MINISTRY OF AGRICULTURE
INDIA

No. 1

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR CONSTRUCTION OF THE DREDGER FOR MINOR FISHERIES HARBOURS
IN
INDIA

OCTOBER 1997

JAPAN INTERNATIONAL COOPERATION AGENCY

OVERSEAS AGRO-FISHERIES CONSULTANTS CO., LTD.
OVERSEAS SHIPBUILDING COOPERATION CENTER

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PREFACE

In response to a request from the Government of India the Government of Japan decided to conduct a basic design study on the Project for Construction of the Dredger for Minor Fisheries Harbours in India and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to India a study team from 10th of April to 14th of May, 1997.

The team held discussions with the officials concerned of the Government of India, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to India in order to discuss a draft basic design, and as this result, 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.

I wish to express my sincere appreciation to the officials concerned of the Government of India for their close cooperation extended to the teams.

October, 1997

Kimio Fujita
President
Japan International Cooperation Agency

October, 1997

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Construction of the Dredger for Minor Fisheries Harbours in India.

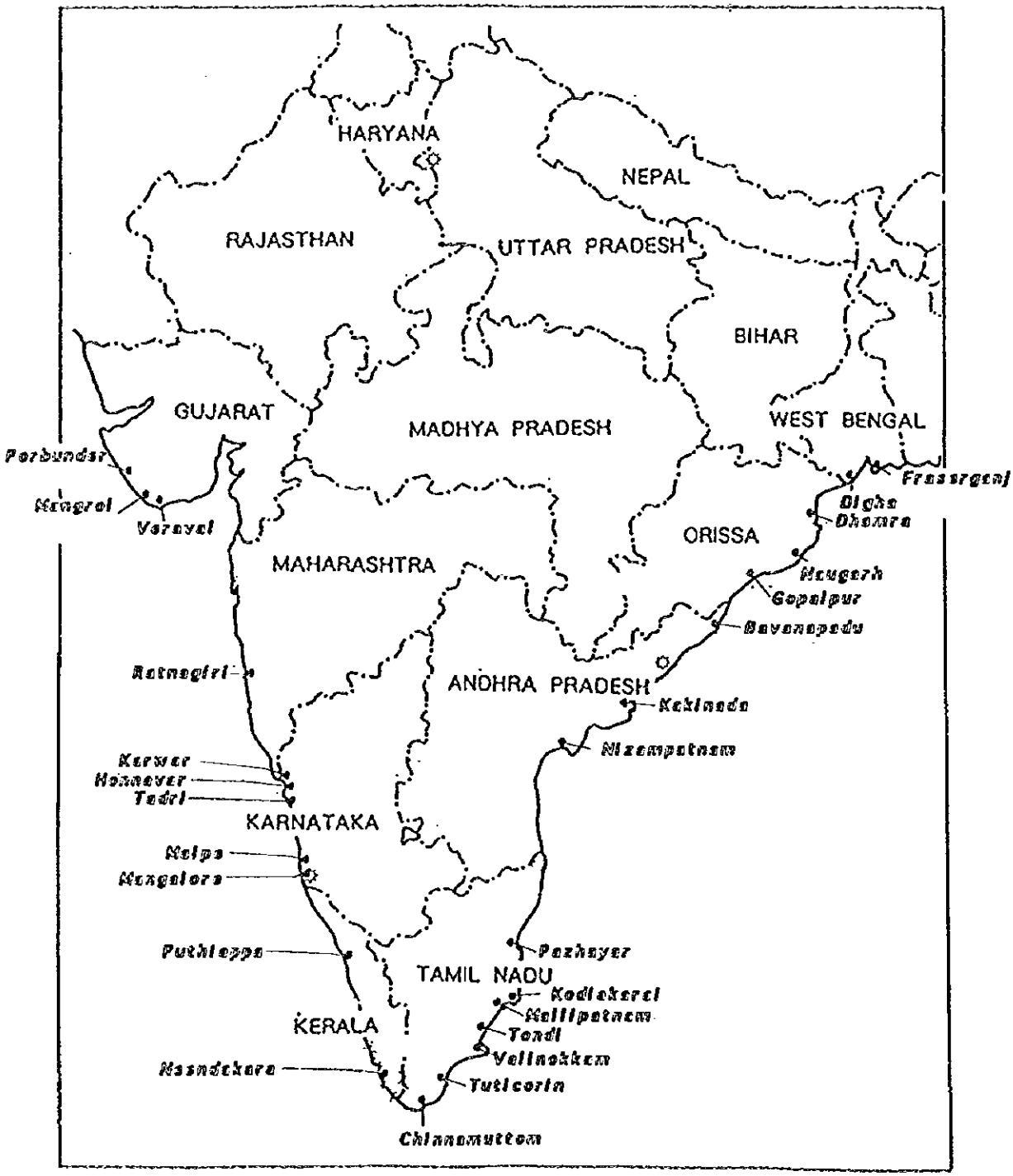
This study was conducted by Overseas Agro-Fisheries Consultants Co., Ltd. and Overseas Shipbuilding Cooperation Centre, under a contract to JICA, during the period from March 14, 1997 to October 20, 1997. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of India and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Tsuyoshi Kanno
Project manager,
Basic design study team on
the Project for Construction of the Dredger
for Minor Fisheries Harbours in India
Overseas Agro-Fisheries Consultants Co., Ltd.

Location Map



Abbreviation

ASBD	average satuated bulk density
ASBD	average satuated bulk density
BD	bucket dredger
CICEF	Central Institute of Coastal Engineering for Fishing
CSD	cutter suction dredger
DCI	Dredging Cooperation of India, Limited
DEA, MOF	Department of Economic Affairs, Ministry of Finance
FD, DAC, MOA	Fisheries Division, Department of Agriculture & Co-operation, Ministry of Agriculture
GD	grab dredger
MLWN	mean lowest water neaps
MLWS	mean lowest water springs
MMSG	mean mixture specific gravity
TSHD	trailing suction hopper dredger

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CHAPTER 1 BACKGROUND OF THE PROJECT

India is located in the Indian sub-continent and its land is approximately nine times larger than that of Japan. The total length of east and west coastal lines reaches to approximately 6,000 km. Its weather in India is monsoon except for the cool weather in inland area and Dekan Plateau. Its population is over 900 million and it is still increasing at high ratio. India is a federation consisting of 27 States and 7 Union Territories, and the political authority of each State is comparably independent.

Fisheries industry in India, especially coastal fisheries, is becoming more significant for obtaining of foreign currency by export, supply of animal protein for people and providing labour for people. In 1995, the total amount of export of fishery products was 300,000 tons, the total value was 3.5 billion rupees, the fish production was approximately 4.95 million tons, and the total number of fishermen was approximately 5.95 million. The numbers of coastal fishing boats operated in 1994 were approximately 250,000 including 47,000 mechanized fishing boats, which are major fishing boats for coastal fisheries.

In view of these situations, it is a key task to improve facilities related to fisheries harbours as the base of fishery and fish marketing in order to develop fishery industries. The facilities related to fisheries harbours in India are divided into major fisheries harbours, minor fisheries harbours and fish landing centres. Major fisheries harbours are targeted on steel trawl fishing boats and larger mechanized fishing boats, and construction of 6 major fisheries harbours were approved and 5 of them have already been opened. On the other hand, regarding minor fisheries harbours and fish landing centres supporting coastal fishing activities, through the measures of assisting funds by the Central Government, the construction of 41 minor fishing harbours and 138 fish landing centres were approved by the end of fiscal 1996, and 28 of those minor fisheries harbours and 114 of those fish landing centres have been opened.

On the other hand, siltation caused by natural conditions, geographical conditions, etc. is gradually taking place. That situation obstructs boats approaching harbours and navigating around the basin in terms of utilization of fishery facilities. Each State Government is supposed to operate and maintain those facilities related to fisheries harbours located in his state. To avoid obstruction caused by siltation, maintenance dredging should be executed regularly. However, only limited State

Governments own dredger vessels and dredging equipment for maintenance dredging of these facilities and in spite of that, the vessels and equipment are decrepit and, as a matter of fact, none of State Governments are able to accomplish maintenance dredging properly by themselves. Under these situation, Dredging Corporation of India Limited (DCI), which is an affiliated organization of Ministry of Surface Transport, executes maintenance dredging sometimes and charges for that upon request by State Governments, but DCI does not own appropriate smaller dredger vessels for maintenance dredging at narrow and shallow harbours such as minor fisheries harbours. Therefore, inland dredger vessels for capital dredging are utilized as temporary measures.

To improve these situations, the Government of India has requested the Government of Japan for the grant aid assistance, because it is necessary to procure a dredger vessel which should be operated for regular maintenance dredging at minor fisheries harbours in order to improve utilization of minor fisheries harbours and contribute to development of fishery industries.

CHAPTER 2 CONTENTS OF THE PROJECT

2-1 Objectives of the Project

The coastal fishery is becoming more significant for obtainings of foreign currency by export, supply of animal protein for people and providing labor for people. In 1995 the total amount of export of fishery products was 300,000 tons, the total value was 3.5 billion rupees (approximately 13 billion yen), the fish production was approximately 4.95 million tons (2.71 million tons from marine fisheries and 2.24 million tons from inland fisheries) and the total number of fishermen was approximately 5.95 million (including 2.4 million full-time fishermen). Compared those figures with the statistics of 1990 and 1985, the total amount of export of fishery products increased 2.1 times of the amount in 1990 and 3.5 times of the amount in 1985, the total value of export increased 3.9 times of it in 1990 and 8.8 times of it in 1985, and the fish production increased 1.3 times of it in 1990 and 1.7 times of it in 1985. The numbers of coastal fishing boats operated in 1994 were 47,000 of mechanized fishing boats, 32,000 of outboard engine fishing boats and 170,000 of non-motorized fishing boats. The number of mechanized fishing boat, as a main fishing boat for coastal fishery, increased 1.6 times of it in 1990 and 2.4 times of it in 1985.

In view of these situations, it is a key task to improve facilities related to fisheries harbours as the base of fishery and fish marketing in order to develop fishery industries. Through the measures of assisting funds by the government, construction of 41 minor fisheries harbours and 138 fish landing centres were approved by the end of fiscal 1996, and 28 of those minor fisheries harbours and 114 of those fish landing centres have been opened and supported coastal fishery activities.

On the other hand, siltation caused by natural conditions, geographical conditions, etc. is gradually taking place. That situation obstructs boats approaching harbours and navigating around the basin in terms of utilization of fishery facilities. Each State Government is supposed to operate and maintain those facilities related to fisheries harbours located in his state. However, only limited State Governments own dredger vessels and dredging equipment for maintenance dredging of these facilities and in spite of that, these vessels and equipment are decrepit and, as a matter of fact, none of State Governments are able to accomplish maintenance dredging by themselves. To improve these situations, FD, DAC, MOA (Fisheries Division, Department of

Agriculture and Co-operation, Ministry of Agriculture) in charge of fishery administration in the Central Government determined to take measures to assist in establishing the maintenance dredging system for the related minor fisheries harbours.

This project is positioned to accomplish maintenance dredging in the measures by operation of a dredger vessel. The objectives of the project are to improve the circumstances of utilization for minor fisheries harbours and, consequently, to develop the fishery industries by introducing and operating an appropriate dredger vessel for maintenance dredging for as many of the applicable minor fisheries harbours as possible. The content of the project is to procure an appropriate dredger vessel for these objectives.

2-2 Basic Concept of the Project

An outline of study and examination on the contents of the request by the basic design study team is as follows:

(1)System of Maintenance Dredging

The characteristics of minor fisheries harbours, target for maintenance dredging in this project, are as follows:

① The minor fisheries harbours, target for maintenance dredging, are separately located on the coastal line of east and west sides of India (the distance of east coast is approximately 2,650 km and that of west coast is approximately 3,340 km).

② Number of minor fisheries harbours by category

- Harbours already opened : 28 harbours
- Harbours necessary for maintenance dredging amongst above harbours : 26 harbours
- Harbours of planned depth of more than 2.0 m in depth amongst above harbours : 21 harbours

③ As the planned depth of navigation channel and harbour basin at minor fisheries harbours is shallower than the commercial harbours.

④ The necessary amount of maintenance dredging for each harbour varies from 10,000 m^3 to 150,000 m^3.

⑤ In general the minor fisheries harbours are very crowded and utilized by far larger numbers of boats than the expected numbers when those harbours were designed.

⑥ The minor fisheries harbours are located in the coastal area and the mouth of river, and many of them are accessible only by narrow unpaved roads, less than a few meters wide and far away from trunk roads such as national highways and state highways allowing large vehicles to pass. Many of minor fisheries

harbours along the west coast are generally reached within an hour from trunk roads, while most of fisheries harbours along the east coast are reached in several hours from trunk roads.

Taking the points above into consideration, accessibility to the dredging site and maneuverability of dredging equipment should be qualified to be utilized for maintenance dredging in these minor fisheries harbours. From this point of view, dredging equipment requiring land transportation and assembly before its operation is not suitable for this project. Therefore, vessel type of dredging equipment should be considered as suitable equipment, while it is necessary to consider the situations such as comparably shallow depths of fisheries harbours and jams in harbours.

As dredging vessel, GD(grab dredger), CSD(cutter suction dredger), BD(bucket dredger) and TSHD(trailing suction hopper dredger) are generally used. The Government of India regards the type of self-propelled TSHD as an appropriate dredger vessel and requests it. That type is the same as that of main vessels of DCI, who is entrusted by FD, DAC, MOA with operation and maintenance of a dredger vessel for this project. DCI accordingly is qualified and accomplished in terms of operation and technical maintenance for this type of dredger vessel. As well as deliberating the fact as aforementioned, the basic design of this project should be established through comparing functions of each dredger, and examining characteristics in the structures of vessels and advantages and disadvantages of vessels for operation of maintenance dredging in this project.

(2) Fisheries Harbours Applicable to Maintenance Dredging by This Project

The Government of India intends that maintenance dredging by means of operating a dredger vessel planned for this project would apply to minor fisheries harbours of which planned depth are over 2.0 m. The minor fisheries harbours applicable to this condition are 21 and their planned depths vary from 2.0 m up to more than 5.0 m. Therefore, the dredger vessel for this project is to be engaged in maintenance dredging in a plural number of minor fisheries harbours having different planned depths.

The shallow draught of a dredger vessel is necessary for maintenance dredging in the harbours of shallow planned depths, but the shallower draughts will decrease their abilities to carry silt. The decline of the abilities will increase the frequency of silt dumping and the share of silt dumping interval among the whole operation, and consequently the decrease of the share of actual maintenance dredging will be caused. For instance, the dredger vessel targeting on harbours of comparatively shallower planned depth would be less economical in order to operate maintenance dredging for harbours of comparatively deeper planned depths. This matter should be considered in examination on the scale of a dredger vessel. Furthermore, where present depth is extremely shallow because of the conditions of siltation, the efficiency of the dredging work would decrease or, worse still, the operation could not be performed immediately. For these reasons, the specifications and the scale of a dredger vessel should be examined by considering the efficiency of operation in the present depth of each harbour.

As a result of the examination aforementioned, the basic concept of the project is to procure a dredger vessel capable of accomplishing maintenance dredging in as many applicable open minor fisheries harbours as possible, which requires maintenance dredging and of which planned depths are over 2.0 m.

2-3 Basic Design

2-3-1 Design Concept

(1) Design Stance

1) Natural Conditions

① The depth standardized by MLWS (Mean Lowest Water Springs) is adopted in this report regarding the study of the planned depths of minor fisheries harbours.

② The average depth between the depth standardized by MLWS and that standardized by MLWN (Mean Lowest Water Neaps) is adopted in this report regarding the study of a dredger vessel operation for the present depths of minor fisheries harbours. This depth is termed operation depth in this report hereafter.

③ During the period of southeast monsoon in between June and September, storm is expected along the coast of India, especially along the west coast southwest blow is scarcely protected and it is easily affected by storm. This natural condition should be considered in the basic design of a dredging vessel.

2) Utilization of Local Equipment

Based on the following points, the project dredger vessel will be basically constructed in Japan but it would be considered to utilize some of meters, measurement and control device made in the European countries.

① The procurement of dredging equipment in India depends mainly on import from foreign countries. Most of dredger vessels are constructed in Holland and dredging equipment such as sand pumps are made in Japan, Western countries and South East Asian countries.

② The ability of constructing steel vessels in India reaches to the standard and it is considered to be possible to construct dredger vessels by only importing

dredging equipment. However, carrying out the construction would require a great deal of technical supports by foreign countries.

③ The construction of dredger vessels in Japan has been achieved, never inferior to that of any other countries, and highly evaluated by South East Asian countries even though it is infrequent to construct dredger vessels for India.

3) Capabilities for Operation and Maintenance

① DCI as a body for operation and maintenance of the dredger vessel by this project operates CSD for capital dredging and TSHD for maintenance dredging. The basic design should be established through considering the state of operation and experience and the aptitude of the personnel.

② The following points should be considered in terms of examination of the maintenance dredging system:

- Maneuverability is important in order to apply to several fisheries harbours.
- It is necessary to minimize the effects of dredging works on navigation of fishing boats, etc. in fisheries harbours.
- It is likely that the difficulty of operation is increased by taking the dredging system utilizing several vessels because of the complicated operation and management.

4) Scope and the Levels of Equipment

① The system of dredging will be determined through comparing advantages and disadvantages of each dredging system for maintenance dredging.

② The required ability of the dredger vessel is evaluated through the estimation to the necessary amount of annual maintenance dredging in minor fisheries harbours applying to the project.

③ The scope of the dredger vessel is examined by comparing and studying the characteristics of the vessel structure, the number of applicable fisheries

harbours and the ability of dredging against different draught and silt loading capacity.

5) Period of the Project Implementation

A period of the project implementation is determined in consideration of appropriateness to the system of Japan's grant aid assistance.

(2) Determination of the Level and Examination of the Scope of the Dredger Vessel

1) Dredging System

The comparison of functions and advantages and disadvantages of dredging systems, GD, CSD, BD and TSHD, for maintenance dredging operation for this project are summarized as follows:

① GD (grab dredger)

There are a self-propelled type and a non-propelled type. It is a dredging system that a grab bucket digs and scoops silt in the bottom of the sea by utilizing its own weight.

As the advantages, this system has flexibility to choose spots for dredging and is able to be utilized for maintenance dredging and capital dredging.

As the disadvantages, in case of self-propelled type, this system is not appropriate where the depth of water is shallow, as the GD device is heavy and accordingly its draught is deep. In case of non-propelled type, this system is appropriate where the depth of water is shallow, but it requires assistance by slurry barges and tug boats, and the operation and management become complicated owing to the operation by several vessels. Four point support is also required on dredging operation and it would prevent the navigation of fishing boats.

② CSD (cutter suction dredger)

A non-propelled type is general. This type is utilized mainly for

capital dredging for hard silt. It digs the bottom of the sea, sucks up silt water by pumps and dumps it through a discharge pipe.

As advantages, this system is appropriate where the depth of water is shallow and is utilized for both capital and maintenance dredging.

As disadvantages, the management of operation becomes complicated because this system requires assistance by tug boats, etc. and installation of a discharge pipe. Four point support is also required on dredging operation and it would prevent the navigation of fishing boats.

③ BD (bucket dredger)

There are a self-propelled type and a non-propelled type. This dredging system spin-drives the bucket line installed between an upper tumbler and a lower tumbler and each bucket digs and sucks up the silt at the bottom of the sea.

As advantages, this system digs the site flat and the operation runs well under the natural conditions such as wind and wave. This system also would be utilized for both capital and maintenance dredging.

As disadvantages, in case of self-propelled type, this system is not appropriate where the depth of water is shallow, because the bucket is heavy and the draught has to be deep for the heaviness. In case of non-propelled type, this system is appropriate where the depth of water is shallow, but it requires assistance by slurry barges and tug boats, and the operation and the management become complicated owing to the operation by several vessels. Four point support is also required on dredging operation and it would prevent the navigation of fishing boats.

④ TSHD (trailing suction hopper dredger)

A self-propelled type is general. This system sucks up silt water into the hopper of the vessel and the silt precipitates in the hopper repeatedly, and the capable amount of sediment is checked by the fall of the draught line.

As advantages, this system has the high mobility and maneuverability.

It could operate dredging independently and therefore simplify the management of operation. Compared to the self-propelled types of GD and BD, the weight of dredging facilities is lighter and the design of vessels with the shallow draught could be possible.

As disadvantages, since this system only runs well where the silt is soft, it could be utilized only for maintenance dredging. It will be difficult for dredging at the corners of harbours.

The following points should be considered upon the determination of the dredging systems for the project:

① The objectives of dredging are limited for the maintenance dredging at minor fisheries harbours and not for capital dredging.

② The efficiency of dredging work has to be improved by the mobility of the transportation and the navigation of the vessel.

③ Considering the small extents of harbours and the narrow access channels, the dredging system, which does not prevent the functions of harbours and the navigation of fishing boats, has to be selected.

④ It is preferable that maintenance dredging should apply to as many fisheries harbours as possible.

⑤ It is preferable that the dredging system, on which DCI has experience and achievement, should be selected.

The results of examination on the appropriateness of each dredging system for the points above as follows:

① The objectives of dredging

Every system could be utilized for maintenance dredging.

② The mobility of the transportation and the navigation of the vessel

TSHD system is superior, and self-propelled GD and self-propelled

BD systems are slightly inferior and the rest of systems are strikingly inferior.

③ The degree of obstruction to the navigation of fishing boats

The degree of obstruction in terms of TSHD, self-propelled GD and self-propelled BD is the lowest. That of non-propelled GD and non-propelled BD is higher. That of CSD is the highest.

④ The number of applicable fisheries harbours to maintenance dredging

Non-propelled GD, non-propelled BD and CSD could apply to many of fisheries harbours. TSHD could apply to less and self-propelled GD and self-propelled BD could apply to far less than those systems.

⑤ The experience and the achievement of DCI

DCI has experience and achievement in TSHD and CSD.

By the examination aforementioned, the dredger vessel of TSHD, which is also requested by the Government of India, is considered appropriate to be utilized for the project.

However, the simple TSHD system will cause the following restrictions because of the characters of the system, and it is preferable to take counter-measures in order to improve those restrictions.

① Due to its structure having propellers, the vessel has restriction in having shallower draught and the applicable dredging area is limited compared with that of CSD.

② As the head of trailing suction is located at the centre side of the vessel, if sediment in the course is shallower than the draught, the vessel is not able to enter the course for digging.

③ The dredging at the corners of harbours is difficult.

As the counter-measures to ①, the weight of the vessel with light load has to be minimized and the draught before dredging has to be shallow. The suitable propeller has to be selected for this draught and the tanks have to be

positioned in the place to maintain the minimum trim. Furthermore, by installing the overflow device for adjustment of hopper capacity, the vessel is designed to facilitate the control of the draught.

As the counter-measures to the number ② and ③, backup dredging devices should be installed. As the back up dredging devices, grabs, dust pans, jet pumps and underwater pumps are considered.

From the points such as aiming the maintenance dredging, lighting weight of equipment and not complicating the equipment, the results of examination and comparison are as follows:

① Objectives of maintenance dredging

Any type of backup dredging device is appropriate to be utilized for maintenance dredging.

② Weight of a device

The weight of an underwater pump is the lightest, those of a dust pan and a jet pump increase slightly, and that of grab is rather heavy.

③ Complexity of a device

An underwater pump has the simplest structure, a grab has a slight complicated structure, and a dust pan and a jet pump have a rather complicated structure.

As the results of examination aforementioned, an underwater pump of suitable capacity is judged as the most appropriate backup dredging device.

2) Capability of dredging

Table 1 shows the planned depths, the operation depths and the necessary amounts of maintenance dredging in 26 open minor fisheries harbours requiring maintenance dredging. Based on the situations of the minor fishing

Table 1. Planned depth, operation depth and the amount of annual maintenance dredging required in minor fisheries harbours

	Name of harbour	Name of State	Planned Depth (m)	MLWS Present Depth (m)	MLWN Present Depth (m)	Operation Depth (m)	Amount of Present silt (m3)	Dredging Cycle (Year)	Amount of Annual Maintenance Dredging required (m)	Number of Fishing Boats	Annual Fish Landings (tons)	Over 2.0 m of Planned Depth
1	Veraval	GU	2.98	2.98	3.59	3.29	100,000	2	50,000	2,849	213,117	○
2	Mangrol	GU	3.08	2.08	2.76	2.42	29,350	8	3,669	1,220	29,722	○
3	Porbunder	GU	3.07	1.82	2.51	2.17	67,000	2	33,500	1,800	43,844	○
4	Malpe	KA	5.26	2.26	2.44	2.35	90,000	8	11,250	799	69,775	○
5	Honnavar	KA	2.49	1.49	1.91	1.76	75,000	-	25,000	193	10,851	○
6	Karwar	KA	2.04	1.82	2.42	2.12	20,000	3	6,667	223	12,714	○
7	Mangalore	KA	4.37	2.43	2.97	2.70	150,000	-	50,000	630	57,489	○
8	Tadri	KA	3.04	2.29	2.68	2.49	22,364	-	7,455	275	6,172	○
9	Neendakara	KE	2.65	1.65	1.88	1.77	150,000	2	75,000	-	40,000	○
10	Puthiappa	KE	3.08	1.58	1.91	1.75	80,000	-	26,667	-	-	○
11	Ratnagiri	MA	2.52	1.52	2.59	2.06	100,000	1	100,000	-	-	○
12	Kakinada	AP	2.70	2.45	3.85	3.15	20,000	3	6,667	656	6,687	○
13	Nizampatnam	AP	1.80	1.30	-	1.30	10,000	-	3,333	733	5,000	
14	Bhavanapadu	AP	2.28	1.53	1.85	1.69	50,000	1	50,000	-	-	○
15	Tuticorin	TN	4.90	1.80	2.05	1.93	80,000	-	26,667	416	18,315	○
16	Chinnamunom	TN	4.29	2.79	2.98	2.89	90,000	-	30,000	152	18,609	○
17	Vallinokkam	TN	2.80	2.30	2.60	2.45	75,000	-	25,000	17	6,382	○
18	Pazhayar	TN	1.80	0.90	1.10	1.00	11,200	-	2,733	449	6,606	
19	Tondi	TN	1.91	1.41	1.54	1.48	not clarified	-	-	26	7,076	
20	Mallipatnam	TN	1.79	1.04	1.16	1.10	3,600	-	1,200	403	7,468	
21	Kodikarai	TN	2.84	0.34	0.44	0.39	40,000	-	13,333	-	-	○
22	Dhamra	OR	2.30	1.80	2.50	2.15	30,000	-	10,000	-	-	○
23	Nuagahr	OR	2.40	2.15	2.55	2.35	15,000	-	5,000	-	-	○
24	Gopalpur	OR	3.57	3.07	3.58	3.33	30,000	-	10,000	-	-	○
25	Digha	WB	2.00	2.00	2.79	2.40	10,000	-	3,333	-	-	○
26	Fraserganji	WB	1.80	1.80	3.10	2.45	10,000	-	3,333	-	-	
						Sub Total (Over 2.0 m of Planned Depth)			569,210	9,230	533,677	
						Sub Total (Over 2.3 m of Operation Depth)			202,374	6,598	407,953	
						Sub Total (Over 2.4 m of Operation Depth)			186,124	-	-	

Name of State : GU ; Gujarat, KA ; Karnataka, kE ; Kerala, MA ; Maharashtra

AP ; Andhra Pradesh, TN ; Tamil Nadu, OR ; Orissa, WB ; West Bengal

(Source : FD, DAC, MOA)

harbours, the necessary amount of annual dredging applied by the dredger vessel of the project has to be calculated through the consideration of the following points:

① It is difficult to carry out maintenance dredging where the operation depths of fisheries harbours are extremely shallow as long as the present situation remains, even though they are applicable to maintenance dredging in terms of planned depth.

② Regarding fisheries harbours of which planned depths are over 2.0 m, the necessary amounts of annual maintenance dredging should be estimated by category of the operation depths and should be compared and examined.

③ Regarding fisheries harbours of which cycles of maintenance dredging are not clarified, the cycles of maintenance dredging are assumed every 3 years by considering it that maintenance dredging at some of the minor fisheries harbours in India has been performed every 3 years in the past.

As results of estimation based on Table 1., the necessary amount of required maintenance dredging and the number of applicable fisheries harbours by operation depth amongst the minor fisheries harbours of which planned depths are over 2.0 m are as follows:

Operation depth	Annual amount of required maintenance dredging	Applicable fisheries harbours
over 2.0 m	352,541 m³	15
over 2.1 m	252,541 m³	14
over 2.2 m	202,374 m³	11
over 2.3 m	202,374 m³	11
over 2.4 m	186,124 m³	9

Even though not all of the fisheries harbours may be targeted for actual maintenance dredging in this project, a dredger vessel with annual dredging capacity of around 200,000 m³ would be required.

3) Scale of a dredger vessel

When the scale of a dredger vessel for the project is determined, firstly the appropriateness of the structure of it by the differences of maximum draught should be examined and secondly the appropriateness of capability for dredging by the difference of hopper capacities should be examined and the appropriate scale should be determined.

The type of a vessel requested by the Government of India is a vessel with 2.5 m of maximum draught and 200 m³ of hopper capacities, but by taking it into account that the operation depth at most of minor fisheries harbours varies between 2.0 m and 2.5 m, the draught of a vessel for the project should be shallower in order to operate maintenance dredging at as many fisheries harbours as possible. The proper level of maximum draught in terms of vessels with 2.5 m, 2.0 m and 1.8m of maximum draught should be determined by comparison with propeller efficiency, the installment of equipment and the number of applicable fisheries harbours. To clarify the comparison, fixing 9 knots for speed and 200 m³ for hopper capacities as conditions, the structure of the vessels and horsepower of the main engines were calculated, and the comparison and examination were made. Regarding the scale of speed and the hopper capacities as conditions, the scales requested by India are adopted temporarily. Table 2. shows the characteristics of the structure in each vessel type and the results by examining the appropriateness are as follows:

① Submergence rate of propeller

The submergence rate of propeller is the value calculated by (propeller depth ÷ diameter of propeller) and indication for propeller efficiency to show the effect of conveying propulsive energy. To secure the adequate propeller efficiency, the value is generally required to be over 0.75. Taking this point into account, a vessel with 2.0 m or 2.5 m of maximum draught is considered appropriate.

② Distance between the surface of water and the upper edge of trunnion

The upper edge of trunnion which sucks up silt water will be positioned at 940 mm from the bottom of a vessel. To prevent cavitations upon sucking silt water, the distance between the surface of water and the upper edge of trunnion upon light load is preferable to be far. When the

weather is calm at the level 1 or 2 of the Beaufort scale, the reference height of waves is between 100 mm and 200 mm. Considering the situation, all types of the vessels keep the minimum clearance, but the design of a vessel with 1.8 m of maximum draught is in a serious condition.

③ Number of applicable fisheries harbours

The number of applicable fisheries harbours stands for the number of minor fisheries harbours of which operation depths are over the mean operation draught anticipating 50 cm of clearance. (See Table 1) The mean operation draught stands for the value of simple average of maximum draught and afterward-draught at starting dredging. Regarding a vessel with 2.5 m of maximum draught, the number of applicable fisheries harbours is considered to be extremely small.

As results of examination above, a vessel with 2.0 m of the maximum draught is considered to be appropriate for the project.

Table 2. Characteristics of the structure in each vessel type by the difference of maximum draught

Maximum draught	1.8 m	2.0 m	2.5 m
length x breadth x depth(m)	57 x 13.2 x 3.4	53 x 11.8 x 3.2	42 x 9.2 x 3.5
HP of main engine	700 HP x 2	550 HP x 2	300 HP x 2
total length / total breadth	4.32	4.49	4.57
total length / total depth	16.76	16.56	12.00
total breadth / total depth	7.33	5.90	3.68
draught on light load	1,146 mm	1,175 mm	1,302 mm
afterward-draught at starting dredging	1,571 mm	1,683 mm	1,984 mm
mean operation draught	1,686 mm	1,842 mm	2,242 mm
submergence rate of propeller	0.68	0.88	1.25
distance between surface of water and upper edge of trunnion on light load	206 mm	235 mm	362 mm
the number of applicable fisheries harbours	11	11	4

Through comparison with and examination on annual dredging ability by the difference of hopper capacities and the efficiency of operation , the appropriate hopper capacities are examined. To clarify the comparison, 9 knots for speed and 1,500 ㎥/hr. for the dredge pump power are fixed as the criteria. Under those criteria, the structure of a vessel and HP of a main engine were compared and examined. Table 3. shows the difference of dredging ability by hopper capabilities and the results of examination on the level of appropriate hopper capabilities are as follows:

① Annual dredging ability

The annual dredging ability in Table 3. is the ability of maintenance dredging operation in the state that the hopper is filled up by sucking silt water. However, the operation with lowering the overflow level, decreasing full of hopper capacities to 80 % and controlling the drop of draught will be required in this project, because the operation depths are shallow in most of minor fisheries harbours applying to the project. Consequently the dredging ability in the state of adjusted hopper capacities should be taken into account upon comparing the dredging ability of a dredger vessel for the annual amount of required maintenance dredging. Based on those points, as the annual amount of required maintenance dredging is 200,000 ㎥, a vessel with 200 ㎥ of hopper capacities is considered to have the appropriate dredging ability.

② Performance of operation

The hopper capacities become larger, the length, the breadth and the depth of a vessel become longer generally. In general, the length becomes longer, the seaworthiness is improved because the longer length decreases pitching, but the operation of a vessel becomes inconvenient. The breadth becomes wider, the stability is improved, but resistance is increased and the high HP is required. The changes in performance of a vessel by sizes of length and breadth has merits and demerits as aforementioned. The steerability affecting the performance of a vessel in operation is compared by the value tripling the length and the smaller value is the better sterility. Considering points aforementioned and the maintenance dredging operation in the comparably crowded minor fisheries harbours, the performance of a vessel with 100 ㎥ of hopper capacities is superior to that with 200 ㎥, but the difference of length is about 10 % and the difference performance is not outstanding.

As the results of examination above, a vessel with 2.0 m of maximum draught and 200 m³ of hopper capacities is judged as the appropriate dredger vessel for the project.

Table 3. Comparison of dredging ability by the difference of hopper capacities

Hopper capacities	100 m³	150 m³	200 m³
length x breadth x depth	47 x 10.2 x 2.8	50 x 11.0 x 3.0	53 x 11.8 x 3.2
HP of main engine	500 HP x 2	550 HP x 2	550 HP x 2
amount of silt dredged by one dredging cycle	40.7 m³	61.1 m³	81.4 m³
annual frequency of dredging cycle	3,686	3,234	2,926
ability of annual dredging	150,000 m³	198,000 m³	238,000 m³
ability of annual dredging with adjusted hopper capacities	120,000 m³	158,000 m³	190,000 m³

Remark: the calculation of ability of annual dredging

① Calculated by the formula (ability of annual dredging = amount of silt dredged by one dredging cycle x annual frequency of dredging cycle)

② Amount of silt dredged by one dredging cycle: the amount of silt in the silt water of dredging on full load

1) Calculated by the following formula (Hopper capacities x solid concentration in hopper)

2) Solid concentration in hopper is calculated by the following formula:

$$\frac{(\text{MMSG}) - (\text{seawater specific gravity})}{(\text{ASBD}) - (\text{seawater specific gravity})}$$

The each value above is as follows and therefore solid concentration is 0.407.

ASBD (Average saturated bulk density) : 1.70 (the value varies between 1.5 and 2.0 according to the difference of silt applying to dredging, and in case of sand the value usually sets 1.80 in Japan, but the value above is utilized by DCI because sand in India contains much silt.)

MMSG (Mean mixture specific gravity) : 1.30 (the value is set by the target percentage of the silt and the value usually sets 1.40 in Japan, but the value above is utilized by DCI because sand in India contains much silt.)

Seawater specific gravity : 1.025

3) By the values above, the amount of silt dredged by one dredging cycle is 40.7 ㎥ with 100 ㎥, 61.1 ㎥ with 150 ㎥ and 81.4 ㎥ with 200 ㎥ of hopper capacities.

③ Annual frequency of dredging cycle

1) Calculated by the following formula (annual frequency of dredging cycle = annual operating hours of dredging ÷ hours of dredging in one cycle)

2) Annual operating hours of dredging

By the dredging vessel operation plans of India (16 hours / day, 240 days / year), the annual operation hours are 3,840 hours, but as the hours for travel should be anticipated, the annual operating hours have to be 80 % of the total. Therefore 3,072 hours / year are set up.

3) Hours of dredging in one cycle : hours required by the maximum load of silt water and the completion of dumping

Calculated by the formula (suction hours of silt water + dumping hours of silt)

Suction hours of silt water :

Suction hours of silt water = amount of required silt suction ÷ dredge pump power + operation preparation interval

Amount of required silt suction = (the amount of silt water by dredging / cycle) ÷ (the rate of silt) × (overflow supplement ratio)

The rate of silt : 0.15 (the value stands for the rate of silt contained in silt water and measured by the silt meter during dredging operation. It is estimated as approximately 15 % from the past experiences)

Overflow supplement ratio : 1.15 (the value stands for the rate of a part of silt which is swept away with overflow water during suction. To supplement the lost silt, approximately 15 % of the amount of silt by dredging is usually anticipated.)

Dredge pump power : 1,500 ㎥ / hour

Operation preparation interval : 13 minutes. (about 5 minutes are required for both start up and cut off and 3 minutes are anticipated for checking hours.)

By the formulas and values above, the amount of required silt suction is 312 ㎥ with 100 ㎥, 468 ㎥ with 150 ㎥ and 624 ㎥ with 200 ㎥ of hopper capacities. By these amounts, the suction hours of silt water is 25 minutes for 100 ㎥, 32 minutes for 150 ㎥ and 38 minutes for 200 ㎥ of hopper capacities.

Dumping hours of silt :
Dumping hours of silt = traveling hours + opening and closing hours of a hopper door)

Traveling hours : 20 minutes (As the average distance between the dredging site and dumping site is 2 km, traveling hours by the speed of 8 knots for going and 9 knots for returning are calculated as well as anticipated preparing hours before sailing.)

Opening an closing hours of a hopper door : 5 minutes (3 minutes for opening and closing and 2 minutes for checking dumping operation are anticipated.)

Therefore, regardless of hopper capacities, 25 minutes for dumping hours are required.

By the values calculated above, hours of dredging in one cycle are 50

minutes with 100 ㎥, 57 minutes with 150 ㎥ and 63 minutes with 200 ㎥ of hopper capacities.

4) By the hours calculated so far, the annual frequency of dredging cycle is about 3,686 cycles with 100 ㎥, 3,234 cycles with 150 ㎥ and 2,926 cycles with 200 ㎥ of hopper capacities.

④ The results of those calculations, the ability of annual dredging is 150,000 ㎥ with 100 ㎥, 198,000 ㎥ with 150 ㎥ and 238,000 ㎥ with 200 ㎥ of hopper capacities. The ability upon 80 % of full hopper capacities adjusted by overflow is about 120,000 ㎥, 158,000 ㎥ and 190,000 ㎥ respectively.

2-3-2 Basic Design

(1) Basic Conditions

1) Type of a vessel

A vessel for the project is to be designed as a self-propelled TSHD dredger vessel and an underwater pump as its backup dredging device is to be set at the forward deck. Because of that, the vessel type of quarter deck is selected for the convenience of the operation of the vessel and dredging and the efficient utilization of accommodation on the deck.

2) Applied regulations and the classification of a vessel

① Regulations by Nippon Kaiji Kyokai (in reference to basic points for the design of a vessel such as the strength and the structure, the equipment and the fittings)

② Acquisition of NS*MNS (the classification passing the inspection of a vessel during construction by Nippon Kaiji Kyokai)

③ Regulations relevant to the present laws in India (fire prevention, the extinction of a fire and life saving appliance)

④ International Load Line Convention, 1966

⑤ International Convention of Measurement of Ship, 1969

⑥ Convention on International Regulation for Preventing Collision at Sea, 1972

⑦ Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978

3) Conditions of temperature

The machinery of a vessel for the project is to be designed to fulfill the designed capacity under the following circumstances:

Temperature	35 ℃
Seawater temperature	32 ℃
Relative moisture	70 %

4) Conditions upon navigation

According to the scale and the navigation plans of a vessel for the project, the vessel is to be designed to hold the capacities and abilities as follows:

Dredging system: one-sided TSHD and hanging type of a underwater pump

Dredging site and targets : minor fisheries harbours in India

Hopper capacity : approximately 200 m^3

Fuel tank capacity : (15 days dredging operation + 25 % for margin) + 5 days sailing

Fresh water tank capacity : (15 days dredging operation + 25 % for margin) + 5 days sailing

Crew capacity : 22 persons

Operation days per year and hours per day : 240 days / year, 16 hours / day

5) Conditions of performance

To improve the steerability and the turning ability of a vessel for the project in small dredging sites, the conditions are designed as follows:

Tactical diameter : (length × 1/2) × 1.1 or less

Bowthruster : Equipment servicing maximum propulsive energy amongst these to be able to be installed at light draught condition.

(2) Determination of principal sizes

The principal sizes of a vessel should be determined by considering the stability, the performance of propelling and operation on the whole, and positioning well-balanced devices and equipment after the calculations of the capacities of tanks under a deck, the capacity of a engine room and the capacities of storage and steering rooms, and further more the size of a deck room on the deck.

1) Ratio of hopper capacity (V) and cubic number (CN)

The ratio of V and CN in the similar TSHD dredger vessels with the shallow draught to a vessel for the project is as follows :

$V / CN = 0.109 \sim 0.137$

The ratio of V / CN becomes smaller, if a vessel and its hopper capacity are small and the capacities of other tanks becomes bigger. As the capacities of tanks in a vessel for the project are bigger than that similar vessel, the ratio of V / CN is to be 0.1.

2) Length between perpendicular (L)

The larger L becomes, the less a vessel resists and the more performance of propeller improved, but the tactical diameter becomes bigger. Examining the charts of minor fisheries harbours, a vessel with L = 53 m or less is confirmed to be preferable.

Therefore L should be 53 m.

3) Breadth (B) and depth (D) of a vessel

By $V = 200\ m^3$, $V / CN = 0.1$,

$CN = V / 0.1 = 200 / 0.1 = 2{,}000\ m^3$

and

by $CN = L \times B \times D$, $L = 53$ m

$B \times D = CN / L = 2{,}000 / 53 = 37.74$

On the other hand, the average value of L / B of the similar vessel is 4.65, and the planned speed is high and the value is as big as the large vessels. As a vessel for the project is small and the planned speed is low, L / B is to be 4.5.

By L / B = 4.5, L = 53 m,
B = L / 4.5 = 53 / 4.5 = 11.78 m

D is calculated as follows :
By B × D = 37.74, B = 11.78,
D = 37.74 / B = 37.74 / 11.78 = 3.20 m

4) Planned maximum draught (d)

As the result of examining the scale for the project, the maximum draught to be 2 m.

5) Examination of the rate of principal sizes

By the values calculated, the principal sizes, L, B, D and d are to be set as follows:
L (length between perpendicular) = 53.00 m
B (breadth) = 11.80 m
D (depth) = 3.20 m
d (planned maximum draught) = 2.0 m

By the figures above, the rate of L, B, D and d are as follows:
L / B = 4.49
B/ d = 5.90
L / D = 16.56
B / D = 3.69

The results of examining and evaluating the balance of L, B, D and d are as foltows:

① L / B = 4.49

The shape of a vessel is slightly stocky but the vessel is qualified for

this scale of operation and appropriate. However, noting the performance of its going straight, the rudder area has to be large or an afterward fixed fin should be equipped.

② B / d = 5.90

The rate is slightly big, compared to those of general vessels, but it is within the limit. Noting the strength of hull construction, the edge of opening part should be structured to eliminate stress concentration.

③ L / D = 16. 56

The rate is rather big, compared to those of general vessels, and it reaches to the limit. That is because the breadth is rather short, compared to the length between perpendicular. It is difficult to be improved more owing to the limit of the draught. Therefore, in the event of designing, especially the longitudinal strength at hopper should be well reinforced.

④ B / D = 3.69

The rate shows it that the stability has enough margin.

5) Principal sizes

As the results of examination aforementioned, there are some aspects inferior to the other types of vessels, but, as a whole, they are within the allowable limits. Therefore the value of each size obtained by the examination should be adopted.

(3) Plan for Hull Department

1) Speed and HP of a main engine

In case of a vessels of which block coefficient is over 0.80 like a vessel for the project, the wave resistance increases on the very point of passing over 0.2 of the fraud number. It is economical that the planned speed should be established by setting the fraud number at around 0.2.

The fraud number is the value which is the planned speed (V' m / second) is divided by the square root of the value multiplied the length on water line (L') by the acceleration of gravity ($V' / \sqrt{L' \cdot g}$), and in case of

a vessel for the project, the length on water line is about 55 m and the maximum value approximately calculated is as follows:

$V' = 0.2 \times \sqrt{L' \cdot g}$
$= 0.2 \times \{$ square root of $(55 \times 9.8) \}$
$= 4.64$ m / second
by 1 knot = 0.514 m / second,
V (knot) = 4.64 / 0.514 = 9.03 knots

Consequently, the planned speed is about 9 knots.

The HP of a main engine is determined by calculating the resistance of a vessel caused by the speed and adding the margin for the propeller efficiency and the circumstances.

The formula represents (resistance × speed ÷ propeller efficiency = output) and the followings are the results of calculation :

Imposing conditions ;

displacement	approximately 1,015 tons
block coefficient	approximately 0.83
wet surface area	approximately 700 m²
sea margin	15 %
main engine margin	10 %

HP of a main engine on sailing ;

speed (knot)	8.5	9.0	9.5
necessary HP	800	1,030	1,350
HP of a main engine	889	1,144	1,500

Consequently, the HP of a main engine is planned by 550 PS × 2 engines = 1,100 PS

2) Hopper capacity

According to the results of examination the scale of a vessel for the project, the hopper capacity is planned to set approximately 200 m³, but the

final value of the capacity should be the appropriate value for the design of vessel construction. Furthermore, an overflow control device is to be equipped in order to improve the dredging operation at the shallow depth of sea.

3) Fuel tank capacity

The fuel tank capacity should be calculated by the amount of fuel oil consumption for the operation plan of a vessel for the project. Furthermore considering the difficulty in providing a bunker port, the margin against the maximum fuel oil consumption without refueling, tank loading ration, then the fuel tank capacity should be determined.

The amount of fuel oil consumption (ℓ / day) is calculated as follows:

the amount of fuel oil consumption = HP of engines × load factor × fuel oil consumption ratio (kg / hour · HP) × 1 / specific gravity × operating hours (hours / day)

157 gr / PS / hour is adopted as the fuel oil consumption rate of main engines (550 PS × 2 engines), 165 gr / PS / hour is adopted for other engines such as generator engines (180 PS × 2 engines), a engine for dredging pumps (200 PS × 1) and a engine for bowthruster, the fuel oil consumption / day is calculated as follows :

[Main engines]

PS × engines	Traveling	Dredging operation
550 × 2	550 × 2 × 0.9 × 0.157 × 1 / 0.84 × 24 = 4,441 ℓ / day	(dumping) 550 × 2 × 0.9 × 0.157 × 1 / 0.84 × 5.33 = 986 ℓ / day (dredging) 550 × 2 × 0.4 × 0.157 × 1 / 0.84 × 10.13 = 833 ℓ / day (Total of main engines) 986 + 833 = 1,819 ℓ / day

[Generator engines]

PS × engines	Traveling	Dredging operation
180 × 2	180 × 1 × 0.85 × 0.165 × 1 / 0.84 × 24 = 721 ℓ / day	(dredging) 180 × 2 × 0.8 × 0.165 × 1 / 0.84 × 16 = 905 ℓ / day (mooring) 180 × 1 × 0.4 × 0.165 × 1 / 0.84 × 8 = 113 ℓ / day (Total of generator engines) 905 + 113 = 1,018 ℓ / day

[Engines for dredging pumps]

PS × engines	Traveling	Dredging operation
200 x 1	-	200 x 0.9 x 0.165 x 1 / 0.84 x 10.13 = 358 ℓ / day

[Engine for bowthruster]

PS x engines	Traveling	Dredging operation
200 x 1	-	200 x 0.5 x 0.165 x 1 / 0.84 x 10.7= 210 ℓ / day

Total	5,162 ℓ / day	3,405 ℓ / day

In case of 15 days of dredging operation and 25 % of margin, and 5 days of sailing, the capacity of a necessary fuel oil tank is as follows :

The amount of fuel oil consumption during dredging operation

3,405 ℓ / day x 15 days x 1 / 1,000 = 51.1 kℓ

For taking 25 % of margin

51,000 ℓ / day x 0.25 x 1 / 1,000 = 12.8 kℓ

The amount of fuel oil consumption during sailing

5,162 ℓ / day x 5 days x 1 / 1,000 = 25.8 kℓ

The total amount of necessary fuel oil

89.7 kℓ

For taking 10 % of the dead oil ratio in the tank

89.7 x 1.1 = 99.0 m³

Considering 85 % of the fuel loading ratio

$$99.0 \times 1 / 0.85 = 116.5 \text{ m}^3$$

Consequently, as the capacity of a fuel oil tank is approximately 120 m^3 , the bigger tank becomes, the more efficient vessel runs, the final value of the capacity should be the appropriate value for the design of vessel construction as well as hopper capacity.

4) Capacity of a fresh water tank

Provided that the amount of fresh water consumption per person is 180 ℓ , the amount of necessary fresh water is calculated as follows:

The amount of fresh water consumption during dredging operation :

$$0.18 \text{ m}^3 \times 17 \text{ persons} \times 15 \text{ days} = 45.9 \text{ m}^3$$

For taking 25 % of margin

$$45.9 \text{ m}^3 \times 0.25 = 11.5 \text{ m}^3$$

The amount of fresh water consumption during sailing :

$$0.18 \times \text{m}^3 \times 22 \text{ persons} \times 5 \text{ days} = 19.8 \text{ m}^3$$

Total 77.2 m^3

By the figures above, the fresh water tank with 80 m^3 of the capacity should be secured.

5) Structure of a vessel

To secure the effective performance of operation and the efficient strength of a vessel, the vessel should be total welding and longitudinal frame construction. The classified materials should be used as the vessel steel and oscillation and stress concentration should be taken care. As most of the operation areas for the project are shallow, the bottom plate should be thicker than the standard.

6) Hull fitting of a vessel

① Accommodation

By the operation style of DCI who will engage in operation of a vessel for the project, the numbers of constituent members are different between

dredging operation and sailing. In case of a vessel for the project, 18 persons as sailing personnel and 17 persons for dredging personnel are required. The most of personnel should overlap both of the jobs, but a part of them should be engaged in the specialized work. The constituent members, the number of personnel and the classification are shown below, and the total number of personnel is 22 persons. As a radio officer is able to be deleted after 1st of February, 1999 according to the international regulations, the members for the vessel is arranged without a radio officer. As the role of the radio officer will be covered by deck officers who take relevant lectures, the operation of the vessel is considered to have no difficulty without a radio officer.

	Classification	Sailing	Dredging	Total
Captain	A	1	1	1
Deck officers	B	2	1	2
Chief engineer	A	1	1	1
Engineers	B	2	1	2
Wireman	C	1	1	1
Seamen	D	6	4	6
Oiler	D	3	2	3
Cook and Steward	D	2	2	2
Petty officers for dredging	C	0	2	2
Workers for dredging	D	0	2	2
Total		18	17	22

According to the agreement between DCI and Seamen's association, the classification and the specifications of rooms are shown below. The design of positioning accommodation follows those specifications, but the air conditioning should be central air conditioning system.

Classification	Specifications
A :	Private room with bathroom / toilet / air conditioner
B :	Private room, wash basin / desk / chair / water jug
C :	Room with 2 beds / desk / chair / water jug
D :	Room with 4 beds / desk / chair / water jug

② Life-saving appliance

2 units of inflatable type life raft and one set of rescue boat should be equipped, following the life saving regulations.

③ Fire Extinguishing Appliance

Following the safety regulations, the engine room should be quipped with the carbonic acid gas blow system and the accommodation area should be equipped with the seawater hydrant or the portable fire extinguishers.

④ Deck machinery

To improve the efficiency of dredging operation, an electric anchor crane and capstan at the stern should be quipped.

(4) Plan for Dredging Department

1) Drag-arm

To improve the performance of dredging operation in the narrow routes, a drag-arm should be single arm and positioned at the starboard of a vessel.

2) Trunnion winch and drag-arm winch

An electric trunnion winch and a drag-arm winch for the elevation of drag-arm should be equipped on the deck and be remote controlled.

3) Dredging pump

A dredging pump of 1,500 ㎥ / hour should be fixed adjacent to

hopper and be a diesel engine driven type for the economical reasons. The performance of the pump could be watched from a steering room.

4) Swell compensator

A swell compensator should be equipped with the tip of a drag-arm to follow the uneven bottom of the sea and its stroke should be remote controlled from a steering room.

5) Bowthruster

To perform steering and maintain the minute position of a vessel, the bowthruster should be equipped at the bow side. The specifications are as follows :

Nozzle duct diameter	: approximately 630 mm
Propeller thrust	: approximately 1,400 kg

As prime movers, electric motors or hydraulic motors are available. Considering the simplicity of the spinning control and maintenance, the hydraulic motor should be selected and the hydraulic source should be a hydraulic pump attached to the diesel engine.

6) Backup dredging devices

To perform dredging operation at the corners of basin in fisheries harbours or at the areas where depth of water is too shallow for the planned vessel to enter, the hanging type of an automatic underwater pump should be equipped at the forward deck. The components of the pump are as follows :

Underwater pump	: Electric powered, approximately 350 m^3 / hour x 1 unit
Crane	: expandable / electric hydraulic type, approximately 1.3 tons x 1 unit
Accessories	: portable flexible discharge pipe, joint, approximately 40 m

(5) Plan for Engine Department

1) Main engines

The main engines should be 2 units of middle speed engines by considering the shallow draught of a vessel and economical reasons, and the special attention should be paid to the suction air and the heat exchanger to cope with hot areas. In the reduction gear, the reversing gear should be quipped to be able to reverse the propeller without stopping engines, and the safety and the swiftness of a planned vessel operation will be intended. Switching the crutch and spin control should be remote controlled from the steering room and the necessary safety devices should be equipped, and the preservation of engines should be intended. The output of main engines is planned to be 2 units of 550 HP.

2) Propulsion

The number of propellers should be 2 sets because of the particularity of the afterward-draught and the shape of a vessel for the project, and each of 2 propellers should be connected directly with each engine. The system of propeller should be fixed pitch by considering the economical aspect and the simple operation, and its materials should be aluminum bronze or equivalent materials to resist cavitation. The stern tube should be oil bath beaving to prevent the effect of silt.

3) Generator engines

The number of the generator engines should be 2 units of 180 HP. Sailing requires only one but both of them are planned to run to supply enough power for the dredging operation.

4) Engine for the dredging pump.

The engine for the dredging pump should be 200 HP, and the air damper coupling should be set for the pump in order to prevent the unpredictable damage caused by the load.

5) Engine for bowthruster

The engine for the bowthruster should be 200 HP, and the type of the engine should be the same as the one for the dredging pump for easy

maintenance.

(6) Plan for Electric Department

1) Voltage and frequency

To meet the situations of national electric facilities in India, the voltage and the frequency of a vessel for the project are as follows:

Primary power supply : 380 V, 50 Hz, 3 wire system

Secondary power supply : 225 V, 50 Hz, 3 wire system

2) Power generator

The power generator should be 100 kW and the device which enables parallel operation.

3) Navigation and Radio Equipment

The followings should be equipped :

① Radar	:1 unit
② DGPS	
(Differential Global Positioning System)	:1 unit
③ Echo sounder	:1 unit
④ SSB Radio Telephone	:1 unit
⑤ VHF Radio Telephone	:1 unit
⑥ Narvtex Receiver	:1 unit
⑦ Search and Rescue Radar Transponder	:1 unit
⑧ Emergency Position Indicating Radio Beacon	:1 unit
⑨ Two-way VHF Radio Telephone	:1 unit

4) Dredging measures and meters

The followings should be equipped :

① Drag-arm Depth Indicator	:1 unit
② Displacement and Draught Indicator	:1 unit
③ Flow Meter	:1 unit

④ Concentration Meter and Production Meter :1 unit

(7) Principal particulars of a vessel for the project

① Principal particulars of a vessel for the project

The scale and the principal particulars of a vessel for the project are as follows :

Vessel type	:	Afterdeck type TSHD dredger vessel
Gross tonnage	:	approximately 710 tons
Principal sizes		
Length / overall	:	approximately 56.50 m
Length / b.p.	:	approximately 53.00 m
Breadth / moulded	:	approximately 11.80 m
Depth / moulded	:	approximately 3.20 m
Tank capacities		
Fresh water tank	:	approximately 80 m^3
Fuel tank	:	approximately 120 m^3
Hopper	:	approximately 200 m^3
Crew capacity	:	22 persons
Crew accommodation		
Private room	:	6 rooms
Room for 2 persons	:	2 rooms
Room for 4 persons	:	3 rooms
Galley	:	1 room
Mess room	:	2 rooms (For officers x 1, for crew x 1)
Toilet / shower	:	3 places
Main engines	:	2 units, approximately 550 HP
Propeller	:	2 sets, fixed pitch propeller, 1.3 m in diameter
Sailing speed	:	approximately 9 knots
Auxiliary engines /		
Power generator	:	2 units , approximately 180 HP
Auxiliary engine /		
Dredging pump	:	1 unit, approximately 200 HP

Auxiliary engine /		
Bowthruster	:	1 unit , approximately 200 HP
Dredging equipment		
Hopper door	:	6 units, hydraulic drive, box type
Drag-arm	:	1 unit, steel pipe, for 7 m of dredging depth
Draghead	:	1 unit, Califomia type
Dredging pump	:	1 unit, diesel engine drive, approximately 1,500 m³ / hour
Draghead winch	:	1 unit, electrically powered approximately 3.5 tons x 9 m / minute
Trunnion winch	:	1 unit, electrically powered approximately 3.5 tons x 4.5 m / minute
Backup dredging device		
Underwater pump	:	1 unit, electrically powered approximately 350 m³ / hour
Discharge pipe and coupling	:	flexible type, approximately 40 m
Mooring device	:	1 unit, electrically powered approximately 0.8 tons x 9 m / minute
Crane	:	1 unit, electrically powered hydraulic, approximately 1.3 tons
Dredging measures • meters		
Drag-arm depth indicators	:	1 unit, electric and air type
Displacement and draught indicator	:	1 unit, electric and air type
Flow meter	:	1 unit, electromaginetical type
Concentration meter and production meter	:	1 unit, isotope type
Navigation • radio wave equipment		
Radar	:	1 unit, 1 cm wave, approximately 10 kw

GPS	:	1 unit, Deferential GPS type
Echo sounder	:	1 unit, single frequency, for shallow water, recording type
SSB Radio Telephone	:	1 unit, 10 W
VHF Radio Telephone	:	1 unit, 25 channel, 25 W
Narvtex Receiver	:	1 unit, 518 MHz
Search and Rescue Radar Transponder	:	1 unit, 9 MHz,
Emergency Position Indicating Radio Beacon	:	1 unit, 406 MHz, 5 W
Two-way VHF Radio Telephone	:	1 unit, 3 channel, 154 MHz

② Equipment

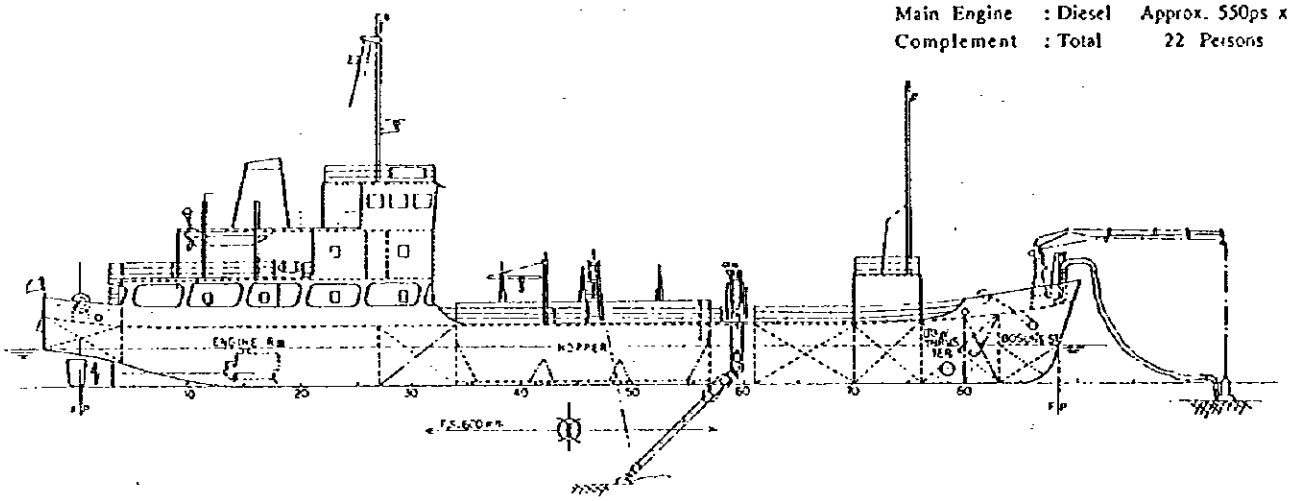
Spareparts	:	1 lot

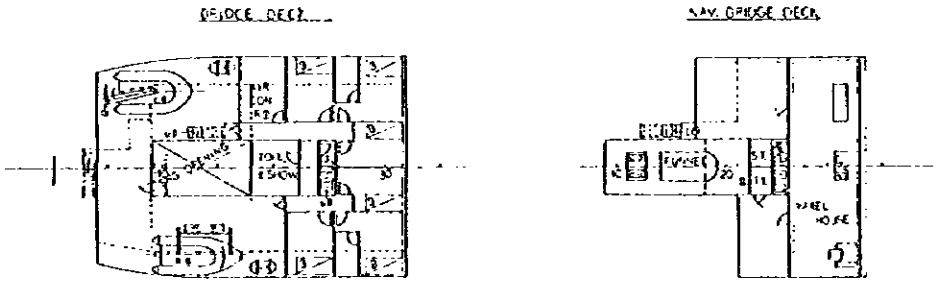
GENERAL ARRANGEMENT

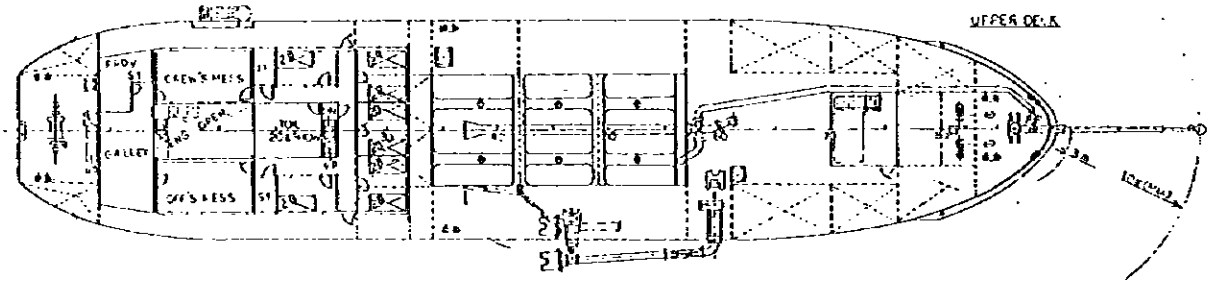
(SCALE: 1/200)

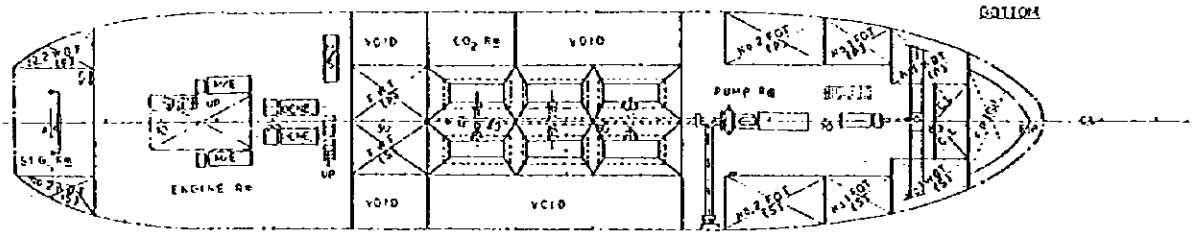
PRINCIPAL PARTICULARS

L oa	: Approx.	56.5	m
L bp	:	53.00	m
B mld	:	11.80	m
D mld	:	3.20	m
d mld	:	2.00	m
Gross Tonnage	: Aprrox.	710	tons
Main Engine	: Diesel	Approx. 550ps x 2 sets	
Complement	: Total	22	Persons









CHAPTER 3 IMPLEMENTATION PLAN

3-1 Implementation Plan

3-1-1 Implementation Concept

This project aims to perform maintenance dredging by a TSHD dredger vessel at the channels and the basins of the related minor fisheries harbours located along the east and the west coasts of India. It is required for the vessel to decrease its weight and to keep as small trim as possible to secure the safe dredging operation as well as the enough stability and seaworthiness.

It is also required to improve the disorder of flow line to its propeller and to secure the efficient longitudinal and transverse strength, because of the shallow draught. To meet these requirements, the high level technique is required for construction of the vessel.

Consequently the vessel should be constructed by the dockyard that has the achievement and the technique of the TSHD dredger vessel similar with the vessel for the project and has enough technical personnel.

3-1-2 Implementation Conditions

The following points should be considered upon implementation

① Trim

If the distance between the keel of a vessel and the bottom of the sea is short, in general, the flow line to the propeller is thrown into disorder. In case of the extreme trim, there could be danger in the bottom of a vessel touching the bottom of the sea. For those reasons, positioning the tanks of fuel, freshwater, hopper, ballast, etc. and balancing the weight of the equipment should be carefully considered.

② Flow to Propeller

If the ratio of the breadth and the depth is large as the vessel for the project and the keel clearance is small, the cavitation could be caused upon the

propellers. To solve this problem, a skeg should be equipped with the stern hull plate, and its type and adequate positions should be confirmed through the tank experiment.

③ Reinforcement of the vessel

The shape of the vessel for the project has disadvantage in rigidity. Because of that, the stress concentrates especially on the corner of the opening of the vessel, so that the adequate reinforcement should be considered.

3-1-3 Scope of Works

When the project is implemented by the Japan's grant aid assistance, the followings are responsibilities shared by Japan and India, and the necessary expenditure should be covered by the responsible country.

(1) Responsibility shared by Japan

① Supervising consulting services such as detail design of the vessel for the project, tendering assistant service, construction work supervision and technical assistance at the delivery.

② Construction of the vessel in Japan, procurement of accessories and spare parts and execution of necessary inspections.

③ After the completion of construction, taking the vessel for the project to Vishakhapatnam, India.

(2) Responsibility shared by India

① Acquisition of necessary permissions and licenses required for implementation of the project, construction of the vessel for the project and the ownership of the vessel.

② Acquisition of the provisional national paper of the vessel and other documents required for taking the vessel to India.

③ Securing safety space for mooring the vessel at Vishakhapatnam.

④ To go through the procedures for entering Vishakhapatnam port, to clear customs for the vessel and its attached equipment and to go through the procedures for registration of the vessel.

⑤ To go through the procedures for securing the site of dredging trials and acquisition of necessary permissions.

3-1-4 Consultant Supervision

Based on the basic design, a consultant from Japan will engage in detail designing of the vessel for the project, assist the implementation body in execution of the tender, conclusion of the construction contracts, examination and approval of the construction drawings, construction work supervision, inspection and delivery throughout.

During the period of construction, construction work supervision should be executed by the technician such as construction of the vessel, fitting, engine fitting, dredging equipment fitting, etc., the supervision of construction should be executed such as attending inspection, etc. and the necessary instruction, advice and suggestions should be indicated.

3-1-5 Procurement Plan

Many of existing dredger vessels owned by DCI are constructed in Holland, and the equipment was mainly made in Europe, but acoustic equipment was mainly made in Japan. Regarding procurement of spare parts for the equipment, they are mostly imported from foreign countries through the local agencies. Consequently crew are rather familiar with the products of Europe, but there are not technical differences between the products of Europe and those of Japan with regard to acquisition of spare parts. On the other hand, when the equipment for the vessel for the project is imported from foreign manufacturers that have no agencies in Japan, several different kinds of restrictions would be expected such as technical negotiations, equipment inspections, delivery, implementation period, etc.

Therefore, regarding procurement of equipment, the products of European manufacturers that have agencies in Japan or the products of Japan should basically be selected, and, upon the selection of those products, the manufacturers, which have branches or local agencies in India or in Singapore and can provide technical services such as supplement of spare parts and maintenance, should be selected. To avoid the unnecessary confusion after the equipment being installed, the quality, capacity and ability of the equipment should be inspected before it is installed.

3-1-6 Implementation Schedule

It will take approximately 4.5 months for detail design phase including tender and approximately 11.5 months for procurement phase including drawings approval, vessel construction, inspection, trial, taking the vessel to India and delivery. The implementation schedule is shown in Fig. 1.

3-1-7 Obligations of Recipient Country

The following necessary measures should be taken by the Government of India on condition that the Grant Aid by the Government of Japan is extended to the Project.

1. To ensure tax exemption and customs clearance of the products purchased under the Japan's Grant Aid at ports of disembarkation in India.

2. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in India with respect to the supply of the products and services under the Verified Contracts.

3. To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts such facilities as may be necessary for their entry into India and stay therein for the performance of their work.

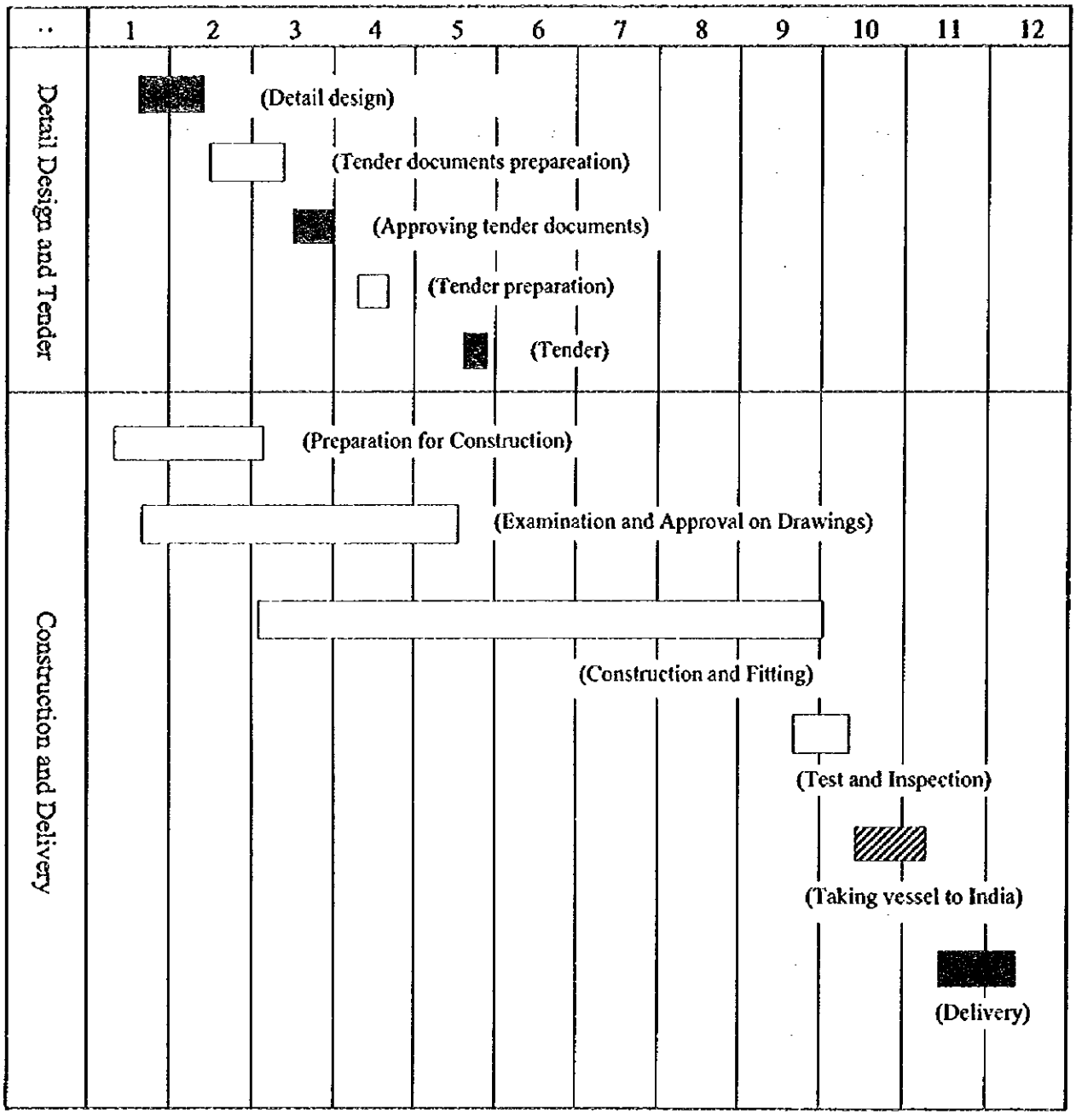
4. To bear commissions, namely the advising commission of the Authorization to Pay (A / P) and payment commissions, to the Japanese foreign exchange bank for its banking services based upon the Banking Arrangement (B / A).

5. To provide necessary permissions, licenses and other authorization for implementing the Project, if necessary.

6. To ensure that the vessel purchased under the Japan's Grant Aid be maintained and used properly and effectively for the Project.

7. To bear all the expenses, other than those covered by the Grant Aid, necessary for the Project.

Fig. 1 Implementation Schedule



3-2 Operation and Maintenance Plan

The operation and repair and maintenance of the vessel for the project should be executed by DCI entrusted by FD, DAC, MOA. DCI has performed capital and maintenance dredging at major and minor commercial harbours since it was founded. At present, it owes 8 TSHD dredger vessels, 4 CSD dredger vessels and 3 small CSD dredger vessels for inland use and main dredger vessels of all are TSHD. The average annual operation days of TSHD dredger vessels per vessel are more than 250 days and the annual capability of dredging is 43,000,000 m^3. The age of 4 vessels of those 8 TSHD dredger vessels is more than 25 years and vessels are evaluated to be well maintained by DCI and its crew is evaluated to have very high technical standard, considering equipping comparably high control system, measures and meters related to dredging and operation. DCI is run by 548 of office workers and 795 seamen. The appropriate maintenance and management of the vessel for the project is expected from past experience and achievement, the high technical standard of crew and manpower of management department.

The home port of the vessel for the project is Vishakhapatnam and this port is one of the three major commercial ports as well as Calcutta and Madras and the major fisheries harbour is established as annex to it. Regular inspection and repair are to be performed at national Hindustan Shipyard, the biggest shipyard in the east coast, close to Vishakhapatnam port. This shipyard is internationally well known and owes a shipbuilding yard, a repair factory and a structure construction factory. Over 450 personnel work for the repair factory and it is equipped with a dry dock (length : 244 m $\times$ breadth : 38 m) and ship building birth cum dry dock (length : 200 m $\times$ breadth : 53 m), and in total 7 jibs and gantry cranes of which abilities vary minimum 10 tons to maximum 150 tons. The repairing quay is 1,022 m long and in total 8 cranes are quipped there of which abilities vary minimum 5 tons to maximum 50 tons. Consequently there is not any potential problem for repair and maintenance of the heavy weight dredging equipment of the vessel for the project. As repair factories for an iron shop, boiler manufacturing, tube, fitting, machinery, electricity, carpenter etc. are also equipped, the other repairs except navigation equipment and radio wave devices is possible. Regarding navigation equipment and radio wave devices, the technical service will be provided by the makers that has agencies in Bombay. Most of the parts for multipurpose devices are able to be supplied from Singapore.

To maintain the classification, the inspection by Classification Society is required, but there would be no problem because the entrusted inspector of Nippon Kaiji Kyokai is stationed at Vishakhapatnam port.

A vessel for the project is occasionally to be repaired at the repairing facility in the west coast in order to perform dredging at minor fisheries harbours located along the east and the west coasts of India. Along the west coast there are adequate repairing facilities in Bombay and Cochin, and the entrusted inspectors of Nippon Kaiji Kyokai are positioned in both cities and inspection and repair of the vessel could be performed without any problem.

CHAPTER 4 PROJECT EVALUATION AND RECOMMENDATION

4-1 Project Effect

This project is positioned in the maintenance dredging plan by the operation of a dredger vessel, in the programme performed by FD, DAC, MOA to establish the maintenance dredging system at minor fisheries harbours.

Siltation is taking place at most of these minor fisheries harbours and this situation obstructs boats approaching the harbours and navigating in terms of utilization of facilities. Nonetheless, as a matter of fact, the affiliates in charge of maintenance dredging have no practical method to perform necessary maintenance dredging by themselves. Under those situations, procurement of a dredger vessel by implementation of the project will present a practical method for maintenance dredging. The numbers of minor fisheries harbours requiring maintenance dredging are 26 and not all of them could be applied to maintenance dredging by the vessel for the project because of the different situations of siltation. However, the project is to provide eleven harbours amongst them the efficient solution in terms of maintenance dredging, and is considered to improve the circumstances for utilization of these harbours and contribute to the promotion of fishery industries.

The followings are the practical effects by the project :

① Realization of maintenance dredging in minor fisheries harbours

Though it is necessary to conduct maintenance dredging in minor fisheries harbours due to problems of siltation, in the present situation it is not possible to perform proper counter-measures because of lack of an appropriate dredger vessel for maintenance dredging in minor fisheries harbours. Introduction of the dredger vessel by this project will present concrete counter-measures against maintenance dredging, which will enable the Government of India to solve the siltation problem.

② Recovery of the planned depth of minor fisheries harbours

The amount of annual maintenance dredging required in 21 minor fisheries harbours of which planned depth is over 2.0 m, which are targeted by Indian side for maintenance dredging by the operation of the dredger vessel, is

approximately 570,000 m³. However, amongst the fisheries harbours of which planned depth is over 2.0 m, there are many harbours where siltation is considerable and operation depths are shallow. It is not very effective to utilize the project dredger vessel immediately in those fisheries harbours. In those fisheries harbours, the bottom of the sea should be dug by dredging equipment for capital dredging until the appropriate operation depth is secured and after that the project dredger vessel would be operated effectively and the efficient maintenance dredging is expected.

To operate the project dredger vessel effectively, the operation depth should be 2.3 m or more. Amongst minor fisheries harbours of which planned depth is over 2.0 m, 11 of them have operation depths over 2.3 m. Through maintenance dredging by the project dredger vessel, the planned depths will be recovered in these minor fisheries harbours where the basin depths became shallow due to siltation. While the amount of annual maintenance dredging required in these 11 harbours is estimated approximately 202,000 m³, the capacity of annual dredging of the project dredger vessel is 200,000 m³. (See Table 1.)

③ Benefits to fishing boats utilizing minor fisheries harbours

Mechanized fishing boats mainly utilize minor fisheries harbours in India. It was mainstream that the length of these boats is about 15 m, but recently the boats are becoming larger for the purpose of improvement of efficient operation, access to the offshore fishing ground and safe navigation. On the other hand, most of minor fisheries harbours are not able to keep up with size increase of those boats because of siltation and, what is worse, obstruct approach of boats, mooring and navigation in the harbours. At low tide, departure for fishing is postponed and the bottom of a boat often touches the bottom of the sea, and even at high tide, the risk of accident increases because fishing boats are coming and going in the shallow and narrow channels. In the fisheries harbours where the level of the planned depths will be recovered through maintenance dredging by the project dredger vessel, utilization of fisheries harbours by those fishing boats will become proper and it will be possible to keep up with size increase of the boats. The number of fishing boats utilizing 8 minor fisheries harbours amongst the above 11 harbours is 6,600 at present. (See Table 1.)

④ Promotion for prevention of post-harvest loss by recovery of fish landing function

The fish products landed at minor fisheries harbours are an important source for supply of animal protein for people. From the view of improving nutrition of people, the effective utilization of fishery products is expected. In fishery industries, post-harvest loss such as deterioration of quality and spoilage is outstanding, and the decrease of post-harvest loss is a key task for effective utilization of fish products. One of the effective methods to decrease post-harvest loss is to smoothen fish landing activities by construction of fisheries harbours. However, in the present situation of minor fisheries harbours proper function of fish landing is not realized due to siltation problem. In the fisheries harbours where the level of the planned depths will be recovered through maintenance dredging by the project dredger vessel, such a fish landing function will be normalized, it will be possible to promote smoothening of fish landing which is one of important purposes of construction of fisheries harbours, and consequently it will be possible to promote the decrease of post-harvest loss. The yield of annual fish landing in 8 fisheries harbours amongst those 11 harbours is approximately 410,000 tons. (See Table 1.)

As aforementioned, even though the Government of India invested a large amount of fund on constructing minor fisheries harbours, the utilization is restricted because of siltation, but by implementation of the project, a part of minor fisheries harbours are to be improved and the effects of the investment are to be normalized. In addition, by normalizing the functions of fisheries harbours, the decrease of post-harvest loss of fish products from fish landings is to be promoted and nutrition of people is to be effectively realized. Consequently it is considered appropriate to implement this project by Japan's grant aid.

4-2 Recommendation

The effects aforementioned are expected by implementation of this project, and for manifestation and further promotion of these effects, the following points should be considered :

① Cooperation / Assistance by the Central Government and Related Ministries

DCI will change for maintenance dredging by the project dredger vessel and the related State Governments have to make its payment to DCI. Most of the State Governments will secure the budget for maintenance dredging. However, it is anticipated that the large amount of costs is required depending on the amount of silt and frequency. Though the role of the Central Government is basically to provide technical and financial assistance for newly construction of fisheries harbours, it is preferable to consider assistance measures such as financial assistance or loans, etc. even for maintenance dredging. On the other hand, between the related State Government and DCI, disagreement in terms of the order and timing for maintenance dredging amongst plural minor fisheries harbours and the different points of view for dredging costs may come. In case of facing those situations, appropriate mediation and leadership by FD, DAC, MOA, as a planner of the maintenance dredging programme for the project and the responsible organization, are desirable and cooperation and assistance by other ministries are also desirable.

② Appropriate maintenance plans

DCI is experienced well enough for maintenance of dredger vessels and there are the leading dockyard and repair facilities of India located at Vishakapatnam, a home port for the project dredger vessel. Because of that, there is not any basic problem for maintenance of the vessel. However, taking it into account that the vessel is to sail along the whole coast of India and call at several minor fisheries harbours, it is considered important to secure maintenance site besides Vishakapatnam, and establish adequate maintenance plans including setting timely maintenance period from the view of bad weather season. Furthermore, the maintenance plans should preferably be established to be flexible to any change of situation, as the applicable fisheries harbours are subject to change every fiscal year, sometimes in the same year.

③ Fisheries harbours having the shallow present depth

Amongst minor fisheries harbours, there are some fisheries harbours where dredging operation by the project dredger vessel are not able to be started because the present depth is shallow, even though they are applicable to maintenance dredging by the project dredger vessel with respect to planned depth. For these harbours, after the approaching routes are widen and the operation areas are dug by some adequate tools such as the CSD dredger vessels owned by DCI or the State Governments, introduction of the project dredger vessel is considered to result in the effective maintenance dredging operation. CSD dredger vessels are proper to shallow depth of water, but it obstructs navigation of other boats and lacks maneuverability. Accordingly if the whole maintenance dredging was performed by this type of a dredger vessel, the maintenance dredging would be inefficient and only obstructs daily activities of fishing boats, and result in opposing to the original objectives to normalize functions of fisheries harbours. The TSHD dredger vessel for the project rarely obstructs navigation of fishing boats and is superior in maneuverability, and is appropriate for maintenance dredging in fisheries harbours that have already been constructed and utilized. The ability of annual dredging by this dredger vessel almost meets the dredging demand in fisheries harbours of which operation depths allows the vessel to start operation immediately, and the margin of the dredging ability is expected to be produced as the efficiency of operation is gradually improved as it is operated more times. The more demand for maintenance dredging is preferable in consideration that the cost of operation and maintenance of the vessel will be compensated by the income from maintenance dredging. Therefore, it is expected to utilize both the project dredger vessel and existing dredger vessels and equipment for capital dredging, making the best of advantages of each vessel. As a result of that, the number of minor fisheries harbours where the project dredger vessel is able to be operated is increased, the increase of revenue for operation and maintenance, stabilization of operation, etc. are expected.

Appendices

Appendix 1. Member List of the Survey Team

(1) For the basic design survey

Mr. Takeru KATO	Team Leader	Fisheries Development Division, Fisheries Promotion Department, Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries
Mr. Shunji SUGIYAMA	Coordinator	Second Project Study Division, Grant Aid Project Study Dep., Japan International Cooperation Agency (JICA)
Mr. Kyoji YANO	Technical Advisor	Deputy Director, Fishing Boat Division, Oceanic Fisheries Department, Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries
Mr. Tsuyoshi KANNO	Chief Consultant	Overseas Agro-Fisheries Consultants, Co., Ltd.
Mr. Munehiro SHIMADA	Ship Operation Planner	Overseas Agro-Fisheries Consultants, Co., Ltd.
Mr. Yoshio WAKAMATSU	Shipbuilding Engineer	Overseas Shipbuilding Cooperation Centre
Mr. Kazuki AIHARA	Equipment Planner	Overseas Shipbuilding Cooperation Centre
Mr. Akiyoshi TAKAHASHI	Site Surveyor	Overseas Agro-Fisheries Consultants, Co., Ltd.

(2) For the draft basic design explanation

Mr. Kyoji YANO	Technical Advisor	Deputy Director, Fishing Boat Division, Oceanic Fisheries Department, Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries
Mr. Takashi TOYAMA	Coordinator	Second Project Study Division, Grant Aid Project Study Dep., Japan International Cooperation Agency (JICA)
Mr. Tsuyoshi KANNO	Chief Consultant	Overseas Agro-Fisheries Consultants, Co., Ltd.
Mr. Munehiro SHIMADA	Ship Operation Planner	Overseas Agro-Fisheries Consultants, Co., Ltd.

Appendix 2. Survey Schedule

(1) For the basic design survey

① First phase (All 8 members of the Team)

Date	Stay	Activity
Apr. 10 (Thu.)	Delhi	Japan ⇒ India
Apr. 11 (Fri.)	Delhi	Courtesy call to Japanese Embassy, JICA Delhi office, Ministry of Finance and Ministry of Agriculture. Inception report explanation.
Apr. 12 (Sat.)	Bombay	Detail discussions on the contents of the Project with the Fisheries Division and other relevant agencies. Delhi ⇒ Bombay
Apr. 13 (Sun.)	Mangalore	Bombay ⇒ Mangalore Survey on Malpe port.
Apr. 14 (Mon.)	Bangalore	Survey on Mangalore port. Mangalore ⇒ Bangalore
Apr. 15 (Tue.)	Hyderabad	Meeting with Karnataka State Fisheries office. Meeting with Central Institute of Coastal Engineering for Fishery. Bangalore ⇒ Hyderabad
Apr. 16 (Fri.)	Vishakhapatnam	Hyderabad ⇒ Vishakhapatnam Courtesy call and meeting with DCI. Survey on relevant facilities.
Apr. 17 (Sat.)	Vishakhapatnam	Meeting with DCI. Survey on Vishakhapatnam port and relevant facilities.
Apr. 18 (Sun.)	Delhi	Vishakhapatnam ⇒ Hyderabad Meeting with Andhra Pradesh State Fisheries Office. Hyderabad ⇒ Delhi
Apr. 19 (Mon.)	Delhi	Detail discussions on the contents of the Project with the Fisheries Division and other relevant agencies.
Apr. 20 (Tue.)	Delhi	Team Meeting

Apr. 21 (Wed.)	Delhi	Discussions on the contents of Minute of Discussions.
Apr. 22 (Thu.)	Delhi	Signature on the Minute of Discussions. Reporting to Japanese Embassy and JICA office.
Apr. 23 (Fri.)	-	Leaving of Mr. T. KATO, Mr. K. YANO and Mr. S. SUGIYAMA.

② Second phase

(i) Team A (Mr. KANNO, Mr. WAKAMATSU and Mr. AIHARA)

Date	Stay	Activity
Apr. 23 (Wed.)	Delhi	Detail discussions on the contents of the Project with the Fishery Division and other relevant agencies.
Apr. 24 (Thu.)	Vishakhapatnam	Delhi ➡ Calcutta ➡ Vishakhapatnam
Apr. 25 (Fri.)	Vishakhapatnam	Detail discussions on the contents of the Dredger with DCI.
Apr. 26 (Sat.)	Vishakhapatnam	Detail discussions on the contents of the Dredger with DCI.
Apr. 27 (Sun.)	Vishakhapatnam	Vishakhapatnam ⇄ Kakinada Survey on Kakinada port.
Apr. 28 (Mon.)	Vishakhapatnam	Detail discussions on the contents of the Dredger with DCI.
Apr. 29 (Tue.)	Vishakhapatnam	Detail discussions on the contents of the Dredger with DCI.
Apr. 30 (Fri.)	Vishakhapatnam	Detail discussions on the contents of the Dredger with DCI.
May 1 (Sat.)	Madras	Vishakhapatnam ➡ Madras
May 2 (Sun.)	Madras	Meeting with Tamil-Nadu State Fisheries Office.
May 3 (Mon.)	Madras	Survey on Pondicherry port and Pazhayar port.
May 4 (Tue.)	Delhi	Madras ➡ Delhi

May 5 (Wed.)	Delhi	Detail discussions on the contents of the Project with the Fisheries Division and other relevant agencies. [Mr. SHIMADA joins in TEAM A. Mr. WAKAMATSU and Mr. AIHARA leave Delhi for Japan.]
May 6 (Thu.)	Delhi	Detail discussions on the contents of the Project with the Fisheries Division and other relevant agencies.
May 7 (Fri.)	Delhi	Detail discussions on the contents of the Project with the Fisheries Division and other relevant agencies.
May 8 (Sat.)	Delhi	Reporting to Japanese Embassy and JICA office.
May 9 (Sun.)	-	Mr. KANNO and Mr. SHIMADA leave Delhi for Japan.

(ii) TEAM B. (Mr. SHIMADA and Mr. TAKAHASHI)

Date	Stay	Activity
Apr. 23 (Wed.)	Porbunder	Delhi ➡ Rajkot, Rajkot ➡ Porbunder
Apr. 24 (Thu.)	Veraval	Survey on Porbunder port. Porbunder ➡ Veraval
Apr. 25 (Fri.)	Bhavnagar	Survey on Veraval port. Veraval ➡ Bhavnagar
Apr. 26 (Sat.)	Ahmadabad	Bhavnagar ➡ Ahmadabad
Apr. 27 (Sun.)	Ahmadabad	Meeting with Gujarat State Fisheries Office.
Apr. 28 (Mon.)	Bangalore	Ahmadabad ➡ Bombay ➡ Bangalore
Apr. 29 (Tue.)	Bangalore	Meeting with Karnataka State Fisheries Office.
Apr. 30 (Wed.)	Bangalore	Meeting with Central Institute of Coastal Engineering for Fishery.
May 1 (Thu.)	Cochin	Bangalore ➡ Cochin
May 2 (Fri.)	Cochin	Meeting with IFP. Survey on the former grant fishing boats and repair facilities.

May 3 (Sat.)	Trivandrum	Cochin ➡ Trivandrum. Survey on Neendakara and Thangassery ports.
May 4 (Sun.)	Bombay	Meeting with Kerala State Fisheries Office. Trivandrum ➡ Bombay
May 5 (Mon.)	Bombay	Meeting with Maharashtra State Fisheries Office. [Mr. SHIMADA joins in TEAM A.]
May 6 (Tue.)	Bombay	Meeting with Maharashtra State Fisheries Office.
May 7 (Wed.)	Ratnagiri	Bombay ➡ Ratnagiri
May 8 (Thu.)	Ratnagiri	Survey on Ratnagiri port.
May 9 (Fri.)	Bombay	Ratnagiri ➡ Bombay
May 10 (Sat.)	Bombay	Natural condition data collection
May 11 (Sun.)	Delhi	Bombay ➡ Delhi
May 12 (Mon.)	Delhi	Detail discussions on the contents of the Project with the Fisheries Division and other relevant agencies.
May 13 (Tue.)	Delhi	Reporting to Japanese Embassy and JICA office.
May 14 (Wed.)	Delhi	Mr. TAKAHASHI leave Delhi for Japan.

(2) For the draft basic design explanation

Date	Stay	Activity
Aug. 5 (Tue.)	Delhi	Tokyo ⇨ Delhi
Aug. 6 (Wed.)	Delhi	Courtesy call to Japanese Embassy, JICA Delhi office, Ministry of Finance, Ministry of Agriculture and other relevant agencies. The draft basic design explanation.
Aug. 7 (Thu.)	Vishakhapatnam	Delhi ⇨ Hyderabad ⇨ Vishakhapatnam Courtesy call to DCI. The draft basic design explanation.
Aug. 8 (Fri.)	Vishakhapatnam	Detail discussions on the contents of the draft basic design.
Aug. 9 (Sat.)	Delhi	Vishakhapatnam ⇨ Hyderabad ⇨ Delhi
Aug. 10 (Sun.)	Delhi	Team meeting.
Aug. 11 (Mon.)	Delhi	Discussions on the contents of the draft basic design with Ministry of Agriculture and other relevant agencies.
Aug. 12 (Tue.)	Delhi	Discussions on the further procedures with Ministry of Agriculture and other relevant agencies.
Aug. 13 (Wed.)	Delhi	Discussions on the contents of Minute of Discussions.
Aug. 14 (Thu.)	Delhi	Signature on the Minute of Discussions. Reporting to Japanese Embassy and JICA office
Aug. 15 (Fri.)	-	Leaving Delhi
Aug. 16 (Sat.)	-	Arriving in Tokyo.

Appendix 3. List of Party Concerned in the Recipient Country

1. Ministry of Finance

Ms. RAMA MURALI	Joint Secretary, Department of Economic Affairs
Mr. V. BHASKAR	Director, Department of Economic Affairs

2. Ministry of Agriculture

Mr. SUNIL SUD	Joint Secretary, Department of Agriculture and Co-operation (Fisheries Division) (On the basic design survey)
Mr. PAUL JOSEPH	Joint Secretary, Department of Agriculture and Co-operation (Fisheries Division) (On the draft basic design explanation)
Dr. YUGRAJ SINGH YADAVA	Fisheries Development Commissioner, Department of Agriculture and Co-operation
Mr. K. VIJAYAKUMARAN	Department of Agriculture and Co-operation
Mr. TARSEM LAL	Department of Agriculture and Co-operation
Mr. H. N. ASWATH	Department of Agriculture and Co-operation
Mr. K. OMPRAKASH	Director, Central Institute of Coastal Engineering for Fishery
Mr. M. K. R. NAIR	Director, Integrated Fisheries Project
Mr. K. NINAN	Chief Engineer, Integrated Fisheries Project

3. DCI (Dredging Cooperation of India, Limited)

Mr. C. S. SASTRY	Chairman - cum - Managing Director
Mr. B. S. REDHU	Director (Operation & Technical)
Mr. M. H. SUNDARAIAH	Deputy General Manager (Technical)
Mr. K. CHANDRACHOODAN	Manager (Operation)

4. Andhra Pradesh State

Mr. PRASADA RAO	Director, Department of Fisheries
Mr. V. SURYANARAYANA	Department of Fisheries
Mr. K. SUBRAMANYAN	Kakinada Port Officer

5. Gujarat State

Mr. P. K. VALERA	Commissioner of Fisheries

Mr. Y. A. TRIVEDI	Deputy Director, Department of Fisheries
Mr. H. G. JOSHI	Superintending Engineer (Mech.), Gujarat Maritime Board
Mr. S. B. KANANI	Superintending Engineer (Civil), Gujarat Maritime Board
Mr. L. C. OZA	Veraval Port Officer, Gujarat Maritime Board

6. Kerala State

Mr. D. RAVI	Secretary of Fisheries
Mr. KAMAL V. RAO	Director, Department of Fisheries

7. Karnataka State

Mr. K. JAYAPRAKASH HEDGE	Minister for Port and Fisheries
Mr. C. K. NEELAKANTA RAJ IAS	Secretary, Animal Husbandry and Fisheries Development
Mr. S. N. SHANMUKHA	Director, Department of Fisheries
Mr. K. SHYAMA BHAT	Joint Director, Department of Fisheries

8. Tamil-Nadu State

Mr. M. RAMAN	Secretary, Animal Husbandry and Fisheries Department
Mr. R. RAJAMANIKAM	Department of Fisheries
Mr. S. KALIYAMOOTHY	Department of Fisheries

9. Pondicherry

Mr. R. KNISHAMOORTH	Director, Department of Fisheries
Mrs. D. SELVI	Joint Director, Department of Fisheries

10. Maharashtra State

Dr. M. L. GAUTAM	Commissioner of Fisheries

11. Other Relevant Agencies

Mr. K. K VARMA	Head, Marine Consultancy Service, National Ship Design & Research Centre
Mr. GURUDAS GUPTA	Chief Manager, (Technical), National Ship Design & Research Centre

Mr. N. V. RAO	Chief Manager, (Design), National Ship Design & Research Centre

12. Embassy of Japan

Mr. YOSHIAKI MURATA	First Secretary
Mr. JUNICHI TANIUCHI	First Secretary

13. JICA Indian Office

Mr. HIDEKAZU KUMANO	Resident Representative
Mr. TOSHIAKI TANAKA	Deputy Representative
Mr. TSUTOMU SHIMIZU	Assistant Resident Representative

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY
ON THE
PROJECT FOR CONSTRUCTION OF THE DREDGER
FOR MINOR FISHERIES HARBOURS IN INDIA

In response to the request from the Government of India (GOI), the Government of Japan (GOJ) has decided to conduct a basic design study on the Project for Construction of the Dredger for Minor Fisheries Harbours (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA)

JICA has sent to India a basic design study team headed by Mr. KATO Takeru, Deputy Director, Fisheries Development Division, Fisheries Agency, Ministry of Agriculture, Forestry, and Fisheries, and the Team is scheduled to stay in the country from April 10 to May 14, 1997.

The team held a series of discussions with the officials concerned of the Government of India and conducted a field survey at the study area.

In the course of the discussions and the field survey, both parties have confirmed the main items described on the attached sheets. The team will proceed to further works and prepare the basic design study report.

Delhi, April 22, 1997

加藤 武留

KATO Takeru
Leader
Basic Design Study Team
JICA

SUNIL SUD
Joint Secretary
Ministry of Agriculture
Government of India

RAMA MURALI
Joint Secretary
Department of Economic affairs,
Ministry of Finance

ATTACHMENT

1. **Participants in the Discussions**

During the team's stay in India, Japanese and Indian sides had a series of discussions on the Basic Design of the Project. List of participants in the discussions is shown in ANNEX I.

2. **Objective of the Project**

The objective of the Project is to facilitate maintenance dredging for fishing harbours by introducing appropriate dredging equipment so as to promote effective utilization of said facilities.

3. **Responsible Agency**

The Department of Agriculture and Cooperation (DAC), Ministry of Agriculture is the responsible agency of the Project. The organizational charts of the agency are shown in ANNEX II.

However, operation and maintenance of the Project vessel will be entrusted to the Dredging Corporation of India (DCI) in accordance with the agreement between DAC and DCI.

4. **Items requested by the Government of India**

One dredger with such specifications as stated below is requested by the Government of India.

- The type of dredging equipment is one side trailing suction hopper dredger.
- The vessel is of self - propelled type.

The team explained that the technical limitations of one side trailing suction hopper type dredger to be operated in fishing harbours which have relatively narrow channels and shallow basins would be ;

- The corners of the basins can not be dredged.
- Fishing harbours which have shallower depth than the draft of the dredger may not be able to be dredged.

Principal particulars and other aspects of specifications of the vessel will be determined after further studies.

5. **Japan's Grant Aid System**

1) The Government of India has understood the system of the Japan's Grant Aid explained by the Team. The main feature of the system is described in ANNEX III.

2) The Government of India will take necessary measures described in ANNEX IV for the smooth implementation of the Project on condition that the Grant Aid by the Government of Japan is extended to the Project.

6. **Operation & Maintenance**

The vessel constructed under the Japan's Grant Aid will be operated for the purpose of maintenance dredging of fishing harbours.
The operation programme of the vessel shall be prepared by DAC/DCI in consultation with agencies concerned and DAC shall take responsibility for ensuring that the vessel is operated and maintained properly.

7. **Other relevant issues**

DAC will proceed the preparation of the agreement with DCI once the Project is approved by GOJ, and execute the agreement before March 1999.

8. **Further Schedule of the Study**

1) Several members of the team will proceed further studies in India until May 14, 1997
2) JICA will prepare the draft basic design of the Project and dispatch a mission in order to explain its contents around July 1997.
3) In case that the contents of the design is accepted in principle by the Government of India, JICA will complete the basic design study report and send it to the Government of India by October, 1997.

ANNEX I: LIST OF PARTICIPANTS IN THE DISCUSSIONS

1. FOR GOI SIDE

Ministry of Agriculture (MOA)

- SUNIL SUD
  Joint Secretary (Fisheries), Department of Agriculture and Co-operation, MOA
- Dr. Y. S. YADAVA
  Fisheries Development Commissioner, DAC, MOA
- K. VIJAYAKUMARAN
  Joint Commissioner (Fisheries), DAC, MOA
- TARSEM LAL
  Deputy Commissioner (Fishery Harbour), DAC, MOA

Ministry of Finance (MOF)

- V. BHASKAR
  Director, Department of Economic Affairs, MOF

Central Institute of Coastal Engineering for Fishery. (CICEF)

- K. OMPRAKASH
  Director, CICEF, MOA

Dredging Corporation of India Limited (DCI)

- C. S. SASTRY
  Chairman cum Managing Director, DCI
- Capt. B. S. REDHU
  Director (Operation), DCI
- H. K. DHAR
  Director (Finance), DCI
- M. H. SUNDARAIAH
  Deputy General Manager (Tech), DCI
- M. N. K. S. VARMA
  Deputy General Manager (P.A.), DCI

National Ship Design & Research Centre. (NSDRC)

- Cdr. K. K. VARMA
  Head, Marine Consultancy Services. (NSDRC)

2. FOR GOJ SIDE

- KATO, Takeru
- SUGIYAMA, Shunji
- YANO, Kyoji
- KANNO, Tsuyoshi
- SHIMADA, Munehiro
- WAKAMATU, Yoshio
- AIHARA, Kazuki
- TAKAHASHI, Akiyoshi

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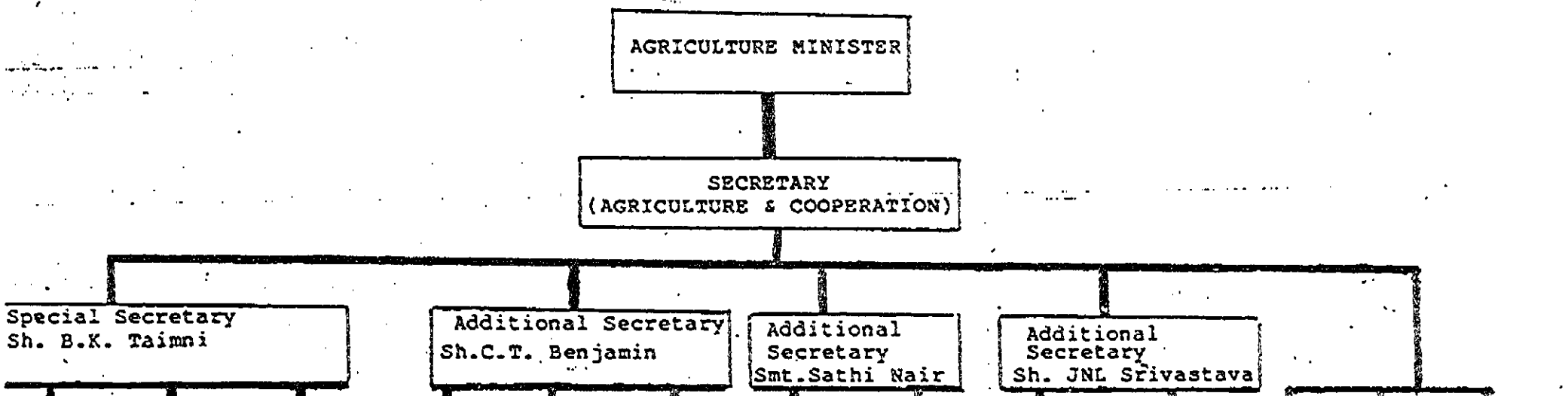
Annex II

AS ON 05.03.1997.

DEPARTMENT OF AGRICULTURE & COOPERATION
ORGANISATIONAL CHART



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JS(FY)	JOINT SECRETARY (FISHERIES)
FDC	FISHERIES DEVELOPMENT COMMISSIONER
JC(FY)	JOINT COMMISSIONER (FISHERIES)
DS(FY)	DEPUTY SECRETARY (FISHERIES)
DC(FY)	DEPUTY COMMISSIONER (FISHERIES)
AC(FY)	ASSISTANT COMMISSIONER (FISHERIES)
C.E.FY	CIVIL ENGINEERING (FISHERIES)
US(FY)	UNDER SECRETARY (FISHERIES)
FRIO	FISHERIES RESEARCH & INVESTIGATION OFFICER
FRI	FISHERIES RESEARCH INVESTIGATOR
AO	ACCOUNT OFFICER
AD(FY)	ASSISTANT DIRECTOR (FISHERIES)
SO	SECTION OFFICER
SR.D.MAN	SENIOR DRAFTMAN
STA	SENIOR TECHNICAL ASSISTANT
RA	RESEARCH ASSISTANT
UDC	UPPER DIVISION CLERK
LDC	LOWER DIVISION CLERK
COM	COMPUTOR
FH	FISHERY HARBOUR
FS	FISHERIES STATISTICS
FE	FISHERIES ECONOMICS
BW	BRACKISH WATER
IF	INLAND FISHERIES
M	MARINE
SG	SELECTION GRADE
OG	ORGANISATION GRADE
IC	INTERNAL COORDINATION

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DEPTT. OF AGRICULTURE & COOPERATION
FISHERIES DIVISION

ORGANIZATION CHART

TECHNICAL SIDE

JS (FY)

FDC

JC(FY)

ADMINISTRATIVE SIDE

DS-(FY)

DC(IF)		DC(M)		DC(FH)		DC(FS)		DC(FE)		
AC(IF)	AC (E)	AC(M)	AC(B.W)	AC(FH)	AC(C.E.FY)				US(FY.I)	US(FY.II)
				AD(FH)		AD(FS)				
FRIO		FRIO	FRIO	SR.D'Man					AO(B&A)	SO(AD)
Inland Section		Marine Section	B.W. Section	Harbour Section		Stat. Section	Fy Eco Section	IC Section	Fy(B&A) Section & Welfare Section	FY(Admn) Section
STA-1 FRI(SG)-1 FRI(OG)-1 LDC-2		STA-1 LDC-1	LDC-1	Asstt-1 RA-1 UDC-1		RA-1 Com-1 LDC-2	RA-1 UDC-1 Com-1 LDC-2	STA-2 LDC-1	Asstt-1 Acctt-2 LDC-4	Asst-2 LDC-3

XVII

ANNEX III: JAPAN'S GRANT AID SCHEME

1. Grant Aid Procedure

1) Japan's Grant Aid Program is executed through the following procedures.

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Governments of Japan and the recipient country)

2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using Japanese consulting firms.

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

1) Contents of the Study

The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter referred to as "the Project"), is to provide a basic document necessary for the appraisal of the Project by the Government of Japan. The contents of the Study are as follows:

a) confirmation of the background, objectives and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation;
b) evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from the technical, social and economic points of view;

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c) confirmation of items agreed on by both parties concerning the basic concept of the Project;
d) preparation of a basic design of the Project; and
e) estimation of costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even through they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For the smooth implementation of the Study, JICA uses a consulting firm selected through its own procedure (competitive proposal). The selected firm participate the Study and prepare a report based upon the terms of reference set by JICA.

At the beginning of implementation after the Exchange of Notes, for the services of the Detailed Design and Construction Supervision of the Project, JICA recommends the same consulting firm which participated in the Study to the recipient country, in order to maintain the technical consistency between the Basic Design and Detailed Design as well as to avoid any undue delay caused by the selection of a new consulting firm.

3. Japan's Grant Aid Scheme

1) What is Grant Aid?

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

2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

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3) "The period of the Grant" means the one fiscal year which the Cabinet approves the project for. Within the fiscal year, all procedure such as exchanging of the Notes, concluding contracts with consulting firms and contractors and final payment to them must be completed.
However, in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

4) Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments 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 consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

5) 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 the Government of Japan. This "Verification" is deemed necessary to secure accountability of Japanese taxpayers.

6) Undertakings required to the Government of the recipient country

a) to secure a lot of land necessary for the construction of the Project and to clear the site;
b) to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities outside the site;
c) to ensure prompt unloading and customs clearance at ports of disembarkation in the recipient country and internal transportation therein of the products purchased under the Grant Aid;
d) to exempt Japanese nationals from customs duties, internal taxes and fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts;
e) to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such as facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work;
f) to ensure that the facilities constructed and products purchased under the Grant Aid be maintained and used properly and effectively for the Project; and
g) to bear all the expenses other than those covered by the Grant Aid, necessary for the Project.

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7) "Proper Use"

The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign the necessary staff for operation and maintenance of them as well as to bear all the expenses other than those covered by the Grant Aid.

8) "Re-export"

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

9) Banking Arrangement (B/A)

a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank". The Government of Japan 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 the Government of Japan under an Authorization to Pay (A/P) issued by the Government of recipient country or its designated authority.

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ANNEX IV: UNDERTAKINGS BY THE GOVERNMENT OF INDIA

1. To ensure prompt unloading, tax exemption and customs clearance at ports of disembarkation in India and internal transportation therein of the products purchased under the Japan's Grant Aid.

2. To exempt Japanese nationals from customs duties, internal taxes and fiscal levies which may be imposed in India with respect to the supply of the products and services under the verified contracts.

3. To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such facilities as may be necessary for their entry into India and stay therein for the performance of their work.

4. To bear commissions, namely advising commissions of an Authorization to Pay (A/P) and payment commissions, to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement (B/A).

5. To provide necessary permissions, licenses, and other authorization for implementing the Project, if necessary.

6. To ensure that the facilities constructed and equipment purchased under the Japan's Grant Aid be maintained and used properly and effectively for the Project.

7. To bear all the expenses, other than those covered by the Japan's Grant Aid, necessary for the Project.

MINUTES OF DISCUSSIONS
BASIC DESIGN STUDY
ON THE
PROJECT FOR CONSTRUCTION OF THE DREDGER
FOR MINOR FISHERIES HARBOURS IN INDIA

(Consultation on the Draft Basic Design)

The Japan International Cooperation Agency (JICA) has dispatched a basic design study team on the Project for Construction of the Dredger for Minor Fisheries Harbours (hereinafter referred to as "the Project") to India in April 1997. As a result of the series of discussions in India, and technical examination of the results in Japan, JICA prepared the Draft Basic Design of the Project.

To inform the Indian side with the components of the Draft Basic Design, JICA sent to India a study team headed by Mr. YANO Kyoji, Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries. The team is scheduled to stay in India from August 5 to August 15 1997.

As a result of discussions, both sides have confirmed one dredger with such specifications as described on the attached sheets. The team will proceed to further works and finalize the Basic Design Study Report.

Delhi, August 14, 1997

矢野京次

YANO Kyoji
Leader,
Draft Basic Design Explanation Team,
JICA

PAUL JOSEPH
Joint Secretary
Department of Agriculture and Co-operation,
Ministry of Agriculture
Government of India

V. BHASKAR
Director
Department of Economic Affairs
Ministry of Finance
Government of India

ATTACHMENT

1. Participants in the Discussions

During the team's stay in India, Japanese and Indian sides had a series of discussions on the Draft Basic Design of the Project. List of participants in the discussions is shown in ANNEX I.

2. Components of the Draft Basic Design

The Government of India has in principle accepted the components of the Draft Basic Design proposed by the team which are shown in ANNEX II.

3. Responsible Agency

The Department of Agriculture and Co-operation (DAC), Ministry of Agriculture is the responsible Agency of the Project.

However, operation and maintenance of the Project Vessel will be entrusted to Dredging Corporation of India (DCI) in accordance with the agreement between DAC and DCI.

4. Items confirmed by both Japanese and Indian sides

1) After completion of EFC clearance by Indian side, the Government of Japan will proceed to obtain Cabinet approval of the Project.
2) DAC will proceed with the preparation of the agreement with DCI once the Project is approved by the Government of Japan, and execute the agreement before March, 1999.

5. Japan's Grant Aid System

1) The Government of India has understood the system of the Japan's Grant Aid explained by the Team. The main feature of the system is described in ANNEX III.
2) The Government of India will take necessary measures described in ANNEX IV for the smooth implementation of the Project on condition that the Grant Aid by the Government of Japan is extented to the Project.

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ANNEX I: LIST OF PARTICIPANTS IN THE DISCUSSIONS

1. FOR GOVERNMENT OF INDIA SIDE:

Ministry of Agriculture (MOA)

- PAUL JOSEPH
  Joint Secretary (Fisheries), Department of Agriculture and Co-operation, MOA
- Dr. Y. S. YADAVA
  Fisheries Development Commissioner, DAC, MOA
- K. VIJAYAKUMARAN
  Joint Commissioner (Fisheries), DAC, MOA
- TARSEM LAL
  Deputy Commissioner (Fishing Harbours), DAC, MOA
- A. N. ASWATH
  Assistant Director (Fishing Harbours), DAC, MOA

Ministry of Finance (MOF)

- V. BHASKAR
  Director, Department of Economic Affairs, MOF

Central Institute of Coastal Engineering for Fishery (CICEF)

- K. OMPRAKASH
  Director, CICEF, MOA

Dredging Corporation of India Limited (DCI)

- Capt. B. S. REDHU
  Director (Operation), DCI
- CHANDRA CHOODAN
  Deputy General Manager, DCI

National Ship Design and Research Centre (NSDRC)

- Dr. SAMBANDAM
  Director, NSDRC
- N. V. RAO
  Chief Manager (Design), NSDRC

2. FOR GOVERNMENT OF JAPAN SIDE:

- YANO, Kyoji
- TOYAMA, Takashi
- KANNO, Tsuyoshi
- SHIMADA, Munehiro

ANNEX II: COMPONENTS OF THE DRAFT BASIC DESIGN

1. Dredger: One Vessel

1)	Purpose of use:	For maintenance dredging of minor fisheries harbours
2)	Type:	Self-propelled one side trailing suction hopper type
3)	Shape:	Afterward deckhouse type
4)	Dimension:	
	Length overall	approx. 56.5 m
	Length b.p.	approx. 53.0 m
	Breadth moulded	approx. 11.8 m
	Depth moulded	approx. 3.2 m
5)	Main engine:	approx. 550 HP×2 units
6)	Maximum draught:	2.0 m
7)	Hopper capacity:	approx. 200m³
8)	Crew capacity:	22 persons
9)	Backup dredging device:	Underwater pump system

2. Equipments: Spare parts for engines, dredging device, etc.×1 lot

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ANNEX III: JAPAN'S GRANT AID SCHEME

1. Grant Aid Procedure

1) Japan's Grant Aid Program is executed through the following procedures.

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan & Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Governments of Japan and the recipient country)

2) Firstly, the application or request for a Grant Aid Program submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using Japanese consulting firms.

Thirdly, the Government of Japan appraises the program to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA and the results are then submitted to the Cabinet for approval.

Fourth, the program, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Government of Japan and the recipient country.

Finally, for the implementation of the program, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

1) Contents of the Study

The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on the requested program (hereinafter referred to as "the Program"), is to provide a basic document necessary for the appraisal of the Program by the Government of Japan. The contents of the Study are as follows:

a) confirmation of the background, objectives and benefits of the Program and also institutional capacity of agencies concerned of the recipient country necessary for the Program's implementation;
b) evaluation of the appropriateness of the Program to be implemented under the Grant Aid Scheme from the technical, social and economic points of view;
c) confirmation of items agreed on by both parties concerning the basic concept of the Program;

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d) preparation of a basic design of the Program; and
e) estimation of costs of the Program.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid Program. The Basic Design of the Program is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Program. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Program. Therefore, the implementation of the Program is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For the smooth implementation of the Study, JICA uses a consulting firm selected through its own procedure (competitive proposal). The selected firm participate the Study and prepare a report based upon the terms of reference set by JICA.

At the beginning of implementation after the Exchange of Notes, for the services of the Detailed Design and Construction Supervision of the Program, JICA recommends the same consulting firm which participated in the Study to the recipient country, in order to maintain the technical consistency between the Basic Design, and Detailed Design as well as to avoid any undue delay caused by the selection of a new consulting firm.

3. Japan's Grant Aid Scheme

1) What is Grant Aid?

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

2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the Program, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

3) "The period of the Grant" means the one fiscal year which the Cabinet approves the Program for. Within the fiscal year, all procedure such as exchanging of the Notes, concluding contracts with consulting firms and contractors and final payment to them must be completed.

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However, in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

4) Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments 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 consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

5) 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 the Government of Japan. This "Verification" is deemed necessary to secure accountability of Japanese taxpayers.

6) Undertakings required to the Government of the recipient country

a) to secure a lot of land necessary for the construction of the Program and to clear the site;
b) to provide facilities for distribution of electricity, water supply, drainage and other incidental facilities outside the site;
c) to ensure prompt unloading, tax exemption and customs clearance at ports of disembarkation in the recipient country and internal transportation therein of the products purchased under the Grant Aid.
d) to exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts.
e) to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such as facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.
f) to ensure that the facilities constructed and products purchased under the Grant Aid be maintained and used properly and effectively for the Program; and
g) to bear all the expenses other than those covered by the Grant Aid, necessary for the Program.

7) "Proper Use"

The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign the

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necessary staff for operation and maintenance of them as well as to bear all the expenses other than those covered by the Grant Aid.

8) "Re-export"
The products purchased under the Grant Aid shall not re-exported from the recipient country.

9) Banking Arrangement (B/A)

a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan 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 the Government of Japan under an authorization to pay issued by the Government of recipient country or its designated authority.

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ANNEX IV: NECESSARY MEASURES TO BE TAKEN BY THE GOVERNMENT OF INDIA

The following necessary measures should be taken by the Government of India on condition that the Grant Aid by the Government of Japan is extended to the Project.

1. To ensure tax exemption and customs clearance of the products purchased under the Japan's Grant Aid at ports of disembarkation in India.

2. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in India with respect to the supply of the products and services under the Verified Contracts.

3. To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts such facilities as may be necessary for their entry into India and stay therein for the performance of their work.

4. To bear commissions, namely the advising commission of the Authorization to Pay (A/P) and payment commissions, to the Japanese foreign exchange bank for its banking services based upon the Banking Arrangement (B/A).

5. To provide necessary permissions, licenses and other authorization for implementing the Project, if necessary.

6. To ensure that the vessel purchased under the Japan's Grant Aid be maintained and used properly and effectively for the Project.

7. To bear all the expenses, other than those covered by the Grant Aid, necessary for the Project.

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