

# 資 料

## 資料 1. 調査団員・氏名

### <第一次現地調査>

氏名	担当	所属・役職
井上 陽一	総括	(独) 国際協力機構 地球環境部 防災グループ 防災第一チーム 企画役
山内 洋	技術参与 (気象レーダー)	気象庁 観測部観測課 調査官
赤津 邦夫	国際気象	(独) 国際協力機構 国際協力専門員
内田 善久	業務主任/気象レーダー計画/運営維持管理	(株) 国際気象コンサルタント
遠藤 肇秀	通信機器計画/機材計画	(株) 国際気象コンサルタント
森 健二	レーダー塔建築設計	(株) 国際気象コンサルタント
猪又 裕之	施工計画/自然条件調査/積算	(株) 国際気象コンサルタント
山内 元宏	調達計画	(株) 国際気象コンサルタント

## <第二次現地調査>

氏名	担当	所属・役職
井上 陽一	総括	(独) 国際協力機構 地球環境部 防災グループ 防災第一チーム 企画役
内田 善久	業務主任/気象レーダー計画/運営維持管理	(株) 国際気象コンサルタント
遠藤 肇秀	通信機器計画/機材計画	(株) 国際気象コンサルタント
猪又 裕之	施工計画/自然条件調査/積算	(株) 国際気象コンサルタント

## 資料 2. 調査行程

### (1) 第一次現地調査

調査日程	官団員			コンサルタント団員					
	井上 陽一	山内 洋	赤津 邦夫	内田 善久	遠藤 肇秀	森 健二	猪又 裕之	山内 元宏	
2016年	総括 JICA地球環境部 防災第一チーム 企画役	技術参与（気象レーダー） 気象庁観測部 観測課 調査官	国際気象 JICA国際協力専門員	業務主任/気象レーダー計画/ 運営維持管理	通信機器計画/機材計画	レーダー塔建築設計	施工計画/自然条件調査/積算	調達計画	
1	2月18日	木		東京→バンコク→コロンボ					
2	2月19日	金		DOMコロソ本局との協議、自然条件調査見知り依頼のため現地業者との協議、通信規制委員会との協議		DOMコロソ本局との協議、自然条件調査見知り依頼のため現地業者との協議			
3	2月20日	土		DOMコロソ本局（気象センター）でのサイト調査、資料収集、内部打合せ					
4	2月21日	日		資料収集、内部打合せ					
5	2月22日	月	東京→コロソ	DOMコロソ本局（気象センター）でのサイト調査、資料収集、内部打合せ			東京→バンコク→コロソ		
6	2月23日	火	東京→コロソ DOMコロソ本局との協議（インセプションレポート説明）、災害管理者への表敬訪問	DOMコロソ本局との協議（インセプションレポート説明）、災害管理者への表敬訪問	DOMコロソ本局との協議（インセプションレポート説明）、自然条件調査見知り依頼のため現地業者との協議	DOMコロソ本局との協議（インセプションレポート説明）、自然条件調査見知り依頼のため現地業者との協議	資料収集、DOMコロソ本局との協議		
7	2月24日	水	財務計画省対外援助局との協議、DOMポツピル観測所（ポツピル気象レーダー観測所）でのサイト調査	DOMポツピル観測所（ポツピル気象レーダー観測所）でのサイト調査、ポツピル市と海岸保全局との協議、マツララジャバスカ国際空港DOM気象事務所でのサイト調査					
8	2月25日	木							
9	2月26日	金	DOMコロソ本局との協議、ミニッツ内容確認	DOMコロソ本局との協議、ミニッツ内容確認	DOMプッタラム観測所（プッタラム気象レーダー観測所）でのサイト調査、プッタラム地方自治体との協議	DOMプッタラム観測所（プッタラム気象レーダー観測所）でのサイト調査、プッタラム地方自治体との協議	DOMプッタラム観測所（プッタラム気象レーダー観測所）でのサイト調査、IP-VPNデータ送信スピード計測テスト		
10	2月27日	土	資料収集、内部打合せ	コロソ国際空港DOM気象事務所でのサイト調査、資料収集、内部打合せ					
11	2月28日	日	DOMプッタラム観測所（プッタラム気象レーダー観測所）でのサイト調査	DOMプッタラム観測所（プッタラム気象レーダー観測所）でのサイト調査					
12	2月29日	月	DOMコロソ本局及び通信規制委員会との協議	DOMコロソ本局及び通信規制委員会との協議	DOMコロソ本局（気象センター）でのサイト調査、資料収集				
13	3月1日	火	DOMコロソ本局との協議、ミニッツ内容確認、在スリランカ日本大使館への報告	DOMコロソ本局との協議、ミニッツ内容確認			資料収集、積算調査、建築材料単価調査		
14	3月2日	水	DOMコロソ本局との協議、ミニッツ署名、災害管理者への報告、JICAスリランカ事務所への報告	DOMコロソ本局との協議、ミニッツ署名、災害管理者への報告、JICAスリランカ事務所への報告			DOMコロソ本局との協議、積算調査、建築材料単価調査		
15	3月3日	木	コロソ→東京	DOMコロソ本局及び中央環境庁との協議	DOMコロソ本局との協議、インターネットサービスプロバイダーとの協議	DOMコロソ本局及び中央環境庁との協議	DOMコロソ本局（気象センター）でのサイト調査、資料収集		
16	3月4日	金		資料収集、DOMコロソ本局との協議			資料収集、DOMプッタラム観測所（プッタラム気象レーダー観測所）の自然条件調査フォローアップ、プッタラム都市審議会との協議、都市開発庁、クルネーグラ北西地方事務所との協議	輸出入管理局との協議	
17	3月5日	土		資料収集、内部打合せ					
18	3月6日	日		資料収集、内部打合せ					
19	3月7日	月		資料収集、内部打合せ					
20	3月8日	火		DOMコロソ本局との協議、沿岸保全・沿岸資源管理局との協議	資料収集、DOMコロソ本局との協議、輸送会社との協議	DOMコロソ本局との協議、沿岸保全・沿岸資源管理局との協議	資料収集、積算調査、建築材料単価調査	資料収集、DOMコロソ本局との協議、輸送会社との協議	
21	3月9日	水		資料収集、DOMコロソ本局との協議			資料収集、DOMポツピル観測所（ポツピル気象レーダー観測所）の自然条件調査フォローアップ、ポツピル市と海岸保全局との協議、都市開発庁、アンバラ県事務所との協議	資料収集、DOMコロソ本局との協議	
22	3月10日	木		資料収集、DOMコロソ本局との協議			資料収集、積算調査、建築材料単価調査		
23	3月11日	金		DOMコロソ本局との協議、財務・計画省 財政政策局との協議	資料収集、DOMコロソ本局との協議	DOMコロソ本局との協議、財務・計画省 財政政策局との協議	資料収集、積算調査、建築材料単価調査	資料収集、DOMコロソ本局との協議	
24	3月12日	土		資料収集、内部打合せ					
25	3月13日	日		資料収集、内部打合せ					
26	3月14日	月		DOMコロソ本局との協議、インターネットサービスプロバイダーとの協議		資料収集、積算調査、建築材料単価調査			DOMポツピル観測所（ポツピル気象レーダー観測所）でのサイト調査
27	3月15日	火		資料収集、DOMコロソ本局との協議					
28	3月16日	水		資料収集、DOMコロソ本局との協議	資料収集、DOMコロソ本局との協議、通信規制委員会との協議	資料収集、積算調査、建築材料単価調査		資料収集、DOMコロソ本局との協議	
29	3月17日	木		資料収集、DOMコロソ本局との協議、スリランカ中央銀行との協議	資料収集、DOMコロソ本局との協議	資料収集、DOMコロソ本局との協議、スリランカ中央銀行との協議	資料収集、積算調査、建築材料単価調査	資料収集、DOMコロソ本局との協議	
30	3月18日	金		資料収集、DOMコロソ本局との協議	コロソ→バンコク→東京			資料収集、DOMコロソ本局との協議	コロソ→バンコク→東京
31	3月19日	土		資料収集、内部打合せ					
32	3月20日	日		資料収集、内部打合せ					
33	3月21日	月		JICAスリランカ事務所との協議、DOMコロソ本局との協議			JICAスリランカ事務所との協議、DOMコロソ本局との協議		
34	3月22日	火		コロソ→バンコク→東京					

資料 2. 調査行程

(2) 第二次現地調査

調査日程			官団員	コンサルタント団員		
			井上 陽一	内田 善久	遠藤 肇秀	猪又 裕之
2016年			総括 JICA地球環境部 防災第一チーム 企画役	業務主任/気象レーダー計画/運営 維持管理	通信機器計画/機材計画	施工計画/自然条件調査/積算
1	9月13日	火			東京→バンコク→コロombo	
2	9月14日	水		東京→バンコク→コロombo	DOMコロombo本局との協議、準備 調査報告書(案)説明	東京→バンコク→コロombo
3	9月15日	木		DOMコロombo本局との協議、準備調査報告書(案)説明		
4	9月16日	金		資料収集、内部打合せ		
5	9月17日	土		資料収集、内部打合せ		
6	9月18日	日	東京→コロombo	資料収集、内部打合せ		
7	9月19日	月	JICAスリランカ事務所と打合せ、 災害管理省への表敬訪問、DOMコ ロombo本局との協議、準備調査報 告書(案)説明	JICAスリランカ事務所と打合せ、災害管理省への表敬訪問、DOMコロombo本局との協議、準備調査報告書 (案)説明		
8	9月20日	火	DOMコロombo本局とのミニッツの 協議	DOMコロombo本局とのミニッツの協議		
9	9月21日	水	DOMコロombo本局との協議、ミ ニッツ内容確認	DOMコロombo本局との協議、ミニッツ内容確認		
10	9月22日	木	DOMコロombo本局との協議、ミ ニッツ署名、災害管理省への報 告、日本大使館及びJICAスリラン カ事務所への報告	DOMコロombo本局との協議、ミニッツ署名、災害管理省への報告、日本大使館及びJICAスリランカ事務所 への報告		
11	9月23日	金	コロombo→東京	DOMコロombo本局との協議		
12	9月24日	土		資料収集、内部打合せ		
13	9月25日	日		資料収集、内部打合せ		
14	9月26日	月		DOMコロombo本局との協議、資料収集		
15	9月27日	火		DOMコロombo本局との協議、資料収集		
16	9月28日	水		コロombo→バンコク→東京	コロombo→デリー	コロombo→バンコク→東京
17	11月4日	金	DOMとの協議及び準備調査報告書 (案)説明			

### 資料 3. 関係者(面会者)リスト

- 災害管理省 (Ministry of Disaster Management)

Mr. S. S. Miyanawala Secretary

- スリランカ気象局 (Department of Meteorology : DOM)

Colombo Head Office

Mr. Lalith Chandrapala	Director General
Mr. K.H.M.S. Premalal	Director
Mr. S.R. Jayasekara	Director
Mr. D.A. Jayasinghearachchi	Deputy Director
Ms. Anusha Warnasooriya	Deputy Director
Mr. Channa Rodrigo	Meteorologist
Ms. Pabodini Karunapala	Meteorologist
Ms. Nadi Rupasinghe	Meteorologist
Mr. Sachith Wickramasooriya	Meteorologist
Mr. Malith Fernando	Meteorologist
Mr. Nuwan Kumarasinghe	Chief Electronic Engineer
Mr. Kelum Priyadarshana	Electronic Engineer
Mr. W.A.T.K.Palitha De Silva	Senior Telecommunication & Radar Technical Officer

DOM Puttalam Observatory (Puttalam Radar Observation Station)

Mr. Jamaldeen Mursaleen	Meteorological Officer
Mr. Aasiri Abeyratne	Meteorological Assistance

DOM Pottuvil Observatory (Pottuvil Radar Observation Station)

Mr. Mohomed Naheem	Officer in Charge of the Observatory
Mr. Rasika Rathnayaka	Officer

DOM Aviation Meteorological Office in the Colombo International Airport

Mr. Murukkuwadura Meril Prasantha Mendis	Meteorologist in Charge
Mr. Kapila Samarasooriya	Officer in Charge

DOM Aviation Meteorological Office in the Mattala Rajapaksa International Airport

Mr. Thammahetti Mudalige Nandalal Peiris	Officer in Charge
Mr. Wijesekara Widanapatirawa Dayananda	Senior Meteorological Officer
Mr. Don Mariyan Bernard Suraweera	Meteorological Officer

- 通信規制委員会 (Telecommunication Regulatory Commission (TRC) of Sri Lanka)

Mr. M. C. M. Farook	Deputy Director/Spectrum Planning & Database Management
Mr. J. A. S. Gunanandana	Deputy Director/Spectrum Monitoring & Compliance

- **ポトゥビル市 (Pottuvil Pradesiya Sabha)**  
 Mr. L. Mohamed Irfan Secretary  
 Mr. Z. A. M. Imthiyas Development Officer
- **沿岸保全・沿岸資源管理局 ポトゥビル事務所 (Coast Conservation & Coastal Resource Management Department, Pottuvil Office)**  
 Mr. Sameera Perera District Project Coordinator  
 Mr. W. Wajira Lakmal Planning Assistant
- **プッタラム都市審議会 (Puttalam Urban Council)**  
 Mr. W. G. Nishantha Kumara Secretary  
 Mr. R. Thangarasa Technical Officer  
 Mr. K. A. Kazari Technical Officer
- **中央環境庁 (Central Environmental Authority)**  
 Ms. T. W. A. W. Wijesinghe Director, Laboratory Services Division  
 Ms. Hiranthi Jansz Assistant Director, Air Resource Management & Monitoring Division  
 Mr. Kamal Priyantha Assistant Director, Air Resource Management & Monitoring Division
- **都市開発庁、クルネーガラ北西地方事務所 (Urban Development Authority, North Western Provincial Office (Kurunegala))**  
 Mr. A. M. Senarathne Deputy Director/Planning
- **沿岸保全・沿岸資源管理局 (Coast Conservation & Coastal Resource Management Department)**  
 Mr. Nimal Sri Rajarathna Assistant Deputy Director/Planning
- **都市開発庁、アンパラ県事務所 (Urban Development Authority, Ampara District Office)**  
 Mr. J. Somasiri Deputy Director/Planning  
 Mr. Chandana Karunaratne Planning Officer
- **財務・計画省 財政政策局 (Department of Fiscal Policy, Ministry of Finance & Planning, the Secretariat)**  
 Ms. H. D. Aneesha Rukshini Assistant Director
- **ランカ通信サービス会社 (Lanka Communication Services (Private) Limited)**  
 Mr. Roshan Jaytilake Head of pre sales  
 Mr. Ugantha Welikala Head Customer Services
- **スリランカ中央銀行 (Central Bank of Sri Lanka)**  
 Ms. Madhavi Jayasekara Senior Accountant, Financial Department  
 Mr. S. H. S. Karunaratne Senior Accountant, Financial Department

- **財務計画省 对外援助局 (Department of External Resources (ERD), Ministry of National Policies and Economic Affairs)**

Ms. Gayoma Senaynayake

Assistant Director (Japan and Korea Desk)

- **在スリランカ日本国大使館**

岡井 朝子

公使

岩瀬 喜一郎

一等書記官

音喜多 卓嗣

二等書記官

- **独立行政法人 国際協力機構 スリランカ事務所**

小早川 徹

次長

橋本 大樹

所員




**Minutes of Discussions**  
**on**  
**the Preparatory Survey**  
**for**  
**the Project for the Establishment of a Doppler Weather Radar**  
**Network**

In response to the request from the Government of the Democratic Socialist Republic of Sri Lanka (hereinafter referred to as "Sri Lanka"), the Government of Japan decided to conduct a Preparatory Survey for the Project for the Establishment of a Doppler Weather Radar Network (hereinafter referred to as "the Project"), and entrusted the Preparatory Survey to Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent the Preparatory Survey Team for the Outline Design (hereinafter referred to as "the Team") to Sri Lanka, headed by Mr. Yoichi Inoue, Acting Director of Disaster Risk Reduction Team 1, Global Environment Department, and is scheduled to stay in the country from 22nd February to 22<sup>nd</sup> March, 2016.

The Team held a series of discussions with the officials concerned of the Government of Sri Lanka and conducted a field survey in the Project area. In the course of the discussions, both sides have confirmed the main items described in the attached sheets. The Team will proceed to further works and prepare the Preparatory Survey Report.

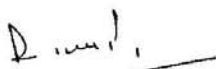
Colombo, 2nd March, 2016



\_\_\_\_\_  
**Mr. Yoichi Inoue**  
**Team Leader**  
**Preparatory Survey Team**  
**Japan International Cooperation Agency**  
**Japan**



\_\_\_\_\_  
**Mr. S. S. Miyanawala**  
**Secretary**  
**Ministry of Disaster Management**  
**The Democratic Socialist Republic of**  
**Sri Lanka**



\_\_\_\_\_  
**Mr. R. M. P. Rathnayake**  
**Director General**  
**Department of External Resources,**  
**Ministry of National Policies and Economic**  
**Affairs, The Democratic Socialist Republic of**  
**Sri Lanka**



\_\_\_\_\_  
**Mr. Lalith Chandrapala**  
**Director General**  
**Department of Meteorology**  
**Ministry of Disaster Management**  
**The Democratic Socialist Republic of**  
**Sri Lanka**

## ATTACHMENT

1. **Objective of the Project**  
The objective of the Project is to improve and strengthen the capacities of short range forecast by establishment of a Doppler Weather Radar Network, thereby contributing to mitigation of damages by weather-related disasters.
2. **Title of the Preparatory Survey**  
Both sides confirmed the title of the Preparatory Survey as “the Preparatory Survey for the Project for the Establishment of a Doppler Weather Radar Network”.
3. **Project Site**  
Both sides confirmed that the sites of the Project are DOM Puttalam Observatory (Puttalam Radar Observation Station), DOM Pottuvil Observatory (Pottuvil Radar Observation Station), National Meteorological Centre (NMC) at DOM Head Office, DOM Aviation Meteorological Offices in Colombo International Airport and Mattala Rajapaksa International Airport which are shown in Annex 1.
4. **Line Agency and Executing Agency**  
Both sides confirmed the line agency and executing agency as follows:
  - 4-1. The line agency is Ministry of Disaster Management, which would be the agency to supervise the executing agency.
  - 4-2. The executing agency is Department of Meteorology, Ministry of Disaster Management (hereinafter referred to as “DOM”). The executing agency shall coordinate with all the relevant agencies to ensure smooth implementation of the Project and ensure that the undertakings are taken by relevant agencies properly and on time. The organization charts are shown in Annex 2.
5. **Items requested by the Government of Sri Lanka**
  - 5-1. As a result of discussions, both sides confirmed that the items requested by the Government of Sri Lanka are as shown in Table below.

**Table: Items requested by the Government of Sri Lanka**

Component	DOM Puttalam Observatory (Puttalam Radar Observation Station)	DOM Pottuvil Observatory (Pottuvil Radar Observation Station)	National Meteorological Centre (NMC) at DOM Head Office	DOM Aviation Meteorological Office in the Colombo International Airport	DOM Aviation Meteorological Office in the Mattala Rajapaksa International Airport
<b>Procurement and Installation of Equipment</b>					
C-Band Solid State Dual Polarization (Polarimetric) Meteorological Doppler Radar System	1	1	-	-	-
Central Processing System	-	-	1	-	-
Meteorological Radar Data Display System	1	1	1	1	1
Meteorological Data Communication System	1	1	1	-	-
<b>Construction of Radar Tower Building</b>					
Radar Tower Building	1	1	-	-	-
Initial Technical Training of the equipment	Initial operation guidance in the contract of manufacturer				
<b>Soft Component</b>					

- 5-2. JICA will assess the appropriateness of the above requested items through the survey and will report findings to the Government of Japan. The final components of the Project would be decided by the Government of Japan.

6. Japanese Grant Aid Scheme

6-1. The Sri Lankan side understands the Japanese Grant Scheme and its procedures as described in Annex 3, Annex 4 and Annex 5, and necessary measures to be taken by the Government of Sri Lanka.

6-2. The Sri Lankan side understands to take the necessary measures, as described in Annex 6, for smooth implementation of the Project, as a condition for the Japanese Grant to be implemented. The detailed contents of the Annex 6 will be worked out during the survey and shall be agreed no later than by the Explanation of the Draft Preparatory Survey Report. The contents of Annex 6 will be used to determine the following:

- (1) The scope of the Project.
- (2) The timing of the Project implementation.
- (3) Timing and possibility of budget allocation.

Contents of Annex 6 will be updated as the Preparatory Survey progresses, and will finally be the Attachment to the Grant Agreement.

7. Schedule of the Survey

7-1. The Team will proceed with further survey in Sri Lanka until 22<sup>nd</sup> March 2016.

7-2. JICA will prepare a draft Preparatory Survey Report in English and dispatch a mission to Sri Lanka in order to explain its contents around the end of August 2016.

7-3. If the contents of the draft Preparatory Survey Report is accepted in principle and the undertakings are fully agreed by the Sri Lankan side, JICA will complete the final report in English and send it to the Government of Sri Lanka around December 2016.

7-4. The above schedule is tentative and subject to change.

8. Other Relevant Issues

8-1. Specifications Summary

Both sides confirmed basic specifications as follows;

- 1) Specifications of the requested Radar System: C-band Solid State Dual Polarization (Polarimetric) Meteorological Doppler Radar System including Isolation Transformer, Power Supply Capacitor, Power Back-up System, Lightning protection system, Measuring Equipment and Spare Parts.
- 2) Specifications of the major data communication to be arranged by Sri Lanka side: VSAT and/or IP/VPN with the required transmission speed (more than 512kbps continuous)
- 3) Specifications of the radar tower (steel or reinforced concrete tower building) will be further examined by the Team to consider necessary functions, cost and construction period

The Team will make necessary survey further and make analysis in Japan. Detailed specifications will be explained in next Mission to be scheduled around the end of August 2016.

8-2. Soft component

Both sides confirmed that initial guidance for operation and maintenance of the equipment and machinery will be included the Project to support smooth operation. Components will be studied further.

8-3. Permission of the frequency

Both sides confirmed DOM shall apply permission of the frequency of proposed C band to Telecommunications Regulatory Commission and will get permission by the beginning of August 2016.

8-4. EIA procedure

Both sides confirmed DOM shall submit Environmental Impact Report to Central Environmental Authority and get approval by the beginning of August 2016.

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8-5. Land acquisition

DOM explained lands of Meteorological Observation Station in Pottuvil and Puttalam are properties of DOM and available for the Project.

8-6. Dissemination of radar data

Both sides confirmed 1) near real-time radar data/products will be provided to the public by DOM web site and also provided to other related organizations through data servers in DOM and 2) radar data will be archived and be available to other disaster management related organizations for disaster survey. The Team will survey possible means for assurance of radar data quality.

8-7 Operation room in DOM and International Airports

DOM shall secure enough space for installation of equipment in DOM and international airport offices. The Team will plan the layout of the equipment.

8-8 Necessary budget and number of staff for Operation and Maintenance

Necessary budget and number of staff for operation and maintenance of the Project after the completion will be estimated through the Survey. DOM promised to allocate necessary budget and staff for proper operation and maintenance. The Team explained that number of staff in radar tower sites will be minimized and radars will be operated from DOM headquarters.

8-9 Taxes borne by Sri Lankan side and its budget allocation

With reference to Annex-3 and Annex-6, both sides confirmed that indirect taxes and levies related to the Project implementation as well as direct taxes levied on corporations and individuals involved in the Project implementation will be borne by DOM. DOM shall secure necessary budget. The Team will provide information on estimated amount of Taxes with time plan to DOM by the end of August 2016.

8-10 Monitoring during the implementation

DOM agreed to monitor the Project every three (3) months during the implementation by using the Project Monitoring Report form as attached in Annex-7

8-11 Confidentiality of the Project

The Team explained that preparatory survey report to be prepared at the end of the survey would be disclosed to the public 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 Project Site

Annex 2 Organization Chart

Annex 3 Japanese Grant

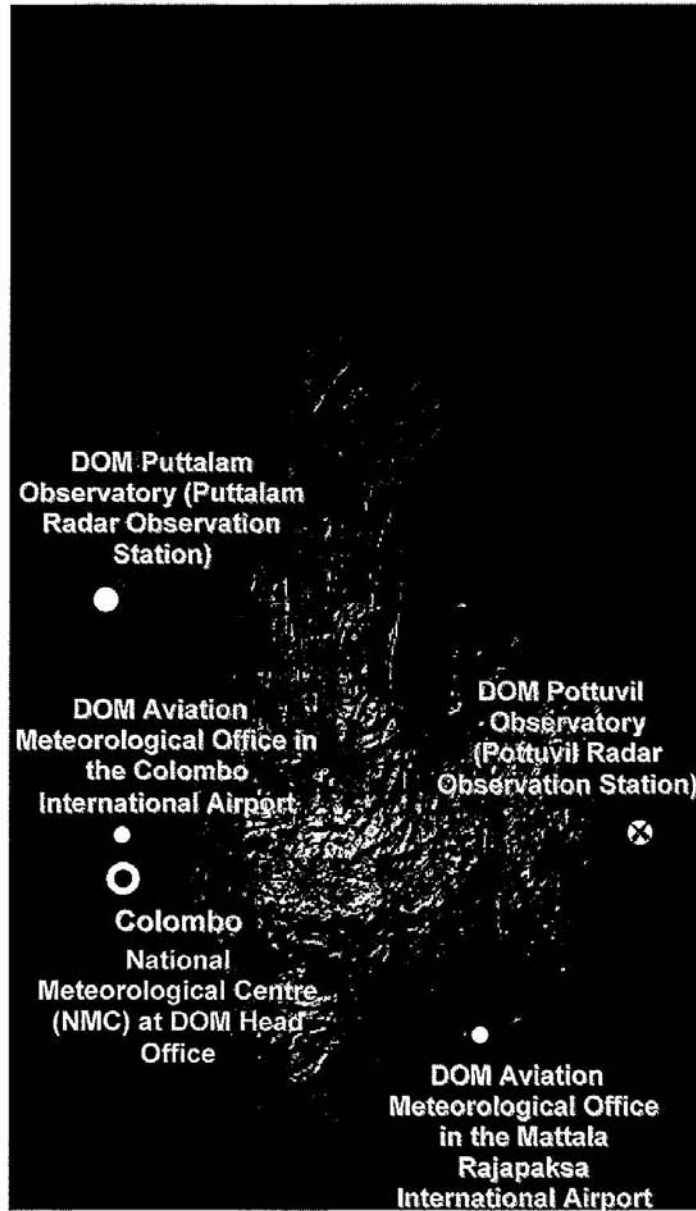
Annex 4 Flow Chart of Japanese Grant Procedures

Annex 5 Financial Flow of Japanese Grant

Annex 6 Major Undertakings to be taken by Recipient Government

Annex 7 Project Monitoring Report (template)

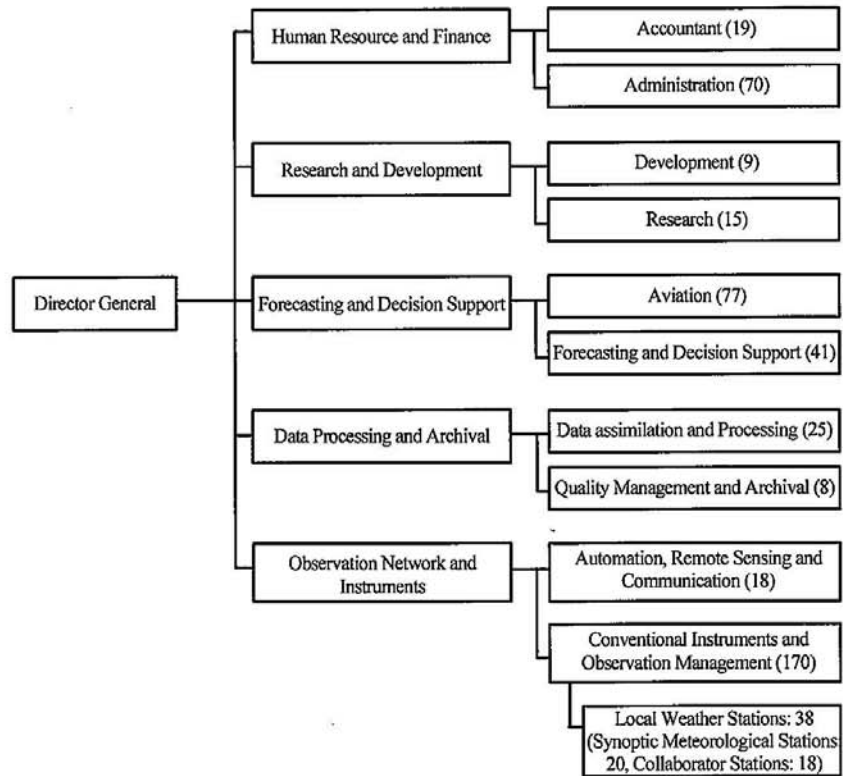
Project Sites



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Annex 2

Organization Chart of Department of Meteorology (DOM)



**JAPANESE GRANT**

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

Based on a JICA law which was entered into effect on October 1, 2008 and the decision of the GOJ, JICA has become the executing agency of the Japanese Grant for Projects for construction of facilities, purchase of equipment, etc.

**1. Grant Procedures**

The Grant is supplied through following procedures :

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

**2. Preparatory Survey****(1) Contents of the Survey**

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

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of 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 project. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant scheme.

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

#### (2) Selection of Consultants

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

#### (3) Result of the Survey

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

### **3. Japanese Grant Scheme**

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

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be 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, in accordance with the E/N, to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

#### (2) Selection of Consultants

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

#### (3) Eligible source country

Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. The Grant may be used for the purchase of the products or services of a third country, if necessary, taking into account the quality, competitiveness and economic rationality of products and services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals", in principle.



(4) Necessity of "Verification"

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

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

In the implementation of the Grant Project, the recipient country is required to undertake such necessary measures as Annex. The Japanese Government requests the Government of the recipient country to exempt all customs duties, internal taxes and other fiscal levies such as VAT, commercial tax, income tax, corporate tax, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract, since the Grant fund comes from the Japanese taxpayers.

(6) "Proper Use"

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

(7) "Export and Re-export"

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

(8) Banking Arrangements (B/A)

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

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

(9) Authorization to Pay (A/P)

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

(10) Environmental and Social Considerations

The Government of the recipient country must carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the recipient country and JICA Guidelines for Environmental and Social Consideration (April, 2010).

(11) Monitoring

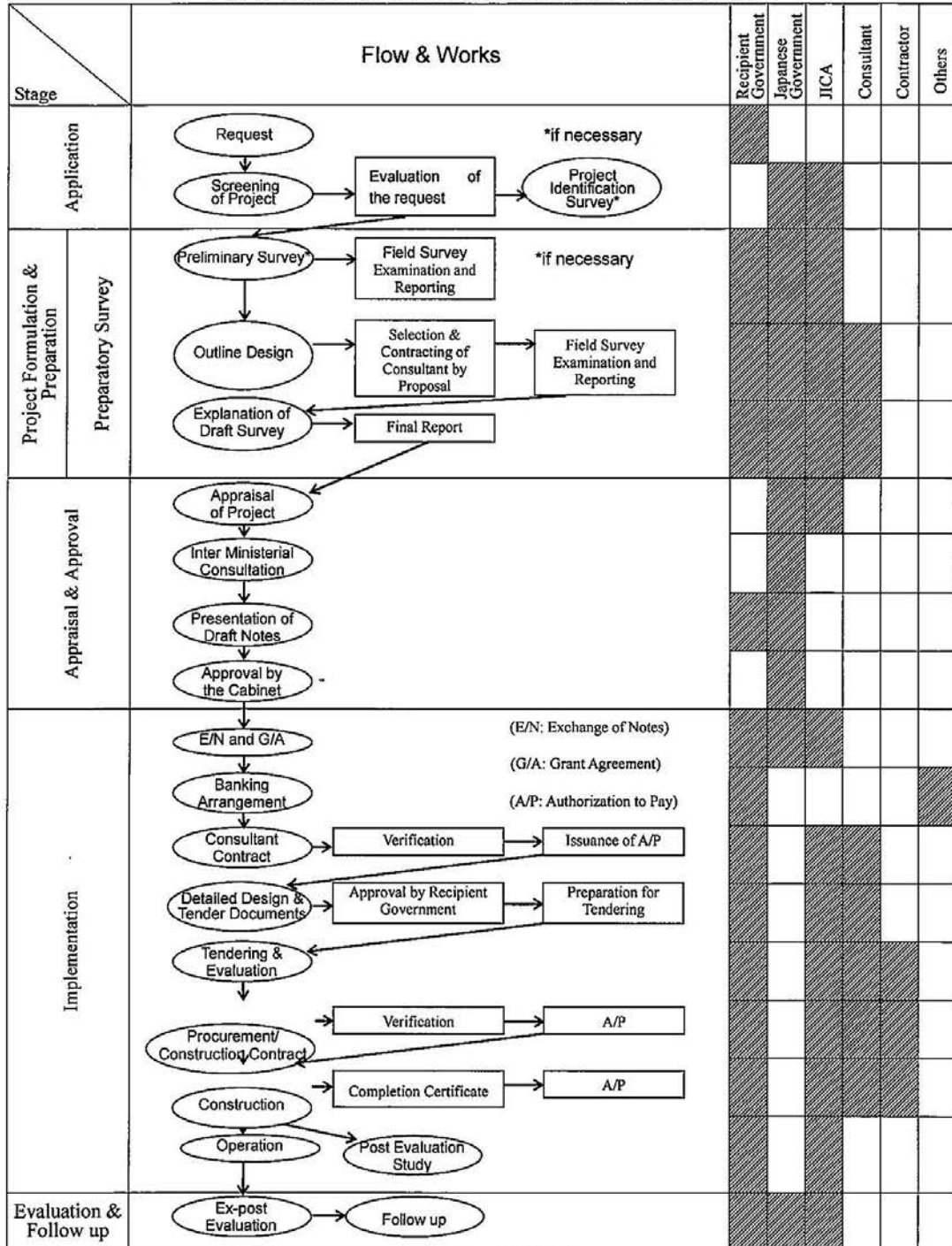
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The Government of the recipient country must take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and must regularly report to JICA about its status by using the Project Monitoring Report (PMR).

(12) Safety Measures

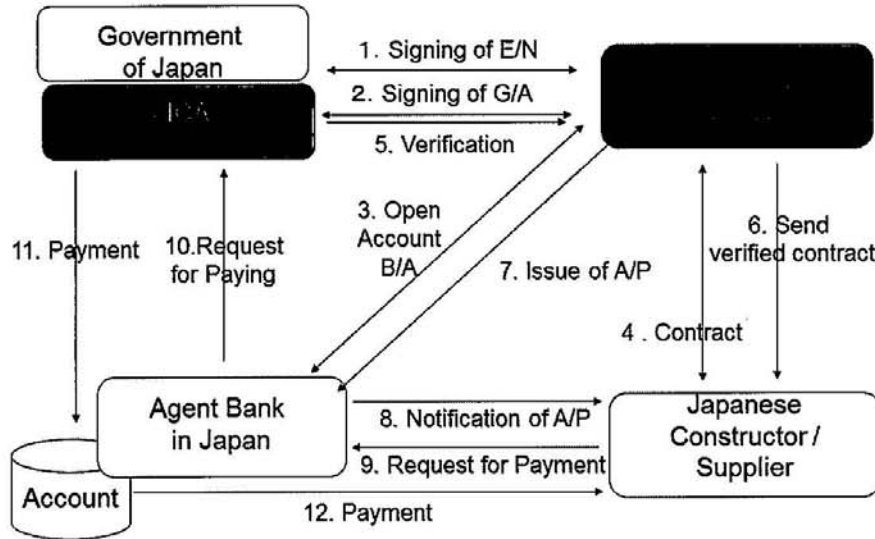
The Government of the recipient country must ensure that the safety is highly observed during the implementation of the Project.

FLOW CHART OF JAPAN'S GRAND AND PROCEDURES



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### Financial Flow of Grant Aid



## Annex 6

## Major Undertakings to be taken by Recipient Government

## 1) Before the Tender

NO	Items	Deadline	In charge	Cost	Ref.
1	To open Bank Account (Banking Arrangement (B/A))	within 1 month after G/A	ERD		
2	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.	before notice of of the Tender	DOM		
3	To obtain necessary permissions from the Puttalam Urban Council for the construction of the Radar Tower in the DOM Puttalam Observatory (Radar Observation Station)	before notice of the Tender	DOM		
4	To obtain necessary permissions from the Pottuvil Divisional Council for the construction of the Radar Tower in the DOM Pottuvil Observatory (Radar Observation Station)	before notice of the Tender	DOM		
5	To obtain the Coast Conservation Clearance from the Coast Conservation Department for the construction of the Radar Tower in the DOM Pottuvil Observatory (Radar Observation Station)	before notice of the Tender	DOM		
6	To submit the required application to the Ceylon Electricity Board (CEB) for Commercial Power Supply and Step-down Transformer Installation for the Radar Tower Buildings to be constructed in the DOM Puttalam and Pottuvil Observatories (Radar Observation Stations)	before notice of the Tender	DOM		

## 2) During the Project

NO	Items	Deadline	In charge	Cost	Ref.
1	To bear the following commissions to a bank of Japan for the banking services based upon the B/A				
	1) Requesting budget for the Project	at the initial occasion to request a budget for the Project	DOM		
	2) Advising commission of A/P	within 1 month after the budget of the Project gets authorized by the national congress	ERD, DOM		
	3) Payment commission for A/P	every payment	ERD, DOM		
2	To ensure prompt unloading, customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation in the country of the Recipient of the products				
	1) Marine (air) transportation of the Products from Japan to Sri Lanka	during the Project	Contractor		
	2) Tax exemption and customs clearance of the products at the port of disembarkation	during the Project	DOM		
	3) Internal transportation from the port of disembarkation to the project site	during the Project	Contractor		
3	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work	during the Project	DOM		
4	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the Products and/or the Services be borne by its designated authority without using	during the Project	DOM		

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	the Grant. Such customs duties, internal taxes and other fiscal levies mentioned above include VAT, commercial tax, income tax and corporate tax of Japanese nationals, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract.				
5	To bear all the expenses, other than those to be borne by the Japanese Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment	during the Project	DOM		
6	Provision of temporary facilities for the availability or accessibility of electricity, water, etc. for the construction work	Prior to commencement of the radar tower building construction	DOM		
7	To provide facilities for distribution of electricity, water supply, drainage and other incidental facilities necessary for the implementation of the Project outside the site(s)				
	1) Electricity	before completion of the radar tower building construction			
	The Distribution line to the site		DOM		
	2) Water Supply		DOM		
	The city water distribution main to the site		DOM		
	3) Drainage		DOM		
	The city drainage main (for storm, sewer and others) to the site				
	4) Internet access		DOM		
	High-speed Internet access to the site		DOM		
	5) Furniture and Equipment		DOM		
	General Furniture				

### 3) After the Project

NO	Items	Deadline	In charge	Cost	Ref.
1.	To maintain and use properly and effectively the facilities constructed and equipment provided under the Japanese Grant	after completion of the Project			
	1) Allocation of maintenance cost		DOM		
	2) Operation and maintenance structure		DOM		
	3) Routine check/Periodic inspection		DOM		
	4) Others		DOM		

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

(Note) Progress of the specific obligations of the Recipient may be confirmed and updated from time to time with written agreement between JICA and the Recipient in the form other than the amendment of the G/A.

<p><b><u>Project Monitoring Report</u></b>  <b>on</b>  <b><u>Project for the Establishment of a Doppler Weather Radar Network</u></b>  <b>Grant Agreement No. <u>XXXXXXXX</u></b>  <b>20XX, Month</b></p>
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## Organization Information

<b>Authority (Signer of the G/A)</b>	Person in Charge _____ Contacts _____ <u>Address:</u> _____ <u>Phone/FAX:</u> _____ <u>Email:</u> _____
<b>Executing Agency</b>	Person in Charge _____ Contacts _____ <u>Address:</u> _____ <u>Phone/FAX:</u> _____ <u>Email:</u> _____
<b>Line Agency</b>	Person in Charge _____ Contacts _____ <u>Address:</u> _____ <u>Phone/FAX:</u> _____ <u>Email:</u> _____

## Outline of Grant Agreement:

<b>Source of Finance</b>	Government of Japan: Not exceeding JPY _____ Government of Sri Lanka: _____
<b>Project Title</b>	
<b>E/N</b>	Signed date: _____ Duration: _____
<b>G/A</b>	Signed date: _____ Duration: _____



## 1: Project Description

### 1-1 Project Objective

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### 1-2 Necessity and Priority of the Project

- Consistency with development policy, sector plan, national/regional development plans and demand of target group and the recipient country.

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### 1-3 Effectiveness and the indicators

- Effectiveness by the project

Quantitative Effect (Operation and Effect indicators)		
Indicators	Original (Yr 2016)	Target (Yr 2021)
Qualitative Effect		



**2: Project Implementation**

**2-1 Project Scope**

Table 2-1-1a: Comparison of Original and Actual Location

<b>Location</b>	<b>Original: (M/D)</b>	<b>Actual: (PMR)</b>
	<b>Attachment(s):Map</b>	<b>Attachment(s):Map</b>

Table 2-1-1b: Comparison of Original and Actual Scope

<b>Items</b>	<b>Original</b>	<b>Actual</b>

**2-1-2 Reason(s) for the modification if there have been any.**

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**2-2 Implementation Schedule**

**2-2-1 Implementation Schedule**

Table 2-2-1: Comparison of Original and Actual Schedule

Items	Original		Actual
	DOD	G/A	
Cabinet Approval		-	-
E/N			
G/A			
Approval of consultant contract			
Early Mobilization of consultant			
Detailed Design			
Budget Request for FY2016			
Tender Process of contractor and supplier			
Approval of contractor and supplier contract			
Budget Appropriation and Issuance of A/P			
Construction Period			
Shipment			
Custom Clearance			
Installation and acceptance Check			
Soft component			
Project Completion Date			
Defect Liability Period			

\*Project Completion was defined as Completion of Soft component at the time of G/A.

**2-2-2 Reasons for any changes of the schedule, and their effects on the project.**

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**2-3 Undertakings by each Government**

**2-3-1 Major Undertakings**

See Attachment 2.

**2-3-2 Activities**

See Attachment 3.

**2-3-3 Report on RD**

See Attachment 4.

2-4 Project Cost  
 2-4-1 Project Cost

Table 2-4-1a Comparison of Original and Actual Cost by the Government of Japan  
 (Confidential until the Tender)

Items	Cost (Million Yen)			
	Original	Actual	Original	Actual
Construction of Facilities				
Equipment				
Soft Component				
Consulting Services				
Contingency				
Total				

Note: 1) Date of estimation:  
 2) Exchange rate: 1 US Dollar =\*\*Yen

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Table 2-4-1b Comparison of Original and Actual Cost by the Government of \*\*

Items			Cost (Thousand MMK)	
	Original	Actual	Original	Actual
				Please state not only the most updated schedule

Note: 1) Date of estimation:

2) Exchange rate: 1 US Dollar =(local currency)

**2-4-2** Reason(s) for the wide gap between the original and actual, if there have been any, the remedies you have taken, and their results.

2-5 Organizations for Implementation

2-5-1 Executing Agency:

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original: (M/D)
Actual, if changed: (PMR)

2-6 Environmental and Social Impacts

- The environmental monitoring is not required in the Project as this project was categorized as category C in accordance with the GUIDELINES FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS of JICA as of April 2010.

**3: Operation and Maintenance (O&M)**

3-1 O&M and Management

- Organization chart of O&M
- Operational and maintenance system (structure and the number, qualification and skill of staff or other conditions necessary to maintain the outputs and benefits of the project soundly, such as manuals, facilities and equipment for maintenance, and spare part stocks etc)

Original: (M/D)
Actual: (PMR)

3-2 O&M Cost and Budget

- The actual annual O&M cost for the duration of the project up to today, as well as the annual O&M budget.

Original: (M/D)
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Actual: (PMR)
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#### 4: Precautions (Risk Management)

- Risks and issues, if any, which may affect the project implementation, outcome, sustainability and planned countermeasures to be adapted are below.

Original Issues and Countermeasure(s): (M/D)	
Potential Project Risks	Assessment
1. Delay of budget appropriation	Probability: H/M/L
	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
2.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
3.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
Actual issues and Countermeasure(s)	
(PMR)	

[Empty box]

**5: Evaluation at Project Completion and Monitoring Plan**

**5-1 Overall evaluation**

Please describe your overall evaluation on the project.

[Empty box]

**5-2 Lessons Learnt and Recommendations**

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

[Empty box]

**5-3 Monitoring Plan for the Indicators for Post-Evaluation**

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

[Empty box]

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Attachment

1. Project Location Map
2. Undertakings to be taken by each Government
3. Monthly Report
4. Report on RD
5. Yearly disbursement plan
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)  
(Final Report Only)

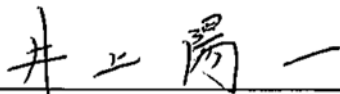


**Minutes of Discussions**  
**on the Preparatory Survey for the Project for**  
**the Project for the Establishment of a Doppler Weather Radar Network**  
**(Explanation on Draft Preparatory Survey Report)**

With reference to the minutes of discussions signed between Ministry of Disaster Management and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on 2<sup>nd</sup> March 2016 and in response to the request from the Government of the Democratic Socialist Republic of Sri Lanka (hereinafter referred to as "Sri Lanka") dated 25<sup>th</sup> June 2014, JICA dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") for the explanation of Draft Preparatory Survey Report (hereinafter referred to as "the Draft Report") for the Project for the Establishment of a Doppler Weather Radar Network (hereinafter referred to as "the Project"), headed by Mr. Yoichi Inoue, Acting Director of Disaster Risk Reduction Team 1, Global Environment Department from 14<sup>th</sup> September to 27<sup>th</sup> September 2016.

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

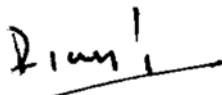
Colombo, 22<sup>nd</sup> September, 2016



**Mr. Yoichi Inoue**  
**Team Leader**  
**Preparatory Survey Team**  
**Japan International Cooperation Agency**  
**Japan**



**Mr. S. S. Miyanawala**  
**Secretary**  
**Ministry of Disaster Management**  
**The Democratic Socialist Republic of**  
**Sri Lanka**



**Mr. R. M. P. Rathnayake**  
**Director General**  
**Department of External Resources,**  
**Ministry of National Policies and Economic**  
**Affairs, The Democratic Socialist Republic of**  
**Sri Lanka**



**Mr. Lalith Chandrapala**  
**Director General**  
**Department of Meteorology (DOM)**  
**Ministry of Disaster Management**  
**The Democratic Socialist Republic of**  
**Sri Lanka**

## ATTACHEMENT

1. Contents of the Draft Report  
After the explanation of the contents of the Draft Report by the Team, the Sri Lankan side agreed to its contents.
  
2. Cost estimate  
Both sides confirmed that the cost estimate including the contingency described in Annex-1 is provisional and will be examined further by the Government of Japan for its approval. The contingency would cover the additional cost against natural disaster, unexpected natural conditions, etc.
  
3. Confidentiality of the cost estimate and technical specifications  
Both sides confirmed that the cost estimate in Annex-1 and technical specifications in the Draft Report should never be duplicated or disclosed to any third parties until all the contracts under the Project are concluded.
  
4. Japanese Grant Aid Scheme  
The Sri Lankan side understands the Japanese Grant Aid Scheme and its procedures as described in Annex 2, Annex 3 and Annex 4, and necessary measures to be taken by the Government of Sri Lanka.
  
5. Timeline for the project implementation  
The Team explained to the Sri Lankan side that the expected timeline for the project implementation is as attached in Annex 5.
  
6. Expected outcomes and indicators  
Both sides agreed that key indicators for expected outcomes are as follows. The Sri Lankan side will be responsible for the achievement of agreed key indicators targeted in year 2023 and shall monitor the progress based on those indicators.

Table: Quantitative indicators

Indicator	Present (Baseline in 2016)	Target (2023)
Enhancement of Severe Weather Monitoring Capability	Limited capability for remote monitoring precipitation intensity and wind direction & velocity.	<ul style="list-style-type: none"> <li>■ Observation of upper wind direction &amp; speed in the rainfall area: within a 150km radius.</li> <li>■ Precipitation intensity 1mm/h or more in the radar detection range: 300km radius.</li> </ul>
	Spatial resolution and observation intervals of precipitation data of the	Spatial resolution and observation intervals of precipitation data in the

	existing automatic weather observation systems (38) in Sri Lanka: approximately 41km mesh (square root of 65,610km <sup>2</sup> /38 AWSs) at 10 minute observation intervals.	radar detection range: 1 km mesh at 10 minute observation intervals within a 300km radius.
	Receiving intervals of satellite images showing tropical depression and cyclone location and track: 30/60 minute intervals.	Observation intervals of rainfall intensity, location, track, wind velocity of tropical depression and cyclone in the radar detection range: 10 minute observation intervals.
Improvement of Dissemination Capability for Weather Information	Provision of heavy rain information/advisory/warning indicating the Province(s)/District(s) only with the existing observatory(s) has/have received rainfall of over 50mm within the last 6 hours and 100 mm within the last 12 hours to the government agencies concerned with disaster management and mass media.	Provision of heavy rain information/advisory/warning indicating the area(s) identified by the radar observation data which has/have received rainfall of over 50mm within the last 6 hours and 100 mm within the last 12 hours to the government agencies concerned with disaster management and mass media.

Table: Qualitative indicators

Indicator	Present (Baseline in 2016)	Target (2023)
Enhancement of Heavy Rain Monitoring Capability	Limited activity of rain cloud movement monitoring.	Implementation of rain cloud movement monitoring by the radar systems.
Enhancement of capability for weather observation around the major International Airports	Provision of manually observed information to the airport operators on weather conditions such as cumulonimbus, etc. which have a negative impact to aircraft operations in the area surrounding the major International Airports at Colombo and Mattala	Information provision to the airport operators on weather conditions such as cumulonimbus, etc. detected by the radar systems to aircraft operations in the area surrounding the major International Airports at Colombo and Mattala.
Improvement of Dissemination Capability for Weather Information	Provision of still pictures of satellite for TV broadcasting.	Provision of radar animation images of the entire area of Sri Lanka for TV broadcasting.
	Provision of rainfall data (still pictures) of the major cities through the DOM Web site to the public, the government agencies concerned with disaster management and mass media.	Provision of radar animation images (rainfall) of the entire area of Sri Lanka through the DOM Web site to the public, the government agencies concerned with disaster management and mass media.
	Provision of rain cloud of severe weather, tropical depression & cyclone information indicating locations and past tracks to the government agencies concerned with disaster management and mass	Improvement of quality and provision frequency of DOM's information by hourly provision of forecast & warning on the cloud of severe weather and tropical depressions & cyclones located

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	media.	within the radar detection range indicating intensity, location and tracks (past and current) to agencies concerned with disaster management, especially to the directly affected local government units, and also to International Organizations, the Red Cross, NGOs and mass media.
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7. Technical assistance (“Soft Component” of the Project)

Considering the sustainable operation and maintenance of the products and services granted through the Project, following technical assistance is planned under the Project. The Sri Lankan side confirmed to deploy necessary number of counterparts who are appropriate and competent in terms of its purpose of the technical assistance as described in the Draft Report.

8. Undertakings of the Project

Both sides confirmed the undertakings of the Project as described in Annex 6.

With reference to Annex 2 and Annex 3, both sides confirmed that indirect taxes and levies related to the Project implementation as well as direct taxes levied on corporations and individuals involved in the Project implementation will be borne by Department of Meteorology (hereinafter referred to as “DOM”).

The Sri Lankan side assured to take the necessary measures and coordination including allocation of the necessary budget which are preconditions of implementation of the Project. It is further agreed that the costs are indicative, i.e. at Outline Design level.

Both sides also confirmed that the Annex 6 will be used as an attachment of G/A.

The Sri Lankan side promised to secure necessary budget as described in Annex 7 (Disbursement Schedule).

9. Monitoring during the implementation

The Project will be monitored by the DOM and reported to JICA by using the form of Project Monitoring Report (PMR) attached as Annex 8. The timing of submission of the PMR is every six months and described in Annex 6.

10. Project completion

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Both sides confirmed that the project completes when all the facilities constructed and equipment procured by the grant are in operation. The completion of the project will be reported to JICA promptly, but in any event not later than six months after completion of the Project.

11. Ex-Post Evaluation

JICA will conduct ex-post evaluation after three (3) years from the project completion, in principle, with respect to five evaluation criteria (Relevance, Effectiveness, Efficiency, Impact, Sustainability). The result of the evaluation will be publicized. The Sri Lankan side is required to provide necessary support for the data collection.

12. Schedule of the Study

JICA will finalize the Preparatory Survey Report based on the confirmed items. The report will be sent to the Sri Lankan side around the middle of November 2016.

13. Environmental and Social Considerations

The Team explained that 'JICA Guidelines for Environmental and Social Considerations (April 2010)' (hereinafter referred to as "the Guidelines") is applicable for the Project. The Project is categorized as C because the Project is likely to have minimal adverse impact on the environment under the Guidelines.

14. Other Relevant Issues

14-1. Disclosure of Information

Both sides confirmed that the Preparatory Survey Report which project cost is excluded will be disclosed to the public after completion of the Preparatory Survey. The comprehensive report including the project cost will be disclosed to the public after all the contracts under the Project are concluded.

14-2. Permission of the frequency

DOM explained that permission of frequency of proposed C band is still under consideration of Telecommunication Regulatory Board (TRC) and DOM is requested to submit further information to TRC. DOM also explained that DOM confirmed permission of the frequency basically with TRC and will soon get the approval letter from TRC.

DOM promised to send permission letter on allocation of the frequency from TRC by the end of December 2016 to JICA Sri Lanka Office.

The Japanese side explained that permission of the frequency is pre-condition of

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the Project and the delay of the submission of the approval letter will lead to the delay of the Project.

### 14-3. EIA procedure

DOM explained that Environmental Impact report was submitted to Central Environmental Authority.

DOM promised to send approval letter from Central Environmental Authority by the end of October 2016 to JICA Sri Lanka Office.

The Japanese side explained the delay of the submission of the approval letter will lead to the delay of the Project.

### 14-4. Necessary budget and number of staff for Operation and Maintenance

The Team explained the necessary budget and number of staff for operation and maintenance of the Project after the completion as follows

DOM promised to allocate necessary budget and staff for proper operation and maintenance.

Table: Recurrent Cost of Puttalam Meteorological Radar Observation

Estimated Recurrent Cost														
	Equipment	Item	Q'ty	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Remarks
1	Antenna	Grease (16kgs/can, For AZ/EL)	1	0	0	0	0	28,300	0	0	0	0	36,100	Every 5 years
		Timing belt (For AZ/EL)	2	0	0	0	0	0	0	0	26,200	0	0	0
2	Antenna controller	AC fan	3	0	0	0	0	0	0	0	0	0	70,400	Every 10 years
		Transmitter	36	0	0	0	0	0	0	0	0	0	845,100	Every 10 years
4	Receiver	AC fan	3	0	0	0	0	0	0	0	0	0	70,400	Every 10 years
		Product Monitor	12	2,500	2,600	2,800	2,900	3,100	3,200	3,400	3,500	3,700	3,900	
6	Printer	Printer ink cartridge	2	8,100	8,600	9,000	9,400	9,900	10,400	10,900	11,500	12,000	12,600	
		Paper(500sheets/set)	4	1,900	2,000	2,100	2,200	2,300	2,400	2,500	2,600	2,800	2,900	
7	Power Supply Capacitor	AC fan	3	0	0	0	0	0	0	0	0	0	70,400	Every 10 years
		Arrester	5	0	0	0	0	0	0	0	0	0	135,400	Every 10 years
8	Diesel Engine Generator	Oil seal	2	0	4,600	4,900	5,100	5,400	5,600	5,900	6,200	6,500	6,900	Every 1 year
		Filter	2	0	0	18,000	0	19,800	0	21,800	0	24,100	0	Every 2 years
		Battery for Engine start	2	0	0	0	0	0	23,800	0	0	0	28,900	Every 5 years
Sub total (LKR)				12,500	17,800	36,800	19,600	68,800	45,400	44,500	50,000	49,100	1,283,000	

Others														
	Cost Item	Details	Q'ty	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Remarks
1	Electricity Charge		1	3,170,300	3,328,800	3,495,300	3,670,000	3,853,500	4,046,200	4,248,500	4,460,900	4,684,000	4,918,200	*1
2	Fuel cost	Fuel consumption of DEG	1	101,300	123,800	130,000	136,500	143,300	150,400	158,000	165,900	174,200	182,900	*2
3	Water supply charge		1	4,000	4,200	4,400	4,600	4,900	5,100	5,400	5,600	5,900	6,200	*3
4	Special maintenance	System brush-up by the manufacture's engineer	1	0	0	1,155,000	0	0	1,337,000	0	0	1,547,800	0	For 5 days at site
5	Remote maintenance	Remote maintenance by the manufacture's engineer through the Internet	1	232,800	244,400	256,700	269,500	283,000	297,100	312,000	327,600	344,000	361,100	
6	Radome	Caulking repair	1	25,600	26,900	28,200	29,600	31,100	32,700	34,300	36,000	37,800	39,700	
7	Pest-control	Exterminating vermination	1	23,000	24,200	25,400	26,700	28,000	29,400	30,900	32,400	34,100	35,800	
Sub total (LKR)				3,557,000	3,752,300	5,095,000	4,136,900	4,343,800	5,897,900	4,789,100	5,028,400	6,827,800	5,543,900	
Total (LKR)				3,569,500	3,770,100	5,131,800	4,156,500	4,412,600	5,943,300	4,833,600	5,078,400	6,876,900	5,543,900	
Total (JPY)				¥3,066,581	¥3,238,918	¥4,408,763	¥3,570,876	¥3,790,893	¥5,105,928	¥4,152,577	¥4,362,887	¥5,907,990	¥4,865,034	

#### Estimate of annual electricity charge

Annual power consumption	(kWh)	213,080
Annual power consumption by commercial power (98%)	(kWh)	208,818
Annual power consumption by DEG (2%)	(kWh)	4,262
Annual fuel consumption	(Liter)	1,066

Fuel consumption of DEG = 0.25 Liter/kWh

*1 Annual electricity charge of commercial power	(LKR)	3,170,302
*2 Annual fuel cost of DEG	(LKR)	101,270

Electricity charge = 14.55 LKR/kWh  
Fuel cost = 95.00 LKR/Liter

*3 Annual water supply charge	(LKR)	0
*4 Inflation: 5%/year considered		

Exchange rate = 1.164 LKR/JPY

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Table: Recurrent Cost of Pottuvil Meteorological Radar Observation

Estimated Recurrent Cr															
Equipment	Item	Q'ty	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Remarks		
1	Antenna	Grease (16kgs/can, For AZ/EL)	1	0	0	0	0	28,300	0	0	0	0	36,100	Every 5 years	
		Timing belt (For AZ/EL)	2	0	0	0	0	0	0	26,200	0	0	0	Every 5 years	
2	Antenna controller	AC fan	3	0	0	0	0	0	0	0	0	0	70,400	Every 10 years	
3	Transmitter	AC fan	36	0	0	0	0	0	0	0	0	0	845,100	Every 10 years	
4	Receiver	AC fan	3	0	0	0	0	0	0	0	0	0	70,400	Every 10 years	
5	Product Monitor	Blu-ray disk for data storage	12	2,500	2,600	2,800	2,900	3,100	3,200	3,400	3,500	3,700	3,900		
6	Printer	Printer ink cartridge	2	8,100	8,600	9,000	9,400	9,900	10,400	10,900	11,500	12,000	12,600		
		Paper(500sheets/1set)	4	1,900	2,000	2,100	2,200	2,300	2,400	2,500	2,600	2,800	2,900		
7	Power Supply Capacitor	AC fan	3	0	0	0	0	0	0	0	0	0	0	70,400	Every 10 years
		Arrester	5	0	0	0	0	0	0	0	0	0	0	0	135,400
8	Diesel Engine Generator	Oil seal	2	0	4,600	4,900	5,100	5,400	5,600	5,900	6,200	6,500	6,900	Every 1 year	
		Filter	2	0	0	18,000	0	19,800	0	21,800	0	24,100	0	28,900	Every 2 years
		Battery for Engine start	2	0	0	0	0	0	23,800	0	0	0	28,900	Every 5 years	
Sub total (LKR)				12,500	17,800	36,800	39,600	68,800	45,400	44,500	50,000	49,100	1,283,000		

Others														
Cost Item	Details	Q'ty	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Remarks	
1	Electricity Charge		3,170,300	3,328,800	3,495,300	3,670,000	3,853,500	4,046,200	4,248,500	4,460,900	4,684,000	4,918,200	*1	
2	Fuel cost	Fuel consumption of DEG	1	101,200	123,800	130,000	136,500	143,300	150,400	158,000	165,900	174,200	182,900	*2
3	Water supply charge		1	4,000	4,200	4,400	4,600	4,900	5,100	5,400	5,900	6,200	*3	
4	Special maintenance	System brush-up by the manufacture's engineer	1	0	0	1,155,000	0	0	1,337,000	0	0	1,547,800	0	For 5 days at site
5	Remote maintenance	Remote maintenance by the manufacture's engineer through the Internet	1	232,800	244,400	256,700	269,500	283,000	297,100	312,000	327,600	344,000	361,100	
6	Radone	Caulking repair	1	25,600	26,900	28,200	29,600	31,100	32,700	34,300	36,000	37,800	39,700	
7	Pest-control	Exterminating vermination	1	23,000	24,200	25,400	26,700	28,000	29,400	30,900	32,400	34,100	35,800	
Sub total (LKR)				3,557,000	3,752,300	5,095,000	4,136,900	4,343,800	5,897,900	4,789,100	5,028,400	6,876,900	5,543,900	
Total (LKR)				3,569,500	3,770,100	5,131,800	4,156,500	4,412,600	5,943,300	4,833,600	5,078,400	6,876,900	6,826,900	
Total (JPY)				¥3,066,581	¥3,238,918	¥4,408,763	¥3,570,876	¥3,790,893	¥5,105,928	¥4,152,577	¥4,362,887	¥5,997,990	¥5,865,034	

Estimate of annual electricity charge

Annual power consumption	(kWh)	213,080
Annual power consumption by commercial power (98%)	(kWh)	208,818
Annual power consumption by DEG (2%)	(kWh)	4,262
Annual fuel consumption	(Liter)	1,066

Fuel consumption of DEG = 0.25 Liter/kWh

\*1 Annual electricity charge of commercial power

(LKR) 3,170,302

Electricity charge = 14.55 LKR/kWh

\*2 Annual fuel cost of DEG

(LKR) 101,270

Fuel cost = 95.00 LKR/Liter

\*3 Annual water supply charge

(LKR) 0

Exchange rate = 1.164 LKR/JPY

\*4 Inflation: 5%/year considered

Table: Recurrent Cost of the DOM Head Office and the DOM Aviation Meteorological Offices in the Colombo International Airport and the Mattala Rajapaksa International Airport

Estimated Recurrent Cost														
Equipment	Item	Q'ty	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Remarks	
Storm Warning Centre (SWC)														
1	Product Monitor	Blu-ray disk for data storage	24	5,800	5,300	5,500	5,800	6,100	6,400	6,700	7,100	7,400	7,800	
2	Printer	Printer ink cartridge	4	16,300	17,100	18,000	18,900	19,800	20,800	21,800	22,900	24,100	25,300	
		Paper(500sheets/1set)	10	5,200	5,500	5,800	6,100	6,400	6,700	7,000	7,400	7,700	8,100	
3	Compact UPS	Battery	12	0	0	137,100	0	0	158,700	0	0	183,700	0	Every 3 years
4	St-V-A UPS	Battery	1	0	0	192,500	0	0	222,800	0	0	258,000	0	Every 3 years
DOM Meteorological Office in the Colombo International Airport and Mattala Rajapaksa International Airport														
1	Compact UPS	Battery	2	0	0	22,800	0	0	26,400	0	0	30,600	0	Every 3 years
Sub total (LKR)				26,500	27,900	381,200	30,800	32,300	441,800	35,500	37,400	511,500	41,200	
Total (LKR)				14,357,600	15,075,500	15,829,300	16,620,600	17,451,700	18,324,400	19,240,700	20,202,700	21,212,700	22,273,400	
Total (JPY)				¥12,357,474	¥12,975,430	¥13,926,976	¥14,305,326	¥15,020,619	¥16,122,165	¥16,560,309	¥17,388,402	¥18,663,402	¥19,170,619	

Estimate of annual electricity charge

Annual power consumption of DOM Head Office (Commercial Power)	(kWh)	21,341	*99% of power consumption
Annual power consumption of DOM Meteorological Office in the Colombo International Airport (Commercial Power)	(kWh)	2,160	
Annual power consumption of DOM Meteorological Office in the Mattala Rajapaksa International Airport (Commercial Power)	(kWh)	2,160	
Total annual power consumption (Commercial Power)	(kWh)	25,661	
Annual power consumption of DOM Head Office (DEG)	(kWh)	216	*1% of power consumption
Annual fuel consumption	(Liter)	54	

Fuel consumption of DEG = 0.25 Liter/kWh

\*1 Annual electricity charge of commercial power

(LKR) 373,368

Electricity charge = 14.55 LKR/kWh

\*2 Annual fuel cost of DEG

(LKR) 5,130

Fuel cost = 95.00 LKR/Liter

\*3 Inflation: 5%/year considered

Exchange rate = 1.164 LKR/JPY

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Position	Puttalam Radar Observation Station	Pottuvil Radar Observation Station
Senior Electronics Technical Officer (Station Leading Officer)	1	1
Electronics Technical Officer	1	1
Electronics Technical Assistant	1	1
Pion	1	1
Security Guard	1	1
Total	5	5

Position	Number of Staff
Quick Response Team Leading Engineer: Chief Electronics Engineer	1
Quick Response Team Deputy Leading Engineer: Electronics Engineer	1
Quick Response Team Member: Senior Electronics Technical Officer	2
Quick Response Team Assistant: Electronics Technical Officer	2

- <Electronics Engineer and Electronics Technical Officer's Operation & Maintenance and Repairing Duty>
- ✓ Electronic Equipment: Transmitter, Digital Receiver and Signal Processor, Dehydrator, Radar Power Maintenance Panel, Radar Operation Software, Power Back-up System and Building Electrical Equipment (Isolation Transformer, Power Distribution Board, Lightings, etc.), Lightning Protection System
  - ✓ Data Communication Equipment: Data Communication Equipment (VSAT In-door & Out-door Units, VSAT Antenna, Dual Router, Optical Repeater, Dual Switch, Terminal (PC), Printer, Peripherals, Data Communication Software
  - ✓ Mechanical Equipment: Radar Antenna, Radar Antenna Pedestal, Radome, Engine Generator, Air-conditioning Unit, Water Pump, Ventilation Duct & Fan, Door & Window, Furniture

Shift	Working Time	Working Hours	Meteorologist	Meteorological Technical Officer	Electronics Technical Officer
Day Shift	08:00-16:00	8	1	1	1
Night Shift	16:00-08:00	16	1	1	1

#### 14-5 Remote maintenance and Special maintenance

The Japanese side recommended that DOM should make contracts with Radar manufacturer for remote maintenance and special maintenance as described in 14-4 for stable operation. The Japanese side also explained that radar should be operated 24/7 basis and remote maintenance and special maintenance will help the 24/7 operation. DOM understood it.

#### 14-6 Sharing of the radar observation images and animation images

DOM agreed to provide radar animation images (rainfall) of the entire area of Sri Lanka on the responsive Web site of DOM with the automatic play function of GIF animations to the Public through technical supports of the Consultant to be recommended by JICA and Information & Communication Technology Agency (ICTA), Sri Lanka.

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DOM also agreed to provide hourly forecast and warning on severe weather and tropical depressions or cyclones located within the radar detection range to the agencies concerned with disaster risk reduction

#### 14-7 Adaptation to Climate change

Due to the increase of rainfall intensity by the impact of Climate change, more frequent and severe rainfall can be expected in Sri Lanka. The project is aiming to improve and strengthen the capacities of short range weather forecasting by the establishment of a Doppler Weather Radar Network, thereby contributing to mitigation of damages by weather-related disasters. From such aspect, the Project is expected to contribute to adaptation to climate change.

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Project Cost Estimation

1. Project Cost to be borne by Japan's Grant Aid

This item is closed due to confidentiality

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## JAPANESE GRANT

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

Based on a JICA law which was entered into effect on October 1, 2008 and the decision of the GOJ, JICA has become the executing agency of the Japanese Grant for Projects for construction of facilities, purchase of equipment, etc.

### 1. Grant Procedures

The Grant is supplied through following procedures :

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

### 2. Preparatory Survey

#### (1) Contents of the Survey

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

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

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- Confirmation of items agreed between 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 project. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant scheme.

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

#### (2) Selection of Consultants

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

#### (3) Result of the Survey

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

### 3. Japanese Grant Scheme

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

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be 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, in accordance with the E/N, to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

#### (2) Selection of Consultants

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

#### (3) Eligible source country

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Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. The Grant may be used for the purchase of the products or services of a third country, if necessary, taking into account the quality, competitiveness and economic rationality of products and services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals", in principle.

(4) Necessity of "Verification"

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

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

In the implementation of the Grant Project, the recipient country is required to undertake such necessary measures as Annex. The Japanese Government requests the Government of the recipient country to exempt all customs duties, internal taxes and other fiscal levies such as VAT, commercial tax, income tax, corporate tax, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract, since the Grant fund comes from the Japanese taxpayers.

(6) "Proper Use"

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

(7) "Export and Re-export"

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

(8) Banking Arrangements (B/A)

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

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designated authority.

(9) Authorization to Pay (A/P)

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

(10) Environmental and Social Considerations

The Government of the recipient country must carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the recipient country and JICA Guidelines for Environmental and Social Consideration (April, 2010) .

(11) Monitoring

The Government of the recipient country must take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and must regularly report to JICA about its status by using the Project Monitoring Report (PMR).

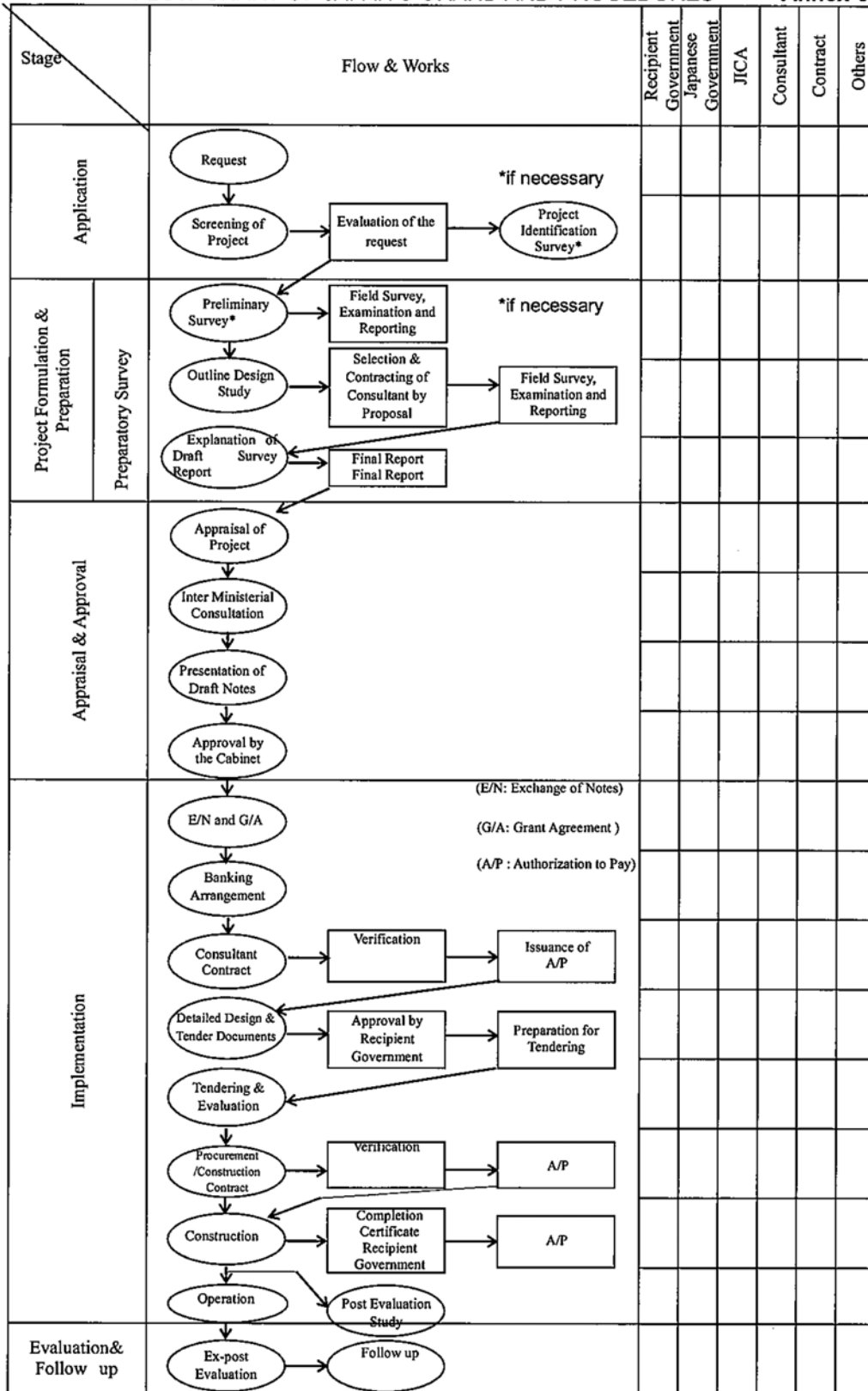
(12) Safety Measures

The Government of the recipient country must ensure that the safety is highly observed during the implementation of the Project.

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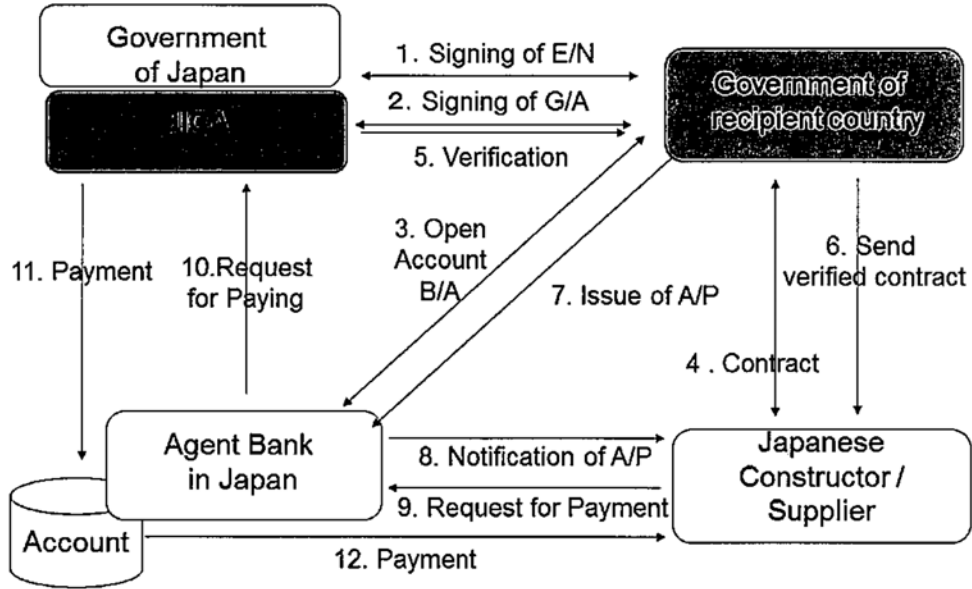
FLOW CHART OF JAPAN'S GRAND AND PROCEDURES

Annex-3



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Financial Flow of Grant Aid



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# Annex 5

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			
<b>Puttalam Radar Observation Station</b>																																		
Construction Work	Total : 18.0 months																																	
Temporary/Piling/Earth Works																																		
Structure Work																																		
Finishing Work																																		
Building Equipment																																		
Equipment Work	Total : 17.0 months																																	
Equipment Manufacturing																																		
Equipment Transportation																																		
Equipment Installation/Adjustment																																		
<b>National Meteorological Centre (NMC) at DOM Head Office</b>																																		
Equipment Work	Total : 15.0 months																																	
Equipment Manufacturing																																		
Equipment Transportation																																		
Equipment Installation/Adjustment																																		
<b>DOM Aviation Meteorological Office in the Colombo International Airport</b>																																		
Equipment Work	Total : 15.0 months																																	
Equipment Manufacturing																																		
Equipment Transportation																																		
Equipment Installation/Adjustment																																		
<b>DOM Aviation Meteorological Office in the Mattala Rajapaksa International Airport</b>																																		
Equipment Work	Total : 15.0 months																																	
Equipment Manufacturing																																		
Equipment Transportation																																		
Equipment Installation/Adjustment																																		
<b>Pottuvil Radar Observation Station</b>																																		
Construction Work	Total : 17.5 months																																	
Temporary/Piling/Earth Works																																		
Structure Work																																		
Finishing Work																																		
Building Equipment																																		
Equipment Work	Total : 17.0 months																																	
Equipment Manufacturing																																		
Equipment Transportation																																		
Equipment Installation/Adjustment																																		
<b>Soft Component</b>																																		
Soft Component (Activity No. 1)																																		
Soft Component (Activity No. 2)																																		
Soft Component (Activity No. 3)																																		
Soft Component (Activity No. 4)																																		
Soft Component (Activity No. 5)																																		

or Yes Less

## Annex 6

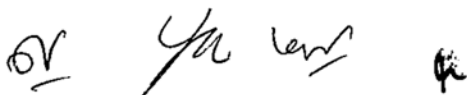
### Major Undertakings to be taken by Recipient Government

#### 1) Before the Tender

NO	Items	Deadline	In charge	Cost (Rupee)	Ref.
1	To open Bank Account (Banking Arrangement (B/A))	within 1 month after G/A	ERD		
2	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.	before notice of the Tender	DOM		
3	To obtain necessary permissions from the Puttalam Urban Council for the construction of the Radar Tower in the DOM Puttalam Observatory (Radar Observation Station)	before notice of the Tender	DOM		
4	To obtain necessary permissions from the Pottuvil Divisional Council for the construction of the Radar Tower in the DOM Pottuvil Observatory (Radar Observation Station)	before notice of the Tender	DOM		
5	To obtain the Coast Conservation Clearance from the Coast Conservation Department for the construction of the Radar Tower in the DOM Pottuvil Observatory (Radar Observation Station)	before notice of the Tender	DOM		
6	To submit the required application to the Ceylon Electricity Board (CEB) for Commercial Power Supply and Step-down Transformer Installation for the Radar Tower Buildings to be constructed in the DOM Puttalam and Pottuvil Observatories (Radar Observation Stations)	before notice of the Tender	DOM		

#### 2) During the Project

NO	Items	Deadline	In charge	Cost (Rupee)	Ref.
1	To obtain approval of Specified Project for Simplified Value Added Tax (VAT)	within 1 month after signing of the contract(s)	DOM	225,000,000	
2	To bear the following commissions to a bank of Japan for the banking services based upon the B/A				
	1) Requesting budget for the Project (Capital Cost to be borne by the DOM)	at the initial occasion to request a budget for the Project	DOM	486,650,000 (in Total)	
	2) Advising commission of the Authorization to Pay (A/P)	within 1 month after the budget of the Project gets authorized	ERD, DOM		
	3) Payment commission for A/P	every payment	ERD, DOM	1,550,000	
3	To ensure prompt unloading, customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation in the country of the Recipient of the products				
	1) Marine (air) transportation of the Products from Japan to Sri Lanka	during the Project	Contractor		
	2) Tax exemption and customs clearance of the products at the port of disembarkation (To pay imposed tax (custom duty) and other fiscal levies and all demurrage required at the port of disembarkation for the materials and equipment imported for the Project.)	during the Project	DOM	250,000,000	



	3) Internal transportation from the port of disembarkation to the project site	during the Project	Contractor		
4	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work	during the Project	DOM		
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the Products and/or the Services be borne by its designated authority without using the Grant. Such customs duties, internal taxes and other fiscal levies mentioned above include VAT, commercial tax, income tax and corporate tax of Japanese nationals, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract.	during the Project	DOM		
6	To bear all the expenses, other than those to be borne by the Japanese Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment	during the Project	DOM		
7	To provide temporary facilities for the availability or accessibility of electricity, water, etc. for the construction work	Prior to commencement of the radar tower building construction	DOM		
8	To provide facilities for distribution of electricity, water supply, drainage and other incidental facilities necessary for the implementation of the Project				
	1) Electricity To provide the commercial power (415V, 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 Puttalam and Pottuvil Radar Tower Buildings To install the required step-down transformer as well as service entrance connections for the commercial power supply at the Puttalam and Pottuvil Radar Tower Buildings.		DOM	4,400,000 (2,200,000×2 sites)	
	2) Drainage The city drainage main (for storm, sewer and others) to the site	during the radar tower building construction	DOM		
	3) Data Communication Access To provide reliable and high-speed Internet environment at the DOM Head Office and each project site for establishment of Internet Protocol-Virtual Private Network (IP-VPN).		DOM	200,000 (100,000×2 sites)	
	4) Furniture and Equipment General Furniture		DOM		
	5) Incidental Facilities To provide incidental facilities, such as public water supply, telephone lines, Internet, etc. for Puttalam and Pottuvil Radar Tower Buildings.		DOM	1,400,000 (700,000×2 sites)	
	6) Replacement of 2 existing air-conditioning systems at the National Meteorological Centre at the DOM Head Office.		DOM	600,000	
9	To obtain necessary permissions from the relevant agencies for the construction of the Radar Tower Buildings in the DOM Puttalam and Pottuvil Observatories (Radar Observation Stations).	during the Project	DOM	100,000	

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10	To undertake incidental outdoor works such as gardening, fencing, gates, boundary walls and exterior lightings and to renovate the existing buildings and facilities in the DOM Puttalam and Pottuvil Observatories (Radar Observation Stations).	during the Project	DOM	500,000 (250,000×2 sites)	
11	To shift the existing observation field in the DOM Pottuvil Observatories (Radar Observation Station).	during the Project	DOM	100,000	
12	To make the advance payment for 2 months for the required space segment for the use of satellite communication for the meteorological data satellite communication system (VSAT).	during the Project	DOM	2,000,000	
13	To bear cost of DOM personnel for the Project implementation and soft component such as transportation, accomodation and daily allowance, etc.	during the Project	DOM	800,000	
14	To submit the Project Monitoring Report (PMR)	every 6 months during the Project	DOM		

### 3) After the Project

NO	Items	Deadline	In charge	Cost (Rupee)	Ref.
1.	To maintain and use properly and effectively the facilities constructed and equipment provided under the Japanese Grant	after completion of the Project			
	1) Allocation of maintenance cost		DOM		
	2) Operation and maintenance structure		DOM		
	3) Routine check/Periodic inspection		DOM		
	4) Others		DOM		

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

(Note) Progress of the specific obligations of the Recipient may be confirmed and updated from time to time with written agreement between JICA and the Recipient in the form other than the amendment of the G/A.

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<p><b><u>Project Monitoring Report</u></b>  <b>on</b>  <b><u>Project for the Establishment of a Doppler Weather Radar Network</u></b>  <b>Grant Agreement No. <u>XXXXXXXX</u></b>  <b>20XX, Month</b></p>
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**Organization Information**

<b>Authority (Signer of the G/A)</b>	_____ Person in Charge _____ Contacts _____ <u>Address:</u> _____ <u>Phone/FAX:</u> _____ <u>Email:</u> _____
<b>Executing Agency</b>	_____ Person in Charge _____ Contacts _____ <u>Address:</u> _____ <u>Phone/FAX:</u> _____ <u>Email:</u> _____
<b>Line Agency</b>	_____ Person in Charge _____ Contacts _____ <u>Address:</u> _____ <u>Phone/FAX:</u> _____ <u>Email:</u> _____

**Outline of Grant Agreement:**

<b>Source of Finance</b>	Government of Japan: Not exceeding JPY ; Government of Sri Lanka:
<b>Project Title</b>	
<b>E/N</b>	Signed date: Duration:
<b>G/A</b>	Signed date: Duration:

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## 1: Project Description

### 1-1 Project Objective

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### 1-2 Necessity and Priority of the Project

- Consistency with development policy, sector plan, national/regional development plans and demand of target group and the recipient country.

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### 1-3 Effectiveness and the indicators

- Effectiveness by the project

Quantitative Effect (Operation and Effect indicators)		
Indicators	Original (Yr 2016)	Target (Yr 2021)
Qualitative Effect		

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**2: Project Implementation**

**2-1 Project Scope**

Table 2-1-1a: Comparison of Original and Actual Location

<b>Location</b>	<b>Original:</b> (M/D)	<b>Actual:</b> (PMR)
	<b>Attachment(s):Map</b>	<b>Attachment(s):Map</b>

Table 2-1-1b: Comparison of Original and Actual Scope

<b>Items</b>	<b>Original</b>	<b>Actual</b>

**2-1-2 Reason(s) for the modification if there have been any.**

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**2-2 Implementation Schedule**

**2-2-1 Implementation Schedule**

Table 2-2-1: Comparison of Original and Actual Schedule

Items	Original		Actual
	DOD	G/A	
Cabinet Approval		-	-
E/N			
G/A			
Approval of consultant contract			
Early Mobilization of consultant			
Detailed Design			
Budget Request for FY2016			
Tender Process of contractor and supplier			
Approval of contractor and supplier contract			
Budget Appropriation and Issuance of A/P			
Construction Period			
Shipment			
Custom Clearance			
Installation and acceptance Check			
Soft component			
Project Completion Date			
Defect Liability Period			

\*Project Completion was defined as Completion of Soft component at the time of G/A.

**2-2-2 Reasons for any changes of the schedule, and their effects on the project.**

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**2-3 Undertakings by each Government**

**2-3-1 Major Undertakings**

See Attachment 2.

**2-3-2 Activities**

See Attachment 3.

**2-3-3 Report on RD**

See Attachment 4.

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2-4 Project Cost

2-4-1 Project Cost

Table 2-4-1a Comparison of Original and Actual Cost by the Government of Japan  
(Confidential until the Tender)

Items	Cost (Million Yen)			
	Original	Actual	Original	Actual
Construction of Facilities				
Equipment				
Soft Component				
Consulting Services				
Contingency				
Total				

Note: 1) Date of estimation:

2) Exchange rate: 1 US Dollar =\*\*Yen

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Table 2-4-1b Comparison of Original and Actual Cost by the Government of \*\*

Items			Cost (Thousand MMK)	
	Original	Actual	Original	Actual
				Please state not only the most updated schedule

Note: 1) Date of estimation:

2) Exchange rate: 1 US Dollar =(local currency)

**2-4-2** Reason(s) for the wide gap between the original and actual, if there have been any, the remedies you have taken, and their results.

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**2-5 Organizations for Implementation**

**2-5-1 Executing Agency:**

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

<b>Original:</b> (M/D)
<b>Actual, if changed:</b> (PMR)

**2-6 Environmental and Social Impacts**

- The environmental monitoring is not required in the Project as this project was categorized as category C in accordance with the GUIDELINES FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS of JICA as of April 2010.

**3: Operation and Maintenance (O&M)**

**3-1 O&M and Management**

- Organization chart of O&M
- Operational and maintenance system (structure and the number, qualification and skill of staff or other conditions necessary to maintain the outputs and benefits of the project soundly, such as manuals, facilities and equipment for maintenance, and spare part stocks etc)

<b>Original:</b> (M/D)
<b>Actual:</b> (PMR)

**3-2 O&M Cost and Budget**

- The actual annual O&M cost for the duration of the project up to today, as well as the annual O&M budget.

<b>Original:</b> (M/D)
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Actual: (PMR)
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**4: Precautions (Risk Management)**

- Risks and issues, if any, which may affect the project implementation, outcome, sustainability and planned countermeasures to be adapted are below.

Original Issues and Countermeasure(s): (M/D)	
Potential Project Risks	Assessment
1. Delay of budget appropriation	Probability: H/M/L
	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
2.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
3.	Probability: H/M/L
(Description of Risk)	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
Actual issues and Countermeasure(s)	
(PMR)	

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**5: Evaluation at Project Completion and Monitoring Plan**

**5-1 Overall evaluation**

Please describe your overall evaluation on the project.

**5-2 Lessons Learnt and Recommendations**

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

**5-3 Monitoring Plan for the Indicators for Post-Evaluation**

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

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Attachment

1. Project Location Map
2. Undertakings to be taken by each Government
3. Monthly Report
4. Report on RD
5. Yearly disbursement plan
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)  
(Final Report Only)

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## ソフトコンポーネント計画書

## (1) ソフトコンポーネントを計画する背景

スリランカ民主社会主義共和国（以下「ス」国）では、集中豪雨による洪水や土砂災害などが毎年発生している。2003年5月に発生した集中豪雨では、大規模な洪水や土砂災害により約14万世帯が被災し235名の人命が失われ、GDPの0.3%に相当する約5,600万ドルの被害額が発生した旨が記録されている。2006年においては、38件の洪水・地すべりが発生している。更に2008年と2011年に、それぞれ3度の大規模な河川氾濫や洪水が発生し、過去約20年間（1996年～2015年）で、全人口約2,035万人（2012年）の66%以上の約1,350万人が、気象現象に起因した災害により被災したものと記録されている。そのため集中豪雨に伴う気象災害の軽減は、「ス」国にとって喫緊の課題となっている。

「ス」国の自然災害の9割以上は気象に起因していることから、気象現象は文字通り生死にかかわる問題であり、「ス」国で唯一気象情報を提供しているスリランカ気象局 (Department of Meteorology: DOM) の役割は極めて重要である。災害による被害の軽減という目標達成に対し、DOMが貢献するには、気象観測・予報の精度を上げ、災害の危険性が高まる前に気象状況を把握し、より早い段階で予警報を発出して、的確に国民へ伝達されることが最重要課題である。しかしながら「ス」国には、稼働している気象レーダーシステムが無いことから、悪天候を的確且つ迅速に把握することが困難な状況である。

このため、本プロジェクトは、「ス」国にCバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステム、気象レーダー中央処理システム、気象レーダーデータ表示システム及び気象データ衛星通信システムを投入するとともに、人材育成を実施して、大雨やサイクロンなどの災害を引き起こす気象現象の監視能力を強化させることにより、「ス」国のサイクロン情報や気象予警報の精度が向上され、自然災害による被害の軽減に寄与することを目標とするものである。

海軍基地内にあるDOMのトリンコムアリー (Trincomalee) 既設アナログ気象レーダーシステムが2007年に稼働を停止してから大凡9年が経過し、実際にDOMでは、気象レーダーシステムの運用維持管理の経験を有する技術者は数人となっている。またDOM技術職員は、コンピュータを含むデジタル気象観測機材には習熟しているものの、本プロジェクトで導入予定のデジタル気象レーダーシステムの運用維持管理の経験を有している技術職員がいないことから、導入される気象レーダーシステムの運用維持管理が円滑に開始され且つプロジェクト成果の持続性を最低限確保するため、本プロジェクト実施中において、本計画書に記載したソフトコンポーネントを投入することが、プロジェクト成果の持続性を確保する上においても妥当である。



と判断した。

(2) ソフトコンポーネントの目標

DOM が、独自でCバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムの確実な運用ができるようになること。

(3) ソフトコンポーネントの成果

ソフトコンポーネントの成果は下表の通りである。

表1 ソフトコンポーネントの成果

No.	活動（技術移転）項目	成果	成果指標	成果達成度の確認方法
1	Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステム点検、調整、軽微な故障の探究・処置・復旧及び重大な故障発生時の対応	DOM職員が気象レーダー機器のメンテナンス方法を習得する	点検、調整、軽微な故障の探究・処置・復旧（a.測定器類を用いた定期保守点検、b.予備品の実機への組入れ後のシステムの動作確認（観測状況）、c.重大な故障発生時の対応（コンサルタント及び製造メーカーへの情報伝達、技術アドバイス受領等）	1)測定器類を用いた定期保守点検、2)予備品の実機への組入れ後の動作確認（観測状況）、3)軽微な故障の探求・処置・復旧確認作業、4)重大な故障発生時の対応に関する習熟度を、目視及びインタビューにより確認する
2	Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムマニュアル概要及びレーダーシステム保守管理台帳を活用した迅速且つ適切な気象レーダー運用・管理（観測生データの取得方法及びデータテーブルの読み方を含む）	DOM職員が気象レーダーの運用・管理方法を習得する	Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムマニュアル概要及び保守管理台帳を活用した、迅速且つ適切な運用・管理技術	Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムマニュアル概要の利用頻度、保守管理台帳の活用を記載内容及びインタビューにより確認する
3	気象データ衛星通信システム（VSAT）点検、調整、軽微な故障の探究・処置・復旧及び重大な故障発生時の対応	DOM職員が気象データ衛星通信システム（VSAT）機器のメンテナンス方法を習得する	点検、調整、軽微な故障の探究・処置・復旧（a.測定器類を用いた定期保守点検、b.予備品の実機への組入れ後のシステムの動作確認、c.アンテナアライメントの調整、d.重大な故障発生時の対応（コンサルタント及び製造メーカーへの情報伝達、技術アドバイス受領等）	1)測定器類を用いた定期保守点検、2)予備品の実機への組入れ後の動作確認、3)軽微な故障の探求・処置・復旧確認作業、4)アンテナアライメントの調整、5)重大な故障発生時の対応に関する習熟度を、目視及びインタビューにより確認する
4	気象データ衛星通信システム（VSAT）マニュアル概要及びレーダーシステム保守管理台帳を活用した迅速且つ適切な気象レーダー運用・管理	DOM職員が気象データ衛星通信システム（VSAT）の運用・管理方法を習得する	気象データ衛星通信システム（VSAT）マニュアル概要及び保守管理台帳を活用した、迅速且つ適切な運用・管理技術	気象データ衛星通信システム（VSAT）システムマニュアル概要の利用頻度、保守管理台帳の活用を記載内容及びインタビューにより確認する
5	気象レーダー基礎、データ品質管理概要及び降雨強度及びドップラー速度観測のシークエンス・スケジュールに従った気象レーダー観測及び観測	DOM職員が気象レーダーを適切に操作できる	気象現象を的確に把握し、気象レーダー観測データを予報業務に活用するため、降雨強度及びドップラー速度観測のシークエンス・スケジュールに従った気象レーダー観測	観測シークエンス・スケジュールに沿った気象レーダー観測の実施を、降雨強度及びドップラー速度観測データにより確認する

(4) 成果達成度の確認方法

ソフトコンポーネントの成果達成度の確認方法は表1に示した通りである。

(5) ソフトコンポーネントの活動（投入計画）

ソフトコンポーネントの活動（投入計画）は以下の通りである。

表2 ソフトコンポーネントの活動(投入計画)

成果	必要とされる技術・業種	現況の技術と必要とされる技術レベル	ターゲットグループ	実施方法	実施リソース	成果品				
成果1: Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムの点検、調整、軽微な故障の探究・処置・復旧技術をDOM技術者が習得する	Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムの調整・軽微な故障の探究を行える技術者を有する技術者	DOMは、アナログ気象レーダーシステムの調整・故障探求の実施経験のみであるため、デジタル気象レーダーシステムの技術が必要	次表に示した通り	測定器類を用いた定期保守点検研修	<第1回> 気象レーダー調整・故障探求技術担当コンサルタント: 1.13人月(現地技術移転期間: 34日) 直接支援型	測定器類を用いた定期保守点検実施手順書				
				納入された予備品の実機への組入れ後の動作確認(観測状況)研修			予備品の実機への組入れ後の動作確認(観測状況)手順書			
				故障状態を想定した故障探求・処置・復旧確認研修						
				重大な故障発生時の対応研修				<第2回> 気象レーダー調整・故障探求技術担当コンサルタント: 0.73人月(現地技術移転期間: 22日) 直接支援型	故障探求・処置・復旧確認手順書	
				実施手順書の作成						重大な故障発生時の対応手順書
成果2: DOM技術者が、Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムのマニュアル概要及び保守管理台帳を活用した迅速且つ適切な運用・管理技術を習得する(観測生データの取得方法及びデータテーブルの読み方を含む)	気象レーダーの運用・管理を行える技術者を有する技術者	DOMは、アナログ気象レーダーシステムの運用・管理を行った経験のみであるため、デジタル気象ドップラーレーダーシステムのマニュアル概要及び保守管理台帳に沿った運用・管理が実施できる技術が必要(観測生データの取得方法及びデータテーブルの読み方を含む)	次表に示した通り	DOM技術者との技術ディスカッション	<第1回> 気象レーダー運用・管理技術担当コンサルタント: 1.23人月(現地技術移転期間: 37日) 直接支援型	Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムマニュアル概要				
				Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムマニュアルから最重要部分の選出			レーダーシステム保守管理台帳の作成			
				Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムマニュアル概要の作成				<第2回> 気象レーダー運用・管理技術担当コンサルタント: 0.90人月(現地技術移転期間: 27日) 直接支援型	レーダーシステム保守管理台帳の作成	
				レーダーシステム保守管理台帳の作成						観測生データの取得方法及びデータテーブルの読み方
				DOM技術者によるCバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムマニュアル概要及び保守管理台帳の使用						
観測生データの取得方法及びデータテーブルの読み方	観測生データの取得方法及びデータテーブルの読み方									
成果3: 気象データ衛星通信システム(VSAT)	気象データ衛星通信システム(VSAT)の調	DOMの既設VSAT通信機器は故障が多く機材メーカーに依存せざるを得な	次表に示した通り	測定器類を用いた定期保守点検研修	気象データ衛星通信システム(VSAT)調整・故障探求技術担当	測定器類を用いた定期保守点検実施手順書				
				納入された予備品の実機への組入れ後の			予備品の実機への組			

スリランカ民主社会主義共和国  
気象観測レーダー整備計画準備調査

<p>の点検、調整、軽微な故障の探求・処置・復旧技術をDOM技術者が習得する</p>	<p>整・軽微な故障の探求を行える技術を有する技術者</p>	<p>いことから多額の支払いを行っている。現状の改善のためDOMが独自に維持管理するための技術が必要</p>		<p>動作確認研修、アンテナアライメントの調整研修 故障状態を想定し、故障探求・処置・復旧確認研修 重大な故障発生時の対応研修 実施手順書の作成</p>	<p>コンサルタント：0.73人月（現地技術移転期間：22日） 直接支援型</p>	<p>入れ後の動作確認手順書 故障探求・処置・復旧確認手順書 重大な故障発生時の対応手順書</p>
<p>成果4：DOM技術者が、気象データ衛星通信システム（VSAT）マニュアル概要及び保守管理台帳を活用した迅速且つ適切な運用・管理技術を習得する</p>	<p>気象データ衛星通信システム（VSAT）運用・管理を行える技術を有する技術者</p>	<p>DOMが独自にマニュアル概要及び保守管理台帳に沿った運用・管理ができる技術が必要</p>	<p>次表に示した通り</p>	<p>DOM技術者との技術ディスカッション 気象データ衛星通信システム（VSAT）マニュアルから最重要部分の選出 気象データ衛星通信システム（VSAT）マニュアル概要の作成 保守管理台帳の作成 DOM技術者による気象データ衛星通信システム（VSAT）マニュアル概要及び保守管理台帳の使用</p>	<p>気象データ衛星通信システム（VSAT）運用・管理技術担当コンサルタント：0.73人月（現地技術移転期間：22日） 直接支援型</p>	<p>気象データ衛星通信システム（VSAT）マニュアル概要 気象データ衛星通信システム（VSAT）保守管理台帳 ・システム障害/トラブルの発生日時 ・システム障害/トラブルの原因 ・実施した復旧手順 ・交換した部品の名称及び数量 ・復旧/トラブルシューティングを行ったエンジニアの氏名</p>
<p>成果5：降雨強度及びドップラー速度観測のシーケンス・スケジュールに従った気象レーダー観測が開始される</p>	<p>気象レーダー観測データよりクラッター及びブラインドエリアの特定が行え且つスリランカの気象現象に即した観測のシーケンス・スケジュールの作成技術を有する技術者</p>	<p>既設アナログ気象レーダーシステムにはCAPPI機能がなかったことから、DOMはCAPPIによる観測を実施した経験がないため、CAPPIによる降雨強度及びドップラー速度観測のシーケンス・スケジュール作成に関する技術が必要</p>	<p>次表に示した通り</p>	<p>DOM予報官及び技術者との技術ディスカッション及び座学（気象レーダー基礎、データ品質管理概要） Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムのクラッター及び各アンテナ仰角時のブラインドエリアの特定 各アンテナ仰角時のブラインドエリア図の作成 降雨強度及びドップラー速度観測の一般的なシーケンス・スケジュールの作成 降雨強度及びドップラー速度観測のシーケンス・スケジュールに従った気象レーダー観測の実施</p>	<p>気象レーダー観測技術担当コンサルタント：0.97人月（現地技術移転期間：29日） 直接支援型</p>	<p>降雨強度及びドップラー速度観測のシーケンス・スケジュール</p>

各成果のターゲットグループを以下の表に示す。

表3 成果1、2及び4のターゲットグループのターゲットグループ

技術者/職員	DOM 本局	プッタラム 気象レーダー観測所	ポトゥビル 気象レーダー観測所
主席電子技師	1	0	0
電子技師	1	0	0
上級電子技官	2	1	1
電子技官	4	1	1
電子技術補佐官	4	1	1

表4 成果3及び5のターゲットグループ

技術者/職員	DOM 本局 (気象センターを含む)	プッタラム 気象レーダー観測所	ポトゥビル 気象レーダー観測所
主席電子技師	1	0	0
電子技師	1	0	0
上級電子技官	2	1	1
電子技官	4	1	1
電子技術補佐官	4	1	1
気象センター予報官	11	0	0

活動日程詳細計画は以下の通りである。

第1回活動（プッタラム気象レーダーシステム設置工事完了時）

表5 活動No.1、活動No.2及び活動No.5の第1回目の日程詳細計画

	活動No.1	活動No.2	活動No.5
日	Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステム点検、調整、軽微な故障の探究・処置・復旧及び重大な故障発生時の対応	Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムマニュアル概要及びレーダーシステム保守管理台帳作成	降雨強度及びドップラー速度観測のシーケンス・スケジュール
1	日本発 土曜日	日本発 土曜日	日本発 土曜日
2	コロンボ着 事前準備 日曜日	コロンボ着 事前準備 日曜日	コロンボ着 事前準備 日曜日
3	プッタラムへ移動 プッタラム気象レーダー塔施設において準備作業	プッタラムへ移動 プッタラム気象レーダー塔施設において準備作業	DOM本局 気象センター予報官及び技術者との技術ディスカッション及び座学（気象レーダー基礎、データ品質管理概要）
4	測定器類を用いた定期保守点検の実施 研修及び実施手順書の作成	DOM 技術者との技術ディスカッション及びCバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムマニュアルから最重要部分の選出	Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムのクラッター及び各アンテナ仰角時のブラインドエリアの特定
5			
6			
7			
8	土曜日（休日）	土曜日（休日）	土曜日（休日）
9	日曜日（休日）	日曜日（休日）	日曜日（休日）
10	実施手順書の作成	Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムマニュアル概要（案）の作成 レーダーシステム保守管理台帳（案）の作成	各アンテナ仰角時のブラインドエリア図の作成
11	納入された予備品の実機への組入れ後の動作確認（観測状況）研修及び実施手順書の作成		降雨強度及びドップラー速度観測のシーケンス・スケジュール（案）作成
12			降雨強度及びドップラー速度観測のシーケンス・スケジュールに従った気象レーダー観測の実施
13			
14			
15	土曜日（休日）	土曜日（休日）	土曜日（休日）

スリランカ民主社会主義共和国  
気象観測レーダー整備計画準備調査

16	日曜日 (休日)	日曜日 (休日)	日曜日 (休日)
17	実施手順書の作成	C バンド固体化電力増幅式 2 重偏波気象ドップラーレーダーシステムマニュアル概要 (案) の作成	降雨強度及びドップラー速度観測のシーケンス・スケジュール (案) 見直し
18	故障状態を想定した故障探求・処置・復旧確認研修及び実施手順書の作成 重大な故障発生時の対応研修	DOM 技術者による C バンド固体化電力増幅式 2 重偏波気象ドップラーレーダーシステムマニュアル概要 (案) 及びレーダーシステム保守管理台帳 (案) の使用及び見直し DOM 技術者による C バンド固体化電力増幅式 2 重偏波気象ドップラーレーダーシステムマニュアル概要及びレーダーシステム保守管理台帳の使用	降雨強度及びドップラー速度観測のシーケンス・スケジュールに従った気象レーダー観測の実施
19			
20			
21			
22	土曜日 (休日)	土曜日 (休日)	土曜日 (休日)
23	日曜日 (休日)	日曜日 (休日)	日曜日 (休日)
24	実施手順書の作成	C バンド固体化電力増幅式 2 重偏波気象ドップラーレーダーシステムマニュアル概要 (案) 及びレーダーシステム保守管理台帳 (案) 見直し	降雨強度及びドップラー速度観測のシーケンス・スケジュールの完成
25	重大な故障発生時の対応研修	DOM 技術者による C バンド固体化電力増幅式 2 重偏波気象ドップラーレーダーシステムマニュアル概要及びレーダーシステム保守管理台帳の使用	完了報告書の作成
26	DOM による研修復習		
27	実施手順書の作成		
28			DOM との技術ディスカッション
29	コロomboへ移動 土曜日 (休日)	コロomboへ移動 土曜日 (休日)	コロombo発 日本帰国
30	日曜日 (休日)	日曜日 (休日)	
31	完了報告書の作成	観測生データの取得方法及びデータテーブルの読み方手引書の作成	
32		観測生データの取得方法及びデータテーブルの読み方手引書の評価及び活用	
33	DOM 本局 気象センター (コロombo) との技術ディスカッション		
34	コロombo発 日本帰国	完了報告書の作成	
35		DOM 本局 気象センター (コロombo) との技術ディスカッション	
36		完了報告書の作成 土曜日	
37		コロombo発 日本帰国 日曜日	

表 6 活動 No.3 及び活動 No.4 の日程詳細計画

	活動 No. 3	活動 No. 4
日	気象データ衛星通信システム (VSAT) 点検、調整、軽微な故障の探究・処置・復旧及び重大な故障発生時の対応	気象データ衛星通信システム (VSAT) マニュアル概要及び保守管理台帳作成
1	日本発 土曜日	日本発 土曜日
2	コロombo着 事前準備 日曜日	コロombo着 事前準備 日曜日
3	測定器類を用いた定期保守点検の実施 研修及び実施手順書の作成	DOM 技術者との技術ディスカッション 及び気象データ衛星通信システム (VSAT)
4		マニュアルから最重要部分の選出
5		気象データ衛星通信システム (VSAT) マニュアル概要及び保守管理台帳 (案) の作成
6	納入された予備品の実機への組入れ後の動作確認研修及び実施手順書の作成	
7		
8	土曜日 (休日)	土曜日 (休日)
9	日曜日 (休日)	日曜日 (休日)
10	故障状態を想定した故障探求・処置・復旧確認研修及び実施手順書の作成	気象データ衛星通信システム (VSAT) マニュアル概要及び保守管理台帳の作成
11		気象データ衛星通信システム (VSAT) マニュアル概要及び保守管理台帳の使

		用及び見直し
12	プッタラムへ移動	プッタラムへ移動
13	プッタラム気象レーダー塔施設において納入された予備品の実機への組入れ後の動作確認研修、故障状態を想定した故障探求・処置・復旧確認研修 コロンボへ移動	プッタラム気象レーダー塔施設において気象データ衛星通信システム (VSAT) マニュアル概要及び保守管理台帳の使用 コロンボへ移動
14	アンテナアライメントの調整研修 重大な故障発生時の対応研修	気象データ衛星通信システム (VSAT) マニュアル概要及び保守管理台帳の使用
15	土曜日 (休日)	土曜日 (休日)
16	日曜日 (休日)	日曜日 (休日)
17	DOM による研修復習	気象データ衛星通信システム (VSAT) マニュアル概要及び保守管理台帳の使用
18	実施手順書の作成	
19	完了報告書の作成	完了報告書の作成
20		
21	DOM との技術ディスカッション	DOM との技術ディスカッション
22	コロンボ発 日本帰国	コロンボ発 日本帰国

第 2 回活動 (ポトゥビル気象レーダーシステム設置工事完了時)

表 7 活動 No.1 及び活動 No.2 の第 2 回目の日程詳細計画

	活動 No. 1	活動 No. 2
日	Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステム点検、調整、軽微な故障の探究・処置・復旧及び重大な故障発生時の対応	Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムマニュアル概要及びレーダーシステム保守管理台帳作成
1	日本発 土曜日	日本発 土曜日
2	コロンボ着 事前準備 日曜日	コロンボ着 事前準備 日曜日
3	ポトゥビルへ移動	ポトゥビルへ移動
4	ポトゥビル気象レーダー塔施設において準備作業	ポトゥビル気象レーダー塔施設において準備作業 DOM 技術者との技術ディスカッション及びCバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムマニュアルから最重要部分の選出
5	測定器類を用いた定期保守点検の実施研修及び実施手順書の作成 (プッタラムCバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムの実実施手順書を参照)	
6	納入された予備品の実機への組入れ後の動作確認 (観測状況) 研修及び実施手順書の作成 (プッタラムCバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムの実実施手順書を参照)	
7		
8	土曜日 (休日)	土曜日 (休日)
9	日曜日 (休日)	日曜日 (休日)
10	納入された予備品の実機への組入れ後の動作確認 (観測状況) 研修及び実施手順書の作成 (プッタラムCバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムの実実施手順書を参照)	プッタラムCバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムマニュアル概要及びレーダーシステム保守管理台帳をポトゥビルCバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステム用に改定
11		
12	故障状態を想定し、故障探求・処置・復	DOM 技術者によるCバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムマニュアル概要 (改定案) 及びレーダーシステム保守管理台帳
13		
14	旧確認研修及び実施手順書の作成 (プッタラムCバンド固体化電力増幅式2	

	重偏波気象ドップラーレーダーシステムの実施手順書を参照) 重大な故障発生時の対応研修	(改定案)の使用及び見直し DOM 技術者による C バンド固体化電力増幅式 2 重偏波気象ドップラーレーダーシステムマニュアル概要及びレーダーシステム保守管理台帳の使用
15	コロンボへ移動 土曜日 (休日)	土曜日 (休日)
16	日曜日 (休日)	日曜日 (休日)
17	重大な故障発生時の対応研修	
18	DOM による研修復習 実施手順書の作成 (プッタラム C バンド固体化電力増幅式 2 重偏波気象ドップラーレーダーシステムの実施手順書を参照)	DOM 技術者による C バンド固体化電力増幅式 2 重偏波気象ドップラーレーダーシステムマニュアル概要及びレーダーシステム保守管理台帳の使用
19	完了報告書の作成	観測生データの取得方法及びデータテーブルの読み方手引書の作成
20		
21	DOM との技術ディスカッション	観測生データの取得方法及びデータテーブルの読み方手引書の評価及び活用
22	コロンボ発 日本帰国 土曜日	コロンボへ移動 土曜日 (休日)
23		日曜日 (休日)
24		観測生データの取得方法及びデータテーブルの読み方手引書の評価及び活用
25		完了報告書の作成
26		DOM との技術ディスカッション
27		コロンボ発 日本帰国

#### (6) ソフトコンポーネントの実施リソースの調達方法

実施リソースは、本プロジェクトの機材調達に関わる本邦コンサルタントによる直接支援型とする。その理由は以下の通りである。

- 気象業務及び導入される気象ドップラーレーダーシステム及び気象データ衛星通信システム (VSAT) に関する高度な技術及び知識を有している人材が不可欠であること。
- 通常、上述のような技術や知識を豊富に有している人材は、気象コンサルティング業務を実際に行っている組織に在籍していること。
- 計画されている技術移転と同様の経験を有する人材が必要であること。

これより、本邦コンサルタントの直接支援型とする。

#### (7) ソフトコンポーネントの実施工程

プロジェクト全体工程及びソフトコンポーネント実施工程を以下に示した。ソフトコンポーネントは、気象レーダーシステムの据付が完了して、調整段階となる、本プロジェクトの完了時前に実施する計画としている。

表 8 ソフトコンポーネント実施工程表

月	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	
プッタラム気象レーダー観測所																																
建設工事	計:180ヶ月																															
仮設・杭・基礎工事	■																															
躯体工事	■																															
仕上工事	■																															
電気・空調・衛生設備工事	■																															
機材工事																																
計:170ヶ月																																
機材製作	■																															
機材輸送	■																															
機材据付/調整	■																															
DOMコロンボ本局気象センター																																
計:150ヶ月																																
機材調達・据付工事																																
機材製作	■																															
機材輸送	■																															
機材据付/調整	■																															
コロンボ国際空港DOM気象事務所																																
計:150ヶ月																																
機材調達・据付工事																																
機材製作	■																															
機材輸送	■																															
機材据付/調整	■																															
マッタラ ラジャパクサ国際空港DOM気象事務所																																
計:150ヶ月																																
機材調達・据付工事																																
機材製作	■																															
機材輸送	■																															
機材据付/調整	■																															
ポトゥッセル気象レーダー観測所																																
計:175ヶ月																																
建設工事																																
仮設・杭・土工	■																															
躯体工事	■																															
仕上工事	■																															
電気・空調・衛生設備工事	■																															
機材工事																																
計:170ヶ月																																
機材製作	■																															
機材輸送	■																															
機材据付/調整	■																															
ソフトコンポーネント																																
ソフトコンポーネント(活動 No.1)																									■							
ソフトコンポーネント(活動 No.2)																									■							
ソフトコンポーネント(活動 No.3)																									■							
ソフトコンポーネント(活動 No.4)																									■							
ソフトコンポーネント(活動 No.5)																									■							

(8) ソフトコンポーネントの成果品

ソフトコンポーネントの成果品は以下の通り。

表 9 ソフトコンポーネントの成果品(アウトプット)

資料名	提出時期	ページ数
Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムの1)測定器類を用いた定期保守点検、2)予備品の実機への組入れ後の動作確認(観測状況)、3)軽微な故障の探求・処置・復旧確認作業実施手順書、4)重大な故障発生時の対応手順書	技術移転実施後	20
Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステムマニュアル概要		30
Cバンド固体化電力増幅式2重偏波気象ドップラーレーダーシステム保守管理台帳		5
気象データ衛星通信システム(VSAT)の1)測定器類を用いた定期保守点検、2)予備品の実機への組入れ後の動作確認、3)アンテナアライメントの調整、4)軽微な故障の探求・処置・復旧確認作業実施手順書、5)重大な故障発生時の対応手順書		15
気象データ衛星通信システム(VSAT)マニュアル概要		20
気象データ衛星通信システム(VSAT)保守管理台帳		5
降雨強度及びドップラー速度観測のシーケンス・スケジュール		15



資料名	内容	提出時期	ページ数
ソフトコンポーネント実施完了報告書	<ul style="list-style-type: none"> <li>• 活動計画と実績</li> <li>• 計画した成果と成果の達成度</li> <li>• 成果の達成度に影響を与えた要因</li> <li>• 効果の持続・発展のための今後の課題・提言等</li> <li>• 成果品一式</li> </ul>	ソフトコンポーネント実施完了時	50

## (9) 相手国側の責務

ソフトコンポーネントの実施に関して DOM 側の責務は、以下の通りである。

- 1) 人的資源開発
  - a) 継続的に次世代を担う人材を雇用する。
  - b) 研修と人的資源開発計画を通じて、より優れた人材の育成を行う。
- 2) プロジェクトにおいて調達された機材の長期運用
  - a) 定期的にシステム運用維持管理に必要な予算を確保し、プロジェクトで供給された全ての気象機材の交換部品、消耗品の調達を計画的に行う。
  - b) 盗難や破損から機材を保護する。

上述に記述した DOM 側の責務に関しては、DOM の組織的且つ人的能力を鑑みると、十分に実施可能であると考えている。特に「継続的に次世代を担う人材を雇用」に関しては、気象レーダー及び気象データ衛星通信システム (VSAT) の維持管理面において DOM が自立的発展するためには、電子関連技術者を継続的に補充し、補助業務を行う職員から電子技師に至る全てのスタッフに気象レーダー及び気象データ衛星通信システム (VSAT) の維持管理能力を継承していくことが必要不可欠である。

## 資料 6. 参考資料

調査名：スリランカ国気象観測レーダー整備計画準備調査

番号	名 称	形態 図書・ビデオ 地図・写真等	オリジナル ／コピー／ 電子ファイル	発行機関	発行年
1	Sri Lanka Journal of Meteorology	図書	電子ファイル	Department of Meteorology	2015年