacity : 1.5 kw x 2 sets

No. of set : 1 set

12) Davit for Work Boat

Type : Electric driven hoisting winch

No. of set : 2 sets

13) Davit for Dinghy

Type : Electric driven hoisting winch

No. of set : 1 set

14) Davit for Anchor Handling

Type : Electric driven hoisting winch

No. of set : 1 set

15.) Air Conditioning System

Forward Package Unit

Application : Crew's cabin

No. of set : 1 set

Aft Package Unit

Application : Capt. cabin, Chief Engineer's cabin, Officer cabin, Officer's mess room, Crew's mess room, Wheelhouse

No. of set : 1 set

16) Work Boat

Type & Material : FRP, Length abt. 6 m, Engine 20 PS

No. of set : 1 set

17) Dinghy

Type & Material : FRP, Length abt. 4 m, Engine 10 PS Outboard engine

No. of set : 1 set

18) Life Saving Equipment

Type : Inflatable life raft for 10 persons (in container)

No. of set : 2 sets

19) Fire Fighting Equipment

Hydrant system : Accommodation, upper deck, engine room

Portable fire extinguisher : As per regulation

(2) Dredge Part

1) General

Type : Grab crane system

Max. dredging depth : 15 m below water level on light load condition

Hopper capacity : 300 m^3

Hopper design load : 480 ton (density of soil in hopper 1.6 t/ m^3)

2) Dredging Crane

Type : Diesel engine driven,
360 deg. slewing type jib crane

No. of set : 1 set

Length of Jib : about 20 m

Hoisting capacity : 11 ton

Hoisting speed (Max.) : not less than 70 m/min.

3) Grab Bucket

Type : Cram shell type

Capacity & No. of set : Light type 2.5 m^3 1 set

: Heavy type 1.0 m^3 1 set

4) Hopper Bottom Door

Type : Hinged type, chain drive with hydraulic cylinder

No. of set : 4 sets

5) Hydraulic Pump Unit for Bottom Door

Type : Variable volume piston pump

No. set : 1 set

(3) Machinery Part

The diesel engine plant of the Vessel consists of the following:

- Two (2) main diesel engines, each driving a fixed pitch propeller.

- Two (2) main generator diesel engines, each driving a main generator.

The propulsion system consists of twin fixed pitch propellers, each driven by a main diesel engine through a reversible reduction gear.

Marine diesel oil shall be used for all diesel engines.

1) Main Diesel Engine

Type	: 4 stroke cycle, single acting trunk piston type marine diesel engine
Maximum output	: 800 PS
No. of set	: 2 sets

2) Main Generator Engine

Type	: 4 stroke cycle, single acting, trunk piston type marine diesel engine
Maximum output	: 154 PS
No. of set	: 2 sets

3) Propeller

Type	: Fixed pitch type, Ni-Al-Bronze
No. of set	: 2 sets

4) Reduction Gear

Type	: Reversible reduction gear with clutch single input/single output
No. of set	: 2 sets

5) Auxiliary Machinery

Main cooling S.W. pump	2 sets
Bilge and ballast pump	1 set
Fire and general service pump	1 set
Stand-by F.W. cooling pump	1 set
Fresh water pump	2 sets
Sanitary water pump	1 set
Fuel oil transfer pump	1 set
L. O. transfer pump	1 set
Bilge pump	1 set
Sludge pump	1 set
Main air compressor	2 sets

Main air reservoir	2 sets
Oily waster separator	1 set
Sewage treatment unit	1 set
Engine room ventilation fan	2 sets
Grinder, boring machine, Vice	1 set
Electric welder	1 set

6) Automation and Remote Control

Starting and normal stopping of main engine shall be performed manually at machinery side and revolution control and reversing control shall be performed in the wheelhouse.

The followings shall be controlled automatically.

For main diesel engines

L.O. and F.W. temperature control

For main generator diesel engine

L.O. and F.W. temperature control

For other machinery

Start and stop of fuel oil transfer pump

Start and stop of main air compressor

Start and stop of fresh water pump and sanitary water pump

(4) Electric Part

1) Supply System

Power	AC 400V	50Hz	3 phase system
Lighting	AC 230V	50Hz	1 phase system
Communication	AC 230V	50Hz	1 phase system and/or DC24V
Navi./Radio equipment	AC 230V	50Hz	1 phase system and/or DC24V
Indicator, Gauge etc.	AC 230V	50Hz	1 phase system and/or DC24V

2) Electric Source

Main generator	AC 100 kw	2 sets
Main switchboard	Dead Front Type	1 set
Transformer	3 phase 400/230V	1 set
Storage battery	24V, Lead acid type	1 set

3) Lighting

Accommodation space	Fluorescent lamp in general
Machinery space	Fluorescent lamp in general
Deck	400W mercury floodlight

Search light	500W	incandescent

4) Communication Equipment

Telephone system (8 units)	1 set
Public addresser	1 set
General alarm and fire alarm system	1 set

5) Navigation Equipment

Steering control	1 set
Magnetic compass	1 set
Echo sounder	1 set
DGPS	1 set
Wind speed and wind direction indicator	1 set
Window wiper	1 set

6) Radio Equipment

SSB (MF/HF) radio telephone	1 set
VHF radio telephone	1 set
Emergency radio beacon (EPIRB)	1 set
Broad casting radio receiver	1 set

7) Precise Echo Sounder

Type : Portable precise echo sounder with DGPS

No. of set : 1 set

(5) Miscellaneous

In the site survey in Sri Lanka, through the hearing and discussions with the engineers of CFHC and the captain of GHD "R" on the situation and the operation of GHD "R", CFHC newly requested the following items about the alteration from the specifications of GHD "R" which are incorporated in the design of the new dredger after being investigated by the Team in Japan.

- The type of ladders to be altered from hunger type to shoe piece type
- Each side void space to be separate into two (2) compartment
- Air conditioning system to be provided to the accommodation space
- Indicator panel for bottom doors to be provided in wheelhouse

2-2-3 Outline Designing Drawing

The Outline Designing Drawing is shown in Fig 2-1.

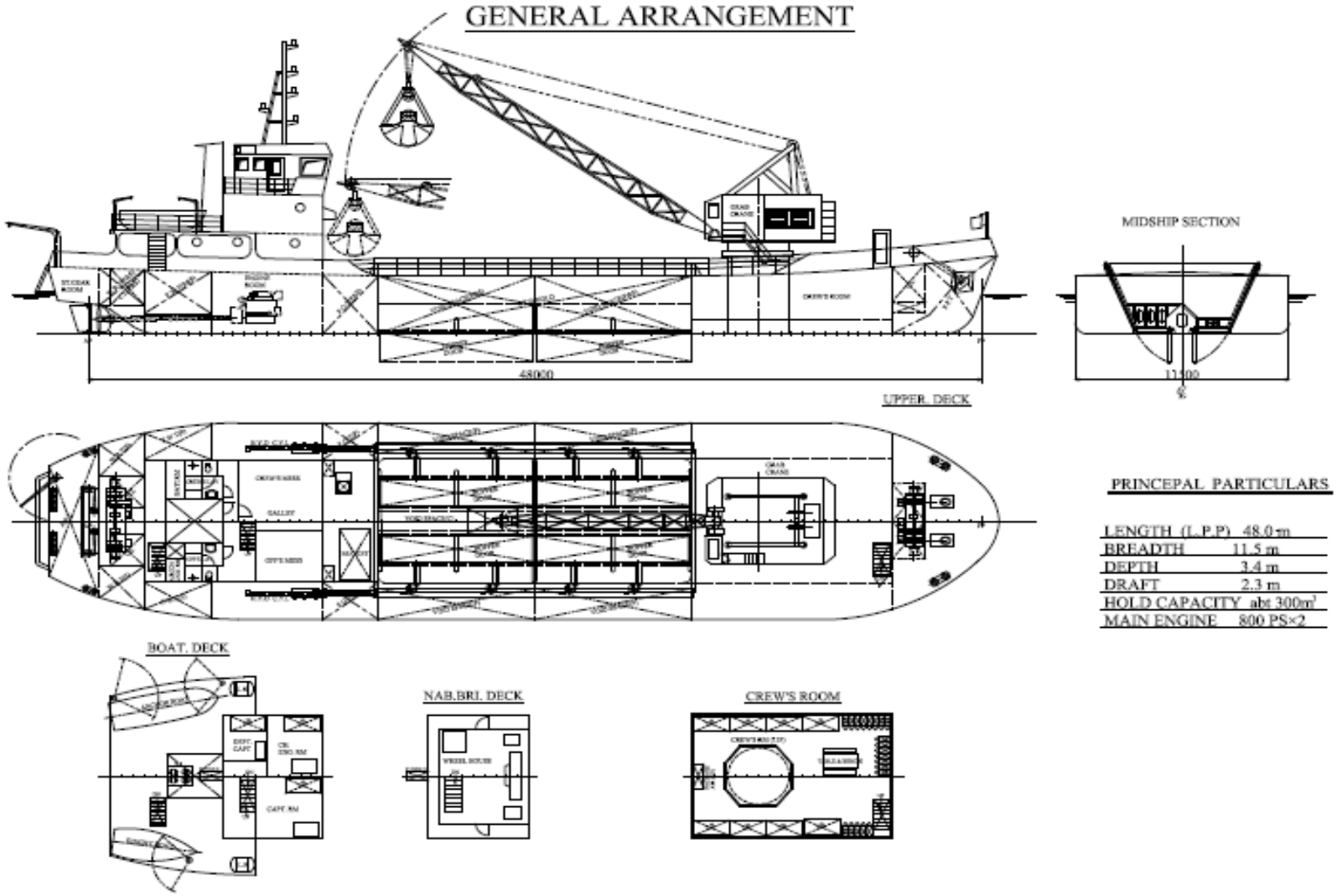


Fig 2-1 Outline Designing Drawing

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

After conclusion of the Exchange of Notes for the Project, the Government of Sri Lanka and the selected consultant shall develop the detailed design of the new dredger based on the concept of basic design and invite qualified shipbuilders for bidding the construction of the new dredger,.

As the new dredger is a self-propelled dredger which has such special structure and hull form as having large openings and doors at the bottom and two (2) main engines and two (2) rudders of shallow draft type with wide breadth, the remarkable engineering and techniques are required not only for its design but also for the construction works.

To construct the dredger, the strict quality control and construction schedule control are essential. To meet with these requirements, the construction of the dredger should be planned to do at one of the Japanese shipbuilding companies, who has technique and experience in building and repairing of similar type of vessels and also has enough engineering capability.

The selected shipbuilder by the tender shall enter into the shipbuilding contract, and carry out construction works under the inspection and supervision of the classification society and consultant. And also the shipbuilder shall arrange instruction and training program for crew at the shipyard and manufacturers to become proficient in handling the machinery and equipment installed on the vessel during construction works.

After completion of the construction of the dredger, the shipbuilder shall transport her at his expense and risk to Sri Lanka, and handover to the Government of Sri Lanka after the confirmation of her function is appropriate.

2-2-4-2 Implementation Conditions

In implementation of the Project, the following attention should be paid.

(1) Quality Control

The new dredger shall be designed and constructed in accordance with the rules of NK under the inspection and survey of NK and shall be obtained approval of NK.

The Consultant shall have close contact with the shipbuilder to make sure the construction schedule and inspection procedures, and shall visit the shipyard to attend and/or supervise the tests of material and equipment, as necessary.

(2) Schedule Control

As mentioned before, the new dredger is a self-propelled dredger with large openings at the bottom and with 2 main engines/ 2 propellers/ 2 rudders and equipped with a dredging crane and special machinery and equipment such as for the operation of bottom doors.

The new dredger shall be built according to the schedule as shown in the Table2-10 Implementation Schedule, and as there is the equipment which needs long time before delivery due to the situation of the market, not only construction schedule but the procurement schedule shall be thoroughly checked to make sure the schedule control.

2-2-4-3 Scope of works

When the Project will be executed in Japan's Grant Aid program, the scope of works of Sri Lanka and Japan shall be as follows.

(1) Scope of works shared by Japan

1) To carry out the consulting services from the detailed design of the new dredger, assistance of tendering works, and supervision of the construction works of the new dredger at the shipyard.
2) To undertake construction of the new dredger, procurement of material, machinery, equipment and spare parts, and required tests and trial in Japan.
3) To assist training of crew for operation technique of the new dredger and for handling the machinery and equipment.
4) To transport the new dredger to Colombo Port after completion.

(2) Scope of works shared by Sri Lanka

1) To obtain the provisional nationality certificate and necessary documents for the transportation of the new dredger from Japan to Sri Lanka.
2) To perform the custom clearance, tax and port charges exemption and registration of the new dredger.
3) To provide appropriate berthing/ mooring space for the new dredger.
4) To carry out the domestic transportation of the new dredger from the hand over point to the designated birthing / mooring area

5) To perform the necessary formalities in case the new dredger being registered in the Classification Society in Sri Lanka.
6) To bear all the expenses for the operation and maintenance costs for the new dredger in addition to those for the existing dredgers of CFHC.

In case the expenses are needed during the procedure of recipient country, those shall be borne by them.

2-2-4-4 Consultant Supervision

To assist the Implementation Agency, a Japanese consultant will execute consistent consulting services from detailed design until delivery of the new dredger, including provision of tendering works, conclusion of the building contract, check and approval of key drawings, and supervision and inspection of the construction works.

During the construction of the new dredger, the consultant, with their experts for construction and outfitting of hull part, outfitting of machinery and dredging parts, will carry out supervision, including attendance to tests and trials and give instruction, advice and recommendation as necessary in consideration of the schedule of construction works.

Furthermore, the guidance and advice on the method of operation of the new dredger will be given at the time of delivery.

In addition, one (1) year after the delivery, the consultant will carry out the inspection on the defects of the new dredger.

2-2-4-5 Quality Control Plan

(1) Schedule Control

Periodical tracing activity will be carried out without delay, in accordance with the construction schedule arranged separately. Actual results of the work and delivery of the equipment delivered from respective manufacturers shall be controlled in comparison with planned schedule and delivery time result.

Close communications with the shipyard will be essential to take the necessary measures to meet the situation, such the case that some unforeseen accidents would happen.

(2) Quality Control

Inspections, not only at the shipyard but at the each manufacturer workshop, are important to maintain the sufficient quality level, in order to meet the rules and regulations of the registered government and the classification society. Therefore, the consultants will take the necessary action of inspection, depending on the case.

2-2-4-6 Procurement Plan

In accordance with the scheme of the Japan Grant Aid, the new dredger shall be procured from Japan or the recipient country (Sri Lanka).

In the site survey, the Team investigated the shipyard in Sri Lanka and found the only yard that can build this scale of steel vessels is Colombo Dockyard. The shipyard, however, has no experience to design and build such vessels as required high technology for bottom doors with the operation system and there remains uncertainty in the technical capability. In addition, the all equipment and material such as steel, pipes, cables, paint are imported and only works done by the dockyard is the construction of hulls, and there remains uncertainty in the schedule and the quality control. Furthermore, as CFHC satisfies the quality of GHD “R”, and requested strongly the new dredger made in Japan, the new dredger is planned to be procured from the shipbuilder having the experience to build the similar vessel as GHD “R”.

As for the equipment and machinery installed on the new dredger, CFHC still requested strongly those made in Japan as the experience of GHD “R” in view of the high quality, easy maintenance and the compatibility of GHD “R”.

Considering the new dredger will be built in Japan, Japanese material, machinery and equipment shall be adopted as much as possible in general as far as without causing any inconvenience to enjoy economical advantages, and also to actualize merits easily on negotiation with manufacturers, assurance of delivery time, attendance to tests at factories, education and training of crew at factories, etc.

2-2-4-7 Operation Guidance Plan

Since the new dredger is much larger than GHD “R” and the machinery and equipment have been modernized and different from those of 23 years ago, the familiarization training on the operation of the new dredger, the machinery and equipment will be carried out for the main crew members of the new dredger in the shipyard or the manufacturers. (four (4) persons for about two (2) weeks)

2-2-4-8 Soft Component

The soft component is not included in the Project, since it is not requested by the Sri Lanka side regarding the operation of the new dredger, dredging works, maintenance works, etc. on which CFHC have the abundant experience through the operation of GHD “R” of similar type of the new dredger.

2-2-4-9 Implementation Schedule

Detailed design work for the new dredger will be completed in about 3 months, and after that the shipbuilding contract will be signed within about 2.5 months. About 15 months will be required for the construction, and further about 1.5 months will be necessary for transportation from Japan to Colombo Port in Sri Lanka and its delivery.

According to the strong request of the Government of Sri Lanka, the Japan side will make the best effort to minimize the construction period based on the effective implementation planning.

The implementation schedule is shown in Table 2-10.

Table 2-10 Implementation Schedule

Month from Consultant Agrt.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Detail Design	Confirmation of Spec, in Sri Lanka																		
	Detailed Design																		
	Preparing Spec. /DWG Approval																		
Tender/ Contract	Annaunsment of Tender				△														
	Delivery of TenderDocu.				△														
	Bid					△													
	Evaluation, Discuss. And Contract																		

Months from Building Contract		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Const, Super-vision	Designing Making Drawing																		
	Purchasing Machinery And Equipment																		
	Purchasing Steel for Hull				△														
	NC Nesting																		
	NC Cut																		
	Building Block																		
	Hull Construction																		
	Main Engine, Aux. Mach. and Equipment Fitting																		
	Launching												△						
	Fitting Works at Pier																		
	Sea Trial/ Completion at Shipyard																△		
	Transportation																		
	Delivery / Acceptance																	△	

2-3. Obligations of Recipient Country

Following are the items as “the major undertakings to be taken by the recipient country” which were confirmed in writing between both countries.

1) To obtain the provisional nationality certificate and necessary documents for the transportation of the new dredger from Japan to Sri Lanka.

2) To perform the custom clearance, tax and port charges exemption and registration of the new dredger.

3) To provide appropriate berthing/ mooring space for the new dredger.

4) To carry out the domestic transportation of the new dredger from the hand over point to the designated birthing / mooring area

5) To perform the necessary formalities in case the new dredger being registered in the Classification Society in Sri Lanka.

6) To bear all the expenses for the operation and maintenance costs for the new dredger in addition to those for the existing dredgers of CFHC.

7) To bear the following commissions to the Japanese bank for banking services based upon the Banking Arrangement (B/A)
   - Advising commission of Authorization to Pay (A/P)
   - Payment commission

In case the expenses are needed during the procedure of the recipient country, those shall be borne by them.

2-4. Project Operation Plan

2-4-1 Operation Plan

CFHC shall undertake the operation, maintenance and repair work of the new dredger.

1) Daily operation and maintenance work

The operation and maintenance are undertaken in the engineering service division of total staff of about 70. The daily operation and maintenance of each dredger is carried out by the crew of each dredger and the number of the crew is 18 persons for GHD “R”, 16 persons for CSD “W” and 6

persons for each CSD “”S” and CSD “N” total 46 persons and by the staff of the work shop if necessary. The operation and maintenance of the new dredger will be carried out in this organization, the staffs, however, shall be increased as shown in (4) below.

2) Periodical maintenance

The routine maintenance work is carried out at the workshop located in Beruwala every six (6) months. The facilities and staffs of the workshop are shown in 4-2(2).

3) Periodical inspection and repair

GHD “R” is scheduled to be in the dry docking every two(2) years for the periodical inspection by the inspector of NK and for repair works. The new dredger will be followed this.

4) Recruit of the Crew

At the stage of decision of the Grant, CFHC will recruit new staffs from the university and the market. In Colombo there is National Institute of Nautical Science (once controlled in MFARD) from where 50 to 60 students are graduated every year. For the recruit from the market the advertisement is published in the newspaper and the crane operators are sometimes recruited from the factories .

2-4-2 Maintenance and Repair Facility

1) Mooring quay

GHD “R” is moored at the quay of Beruwala Fishery Harbor as its mother port when there is no dredging work. There are facilities for supplying fuel oil, fresh water and electricity to the vessels near the quay, where is suitable location for berthing and mooring of GHD “R”.

CSD “W” is moored at the quay of Kirinda Fishery Harbor or engaged in the dredging works in the harbor. There are facilities for supplying fuel oil, fresh water and electricity at the quay, where is appropriate location for berthing of CSD “W”.

CSD “N” and CSD “S” are of small portable type and can be transported after being disassembled on land and can be moored at the quay of the harbor dredged or moored in the harbor or stored on land.

The berthing/ mooring place for the new dredger will be the part of 360 m quay of Dikkovita Fishery Harbor which was operational on 18th January, 2013 , where there are facilities for supplying fuel oil, fresh water and electricity. Dikkovita is located near Colombo where the parts and equipment can be obtained easily and appropriate place for mooring the new dredger in view of the convenience for the operation and maintenance .

2) Maintenance shop

There is the workshop of CFHC in Beruwala. The factory, office and ware house are arranged in the house of about 500 m^2. In the factory, there are four (4) electric welders, one (1) lathe, one (1) cutter, three (3) grinders and one (1) vice and in the warehouse, there are various material and parts for repair works.

Heavy articles are transported by the truck cranes parking inside the house, (one supplied in Japan Grant Aid, one supplied from China) The replacement work of the bearing of dredging crane of GHD "R" was carried out by CFHC here.

The number of staffs is 17 persons in total including engineer, foremen, three (3) welders, two (2) painters, three (3) assistants, staff of warehouse and office.

It is considered that the maintenance works including small repair works can be carried out by CFHC themselves in this workshop.

3) Colombo Dockyard

The Team investigated Colombo Dockyard where the dredgers of CFHC are in dry docking for the periodical inspection and repair works. There are three (3) docks for repair works (122m x 16 m / 213m x 26m / 263m x 44m) and one (1) dock for new building (107m x 18,5m) and the new building works of conventional vessels and work vessels and repair works are performed positively. GHD "R" has been in dry docking every two (2) years and total for ten (10) times so far.

Although all the material, parts and equipment should be imported, there are enough stocks in the warehouse and the urgent articles can be obtained from Singapore.

The Team understood that the facilities, technical staffs and man power of Colombo Dockyard are enough for the repair and maintenance of the new dredger.

2-5. Project Cost Estimation

2-5-1 Initial Cost Estimation

(1) Project costs undertaken by the recipient country

The project cost to be borne by Sri Lankan side is roughly estimated as follows:

1) Transportation cost of the new dredger from Colombo Port to the mooring site (Dikkovita) about Rp. 0.04 million

2) Commission of banking services about Rp. 1.23 million

Total about Rp. 1.27 million

In case the expenses other than the above are needed during the procedure of the recipient country, those shall be borne by them.

2-5-2 Operation and Maintenance Cost

The expenses of CFHC for the operation and maintenance works are covered by the budget of MFARD and the income earned by CFHC themselves with the tariff of fishery harbors, selling fuel oil and fresh water to the fishermen, etc. The necessary cost is always secured.

When the survey on board the GHD ”R” were carried out, the maintenance and adjustment work were considered well performed for the dredging crane, propulsion engines, electric generators and miscellaneous pumps, etc. of such the old dredger as 23 year old. Generally, it can be understood that maintenance works on dredger operation are executed without any difficulties.

It is understood for the operation and maintenance works of the new dredger to be performed in the same manner as those of GHD “R”.

Based on the actual data of operation hours of GHD “R” and the fuel oil consumption of new diesel engines, the additional annual budget on top of the current budget is estimated about Rs, 32 million, which is such small amount as about 6% in the total budget Rp. 559 million of CFHC and it has been confirmed that those necessary costs shall be secured after the new dredger is engaged in the dredging works.

CFHC, however, shall perform the effective operation and maintenance of the new dredger in order to minimize the operation and maintenance costs.

The annual operation and maintenance cost is estimated as shown on Table 2-11 and Table 2-12.

Table 2-11 Estimated Annual Operation and Maintenance Cost for The New Dredger (Rs. million)

Items		Operation & Maintenance Cost	Remarks
Operation	(1) Fuel cost	17.7	Estimated based on the data shown in Table2-12
	(2) Lubrication	1.4	8% of Fuel cost
	Operation Cost	19.1	
Maintenance	(1) Wage and salaries）	5.1	For 18 persons same as GHD"R"
	(2) Dry docking	6.2	Estimated based on data of GHD "R" modified according to the age
	(3)Spare parts/Repair	2.0	Estimated based on data of GHD "R" modified according to the age
	Maintenance cost	13.3	
Operation and Maintenance Costs		32.4	

Table 2-12 Base Data for Estimation of Operation & Maintenance Cost

Items		Main Engine	Generator Engine
(A) Horse Power		1,600 PS(800x2)	308 PS(154x2)
(B) Fuel consumption (per PS/Hour)		0.175 L	0.194 L
(C) Load on engine	Dredging	0 %	50 %
	Navigation/ Dumping	60 %	50 %
	Navigation for shifting	85 %	50 %
(D) Operation hour	Dredging	4.0 H/ cycle	
	Navigation/ Dumping	1.5 H/ cycle	
	Navigation for shifting	54.0 H(800km—8.0knots) per year	
(E) Cycle (Dredging/Navigation/Dumping)		2 times / day	
(F) Operation day		16 days / month	
(G) Operation month		10.5 month/year	
(H) Price of fuel oil		115 Rs. / L	

Chapter 3 Project Evaluation

3-1 Preconditions

- The maintenance dredging works by the existing dredgers of CFHC to be continued in the same manner as being carried out so far.
- The proper operation and maintenance for the new dredger to be secured by CFHC.

3-2 Necessary Inputs by Recipient Country

- Complement for the new dredger
  - Eighteen (18) complements including two (2) crane operators to be secured.
- Facilities
  - The mooring facility for the new dredger to be secured (Dikkovita Fishery Harbour)
  - The facility for repair and maintenance of the new dredger to be secured(Work shop in Beruwala)
- Operation and maintenance cost
  - The annual operation and maintenance cost of about Rs.32 million to be secured for the new dredger

3-3 Important Assumptions

- The political situation and security conditions in Sri Lanka and neighbor countries not to become worth
- Unexpected natural disaster not to occur.
- The development, control and maintenance of the fishery harbors in Sri Lanka not to be changed.

3-4 Project Evaluation

3-4-1 Relevance

Implementation of this project with Japan grant aid is considered relevant from the view points as follows.

(1) Implementation of the project will promote the productivity and profitability of fishery activities in the fishery villages where are a lot of poor people and will contribute alleviation of poverty stated in the National Development Plan in Sri Lanka and benefit the stability of the socio-economic situation.

(2) The implementation Agency (CFHC) has had the similar grab hopper dredger “R” and operated well so far and there is no problem for them to carry out the proper operation and maintenance of the new dredger.

(3) The required depth of the fishery harbors will be maintained to secure the smooth operation and safe anchorage for the fishery boats in the harbors, which will lead to the promotion of productivity and profitability of fishery industry

(4) Since there is little environmental and social problems in conducting the dredging works and the project is treated as Category :C

(5) Since the new dredger will be built in Japanese shipyard in the Japan Grant Aid Scheme, there is no particular difficulty in implementation of the project.

Furthermore, in the assistant plan of Japan for each country, " Assistance for the improvement of capability for earning the foreign currency." is indicated for Sri Lanka. Since this project aims to increase the fish catch and to promote the export through maintenance dredging for the fishery harbors, it will fit the assistant policy of our country.

3-4-2 Effectiveness

(1) Quantitative Effectiveness

Index	Base Line （Result in 2011）	Target(2018)（3 years after completion of the Project）
Prevention of the accidents due to the sedimentation of in the fishery harbors area	Annual number of accidents：144 Registered Boats ：4,280 Annual number per boat ：0.03	Annual number of accidents per boat: About 0.03 or less

(2) Qualitative Effectiveness

To contribute to the improvement of productivity and profitability of fishery industry through maintaining the required water depth to secure the smooth operation and safe anchorage for the fishing boats in the fishery harbors.

As mentioned above, it is considered that the implementation of this project has high relevance and effectiveness to be expected.

Appendix 1　Member List of the Survey Team

(1) Preparatory Survey Team

Leader	ONO Tomohiro	Deputy Director Transportation and ICT Division 1 Transportation and ICT Group Economic Infrastructure Department Japan International Cooperation Agency
Project Coordinator	ARAKI Yutaka	Transportation and ICT Division 1 Transportation and ICT Group Economic Infrastructure Department Japan International Cooperation Agency
Chief Consultant/Operation and Maintenance Planner	TOMOI Takehito	Shipbuilding Research Centre of Japan
Dredging Planner	SAKURAI Shinji	Dram Engineering Co. Ltd
Hull Designer	ISHII Tetsuro	Shipbuilding Research Centre of Japan
Outfitting/ Dredging Equipment Designer	FUJI Yasuhiro	Shipbuilding Research Centre of Japan
Shipbuilding Plan/ Cost Estimator	YAMADA Michimasa	Shipbuilding Research Centre of Japan

(2) Draft Report Explanation Team

Leader	AO Harumi	Chief Representative Sri Lanka Office Japan International Cooperation Agency
Project Coordinator	ARAKI Yutaka	Transportation and ICT Division 1 Transportation and ICT Group Economic Infrastructure Department Japan International Cooperation Agency
Chief Consultant/Operation and Maintenance Planner	TOMOI Takehito	Shipbuilding Research Centre of Japan
Hull Designer	ISHII Tetsuro	Shipbuilding Research Centre of Japan

Appendix 2　Survey Schedule

(1) Preparatory Survey

Day	Date		Survey Activities
1	6/27	Wed	Lv. Narita　Ar. Colombo (Consultant)
2	6/28	Thu	Meeting with JICA Sri Lanka Office　Discussion with CFHC（ Schedule, Questionnaire）
3	6/29	Fri	Discussion with CFHC(Questionnaire）(Consultant)
4	6/30	Sat	Preparation for the site survey, Internal meeting
5	7/ 1	Sun	Ditto
6	7/ 2	Mon	Site survey at Beruwala FH / Panadra FH (Consultant)
7	7/ 3	Tue	Internal meeting
8	7/ 4	Wed	Lv. Narita　Ar. Colombo（JICA Ono・Araki) Site survey at MutuwalFH/ Dikkovita FH/ Negombo FH（Consultant）
9	7/ 5	Thu	Meeting with ERD, MFARD, ADB（Ono, Araki, Tomoi, Sakurai）
10	7/ 6	Fri	Discussion with CFHC（Inception report, Questionnnaire）（Ono, Araki, Consultant）
11	7/ 7	Sat	Site survey at Kirinda FH（Ono, Araki, Tomoi, Sakurai）
12	7/ 8	Sun	Internal meeting
13	7/ 9	Mon	Discussion with MFARD, MFP（Ono, Araki, Tomoi, Sakurai） Discussion with CFHC（Consultant）
14	7/10	Tue	Discussion with CFHC（Consultant） Site survey at Beruwala FH（JICA, Tomoi, Sakurai）
15	7/11	Wed	Signing MOD at MFARD(JICA/CFHC) Discussion with NARA,CCD,CFHC（Consultant）
16	7/12	Thu	Site survey at Chilaw FH（here after Consultant only）(JICA Lv. Colombo)
17	7/13	Fri	Site survey at Kalpitiya FH
18	7/14	Sat	Making the report
19	7/15	Sun	Moving to Colombo
20	7/16	Mon	Discussion with CFHC　Visiting Neil Marine
21	7/17	Tue	Discussion with MEPA, CEA
22	7/18	Wed	Site survey at Cod Bay FH
23	7/19	Thu	Site survey at Valachchinai FH
24	7/20	Fri	Site survey at Oluvil FH
25	7/21	Sat	Moving
26	7/22	Sun	Internal meeting　Moving

27	7/23	Mon	Discussion with CFHC　Moving
28	7/24	Tue	Site survey at Kirinda FH/ Hambantota/ Tangalle
29	7/25	Wed	Site survey Kudawella FH/ Nilwalla FH/ Purunawella FH/ Mirissa FH
30	7/26	Thu	Site survey Galle FH/ Hikkaduwa FH/ Ambalangoda FH Survey on GHD “R” at Beruwala
31	7/27	Fri	Visiting Colombo Dockyard　Visiting Meteorological Agency
32	7/28	Sat	Preparation of report
33	7/29	Sun	Preparation of Technical MOD
34	7/30	Mon	Discussion with CFHC and Signing MOD　Reporting JICA Office
35	7/31	Tue	Lv. Colombo　Ar. Narita

(2) Draft Report Explanation

Day	Date		Survey Activities
1	12/ 9	Sun	Lv. Narita　Ar. Colombo (Consultant)
2	12/10	Mon	Meeting with JICA Sri Lanka Office JICA Discussion with ERD（Explanation of Draft Report） Discussion with CFHC（Explanation of Draft Report ）
3	12/11	Tue	Discussion with CFHC（Specifications ） Discussion with MFARD（Draft Report ）
4	12/12	Wed	Discussion with CFHC（Specifications/ ERD comment） Site survey on GHD “R” (Dredging work)　（Dikkovita FH）
5	12/13	Thu	Discussion with CFHC Meeting with JICA Sri Lanka Office
6	12/14	Fri	Discussion with ERD Reporting to Embassy of Japan
7	12/15	Sat	Lv. Narita　Ar. Colombo (Consultant)

Appendix 3　List of Parties Concerned in the Recipient Country

1. Department of External Resources,　Ministry of Finance and Planning

MPUDK Mapa Pathiran	Director General
DLU Peris	Director

2. Department of National Planning, Ministry of Finance and Planning

Malini Gamage	Director General

3. Ministry of Fisheries and Aquatic Resources Development (MFARD)

Damitha de Zoysa	Secretary
Indra Renasinghe	Director General (Technical)

4. Asian Development Bank

Sarath Mathugala	Procurement Specialist
Amila Salgado	Portfolio Management Officer

5. CEYLON FISHERY HARBOURS CORPORATION (CFHC)

CFHC（Head Quarter）

Upali Liyanage	Chairman
Lal Samarasinghe	Managing Director
G.G.P.Abeysekara	General Manager
Sumith　De　Silva	Manager (Engineering Service)
Sasanka Nuwan Jayasinghe	Manager Harbour Operation
Theja Wadaarachchi	Civil Engineering Manager
Athula Amarasinghe	Marine Engineer
Rasika Wiiewardane	Marine Engineer
Vdayu Parsecl	Network Administrator

Beruwala Office

Sudath　Dissnayale	Harbor Manager
Dhannapola	Marine Engineer
Dayananda	Chief of Fisherman Cooporation
Tissa	Treasurer
Sajith	Vice Mayor, Beruwala Municipal

Panadura Office

Sumudu Dahanayake	Harbor Manager

Mutuwal Office

M.B.J.S.Pemananda	Senior Harbor Manager

Dikkovita Office

Sasanka Nuwan Jayasinghe	Manager, Harbor Operation

Negonbo Office

Samantha Wass	Harbor Manager

Chilaw Office

Pasindu	Harbor Manager
K.S.Wiclram Scigb	Dredging Cordinator

Kalpitiya Office

Jayasouriya	Deputy Harbor Manager
K,L,B,Layton	Chairman of Kalpitiya MDB Society

Cod Bay Office

Heshada Saneewa	Deputy Harbor Manager
Majeedhan Ralikhan	Jetty Supervisor
Chaminda Ruwan Kuwara	Committee member of Fishery Association

Valaichchenai Office

S.S.Hettige	Harbor Manager
M.S.Imriyas	Committee member of Fishery Association

Oluvil Office(Construction)

Karanaratna	Resident Engineer
M.T.a.Fowmy	Project Engineer

Kirinda Office

Nandani Rajapakshe	Harbor Manager

Hambantota Office

P. Panchihewa	Harbor Manager

Tangalla Office

Indalar Sargeew	Civil Supervisor
Barath Chauminda Rubasinghe	Jetty Supervisor

Kudawalla Office

P.Punchihewa	Harbor Manager
Edward Erarga Dayamal	

Nilwella Office

Mithila Witharanage	Harbor Manager

Purawawella Office

M.K.Sunil Shantha	Harbor Manager

Mirissa Office

J.P.Ananda	Harbor Manager
B.H.Sanjaya Deshapriya	Deputy Harbor Manager

Galle Office

P.B.Gamini	Fishing Society Chairman

Hikkaduwa Office

Nishan Madawa	Deputy Harbor Manager

Ambalangoda Office

P. M. A. Niroshan	Harbor Manager

6. National Aquatic Resources Research & Development Agency (NARA)

Dr K.Arul	
S.A.M.Azmy	Head, Environments Studies Division
Prabath Jayasinghe	Marine Biologist

7. Coast Conservation Department (CCD)

Bandula Wickramaarachchi	
R.A.S.Ranawaka	

8. Marine Environment Protection Authority (MEPA)

S.R. Samaratunga	General Manager

9. Central Environmental Authority (CEA)

Mrs Jeewa Warmakulasuri	Deputy Director
Mrs Driyangani Gumathilake	Deputy Director

10.Colombo Dockyard PLC

A.Nakauti	Chairman
Y.Kijima	Director
K.Nayakarathna	General Manager(Commercial)
M.Prince Lye	Head of Marketing,New Building
D.Chandrasekera	Head of Marketing,Ship Repeirs

11. Neil Marine (Shipyard)

Kapila Sumanapala	Director Administration

APPENDIX 4(1)

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY
ON PROCUREMENT OF A SELF PROPELLED GRAB HOPPER DREDGER

In response to a request from the Government of the Democratic Socialist Republic of Sri Lanka (hereinafter referred to as "GoSL"), the Government of Japan decided to conduct a Preparatory Survey on Procurement of a Self Propelled Grab Hopper Dredger (hereinafter referred to as "the Project"). In accordance with the decision, Japan International Cooperation Agency (hereinafter referred to as "JICA") decided to commence the survey.

JICA sent to Sri Lanka the Preparatory Survey Team for the Field Survey (hereinafter referred to as "the Team"), which is headed by Mr. Tomohiro Ono, Deputy Director, Economic Infrastructure Department, JICA, and is scheduled to stay in the country from July 4th to July 31th, 2012.

The Team held discussions with the officials concerned of GoSL and conducted a field survey at the Project site.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Preparatory Survey Report.

Colombo, Sri Lanka, July 11, 2012

Tomohiro Ono
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Dr. Damitha de Zoysa
Secretary
Ministry of Fisheries and Aquatic Resources Development
Sri Lanka

M P D U K Mapa Pathirana
Director General
Department of External Resources
Ministry of Finance and Planning
Sri Lanka

Upali Liyanage
Chairman
Ceylon Fishery Harbours Corporation
Ministry of Fisheries and Aquatic Resources Development
Sri Lanka

ATTACHMENT

1. Objective of the Project

The objective of the Project is to construct a dredger(s) to recover the function of domestic fishery harbors, which enables smooth entry and departure of fishing crafts.

2. Project Site

The site is shown in Annex-1.

3. Responsible and Implementing Organizations

The responsible ministry is the Ministry of Fisheries and Aquatic Resources Development (MFARD).

The implementing organization is Ceylon Fishery Harbours Corporation (CFHC).

The organization charts are shown in Annex-2 and 3 respectively.

4. Items requested by GoSL

After discussions with the Team, both sides confirmed the items below.

4-1. The original request from GoSL was to build a Self propelled Grab Hopper Dredger.

4-2. JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.

4-3. Both sides agreed that the name of the project should be changed to "Provision of a dredger" from "Procurement of a Self Propelled Grab Hopper Dredger" due to the reason that type of a dredger should be determined based on the result of the survey.

5. Japan's Grant Aid Scheme

5-1. GoSL understands the Japan's Grant Aid Scheme and necessary measures to be taken by GoSL. The Team explained the procedures for the Project described in Annex-4 and 5.

5-2. GoSL will take the necessary measures, as described in Annex-6 for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented. Necessary measures specially for the project are as follows.

- Necessary formalities in case the dredger being registered in the Classification Society in Sri Lanka
- Performance of custom clearance, tax and port charge exemption measures, registration of the dredger
- Provision of appropriate berthing/mooring space for the dredger
- Domestic transportation of the dredger from unloading (handing over) point to designated berthing/mooring area

6. Schedule of the Survey

6-1. The Team will proceed with further studies in Sri Lanka until July 31st, 2012.

6-2. JICA will prepare the draft report and the draft specification in English and dispatch a mission in order to explain their contents around December, 2012.

6-3. If the contents of the report are accepted in principle by GoSL, JICA will complete the final report and send it to GoSL by February, 2013.

7. Other Relevant Issues

7-1. Both sides confirmed that it is essential that GoSL will undertake periodical maintenance for the procured dredger(s). GoSL recognized the importance of the operation and maintenance and made a commitment to provide funds under their budget including the required personnel.

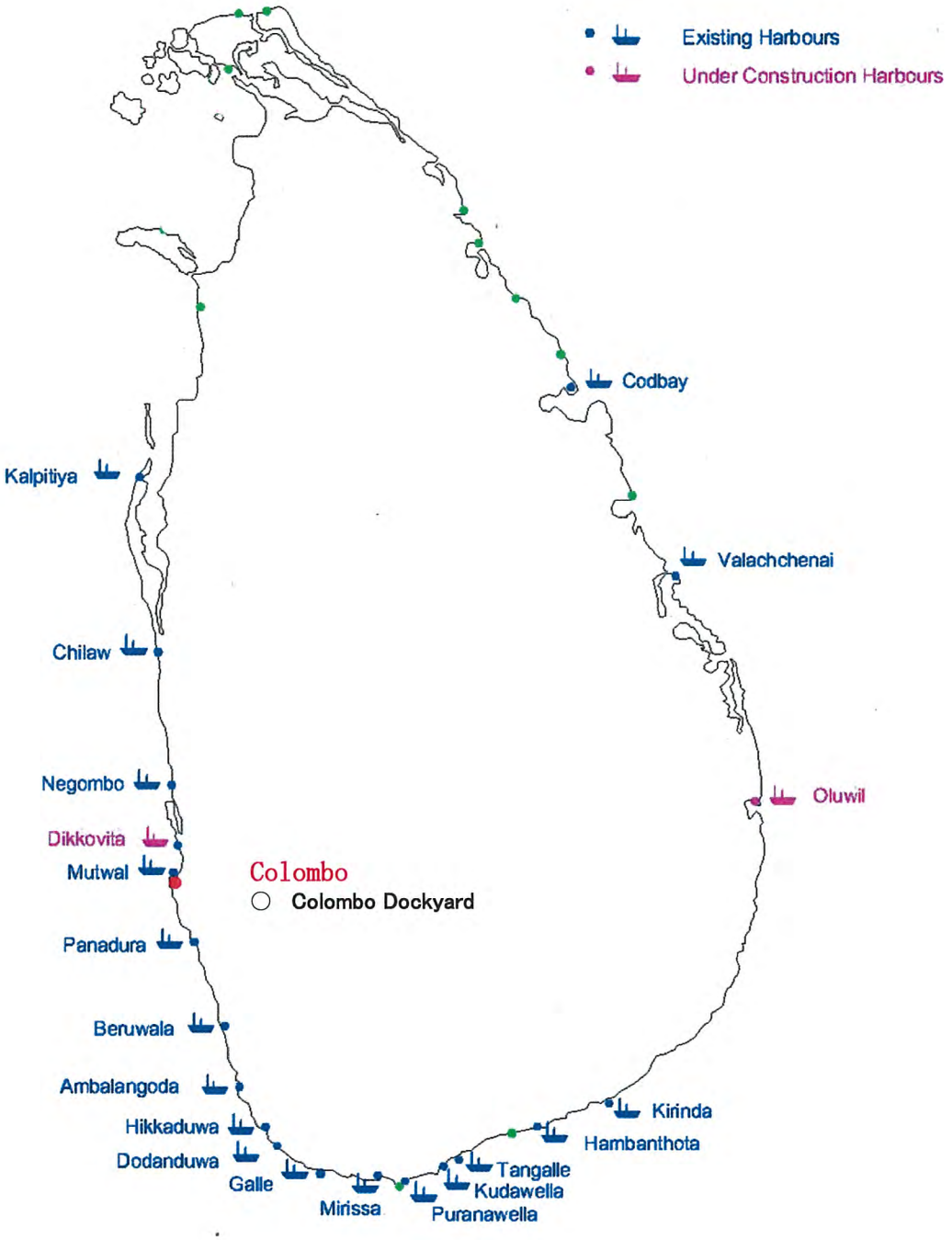
7-2. In addition to the necessary measures mentioned in 5.2, JICA requested GoSL the following cooperation for the smoothly conducting of the survey.

- Provision of necessary data for the survey
- Replying to the questionnaire
- Arrangement of meeting with administrator of fishery harbors and of site survey of fishery harbors
- Arrangement of meeting with fishery harbor users
- Arrangement of CFHC staffs' attendance on the team travelling to fishery harbors
- Approval of taking photo necessary for the project report
- Securing the safety of the survey team during their survey in the country
- Approval of bringing back relevant documents to Japan

Annex-1 Project Site
Annex-2 Organization Chart (MFARD)
Annex-3 Organization Chart (CFHC)
Annex-4 Japan's Grant Aid
Annex-5 Flow Chart of Japan's Grant Aid Procedures
Annex-6 Major Undertakings to be taken by Each Government

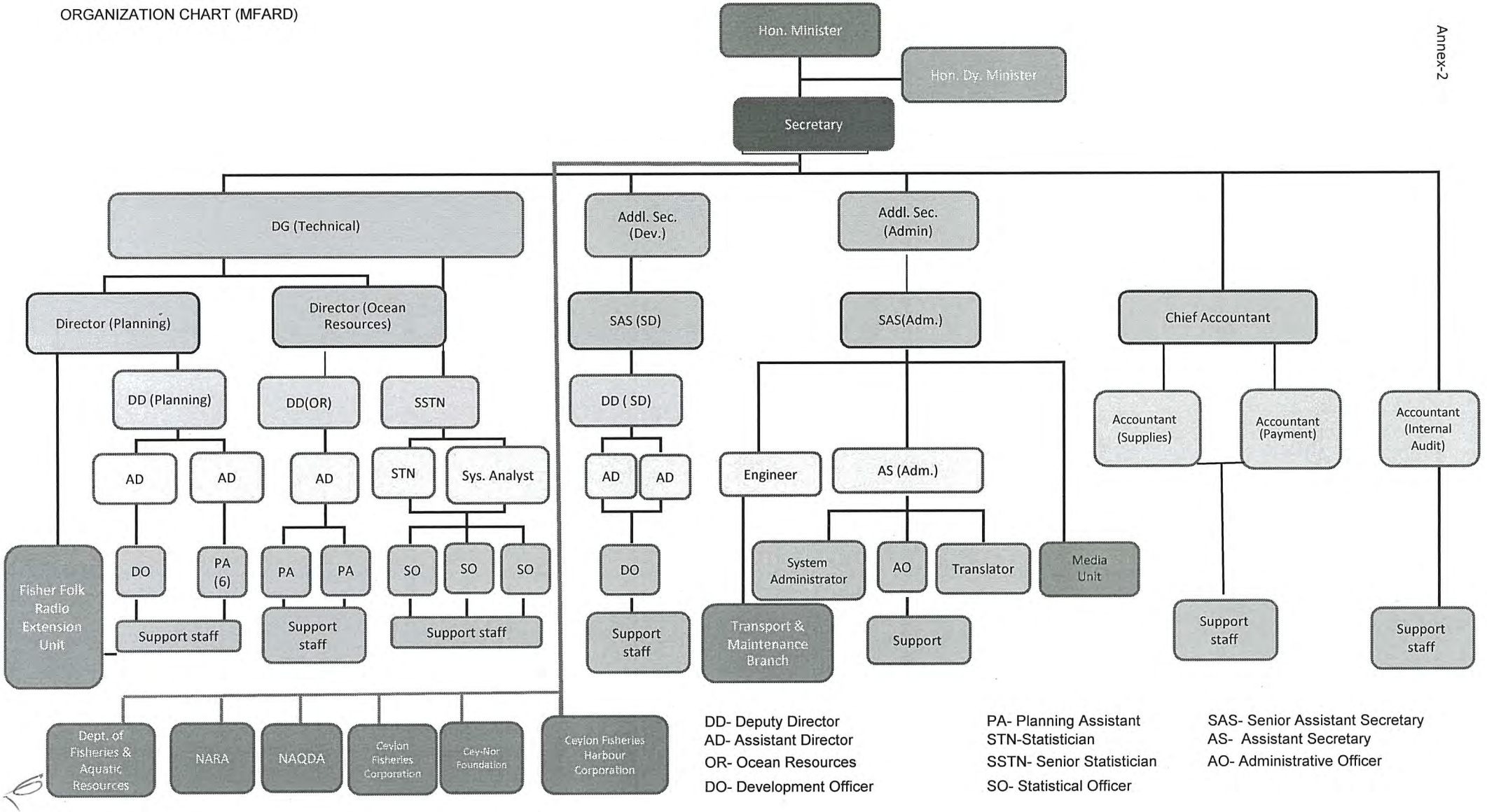
Annex-1

PROJECT SITE



Annex-2

ORGANIZATION CHART (MFARD)

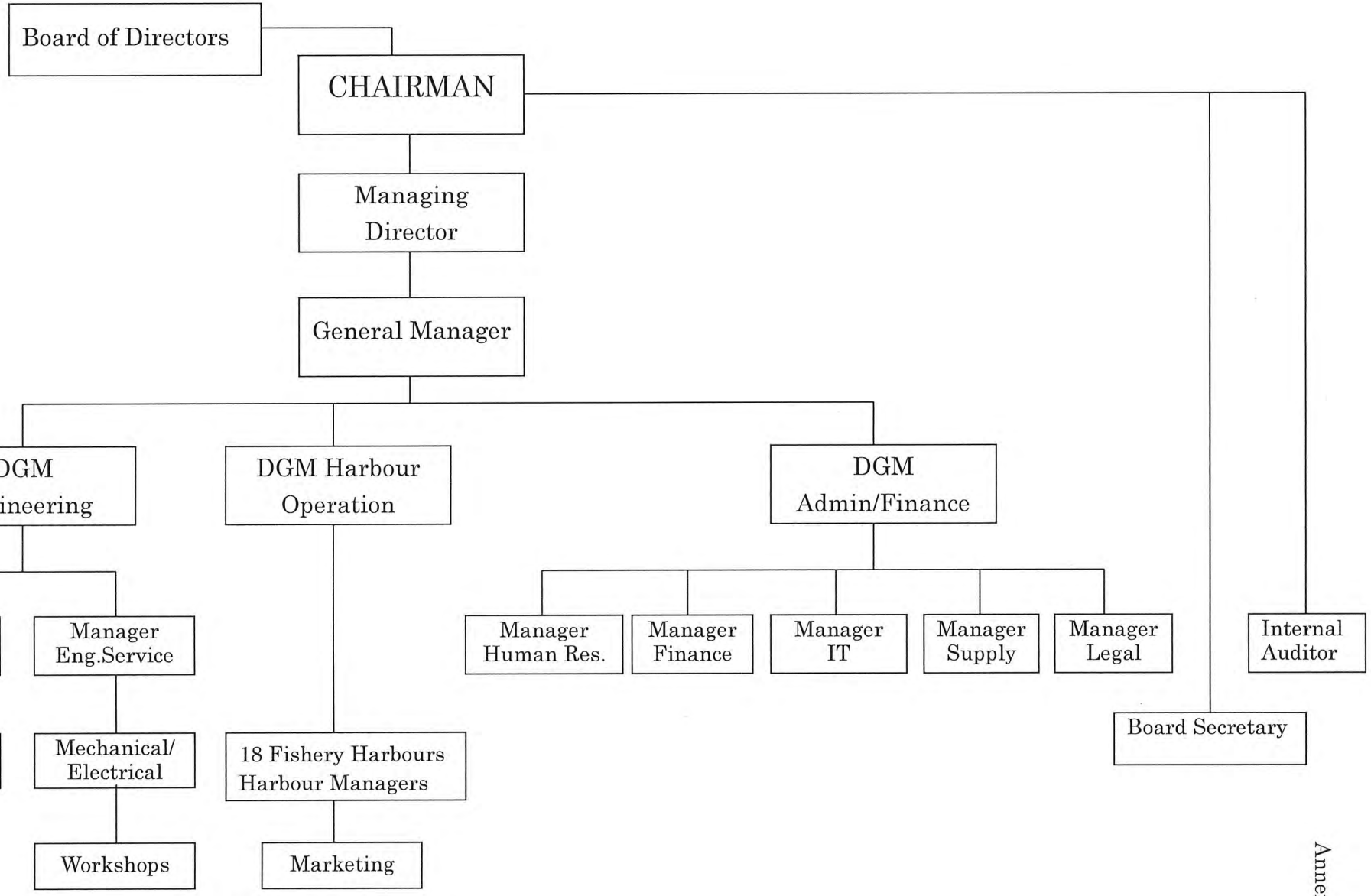


DD- Deputy Director
AD- Assistant Director
OR- Ocean Resources
DO- Development Officer

PA- Planning Assistant
STN-Statistician
SSTN- Senior Statistician
SO- Statistical Officer

SAS- Senior Assistant Secretary
AS- Assistant Secretary
AO- Administrative Officer

ORGANIZATION CHART (CFHC)



Annex-3

JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures :

- Preparatory Survey
  - The Survey conducted by JICA
- Appraisal &Approval
  - -Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
  - -The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - -Agreement concluded between JICA and a recipient country
- Implementation
  - -Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.

- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of a outline design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

APPENDIX 4 (2)

MEMORANDUM OF TECHNICAL DISCUSSIONS
ON
THE PREPARATORY SURVEY
ON
PROCUREMENT
OF
A SELFPROPELLED GRAB HOPPER DREDGER

From June 28, 2012 to July 30, 2012 , the Preparatory Survey Team (hereinafter referred to as" the Team") held a series of technical discussions with the officials of Ceylon Fishery Harbours Corporation (hereinafter referred to as" CFHC") at Colombo and twenty (20) fishery harbors managed by CFHC and had field surveys at each fishery harbor thereof with the project-related facilities.

As a result of the discussions and the field surveys, the both sides confirmed the items described in the attached sheets and annexes.

Colombo, July 30, 2012

友井武人

Takehito Tomoi
Chief of the Consultant
Shipbuilding Research Centre of Japan
JICA Preparatory Survey Team

Upali Liyanage
Chairman
Ceylon Fishery harbours Corporation

Sumith De Silva
Manager (Engineering Service)
Ceylon Fishery harbours Corporation

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex.

(6) "Proper Use"

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.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

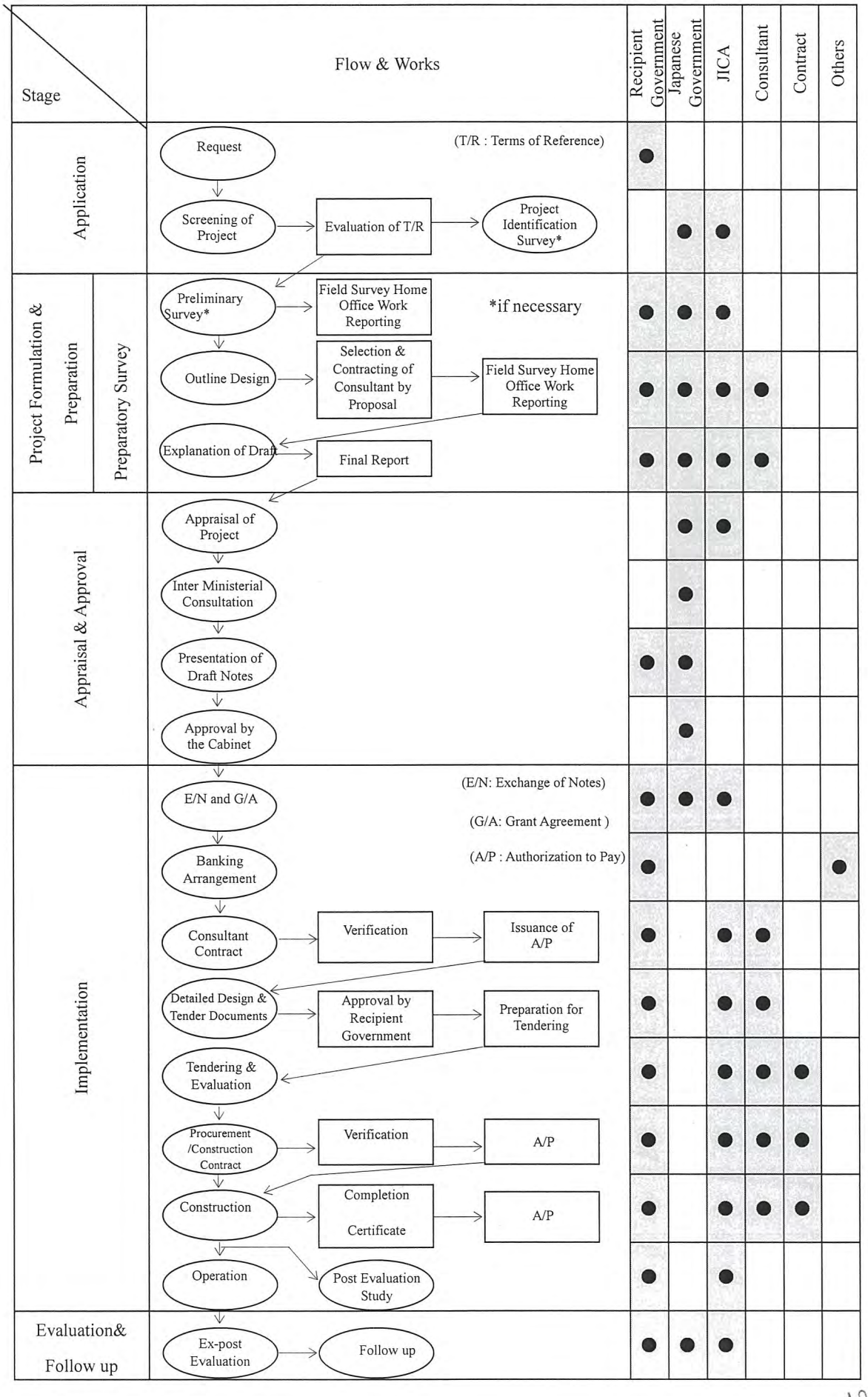
a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

FLOW CHART OF JAPAN's GRANT AID PROCEDURES



Annex-6

Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To design and construct dredger(s)	●	
2	To procure equipment to be covered under the Project	●	
3	Any items which are not covered under the Project, e.g. rehabilitation of existing wharf, etc.		●
4	Allocate the appropriate budget and conduct the undertakings in a timely manner necessary for proper operation and maintenance of dredger(s) to be provided (procurement of fuel, spare parts and overhaul of the dredger(s))		●
5	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the products from Japan to the recipient country (Sailing of the new dredger(s) with equipment on board by their own propulsion)	●	
	2) Tax exemption and custom clearance of the products (dredger with equipment on board) at the port of disembarkation (homeport)		●
6	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted		●
7	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
8	To ensure that the dredger(s) be maintained and used properly and effectively		●
9	To bear all the expenses, other than those covered by the Grant, necessary for implementation of the Project		●
10	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●

(B/A : Banking Arrangement, A/P : Authorization to pay)

1. Required dredging quantity

1.1 Regarding the bathymetric survey monitor and the estimation of annual dredging volume of CFHC, the Team found the followings:

(1) Bathymetric survey has been done twice a year from 2002 by the set of survey equipment as follows:

1) Survey platform	: Shallow draft dingy boat with Out- board- Motor
2)Positioning system	: Global Positioning System - Trimble DSM 212/DGPS
3)Echo Sounder	: Hydrotrac
4)survey software	: HYDROpro

(2) Latest results of bathymetric survey of the harbors except Dikkowita, Nilwalla, Oulvil were given in PDF Data to the Team.

(3) The Team considers the survey method and equipment are appropriate.

(4) Despite the above monitoring system, the previous survey data were almost lost due to the PC crash. Only 6 harbors have 2 sets of bathymetric data of the different time.

(5) The table of Annexure-06 Estimated annual dredging requirement of Fishery Harbours in "Application for Grant Aid from Japan for the Project of Procurement of a Self Propelled Grab Dredger October 2011"was made by the dredging area multiplied by the annual sedimentation thickness, which comes from "estimation by experience".

1.2 Re-estimation of annual dredging volume (sedimentation volume)

Following the above, the Team requested re-estimation of the volume with thefollowing orientation:

(1) For 6 harbours having 2 sets of data at the different survey time, the sedimentation volume is calculated from the difference of those 2 data and the volume of dredging between 2 survey times.

(2) For new harbors, the estimation of sedimentation is referred to the design report.

(3) For the other harbors, the volume above the design level of the basin is calculated. Reviewing the volume with the information gained by the interview with harbor operators and fishermen at each harbor, the annual sedimentation thickness is decided.

1.3. Re-estimated volume of sedimentation is shown in "Required Dredging Quantity." (ANNEX- 1)

1.4 The both side agreed to design the Dredger on the following conditions;

(1) Required dredging quantity by new dredger:

Off-monsoon season	: 7,300m3/month
Season transition period	: 5,600m3/month

(2) Operation days/ month : 16 days / month

The dredging quantity of the existing dredgers is shown in "Dredging Quantity (2010 to 2012 (expect.)) " (ANNEX- 2)

2. Specifications of the Dredger

In accordance with the required dredging quantity and design condition mentioned above and the information of the operation site and the various data obtained in the course of discussions with CFHC, the Team conducted the preliminary review on the CFHC request for the Dredger mentioned below, and the Team considered the request to be basically appropriate to the Project.

(1) Quantity and type : One (1) Self propelled grab hopper dredger

(2) Principal Particulars :

Length	approx. 45 m
Beam(mould)	approx. 11 m
Draft (mould) (max.)	not more than 2.5 m
Hopper capacity	not less than 300 m3
Grab bucket capacity	not less than 2.0 m3
Dredging depth	not less than 15 m

(3) The other and detailed specifications are in general followed to those of the existing grab hopper dredger "Ruhunuputha" except the items in relation to the capacity and size of the Dredger and the items which CFHC newly requested to apply to the Dredger as shown below.

1) The rudders shall be of shoe-pin type.

2) The each side void space shall be provided with a transverse bulkhead to be separated into two (2) compartments.

3) The air conditioning facility shall be provided to the following accommodation space.

- Captain class --- One (1) cabin
- Officers class --- Two (2) cabins

- Crew cabin
- Mess room
- Wheelhouse

4) Indication panel for the loading condition of the hopper in wheelhouse

(3) General Arrangement

The preliminary general arrangement of the Dredger is shown in ANNEX-3 General Arrangement (Preliminary), which, however, the new requests by CFHC mentioned above are not included.

On the basis of the technical items mentioned above, the Team will proceed the further study in the course of Preparatory Survey of the Project and through the investigation to be made in Japan, and the Preparatory Survey of the Project will be finalized with due consideration of the objectives and necessity within the frame work of the Japan's ODA with discussions between higher authorities of the Government of Japan.

3. Operation and maintenance

The Team obtained the data concerning the operation and maintenance of the existing dredgers of CFHC as follows:

1) Annual amount for Operation and Maintenance (CFHC)
2) Operation and Maintenance Cost for "Ruhunuputha"
3) Organization of Operation and Maintenance

Refer to "Operation and Maintenance Cost for Dredgers" (ANNEX- 4) and " Organization Chart for Operation and Maintenance of Existing Dredgers" (ANNEX- 5)

4. Familiarization Training

CFHC requested the acceptance of total four (4) persons for familiarization training in the shipyard in Japan. The Team will investigate the numbers of persons and the period of training etc., in the course of the Preparatory Survey.

5. Other

(1) Environment

CFHC was required to follow all the environmental regulations of the relating

offices including MEPA, CEA and CCD for the operation of the dredger.

(2) Shipyard of the Dredger to be built

CFHC strongly requested the Dredger to be built in the shipyard in Japan and the machinery and equipment to be of Japanese make as far as practicable from the view point of reliability, durability and easy operation and maintenance as well as the familiarization of the similar dredger "Ruhunuputha" made in Japan in 1989.

(3) Record of Daily Dredging Operation and Bathymetric Survey Monitor

CFHC should be highly recommended to monitor and record the followings:

1) The daily work log of dredger operation including weather, wave, working hours, number of disposal transportation, special maintenance work etc.

2) The pre-and post-dredging bathymetric survey result

Those data should be recommended to be recorded with duplication in appropriate document filing system.

ANNEX-1 Required Dredging Quantity

ANNEX-2 Dredging Quantity (2010 to 2012 (expect.))

ANNEX-3 General Arrangement (Preliminary)

ANNEX-4 Operation and Maintenance Cost for Dredgers

ANNEX-5 Organization Chart for Operation and Maintenance of Existing Dredger

Annex-1

Required Dredging Quantity

		Registered Boats (2010)			Annual Required Volume (m^3)	CFHC Former Estimated Volume (m^3)
		SDB	MDB	Total		
1	Kalpitiya	73	74	147	6,000	2,000
2	Chilaw				11,000	11,000
3	Negombo	27	162	189	1,000	10,000
4	Dikkowita				18,000	10,000
5	Mutuwal				1,000	3,500
6	Panadura	22		22	7,000	5,000
7	Beruwala	141	457	598	8,000	5,500
8	Ambalangoda	1	8	9	9,000	1,000
9	Hikkaduwa	169	55	224	12,000	10,500
10	Galle	227	293	520	1,000	1,500
11	Mirissa	91	159	250	1,000	2,500
12	Purunawella	66	323	389	5,000	4,500
13	Nilwala				3,000	
14	Kudawella	268	347	615	3,000	1,000
15	Tangalle	117	192	309	4,000	2,500
16	Hambantota	32	12	44	27,000	8,000
17	Kirinda	80	13	93	35,000	30,000
18	Oluvil				12,000	15,000
19	Valachchenai				9,000	20,000
20	Cod Bay	144	731	875	0	1,500
	Total	1,458	2,826	4,284	173,000	145,000

SDB : Single day boat

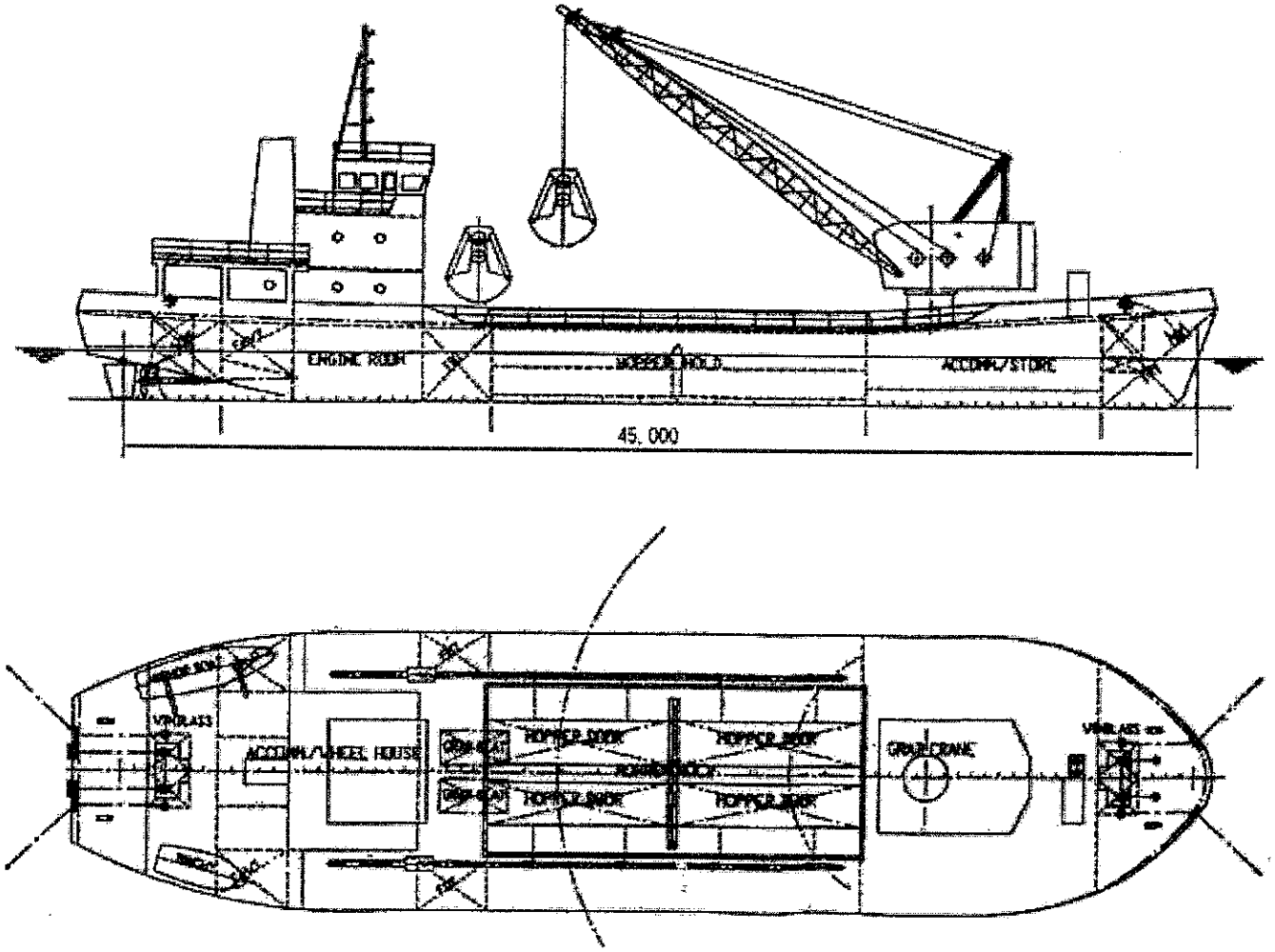
MDB: Multi day boat

ANNEX- 2 Dredging Quantity (2010 to 2012 (expect.))

6

Dredger	Dredging	2010		2011		2012 (expect.)	
		Month	Dredgin Quantity(m3)	Month	Dredgin Quantity(m3)	Month	Dredgin Quantity(m3)
Ruhunuputha (Grab Hopper)	Maintenance	10.0	46,000	8.0	43,500	9.0	42,500
	Capital	-	-	-	-	-	-
	Total	10.0	46,000	8.0	43,500	9.0	42,500
Nildiwara (S.Prop. Cutter Suction)	Maintenance	4.0	4,000	5.0	4,500	4.0	4,500
	Capital	8.0	16,000	5.0	7,000	8.0	12,500
	Total	12.0	20,000	10.0	11,500	12.0	17,000
Salapura (Portable Cutter Suction)	Maintenance	-	-	2.0	3,000	3.0	4,000
	Capital	12.0	15,000	10.0	18,000	9.0	12,000
	Total	12.0	15,000	12.0	21,000	12.0	16,000
Weligouwa (Portable Cutter Suction)	Maintenance	12.0	14,500	12.0	13,500	12.0	15,000
	Capital	-	-	-	-	-	-
	Total	12.0	14,500	12.0	13,500	12.0	15,000
Total	Maintenance	26.0	64,500	27.0	64,500	28.0	66,000
	Capital	20.0	31,000	15.0	25,000	17.0	24,500
Grand Total		46.0	95,500	42.0	89,500	45.0	90,500

ANNEX-3 General Arrangement (Preliminary)



ANNEX- 4 Operation and Maintenance Cost for Dredgers

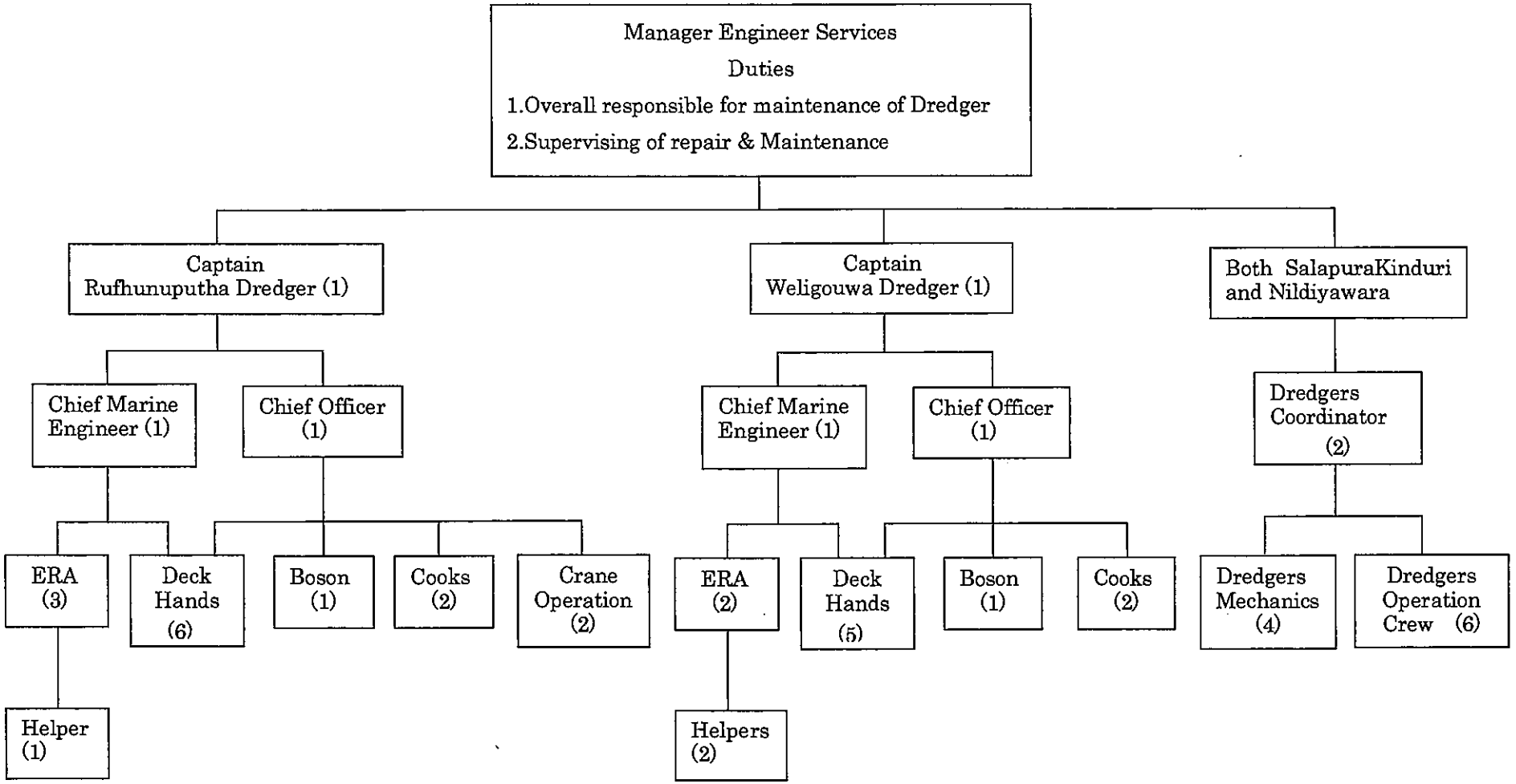
1. Annual Amount for Operation and Maintenance (CFHC)
(for all dredgers)

Year	Record for Last 5 years (Million Rs.)					Plan Budget for Future (Million Rs.)		
	2007	2008	2009	2010	2011	2012	2013	2014
Annual amount for Operation & maintenance	22	26.8	32.6	35.1	45.9	49	57	64
Total Capital Budget for CFHC	264	228	226	166	261	245	375	390

2. Operation and Maintenance Cost for "Ruhunuputha"

Description		Amount (Million Rs.)		
		2009	2010	2011
(1)	Fuel Cost	2.82	2.84	3.20
(2)	Wages & Salaries necessary	4.65	4.98	5.12
(3)	Procurement of Spares	2.10	2.40	3.60
(4)	Lubricants	0.40	0.45	0.52
(5)	Other General repairs	0.58	0.65	0.75
Total		10.55	11.32	13.19

ANNEX- 5 Organization Chart for Operation and Maintenance of the Existing Dredger



APPENDIX 4 (3)

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY
ON THE PROJECT FOR PROVISION OF A DREDGER
FOR THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

In December 2012, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") on the Project for Provision of a Dredger (hereinafter referred to as "the Project") to the Democratic Socialist Republic of Sri Lanka (hereinafter referred to as "Sri Lanka"), and through discussions, field surveys and technical examination of the results in Japan, JICA prepared a Draft Final Report of the study.

In order to explain and to consult with the concerned officials of the Government of Sri Lanka (hereinafter referred to as "GoSL") on the contents of the Draft Final Report, JICA sent to Sri Lanka the team for explaining the Draft Final Report. The team is headed by Mr. Harumi Ao, Chief Representative of JICA Sri Lanka Office and is scheduled to stay in Sri Lanka from December 10th to 14th, 2012.

As a result of the discussions, both sides confirmed the main items described in the attached sheets.

Colombo, Sri Lanka, January 16th, 2013

Harumi Ao
Chief Representative
Sri Lanka Office
Japan International Cooperation Agency
Japan

Dr. Damitha de Zoysa
Secretary
Ministry of Fisheries and Aquatic Resources Development
Sri Lanka

M P D U K Mapa Pathirana
Director General
Department of External Resources
Ministry of Finance and Planning
Sri Lanka

Upali Liyanage
Chairman
Ceylon Fishery Harbours Corporation
Ministry of Fisheries and Aquatic Resources Development
Sri Lanka

ATTACHMENT

1. Contents of the Draft Report

The Sri Lanka side agreed and accepted in principle the contents of the Draft Report explained by the Team.

2. Cost Estimation

Both sides agreed that the Project Cost Estimation as attached in Annex-1 should never be duplicated or disclosed to any third parties before the signing of all the contract(s) with contractor(s) for the Project.

3. Japan's Grant Aid Scheme

3-1. The Sri Lankan side understood the Japan's Grant Aid scheme and the necessary measures to be taken by the recipient country as explained by the Team and described in Annex-5, Annex-6 and Annex-7 of the Minutes of Discussions signed on July 11th, 2012.

3-2. The Sri Lankan side understands that the Team is not in a position to guarantee implementation of the Project but requests early delivery of the new dredger.

4. Schedule of the Study

4-1. JICA will complete the final report in conformity with the confirmed items and time schedule and deliver the same to the Sri Lankan side, in English around January 2013.

4-2. The commencement of the Project is subject to the approval by GoJ and will be informed by GoJ to GoSL.

5. Other Issues Discussed

5-1. Both sides agreed that the new dredger should be used only for the intended purpose and should not be leased or rented under any circumstances.

5-2. Both sides discussed regarding the additional installation of equipment for transporting dredged sand to land such as pumping system to the designed grab hopper dredger, but agreed not to include it in this project due to the following reasons.

- Additional cost will be necessary for the amendment of specification of designed dredger.
- Significant delay of the commencement of the project caused by the drastic amendment of specification and additional Environmental and Social consideration.

6. Undertakings by Sri Lankan Side

6-1. Both sides confirmed that the following undertakings should be carried out by the Sri Lankan side at the Sri Lankan expenses for the Project.

(1) To obtain the provisional nationality certificate and necessary documents for the transportation of the new dredger from Japan to Sri Lanka.

(2) To perform the custom clearance, tax and port charges exemption and registration of the new dredger.

(3) To provide appropriate berthing/ mooring space for the new dredger.

(4) To carry out the domestic transportation of the new dredger from the hand over point to the designated birthing / mooring area.

(5) To perform the necessary formalities in case the new dredger being registered in the Classification Society in Sri Lanka.

(6) To bear all the expenses for the operation and maintenance costs for the new dredger in addition to those for the existing dredgers of CFHC.

6-2. The Sri Lankan side shall bear the following costs as a condition for the Japan's Grant Aid to be implemented.

(1) The commissions for the banking services based upon Banking Arrangement (B/A)

(2) The advising commission of the Authorization to Pay (A/P)

Annex-1 Project Cost Estimation

Project Cost Estimation

This Page is closed due to the confidenciality.

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2. Project cost to be borne by Sri Lankan Side

The commissions for the banking services based upon Banking Arrangement (B/A) and the advising commission of the Authorization to Pay (A/P) is about 800 thousand Japanese Yen (equivalent to 1.23 million Sri Lanka Rupee) for reference.

The project is implemented under the Japan's Grant Aid Scheme. The above project costs will be revised by the Japanese government before the signing of the Exchange of Notes (E/N).

Appendix 5　References

No.	NAME	Form(Book, Video,Map,etc)	Original or Copy
1	DRY DOCKING OF DREDGER "RUHUNUPUTHA"	Book	Copy
2	Main Social　Economic Data of Sri Lanka	Book	Copy
3	Climate of srilanka	Book	Copy
4	Ceylon Fishery Harbours Corporation Vessel length ～ Monthly berthing chargers	Book	Copy
5	Executive Summary	Book	Copy
6	Historical Tables	Book	Copy
7	SPECIFICATION OF DREDGERS	Book	Copy
8	FISHERY HARBOURS	Book	Copy
9	BATHYMETRIC　SURVEY（16 fishery Harbors）	Book	Copy
10	HARBOUR LAYOUT PLAN(DIKOWITA)	Book	Copy
11	LAND SURVEY AT NEGAMBO FISHERY HARBOUR	Book	Copy
12	LAND SURVEY AT DODANDUWA FISHERY HARBOUR	Book	Copy
13	Maritime Zones & Resource Base of Sri Lanka	Book	Copy
14	Ceylon Fishery Harbours Corporation（CFHC）	Book	Copy
15	Dikkowita Fishery Harbour	Book	Copy
16	Valachchennai Fishery Harbour	Book	Copy
17	Trimble,positioning　(Brochure）	Book	Copy
18	Dikkowita Fishery Harbour - Management system	Book	Copy
19	INCOME & EXPENDITURE STATEMENT FOR THE MONTH(JANUARY2011-JUNE2012)	Book	Copy
20	BERTHING CHARGES INCOME　2012 June (Example)	Book	Copy
21	Ceylon Fishery Harbours Corporation Vessel lemgth – Monthry berthing chargers	Book	Copy
22	Directional Wave Climate Study South-West of Sri Lanka	Book	Original
23	NEAL MARINE　（Brochure）	Book	Original
24	OLUVIL PORT DEVELOPMENT PROJECT DETAILS OF OLUVIL PORT PLAN	Book	Original
25	Colombo Dockyard　（Brochure）	Book	Original
26	Data of wind direction and wind speed)	Book	Copy
27	Data of tidal level	Book	Copy
28	Performance 2012 Ministry of Fisheries & Aquatic Resources Development	Video	Copy