Chapter 3
Implementation Plan

Chapter 3 Implementation Plan

3 - 1 Implementation Plan

3 - 1 - 1 Implementation Concept

The coordination among related implementation works for completion of the Project shall be required, because the Project concerns systematically many engineering fields such as meteorology, communication, architecture, civil engineering, etc. In this Project, there is meteorological equipment work portion which refers to manufacturing, shipment, local installation, adjustment and commissioning.
For smooth implementing of the Project and avoiding delays and misunderstanding, communicating with the responsible organization (Bangladesh Meteorological Department), JICA Bangladesh Office and concerned government authorities will be required.

1. Executing agency of the Project

The government agency of Bangladesh responsible for the implementation of this Project is BMD which will be a signer of Consultant Agreement and Contract as the Client .

2. Implementation Plan

As for the implementation plan, it is necessary to discuss in detail and confirm the following points between BMD and the Consultant during the implementation period of the detailed design.

1) Securing and clearing the Project sites, distribution of electricity, water supply, telephone, drainage, sewerage and other incidental facilities to the Project site and also taking all necessary procedures shall be completed by Bangladesh side prior to the commencement of the Project.

2) The construction period is supposed to be approximately 8 months, since part of the building construction works period may fall within the rainy and flooding season, the implementation schedule must be well planned.

3) Dhaka International Airport is one of the Project sites. For avoiding obstruction of the international airport operations, adequate attention and careful consideration will be required.

4) For procurement of the equipment and materials for this Project to be financed by a grant-aid from Japan, careful liaison and coordination must be maintained with concerned Bangladesh governmental agencies. All necessary procedures for importing limited items and tax exemption procedures must be promptly completed in cooperation with the implementing organization, BMD.

5) With regard to the installation works for the meteorological telecommunication system, the equipment to be supplied under the Project will be installed at the existing facilities of BTTB and BMD Head Office, Dhaka International Airport, etc. Therefore, elaborate precautions will have to be taken to ensure the safety of these existing facilities.

6) The materials will be procured as much as possible from Bangladesh. However, in case of procurement of the erquipment from Japan or third countries will be required, the Bangladesh side shall take necessary measures for customs clearance and shall bear all the expenses.

7) At the time of the detailed design, the confirmation of the budgetary allocation will be necessary for the procurement of furniture, fixtures, etc., and also external work and removal and setting of existing equipment, and furniture and fixtures to be borne by Bangladesh side.

3 - 1 - 2 Implementation Conditions

1. Construction Conditions

1) Local Sub-contractors

Generally in Bangladesh, the technical levels of the major construction firms in Bangladesh are relatively sufficient. Thus, no particular problems are expected even in connection with the construction work of the weather radar tower at the Project site and also the equipment installation works with respect the technical levels of private local contractors, who will be undertaking this work together with Japanese main contractor.

2) Labour Condition

Labourers are classified by their skills such as carpenters, masons, steel fitters, etc. and are organized into labor unions, however, there is no standard license or qualification to identify the skill of labourers. Common labourers are not classified into special fields and are employed when necessary. The skills of labourers are much varied and truly skilled labourers are quite few.

3) Quality and process control

Concrete aggregate, cement, lumber, and other primary products as construction materials and building equipment are either produced or assembled on a knock-down basis within Bangladesh. Thus, almost all construction materials can be procured locally. Moreover, special machinery and equipment can be imported from neighboring countries such as Singapore, Thailand, etc., so that reasonable level of quality can be expected in this field.

2. Special Project Considerations

The materials will be procured from Bangladesh as much as possible. Accordingly, the construction work can be adequately carried out by local construction firms. The materials to be procured from Japan or the other countries would not pose any substantial problems, providing these materials are appropriate for the construction standards in Bangladesh.
Weather radar system, meteorological telecommunication system and other sophisticated equipment will be installed in the Rangpur radar tower building. Thus, it would be no exaggeration to say that the electrical power supply equipment for these systems is indispensable for the

weather radar tower building for uninterrupted operation. In accordance with the construction schedule, an electrical engineer will be dispatched at the time of the installation, adjustment and wiring for the electrical power supply equipment, power supply back-up system, and also a building equipment engineer will be dispatched for adjustment and confirmation of air-conditioning performance at the time of the installation of air-conditioning systems. During the construction period, procurement of the materials and securing of the skilled labourers will be necessary to be performed in accordance with the construction schedule.

As to the procurement and installation of the system and equipment, an engineer will be required to be dispatched for on-the-job training at each site for operation and maintenance of all the systems, in view of specific works and precision of installation works. After installation work, more further discussion with BMD will be necessary for smooth and appropriate maintenance of the systems.

The dispatch of the following engineers of the contractor during each implementation period will be required.

<Building construction>

·Resident engineer (Architect) :	1 person
·Electrical engineer :	1 person

<Equipment installation and adjustment>

·Weather radar system engineer :	4 persons
·Radar imagery composition & display engineer :	1 person
·Antenna engineer :	3 persons
·Radio engineer :	2 persons
·Transmission engineer :	2 persons
·Data transmitting & receiving satellite system engineer :	1 persons
·Satellite imagery receiving system engineer :	1 persons
·Meteorological observation system engineer :	2 persons
·Computer system engineer :	2 persons
·Meteorological information system engineer :	1 persons

3 - 1 - 3 Scope of Works

(1) Construction of Weather Radar Tower Building

• Portions to be undertaken by the Japan side :

1) Architectural and civil works for radar tower building
2) Electrical works for radar tower building
3) Air-conditioning works for radar tower building
4) Plumbing works for radar tower building

• Portions to be undertaken by the Bangladesh side :

1) Securing the Project sites (Dhaka and Rangpur)
2) External & planting work
3) Fencing work
4) Access roads work
5) Power supply intake work (including power meter)
6) Water intake work
7) Telephone line intake work
8) Purchase of furniture
9) Movement and relocation of the existing objections on the Project sites

(2) Installation Work for the Equipment:

• Portions to be undertaken by Japan

1) Equipment procurement for establishing the meteorological radar observation network.
2) Transport of the equipment to the various project sites.
3) Installation work for the equipment.
4) Adjustment work for the equipment.
5) Commissioning for the total system.

• Portion's to be undertaken by Bangladesh :

1) Removal and relocation of the existing facilities in the Project site, if any.

3 - 1 - 4 Consultant Supervision

In accordance with the guidelines of Japan's grant aid assistance and the basic design, the Consultant will be responsible for expeditious project implementation, forming project teams of detailed design and supervision for the implementation of the Project.

The Consultant is to dispatch one resident engineer to Bangladesh for the construction of the radar tower building in Rangpur. This resident engineer of the Consultant will provide appropriate advise and direction to personnel of the contractor and will maintain close liaison with the BMD, Civil Aviation Authority, the Embassy of Japan in Bangladesh, the JICA Bangladesh office. With the progress of the construction work, the Consultant's engineer in charge of structures and facilities will be dispatched, as required, to conduct inspections and provide construction guidance on site.

With respect to installation and adjustment works of the system, engineers of the Consultant will be dispatched to Bangladesh timely for installation guidance, inspection, etc. for each system. In connection with the weather radar and radar composite imagery systems, performance test at a factory and also adjustments, inspections, commissioning of equipment and data reception and transmission conditions in Bangladesh will especially be required.

1. Principal Guidelines for Supervisory Plan

1) Closely to communicate with responsible organizations and personnel of both countries, and complete the Project in time in accordance with the implementation schedule.

2) In order to carry out the construction and equipment installation work in accordance with the technical specifications and drawings, direction and advice will be given to contractor personnel without delay.

3) Local construction methods will be adopted, and to the maximum possible extent, locally available materials will be procured.

4) Instruction for construction and installation methods and technique will be provided to a local contractors as technical transfer so as to maximize the Project effect.

5) Upon the Project completion, the contractors will be obliged to submit the maintenance manuals and provide appropriate guidance to the BMD to ensure smooth operation and maintenance of all the systems.

2. Construction Supervision Work

1) Construction supervision

The Consultant will prepare the form of the Contract in accordance with JICA standard and select a Japanese prime contractor through tendering with BMD, and also recommend the contractor to the Government of Bangladesh.

2) Confirmation of the drawings, materials and equipment

The Consultant will inspect and confirm shop-drawings, system drawings & diagrams and material samples submitted by the Contractor as well as performance of all the equipment.

3) Direction for Construction

Based on a review of the construction schedule, the Consultant will provide instructions to the Contractor and submit progress reports on the construction work to BMD, Embassy of Japan in Bangladesh, JICA's Bangladesh office, etc.

4) Approval procedure for payment

The Consultant will cooperate in certification for payment, such as meticulous examination of notice of approval and invoices in connection with implementation cost to be disbursed during the implementation period and upon completion of the Project.

5) Attendance for inspection

As required during the implementation period, the Consultant will perform inspections at each stage of the work and, based on confirmation of completion and fulfillment of the contract conditions.
The Consultant will be present at the handing over of the facilities and equipment, at which point its tasks will be completed, with the approval of the Client. Reports will also be made to concerned personnel in the Government of Japan on all required items, such as progress reports during the implementation period, payment procedures, completion and handing over.

3. Dispatch of Engineers

A meteorological planning engineer will be dispatched to Bangladesh as the general project supervisor.

<Building Construction>

Accurate quality control and supervision of construction progress will be required throughout the construction period. With regard to quality control, it should be observed that, whether the construction materials are sourced within Bangladesh or brought in from Japan or third countries, quality and construction methods may differ even for the same material, so that, in most cases, swift assessments must be made, owing to the severe time restraints of the Project. In case of the absence, precious time would be required to reach decisions.

With respect to the construction schedule, the delays of the construction can be expected in the piling and foundation work in rainy and flood season. Furthermore, as radar tower building is to be constructed at the Rangpur site, the supervisory service is likely to be quite complex. Based on the above considerations, in case of spot supervision, serious problems could be expected in both quality and progress control. Therefore, it is deemed that a resident engineer will be dispatched for the project. Accordingly, architectural engineer-B will be sent to Bangladesh for 8 months under construction period.

During the construction period, the engineer will provide supporting services on construction drawings, methods as well as inspections of the equipment in Japan. In addition, these engineers will be dispatched to Bangladesh, as required, for supervision on installation and adjustment stages.

a) Architectural Engineer-A
b) Architectural Engineer-B
c) Structural Engineer
d) Electrical Engineer
e) Air-conditioning & Plumbing Engineer
f) Quantity Surveyor

<Equipment Work>

The various equipment differs on function and performance. Thus, in order to combine each equipment organically into a single meteorological system, and integrate these separate systems into one total system, based on the specifications, it is vital that such overall integration be made the corner-stone of the construction schedule. To support the resident engineer, each engineer in meteorological communication, radio, transmission, etc. will be dispatched to supervise the meteorological communication system, along with radar engineers to oversee the weather radar system, and a meteorological planning engineer to provide general supervision for all the system. Moreover, these supervisory services will be performed from the standpoint of the user, the BMD. Supervision will be carried out in close coordination with a radar imagery engineer, a data processing engineer and other necessary engineers, based on the meteorological communication, data processing capabilities required for a total meteorological system.

In connection with the supervision of equipment installations, most suitable engineers will be dispatched timely to carefully supervise installations in their respective areas of expertise. During the implementation period, these engineers will also perform checks on system drawings and installation methods along with the equipment inspections in Japan and will be dispatched, as needed, to Bangladesh for installation and adjustment works.

b) Meteorological Telecommunication Engineer
c) Telecommunication Radio Engineer
d) Radar Engineer
e) Radar imagery Analysis Engineer
f) Meteorological Data Transmission Engineer
g) Meteorological Data Transmission and Receiving Satellite System Engineer
h) Meteorological Satellite Imagery Receiving System Engineer
i) Meteorological Observation System Engineer
j) Meteorological Software Engineer
k) Computer system Engineer
l) Meteorological Information System Engineer

3 - 1 - 5 Procurement Plan

The procurement plan for materials and equipment is oriented to local maintenance level and structure for the meteorological systems and equipment, and radar tower building and building equipment. The plan is deemed to be appropriate, in that recurrent costs have been estimated on the basis of BMD's probable financial capabilities after completion of the Project.
The procurement plan has been designed, with full awareness of the current situation at BMD, on the basis of the estimated useful life of each item, a regular maintenance cycle for the systems and equipment, a proper supply of spare parts for maintenance use, and procurement methods. Consideration has also been given to the preparation of operating and maintenance manuals, related guidance, as well as training programs for BMD.

1. Equipment

The most considerable factors in supplying equipment is maintenance method of the equipment and availability of the necessary parts and consumables in Bangladesh. The equipment procurement must take account of ongoing maintenance requirements after completion of the Project. Careful consideration should be given in making maximum use of the local agent when problems occurred with a particular item of the equipment.

The weather radar system, weather radar image composition system and other systems, many of which will be difficult to procure locally. Thus, in connection with quality and maintaining levels of sophisticated systems, it will be absolutely essential to procure such components from Japan and/or third countries. At these days, equipment prices are almost identical in Japan and third countries. For quality control of each system, procurement of the equipment from Japan will be easier than third countries.

In addition, the existing radar systems at Cox's Bazar and Khepupara established under the Japan's Grant Aid Assistance in 1988, these radar systems were procured from Japan. It is sure that procurement from Japan would surely be advantageous to BMD in consideration of unification of the systems and spare parts, operating procedures, maintenance techniques and also familiarity of the equipment.

The most considerable points on supply of the equipment are regarding operation and maintenance methods and also procurement of necessary spare parts after completion of the Project for long time. This will surely be a vital factor is determining the success of the Project.

As might be expected, our major concern from a maintenance standpoint relates to all the sophisticated system such as weather radar, weather radar composite imagery systems, etc., with being essentially computer systems. As activities of the private sector related to computer systems, there are several agents of the computer equipment in Bangladesh.
They have sufficient engineering skills, experiences and capabilities for maintenance and management on computer equipment. The activities of the private sector in Bangladesh will be useful for the computer system of the weather radar system, weather radar composite imagery system and other sophisticated systems introduced under the Project.

Based on the above considerations, the procurement plan for the Project equipment should be designed with a view to achieving the maximum possible degree of standardization as well as ease of obtaining spare parts; and selecting equipment with which BMD is already familiar and which can be maintained locally.

2. Construction Materials

Almost all of the required construction materials such as concrete aggregate, cement, lumber, and fittings are obtainable in Bangladesh. On the other hand, building equipment is, at present, largely imported.
The construction materials should basically be procured locally. Only the materials difficult to obtain in Bangladesh and those specially required to achieve the quality and level of the facility of the Project shall be procured from Japan and/or the other countries.

1) Cement

Supply is relatively stable. However, careful quality checks will be required during construction.

2) Concrete aggregate

Concrete aggregate uses mainly crushed stone and bricks. Local supplies are stable and able to meet current demand in terms of both quantity and quality. In Bangladesh, procurement of rushed stone is rather difficult and rushed stone is expensive than crushed bricks. However, for obtaining 210kg/m^2 of concrete strength for construction of a radar tower building, rushed stone as concrete aggregate will be necessary for the Project.

3) Concrete products

Concrete blocks and other secondary concrete products are also made locally. However in the absence of ready-mixed concrete, all concrete must be made at a site, requiring careful quality and strength checks. Concrete should be test-mixed at the site, after which an optimum mixture can be determined.

4) Reinforced bars

Reinforced bars, as required for the production of reinforced concrete, can be locally sourced, and a reliable intensity value can be confirmed from the mill sheet obtained of the reinforcing bars.

5) Timber and Plywood

Plywood for both interior at exterior use, as well as for use in concrete forms can be procured locally.

6) Door and window products

Various types of windows and doors produced in Bangladesh, they are widely used in the country and generally pose no problems. For this Project, therefore, local steel and aluminum windows and doors will be used.

7) Paint

The paints both for indoor and exterior are available in a wide variety of colors and in terms of quantity, color, and base (oil, emulsion, epoxy).

As noted above, construction materials are generally available in Bangladesh, with quality presenting no particular problem. In connection with the radar tower building construction period, since certain materials for special power-supply equipment, as needed to install the weather radar system, cannot be locally sourced, such items will have to be brought in from Japan or third countries.

3. Transport Routing for Materials

The equipment and materials shipped by sea to Bangladesh from Japan or third countries will be unloaded at Chittagong and railroaded to Dhaka Internal Container Depot (DICD). At the Depot, necessary measures for custom clearance will be held. After the custom clearance, the equipment and materials will be roaded to each site. The road to each site is almost entirely asphalt-paved.

1) Air service

Biman Bangladesh Airline (BG) operates 1 round-trip flight per week between Tokyo and Dhaka International Airports. This airline also have many domestic flights. There is a daily flight between Dhaka and Saidpur.

2) Shipping service

There are 2 ~ 3 scheduled shippings per week between Chittagong from Japanese ports (primarily Kobe, Nagoya, and Yokohama). Direct service takes about 3 ~4 weeks between both ports.

3) Domestic transport

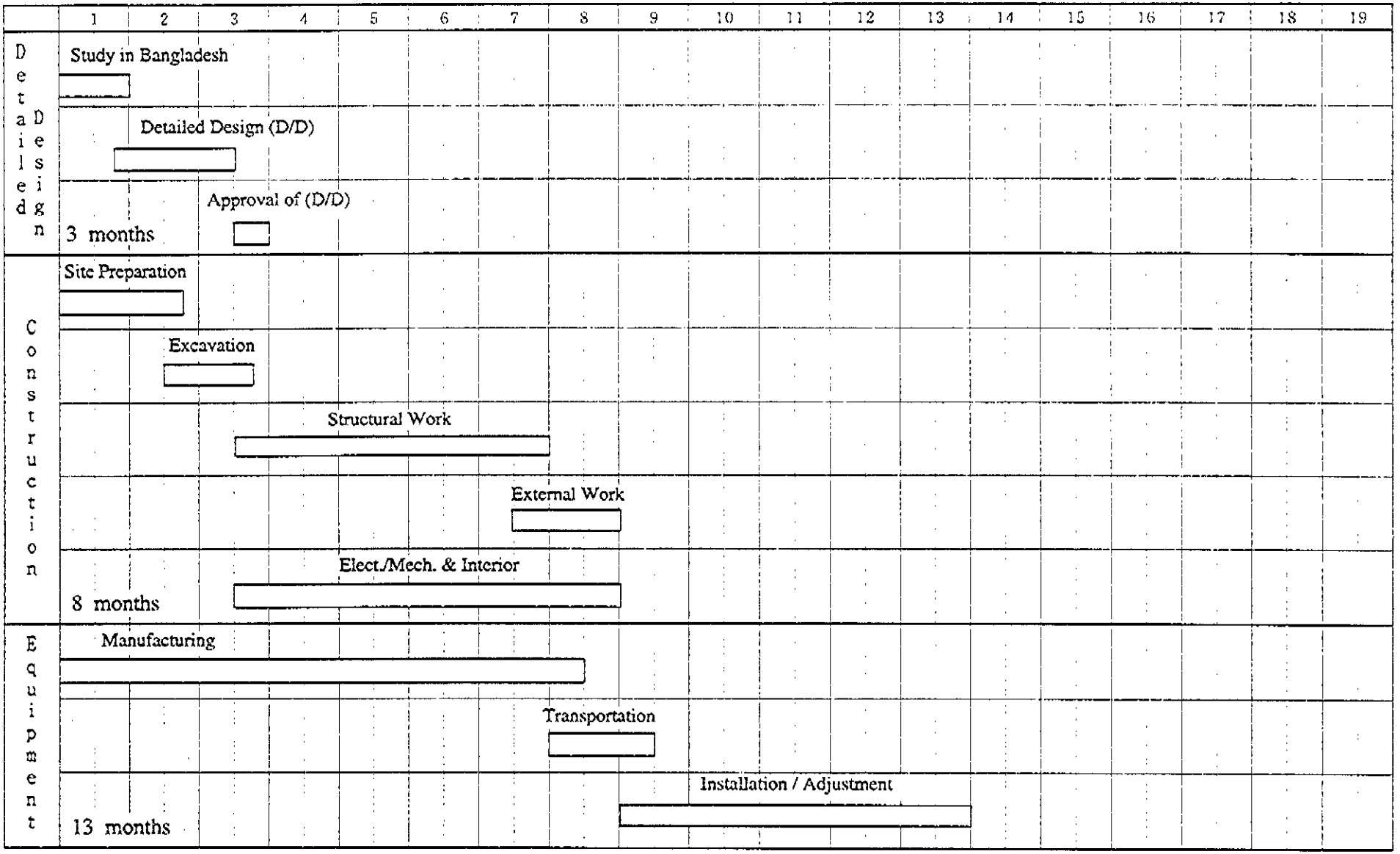
The main forms of domestic transport are road and air. Land transport is cheaper than air for long-haul and large-volume shipments and so more advantageous. Between Dhaka Internal Container Depot (DICD) and each site, the land transport is the most recommendable.

4. Implementation Schedule

The Project involves the construction of weather radar tower building at Rangpur together with the manufacturing, installation, adjustment and commissioning of equipment for weather radar, weather radar composite imagery, meteorological telecommunication, satellite receiving and other sophisticated systems. The entire implementation of the Project is expected to require some 14 months in all.

The building construction work will consume about 8 months from preparation work to completion, while some 7.5 months will be needed to manufacture all the equipment. The equipment introduced under this Project will be of a specialized and used exclusively for meteorological purposes, the production cycle will necessarily be longer than for conventional equipment.

3-1-6 Implementation Schedule



3 - 1 - 7 Obligation of recipient country

Undertakings required of the Government of Bangladesh

In the implementation of the Project under Japan's Grant Aid Assistance, the Government of Bangladesh is required to undertake such necessary measures as the following:

(1) General requirements

1) To take all necessary procedures in Bangladesh.
2) To open an account in the name of the Government of Bangladesh in an authorized foreign exchange bank in Japan and to bear commissions to the Japanese foreign exchange bank for the banking services based upon Banking Arrangement.
3) To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the Project at the port of disembarkation.
4) To accord Japanese nationals whose services may be required in connection with the supply of products and the services under the verified contracts such facilities as may be necessary for their entry into Bangladesh and stay therein for the performance of their work.

(2) Requirements for the Equipment

1) To remove and relocate the existing facilities for installation work of the equipment, if required for the implementation of the Project, at the expense of Bangladesh.
2) To bear all the expenses other than those to be borne by the Grant Aid, necessary for the transportation and the installation of the equipment.
3) To provide appropriate frequencies for radar systems and microwave & UHF links to be established.
4) To secure effective spaces at the existing facilities for installation of the equipment to be supplied.
5) To secure the necessary interfaces on the existing telecommunication links for the Project.
6) To maintain and use properly and effectively that the equipment purchased under the Grant Aid.

(3) Requirements for Construction of Radar Tower Building

1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
2) To provide facilities for distribution of electricity, water supply, telephone, drainage, sewerage and other incidental facilities to the Project sites.
3) To undertake incidental outdoor works such as gardening, fencing, gates and exterior lighting in and around the sites.
4) To construct the access road to the sites prior to commencement of the construction.
5) To provide temporary facilities for distribution of electricity, water supply, telephone, and other incidental facilities for construction of the building.
6) To secure effective spaces at the Project sites for temporary facilities such as a contractor's office, workshop, building materials storage, etc. for construction of the building.
7) To bear all the expenses other than those to be borne by the Grant Aid, necessary for the transportation and construction of the building.
8) To maintain and use properly and effectively that the building constructed and the equipment supplied under the Grant Aid.

3 - 2 Project Cost Estimation

Cost estimation for major undertaking to be borne by Bangladesh side (Capital Budget).

At the time of implementation of the Project under Japan's Grant Aid Assistance, the estimated cost for the major undertaking of the Government of Bangladesh will be necessary as described in the following table.

Item	
External & planting work cost	Taka 18,000.-
Power supply intake cost	Taka 28,000.-
Telephone line intake cost	Taka 24,000.-
Furniture cost	Taka 25,000.-
Total	Taka 95,000.-

3 - 3 Operation and Maintenance Costs

1. Staff Requirements for Implementation of the Project

After completion of the Project, the following staff assignments will be required at the Rangpur radar site for appropriate and effective operation and maintenance of the radar system to be supplied under the Project. These following staff are already available in BMD.

	No. of Post
1. Electronic Engineer	1
2. Assistant Meteorologist	1
3. Electronic Assistant	4
4. Technician	5
5. Sweeper	1
6. Security staff	2
Total : 14	

2. Operation and Maintenance Plan of Facilities

After completion of the Project, BMD will play a role in operating and maintaining the radar tower building at Rangpur, in conjunction with other government agencies. The existing Cox's Bazar and Khepupara radar tower buildings have been operated and maintained well by BMD.

<Maintenance Cost for Facilities>
After completion of the Project, BMD will take care of additional expenditure for operation of the radar tower building at Rangpur at his expense. The necessary expenditure for electricity, water, telephone, etc. are calculated on bases of the present rate as follows.

1) Water charge : Taka 1,300 / year
Per month : 5 staff x 100 ℓ / day x 1.2 x 30 days = 18,000 ℓ / month
4.5 ℓ = 1GAL
18,000 ℓ ÷ 4.5 ℓ = 4,000 GAL
Taka26 / 1,000 GAL
(4,000 GAL ÷ 1,000 GAL) x 12 months x Taka26 = Taka 1,248 x 1,04 = Taka 1,297.-
Taka1,297 x 1 site ≒ Taka 1,300 / year
2) Electricity charge : Taka140,000 / year

Electricity charges at the existing radar sites are approximately Taka140,000/year per site. Based on the expenditure of the existing radar sites, new radar site of Rangpur can be expected as the most likely the same power consumption of the existing radar sites as follows.
Taka140,000 / year

3) Telephone charge : Taka18,500 / year
Telephone calls : 15 calls / day at each site
Telephone : 15 calls / day x 1.7 x 30 days x 12 months = Taka9,180 / year

Facsimile : Taka9,180 / year = 0.8 ≒ Taka7,400 / year
Taka150 (Line charge) x 12 months = Taka1,800 / year
Taka9,180 + Taka7,400 + Taka1,800 = Taka18,380 / year ≒ Taka18,500 / year

4) Rental charge for telecommunication link between Dhaka & Rangpur : Taka914,000/year
Rental charge of the telecommunication link is expected as described above.

3. Operation and Maintenance Plan of Equipment

In connection with equipment operation and maintenance, consideration must be given to the following matters.

- Staff training
- Operation and maintenance structure of BMD
- System failure incidence
- Frequency of scheduled parts & consumables replacement and overhauls

Many electronic parts are used in the electronic equipment in these days. When they have developed a failure internally, only replacement of a part is useful to solve this failure.
Therefore, the following methods will have to be applied to minimize the occurrence of failures and maintenance cost to be borne by BMD.

- The power supply to a radar system should be provided through uninterrupted power supply (UPS) and auto voltage regulator (AVR).

- At the time of installation work of the equipment, effective operation and maintenance method and technique should be provided through on-the-job training by a consultant

method and technique should be provided through on-the-job training by a consultant and a contractor.

- Consideration for selection and procurement of the equipment will be necessary for utilization of local activities in the occurrence of a failure.

- Unification of spare parts and consumables between the existing equipment and the equipment to be supplied under the Project.

- For procurement of the equipment, operation and maintenance procedures should be resembled as closely as possible to the existing equipment.

In order for each responsible person to be able to appropriately and effectively perform his duty to avoid any failure, provision of operation and maintenance manuals are indispensable. In addition, on-the-job training through actual use of the equipment should be conducted to as many staff as possible in accordance with these manuals.

After expiry of the warranty period for 1 year from completion of the Project, BMD will maintain all the equipment himself, thus BMD should recognize necessity of some special expenditures at a time of problem occurred. However, for minimization of expenditures to be taken by BMD for operation and maintenance of the equipment, as much as possible, standardization and unification of spare parts & consumables and selection of the most familiarized equipment of BMD are indispensable. Such a policy will be able to contribute positively to reducing financial burden of future procurement of spare parts and consumables as well as overall maintenance expenditures.

<Maintenance Cost for the Equipment>

Future maintenance costs for the equipment have been calculated on the basis of the following conditions. The systems to be introduced under the Project will be installed at the rooms fully equipped with power backup systems, such as uninterrupted power supply, automatic voltage regulator, and air-conditioning systems. Therefore, the whole equipment will be installed in a suitable and effective environmental condition. In case of normal operation of the equipment under the above said conditions, the annual maintenance cost for the equipment can be estimated on the basis of Japanese experience.

After completion of the Project, for the first year, all the equipment are still under warranty by the contractor, no problems should be encountered. Spare parts for 2 years normal operation to be supplied under the Project should be adequate for the second and third year, and it is probably not expecting any major equipment failure because the whole system is still new. During these early years, therefore, maintenance expenses should be modest.
From the fourth year, practical maintenance cost will be required and the following expense may be anticipated.

Major expensive items
For operating a radar system, the following essential parts, in particular, will have to be procured by BMD on a continuing basis.

- Magnetron (pulse radar transmission tube)
  Life time : approximately 1,500 hours
- Thyratron (pulse radar switching tube)
  Life time : approximately 2,000 hours
- Transmitting/receiving limiter (switching equipment between radar beam transmission & receiving)
  Life time : approximately 10,000 hours
- Batteries for uninterrupted power supply equipment
  Service life : approximately 5~6 years

The systems to be supplied under the Project can be expected to operate for approximately 3,000 hours per year. On this basis, for appropriate operation of a radar system to be installed in Bangladesh, replacement of a magnetron and thyratron would be required approximately every 0.5 years and 1 years and also transmission/receiving remitter would be required approximately every 3 years.

To new radar systems to be installed at Dhaka and Rangpur, 5 magnetrons and 4 thyratrons will be attached for each system. Thus, for 4 ~ 5 years operation with them will provably be possible. However, a magnetron is a pulse radar transmission tube, certain parts will wear out before the end of the magnetron's life time, so BMD must obtain an annual maintenance appropriation at an early stage to be absolutely sure of its ability to procure these essential parts for a radar system, as required.

The BMD's maintenance capabilities have been amply confirmed on the basis of the more than 9 years' experience it has had with the existing radar systems Cox's Bazar and Khepupara. These radar systems are still working well through appropriate maintenance of BMD, in addition, technical skill levels of radar engineers and technicians in BMD are quite enough for maintenance of a radar system.

Minimization of an annual operation and maintenance cost of BMD has been considered in the basic design study, nevertheless the operation and maintenance cost for the radar tower building at Rangpur to be constructed and the equipment to be installed under the Project will additionally be required.

In order to minimize the operation and maintenance cost, it is necessary that BMD must have the spacial consideration on minimization of consumption and must achieve economizing. It is the best method for minimization of expenditure of BMD.

- **Additional Operation and Maintenance Cost due to the Project**

In consequence of the above conditions, the annual operation and maintenance cost for the Project as described in the below table will be needed additionally.

	1st year	2nd year	3rd year	from 4th year
Repairing cost	Tk0.	Tk0.	Tk30,000.	Tk50,000.
Consumables	Tk0.	Tk0.	Tk40,000.	Tk60,000.
Water charge	Tk1,300.	Tk1,300.	Tk1,300.	Tk1,300.
Electricity charge	Tk140,000.	Tk140,000.	Tk140,000.	Tk140,000.
Telephone charge	Tk18,500.	Tk18,500.	Tk18,500.	Tk18,500.
Rental charge for communication lines	Tk914,000.	Tk914,000.	Tk914,000.	Tk914,000.
Total	Tk1,073,800.	Tk1,073,800.	Tk1,143,800.	Tk1,183,800.

Chapter 4
Project Evaluation and Recommendation

Chapter 4 Project Evaluation and Recommendation

4 - 1 Project Effect

1. Project Effect

The Project will have to make the following objectives and the whole population of about 112 million of Bangladesh will benefit from the Project as the Project effect.

1) The reduction of natural disasters in Bangladesh by strengthening the capabilities for weather monitoring and forecasting of disastrous meteorological phenomena such as cyclone, heavy rain, flood, thunderstorm, norwesters, tornadoes etc., and improvement of the safety of people's life and property by providing more accurate forecasts and warnings.

2) The improvement of the living standard of the people of Bangladesh and to the development of socio-economic activities including activities of any sector not only in Bangladesh but also in the region through the provision of the above improved meteorological information.

After the implementation of the Project, the facilities of BMD will greatly be improved and thus BMD will be capable of contributing effectively to the mitigation and prevention of tropical cyclone disasters, flood damages and losses by other natural calamities like norwester, tornadoes, severe thunderstorm etc. in Bangladesh.
In addition, the weather monitoring system of BMD will be strengthened, the position and intensity of severe meteorological phenomena will be determined more accurately and timely, and the computerized weather data will be utilized adequately, and thus the routine forecast accuracy will be improved greatly. Besides, the accuracy and the reliability of meteorological forecasting and warnings related to cyclones, storm surges and severe local storms will be improved. And it is expected that with this BMD can contribute to the reduction of natural disasters in the country. At the same time, overall standard of meteorological information will be in better position, and BMD will thus be able to contribute in a greater perspective to the reduction of disasters also caused by heavy rain, thunderstorm, etc. which in turn will add to the safety of people's life, shipping and civil aviation.
Further, the improvement of observing and forecasting system as a result of this Project will highly enhance BMD's activities and will put BMD in a position to play its due role in the

economic development of Bangladesh.

The cyclone warnings, weather forecasts and various kinds of weather information will be provided to the general public of Bangladesh through mass-media. In addition, the meteorological information is also provided to the other user agencies in the country. Thus, when the project will be completed, it will have high publicity.

Weather radar is a meteorological equipment to detect the distribution of precipitation intensity using microwave. Information to be given and its possible application are as follows:

1) Weather radar system can observe the distribution of precipitation intensity instantaneously, spatially and continuously over a broad area (qualitatively within a radius of 400 km). Whenever precipitation phenomena appear in this area, the distribution of precipitation intensity can be monitored continuously.

2) The precipitation intensity and other characteristics of the precipitation can be obtained from echo intensity. The movement and modification of rainfall area also can be estimated by continuous monitoring of radar echo.

3) By integration of echo intensity data, the fine-meshed distribution of precipitation can be derived.

In this way, weather radar system is very effective equipment for observing precipitation phenomena because it enables to detect precipitation and closely associated meteorological phenomena in minute quantities, both spatially and temporally. Weather radar, therefore, is utilized throughout the world in areas that are frequently attacked by meteorological disaster caused by heavy rain, cyclones, etc.

In Bangladesh, the most major natural disasters are cyclone and flood caused by heavy rainfall around the upper stream basins of the Ganges at the Himalayas and the Brahmaputra at the Tibet and also there are other natural calamities like norwester, tornadoes, severe thunderstorm etc. For detecting and monitoring natural calamities at frequent intervals to forecast their intensity and land-fall more accurately, meteorological radar network will be able to cover the whole area of Bangladesh and to ensure continuous supply of rainfall distribution, intensity and movement, cloud echoes and other necessary information to BMD and other organizations related to reduction of flood disasters.

- The radar observation network in Bangladesh incorporating with the existing radar systems at Cox's Bazar and Khepupara for monitoring cyclone, heavy rain and other meteorological phenomena in the whole area of Bangladesh will be established under the Project. For detecting and monitoring natural calamities at frequent intervals to forecast their intensity and land-fall more accurately, meteorological radar network will be able to ensure continuous supply of rainfall distribution, intensity and movement, cloud echoes and other necessary information to BMD and other organizations related to reduction of flood disasters. For contributing to accurately and speedily make weather forecasting and warning,

- In consequence of establishment of the radar observation network in Bangladesh, observation of weather condition and precipitation in the whole area of Bangladeh and also preparation of flood forecast between several days and 10 days as medium range flood forecast will be able to be possible. In addition, the position and intensity of severe meteorological phenomena will be determined more accurately and timely, and the computerized weather data will be utilized adequately, and thus the routine forecast accuracy will be improved greatly.

- By receiving high resolution data from meteorological satellites, it will be possible to detect and monitor cyclone and heavy rain to be causing flood without range of weather radar network to be established under the Project and also to contribute improvement of forecasting accuracy through obtaining sea & ground surface temperature from the satellites, together with radar imageries from radar systems.

- BMD will be able to make more efficiency at its weather chart preparation work by automatic plotting international and domestic meteorological data. Due to this circumstance, weather forecasting procedures will be minimized and weather forecasting and warning will promptly be issued.

- Weather forecasting and warning will be able to promptly be announced by mass media (TV, radio, and newspaper) to the general public. Specially, in order to prepare a weather program by Bangladesh TV Centre, visible images such as radar images, satellite images and weather charts will be provided. Using those visible meteorological information, Bangladesh TV Centre will be able to provide understandable and attractive weather program for the people of Bangladesh.

- The weather information and warning on cyclone, heavy rain, flooding, etc. from BMD will be utilized for taking measures against natural disaster and making prompt relief action at the Prime Minister's Secretariat as the highest authority of Bangladesh.

- FF&WC will be able to make more accurate flood forecasting information using radar & satellite imageries and weather information transmitted by BMD. The accurate flood forecasting information will directly contribute to reduction of flood disasters through organizations related to flood action.

- Using the following information to be delivered to Dhaka International Airport by BMD, safety operation of civil aviation will be ensured.
  - Surface weather observation data according to ICAO standard
  - Weather information on air turbulence, thunder storm, etc. in Dhaka flight information region.
  - Weather forecasting for flight route schedule
  - Weather forecasting at the airport for aircraft take-off and landing

- Cyclone & Flood Shelters constructed and financed by foreign assistance including Japan's Grant Aid Assistance are indispensable for keeping people's life against natural disasters. It is sure that these shelters and forecasting and warning systems to be established under the Project will be able to protect the people of Bangladesh and also to make good effects and to provide appropriate benefit.

- Meteorological information are exchanged on-line with neighboring countries through the Global Telecommunication System (GTS) of WMO. Thus, the benefits generated by this Project will extend also to the neighboring countries even Japan, will be able to receive meteorological data of Bangladesh.

- A project by international cooperation on improvement of meteorological services, it can make the project effect and provide global benefit to the whole of the world for improving accuracy of numerical weather prediction.

2. Verification of Appropriateness

In consequence of the Implementation of the Project, the BMD's meteorological observation and forecasting operations will be modernized. This will make it possible to continuously detect and monitor the hazardous weather condition, tropical cyclone, heavy rain, etc., that lead to meteorological damage, and so can be expected to improve forecasting accuracy. BMD will thereby be in a position to provide accurately timed forecasts and warnings to the general public, disaster relief organizations, aviation sectors.

BMD has prepared a development plan for organizational restructuring and personnel deployment in connection with ongoing operation and maintenance of all the meteorological systems to be established under the Project. Judging by operating performance, engineers of BMD have been satisfactorily nurtured, while an appropriate training system is also being planned. BMD is, accordingly, deemed fully capable of operation and maintenance of the new systems. It has, therefore, been determined that the operation and maintenance plans for this Project are quite realistic.

Based on all the above consequences, it has been concluded that it would be appropriate to implement the Project under Japan's Grant Aid Assistance.

4 - 2 Recommendation

The Project is expected to produce the considerable benefits as mentioned above. The Project would substantially contribute to the development of the basic human needs in the people of Bangladesh, the appropriateness of carrying out this Project under a grant-aid has been amply confirmed. Therefore, the implementation of the Project is inferred to be truly significant.

In addition, by improving and expediting the following items, the smoothness and effectiveness of the Project could be increased further.

- In order to operate the 4 weather radar systems on an integrated basis, radar information must be standardized and their observations be conducted smoothly. It would be desirable, in this connection, that BMD should strengthen the engineering section and establish new operation and maintenance structure within the organization and a proper maintenance system for the whole meteorological systems.

- Since weather radar systems, radar imagery composite system as well as telecommunication equipment for transmitting the radar imagery will be installed under the Project, it is essential that competent maintenance engineers be secured for ongoing operations. To this end, an efficient and effective training plan should be established to ensure continuing development of a qualified technical personnel.

- In order to diffuse and improve the standards of forecasting techniques based on the use of radar data and imagery, it is desirable that forecasters be trained and that technical skills be constantly refined for very short range forecasts.

- Through observation of precipitation distribution on a continuous basis, using weather radar system, it will be possible to estimate surface rainfall. And, by correcting these radar-based estimates by actual surface measurements, highly accurate rainfall can be obtained which will further enhance forecasting accuracy. For this purpose, it is very useful to have precipitation data from FF&WC at BMD Storm Warning Centre.

Appendices

Appendix 1. Member List of the Survey Team

(1) Basic Design Survey Team

Ms. Kae YANAGISAWA	Leader	Director of Training Division, Chugoku International Center, JICA
Mr. Yoshihisa KIMATA	Technical Advisor	Scientific Official, Observation Division Kansai Aviation Weather Service Centre, Japan Meteorological Agency
Mr. Seiichi SHINOKI	Chief Consultant/ Meteorological Ovservation, Forecast & Warning System Planner	Japan Weather Association
Mr. Yoshihisa UCHIDA	Meteorological Telecommunication System Planner	Japan Weather Association
Mr. Shigemi NISHI	Meteorological Radar System Planner	Japan Weather Association
Mr. Takuji TERATANI	Radar Image Analysis System Planner	Japan Weather Association
Mr. Hiroshi AMEMIYA	Facility and Cost Planner	Japan Weather Association

(2) Explanation of Draft Report

Mr. Kai YANAKA	Leader	Deputy Director of General Affairs Division, Osaka International Centre, JICA
Mr. Seiichi SHINOKI	Chief Consultant/ Meteorological Ovservation, Forecast & Warning System Planner	Japan Weather Association
Mr. Yoshihisa UCHIDA	Meteorological Telecommunication System Planner	Japan Weather Association
Mr. Hiroshi AMEMIYA	Facility and Cost Planner	Japan Weather Association

Appendix 2. Survey Schedule

(1) Basic Design Study

1997/3/15-1997/4/16

	1997		Study Schedule						
			Governmental Member		Consultant Member				
			Ms. Kae YANAGISAWA	Mr. Yoshihisa KIMATA	Mr. Seiichi SHINOKI	Mr. Yoshihisa UCHIDA	Mr. Hiroshi AMEMIYA	Mr. Shigemi NISHI	Mr. Takuji TERATANI
			Team Leader	Technical Advisor	Chief Consultant/ Meteorological Oversevation, Forecast & Warning System Planner	Meteorological Telecommunication System Planner	Facility and Cost Planner	Meteorological Radar System Planner	Radar Image Analysis System Planner
1	15.Mar	Sat	Hiroshima→Singapore(SQ977)	Osaka→ Bangkok (TG623)	Tokyo→ Bangkok (TG641)				
2	16.Mar	Sun	Singapore→ Dhaka(SQ414)	Bangkok →Dhaka (TG321)					
			Preliminary Meeting at JICA Bangladesh Office, and courtesy call on Embassy of Japan						
3	17.Mar	Mon	Visit to ERD, Ministry and BMD, explanation of Inception Report						
4	18.Mar	Tue	Survey of BMD facility & radar site, Bangladesh TV and Dhaka International Airport						
5	19.Mar	Wed	Survey of BMD facility and Flood Forecasting & Warning Centre						
6	20.Mar	Thu	(Moving to Rangpur)						
7	21.Mar	Fri	Survey of Rangpur new radar site and BTTB station (Moving to Dhaka)						
8	22.Mar	Sat	Discussion with BMD on the Minutes of Discussion						
9	23.Mar	Sun	Signing of the Minutes of Discussion				Data collection for cost estimate		
10	24.Mar	Mon	Reporting to EOJ and JICA Office					Tokyo→ Bangkok (TG641)	
				(Moving to Cox's Bazar)					
11	25.Mar	Tue	Dhaka →Bangkok (TG322)	Survey of Cox's radar (Moving to Chittagong)		Survey and data collection on facility		Bangkok →Dhaka (TG321)	
12	26.Mar	Wed	Bngkok →Osaka (TG622)	(Moving to Dhaka)		Preliminary arrangement for survey of BTTB sites		Courtesy Call on BMD, and survey of Dhaka radar site	
13	27.Mar	Thu		Dhaka →Bangkok (TG322)	Survey of Bangladesh TV Centre		Survey of Dhaka radar site		Survey of Bangladesh TV
14	28.Mar	Fri		Bngkok →Osaka (TG728)	Inner meeting				
15	29.Mar	Sat			Data collection on natural disaster	Survey of BTTB	Data collection for cost estimate	Data collection for natural disaster and government publications	
16	30.Mar	Sun			Data collection on natural disaster	Survey of new radio link	Data collection for cost estimate		
17	31.Mar	Mon			Data collection on natural disaster	Survey of existing telephone link	Data collection for cost estimate	Survey of existing telephone link	

				Mr. Seiichi SHINOKI	Mr. Yoshihisa UCHIDA	Mr. Hiroshi AMEMIYA	Mr. Shigemi NISHI	Mr. Takuji TERATANI
18	1.Apr	Tue		Survey on flood F/W system	Survey of existing telephone link	Data collection for transport		
19	2.Apr	Wed		Survey of Dhaka Intl. Airport	Survey of new radio link	Survey of Dhaka International Airport	Survey of new radio link	Survey of Dhaka International Airport
20	3.Apr	Thu		Survey in BMD				
21	4.Apr	Fri		Inner meeting				
22	5.Apr	Sat		Moving to Rangpur	Ordering the site survey of Rangpur radar site		Moving to Rangpur	Survey of Dhaka International Airport
23	6.Apr	Sun		Moving to Dhaka	Survey on back-up power supply facility		Moving to Dhaka	Examination of collected data
24	7.Apr	Mon		Examination of collected data	Data collection for cost estimate		Data collection for equipment planning	
25	8.Apr	Tue		Examination of collected data and results of survey			Data collection for equipment planning	
26	9.Apr	Wed		Survey of facility for new radio link in Dhaka			Data collection for equipment planning	
27	10.Apr	Thu		Analysis of the results of survey and collected data, and additional data collection for cost estimate				
28	11.Apr	Fri		Study on design condition and draft basic design				
29	12.Apr	Sat		Discussion with BMD on preparation of a draft basic design				
30	13.Apr	Sun		Discussion with BMD on preparation of a draft basic design				
31	14.Apr	Mon		Reporting to EOJ and JICA Office	Dhaka			
32	15.Apr	Tue				Singapore(SQ419)		
33	16.Apr	Wed					Narita(SQ998)	

(2) Explanation of Draft Report

			Schedule			
			Governmental Member	Consultant Member		
			K.YANAKA	S.SHINOKI	Y.UCHIDA	H.AMEMIYA
1	10-Jun.	Tue	Osaka → Singapore (SQ985)	Tokyo → Singapore (SQ997)		
2	11-Jun.	Wed	Data collection Singapore → Dhaka (SQ420)			
3	12-Jun.	Thu	Visit to Embassy of Japan, JICA Office, Economic Relations Division and BMD			
4	13-Jun.	Fri	Inspection of the Project Site			
5	14-Jun.	Sat	Data collection / Inner meeting			
6	15-Jun.	Sun	Explanation of Draft Report to BMD			
7	16-Jun.	Mon	Explanation of Draft Report to BMD			
8	17-Jun.	Tue	Explanation of Draft Report to BMD			
9	18-Jun.	Wed	Discussion on the Minutes of Discussion			
10	19-Jun.	Thu	Signing of the Minutes of Discussion Reporting to Embassy of Japan and JICA Office Dhaka → Singapore (SQ413)			
11	20-Jun.	Fri	Singapore → Hongkong (CX714) Hongkong → Osaka (CX502)	Singapore → Tokyo (SQ012)		

Appendix 3. Name of Discussants

Economic Relations Division (ERD)

Mr. M. Azizul Islam	Deputy Secretary
Mr. Muhammad Saifullah	Senior Assistant Secretary

Bangladesh Meteorological Department (BMD)

-Head Office

Mr. Md. Sazedul Rahman	Director
Mr. M. Ershad Hossain	Deputy Director, Headquarters & Planning
Mr. Md. Ashraf Ali Howlader	Deputy Director, Engineering
Ms. Arjumand Habib	Deputy Director, Agrometeorology
Mr. Nasir Uddin Bhuiyan	Senior Electronic Engineer

-Main Meteorological Office, Dhaka International Airport

Mr. Mohammad Ismail	Assistant Electronic Engineer

-Meteorological Office, Rangpur

Mr. Muhammad Abul Hossain	Meteorological Assistant & Officer in Charge

-Meteorological Office, Cox's Bazar

Mr. Manzoorul Haq Khan	Meteorologist
Mr. Md. Abdur Rahman	Assistant Meteorologist
Mr. Swapan Kanti Bhattacharjeeo	Electronic Assistant

Bangladesh TV

Mr. Mustafa Kamal Sayed	Deputy Director General (Program)
Mr. M.A. Wahed	Additional Chief Engineer (TV)
Mr. Enamul Hoq Chowdhury	Controller (Engineering)

Bangladesh Telegraph and Telephone Board (BTTB)

Mr. M. M. R. Khan	Member (M & O)
Mr. Shawkat Osman	General Manager, Transmission Region
Mr. Mohammad Obaidullah	Director-Transmission 1
Mr. Mohammad Abdul Wadud	Director International & Opn. Representative
Mr. Mohammad Abdur Rahim	Sub-Divisional Engineer, Carrier & Wireless, Rangpur
Mr. Muhammad Aminul Islam Khan	Senior Sub-Assistant Engineer, Microwave Station, Rangpur

Bangladesh Water Development Board

Mr. Md. Lutfur Rahaman	Chief Engineer
Mr. A. K. M. Syeed Uddin	Executive Engineer

Flood Forecasting & Warning Centre (FF&WC), Bangladesh Water Development Board

Mr. A. K. M. Shamsul Islam	Director, Surface Water
Mr. Mazizul Islam Bhuiyan	Deputy Director
Mr. Md. Yasin Hossain	Deputy Director
Mr. Md. Syedur Rahman	Deputy Director
Mr. Sudhir Goswami	Sub-Divisional Engineer
Mr. Md. Saiful Hossain	Sub-Divisional Engineer

Embassy of Japan

Mr. Yoshikazu Kaneko	Ambassador of Japan
Mr. Yoichi Yamauchi	Second Secretary

JICA Bangladesh Office

Mr. Morimasa Kanemaru	Resident Representative of JICA
Mr. Hiroyuki Kutsuna	Additional Resident Representative
Mr. Masaaki Matsushima	Deputy Resident Representative
Mr. Tomohiko Teruya	Deputy Resident Representative
Mr. Abdul Khatib	Deputy Director

Appendix 4. Minutes of Discussion

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY ON THE PROJECT FOR STRENGTHENING OF WEATHER WARNING SERVICES RELATED TO NATURAL DISASTERS IN THE PEOPLE'S REPUBLIC OF BANGLADESH

In response to a request from the Government of the People's Republic of Bangladesh, the Government of Japan decided to conduct a Basic Design Study on the Project for Strengthening of Weather Warning Services Related to Natural Disasters (hereinafter referred to as "the Project"), and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Bangladesh the Basic Design Study Team (hereinafter referred to as "the Team"), which is headed by Ms. Kae YANAGISAWA, Director, Training Division, Chugoku International Centre, JICA, and is scheduled to stay in the country from 16th of March to 15th of April, 1997.

The Team held a series of discussions with the relevant officials of the Government of Bangladesh and conducted a field survey at the study area.

In the course of discussions and field survey, both sides have confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Dhaka, March 24, 1997

Ms. Kae Yanagisawa
Leader
Basic Design Study Team
Japan International Cooperation Agency

Mr. M. Azizul Islam
Deputy Secretary
Economic Relations Division

Md. Sazedur Rahman
Director
Bangladesh Meteorological Department

ATTACHMENT

1. OBJECTIVE

The objective of the Project is to strengthen weather warning services related to natural disasters in Bangladesh.

2. PROJECT SITES

The proposed Project sites are as follows:

(1) Rangpur BMD Observation site.
(2) Bangladesh Islamic Solidarity Education Wakf (IDB-BISEW) building at Agargaon in Dhaka.
(3) Storm Warning Centre in Dhaka BMD head office.
(4) Dhaka International Airport.
(5) Bangladesh TV Centre in Dhaka.
(6) Flood Forecasting & Warning Centre (FF&WC) in Dhaka.
(7) Rangpur BTTB exchange station.
(8) Dhaka BTTB Central station.

3. EXECUTING AGENCY

Bangladesh Meteorological Department is responsible for the administration and execution of the Project.

4. ITEMS REQUESTED BY THE GOVERNMENT OF BANGLADESH

As a result of the series of discussions, the following items have finally been requested by the Government of Bangladesh.

(1) Construction of a radar tower building at Rangpur BMD Observation site.
(2) Establishment of S-band meteorological radar system with power supply back-up systems (UPS, generator system, etc.) at Rangpur BMD Observation site, as far as S-band is more feasible than C-band.
(3) Replacement of the existing BMD's S-band meteorological radar system with power supply back-up systems (UPS, generator system, etc.) at Bangladesh Islamic Solidarity Education Wakf (IDB-BISEW) building at Agargaon instead of Dhaka BMD head office.

K.Y

(4) Establishment of radar picture composite processor and display systems for making 4-radar composite pictures at Storm Warning Centre in Dhaka BMD head office.
(4 radars : 2 existing radars at Cox's Bazar & Khepupara and 2 radars at Dhaka and Rangpur to be supplied)

(5) Establishment of computer work station for plotting, analysis and storage of data to introduce improved weather forecastings and warnings at Storm Warning Centre, Dhaka.

(6) Establishment of transmission links either;
between Rangpur BMD Observation site ~ Rangpur BTTB exchange station (2 GHz band microwave link)
or
between Rangpur BMD Observation site and Storm Warning Centre (satellite communication system) for transmitting Rangpur radar imagery to Storm Warning Centre, Dhaka
and between Bangladesh Islamic Solidarity Education Wakf (IDB-BISEW) building at Agargaon ~ Storm Warning Centre (cable/radio link) for transmitting Dhaka radar imagery to Storm Warning Centre.

(7) Establishment of 3 transmission links (2 GHz band microwave link) for providing radar composite pictures and weather information between the following spans.
1. Dhaka BMD head office ~ Dhaka International Airport
2. Dhaka BMD head office ~ Bangladesh TV Centre
3. Flood Forecasting & Warning Centre (FF&WC) in Dhaka ~ Dhaka BTTB Central station/Bangladesh TV Centre.

(8) Establishment of satellite data display systems of GMS (S-VISSR) & NOAA (HRPT) and satellite communication system for meteorological information (WAFS-SADIS) at Storm Warning Centre, Dhaka.

(9) Establishment of automatic weather observation system, radar & satellite imagery display systems, WAFS display system and weather information & chart display system at Dhaka International Airport.

(10) Establishment of imagery display systems and weather information & chart display systems at Bangladesh TV Centre and Flood Forecasting & Warning Centre (FF&WC), Dhaka.

Above components are shown as schematic diagram in ANNEX I.

However, the final components of the Project will be decided after further discussion and field survey in Bangladesh and detailed analysis in Japan.

K. Y.

5. JAPAN'S GRANT AID SYSTEM

(1) The Government of Bangladesh has understood the system of Japan's Grant Aid explained in ANNEX II.

(2) The Government of Bangladesh will take necessary measures described in Annex III for smooth implementation of the Project on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

6. SCHEDULE OF THE STUDY

(1) The Team will continue further studies in Bangladesh until April 15, 1997.

(2) Based on the results of the study in Bangladesh and Japan, JICA will prepare the Draft Basic Design Report in English and dispatch a team around the beginning of June, 1997 in order to explain and confirm the contents.

(3) In case that the contents of the report is accepted in principle by the Government of Bangladesh, JICA will complete the final version of Basic Design Report and forward it to the Bangladesh side by the middle of August, 1997.

7. OTHER RELEVANT ISSUES

(1) The Government of Bangladesh shall provide all necessary information and data when requested by the Basic Design Team.

(2) The Bangladesh side will take all possible measures to secure the safety of the Team during the field survey.

(3) The Government of Bangladesh shall promptly proceed all necessary internal procedures and also shall appropriately coordinate among the organizations concerned for smooth implementation of the Project.

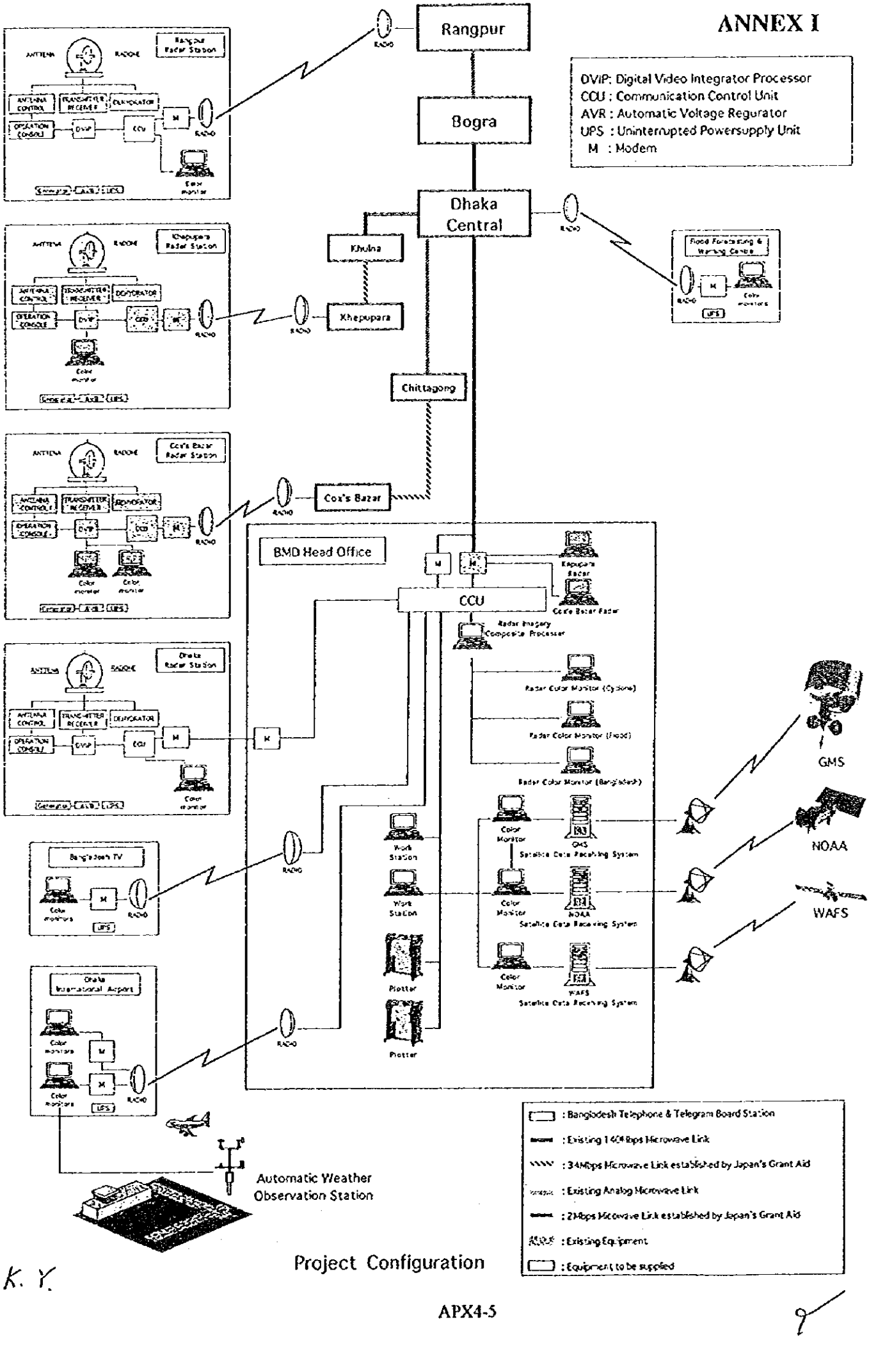
(4) The Government of Bangladesh has recognized the necessity for relevant training related to the Project under JICA's technical cooperation.

(5) The following existing communication links may be required for implementation of the Project, if necessary.

1. Rangpur BTTB exchange station ~ Dhaka BTTB Central station (Analog and Digital Microwave Link).
2. Dhaka BTTB Central station ~ Dhaka BMD head office (Digital Microwave Link).

K. Y.

ANNEX I



Project Configuration

K. Y.

Annex II

Japan's Grant Aid Scheme

1. Grant Aid procedures

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 (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

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 Government 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.

K. Y.

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 Japanese Government. The contents of the Study are as follows:

a) Confirmation of the background, objectives, and benefits of the requested 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 a technical, social and economic point of view.
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
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 though 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 smooth implementation of the Study, JICA uses (a) registered consultant firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms. The firm(s) selected carry (ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

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The consulting firm(s) used for the Study is (are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency and also to avoid any undue delay in implementation should the selection process be repeated.

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.

3) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) 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 Aid, 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.

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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 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 to Japanese taxpayers.

6) Undertakings required of the Government of the Recipient Country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

(1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
(2) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
(3) To secure buildings prior to the procurement in case the installation of the equipment.
(4) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.
(5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.
(6) 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 the recipient country and stay therein for the performance of their work.

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

K. Y

8) "Re-export"

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

9) Banking Arrangements (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 payment 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 the recipient country or its designated authority.

K. Y

Annex III

Necessary measures to be taken by the Government of Bangladesh in case Japan's Grant Aid is executed

1. To secure the site for the Project.
2. To clear, level and reclaim the site prior to commencement of the construction.
3. To undertake incidental outdoor works such as gardening, fencing, gates and exterior lighting in and around the site.
4. To construct the access road to the site prior to commencement of the construction.
5. To provide facilities for distribution of electricity, water supply, telephone, drainage, sewage and other incidental facilities to the Project site.
    1) Electricity distributing line to the site
    2) City water distribution main to the site
    3) Drainage city main to the site
    4) Telephone trunk line and the main distribution panel of building
    5) General furniture such as carpets, curtains, tables, chairs and others
6. To bear commissions to the Japanese foreign exchange bank for the banking services based upon Banking Arrangement.
7. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the project at the port of disembarkation.
8. To accord Japanese nationals whose services may require in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into Bangladesh and stay therein for the performance of their work.
9. To maintain and use properly and effectively that the facilities constructed and equipment purchased under the Grant.
10. To bear all the expenses other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and the installation of the equipment.
11. To secure the existing telecommunication links between Rangpur BTTD exchange station ~ Dhaka BTTB Central station (Analog and Digital Microwave Link) and Dhaka BTTB Central station ~ Dhaka BMD head office (Digital Microwave Link) for the Project, if necessary.
12. To secure appropriate space for installation of meteorological radar system in Bangladesh Islamic Solidarity Education Wakf (IDB-BISEW) building located at Agargaon in Dhaka.

K. Y.

MINUTES OF DISCUSSIONS
BASIC DESIGN STUDY ON THE PROJECT FOR STRENGTHENING OF WEATHER WARNING SERVICES RELATED TO NATURAL DISASTERS IN THE PEOPLE'S REPUBLIC OF BANGLADESH
(CONSULTATION ON DRAFT REPORT)

In June 1997, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study team on the Project for Strengthening of Weather Warning Services Related to Natural Disasters (hereinafter referred to as "the Project") to the People's Republic of Bangladesh, and through discussions, field survey, and technical examination of the results in Japan, has prepared the draft report of the study.

In order to explain and to consult the Bangladesh side on the components of the draft report, JICA sent to Bangladesh a study team, which is headed by Mr. Kai YANAKA, Deputy Director, General Affairs Division, Osaka International Centre, JICA, and is scheduled to stay in the country from 11th to 19th of June, 1997.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Dhaka, June 19, 1997

Mr. Kai YANAKA
Leader
Basic Design Study Team
Japan International Cooperation Agency

Mr. Fakrul Ahsan
Deputy Cheif
Economic Relations Division

Mr. Md. Sazedur Rahman
Director
Bangladesh Meteorological Department

ATTACHMENT

1. Components of Draft Report

The Government of Bangladesh has agreed and accepted in principle the components of the Draft Report proposed by the team.

2. Japan's Grant Aid system

(1) The Government of Bangladesh has understood the system of Japanese Grant Aid explained by the team as attached Annex I.
(2) The Government of Bangladesh will take the necessary measures, described in Annex II, for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

3. Further schedule

The team will make the Final report in accordance with the confirmed items, and send it to Government of Bangladesh within July 1997.

K.Y.

Japan's Grant Aid Scheme

1. Grant Aid procedures

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 (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

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 Government 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 Japanese Government. The contents of the Study are as follows:

a) Confirmation of the background, objectives, and benefits of the requested 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 a technical, social and economic point of view.
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
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 though 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.

K. Y.

2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consultant firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms. The firm(s) selected carry (ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

The consulting firm(s) used for the Study is (are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency and also to avoid any undue delay in implementation should the selection process be repeated.

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.

3) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) 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 Aid, 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 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 to Japanese taxpayers.

6) Undertakings required of the Government of the Recipient Country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

(1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.

(2) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.

(3) To secure buildings prior to the procurement in case the installation of the equipment.

(4) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.

(5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.

(6) 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 the recipient country and stay therein for the performance of their work.

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 staff necessary for this operation and maintenance 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 should not be re-exported from the recipient country.

K.Y.

9) Banking Arrangements (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 payment 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 the recipient country or its designated authority.

Necessary measures to be taken by the Government of Bangladesh in case Japan's Grant Aid is executed

1. To secure the site for the Project.
2. To clear, level and reclaim the site prior to commencement of the construction.
3. To undertake incidental outdoor works such as gardening, fencing, gates and exterior lighting in and around the site.
4. To construct the access road to the site prior to commencement of the construction.
5. To provide facilities for distribution of electricity, water supply, telephone, drainage, sewage and other incidental facilities to the Project site.
    1) Electricity distributing line to the site
    2) City water distribution main to the site
    3) Drainage city main to the site
    4) Telephone trunk line and the main distribution panel of building
    5) General furniture such as carpets, curtains, tables, chairs and others
6. To bear commissions to the Japanese foreign exchange bank for the banking services based upon Banking Arrangement.
7. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the project at the port of disembarkation.
8. To accord Japanese nationals whose services may require in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into Bangladesh and stay therein for the performance of their work.
9. To maintain and use properly and effectively that the facilities constructed and equipment purchased under the Grant.
10. To bear all the expenses other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and the installation of the equipment.
11. To secure the existing telecommunication links between Rangpur BTTB exchange station ~ Dhaka BTTB Central station (Analog and Digital Microwave Link), Dhaka BTTB Central station ~ Dhaka BMD head office (Digital Microwave Link) and Dhaka BTTB Central station ~ Flood Forecasting & Warning Centre, Dhaka (Digital Microwave Link) for the Project, if necessary.
12. To secure appropriate space for installation of meteorological radar system in Bangladesh Islamic Solidarity Education Wakf (IDB-BISEW) building located at Agargaon in Dhaka.

Appendix. 5. Cost Estimation Borne by the Recipient Country

At the time of implementation of the Project under Japan's Grant Aid Assistance, the estimated cost for the major undertaking of the Government of Bangladesh will be necessary as described in the following table.

Item	
External & planting work cost	Taka 18,000.-
Power supply intake cost	Taka 28,000.-
Telephone line intake cost	Taka 24,000.-
Furniture cost	Taka 25,000.-
Total	Taka 95,000.-

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