

Appendices

Appendix 1. Member List of the Study Team

(1) Preparatory Survey (1) Team

Mr. Minoru MIYASAKA	Team Leader	Senior Adviser to the Director General, Global Environment Department, Japan International Cooperation Agency (JICA)
Mr. Hidehiro OKUMURA	Technical Advisor (Weather Observation /Weather Forecasting)	Scientific Officer, Observation Division, Observations Department, Japan Meteorological Agency (JMA)
Mr. Koichi KITAMURA	Project Planning and Management	Disaster Management Division 1, Water Resources and Disaster Management Group, Global Environment Department, Japan International Cooperation Agency (JICA)
Mr. Yoshihisa UCHIDA	Chief Consultant/Project Effect Evaluation/ Operation & Maintenance	Japan Weather Association (JWA)
Mr. Hiroyuki INOMATA	Meteorological Radar Facility Planning	International Meteorological Consultant Inc. (IMC)
Mr. Toshihide ENDO	Communication Equipment Planning	International Meteorological Consultant Inc. (IMC)
Mr. Isao ICHINOSE	Construction Planning/ Procurement Planning/Cost Estimation	International Meteorological Consultant Inc. (IMC)
Mr. Yoshiyuki YAGIRI	Natural Conditions Survey	International Meteorological Consultant Inc. (IMC)

(2) Preparatory Survey (2) Team

Mr. Koichi KITAMURA	Project Planning and Management	Disaster Management Division 1, Water Resources and Disaster Management Group, Global Environment Department, Japan International Cooperation Agency (JICA)
Mr. Yoshihisa UCHIDA	Chief Consultant/Project Effect Evaluation/ Operation & Maintenance	Japan Weather Association (JWA)
Mr. Hiroyuki INOMATA	Meteorological Radar Facility Planning	International Meteorological Consultant Inc. (IMC)
Mr. Toshihide ENDO	Communication Equipment Planning	International Meteorological Consultant Inc. (IMC)

Appendix 2. Study Schedule

Preparatory Survey 1

Schedule	Governmental Member			Consultant Member				
	Mr. Minoru MIYASAKA	Mr. Hidehiro Okumura	Mr. Koichi KITAMURA	Mr. Yoshihisa UCHIDA	Mr. Hiroyuki INOMATA	Mr. Toshihide ENDO	Mr. Isao ICHINOSE	Mr. Yoshiyuki YAGIRI
2014	Team Leader	Technical Advisor (Weather Observation /Weather Forecasting)	Project Planning and Management	Chief Consultant/Project Effect Evaluation/Operation & Maintenance	Meteorological Radar Facility Planning	Communication Equipment Planning	Construction Planning/ Procurement Planning/ Cost Estimation	Natural Conditions Survey
1	18 Jan	Sat	Tokyo→Bangkok →Islamabad			Tokyo→Bangkok →Islamabad		
2	19 Jan	Sun	Data Collection, Internal Meeting			Data Collection, Internal Meeting		
3	20 Jan	Mon	Discussion with JICA Pakistan Office, Discussion with PMD Islamabad			Discussion with JICA Pakistan Office, Discussion with PMD Islamabad		
4	21 Jan	Tue	Discussion with PMD Islamabad, Courtesy Call on Cabinet Secretariat Aviation Division, Courtesy Call on Ministry of Economic Affairs and Statistics			Discussion with PMD Islamabad, Courtesy Call on Cabinet Secretariat Aviation Division, Courtesy Call on Ministry of Economic Affairs and Statistics		
5	22 Jan	Wed	Islamabad →Karachi, Site Survey at PMD Karachi			Islamabad →Karachi, Site Survey at PMD Karachi, Discussion with the Local Contractor for Topographic and Geotechnical Survey		
6	23 Jan	Thu	Discussion with PMD Karachi Karachi →Islamabad			Site Survey at PMD Karachi Site Survey at PMD Karachi		
7	24 Jan	Fri	Confirmation of Minutes of Discussions, Signing on Minutes of Discussions, Report to Ministry of Economic Affairs and Statistics, Report to Embassy of Japan and JICA Pakistan Office, Islamabad→Bangkok			Confirmation of Minutes of Discussions, Signing on Minutes of Discussions, Report to Ministry of Economic Affairs and Statistics, Report to JICA Pakistan Office and Embassy of Japan		
8	25 Jan	Sat	Bangkok →Tokyo			Data Collection, Internal Meeting		
9	26 Jan	Sun				Data Collection, Internal Meeting		
10	27 Jan	Mon				Discussion with PMD Islamabad		
11	28 Jan	Tue				Discussion with PMD Islamabad		
12	29 Jan	Wed				Islamabad → Karachi		Islamabad → Karachi
13	30 Jan	Thu				Site Survey at PMD Karachi		Site Survey at PMD Karachi, Discussion with Sindh Building Control Authority (SBCA)
14	31 Jan	Fri				Discussion with PMD Karachi, Discussion with Karachi Electric Supply Company (KESCO)		Discussion with PMD Karachi
15	1 Feb	Sat				Data Collection, Internal Meeting		Data Collection, Internal Meeting
16	2 Feb	Sun				Data Collection, Internal Meeting		
17	3 Feb	Mon				Discussion with PMD Karachi		Site Survey at PMD Karachi, Survey of Existing Meteorological Radar Observation Station
18	4 Feb	Tue				Discussion with PMD Karachi, Karachi → Islamabad		Topographic and Geotechnical Survey Follow-up, Karachi → Islamabad
19	5 Feb	Wed				Discussion with PMD Islamabad		Discussion with PMD Karachi, Data Collection
20	6 Feb	Thu				Discussion with PMD Islamabad		Discussion with PMD Karachi, Data Collection from Internet Service Provider
21	7 Feb	Fri				Discussion with PMD Islamabad, Report to JICA Pakistan Office, Islamabad → Bangkok		Discussion with PMD Karachi, Data Collection
22	8 Feb	Sat				Bangkok → Tokyo		Discussion with PMD Karachi, Data Collection
23	9 Feb	Sun				Data Collection, Internal Meeting		Bangkok → Tokyo
24	10 Feb	Mon				Discussion with PMD Karachi, Site Survey at PMD Karachi, Survey of Earth Resistance		Discussion with PMD Karachi, Data Collection, Topographic and Geotechnical Survey Follow-up
25	11 Feb	Tue				Discussion with PMD Karachi, Survey of Electric Power Quality		Discussion with PMD Karachi, Data Collection, Topographic and Geotechnical Survey Follow-up
26	12 Feb	Wed				Discussion with PMD Karachi, Site Survey at PMD Karachi, Data Collection		Discussion with PMD Karachi, Data Collection, Topographic and Geotechnical Survey Follow-up
27	13 Feb	Thu				Discussion with PMD Karachi, Site Survey at PMD Karachi, Data Collection		Discussion with PMD Karachi, Data Collection, Topographic and Geotechnical Survey Follow-up
28	14 Feb	Fri				Karachi → Bangkok → Tokyo		Karachi → Bangkok

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Appendix 2. Study Schedule

Preparatory Survey 2

Schedule			JICA Member	Consultant Member		
			Mr. Koichi KITAMURA	Mr. Yoshihisa UCHIDA	Mr. Hiroyuki INOMATA	Mr. Toshihide ENDO
2014			Project Planning and Management	Chief Consultant/Project Effect Evaluation/Operation & Maintenance	Meteorological Radar Facility Planning	Communication Equipment Planning
1	24 May	Sat				Tokyo→Bangkok →Islamabad
2	25 May	Sun				Data Collection
3	26 May	Mon				Explanation of Draft Final Report, Discussion with PMD Islamabad
4	27 May	Tue				Discussion with PMD Islamabad, Discussion with Pakistan Telecommunication Authority (PTA)
5	28 May	Wed				Discussion with PMD Islamabad, Discussion with Frequency Allocation Board (FAB)
6	29 May	Thu				Discussion with PMD Islamabad
7	30 May	Fri				Discussion with PMD Islamabad, Discussion with National Bank of Pakistan
8	31 May	Sat		Tokyo→Bangkok →Islamabad		Data Collection
9	1 Jun	Sun		Data Collection, Internal Meeting		
10	2 Jun	Mon		Discussion with PMD Islamabad, Explanation of Draft Final Report		
11	3 Jun	Tue		Discussion with PMD Islamabad, Explanation of Draft Final Report		
12	4 Jun	Wed		Discussion with PMD Islamabad, Explanation of Draft Final Report		
13	5 Jun	Thu		Discussion with PMD Islamabad, Explanation of Draft Final Report, Discussion about Minutes of Discussion with PMD		Discussion with PMD Islamabad, Discussion with Frequency Allocation Board (FAB)
14	6 Jun	Fri		Discussion about Minutes of Discussion with PMD		Discussion with PMD Islamabad Islamabad → Bangkok
15	7 Jun	Sat	Tokyo→Bangkok →Islamabad		Data Collection, Internal Meeting	
16	8 Jun	Sun	Data Collection, Internal Meeting		Data Collection, Internal Meeting	
17	9 Jun	Mon	Discussion about Minutes of Discussion with PMD Discussion with Economic Affairs Division (EAD) and Aviation Division		Discussion about Minutes of Discussion with PMD Discussion with Economic Affairs Division (EAD) and Aviation Division	
18	10 Jun	Tue	Discussion about Minutes of Discussion with PMD		Discussion about Minutes of Discussion with PMD	
19	11 Jun	Wed	Signing on Minutes of Discussions, Report to EAD, Report to JICA Pakistan Office and Embassy of Japan Islamabad → Bangkok		Signing on Minutes of Discussions, Report to EAD, Report to JICA Pakistan Office and Embassy of Japan Islamabad → Bangkok	
20	12 Jun	Thu	Bangkok → Tokyo		Bangkok → Tokyo	

Appendix 3. List of Parties Concerned in the Recipient Country

- **Economic Affairs Division, Ministry of Economic Affairs and Statistics**

Mr. Qumar Sarwar Abbasi Joint Secretary

- **Aviation Division, Cabinet Secretariat**

Mr. Kh. Iftikhar Ahmed Mir Joint Secretary
Mr. Farooq Hassan Deputy Secretary

- **National Disaster Management Authority, Climate Change Division**

Mr. Ahmed Kamal Member Disaster Risk Reduction

- **Pakistan Meteorological Department (PMD)**

Islamabad Head Office

Mr. Arif Mahmood	Director General
Dr. Ghulam Rasul	Deputy Director General (Chief Meteorologist)
Mr. Hazrat Mir	Chief Meteorologist
Dr. Muhammad Hanif	Director (Forecasting)
Dr. Khalid M. Malik	Director (Agro-meteorology)
Mr. Azmat Hayat Khan	Director (Drought)
Mr. Jan Muhammad Khan	Director (Planning)
Mr. Muhammad Aleem ul Hassan Ramay	Deputy Director, National Weather Forecasting Center
Mr. Muhammad Farooq Dar	Assistant Director, National Weather Forecasting Center
Mr. Usman Rafique	Electric Engineer, Weather Surveillance Radar
Mr. Nazir Khan Niazi	Electronic Engineer
Mr. Wadar Ali	Sub Engineer
Mr. Muhamood Atif Nawaz	Sub Engineer
Mr. Ali Hussain Abbasi	Sub Engineer
Mr. Amjad Ali	Sub Engineer
Mr. Abdus Rahman	Sub Engineer
Mr. Farhan Khaliq	Sub Engineer, Lai Nullah Flood Forecasting and Warning System
Mr. Amjad Ali	Sub-Engineer, Weather Surveillance Radar
Mr. Shahid Abbasi	Assistant Mechanic Sub Engineer

Karachi Office

Mr. Muhammad Touseef Alam	Chief Meteorologist
Mr. Sardar Sarfaraz	Director, Regional Meteorological Center
Mr. Abdul Rashid	Director, Institute of Meteorology & Geophysics
Mr. Abdul Qayoom Bhutto	Director, Tropical Cyclone Warning Center
Mr. Khadim Hussain	Director, Maintenance
Mr. Akhlaq Jameel	Deputy Director, Nation Seismic Monitoring Center

Mr. Nadeen Faisal	Deputy Director, Climate Data Processing Center
Mr. Ali Baqadar Shah	Deputy Director, Jinnah International Airport Karachi
Mr. Liaquat Hussain	Meteorologist, Tropical Cyclone Warning Center
Mr. Anjum Nazir Zaighum	Meteorologist, Main Meteorological Office
Mr. Ghulam Hussain Channa	Assistant Meteorologist, Tropical Cyclone Warning Center
Mr. Asif Hussain	Programmer, Tropical Cyclone Warning Center
Mr. Syed Naseer Haider	Senior Electronic Engineer, Weather Surveillance Radar
Mr. M.Ehsan Siddiqui	Electronic Engineer, Weather Surveillance Radar
Mr. Jai Kumar	Electronic Engineer, Nation Seismic Monitoring Center
Mr. Syed Nasir Ali	Electronic Engineer, Weather Surveillance Radar
Mr. Muhammad Javed	Sub Engineer, Weather Surveillance Radar
Mr. M.Salman	Radio Mechanic, National Meteorological Communication Center

- **Karachi Electric Supply Company (KESC)**

Mr. Kashif Iqbal Ghazi	Deputy General Manager, New Connection R-1
Mr. Muhammad Idris Khan	Head of New Connections

- **Sindh Building Control Authority (SBCA)**

Mr. Mumtaz Haider	Director
Mr. Khwaja Muhammad Badiuzzaman	Director, Town Planning & Regulations
Mr. Ali Mehdi Kagnir	Director, Structure
Mr. Nadeem Ahmad Khan	Officiating Deputy Director
Mr. Ali Giturkan	Deputy Director, Town Planning
Mr. Muhammad Sattar	Deputy Chief Admin Officer
Ms. Nasim Farah	Public Relation Office

- **Pakistan Telecommunication Authority (PTA)**

Mr. Yasir Khan	Assistant Director, Radio Based Services (RBS), Licensing
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- **Frequency Allocation Board (FAB)**

Mr. Imran Zahoor	Deputy Director, Spectrum Planning & Management
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Appendix4-1. Minutes of Discussions

**MINUTES OF DISCUSSIONS
OF
THE PREPARATORY SURVEY
ON
THE PROJECT FOR INSTALLATION OF WEATHER SURVEILLANCE RADAR AT KARACHI
IN
THE ISLAMIC REPUBLIC OF PAKISTAN**

In response to a request from the Government of the Islamic Republic of Pakistan (hereinafter referred to as "Pakistan"), the Government of Japan decided to conduct a Preparatory Survey on "the Project for Installation of Weather Surveillance Radar at Karachi" (hereinafter referred to as "the Project") and entrusted the Preparatory Survey to Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Pakistan the Preparatory Survey Team (hereinafter referred to as "the Team"), which is headed by Mr. Minoru MIYASAKA, Advisor for Director General, Global Environment Department, JICA, and stayed in Pakistan from January 18th to 24th, 2014.

The Team explained the contents of Inception Report to the officials concerned of the Government of Pakistan, and the Pakistani side agreed the purpose and contents of the Preparatory Survey.

Both sides held discussions at Islamabad and conducted a field survey at Karachi. In the course of discussions, both parties confirmed the main items described in the attached sheets. Team will proceed to further works and prepare the Preparatory Survey Report.

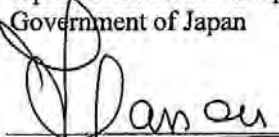
Islamabad, January 24th, 2014

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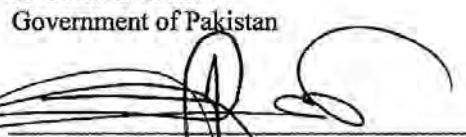


Mr. Minoru MIYASAKA
Team Leader
Preparatory Survey Team
Japan International Cooperation Agency
Government of Japan

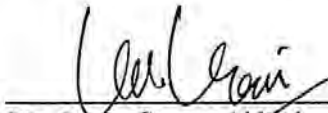
Mr. Arif Mahmood
Director General
Pakistan Meteorological Department
Aviation Division
Government of Pakistan



Mr. Farooq Hassan
Deputy Secretary
Aviation Division
Government of Pakistan



Mr. Ahmed Kamal
Member Disaster Risk Reduction
National Disaster Management Authority
Climate Change Division
Government of Pakistan



Mr. Qumar Sarwar Abbasi
Joint Secretary (ADB/Japan)
Economic Affairs Division
Government of Pakistan

ATTACHMENT

1. Objectives of the Project

The Pakistani side and the Team (hereinafter referred to as "the both sides") confirmed that in line with the National Disaster Management Plan (NDMP), the objectives of the Project are to improve the PMD's capabilities in meteorological observation, weather forecasting and dissemination of forecasts/warnings through the replacement of the existing Karachi C-band ordinary meteorological radar system to state-of-the-art S-band Doppler pulse compression solid state radar system. This will largely contribute to the mitigation of damages caused by natural disasters in Pakistan which are predicted to increase due to the climate change.

2. Title of the Project

Both sides agreed to the Project Title as "Installation of Weather Surveillance Radar at Karachi".

3. Site of the Project

PMD proposed the premises of PMD Karachi Office as the site for the construction of new meteorological radar tower due to staff allocation and reliable infrastructure for the smooth construction, operation and maintenance.

Both sides confirmed that the premises of PMD Karachi Office is an appropriate site for the construction of a new meteorological radar tower. After further studies by the Consultant members of the Team, they will verify the most appropriate location in the premises of PMD Karachi Office as well as the height of Radar antenna based on various conditions. .

4. Responsible/Sponsoring, Implementing and Coordinating Pakistani Agencies

4-1. The Responsible/Sponsoring Agency: Aviation Division, Cabinet Secretariat

4-2. The Implementing Agency: Pakistan Meteorological Department (PMD)

4-3. The Coordinating Agency: Economic Affairs Division (EAD) and National Disaster Management Authority (NDMA)

The organization chart of PMD is shown in **Annex-1**.

5. Items requested by the Government of Pakistan

After discussions between both sides, the items described in **Annex-2** were requested by the Pakistani side. The both sides confirmed that the appropriateness of the request would be examined in accordance with the further studies and analysis, and the final components of the Project would be decided by the Japanese side.

6. Japan's Grant Aid Scheme

6-1. The Pakistani side has shown a full understanding to the Japan's Grant Aid Scheme explained by the Team, as described in **Annex-3**.

6-2. The Pakistani side will take the necessary measures, as described in **Annex-4**, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

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7. Schedule of the Preparatory Survey

- 7-1. The Consultant members of the Team will proceed to further studies in Pakistan until February 13, 2014.
- 7-2. Based on the result of the study, JICA will conduct the analytical work on design of the facilities and equipment and cost estimation from February 2014 to May 2014 in Japan.
- 7-3. JICA will prepare the Draft Final Report and provide cost estimation for the preparation of the PC-1 in English and dispatch a team to Pakistan in order to explain and agree its contents around May, 2014.
- 7-4. If the contents of the Draft Final Report are accepted in principle by the Government of Pakistan, JICA will complete the Final Report and send it to the Government of Pakistan by March, 2015.

The above schedule is tentative and subject to change.

8. Other relevant issues

8-1. Security arrangement

The Government of Pakistan shall take all possible and necessary measures to ensure the safety of the concerned Japanese people during the implementation of the Project at the Project site and movement to the Project site from their accommodations, if Japanese side requests.

8-2. Soft Component

Both sides agreed that initial guidance for operation and maintenance of the equipment and machineries should be included in the Project to support smooth operation.

8-3. Necessary Clearance/Permit for the Project

Both sides confirmed the time table of the following key actions for the Project;

- 1) In order to implement the Project smoothly, the PMD shall confirm with the Environmental Protection Agency (EPA), Sindh Province that an Environmental Impact Assessment (EIA) permit is not required for the Project. Initial Environmental Examination (IEE) on the Project shall be completed for the approval of PC-1.
- 2) The height clearance (No Objection Certificate) from the relevant authorities such as the Civil Aviation Authority, Pakistan Air Force, etc. for construction of a new Meteorological Radar Tower in the PMD Karachi shall be obtained for the approval of PC-1.
- 3) The Building Construction Permit of the Sindh Building Control Authority (KBCA)/Karachi Development Authority (KDA) for construction of a new Meteorological Radar Tower Building shall be obtained for the approval of PC-1.
- 4) The frequency for the proposed S band Doppler radar system in Karachi, which is requested to be the same frequency as that of the Islamabad S band Doppler radar system, shall be allocated and allowed by the Pakistan Telecommunication Authority (PTA)/Frequency Allocation Board (FAB) to the PMD for the approval of PC-1.

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- 5) In order to obtain the required approval from the Japanese Cabinet for the Grant Aid for the implementation of the Project, the PC-1 shall be approved by the Central Development Working Party (CDWP)/Executive Committee of the National Economic Council (ECNEC), Government of Pakistan by the beginning of November, 2014. The Team will provide necessary information for preparation of the PC-1 by the end of May, 2014.
- 6) PC-IV shall be submitted immediately after the completion of the Project.

8-4. Height Restriction

The Team strongly recommended PMD that the Government of Pakistan shall establish Height Restriction avoiding construction of any higher building/facility within 5 km radius from the PMD Karachi than a new Radar Tower Building to be constructed in the PMD Karachi under the Project for ensuring appropriate Radar observation. PMD understood the recommendation made by the Team to take appropriate action in this regard.

8-5. Tax Exemption

The tax exemption including the General Sales Tax (GST), custom duty, and any other taxes and fiscal levies in Pakistan which are to be arisen from the Project activities shall be ensured by the Government of Pakistan. The Government of Pakistan shall take necessary procedures for tax exemption.

8-6. Visibility of the Project

The Pakistani side affirmed the following measures to be taken in order to enhance publicity of the Project:

- (a) Mass media sources
- (b) Brochures
- (c) Commemoration panels

8-7. Adaptation to climate change

In Pakistan, the adverse impacts of climate change induced by global warming have been notable as evidenced by the increase in meteorological disasters such as floods, etc. The possible causes are the increases in the frequency of heavy rain and the intensity of tropical cyclones generated in the Arabian Sea which are closely associated with the increase in sea surface temperature of the Arabian Sea. In recent years, the number of tropical cyclones approaching/landing in Pakistan has increased. To mitigate the impacts of climate change, it is absolutely necessary to monitor tropical cyclones through the Karachi meteorological radar system. Therefore, the Project is expected to contribute to climate change adaptation.

8-8. Confidentiality of the Project

The Team explained that the preparatory survey report to be prepared at the end of the survey

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would be disclosed to the public in principle in Japan. However, the Team also explained that a confidential part which might affect bidding process such as cost estimation should be kept undisclosed until the bidding has completed.

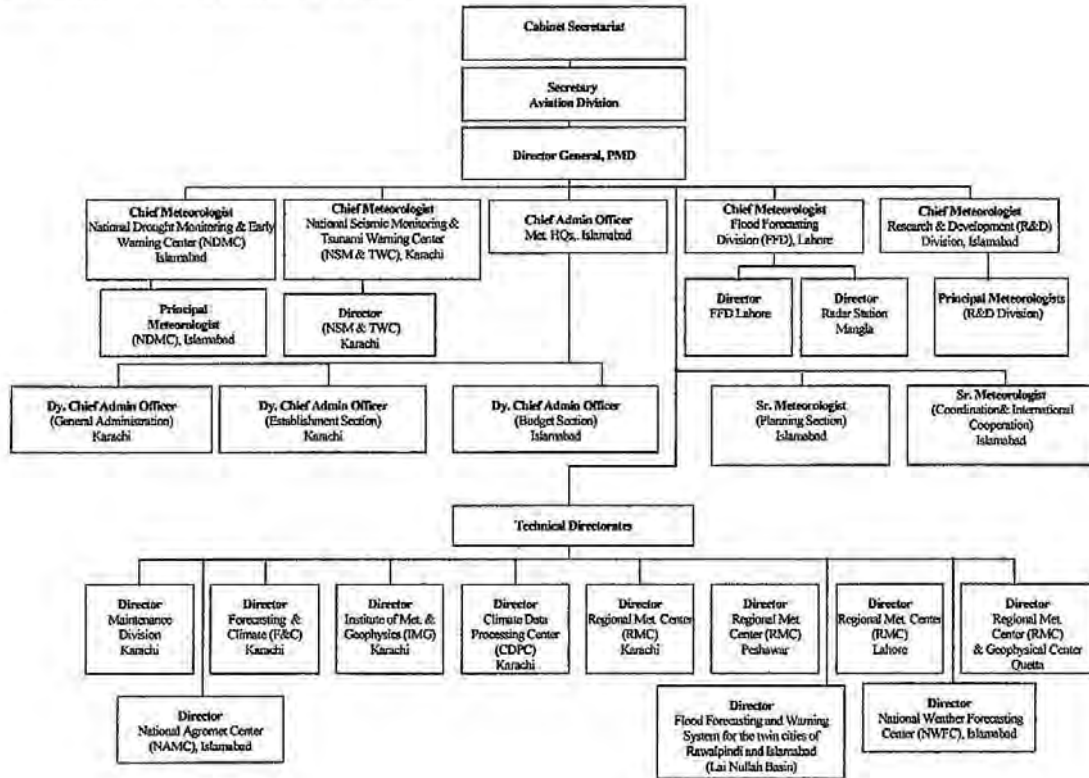
- Annex-1 Organization Chart of PMD
- Annex-2 Items Requested by the Pakistani Side
- Annex-3 Japan's Grant Aid Scheme
- Annex-4 Major Undertakings to be taken by each Government

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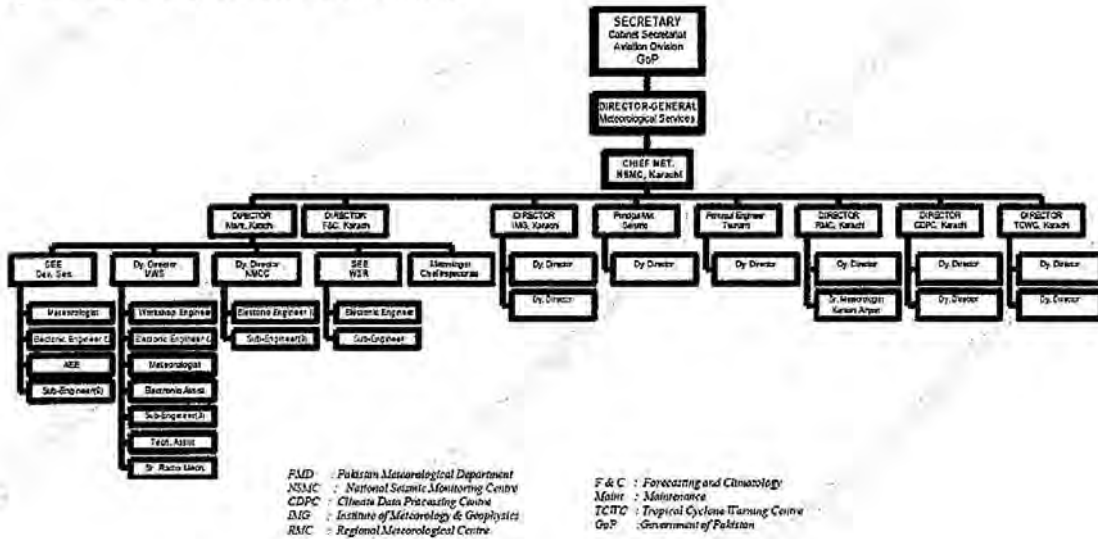
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Annex-1 Organization Chart of PMD



Organization Chart of PMD Karachi Office



FMD : Pakistan Meteorological Department
 NSMC : National Seismic Monitoring Centre
 CDPC : Climate Data Processing Centre
 IMG : Institute of Meteorology & Geophysics
 RMC : Regional Meteorological Centre
 F & C : Forecasting and Climatology
 Maint : Maintenance
 TCWC : Tropical Cyclone Warning Centre
 GoP : Government of Pakistan

Annex-2 Items Requested by the Pakistani Side

Component	PMD Islamabad Head Office National Weather Forecasting Center	PMD Karachi Tropical Cyclone Warning Center	Meteorological Office in Karachi International Airport	Meteorological Office in Islamabad International Airport
Procurement and Installation of Equipment				
S-Band Doppler Pulse Compression Solid State Radar System including Power Back-up System, Lightning System Measuring Equipment and Spare Parts	-	1	-	-
Meteorological Radar Data Display System	1	2	1 (To display Islamabad and Karachi radar products)	1 (To display Karachi radar products)
Construction of Radar Tower Building				
Radar Tower Building		1		
Technical Training	Initial operation guidance including the contract of manufacturer			
Soft Component (referred to 8-2)				

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Annex-3 Japan's Grant Aid Scheme

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

Grant Aid is non-reimbursable fund to a recipient country 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. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures (Attachment 1)

Japanese Grant Aid is conducted as follows-

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

2. Preparatory Survey

(1) Contents of the Survey

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

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.

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

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

(3) Result of the Survey

The Report on the Survey is reviewed by JICA, and after the appropriateness of the Project is confirmed, JICA recommends the GOJ to appraise the implementation of the Project.

3. Japan's Grant Aid Scheme

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

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

(2) Selection of Consultants

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

(3) Eligible Source Country

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

(4) 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 JICA. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

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

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

(6) Proper Use

The Government of recipient country is required to maintain and use the facilities constructed and the 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.

(7) Export and Re-export

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

(8) Banking Arrangements (B/A)

- a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.
- b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

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

(10) Considerations for Environmental and Social Impacts and Disaster Risk Reduction

A recipient country must ensure DRR and the social and environmental considerations for the Project and must follow the regulations concerned of the recipient country and JICA socio-environmental guideline.

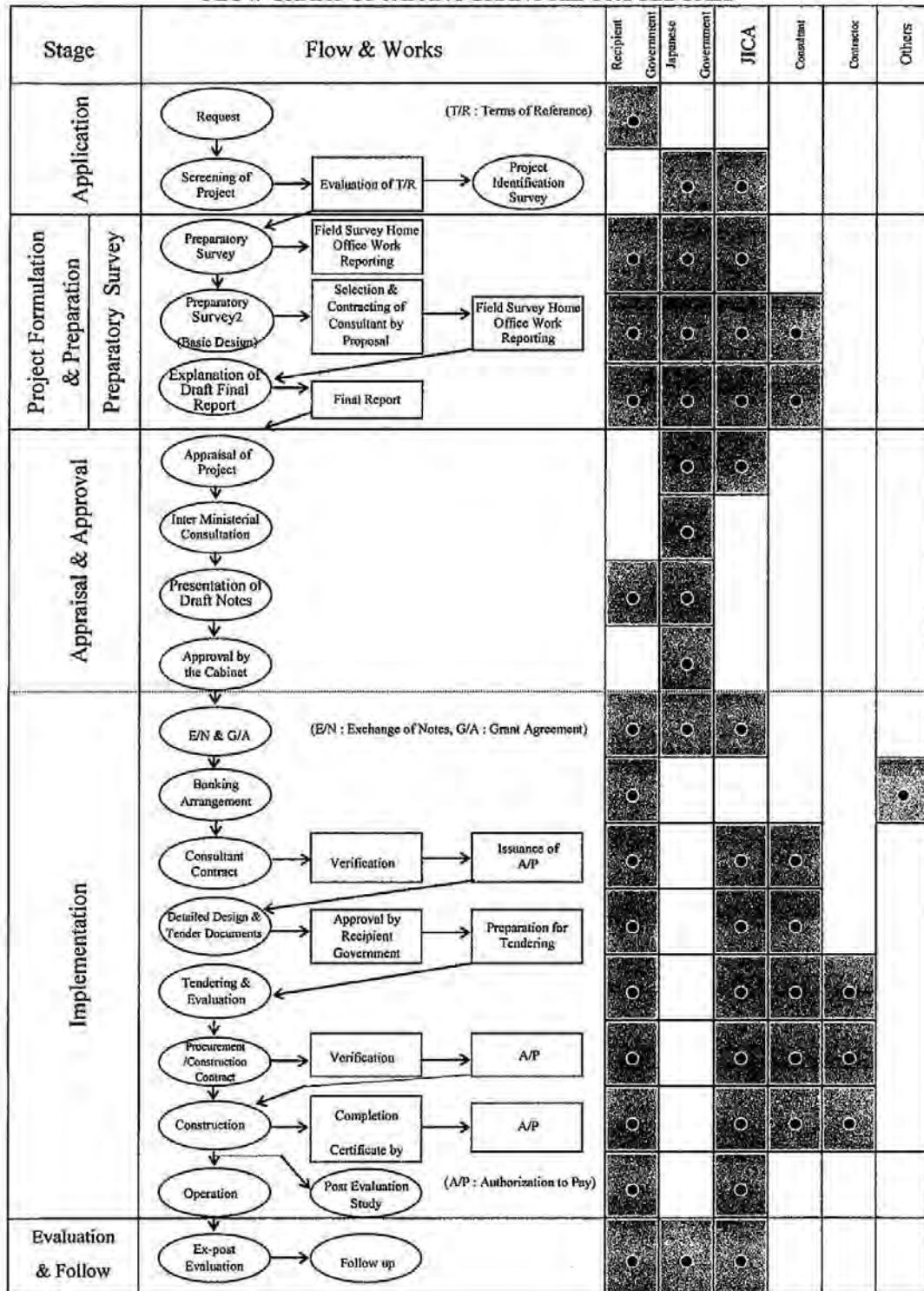
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FLOW CHART OF JAPAN'S GRANT AID PROCEDURES



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Annex-4: Major Undertakings to be taken by each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure land necessary for the implementation of the Project and to clear the sites		•
2	To construct the following facilities		
	1) The building	•	
	2) The gates and fences in and around the site		•
	3) The parking lot	•	
	4) The road within the site	•	
3	5) The road outside the site		•
	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the sites		
	1) Electricity		
	a. The distributing power line to the site		•
	b. The drop wiring and internal wiring within the site	•	
	c. The main circuit breaker and transformer	•	
	2) Water Supply		
	a. The city water distribution main to the site		•
	b. The supply system within the site (receiving and elevated tanks)	•	
	3) Drainage		
	a. The city drainage main (for storm sewer and others to the site)		•
	b. The drainage system (for toilet sewer, common waste, storm drainage and others) within the site	•	
	4) Gas Supply		
	a. The city gas main to the site		•
	b. The gas supply system within the site	•	
5) Telephone System			
a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		•	
b. The MDF and the extension after the frame/panel	•		
6) Furniture and Equipment			
a. General furniture		•	
b. Project equipment	•		
4	To ensure prompt unloading and customs clearance of the products at the port of disembarkation in the recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the products from Japan to the recipient country	•	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		•
5	3) Internal transportation from the port of disembarkation to the project site	•	(•)*
	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted		•
6	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		•
7	To ensure that the facilities and the products be maintained and used properly and effectively for the implementation of the Project		•
8	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		•
9	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		•
10	2) Payment commission		•
	To give due environmental, social consideration and Disaster Risk Reduction during the planning and the implementation of the Project		•

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

* Internal transportation to the sites where Japanese nationals cannot enter due to the security situation would be covered by the Pakistani Side.

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Appendix4-2. Minutes of Discussions


**MINUTES OF DISCUSSIONS
OF THE PREPARATORY SURVEY
(EXPLANATION OF DRAFT PREPARATORY SURVEY REPORT)
ON THE PROJECT FOR
INSTALLATION OF WEATHER SURVEILLANCE RADAR AT KARACHI
IN THE ISLAMIC REPUBLIC OF PAKISTAN**

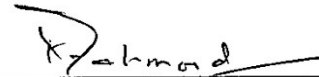
In response to a request from the Islamic Republic of Pakistan (hereinafter referred to as "Pakistan"), the Government of Japan decided to conduct the Preparatory Survey (hereinafter referred to as "the Survey") on the Project for "Installation of Weather Surveillance Radar at Karachi in the Islamic Republic of Pakistan" (hereinafter referred to as "the Project") and entrusted the survey to Japan International Cooperation Agency (hereinafter referred to as "JICA"). JICA sent the Preparatory Survey Team in January and February 2014. The said Preparatory Survey Team held discussions with the officials concerned of the Government of Pakistan (hereinafter referred to as "GoP") and Pakistan Meteorological Department (hereinafter referred to as "PMD") and conducted a field survey at the survey area. In the course of discussions and field survey, both parties confirmed the main items and signed the Minutes of Discussions on 24th January, 2014.

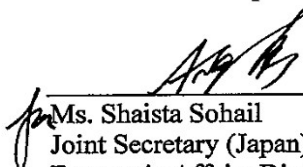
According to the Minutes of Discussions above, JICA finally prepared the Draft Preparatory Survey Report. In order to explain and consult with PMD on the components of the draft report, JICA has sent the Draft Preparatory Survey Report Explanation Team (hereinafter referred to as "the Team"), headed by Mr. Ken Kato, Senior Representative, JICA Pakistan Office from 24th May to 11th June, 2014.

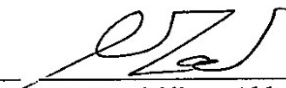
As a result of the discussions, both parties confirmed the items described on the attached sheets.


Islamabad, 11th June, 2014


Mr. Ken Kato
Team Leader
Preparatory Survey Team
Japan International Cooperation Agency
Government of Japan


Mr. Arif Mahmood
Director General
Pakistan Meteorological Department
Aviation Division
Government of Pakistan


Ms. Shaista Sohail
Joint Secretary (Japan)
Economic Affairs Division
Government of Pakistan


Mr. Syed Sibt-e-Abbas Zaidi
Director, Disaster Risk Reduction
National Disaster Management Authority
Climate Change Division
Government of Pakistan


Mr. Ashfaq Javed
Deputy Secretary
Aviation Division
Government of Pakistan

ATTACHMENT

1. Components of the Draft Preparatory Survey Report

PMD agreed and accepted in principle the components of the Draft Preparatory Survey Report explained by the Team. The components of the Project are shown in Annex-1. JICA will finalize the Final Report as per comments of PMD.

2. Tentative Schedule of the Project

2-1 The Team explained the Project Implementation Schedule (Detailed Design & Tendering Procedures, Construction of Karachi Meteorological Radar Tower Building, Equipment Procurement and Soft Components) starting expectedly from February 2015 (after signing of the Grant Agreement) to September 2017 for approximately 32 months as shown in Annex 2 and PMD agreed on it.

2-2 Both sides confirmed the timetable of the following key actions for the Project;

- 1) Initial Environmental Examination (IEE) on the Project shall be completed for the approval of PC-1 (by the beginning of November, 2014), if required so.
- 2) The height clearance (No Objection Certificate) from the relevant authorities such as the Civil Aviation Authority, Pakistan Air Force, etc. for construction of a new Meteorological Radar Tower in the PMD Karachi shall be obtained for the approval of PC-1 (by the beginning of November, 2014).
- 3) In order to submit the Project to the Japanese Cabinet, PMD shall make effort for seeking approval of PC-1 by Central Development Working Party (CDWP)/ Executive Committee of the National Economic Council (ECNEC) by the beginning of November, 2014. The Team will provide necessary information for preparation of the PC-1 by the end of June, 2014.
- 4) The required procedures for the Building Construction Permit of the Sindh Building Control Authority (SBCA)/Karachi Development Authority (KDA) for construction of a new Meteorological Radar Tower Building shall be commenced immediately after signing of the Exchange of Notes of the Project and shall be completed before the commencement of the tendering procedures (by the end of May, 2015).
- 5) The required procedures for the Frequency Permit for the proposed S band Doppler radar system to be issued by the Pakistan Telecommunication Authority (PTA)/Frequency Allocation Board (FAB) shall be commenced

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immediately after signing of the Exchange of Notes of the Project and shall be completed before the commencement of the tendering procedures (by the end of May, 2015).

6) PC-IV shall be submitted right after the completion of the Project.

3. Confidentiality of the Project

3-1 Detailed Specifications

Both sides confirmed all the information related to the Project including technical specifications, drawings and other technical information shall not be released to any other party/parties before the signing of all the Contract(s) for the Project.

3-2 Project Cost Estimate

The Team explained the estimated project cost to be borne by the Government of Japan as attached in Annex-3.

PMD agreed to allocate necessary budget in order to bear requested undertakings as shown in Annex-3 and Annex-4. The Team also explained that these cost estimations are subject to change since they are provisional.

Both sides agreed that the Project Cost Estimate should never be duplicated in any form nor disclosed to any other party/parties before the signing of all the Contract(s) for the Project. This confidentiality of the estimated project cost is necessary to ensure fairness of the tender procedure.

4. Actions to be taken by GoP/PMD



Both sides confirmed that GoP/PMD would carry out the items indicated in the table in Annex-5 for the implementation of the Project in accordance with the Project Implementation Schedule.

5. Existing Facilities in PMD Karachi

PMD agreed to secure ample and strategically located space/s at the existing facilities for the installation of the equipment to be supplied under the Project such as PC terminals & peripherals, furniture, etc. indicated in the drawings attached in the Draft Preparatory Survey Report provided by the Team.

6. Height Restriction

The Team strongly recommended PMD that the Government of Pakistan shall

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establish Height Restriction avoiding construction of any higher building/facility within 5 km radius from the PMD Karachi than a new Radar Tower Building to be constructed in the PMD Karachi under the Project for ensuring appropriate Radar observation. PMD understood the recommendation made by the Team to take appropriate action in this regard.

7. Security Arrangement

PMD agreed to make arrangement for the security of the Japanese and other foreign nationals assigned to the Project during Project implementation period.

8. Meteorological Radar Data Display System in PMD Flood Forecasting Division (FFD), Lahore

PMD requested for additional meteorological radar data display system to be installed in PMD Flood Forecasting Division (FFD), Lahore. The Team confirmed the validity of the request for more accurate flood forecasting and warning of PMD Flood Forecasting Division Lahore and agreed to include the component in the Project according to the information provided by PMD for installation of the required equipment.

- Annex-1: Components of the Project
- Annex-2: Tentative Implementation Schedule
- Annex-3: Project Cost Estimation
- Annex-4: Project Annual Recurrent Cost to be borne by GoP/PMD
- Annex-5: Major Undertakings to be taken by GoP/PMD

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Annex-1: Components of the Project

Component	PMD Islamabad Head Office National Weather Forecasting Center	PMD Karachi	Meteorological Office Karachi International Airport	Meteorological Office New Benazir Bhutto International Airport Islamabad	PMD Flood Forecasting Division (FFD), Lahore
Procurement and Installation of Equipment					
S-Band Doppler Pulse Compression Solid State Radar System including Power Back-up System, Lightning System Measuring Equipment and Spare Parts	-	1	-	-	-
Meteorological Radar Data Display System	1	2 (PMD Karachi and Tropical Cyclone Warning Center)	1 (To display Islamabad and Karachi radar products)	1 (To display Karachi radar products)	1
Construction of Radar Tower Building					
Radar Tower Building	-	1	-	-	-
Technical Training	Initial operation guidance including the contract of manufacturer				
Soft Component	Initial guidance for operation and maintenance of the equipment and machineries				

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Annex-2 Tentative Implementation Schedule

Month	1	2	3	4	5	6	7	8	9	
Detailed Design & Tendering Procedures	Total: 9.0 months									
Detailed Design	█									
Tendering Procedures				█						

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
Construction of Karachi Meteorological Radar Tower Building	Total: 17.0 months																										
Preparation Work	█																										
Temporary/Piling/Earth Works		█																									
Structure Work						█																					
Finishing Works																		█									
Building Equipment						█																					
External Work																											
Equipment Procurement	Total: 18.0 months																										
Equipment Manufacturing						█																					
Equipment Transportation																											
Equipment Installation/Adjustment																											
Soft Component																											
Soft Component (Activity No. 1)																											
Soft Component (Activity No. 2)																											
Soft Component (Activity No. 3)																											

Handwritten initials and marks: "RT" and a signature.

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*Soft component activities: 1. Radar adjustment and fault finding, 2. Radar operation and maintenance, 3. Radar Sequence & Schedule

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Annex-3: Project Cost Estimation

Total Project Cost:

This item is closed due to confidentiality

Annex-3-1: Project Cost to be borne by Japan's Grant Aid

This item is closed due to confidentiality

Annex-3-2: Project Capital Cost to be borne by GoP/PMD

Estimated Total Project Capital Cost: 34,300,000 PKR (approx. 38 Million JP Yen)

No.	Items	Capital Cost (PKR)
1.	To pay bank commission for issuance of the Authorization to Pay (A/P) and FED etc. to the Consultant and the Contractor.	7,000,000
2.	To provide the commercial power (400V, 3-phase, 4-wire, 50Hz) supply (capacity: 100kVA) along with electric poles/wires, etc. from the main supply line to the proposed site for the Karachi Radar Tower Building in the PMD Karachi.	2,000,000
3.	To install the required step-down transformers as well as service entrance connections for the commercial power supply at the PMD Karachi for the Radar Tower Building.	4,000,000
4.	To provide water supply for the Radar Tower Building in the PMD Karachi.	1,000,000
5.	To provide reliable and high-speed Internet environment at the PMD Karachi Tropical Cyclone Warning Center (TCWC) and the Meteorological Office in Karachi International Airport for the establishment of a Virtual Private Network (VPN).	1,000,000
6.	To recruit security personnel (10 persons) equipped with ammunition to ensure the security of the Project site of PMD Karachi during Project implementation.	4,000,000
7.	To shoulder the dispatching cost of the trainees to the training sites, such as daily allowance, transportation fee, accommodation, etc.	300,000
8.	To shoulder the miscellaneous expenditures such as library books, petrol, telephone, application fee (obtaining the required frequencies for the meteorological radar system and the construction permissions of a new Radar Tower Building).	1,000,000
9.	To construct an access road (L=110m, W=5m) in the premises of the PMD Karachi	3,000,000
10.	To construct boundary walls with a gate	4,000,000
11.	To renovate the existing gates, boundary walls and exterior lighting of the PMD Karachi	7,000,000
Total		34,300,000

Applied Exchange Rate: US\$ 1 = 103.45 JP Yen, 1 PKR= 1.115 JP Yen

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Annex-4 Project Annual Recurrent Cost to be borne by GoP/PMD

Estimated Project Annual Recurrent Cost: 5,893,000 PKR (approx. 6 Million JP Yen)

No.	Description	Recurrent Cost (PKR)
1	Electricity Charges	1,000,000
2	Salary of 10 Security personnel	1,440,000
3	Water and Gas Charges	155,000
4	Telephone, Fax, Leased Lines, Internet Connections	1,250,000
5	Spare Parts, Consumables and Special Maintenance of the Systems	900,000
6	Consumables, Stationary, etc.	100,000
7	Books & Journals	48,000
8	Contingencies	200,000
9	P.O.L. Charges (for engine generators, vehicles, etc.)	800,000
	Total	5,893,000

Applied Exchange Rate: US\$ 1 = 103.45 JP Yen, 1 PKR= 1.115 JP Yen

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Annex5: Major Undertakings to be taken by GoP/PMD

No	Items
General Items	
1	To undertake all necessary institutional and juridical procedures in Pakistan.
2	To undertake the Initial Environmental Examination (IEE) procedures in Pakistan, if required so.
3	To handle duty (Tax) exemption procedures and to take necessary measures as well as provide requisite legal and/or administrative documentations for customs clearance to customs broker/forwarder to be employed by the Contractor at the port of disembarkation for the materials and equipment imported for the Project.
4	To provide necessary working spaces with Internet Connection at the PMD Islamabad Head Office and the PMD Karachi for the Consultant and the Contractor for the implementation of the Project.
5	To accord Japanese and other foreign nationals, if required, including their dependent/s (if any), whose services may be required in connection with the supply of products and services under the signed contracts, such facilities as may be necessary for their entry into Pakistan and stay therein for the smooth and uninterrupted performance of their work (i.e. to secure the appropriate Visa including its extension/s required by the recipient country in connection thereof).
6	To exempt goods of Japanese and other foreign nationals from customs duties, internal taxes and other fiscal levies which may be imposed by the Government of Pakistan with respect to their supply (products) and services under the signed contracts.
7	To pay bank commission for the issuance of the Authorization to Pay (A/P) and amendments in A/P, if required, for the Consultant and the Contractor.
8	To bear all the expenses, other than those to be borne by the Japan's Grant Aid, necessary for the implementation of the Project.
9	To ensure the security of the whole Project site/s and of the Japanese and other foreign nationals assigned to the Project prior to the commencement of and during Project implementation.
For the Construction of the Radar Tower Building	
10	To clear, level and reclaim the land prior to the commencement of construction work.
11	To secure sufficient spaces at the respective Project site/s for temporary facilities such as a contractor's office, workshop, building materials storage, etc. needed for the construction work.
12	To obtain necessary permissions from the relevant agencies for the construction of the Radar Tower Building in the PMD Karachi.
13	To provide the commercial power (400V, 3-phase, 4-wire, 50Hz) supply (capacity: 100kVA) along with electric poles/wires, etc. from the main supply line to the proposed site for the Karachi Radar Tower Building in the PMD Karachi.
14	To install the required step-down transformer as well as service entrance connections for the commercial power supply at the PMD Karachi for the Radar Tower Building.
15	To provide incidental facilities, such as water supply, telephone lines and internet provision, for the Radar Tower Building in the PMD Karachi.
16	To provide temporary facilities for the availability or accessibility of electricity, water, etc. for the construction work.
17	To undertake incidental outdoor works such as gardening, fencing, constructing gates, boundary walls and exterior lighting in and around the site, if necessary.
18	To shoulder dispatching cost of the trainees to the training sites, such as daily allowance, transportation fee, accommodation, if any.
For Installation Work of the Equipment	
19	To provide and allocate secure temporary storage area/room for the materials, tools and equipment needed during the installation process.
20	To provide reliable and high-speed Internet environment at the PMD Islamabad Head Office National Weather Forecasting Center, the PMD Karachi Tropical Cyclone Warning Center, Meteorological Office Karachi International Airport, Meteorological Office New Benazir Bhutto International Airport Islamabad and the PMD Flood Forecasting Division (FFD), Lahore for establishment of a Virtual Private Network (VPN).
21	To set up new assigned IP addresses in the computing equipment supplied under the Project.

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22	To secure ample and strategically located space/s at the existing facilities (the PMD Islamabad Head Office National Weather Forecasting Center, the PMD Karachi Tropical Cyclone Warning Center, Meteorological Office Karachi International Airport, Meteorological Office New Benazir Bhutto International Airport Islamabad and the PMD Flood Forecasting Division (FFD), Lahore) for the installation of the equipment (PC terminals and peripherals) to be supplied under the Project.
23	To shoulder the dispatching cost of the trainees to the training sites, such as daily allowance, transportation fee, accommodation, if any.
After the completion of the Project	
24	To renovate the existing gates, boundary walls and exterior lighting in and around the sites.
25	To assign the required staff for the smooth operation and maintenance of the Equipment.
26	To procure the required spare parts and consumables for the smooth operation and maintenance of the Equipment.
27	To provide adequate maintenance of the Radar Tower Building constructed under the Project so that they may function long lasting and effectively.
28	To properly operate and maintain, and also effectively utilize the facilities constructed and the Equipment procured/installed under the Project.
29	To allocate the necessary budget and personnel for the smooth conduct of meteorological radar observation and forecasting works.
30	To periodically update all the operation/antivirus/application software(s).

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Appendix 5. Soft Component Plan

Soft Component Plan

<Background of the Soft Component Plan>

Pakistan is a disaster-prone country which is largely affected by natural disasters such as floods, landslides, cyclones, droughts, earthquake and etc. Floods, in particular, occur most frequently and sometimes affect the most of the country since the Indus River runs through the country longitudinally. Recently, the frequency of floods has increased and, in fact, massive floods have happened in three consecutive years: 2010, 2011 and 2012. Especially, the Indus River Flood in 2010 was the most devastating catastrophe in Pakistan history which caused unimaginable damages to almost the entire nation (killed or missing: approx. 2,000, affected people: over 20 million, total estimated damage: 9.5 billion US dollars). The southern area is also damaged by rain storm or storm surge caused by tropical cyclones which approach/land on the coast of Pakistan facing the Arabian Sea once in every two or three years. These natural disasters have led to the loss of human lives and properties and the stagnation of socio-economic activities in Pakistan.

At present, in Pakistan, there are four meteorological radar systems (Islamabad, Karachi, Dera Ismail Khan and Rahimyar Khan) established under the grant aid of Japan. These networked meteorological radar systems make it possible to observe the precipitation of about 80% areas of the whole country where more than 90% of the overall population live. Among them, the existing Karachi meteorological radar system established in 1991 has played an important role in monitoring meteorological phenomena in the southern area or tropical cyclones which are generated in the Arabian Sea and the Bay of Bengal. However, its function deteriorates day by day and could completely stop in a few years despite the appropriate maintenance done by the radar engineers of the PMD. In addition, since many parts transit from analog to digital and the supply of spare parts and consumables from the manufacturer has become limited, it would be extremely difficult to restore the radar system once a serious failure occurs. Therefore, as a permanent measure, the replacement of the existing Karachi meteorological radar system is an urgent task in Pakistan.

Given the situation indicated above, the key objectives of the Project are to improve the PMD's capabilities in meteorological observation, weather forecasting and dissemination of forecasts/warnings through the replacement of the existing Karachi C-band ordinary meteorological radar system to the S-band Doppler pulse compression solid state radar system. This will largely contribute to the mitigation of damages caused by natural disasters in Pakistan which are predicted to increase due to the climate change.

Majority of the PMD's technical staff is proficient in the use of computers and computerized

meteorological observation equipment. Unfortunately, none of them have the practical experience in operating a digital meteorological radar system which is planned to be procured under the Project as Karachi's existing meteorological radar system is of the analog type. For the smooth operation and maintenance of the digital meteorological radar system, for the dissemination of high accuracy medium range weather forecasts to be prepared through weather guidance to the public, and for the assurance of the required sustainability of the project outcomes, the implementation of the technology transfers in the soft component mentioned below (soft component schedule is indicated in the Implementation Schedule attached hereunder) is required.

<Soft Component Target>

The Soft Component Targets are as follows.

- Inspection, adjustment, minor fault finding, remedy and recovery, and major fault countermeasures (report to the Consultant and Manufacturer and collection of technical advice, etc.) to be appropriately carried out by the PMD.
- Prompt and appropriate meteorological radar operation and maintenance utilizing the meteorological Doppler radar system manual summary and the meteorological radar system maintenance & management record book.
- Meteorological radar observation in accordance with the sequence & schedule for Intensity Mode and Doppler Mode in order to appropriately understand weather phenomena and to utilize the observed radar data for forecasting.

<Soft Component Outputs>

Soft Component Outputs are as follows.

Table: Soft Component Outputs

No.	Item	Output
1	Meteorological Doppler Radar Inspection, Adjustment, Minor Fault Finding, Remedy and Recovery, and Major Fault Countermeasures	Acquisition of technical know-how on appropriate inspection, adjustment, minor fault finding, remedy and recovery. 1) Routine maintenance using measuring instruments and tools. 2) Practice of replacing spare parts into the actual system and the subsequent confirmation of system operation. 3) Practice of fault finding, remedy and recovery. Acquisition of know-how on major fault countermeasures (report to the Consultant and Manufacturer and collection of technical advice, etc.).
2	Prompt and Appropriate Meteorological Doppler Radar Operation and Maintenance utilizing the Meteorological Doppler Radar System Manual Summary and the Meteorological Radar System Maintenance & Management Record Book	Technical knowledge acquisition of prompt and appropriate meteorological Doppler radar operation and maintenance utilizing the meteorological Doppler radar system manual summary and the meteorological radar system maintenance & management record book.
3	Meteorological Radar Observation in accordance with the Sequence & Schedule for Intensity Mode and Doppler Mode	Commencement of meteorological radar observation in accordance with the sequence & schedule for Intensity Mode and Doppler Mode in order to appropriately understand weather phenomena and to utilize the observed radar data for forecast operation.

<Means of Verification for Outputs Achievement>

Means of verification for outputs achievement of the Soft Component are as follows.

Table: Soft Component Indicators

No.	Item	Objectively Verifiable Indicators	Means of Verification
1	Meteorological Doppler Radar Inspection, Adjustment, Minor Fault Finding, Remedy and Recovery and Major Fault Countermeasures	Inspection, adjustment, minor fault finding, remedy and recovery, and major fault countermeasures are carried out appropriately by the PMD.	Confirmation of proficiency through 1) routine maintenance using measuring instruments and tools; 2) practice of replacing spare parts into the actual system and the subsequent confirmation of system operation; 3) practice of minor fault finding, remedy and recovery; and 4) major fault countermeasures.
2	Prompt and Appropriate Meteorological Doppler Radar Operation and Maintenance utilizing the Meteorological Radar System Manual Summary and the Meteorological Radar System Maintenance & Management Record Book	Meteorological Doppler radar operation and maintenance utilizing the meteorological radar system manual summary and the meteorological radar system maintenance & management record book are implemented promptly and appropriately.	<ul style="list-style-type: none"> Evaluation of the frequency of usage of the meteorological Doppler radar system manual summary. Confirmation of indication (daily, weekly, monthly) in the meteorological radar system maintenance & management record book.
3	Meteorological Radar Observation in accordance with the Sequence & Schedule for Intensity Mode and Doppler Mode Sequence & Schedule	Meteorological radar observation is implemented according to the radar observation sequence & schedule for Intensity Mode and Doppler Mode.	Confirmation of meteorological radar observation in accordance with the sequence & schedule for Intensity Mode and Doppler Mode in order to appropriately understand weather phenomena and to utilize the observed radar data for forecast operation.

<Scheduled Activities of Soft Component>

Scheduled Activities of Soft Component are as follows.

Table: Scheduled Activities of Soft Component

Output	Required Technique and Field	Current Technique and Required Technique Level	Target Group	Means of Implementation	Source of Implementation	Product
1. Meteorological Doppler Radar Inspection, Adjustment, Minor Fault Finding, Remedy and Recovery, and Major Fault Countermeasures	An engineer capable of meteorological radar adjustment and fault finding.	Since technicians in the PMD have no practical experience of adjusting and fault finding in a digital meteorological radar system, it is imperative that the PMD technicians should acquire such capability.	Indicated in the table below	Routine maintenance using measuring instruments and tools.	Expert Consultant on meteorological radar adjustment and fault finding: 0.77 Man-Months. (Period of Technology Transfer in Pakistan: 23days)	Manual on routine maintenance using measuring instruments and tools.
				Practice of replacing spare parts into the actual system and the subsequent confirmation of system operation.		Manual on replacing spare parts into the actual system and the subsequent confirmation of system operation.
				Practice of countermeasure, minor fault finding, remedy and recovery.		Manual on fault finding, remedy and recovery.
				Practice of major fault countermeasures.		Manual on major fault countermeasures.
2. Preparation of Meteorological Doppler Radar System Manual Summary and Meteorological Radar System Maintenance & Management Record Book	An engineer capable of meteorological radar operation and maintenance.	Since technicians in the PMD have no practical experience of operating and maintaining a digital meteorological radar system, it is imperative that the PMD technicians should obtain the capability to conduct	Indicated in the table below	Discussion with the PMD technicians.	Expert Consultant on meteorological radar operation and maintenance: 0.77 Man-Months (Period of Technology Transfer in Pakistan: 23 days)	Meteorological Doppler radar system manual summary
				Selection of the most important points from the meteorological Doppler radar system manual.		Meteorological radar system maintenance & management record book
				Production of the meteorological Doppler radar system manual summary.		Date and time of occurrence of system

		meteorological radar operation and maintenance utilizing the meteorological Doppler radar system manual summary and the meteorological radar system maintenance & management record book.		Production of the meteorological radar system maintenance & management record book. Utilization of the meteorological Doppler radar system manual and the meteorological radar system maintenance & management record book by the PMD technicians.	Direct Support	failure/trouble → Cause/s of system failure/trouble (abnormal noise, part degradation, etc.) → Repair procedures implemented → Name and quantity of replaced parts → Name of engineer/s who perform/s the repair /troubleshooting
3. Preparation of the Sequence & Schedule for Intensity Mode and Doppler Mode	An engineer who can identify Clutter and Blind Area by using radar observation data and prepare a sequence & schedule for the meteorological radar observation which is suited to the weather phenomena in Pakistan	Since technicians in the PMD have no practical experience using a digital meteorological Doppler radar system and has no capability in preparing sequences & schedules for Intensity Mode and Doppler Mode, it is imperative that the PMD technicians should obtain the capability to prepare sequences & schedules for meteorological radar observation with an awareness of its importance.	Indicated in the table below	Discussion with the PMD technicians and lecture. Identification of Clutter of meteorological radar system and Blind Area at antenna elevation angle (0.5 interval degree, between 1-3 degree). Preparation of Blind Area at antenna elevation angle (0.5 interval degree, between 1-3 degree). Preparation of Sequence & Schedule for Intensity Mode and Doppler Mode. Implementation of radar observation using Sequence & Schedule for Intensity Mode and Doppler Mode.	Expert Consultant on meteorological radar observation: 1.0 Man-Month (Period of Technology Transfer in Pakistan: 30 days) Direct Support	Sequence & Schedule for Intensity Mode and Doppler Mode and Changing Procedures

Table: Target Personnel in the PMD for the Technology Transfer in the Soft Component

Technology Transfer of No. 1 & 2			Technology Transfer of No. 3	
	Weather Surveillance Radar Section	Development Section	PMD Karachi Tropical Cyclone Warning Center (TCWC)	
Senior Electronic Engineer	1	1	TCWC Personnel	20
Electronic Engineer	3	3		
Assistant Electronic Engineer	1	-		
Sub-Engineer	12	6		
Technical Assistant	1	-		
Junior Staff	4	4		

Details of each activity schedule are as follows.

Table: Details of the Activity Schedule of the Soft Component

	Activity No. 1	Activity No. 2	Activity No. 3
Date	Meteorological Doppler Radar Inspection, Adjustment, Minor Fault Finding, Remedy and Recovery, and Major Fault Countermeasure	Meteorological Doppler Radar System Manual Summary and Meteorological Radar System Maintenance & Management Record Book	Preparation of Sequence & Schedule for Intensity Mode and Doppler Mode
1	Japan → Karachi	Japan → Karachi	Japan → Karachi
2	Preparatory Work	Preparatory Work	Preparatory Work
3	Preparatory Work at Islamabad	Preparatory Work at Islamabad	Discussion with the PMD technicians and

	Meteorological Radar Tower Building	Meteorological Radar Tower Building	lecture.
4	Practice of routine maintenance using measuring instruments and tools.		
5			
6	Production of operation and maintenance manual (refer to Islamabad one).		
7	Practice of replacement of spare parts to actual system and confirmation of system operation. Production of operation and maintenance manual (refer to Islamabad one).	Discussion with the PMD technicians. Selection of the most important points from meteorological Doppler radar system manual.	Identification of Clutter of meteorological radar system and Blind Area at antenna elevation angle (0.5 interval degree, between 1-3 degree).
8	Sat.(Holiday)	Sat.(Holiday)	Sat.(Holiday)
9	Sun.(Holiday)	Sun.(Holiday)	Sun.(Holiday)
10			
11	Practice of replacement of spare parts to actual system and confirmation of system operation. Production of operation and maintenance manual (refer to Islamabad one).	Production revision of meteorological Doppler radar system manual summary for Islamabad. Production revision of meteorological radar system maintenance & management record book for Islamabad.	Preparation of Blind Area at antenna elevation angle (0.5 interval degree, between 1-3 degrees).
12	Practice of minor fault finding, remedy and recovery.		
13	Production of operation and maintenance manual (refer to Islamabad one).	Review of the Meteorological Doppler radar system manual summary (Revised) and the Meteorological radar system maintenance & management record book (Revised).	Preparation of Sequence & Schedule for Intensity Mode and Doppler Mode and Changing Procedures (Draft).
14			Implementation of radar observation using Sequence & Schedule for Intensity Mode and Doppler Mode.
15	Sat.(Holiday)	Sat.(Holiday)	Sat.(Holiday)
16	Sun.(Holiday)	Sun.(Holiday)	Sun.(Holiday)
17	Practice of major fault countermeasure Review of training by the PMD.	Utilization of the meteorological Doppler radar system manual (Revised) and the meteorological radar system maintenance & management record book (Revised) by the PMD engineers.	Review of Sequence & Schedule for Intensity Mode and Doppler Mode and Changing Procedures (Draft).
18	Production of operation and maintenance manual (refer to Islamabad one).		
19	Production of Soft Component	Production of Soft Component	Implementation of radar observation using Sequence & Schedule for Intensity Mode and Doppler Mode.
20	Completion Report.	Completion Report.	
21	Technical discussion with the PMD.	Technical discussion with the PMD.	
22	Departure from Karachi	Departure from Karachi	Sat.(Holiday)
23	Arrival in Japan	Arrival in Japan	Sun.(Holiday)
24			Completion of Radar observation using Sequence & Schedule for Intensity Mode and Doppler Mode and Changing Procedures.
25			
26			Production of Soft Component
27			Completion Report.
28			Technical discussion with the PMD.
29			Departure from Karachi
30			Arrival in Japan

<Procurement Method of Soft Component Implementation Resources>

Implementation Resources are procured based on the direct support of Japanese consultants who are in charge of equipment procurement for the Project. The reasons are presented below.

- Personnel with advanced technique and knowledge of weather services and meteorological radar system is necessary.
- Personnel as indicated above usually belongs to weather organizations which actually conduct weather services.
- Personnel who has similar experience to the proposed technology transfer is required.

<Implementation Schedule>

The implementation schedule of the whole Project and soft component is indicated in the following table. The soft component is planned to be implemented during the adjustment stage after the installation of the meteorological radar system and before the completion of the Project.

Table: Implementation Schedule

Month	1	2	3	4	5	6	7
Detailed Design & Tendering Procedures	Total: 7.0 months						
Detailed Design	■	■	■				
Tendering Procedures				■	■	■	■

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31			
Construction of Karachi Meteorological Radar Tower Building	Total: 17.0 months																																	
Preparation Work	■																																	
Temporary/Piling/Earth Works		■	■	■	■	■																												
Structure Work							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
Finishing Works																																		
Building Equipment																																		
External Work																																		
Equipment Procurement	Total: 18.0 months																																	
Equipment Manufacturing																																		
Equipment Transportation																																		
Equipment Installation/Adjustment																																		
Soft Component																																		
Soft Component (Activity No. 1)																																		
Soft Component (Activity No. 2)																																		
Soft Component (Activity No. 3)																																		

<Soft Component Product>

Soft Component Products are as follows.

Table: Soft Component Products in Technology Transfer

Product Name	Submission Time	No. of Pages	
Implementation report on 1) routine maintenance using measuring instruments and tools, 2) practice of replacing spare parts into the actual system and the subsequent confirmation of system operation, 3) practice of minor fault finding, remedy and recovery, and 4) major fault countermeasure.	After Technology Transfer	20	
Meteorological Doppler radar system manual summary		30	
Meteorological radar system maintenance and management record book		10	
Radar observation sequence & schedule for Intensity Mode and Doppler Mode and Changing Procedures		10	
Output Name	Content	Submission Time	No. of Pages
Soft Component Completion Report	<ul style="list-style-type: none"> Scheduled Activities and Actual Achievement Scheduled Outputs and Achievement Factors which influence Achievement of Outputs Recommendation Outputs 	Completion of Soft Component	50

<Obligations of the Recipient Country>

Obligations of the PMD for the implementation of Soft Component are as follows.

- 1) Manpower Development
 - a) Continuous recruitment of human resources for the next generation.
 - b) Development of more qualified technical personnel through training and other related manpower development programs.
- 2) Longer Life Span of the Equipment procured and the Radar Tower Building constructed under the Project
 - a) Regularly secure the necessary budget for the efficient operation and maintenance of the systems and building equipment, and the procurement of requisite spare parts and consumables for all the equipment to be supplied under the Project.
 - b) Ensure protection of the building, equipment and facilities against theft and vandalism.

The PMD will be able to implement the above obligations through its organizational and personnel capabilities. Most especially, the “continuous recruitment of human resources for the next generation” is of vital concern. It is imperative for the PMD to become self-reliant in technical areas such as the operation and maintenance of radar systems. Hence, it is essential that it puts forth continued efforts to recruit and fill vacancies, thereby, promoting technology transfer across all staff levels, from the assistant personnel to the engineer(s). The PMD fully recognizes the need to strengthen its technical section/s.

Appendix 6. References

No	Name of References	Original/Copy/ Digital File	Publisher	Data of Publication
1	National Climate Change Policy	Digital File	Ministry of Climate Change	2012
2	Pakistan Climate Change Action Plan	Digital File	Ministry of Climate Change United Nations Pakistan	2011
3	High Performance Computing Cluster (HPCC) Facility	Digital File	Research & Development Division, Pakistan Meteorological Department	2012
4	Pakistan Map	Original	Nelles Map	2009
5	Islamabad Street Map	Original	Saeed Book Bank	-
6	Professional Training Courses 2012 Institute of Meteorology & Geophysics Karachi	Original	Government of Pakistan Pakistan Meteorological Department	2012