

## **APPENDICES**

## Appendices

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**Appendix 1 Member List of the Study Team**

**Member List of  
the Project for Improvement of Meteorological and Disaster Information Network  
in the Democratic Socialist Republic of Sri Lanka**

**Basic Design Study Field Survey 1**

- |   |  |
|---|--|
| 1. Takumi UESHIMA<br>Team Leader  | Resident Representative<br>Sri Lanka Office<br>Japan International Cooperation Agency (JICA)           |
| 2. Mariko KOMAZAKI<br>Project Coordinator                                       | ICT & Governance Team,<br>Grant Aid Management Dept.,<br>Japan International Cooperation Agency (JICA) |
| 3. Hiroaki KURITA<br>Chief Consultant /<br>Disaster Management Network Planning | PACIFIC CONSULTANTS INTERNATIONAL  |
| 4. Tetsuro FUKUI<br>Meteorological Information Network Planning                 | PACIFIC CONSULTANTS INTERNATIONAL  |
| 5. Yuko OHBUCHI<br>Equipment Planning (a) /<br>Operation & Maintenance Planning | PACIFIC CONSULTANTS INTERNATIONAL  |
| 6. Chuji YAMAMOTO<br>Equipment Planning (b)                                     | PACIFIC CONSULTANTS INTERNATIONAL  |
| 7. Hirotugu KATO<br>Procurement Planning /<br>Cost Estimation                   | PACIFIC CONSULTANTS INTERNATIONAL  |

**Basic Design Study Field Survey 2**

- |   |  |
|---|--|
| 1. Takumi UESHIMA<br>Team Leader  | Resident Representative<br>Sri Lanka Office<br>Japan International Cooperation Agency (JICA)           |
| 2. Mariko KOMAZAKI<br>Project Coordinator                                       | ICT & Governance Team,<br>Grant Aid Management Dept.,<br>Japan International Cooperation Agency (JICA) |
| 3. Hiroaki KURITA<br>Chief Consultant /<br>Disaster Management Network Planning | PACIFIC CONSULTANTS INTERNATIONAL  |
| 4. Tetsuro FUKUI<br>Meteorological Information Network Planning                 | PACIFIC CONSULTANTS INTERNATIONAL  |

## **Explanation Team for Draft Final Report of Basic Design Study**

1. Hideki SAKATA  
Team Leader  
Deputy Director  
Sri Lanka Office  
Japan International Cooperation Agency (JICA)
2. Hiroaki KURITA  
Chief Consultant /  
Disaster Management Network Planning  
PACIFIC CONSULTANTS INTERNATIONAL
3. Tetsuro FUKUI  
Meteorological Information Network Planning  
PACIFIC CONSULTANTS INTERNATIONAL
4. Yuko OHBUCHI  
Equipment Planning (a) /  
Operation & Maintenance Planning  
PACIFIC CONSULTANTS INTERNATIONAL

## **Appendix 2 Study Schedule**

## Basic Design Study Field Survey 1 (Oct. 24 – Nov. 28, 2006)

Date	Officials			Consultants			
	Takumi UESHIMA Team Leader	Mariko KOMAZAKI Project Coordinator	Hiroaki KURITA Chief Consultant /Disaster Management Network Planning	Chuji YAMAMOTO Equipment Planning (b)	Tetsuro FUKUI Meteorological Information Network Planning	Yuko OHBUCHI Equipment Planning (a) / Operation & Maintenance Planning	Hirotsugu KATO Procurement Planning / Cost Estimation
1	Oct.24	Tue	Narita→Colombo	Narita→Colombo	Narita→Colombo		
2	Oct.25	Wed	Courtesy calls on MDM&HR, DOM, NARA		Courtesy calls on MDM&HR, DOM, NARA		
3	Oct.26	Thu	Courtesy calls and Meeting with DOM, Courtesy calls on Army, Navy and Police		Courtesy calls and Meeting with DOM, Courtesy calls on Army, Navy and Police		
4	Oct.27	Fri	Meeting with DMC Study on the Questionnaire for Component-1		Meeting with DMC, Study on the Questionnaire for Component-1		
5	Oct.28	Sat	Site Survey (Ratnapura)		Site Survey (Ratnapura)		
6	Oct.29	Sun	Internal Meeting & Data Analysis		Internal Meeting & Data Analysis		
7	Oct.30	Mon	Meeting with DOM, Courtesy calls on MOFP, Meeting with Development Studies		Meeting with DOM, Survey of DOM's equipment		
8	Oct.31	Tue	Meeting with DOM & DMC, Meeting with NWM		Narita→Colombo	Meeting with DOM, Preparation for Site Survey	Narita→Colombo
9	Nov.1	Wed	Signing on M/D		Survey of DOM's equipment	Preparation for Site Survey	
10	Nov.2	Thu	Colombo→Narita	Explanation of the Questionnaire for Component-1 (DMC)	Internal Meeting	Site Survey ((1)Anuradhapura, (16)Puttalam)	Survey of Procurement Condition, Survey for Estimation
11	Nov.3	Fri		Meeting with Development Studies, Preparation for Site Survey	Site Survey ((12)Maha Illuppalam, (52)Polonnaruwa)		
12	Nov.4	Sat		Site Survey ((10)Katunayake, (4)Colombo-HQ)	Site Survey ((62)Aralaganwilla)		
13	Nov.5	Sun		Internal Meeting & Data Analysis	Site Survey ((54)Matale)	Data Analysis	
14	Nov.6	Mon		Site Survey ((17)Ratmalana, (4)Colombo-HQ)	Site Survey ((9)Katugastota, (11)Kurunegala)	Survey of Procurement Condition, Survey for Estimation	
15	Nov.7	Tue		Site Survey ((6)Galle)	Site Survey ((51)Wagolla)		
16	Nov.8	Wed		Site Survey ((58)Matara (Ruhuna University), (59)Deniyaya)	Data Analysis and Preparation		
17	Nov.9	Thu		Site Survey ((59)Deniyaya, (7)Hambantota, (56)Angunakolapelessa)	Site Survey ((14)Nuwara Eliya)		
18	Nov.10	Fri		Site Survey ((7)Hambantota, (55)Pelwatte(Sevanagala))	Site Survey ((61)Mt. Pidurutalagala, (60)Horton Plains)		
19	Nov.11	Sat		Site Survey ((5)bandarawela, (63)Balangoda (Rajawaka))	Site Survey ((2)Badulla, (53)Moneragala)		
20	Nov.12	Sun		Site Survey ((64)Mawarella (Maliboda))	Data Analysis		
21	Nov.13	Mon		Meeting with DOM, Meeting with JICA & Development Studies	Meeting with DOM	Colombo→Narita	
22	Nov.14	Tue		Meeting with TRC, Data Collection about network system (DOM)	Preparation		
23	Nov.15	Wed		Meeting on the Questionnaire for Component-1 (DMC) , Coordination for Site Survey (DOM) , Internal Meeting			
24	Nov.16	Thu		Colombo→Ampara	Colombo→Anuradhapura		
25	Nov.17	Fri		Site Survey ((57)Ampara, (15)Pottuvil)	Site Survey ((13)Mannar, (20)Vavuniya)		
26	Nov.18	Sat		Site Survey ((15)Pottuvil) →Colombo	Anuradhapura→Colombo		
27	Nov.19	Sun		Meeting on the Questionnaire for Component-1 (Development Studies)	Data Analysis, Meeting on the Questionnaire for Component-1 (Development Studies)		
28	Nov.20	Mon		Confirmation of Site Survey Result, Meeting on network system, etc. (DOM)			
29	Nov.21	Tue		Meeting with DMC & DOM	Colombo→Narita	Meeting with DMC & DOM	Colombo→Narita
30	Nov.22	Wed		Meeting with DMC & DOM		Meeting with DMC & DOM	
31	Nov.23	Thu		Site Survey ((65)Labugama, (68)Sirikandura)	Site Survey ((65)Labugama, (68)Sirikandura)		
32	Nov.24	Fri		Site Survey ((67)Kudawa)	Site Survey ((67)Kudawa)		
33	Nov.25	Sat		Site Survey ((66)Himiduma)	Site Survey ((66)Himiduma)		
34	Nov.26	Sun		Internal Meeting	Internal Meeting		
35	Nov.27	Mon		Meeting with DOM, Report to JICA	Meeting with DOM, Report to JICA		
36	Nov.28	Tue		Colombo→Narita	Colombo→Narita		

## Basic Design Study Field Survey 2 (Feb. 12 – Mar. 10, 2007)

Date			Officials		Consultants	
			Mr. Takumi UESHIMA Team Leader	Ms. Mariko KOMAZAKI Project Coordinator	Mr. Hiroaki KURITA Chief Consultant/ Disaster Management Network Planning	Mr. Tetsuro FUKUI Meteorological Information Network Planning
1	Feb. 12	Mon			Courtesy calls on JICA Sri Lanka Office, Study on the Disaster Management Information (Police Command Room & Com. Center),	
2	Feb. 13	Tue			Explanation of Inception Report and Questionnaire (NBRO) Discussion on Disaster Management Network (DMC)	Narita→Colombo
3	Feb. 14	Wed			Explanation of Inception Report and Questionnaire (DOM)	
4	Feb. 15	Thu			Briefing of JICA BD Study for DM Coordinator (DMC)	Preparation of the Confirmation Item on DCP Communication System for AWS (DOM)
5	Feb. 16	Fri			Site Survey of the District Office (Matara, Galle)	
6	Feb. 17	Sat			Site Survey of the District Office (Kalutara, Ratnapura)	
7	Feb. 18	Sun			Site Survey of the District Office (Kegalle, Gampaha)	
8	Feb. 19	Mon			Explanation of Inception Report and Questionnaire (SLBC), Site Survey of the District Office (Colombo)	
9	Feb. 20	Tue			Discussion with ICTA, Report to JICA Sri Lanka Office	Meeting with DoM and Confirmation on Communication Network for DOM, and Obtaining of Site Layout Plan of Trincomalee.
10	Feb. 21	Wed			Study on the Operation Condition of Emergency Operation Center (DMC) Meeting with Data Communication Company such as Dialog Meeting on DMC New Building (MDM&HR)	Study on Equipment Specification
11	Feb. 22	Thu			Explanation of Inception Report and Questionnaire (DOI), Explanation of Inception Report and Questionnaire, and Study on the Disaster Management Information (SLRC)	Site Survey for Component-2 (Maliboda), Arrangement of Survey Result
12	Feb. 23	Fri			Meeting on Microwave Frequency Band (TRC), Meeting on Microwave Frequency Band (DoM), Meeting on Disaster Management Communication Network (Lanka Com)	Meeting on Disaster Management Communication Network (DoM), Meeting on Disaster Management Communication Network (LankaCom)
13	Feb. 24	Sat			Preparation of Draft Material on Technical Notes	Site Survey for Component-2 (Hiniduma)
14	Feb. 25	Sun			Internal Meeting & Preparation of Draft Material on Technical Notes	
15	Feb. 26	Mon			Explanation of the Project (NPD and ERD), Meeting with UNDP	Site Survey for Equipment Installation Space (DOM)
16	Feb. 27	Tue			Meeting with DMC/EOC, Meeting with CEO of Sri Lanka Telecom	Site Survey for Equipment Installation Space (SLRC, Police)
17	Feb. 28	Wed		Narita→Colombo	Preliminary Discussion on Technical Notes and Minutes of Discussion (DMC), Report on Site Condition (DOM)	Site Survey for Equipment Installation Space (DOI), Site Survey for Equipment Installation Space (SLBC), Report on Site Condition (DOM)
18	Mar. 1	Thu	Meeting with DMC, Meeting with Development Studies		Meeting with DMC, Meeting with Development Studies, Discussion and Request for Quotation (Sri Lanka Telecom)	
19	Mar. 2	Fri	Explanation and Discussion on Technical Notes, and Confirmation of Network System (DMC, DoM, DOI, NBRO, PoliceCC, SLRC, SLBC)		Meeting with TRC, Explanation and Discussion on Technical Notes, and Confirmation of Network System (DMC, DOM, DOI, NBRO, PoliceCC, SLRC, SLBC)	



Date			Officials		Consultants	
			Mr. Takumi UESHIMA	Ms. Mariko KOMAZAKI	Mr. Hiroaki KURITA	Mr. Tetsuro FUKUI
			Team Leader	Project Coordinator	Chief Consultant/ Disaster Management Network Planning	Meteorological Information Network Planning
20	Mar. 3	Sat	Preparation of Minutes of Discussion		Arrangement of Contract Condition on Disaster Management Communication Network	Colombo→Narita
21	Mar. 4	Sun	Preparation of Minutes of Discussion & Internal Meeting		Arrangement of Contract Condition on Disaster Management Communication Network	
22	Mar. 5	Mon			Site Survey for Equipment Installation Space (NBRO), Confirmation of Contract Condition on Disaster Management Communication Network (Dialog:BMICH, LankaCom at LankaCom) Confirmation of Technical Notes (DOM)	
23	Mar. 6	Tue	Explanation on Minutes of Discussion, Equipment Design and Confirmation of the System Configuration on Disaster Management Communication Network (DMC), Confirmation of Minutes of Discussion (MDM&HR)			
24	Mar. 7	Wed			Explanation of Minutes of Discussion and Communication System (MOFP) Confirmation on Minutes of Discussion and Technical Notes (DMC) Confirmation of Technical Notes on Component-2 (DOM)	
25	Mar. 8	Thu			Explanation on Disaster Management Communication Network (DOI, NBRO, Police), Confirmation of Contract Condition on Disaster Management Communication Network (Sri Lanka Telecom)	
26	Mar. 9	Fri			Signing of Technical Notes on Component-2 (DOM), Signing of Technical Notes on Component-1 (DMC), Report to JICA Sri Lanka Office	
27	Mar. 10	Sat			Colombo→Narita	

### Explanation Team for Draft Final Report of Basic Design Study (May. 23 – June. 1, 2007)

Date			Official	Consultants		
			Hideki SAKATA	Hiroaki KURITA	Tetsuro FUKUI	Yuko OBUCHI
			Team Leader	Chief Consultant/ Disaster Management Network Planning	Meteorological Information Network Planning	Equipment Planning (a) / Operation & Maintenance Planning
1	May 23	Wed		Narita→Bangkok		
2	May 24	Thu		Bangkok→Colombo		
				Courtesy calls on JICA Sri Lanka Office, Meeting with DMC, Explanation on Minutes of Discussion (MOFP)		
3	May 25	Fri		Explanation on the Meteorological Information Network System and Draft Report (DOM), Explanation on the JICA Grant Project (World Bank NAWAM Project Team)		
4	May 26	Sat		Preparation of Technical Notes		
5	May 27	Sun		Internal Meeting & Arrangement of Discussion Result		
6	May 28	Mon		Explanation on the Detailed Technical Specification on Equipment (DOM) Explanation and Discussion on Minutes of Discussions (MODH)		
7	May 29	Tue		Explanation and Confirmation on the Equipment (DOM)		
8	May 30	Wed		Signing of Minutes of Discussion, Report to EOJ, Report to JICA Sri Lanka Office		
9	May 31	Thu		Colombo→Bangkok (→)		
10	Jun. 1	Fri		(→)Narita		

**Appendix 3 List of Parties Concerned in the Recipient Country**

### 3. List of Parties Concerned in the Recipient Country

**Basic Design Study Field Survey 1 (Oct. 24 - Nov. 28, 2006)**

**Basic Design Study Field Survey 2 (Feb. 12 - Mar. 10, 2007)**

**Explanation Team for Draft Final Report of Basic Design Study (May. 23 - June. 1, 2007)**

1. Embassy of Japan

Hideyuki ONISHI : Counsellor, Head of the Economic Cooperation Section  
Yasuhiro WATANABE : Second Secretary  
Noriaki SADAMOTO : Second Secretary

2. JICA Sri Lanka Office

Miki INAOKA : Resident Representative  
Hideki SAKATA : Deputy Resident Representative  
Miki INAOKA : Assistant Resident Representative

3. Ministry of Disaster Management and Human Rights

Mr. Peter Dias Amarasinghe : Secretary

4. Ministry of Finance and Planning

Mr. B. Abeygunawardena : Director General, Department of National Planning  
Mr. M.P.D.U.K. Mapa Pathirana : Director of Department of External Resources

5. Department of Meteorology

Mr. G.H.P. Dharmaratna : Director General  
Mr. P. M. Jayatilaka Banda : Director  
Mr. G.B. Samarasinghe : Deputy Director  
Mr. Lalith Chandrapala : Deputy Director  
Mr. E. S. Silva : Deputy Director  
Mr. S. H. Kaliyawasam : Deputy Director  
Mr. Nuwan Kumarasinghe : Electronics Engineer  
Mr. D.J. Ajith Weerawardena : Meteorologist in Charge

6. Disaster Management Centre

Major General Gamini Hettiarachchi : Director General  
Mr. U.W.L Chandradasa : Director of Technology & Mitigation  
Mrs. Lanani Imbulana : Director Preparedness Planning  
Mr. N.W.S.W.S. De Silva : Deputy Director of Admin & Personnel  
Mr. A. D. Ramya Siriwanasa : Deputy Director (Emergency Operation)  
Wing Cdr Dhammika. Wijeyasooriya : Assistant Director (Emergency Operations)  
Mr. Kelum Jayasoma : Assistant Director (Information Technology)

7. District Disaster Management Coordinating Unit

Lt. Col. J. Fernando	:	DM Coordinator, Matara
Capt H. M. D. S. R. SENARATNA	:	DM Coordinator, Galle
Col. Keerthi Ekanayake	:	DM Coordinator, Kalutara
Lt. Col. Manoj Mudannayake	:	DM Coordinator, Ratnapura
Mrs. A. M. J. D. K. Mudalige	:	DM Coordinator, Kegalle
Mr. Eranga Ratnayake	:	DM Coordinator, Gampaha
Wing Cdr H. D. B. Chandrasekara	:	DM Coordinator, Colombo

8. Department of Irrigation

Mr. P. C. Senaratne	:	Director Specialized Services & Training
Ms. P. P. G. Dias	:	Deputy Director Hydrology

9. National Building Research Organization

Mr. R. M. S. Bandara	:	Acting Head of the Landslide Studies and Services Division
Ms. Kumari	:	GIS Specialist
Mr. Lionel Bandara	:	Network Engineer

10. Police Command Room & Com. Center

Mr. H. A. J. S. K. Wickramaratna	:	Senior Deputy Inspector General
Mr. Kaluarachchi	:	Director of Communication Center
Mr. S.K. Shankar	:	Deputy Inspector General

11. Sri Lanka Rupavahini Corporation

Mr. Rohan Perera	:	Director Engineering Acting Deputy Director General (Engineering)
Mr. Athula Perera	:	Director Engineering (Projects & Planning)
Mr. P. P. Rajapakshe	:	Deputy Director Engineering (Transmission & ICT)

12. Sri Lanka Broadcasting Corporation

Mr. Sanath Panawennage	:	Deputy Director General (Engineering)
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13. National Aquatic Resources Research & Development Agency

Mr. K. Haputantri	:	Chairman
Mr. A.B. Ajith K. Gunaratne	:	Head Information Technology Division

14. The Sri Lanka Army

Major General Tissa Jayawardana	:	Director General Staff
---------------------------------	---	------------------------

15. The Sri Lanka Navy  
Vice Admiral Wasantha Karannagoda : Commander
16. World Bank NAWAM Project  
Mr. Nihal Fernando : Snr.Rural Development Specialist  
Mr. S. Manoharan : Rural Development Specialist  
Mr. Xiaokai Li : Senior Water Resources Specialist  
Mr. Sudharma Elakanda : Project Coordinator / National Water Management Improvement Project (NAWAM)
17. United Nations Development Programme  
Dr. Ananda Mallawatantri : Assistant Resident representative  
Team Leader : Environment, Energy and Disaster Management  
Mr. M. A. S. J. K. Madurapperuma : Programme Coordinator
18. Telecommunications Regulatory Commission of Sri Lanka  
Mr.Helasiri Ranatunga : Deputy Director, Spectrum Management
19. Information Communication Technology Agent  
Ms. Dil Piyaratne : Senior Project Manager, Information Infrastructure  
Mr. Radley Dissanayake : Programme Manager
20. Sri Lanka Telecom  
Mr. Shoji TAKAHASHI : Chief Executive Officer  
Mr. Shuhei ANAN : Ex. Chief Executive Officer  
Mr. Ajith D. Silva : Head / Corporate Market Development  
Mr. Janaka R. Abeysinghe : Deputy General Manager (Solution Business)  
Mr. S. N. Neethan : Engineer (Solution Business)
21. Dialog Telecom  
Mr. Channa Amarasekara : Sales Manager  
Mr. Thevaraj Surendran : Engineer, Solutions Architecture  
Mr. Rukshan Seneviratne : Account Manager, Enterprises Solutions
22. Lanka Com  
Mr. Rohith Udalagama : Manager Director  
Mr. Kapila A. Silva : Administration & Commercial Director  
Mr. Roshan Jayatilleke : Head of Pre Sales

## **Appendix 4 Minutes of Discussions**

**Minutes of Discussions  
on the Basic Design Study on the Project for  
Improvement of Meteorological and Disaster Information 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 Basic Design Study on "Improvement of Meteorological and Disaster Information Network" (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").


JICA sent the Basic Design Study Team (hereinafter referred to as "the Team") to Sri Lanka, headed by Mr. Takumi Ueshima, Resident Representative of the JICA Sri Lanka Office, and is scheduled to stay in the country from October 24, 2006 to November 21, 2006.

The Team held discussions with the officials concerned of the Government of Sri Lanka and conducted a field survey at the study area. As the result of the discussions and field survey, both sides have confirmed the main items described in the attached sheets. The Team will proceed to further study and prepare the Basic Design Study Report.


Colombo, Nov. 01, 2006

植嶋卓巳

Takumi Ueshima  
Leader  
Basic Design Study Team  
Japan International Cooperation Agency



Peter Dias Amarasinghe  
Secretary  
Ministry of Disaster Management  
and Human Rights



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

## ATTACHMENT

### 1. Objective

The objective of the Project is to develop a reliable communication network among the relevant institutions and also improve the meteorological observation and prediction capabilities. This will contribute to improve the early warning system for natural disasters by means of improvement in public services under natural disaster conditions, and thus mitigate the loss of human life and property of the people of Sri Lanka.

The Project shall be closely linked and collaborated with the activities and outcome of the ongoing study conducted by Sri Lanka and JICA, namely "the Comprehensive Study on Disaster Management".

### 2. Components of the Project

- 1) Communication network system among the relevant institutions for proper coordination for early warning and disaster management of Sri Lanka. (Component-1)
- 2) Meteorological observation system to collect accurate and on-time weather data to utilize for early warning and disaster management of Sri Lanka. (Component-2)

### 3. Project Name

In the original request from the Sri Lankan side, the Project was named "Development of a comprehensive disaster early warning system including communication for the Department of Meteorology".

Through the discussion, Sri Lankan side and Japanese side have both agreed to change the project name to "Improvement of Meteorological and Disaster Information Network", which represents the Project more accurately.

### 4. Project Sites

The project sites for Component-1 are yet to be confirmed. It shall be agreed as a result of further discussions held between both sides.

The project sites for Component-2 are shown in Annex-1. Sri Lankan side understands that after the result of the further field survey and analysis of collected data, the project sites will be prioritized and may be limited to the high priority areas, from the perspective of urgency and necessity for disaster management.

### 5. Responsible Organization and Implementing Agency

- 1) The responsible organization for the Project is the Ministry of Disaster Management and Human Rights (hereinafter referred to as "the Ministry"). The organization chart of the ministry is shown in Annex-2-a.



- 2) The implementing agency for Component-1 is the Disaster Management Center (hereinafter referred to as "DMC"). The organization chart of DMC is also shown in Annex-2-a.
- 3) The implementing agency for Component-2 is the Department of Meteorology (hereinafter referred to as "DOM"). The organization chart of DOM is also shown in Annex-2-b.

#### 6. Items Requested by the Sri Lanka Government

- 1) The items for Component-1 are yet to be finalized. Sri Lankan side shall confirm the request promptly, for JICA to carry on the basic design study of the said component.
- 2) After discussions with the Team, the items described in Annex-3 were finally requested by the Sri Lankan side for Component-2. JICA will assess the necessity and appropriateness of the request and will recommend to the Government of Japan for approval.
- 3) For the Tsunami Information Reception and Multi cast report equipment (Main-Hub) which was listed in the original request, both sides agreed that this component is outside of the scope of the Project.

#### 7. Japan's Grant Aid Scheme

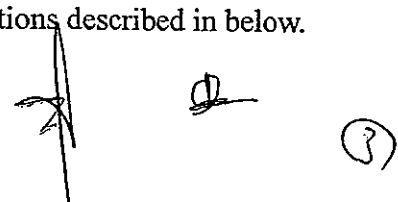
- 1) Sri Lankan side understands the Japan's Grant Aid scheme explained by the Team as described in Annex-4.
- 2) Sri Lankan side will take necessary measures, as described in Annex-5, for smooth implementation of the Project, as a condition for the implementation of Japan's Grant Aid.

#### 8. Schedule of the study

- 1) The Team will proceed to further study in Sri Lanka up to November 21, 2006.
- 2) JICA will prepare the draft report in English and dispatch a mission to Sri Lanka in order to explain its contents around March, 2007.
- 3) In case that the contents of the report are accepted in principle by the Government of Sri Lanka, JICA will complete the final report and send it to Sri Lanka by the end of April, 2007.
- 4) This schedule may be modified and extended due to the discussions in progress concerning Component-1.

#### 9. Other Relevant Issues concerning Component-1

Since the contents of Component-1 are not yet detailed enough for JICA to carry out the basic design study, Sri Lankan side shall promptly take necessary actions described in below.

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- 1) Articulating / Describing the expected use and requirements for the network.
- 2) Acquisition of formal agreement among the concerned organizations/institutions for the planned network, by means of contents, cost burden, role and responsible activities of each organization/institution.
- 3) Confirmation of the items and contents to be requested for Japan's Grant Aid among the planned network. This also should be agreed by the concerned organizations/institutions.

Japanese side submitted a questionnaire attached as Annex-6, which describes the necessary detailed information concerning the above matter. Sri Lankan side agreed to prepare the answer promptly. The subsequent schedule of the basic design study for this component will be considered according to its progress.

#### 10. Other Relevant Issues concerning Component-2

##### 1) Land Preparation

Land preparation for meteorological observation stations is indispensable to implement the Project.

- For the meteorological observation stations to be newly established by the Project, the exact place shall be selected during the further field study of the Team. The Team will give advice and requirement of the place, and the selection shall be the responsibility of DOM, and the specific location of the site shall be specified in the memorandum which will be exchanged with DOM and the consultant before the Team returns to Japan.
- Official land ownership acquisition or agreement of the usage of land from the landowner for each meteorological observation station shall be completed by the end of February, 2007. Demolishing the existing facilities and clearing of the land if needed shall be completed prior to the commencement of the Project. These works shall also be the responsibility of DOM.
- Sri Lankan side understands that even in case the selected land is not owned by DOM, the maintenance and operation of the equipment to be installed by Japan's Grant Aid shall be the responsibility of DOM.

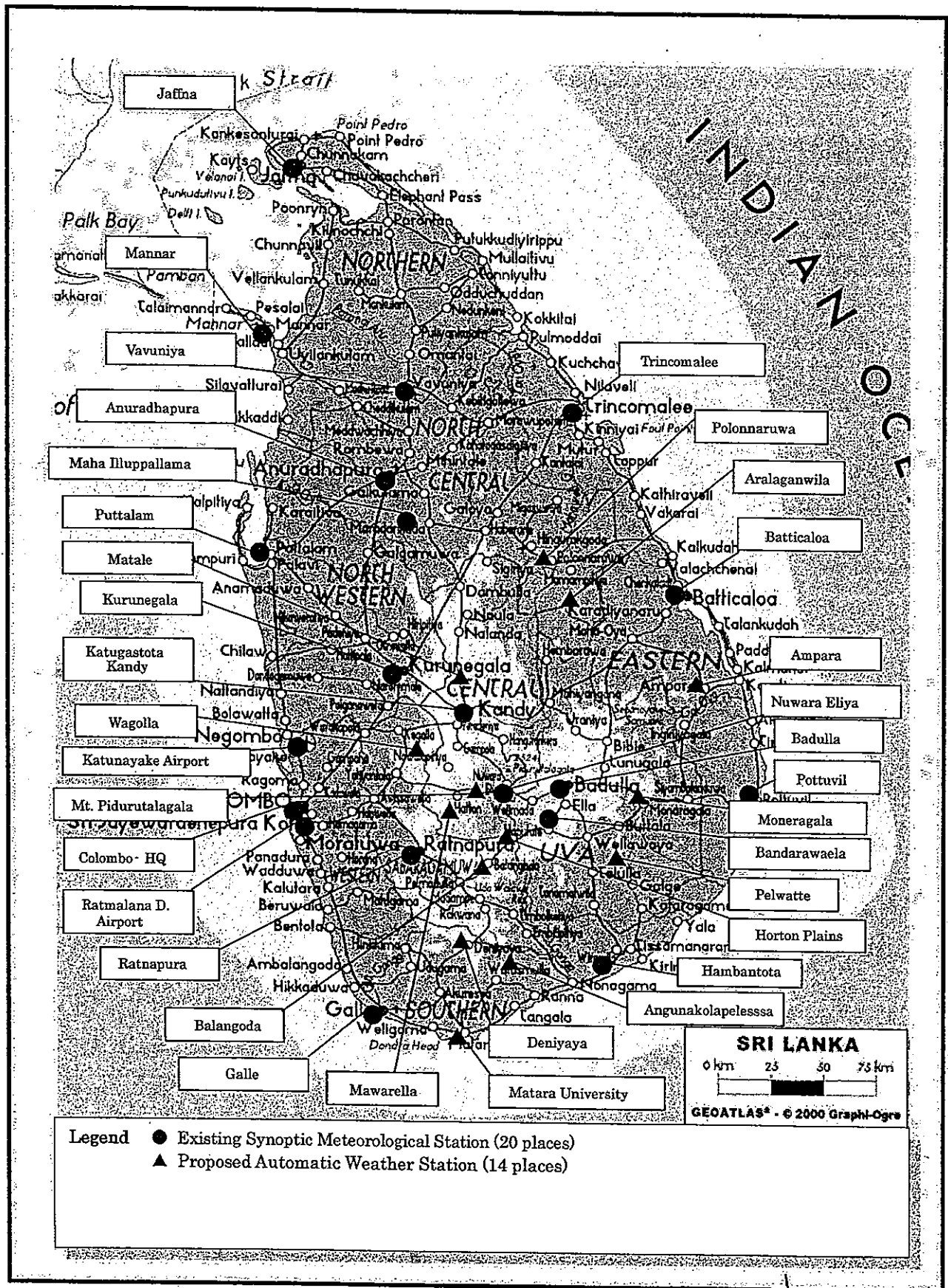
##### 2) Sustainability of the Project

- The Team will carry out the study and consider the most appropriate system to ensure sustainability. Therefore, the communication method for transmitting the data from each observation station to DOM head office will be decided and proposed to the Sri Lankan side by the Team after a careful comparative review of the surrounding circumstances.
- Since the objective of the Project is to mitigate the disaster risks of the people of Sri Lanka, DOM agrees to coordinate with the concerned organizations to utilize the

observed and collected weather data.

- Sri Lankan side agrees to allocate sufficient funds and competent staff for proper and effective operation and maintenance of the equipment to be provided under Japan's Grant Aid. These requirements will be indicated by the Japanese side in the study report.
- Sri Lankan side during discussions requested adequate technical assistance for proper operation and maintenance of the equipment and network which is to be implemented by the Project. Japanese side will assess the necessity of soft component (technical assistance to be included in the Project) and set the scope of assistance.

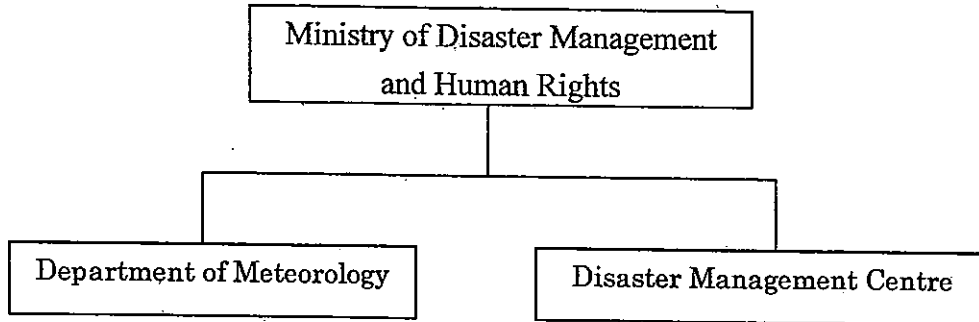




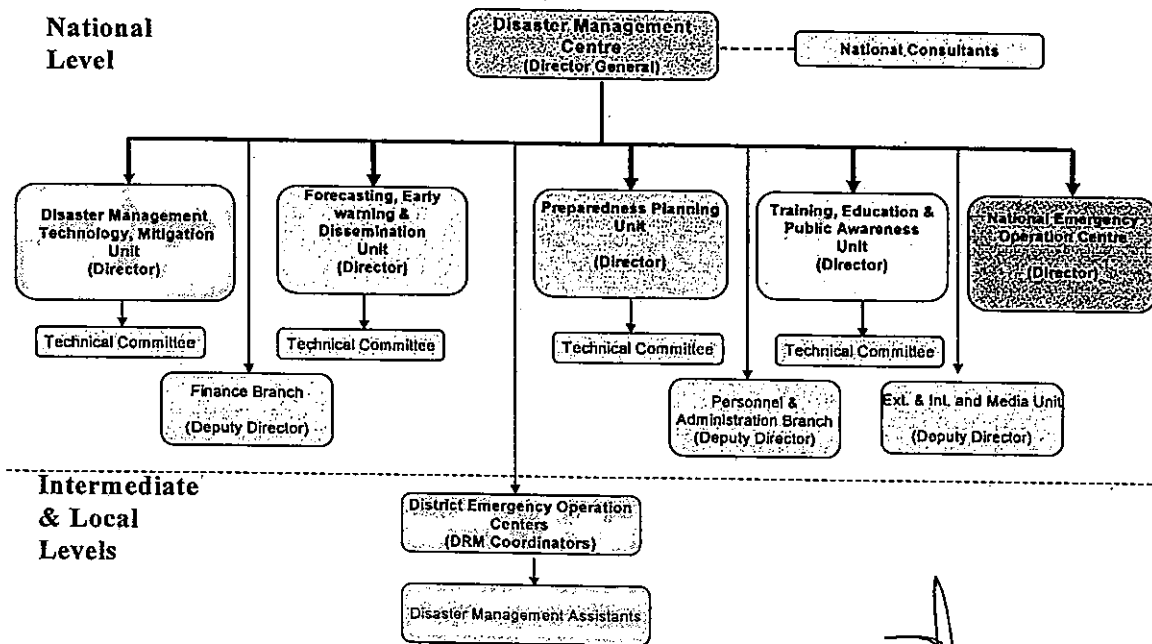
Location Map of Project Site

Handwritten marks including a large 'X' and a circled '9'.

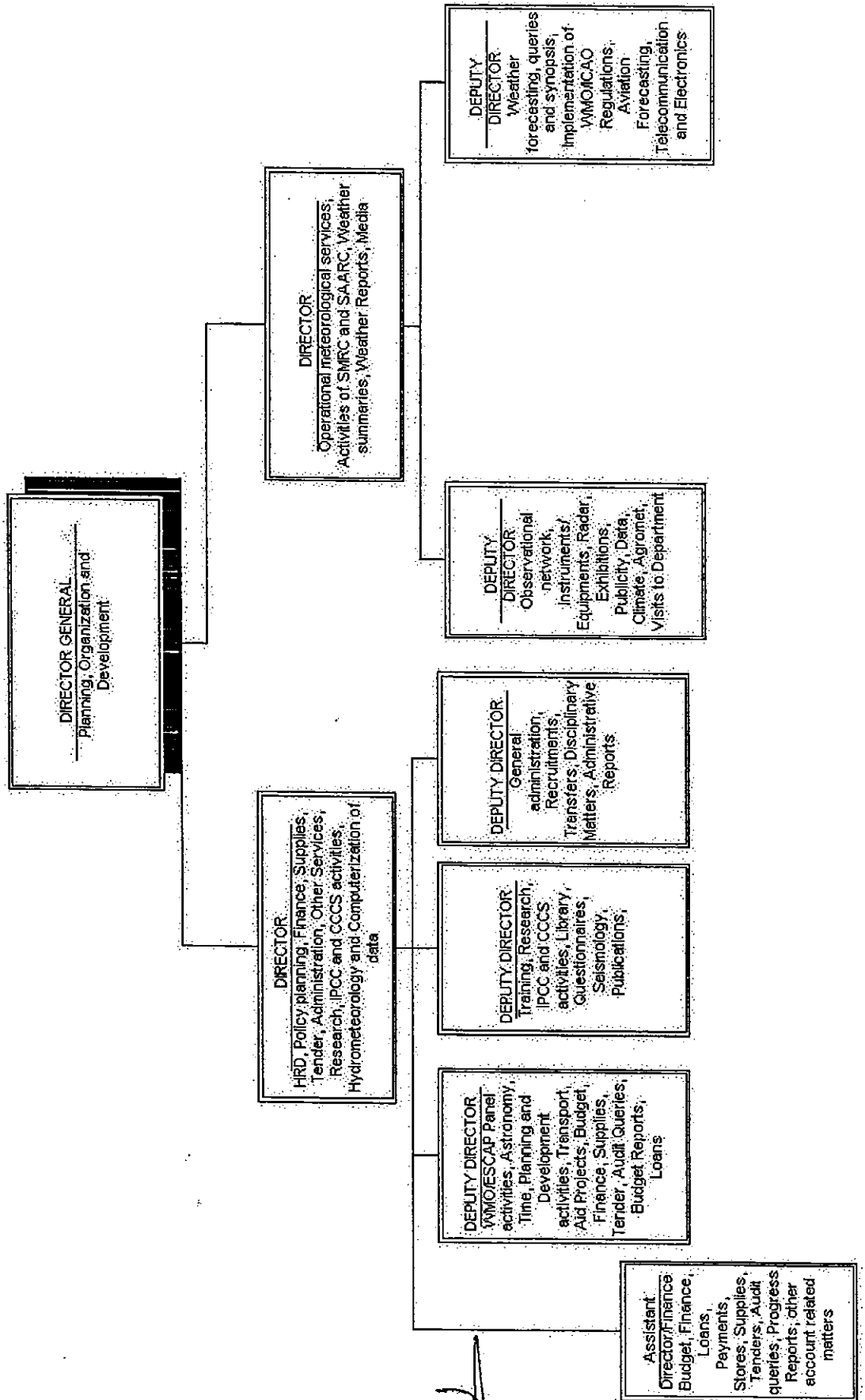
**Organization Chart of the  
Ministry of Disaster Management and Human Rights**



**Organization Chart of the Disaster Management Centre**



Organization Chart of the Department of Meteorology



10

3

**Requested items for Component-2**  
(Component-2: Meteorological observation system)

No.	Item	Quantity	Other remarks
<b>1. Automatic Weather Stations (14 stations)</b>			
1-1	Sensor (rainfall gauge, wind speed, wind direction, air temperature, humidity, air pressure, solar radiation)	14	Items and quantity will be considered due to the situation of each station.
1-2	Sensor pole / Sensor collector	14	
1-3	Logger	14	
1-4	Remote terminal unit (RTU)	14	
1-5	Transmission Equipment	14	
1-6	Operation terminal	14	
1-7	Printer	14	
1-8	Power supply facility	14	
1-9	Shelter	14	
<b>2. Synoptic Meteorological Stations (20 stations)</b>			
2-1	Sensor (rainfall gauge, wind speed, wind direction, air temperature, humidity, air pressure, solar radiation)	20	
2-2	Sensor pole / Sensor collector	20	
2-3	Logger	20	
2-4	Remote terminal unit (RTU)	20	
2-5	Transmission Equipment	19	Except Colombo Station
2-6	Operation terminal	20	
2-7	Printer	20	
2-8	Power supply facility	20	
<b>3. DOM Head Office</b>			
3-1	Transmission Equipment	2	① Stations → DOM ② DOM → DMC
3-2	Communication Control Unit (CCU)	1	
3-3	Central operation terminal	1	
3-4	File server	1	
3-5	Web server	1	
3-6	Router	1	
3-7	Switching Hub	1	
3-8	Laser color printer	1	
3-9	Power supply facility	1	
<b>4. Disaster Management Center (DMC)</b>			
4-1	Transmission Equipment	1	DOM → DMC
4-2	Central operation terminal	1	
4-3	Power supply facility	1	

## JAPAN'S GRANT AID

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

### 1. Grant Aid Procedures

Japan's Grant Aid scheme is executed through the following procedures:

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

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

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

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

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

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



## 2. Basic Design Study

### (1) Contents of the study

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

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

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

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

### (2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA. The consultant firm(s) used for the Study is (are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency.

### 3. Japan's Grant Aid Scheme

#### (1) Exchange of Notes (E/N)

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

(2) "The period of the Grant Aid" means the one fiscal year, which the Cabinet approves, the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed. However, in case of delays in delivery, installation or construction due to unforeseen factors such as national disaster, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

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

#### (4) Necessity of "Verification"

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

#### (5) Undertakings required of the Government of the Recipient Country

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

- a) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction,
- b) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites,
- c) To secure buildings prior to the procurement in case the installation of the equipment,

3

- d) To ensure all the expenses and prompt <sup>or</sup> ~~excursion~~ for unloading, customs clearance at the port of disembarkation of the products purchased under the Grant Aid,
- e) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts,
- f) To accord Japanese nationals, whose services may be required in connection with the supply of the products and services under the Verified contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

(6) "Proper Use"

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

(7) "Re-export"

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

(8) Banking Arrangements (B/A)

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

(9) Authorization to Pay (A/P)

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

(End)

**Major undertakings to be taken by each Government**

No.	Items	To be Covered by Grant Aid	To be Covered by Sri Lankan Side
1	To secure buildings and land		●
2	To clear, level and reclaim the site when needed		●
3	To construct gates, fences and utilities in and around the site when needed		●
4	To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
5	To ensure unloading and customs clearance at port of disembarkation in Sri Lanka		
	1) Marine (Air) transportation of the products from Japan to Sri Lanka	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	●	
6	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 Sri Lanka and stay therein for the performance of their work		●
7	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Sri Lanka with respect to the supply of the products and services under the verified contracts		●
8	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
9	To bear all the expenses, other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment		●
10	To coordinate and solve any issues related to the Project which may be raised from third parties or inhabitants in the Project during implementation of the Project		●

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





**QUESTIONNAIRE ON DISASTER MANAGEMENT NETWORK  
FOR DMC AND RELATED NATIONAL INSTITUTIONS**

**1. General**

The following information is required for the Study of the Project.

- 1) Role or duty of the individual institutions related to the national disaster management, particularly, relation between National Disaster Management Center (NDMC) and Disaster Management Center (DMC) should be clarified. Individual responsible duty and role, related laws or regulations which define the duty also should be clarified.
- 2) Organization Structure of individual National Institutions, and responsible section, department, or division for this Project, contact personnel, telephone number, e-mail address for individual National Institutions.
- 3) Physical address, the building, and the room of individual National Institutions where the equipment is to be installed.

**2. Expected Benefit and Effects of the Project**

It should be specified the prospective direct benefit or effectiveness to be obtained after completion of the planned Disaster Management Network. It should be mentioned as much as specifically.

**3. Necessary Warnings and Information on Disaster Management**

Among the related national institutions, the following information should be clarified in the existing conditions and planning concept respectively as attached form.

- What kind of information/warning is required to transmit/receive from/to which national institutions?
- Update intervals of the above information/warnings during emergency situation of natural disaster

Such information is required to fill up in the attached form.

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#### 4. Agreement among the concerned Organizations

Acquisition of agreement among the concerned organizations/institutions for the planned network should be required. It should be specified the contents, cost burden, role and responsible activities of each organization/institutions in the agreement.

#### 5. Outline of the Project and Request

The items and contents to be requested for Japan's Grant Aid among the planned network should be clarified and confirmed. This also should be agreed by the related organizations/institutions. The following explanations should be provided.

- Outline of the System

The brief explanation of the system or equipment to be requested should be specified

- Breakdown of the Expected Equipment

The breakdown of the equipment, and each quantity should be provided.

- Operation and Maintenance

It should be specified that how the requesting equipment can be operated or maintained in order to keep the sustainable operation. The financial source of operation and maintenance should be clarified.

- Cost Estimation

Approximate total project cost should be specified.



## 6. Budget/Financial Aspect of National Institutions

Detailed budget (staff and manpower, investment, operation and maintenance, administration overhead, etc.) for the past 5 years for DMC and related all National Institutions.

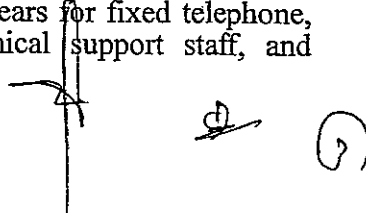
- O&M: utility charge, telecommunications charge, Internet related charge, consumable items, and other O&M
- Investment: Other donors cooperation, own budget, and information on planned cooperation of other donors

## 7. Organizations of National Institutions

It should be specified that the number of personnel of individual national institutions with breakdown of administration staff, engineers, technical support staff, etc.

## 8. Information on the Existing Information and Communication Network

- 1) Information on the existing telecommunications lines, Internet connection, and network conditions in headquarters of individual related National Institutions.
  - Number of personnel (Administration personnel, technical personnel, supporting personnel, others)
  - Number of fixed telephone lines: \_\_\_\_\_ lines
  - Number of cellular mobile phones for the own personnel.  
\_\_\_\_\_ Phones.
  - Internet access bandwidth \_\_\_\_\_ (Mbps/Kbps)
  - Internet Access Method (Dial up/ADSL/Optical Fiber), Is it dedicated lines or shared lines?
  - Do you maintain the own server? (Yes/No) If yes, is it mail server, web server, file server, or others? (Please specify the objectives: \_\_\_\_\_)
  - Type and capacity of LAN. (Wired/Wireless, 10Mbps/100Mbps/others)
  - How many PC is provided for your own personnel?
  - How many mail accounts are operating?
  - How many technical support personnel are working on Internet connection and/or operation of LAN?
  - Annual budget and actual expenditure in the past five (5) years for fixed telephone, cellular mobile phones, Internet connection, own technical support staff, and



outsourced maintenance cost. Please specify whole institutions, head quarters, other regional/local offices respectively.

- 2) Telecommunications line/circuit fault conditions of each National Institutions for headquarters or other offices where the network access point is located.

Occurrence of line/circuit fault: \_\_\_\_\_ times/ year

(Normal Operation case: \_\_\_\_\_ times /Emergency case: \_\_\_\_\_ times)

Causes of circuit fault: \_\_\_\_\_

Time taken for recovery:

Average: \_\_\_\_\_ hours                      Longest \_\_\_\_\_ hours

Affected Problems: \_\_\_\_\_





Information to be Transmitted/Received through the Disaster Management Network  
under Emergency Situation within the Central Level (Existing Condition)

	DMC	DOM	NARA	GSMB	Police CC	Navy	Media
DMC		→Ri(image)/3h → WAWWW(text)/1h					
DOM	Ri(image)/3h→ WAWWW(text)/1h →		Ri(image)/3h→ WAWWW(text)/1h →	Ri(image)/3h→ WAWWW(text)/1h →	Ri(image)/3h→ WAWWW(text)/1h →	Ri(image)/3h→ WAWWW(text)/1h →	Ri(image)/3h→ WAWWW(text)/1h →
NARA							
GSMB							
Police CC							
Navy							
Media							

Legend  
 \*\*\*\*(##)/+++ : Contents of Information/Direction(Type of Information)/Update Intervals  
 →\*\*\*\*() : Receiving Information/Direction

\*\*\*\*()→ : Transmitting Information/Direction

Type of Information  
 (voice) : Voice  
 (text) : Text  
 (image) : Image  
 (movie) : movie

Abbreviations  
 RI : Rain Information including rain fall; rain intensity, accumulated rain fall  
 RI&wl : Rain fall data observed by Department of Irrigation, and water level  
 WA : Weather Advisory  
 WW : Weather Warning  
 EI : Evacuation Instruction

Note : Please extend the above table when it is necessary.

Information to be Transmitted/Received through the Disaster Management Network  
under Emergency Situation within the Central Level (Planning Concept)

	DMC	DOM	NARA	GSMB	Police CC	Navy	Media
DMC		→RI(image)/3h → WAWWW(text)/1h					
DOM	RI(image)/3h→ WAWWW(text)/1h →		RI(image)/3h→ WAWWW(text)/1h →	RI(image)/3h→ WAWWW(text)/1h →	RI(image)/3h→ WAWWW(text)/1h →	RI(image)/3h→ WAWWW(text)/1h →	RI(image)/3h→ WAWWW(text)/1h →
NARA							
GSMB							
Police CC							
Navy							
Media							

Legend  
 \*\*\*((##))/+++ : Contents of Information/Direction (Type of Information)/Update Intervals  
 →\*\*\*\*() : Receiving Information/Direction  
 \*\*\*\*()→ : Transmitting Information/Direction

Type of information  
 (voice) : Voice  
 (text) : Text  
 (image) : Image  
 (movie) : movie

Abbreviations  
 RI : Rain Information including rain fall, rain intensity, accumulated rain fall  
 RI&wl : Rain fall data observed by Department of Irrigation, and water level  
 WA : Weather Advisory  
 WW : Weather Warning  
 EI : Evacuation Instruction

Note : Please extend the above table when it is necessary.

**Minutes of Discussions**  
**on the Second Basic Design Study on the Project for**  
**Improvement of Meteorological and Disaster Information Network**

In October to November 2006, Japan International Cooperation Agency (hereinafter referred to as "JICA") sent a Basic Design Study Team to the Democratic Socialist Republic of Sri Lanka (hereinafter referred to as "Sri Lanka") on the Project for "Improvement of Meteorological and Disaster Information Network" (hereinafter referred to as "the Project").

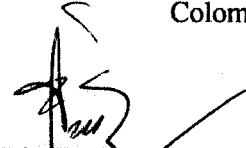
Further study was conducted in Japan, and JICA decided to conduct a second Basic Design Study headed by Mr. Takumi Ueshima, Resident Representative of the JICA Sri Lanka Office, from February 12 to March 9, 2007.

The Team held discussions with the concerned officials of the Government of Sri Lanka and conducted a field survey in the study area. As the result of the discussions and field survey, both sides have confirmed the main items described in the attached sheets. Also, this Minutes shall be distributed to the organizations listed below, and be confirmed with a countersign. The Team will proceed to further works and prepare the Basic Design Study Report.

Colombo, Mar. 15, 2007



Takumi Ueshima  
Leader  
Basic Design Study Team  
Japan International Cooperation Agency



Peter Dias Amarasinghe  
Secretary  
Ministry of Disaster Management  
and Human Rights



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

**Distribution:**

1. Eng. D.M.S. Samarasekara, Director General, Department of Irrigation,  
*Mr. M.K. Ilangakoon, Senior Deputy Inspector General of Police, Ranges IV* Ministry of Irrigation and Water Management *MANO*
2. ~~Mr. H.A.J.S.K. Wickramaratna, Senior Deputy Inspector General, Sri Lanka Police~~ *for* *Ranges I*
3. Mr. Sunil Sarath Perera, Chairman, Sri Lanka Broadcasting Corporation *[Signature]*
4. Dr. Ariyaratne Athugala, Chairman, Sri Lanka Rupavahini Corporation *[Signature]*

## ATTACHMENT

### 1. Overall Issue

Both sides agree that the items confirmed in the previous Minutes of Discussion signed on November 1, 2006 shall remain valid, except for the matters specified in this document.

### 2. Project Sites

The project sites for Component-1 are shown in Annex-1-a. The project sites for Component-2 are shown in Annex-1-b. Both sides agree that this is the final decision, and neither modification nor addition of the site will be accepted hereafter. Also, Sri Lankan side understands that the project sites will be prioritized and may be limited to the high priority areas, from the perspective of urgency and necessity for disaster management.

### 3. Items Requested by the Sri Lanka Government

- 1) After discussions with the Team, the components described in Annex-2-a for Component-1 and Annex-2-b for Component-2 were finally requested by the Sri Lankan side. Both sides agree that this is the final decision, and neither modification nor addition of the request will be accepted here after. JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.
- 2) For the additional request of dedicated lines to District Offices, it was confirmed that the connecting point should be the District Disaster Management Coordination Unit (DDMCU). However, after the field survey at the offices, the Team concluded that using VSAT for data transmission will not be an appropriate option at present for maintenance reasons, and DMC agrees to utilize a data communication operator's service for dedicated connection between the Emergency Operation Centre in DMC and the DDMCUs.
- 3) For the additional request of telephone and facsimile machines, the Team confirmed that those equipments are presently available at the proposed DDMCUs. Also, the standalone PC used at DDMCU does not need to be connected to the local access network, which concludes that a file server will not be necessary. As a result, both sides agree that telephone and facsimile machines, as well as file server for DDMCU will not be included in the final request.
- 4) For the additional request of Systems for Forecasting, both sides agree that the items are out of the scope of Component-2 of the Project, which concentrates on collecting accurate and on-time weather data to utilize for early warning and disaster management, and therefore will not be included in the final request.

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#### 4. Japan's Grant Aid Scheme

Sri Lankan side understands the Japan's Grant Aid scheme and the necessary undertakings to be taken by the Government of Sri Lanka as explained by the Team and described in Annex-4 and Annex-5 of the Minutes of Discussions signed by both sides on November 1, 2006.

#### 5. Schedule of the study

- 1) JICA will prepare the draft report in English and dispatch a mission to Sri Lanka in order to explain its contents around May, 2007.
- 2) In case that the contents of the report are acceptable in principle to the Government of Sri Lanka, JICA will complete the final report and send it to Sri Lanka by the end of June, 2007.

#### 6. Other Relevant Issues concerning Component-1

##### 1) Overall Responsibility of the Organizations Concerned

Disaster Management Centre (DMC), Department of Meteorology (DOM), Department of Irrigation (DOI), National Building Research Organization (NBRO), Sri Lanka Police (SLP), Sri Lanka Broadcasting Corporation (SLBC), and Sri Lanka Rupavahini Corporation (SLRC) (hereinafter referred to as "the concerned organizations"), shall be aware of and take full responsibility for the role which each of the organization shall take, to achieve the objective of the Project. The functions of the information network and the position of each organization are as described in Annex-3.

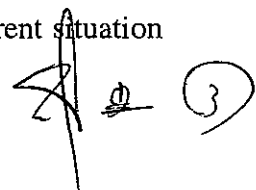
Moreover, DMC shall be responsible for the coordination among the concerned organizations

##### 2) Data Communication System

As the result of the survey and study, the Team proposed to utilize a data communication operator's service to build a network among the concerned organizations. The Sri Lankan side agrees with the idea, and DMC will be responsible to appoint a suitable data communication operator to establish a closed network among the concerned organizations. Also, DMC shall provide and maintain the connectivity between DMC Emergency Operation Centre and the seven proposed DDMCUs.

Allocation of sufficient budget by the Sri Lankan side to engage into a contract including the maintenance service with a data communication operator, and to develop suitable contents for distribution among the concerned organizations are also mandatory for the realization of Component-1. These arrangements shall be made prior to the commencement of Component-1. The Grant Aid usually requires the start up arrangements to be completed before the approval of the Project.

For the equipment requested for Japan's Grant Aid, considering the current situation



of Component-1 and the fact that JICA development study on “the Comprehensive Study on Disaster Management” is ongoing to design and assist the implementation of the necessary contents to be distributed and shared among the concerned organizations, and also that the local procurement of the necessary equipment will not be a problem, the Team feels the necessity to consider other schemes of cooperation as well. The Team will consult in Japan with other JICA departments for other suitable cooperation options for Component-1.

### 3) Equipment Installation

Securing adequate space for the equipment to be provided under Japan’s Grant Aid is indispensable to implement the Project. The concerned organization shall all be prepared for the installation before the arrival of the equipment.

Especially for the installation space at DMC, the Sri Lankan side guarantees to start the construction of the DMC’s new building by May 2007, and complete the construction by March 2008. Also, if there will be any change in the layout plan of the building, DMC shall inform the Japanese side promptly.

### 4) Sustainability of the Project

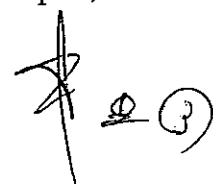
- Sri Lankan side agrees to allocate sufficient budget and qualified staff for proper and effective operation and maintenance of the equipment to be provided under Japan’s Grant Aid. Necessary budget amount will be considered by the Japanese side and be stated in the report of the study.
- Each of the concerned organization shall secure sufficient budget and hold responsibility to maintain and operate the equipment installed in their organization. Shall any trouble occur to the equipment or network, all organization agrees to take necessary measures to restore the function.
- If any of the concerned organization is to be relocated to another place, Sri Lankan side shall be responsible for the relocation of the equipment and reconnection to the network. Also, future improvement / replacement of the equipment shall be implemented by the Sri Lankan side with its own finance from the viewpoint of self-reliance.

## 7. Other Relevant Issues concerning Component-2

### 1) Security Measures

The Team explained to the Sri Lankan side that the Japanese side is presently considering to pass over the equipment provided by Japan’s Grant Aid at Colombo and subsequently to be installed by the Sri Lankan side, in case the installation work may not be taken during the Project period due to security reasons. In that case, DOM shall be responsible for the installation work.

The Japanese side will conclude this consideration in the draft of the final report, and the contents shall be agreed during the draft report explanation mission.

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## 2) Land Preparation

Both sides agreed in the first Basic Design Study mission that the Sri Lankan side shall complete the official land ownership acquisition or agreement of the usage of land from the landowner for each meteorological observation station by the end of February, 2007. However, the procedures are still under process for most of the project sites.

Sri Lankan side agrees that if the documents are not available by the draft report explanation mission, the particular site will be eliminated from the Project.

## 3) Meteorological Observation Network

From the review and study conducted in Japan, the Japanese side proposed using a satellite system for the communication method for sending the data between each observation station and DOM head office. Sri Lankan side agrees with this plan, and also agrees to complete the following works in accordance to the schedule of the Project;

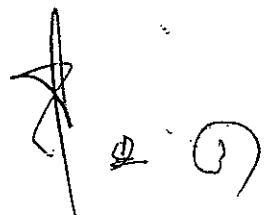
- To obtain the frequency allocation for the VSAT, from the Telecommunications Regulatory Commission.
- To provide necessary space segment for satellite communication under a contract with a satellite operator before the installation of the equipment.
- To secure necessary budget to maintain the satellite communication in advance to the maintenance and operation of the equipment provided by Japan's Grant Aid.

## 4) Others

Sri Lankan side guarantees to provide any assistance to the Japanese side to obtain necessary permissions at the Project sites, to carry on the study as well as the implementation of the Project.

## 8. Summarization of the Undertakings concerning the Project

Summary of the undertakings to be covered by the Sri Lankan side is described and attached as Annex-4.



### Project Site for Component-1

#### Address of the Concerned Organizations for Disaster Management Network

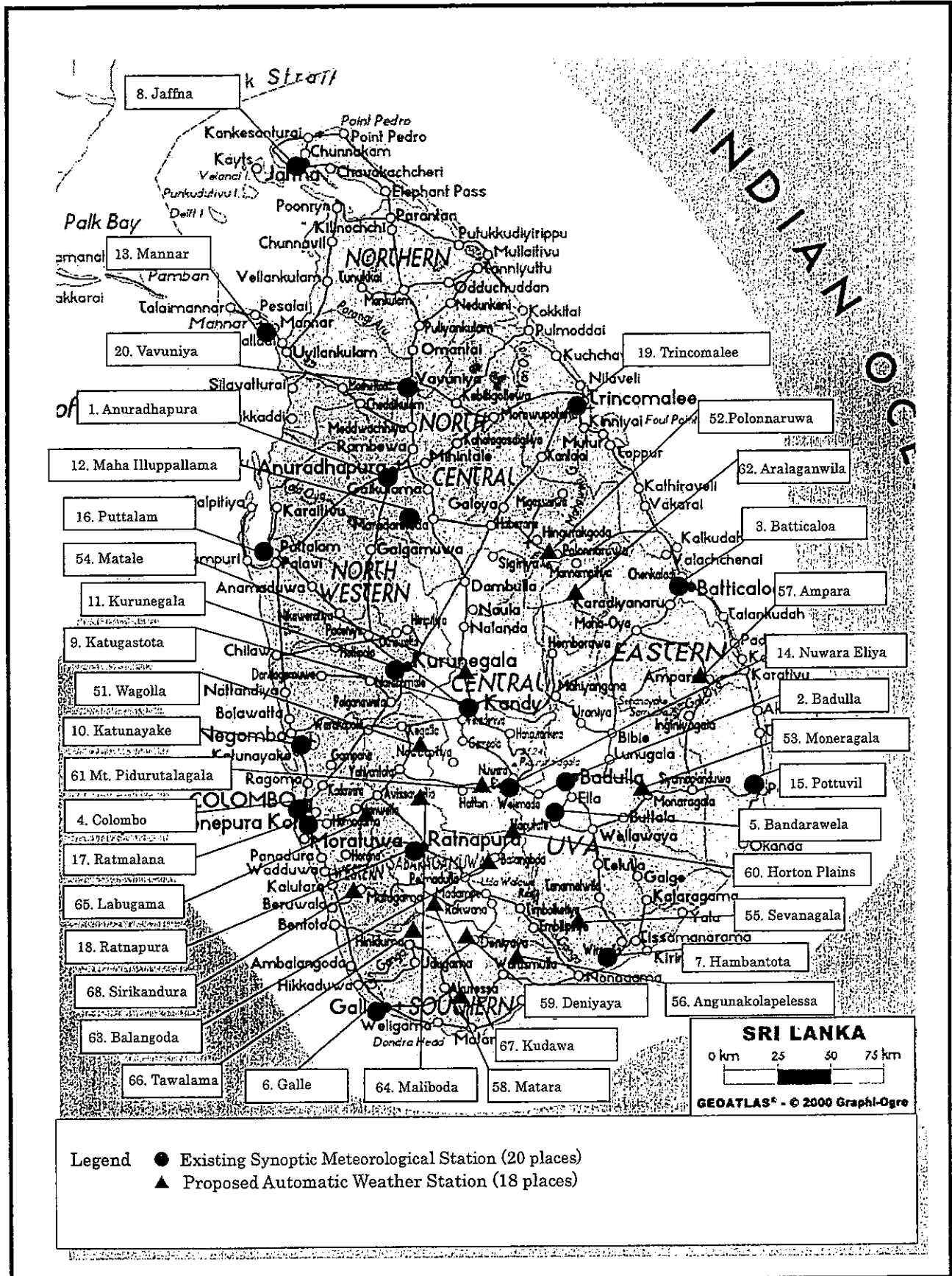
Organization	Address of the Organization
DMC	Sir. James Peiris Mawatha Colombo 2
DoM	383 Bauddhaloka Mawatha, Colombo 7
DOI	238 Bauddhaloka Mawatha Colombo 7
NBRO	99/1, Jawatte Road, Colombo 5
SLP	Inspector General's Command & Information Division, Mirihana
SLRC	Independence Square, Colombo 7
SLBC	Independence Square, Colombo 7

#### Address of District Disaster Management Coordinating Unit (DDMCU) for 7 districts

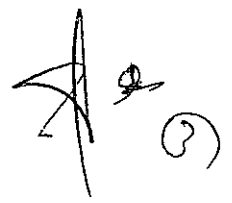
District	Address of the DDMCU
Matara	District Secretariat, Fort, Matara
Galle	448/A Colombo Road Gintota, Galle
Kalutara	District Secretariat Kalutara
Ratnapura	Old Divisional Secretariat Office Building, Ratnapura
Colombo	District Secretariat Colombo
Kegalle	District Secretariat Kegalle
Gampaha	District Secretariat Gampaha

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Location Map of Project Site of Component-2



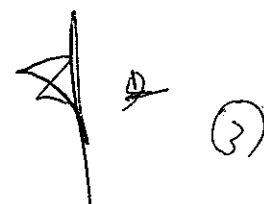
**Requested items for Component-1**

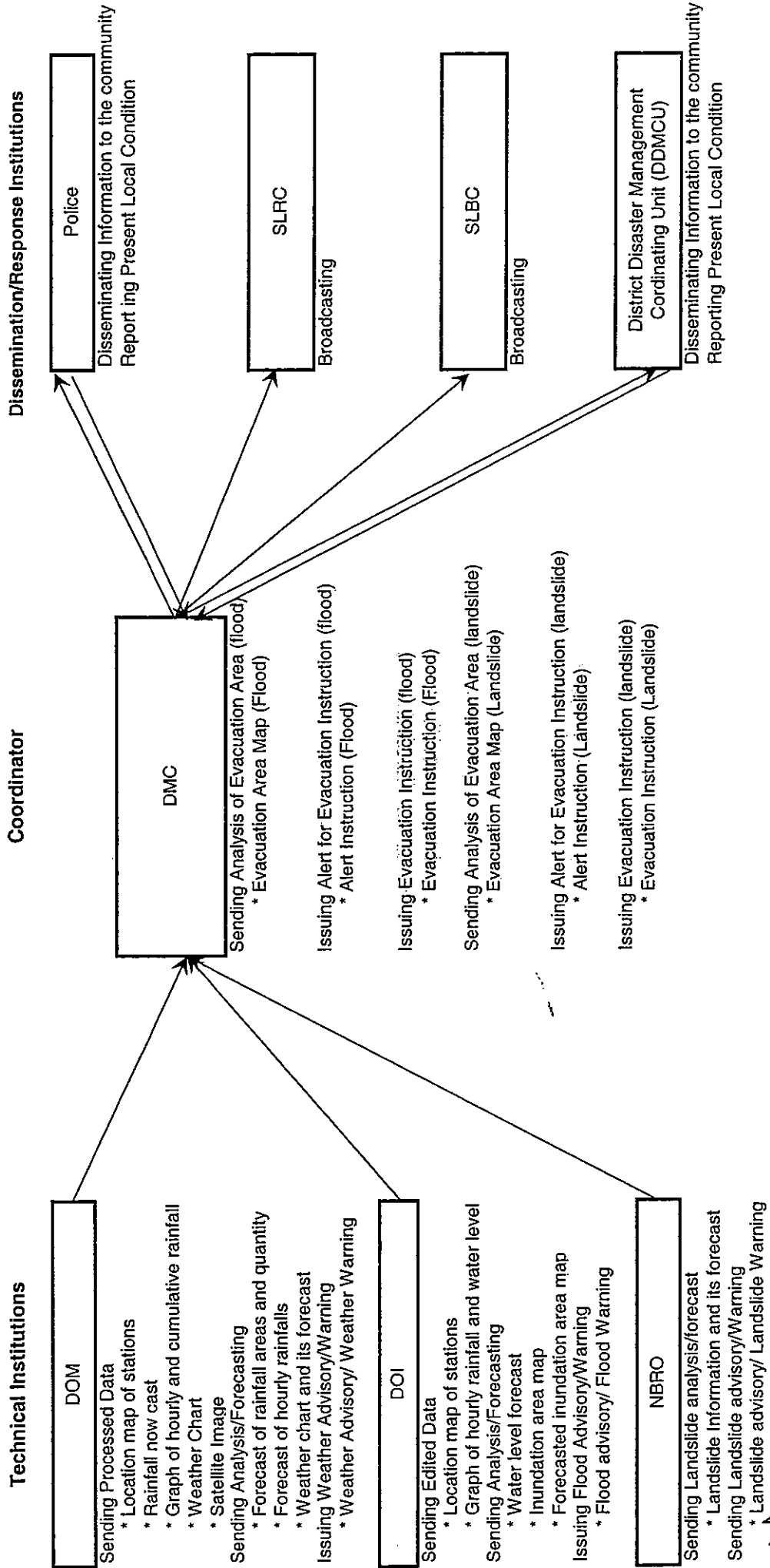
(Component-1: Communication Network System among the relevant institutions)

No.	Item	Quantity	Other remarks
<b>1. Disaster Management Centre (DMC)</b>			
1-1	Web Server	1	
1-2	Monitoring Equipment	1	
1-3	VoIP Phone	1	
<b>2. Department of Meteorology (DOM)</b>			
2-1	Monitoring Equipment	1	
2-2	VoIP Phone	1	
<b>3. Department of Irrigations (DOI)</b>			
3-1	Monitoring Equipment	1	
3-2	VoIP Phone	1	
<b>4. National Building Research Organization (NBRO))</b>			
4-1	Monitoring Equipment	1	
4-2	VoIP Phone	1	
<b>5. Sri Lanka Police (SLP)</b>			
5-1	Monitoring Equipment	1	
5-2	VoIP Phone	1	
<b>6. Sri Lanka Broadcasting Corporation (SLBC)</b>			
6-1	Monitoring Equipment	1	
6-2	VoIP Phone	1	
<b>7. Sri Lanka Rupavahini Corporation (SLRC)</b>			
7-1	Monitoring Equipment	1	
7-2	VoIP Phone	1	
<b>8. District Disaster Management Coordination Units (DDMCUs)</b>			
8-1	Monitoring Equipment	7	
8-2	VoIP Phone	7	

**Requested items for Component-2**  
(Component-2: Meteorological observation system)

No.	Item	Quantity	Other remarks
<b>1. Automatic Weather Stations (18 stations)</b>			
1-1	Sensor (rainfall gauge, wind speed, wind direction, air temperature, solar radiation)	18	
1-2	Sensor pole / Sensor collector	18	
1-3	Logger	18	
1-4	Remote terminal unit (RTU)	18	
1-5	Transmission Equipment	18	
1-6	Power supply facility	18	
1-7	Spare parts	-	
<b>2. Synoptic Meteorological Stations (20 stations)</b>			
2-1	Sensor (rainfall gauge, wind speed, wind direction, air temperature, humidity, air pressure, solar radiation)	20	
2-2	Sensor pole / Sensor collector	20	
2-3	Logger	20	
2-4	Remote terminal unit (RTU)	20	
2-5	Transmission Equipment	19	Except Colombo Station
2-6	Operation terminal	20	
2-7	Printer	20	
2-8	Power supply facility	20	
2-9	Spare parts	-	
<b>3. DOM Head Office</b>			
3-1	Transmission Equipment	1	
3-2	Communication Control Unit (CCU)	1	
3-3	Central operation system	1	Including analysis and display system
3-4	Router	1	
3-5	Switching Hub	1	
3-6	Printer	1	
3-7	Power supply facility	1	
3-8	Spare parts	-	





Role and Relationship of the Concerned Organizations on Disaster Management Information

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### Contents of Disaster Management Information and Development Schedule

Organization	Activities	Shearing Information/Contents	Completion Target
DoM	Data Processing	* Location map of stations (42kB) * Rainfall now casting (55kB) * Graph of hourly and cumulative rainfall (15kB x 15) * Weather Chart (53kB) * Satellite Image (250kB) Number of browsing graph is supposed 15	To be developed by JICA Grant Aid Project or Obtained by the Existing System
	Analysis/Forecasting	* Forecasting of rainfall area and quantity (50kB) * Forecasting of hourly rainfall (50kB) * Weather chart and its forecasting (53kB)	To be developed by JICA Grant Aid Project
	Issuing of Weather Advisory/Warning	* Weather Advisory/ Weather Warning	To be developed by JICA Grant Aid Project
DOI	Data Editin	* Location map of stations (125kB x 3) * Graph of hourly rainfall and water level (25kB x 15) 15 observation stations graph in 3 river basin is supposed to browse.	To be developed under Pilot Project of JICA Comprehensive Study
	Analysis/Forecasting	* Water level forecasting (40kB x 15) * Inundation area map (70kB x 3) * Forecasted inundation area map (70kB x 3)	
	Issuing of Flood Advisory/Warning	* Flood advisory/ Flood Warning	
NBRO	Landslide analysis/forecasting	* Landslide Information and its forecasting (70kB x 3)	<i>To be confirmed</i>
	Landslide advisory/Warning	* Landslide advisory/ Landslide Warning (85kB x 3)	
DMC	Analysis of Evacuation Area for flood	* Map showing Evacuation Area (Flood) (85kB x 3)	To be developed under Pilot Project of JICA Comprehensive Study
	Issuing of alert for evacuation instruction (flood)	* Alert Instruction (Flood) (85kB x 3)	
	Issuing of Evacuation Instruction (flood)	* Evcuation Instruction (Flood) (85kB x 3)	
	Analysis of Evacuation Area for landslide	* Map showing Evacuation Area (Landslide) (85kb x 3)	<i>To be confirmed</i>
	Issuing of alert for evacuation instruction (landslide)	* Alert Instruction (Landslide) (85kB x 3)	
	Issuing of Evacuation Instruction (landslide)	* Evacuation Instruction (Landslide) (85kB x 3)	





**Project Implementation Schedule and Necessary Undertakings**

	2007												2008			2009									
	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>DMC</b> Building Construction Approval of the Cabinet Designing & Construction Contract with a Data Communication Operator for Disaster Management Communication Network Preparation of the Budget Tender Contract		◆																							
<b>DoM</b> Obtaining official permission for land usage of each meteorological observation stations Obtaining of License on Frequency Allocation from TRC Budget Preparation for Satellite Communication (VSAT) Submission of Application Obtaining of License Clearance of Ministry of Defense on VSAT Installation Contract with Satellite Operator (VSAT) Confirmation of Contract Condition (Frequency & Cost) Budget Preparation for Satellite Communication (VSAT) Signing of Contract with Satellite Operator					◆			◆									◆								
<b>Implementation Schedule of the Project (tentative)</b> Explanation and Confirmation of Draft Final Report of Basic Design Study Submission of Final Report of BD Study Approval by the Cabinet of Japan E/N D/D Preparation of Tender Documents Distribution of Tender Document Tender Opening Manufacturing & Installation			□	◆		★																			

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**Minutes of Discussions**  
**on the Basic Design Study on the Project for**  
**Improvement of Meteorological and Disaster Information Network**  
**(Explanation of Draft Final Report)**


From October to November 2006, and February to March 2007, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Basic Design Study Team on the Project for Improvement of Meteorological and Disaster Information Network (hereinafter referred to as "the Project") to the Democratic Socialist Republic of Sri Lanka (hereinafter referred to as "Sri Lanka"), and through discussions, field surveys, and technical examination of the results in Japan, JICA prepared a Draft Final Report of the Study.

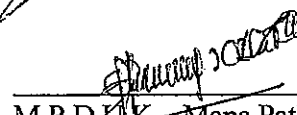
In order to explain and to consult with concerned officials of the Government of Sri Lanka on the contents of the Draft Final Report, JICA sent to Sri Lanka the Draft Report Explanation Team (hereinafter referred to as "the Team"), which is headed by Mr. Hideki Sakata, Deputy Resident Representative of JICA Sri Lanka Office, from May 24 to 31, 2007.

As a result of discussions, both sides confirmed the main items described on the attached sheet.

Colombo, May 30, 2007

  
\_\_\_\_\_  
Hideki Sakata  
Leader  
Basic Design Study Team  
Japan International Cooperation Agency

  
\_\_\_\_\_  
Peter Dias Amarasinghe  
Secretary  
Ministry of Disaster Management  
and Human Rights

  
\_\_\_\_\_  
M P D U K Mapa Pathirana  
Director – Japan Division  
Department of External Resources  
Ministry of Finance and Planning

## ATTACHMENT

### 1. Contents of the Draft Final Report

The Sri Lankan side has agreed and accepted in principle the contents of the draft final report explained by the Team.

Especially, both sides have agreed that the requested equipment for the Communication Network System among the relevant institutions (Component-1) is to be separated from this Project and to be implemented as part of the pilot project of the JICA development study "Comprehensive Study on Disaster Management"

### 2. Implementing Agency

In response to the above agreement, both sides have agreed that the implementing agency will be the Department of Meteorology (DOM) for the Project.

### 3. Japan's Grant Aid Scheme

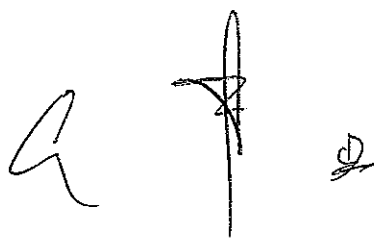
The Sri Lankan side has reconfirmed the Japan's Grant Aid scheme and the necessary undertakings to be taken by the Government of Sri Lanka as explained by the Team and described in Annex-4 and Annex-5 of the Minutes of Discussions signed by both sides on November 01, 2006.

### 4. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items and forward it to the Government of Sri Lanka by July, 2007.


### 5. Other Relevant Issues

- 1) It was agreed that the equipment provided for project sites in Ampara, Batticaloa, Jaffna, Mannar, Pottuvil, Trincomalee and Vavuniya be handed over to the Sri Lankan side in Colombo. Sri Lankan side agreed to allocate adequate budgetary provisions and make arrangements to complete installation and commissioning of these equipments within one year of the completion of the Project (currently due to complete in March 2009).
- 2) The Sri Lankan side has understood the schedule of the Project after signing of the Exchange of Notes (E/N) and agrees to complete the required procedures indicated below before the disembarkation of the products in June 2008.
  - Acquisition of the license on frequency allocation from the Telecommunication Regulatory Commission (TRC).





- Acquisition of the satellite communication by contracting with a satellite operator.
  - Installation of fence around the project site of Maliboda and Tawalama.
  - Allocation of 5 technical staff of DOM for the installation, maintenance and operation of the system.
  - Prompt tax exemption and customs clearance of the procured equipment.
- 3) The Sri Lankan side agreed to assign an appropriate number of counterpart personnel to work with Japanese counterparts during installation and testing of the procured equipment to obtain the skills necessary to install, commission and maintain the system. The Sri Lankan side (including the institutions joining the Disaster Management Network) shall also assign an appropriate number of counterpart personnel during the soft component (technical assistance) period to obtain the skill of proper operation (and maintenance) of the system introduced by the Project.
- 4) Both sides have agreed that the Project Cost Estimation, as attached as Annex, should neither be duplicated nor release to outside parties before the signing of all Contract(s) relating to the Project.
- 5) Both sides have agreed that the specifications of the equipment should neither be duplicated nor released to outside parties until the bidding documents are finalized.

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## ANNEX

### Project Cost Estimation

#### 1 Initial Cost Estimation

The initial project cost needed in the case of grant aid from Japan will be 803 million yen. The breakdown of the project cost according to the contribution sharing between Japan and Sri Lanka will be estimated as follows according to the estimation timing of March 2007. This amount does not indicate the exact amount of grant under the Exchange of Note.

##### (1) Japan's Contribution

Classification		Amount (million yen)
Equipment	Automatic weather observation systems, satellite communication system, central operating system	749
Detailed Design, Supervision, Soft Component		54
Total		803

##### (2) Sri Lanka's Contribution

Classification	Amount (thousand Rs)
Installation of Fence	630

#### 2 Operation and maintenance cost

The equipment pertaining to the meteorological information network system to be procured by this grant aid project mainly includes the automatic weather observation systems, communication equipment for transmitting weather observation data and the server for the central operation system, PCs and other electronic equipment. This will be a completely new system as they collect observation information manually and through ordinary telephone lines now. The project will result in increase of following items of operation and maintenance cost.

##### (1) Circuit cost for the satellite communication system

The circuit charge of the satellite communication system required for operation of the weather information network system is estimated Rs 1,940,000 per year.

(2) Radio frequency charge for the satellite communication

The satellite communication system will be composed of a hub station to be installed at the headquarters of Department of Meteorology (hereinafter referred to as "DOM") and terminal stations to be installed at Synoptic Meteorological Stations and Collaborator's Stations. Concerning use of radio frequency, it is necessary to pay the Telecommunications Regulatory Commission of Sri Lanka Rs 50,000 per year for a hub station and Rs 30,000 per year for one terminal-station. As there are 37 terminal-stations, the radio frequency charge including the hub station will be Rs 1,160,000 per year.

(3) Personnel cost

No additional personnel cost will accrue at Synoptic Meteorological Stations as the current observers will adapt to the new system. Six electronics engineers are needed for operating and maintaining round the clock the automatic weather observation systems, the satellite communication system and the central operating system to be newly introduced. DOM is going to increase 1 engineer and 4 technicians. The personnel cost will increase Rs 1,080,000 per year.

(4) Electricity charge

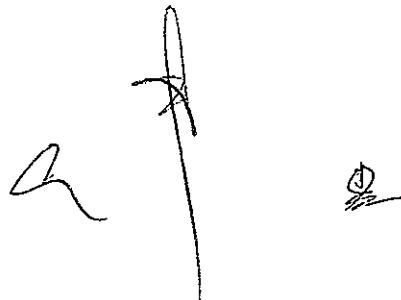
Additional power supply is required for the hub station and two servers and one PC of the central operating system installed at headquarters of DOM. The devices will consume 2kW in total, being translated into Rs 300,000 per year according to the tariff of the public power company of Sri Lanka.

(5) Cost of consumables

For calibration of the automatic weather observation system to be installed by the grant aid project, reagents for humidity calibration for one year are included. From the 2<sup>nd</sup> year on, Rs 11,262 per year will be needed to purchase the reagents.

The printers to be installed at each Synoptic Meteorological Stations will be ink jet printers and it will be necessary to replace the ink cartridges at least once a year. They will have 20 printers at the stations and two printers for the central operating system, 22 in total, requiring a cost of Rs 150,000 per year.

The description above is summarized in the table below.

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**Operation and Maintenance Cost of Procured Equipment (Unit: 1,000 Rs)**

Cost	1 <sup>st</sup> year	2 <sup>nd</sup> year on (percentage against actual expense in 2006)	Expense item and Actual amount of expense in 2006
Circuit cost for the satellite communication system	1,940	1,940 (39%)	Communication 5,000
Radio frequency charge for satellite communication system	1,160	1,160 (23%)	
Personnel cost	1,080	1,080 (1.7%)	Personnel 62,000
Electricity charge	300	300 (5%)	Power 6,000
Cost of consumables	150	162 (6%)	Consumable 2,650
<b>Total</b>	<b>4,630</b>	<b>4,642 (3.6%)</b>	<b>Total 127,000</b>

3 Necessary Installation after Completion of the Project

In this project, the equipment for 7 north and east sites will be handed over to Colombo headquarters of DOM. The equipment is requested to install, adjust, and test by Sri Lankan Side within one year after the Project completion. The necessary cost for this work is estimated Rs 1.94 million.

## **Appendix 5 Soft Component (Technical Assistance) Plan**

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# **1 Background of Implementing Soft component**

## **1.1 Project background**

Sri Lanka has strengthened initiatives against disasters triggered by the tsunami which hit the country's coast facing the Indian Ocean in December 2004 and executing legal system development, setting up organizations and implementing related projects.

This grant aid project is incorporated in the Road Map for Disaster Risk Management which lists the country's disaster risk management initiatives as specific projects. The Road Map for Disaster Risk Management is made up of seven components. Among the ten projects listed up in the Multi-hazard Early Warning System against various disasters as a component, high priority is given to projects for "Improvement of meteorological observation and forecasting" and "Establishment of early warning centre". The former is the superior plan of the meteorological information network improvement plan covered by the grant aid. The latter is the superior plan of communication network system interconnecting disaster management related organizations which are planned to be introduced in the pilot project of the early warning/evacuation component as part of the Comprehensive Study on Disaster Management, a development study of JICA.

The country's major climatic disasters are floods and landslides caused by rainfall. Rivers in the southwest including Kelani, Gin, Kalu and Nilwala are highly vulnerable to floods, for which urgent countermeasures must be taken. The torrential rain in 2003 caused extensive floods and landslide, inflicting damage to about 140,000 households and depriving 235 lives. Property damage amounted to about 56 million US dollars (5.4 billion rupees) which is equivalent to 0.3% of the country's GDP. In 2006, there were 38 cases of floods and landslides.

Presently, the Department of Meteorology (DoM) operates 20 synoptic meteorological stations nationwide. But as the observing appliances for wind direction and speed is of low precision, the obtained weather data is of low precision and insufficient reliability. DoM currently collects observed data every 3 hours from 20 synoptic meteorological stations at normal times and every 1 hour from relevant meteorological stations in the case of severe weather possibly leading to disaster. As the data is collected through ordinary telephone lines, it cannot be collected upon line congestion. This is a material problem in real-time identification of weather information and forecasting.

The project involves installation of automatic weather observation systems at twenty synoptic meteorological stations belonging to the DoM and eighteen collaborator stations supervised by organizations other than DoM, the satellite communication system to transmit to DoM the observed data obtained by automatic weather observation equipment, and edition and processing of collected observation data by a central operating system at DoM headquarters. These are collectively called meteorological information network system.

The project is expected to improve the current situation by introducing meteorological information network system as follows:

- Improvement of accuracy of automated observation elements
- Reduction of data collection time
- Improvement of meteorological observation density spatially and temporally and identification of weather phenomena in better detail thereby contributing to improve weather forecasting accuracy

It also expected to contribute to mitigate the disaster damage on flood and landslide by more accurate weather forecasting and warnings based on the real-time meteorological data to be obtained by the meteorological information network system.

Weather observation information, forecasts and warnings is important to be transmitted to the disaster management related organizations, people in general, and possibly affected residents in particular. The JICA Comprehensive Study on Disaster Management separately plans to introduce communication network system among the disaster management related organizations to transmit and share the information on disaster management, meteorological forecast, warning, and real-time observed data. This network system is planned to be managed by the Disaster Management Centre (DMC). This network system is expected to contribute to transmit the warnings to possibly affected areas promptly, precisely and certainly. The network system is also expected to share the data collected by meteorological information network system for forecast on flood, landslide, and evacuation area analysis.

## **1.2 Necessity of implementing the soft component**

Concerning the meteorological information network system to be introduced by the project, it is necessary to provide guidance for its operation and maintenance and to newly set up a work flow ranging from weather observation, data transmission, editing, and processing of the automatically collected data for analysis and forecast by forecasting officers because of the reason that DoM personnel of Sri Lanka have no experience in them. Related persons should also know how to obtain weather data in the case of disorder of the automatic weather observation systems and how to edit data at the headquarters.

Concerning disaster management responsibilities, DoM is to provide weather forecasting and to issue weather warnings, Department of Irrigation (DOI) to issue flood warnings, the National Building Research Organization (NBRO) to issue landslide warnings, and the police, the Sri Lanka Rupavahini Corporation (SLRC) and Sri Lanka Broadcasting Corporation (SLBC) to transmit warnings and the Disaster Management Center (DMC) to be responsible for issuing evacuation instruction and liaising with related organizations and District Disaster Management Coordinating



Units (DDMCUs). Also, the disaster management related organizations will share weather observation data of DoM. It is therefore necessary to educate them how to interpret weather observation data for forecasting and warning.

It is necessary to provide soft component including all of them for smooth setup of the introduced systems and securing the achievements of the project.

### **1.3 Organization for operation and maintenance**

Presently, the DoM mainly conducts manually forecasting, observation and communication. The system to be introduced by the project will automate observation and communication and enable automatic processing of data required for forecasting and analysis. It is therefore necessary to train the staff of the headquarters of DoM and regional synoptic meteorological stations for smooth transition to operation of the new system.

#### **(1) The job descriptions of the headquarters of DoM**

The communication center and the observation division is in charge of collecting, processing and editing observation data. The communication center is in charge of collecting data from regional synoptic meteorological stations by telephone and the observation division is in charge of observation at the headquarters in Colombo, processing and editing observed data and operation and maintenance of observation equipment.

After the project, the headquarters of DoM should be able to perform the following job descriptions.

Personnel of communication centre should learn the technology for operation and maintenance of the system by which observed data can be automatically collected by computer via a communication satellite.

Personnel of observation division should learn the technology for editorial management of computer-collected data, maintenance of the precision of DoM's observation equipment, and operation and maintenance.

Forecasters of forecasting division should analyze weather, create forecasts, warnings and other weather information to provide them to disaster management related organizations and the people in general.

Personnel of electronics engineering division should be able to maintain appliances used by the observation division, the communication center and the forecasting division.

After the project, domestic weather data can be obtained in real time by communication processing server and weather analysis and forecasting materials prepared by foreign meteorological organizations can be swiftly obtained by improved Global Telecommunication System (GTS). The

data and materials will be edited and processed by analysis processing server and provided on screen or as printed materials to the people in charge of forecasting. The forecasting division should learn the technology for swift analysis processing by smooth operation of the PC for forecasting meetings and transmit weather information such as weather forecasts and warnings to the people in general.

The project will enable transmission of the headquarters' analysis and forecast results to regional synoptic meteorological stations. It should guide them to properly understand transmitted weather information and forecast information when any weather disaster is expected to occur.

## **(2) The job descriptions of regional synoptic meteorological stations**

Presently, the staff of regional synoptic meteorological stations visually observe every three hours the observation items including wind direction/speed, barometric pressure, temperature, humidity, rainfall, solar radiation, weather, cloud amount and other weather phenomena, and inform the headquarters by telephone. Upon severe weather such as torrential rain, they make observation every hour under direction of the headquarters and inform related organizations of the weather information conveyed from the headquarters.

After the project, items such as wind direction/speed, barometric pressure, temperature, humidity, rainfall and solar radiation will be automatically observed and transmitted. Weather, cloud amount and visibility will be observed by the observers as before and transmitted via computers. Observers should learn the technology for operation and maintenance for smooth observation and operation of the system and equipment.

## **(3) Job descriptions relating to the disaster management related organizations**

After the project, information will be provided by the DoM to related organizations and the people through the communication network connecting seven disaster management related organizations configured by the pilot project as part of the JICA Comprehensive Study for Disaster management. The weather information and warnings are to be provided and maritime weather information and warnings concerning cyclone and low pressure analyzed by the meteorological information system introduced by the project. The information should be well understood by users as to how to properly use it and DoM should also prepare information corresponding to the needs of users.

The DoM provides weather observation data such as rainfall as well as forecasts, advisory and warnings. The police, the SLRC and the SLBC play the role of conveying weather information such as forecasts, advisory and warnings received to potentially affected areas and residents. The DOI, the NBRO and the DMC have the role of issuing warnings of flood, landslide and evacuation respectively. Weather information including forecasts and warnings as well as weather observation data such as rainfall are important input for analyzing for issuing warnings.

Therefore, DoM should exchange information with disaster management related organizations, explain the information provided to them and identify the needs of each organization for weather information.

## **2 Objectives of Soft Component**

The objectives of the soft component are shown below;

- 1) DoM can operate and maintain the meteorological information network system to be introduced under this Project
- 2) Disaster management related organizations (DMC, DoM, DOI, NBRO, Police, SLRC, SLBC, DDMCUs) can interpret shared meteorological observation data, forecast and warnings for proper utilization

## **3 Composition of the Soft Component**

The soft component to achieve the objectives above is the following two:

- 1) Operation and maintenance of the meteorological information network system for DoM; and
- 2) Soft component to enable disaster management related organizations to utilize the weather information provided by DoM.

We describe “achievements of the soft component,” “confirmation method of achievement,” “soft component program (input plan),” “assignment method of resources to implement the soft component,” “implementation schedule of soft component,” and “deliverables” below.

### **3.1 Soft component to operate and maintain the meteorological information network system**

#### **3.1.1 Achievement of the soft component**

The soft component activities are expected to achieve the following results concerning operation and maintenance of the meteorological information network system:

- (1) The automatically collected observation data will be edited and processed into materials for forecasting and analysis as well as for weather statistics. By enabling the staff of the communication center and the observation division to understand how to process the materials and to learn how to use the materials, they can properly provide to the forecasting division the materials for short-time forecasting and long-time climatic change analysis;
- (2) The meteorological information network system should be operated as an integrated system to maintain precision of observation equipment, to operate satellite communication system, and to process data by computer; The integrated system can be smoothly operated based on the manuals and training materials to be provided;

- (3) The introduced meteorological observation network system will enable real-time identification of weather phenomena and the training as part of the soft component will contribute to reduce time for weather analysis and forecasting and enable more accurate weather forecasts and warnings in accordance with the introduction of precise weather observation system; It will be possible to use the weather observation data and analysis/forecasting data upon occurrence of weather disaster to be used for improvement of forecasting technology as after-the-fact re-analysis materials;
- (4) The headquarters will learn the technology to identify and restore the automatic weather observation system through the satellite communication system, and it can do so by directing synoptic meteorological stations; By sharing information among the headquarters of DoM and regional synoptic meteorological stations concerning processing of disorders by disorder response manual, it will be possible to make proper judgment for disorder recovery and reduce time for it; and
- (5) Through the network connecting the disaster management related organizations to be separately provided under the pilot project of JICA Comprehensive Study and the network in DoM, it can provide information in consideration of flood and landslide damage appropriate for functions of the DMC, DOI, NBRO, the police, SLRC, SLBC, DDMCUs and regional synoptic meteorological stations.

### **3.1.2 Confirmation method of achievement**

- (1) Confirmation by results of exercises that the staff of the communication center and the observation division can edit and process the automatically collected observation data into materials required for analysis and forecasting and they are properly stored in the analysis server.
- (2) Confirmation by paper tests and results of exercises that the staff of the observation division and synoptic meteorological stations properly understood operation and maintenance of observation appliances. We will also confirm by paper tests and exercises that the communication center and the electronics engineering division properly understood operation and maintenance of the communication system.
- (3) Confirmation by results of exercises and paper tests using data of past cases that the staff of the forecasting division can properly issue forecasts and warnings, using materials processed for forecasting and analysis.
- (4) Confirmation by paper tests and exercises assuming disorders that the staff of the observation division, the communication centre, the electronics engineering division and the forecasting division properly understood how to identify the causes of disorder and how to recover the system.

- (5) Confirmation by paper tests and exercises that the staff of the forecasting division properly understand the contents of observation data, forecasts and warnings, provide appropriate data to disaster management related organizations, issue disaster advisory and warnings, and inform the regional synoptic meteorological stations.

### 3.1.3 Soft component program (input plan)

#### (1) Soft component program

The soft component will be implemented using explanation materials and manuals provided by Japanese consultant.

The portion related to weather observation and communication is divided into the system management mainly depending on hardware concerning communication system, and the system management mainly depending on software concerning weather data collection, editing, and analysis. In any case, the knowledge and technology on both hardware and software should be learned.

#### Instructions and contents of program including specific examples

Achievement target of soft component	Contents of Program
(1) Proper edition, processing, filing, recording, and provision to forecasters of observation data	<ul style="list-style-type: none"> <li>• Explanation of WMO's technical standards</li> <li>• Instruction by manual of observation data editing, processing, filing, recording and provision for specific purposes (monitoring of real-time data from the automatic weather observation appliances, processing of visual observation data, weather information exchange with the GTS, data configuration, filing and use in communication server/analysis serve by lectures and exercises using introductory appliances, etc.)</li> <li>• Technical guidance to verify continuity of conventional manual observation data and the observation data by the new system by concurrent operation               <ul style="list-style-type: none"> <li>• Review of manuals and formats according to the trainings above</li> </ul> </li> <li>• Guidance for technology transfer from trained staff to other staff</li> </ul>
(2) Proper operation and maintenance of the observation appliances and the communication system, and observation precision management by calibration of the equipment	<ul style="list-style-type: none"> <li>• Explanation of technical observation standards of WMO</li> <li>• Exercises for observation appliances (maintenance at normal times, periodical maintenance, and periodical calibration by lectures and equipment operation)</li> <li>• Communication system exercises (maintenance at normal times, monitoring of the satellite communication system, and periodical maintenance by lectures and equipment operation)</li> <li>• Guidance on monitoring and control of the central operating system</li> <li>• Review of manuals and formats according to the trainings above</li> <li>• Guidance for technology transfer from trained staff to other staff</li> </ul>

Achievement target of soft component	Contents of Program
(3) Enable expedition of forecasting work and improvement of forecasting precision	<ul style="list-style-type: none"> <li>• Explanation of the technology standards of WMO</li> <li>• Lectures and exercises by system operation on seasonal weather analysis and severe weather (cyclone, etc.) analysis by using the real-time data from the automatic weather observation system and foreign weather organizations</li> <li>• Lectures and exercises by system operation on the technology to use the weather observation data upon weather disaster, and analyzed forecasting data for after-the-fact re-analysis</li> <li>• Guidance on reviewing warning standard enabled by introduction of the automatic weather observation system under the project</li> <li>• Review of manuals and formats according to the trainings above</li> <li>• Guidance for technology transfer from trained staff to other staff</li> </ul>
(4) Enable swift and proper response to disorders	<ul style="list-style-type: none"> <li>• Guidance by manual on how to identify the troubled part upon disorder, cause analysis and response. (By describing assumed disorder (e.g. observation of abnormal temperature), we will instruct how to identify the cause possibly existing in the automatic weather observation system, satellite communication system or the central operating system)</li> <li>• Recommendation and instruction how to address disorders of collaborator stations</li> <li>• Instruction on the format of disorder records to be prepared after disorders, how to record it and share the disorder records between the headquarters and synoptic meteorological stations</li> <li>• Review of manuals and formats according to the trainings above</li> <li>• Guidance for technology transfer from trained staff to other staff</li> </ul>
(5) Conveyance of proper forecasts and warnings to disaster management related organizations and synoptic meteorological stations	<ul style="list-style-type: none"> <li>• Guidance on contents of observation data, forecasts and warnings to be transmitted to disaster management related organizations</li> <li>• Guidance on contents of observation data, forecasts and warnings to be transmitted to synoptic meteorological stations</li> <li>• Review of manuals and formats according to the trainings above</li> <li>• Guidance for technology transfer from trained staff to other staff</li> </ul>

## (2) Expected Attendance of the soft component

The soft component will be provided to the divisions of DoM listed below.

### List of trainees

No.	Department	Guidance items	No. of required attendants
1	Observation Dept.	Items (1), (2), (3) and (4) above	5
2	Telecommunication Center	Items (1), and (4) above	5
3	Electronics Dept.	Items (2), and (4) above	4
4	Met Station observers	Items (1), (2), (4), and (5) above	20
5	Forecasting Dept.	Items (3), (4) and (5) above	4
Total			38

## (3) Guidance method

Technical guidance will be given using a series of manuals for weather data collection, processing and edition, and analysis and forecasting, work flow materials, manuals corresponding to the activities mentioned above, explanation by lectures, and by using the central operating system to be installed by the grant aid.

At the local synoptic meteorological stations, representative observers gathered in regions will participate five times in lectures and exercises concerning the operation and maintenance of the automatic weather observation systems, and how to deal with disorders.

### 3.1.4 Assignment method of resources to implement the soft component

The soft component requires guidance by engineers or meteorologist familiar with automatic weather observation systems and use of automatically collected observation data. No local resources are available for this purpose Japanese engineers or meteorologist will be dispatched accordingly.

### 3.1.5 Implementation schedule of soft component

#### (1) Activities and assigning plan

The implementing plan for the soft component is indicated below. As the activity items cover several areas of different expertise, “system management instructor” to explain the introduced system and its operation and maintenance, “data processing instructor” to explain collection and edition of observed data and “analysis and forecast instructor” to explain how to use the data for forecasting will be assigned.

Activity of the program		Number of days (M/M)		
		System management	Data processing	Analysis and forecast
1. Preparation of guidance, manuals and training materials	(Japan)	10 (0.33)	10 (0.33)	10 (0.33)
2. Explanatin and confirmation of guidance contents and schedule	(Sri Lanka)	1 (0.03)	-	1 (0.03)
3. Guidance, lectures and exercises				
3.1 Guidance on proper edition, processing, filing, recording, and provision to forecasters on processed observation data	(Sri Lanka)		19 (0.63)	
3.2 Guidance on proper operation and maintenance of observation appliances and precision management of observation	(Sri Lanka)	14.5 (0.48)		
3.3 Guidance on expedition of forecasting and improvement of forecasting precision	(Sri Lanka)			18 (0.60)
3.4 Guidance on and swift and proper response to disorders	(Sri Lanka)	15.5 (0.52)		
3.5 Guidance on transmitting proper forecasts and warnings to disaster management related organizations and synoptic meteorological stations	(Sri Lanka)			5 (0.16)
4. Report (including the number of days of preparation)	(Sri Lanka)	2 (0.07)	2 (0.07)	2 (0.03)
Material arrangement, review of manuals, moving days, and other necessary activities on soft component		14 (0.47)	8 (0.20)	7 (0.23)
Total		57 (1.90)	39 (1.30)	43 (1.43)

## (2) Each item of the Program

### A) Preparation of instruction materials, draft manual and schedule

Guidance schedule, instruction materials, draft manuals, achievement tests, work record formats, and schedule will be prepared in Japan

### B) Explanation and confirmation of guidance plan and schedule

Contents of technical guidance, schedule, training venue, trainees and provision of convenience if necessary will be explained and confirmed with DoM in Sri Lanka before commencement of the lecture or exercise. As a result of the discussion, the guidance plan and schedule will be modified if necessary.

### C) Lectures, guidance and exercises

Technical guidance, lectures and exercise will be provided for each program as indicated in 3.1.3(1) Soft component program.






## D) Report

Final report containing technical guidance dates, contents, results and future subjects will be prepared and submitted to DoM and JICA Sri Lanka Office.

## E) Expert assignment schedule

The expert for the soft component will be assigned as shown in the table below.

Expert	MM	2008	2009		
		Dec.	Jan.	Feb.	Mar.
System management	1.90	0.33M <input type="checkbox"/>	1.57M 		
Data processing	1.30	0.33M <input type="checkbox"/>	0.97M 		
Analysis and forecast	1.43	0.33M <input type="checkbox"/>	1.10M 		



Work in Japan



Installation completion



Work in Sri Lanka

The contents of guidance, lecture, and exercise and the attendance of the soft component by the expert are shown below.

### (1) System management expert

This expert will give mainly hardware guidance on operation and maintenance of the entire meteorological information network system from automatic weather observation system to central operating system, and observation appliances of automatic weather observation system, the server of the central operating system (for communication and analysis) and the satellite communication system, and how to address system disorders.

The trainees will be the staff of the electronics engineering division, observation division, and communication center at the headquarters, and staff of synoptic meteorological stations. In dealing with disorders, the guidance will be provided for the forecasting division of the headquarters.

### (2) Data processing expert

This expert will give guidance on weather observation data collection, processing and editing, recording, analysis and filing. The related systems are the software of the communication and analysis servers and of the PCs for remote monitoring and observation data processing at synoptic meteorological stations. The trainees are the staff of the headquarters' observation division, communication center and electronics engineering division, and staff of synoptic meteorological stations.

(3) Analysis and forecast expert

This expert will give guidance on how to utilize analyzed data, concept of warning criteria, observation data, forecasting and warnings to be provided to disaster management related organizations and synoptic meteorological stations. The objective systems are analysis server and PC for monitoring and visualization processor meetings and the trainees are the staff of the headquarters' forecasting division and observation division, and staff of synoptic meteorological stations.

### **3.1.6 Deliverables**

The deliverables of the soft component are shown below.

- (1) Explanation material on the configuration of the meteorological information network system and titles and contents of whole manuals
- (2) Operation and maintenance manuals, format for operation record and fault and recovery record of the automatic weather observation systems
- (3) Operation and maintenance manual, format for operation record and fault and recovery record of the satellite communication system
- (4) Instruction manual for the trainees to train other staff
- (5) Operation and maintenance manual, format for operation record and fault and recovery record of the central operating system (including the manual showing the steps of observation data processing and the manual for analysis and forecasting)
- (6) Paper test results, printouts of exercise screens and achievement certificate of trainees

## **3.2 Soft component to enable disaster management related organizations to utilize weather information provided by DoM**

### **3.2.1 Achievements of soft component**

The soft component achievement will be enabling disaster management related organizations (DOI, NBRO, DMC, the police, SLRC, SLBC, DDMCUs) to utilize weather information properly as described below.

- (1) Disaster management related organizations understand forecasts, advisory and warnings provided by DoM correctly
- (2) DOI, NBRO and DMC understand weather observation data provided by DoM correctly for flood analysis, landslide analysis and evacuation area analysis, respectively
- (3) DoM will have a capability to provide guidance for disaster management related organizations to let them understand weather information and data provided by DoM

- (4) DoM will have a capability to identify needs of users (disaster management related organizations) concerning weather information and data provided to them

### 3.2.2 Confirmation method of achievement

- (1) Confirmation by paper tests whether disaster management related organizations properly understand weather forecasts, advisory and warnings provided by DoM
- (2) Confirmation by paper tests whether DOI, NBRO and DMC properly understand weather observation data provided by DoM
- (3) At joint meetings of disaster management related organizations, DoM will explain weather information and warnings based on case analysis, and confirm DoM's understanding
- (4) In the joint meetings, collection of the needs from disaster management related organizations on weather observation data or information, and through the arrangement of the needs by DoM, confirm DoM's understanding

### 3.2.3 Soft component program (input plan)

#### (1) Soft component program

Instructions and contents of program including specific examples

Achievement target of soft component	Specific example of program
(1) Disaster management related organizations to correctly understand forecasts, advisory and warnings provided by DoM	<ul style="list-style-type: none"> <li>• Staff of DoM explain weather information and warnings made available by the automatic weather observation systems</li> <li>• Explanation and introduction of the relationship between past disasters and weather warnings</li> <li>• Opinion exchange among disaster management related organizations</li> </ul>
(2) DOI, NBRO and DMC utilize weather observation data such as rainfall provided by DoM for flood analysis, landslide analysis and evacuation area analysis, respectively	<ul style="list-style-type: none"> <li>• Explanation of the contents of weather observation data made available by the automatic weather observation systems</li> <li>• Explanation of the warning criteria to be newly set by DoM</li> </ul>
(3) DoM provides guidance for disaster management related organizations to let them understand weather information and data to be provided by DoM	<ul style="list-style-type: none"> <li>• Guidance of the staff of DoM through preparation of materials and explanation of the technical guidance of (1) and (2) above.</li> </ul>
(4) DoM identifies needs of users (disaster management related organizations) concerning weather information and data provided to them	<ul style="list-style-type: none"> <li>• Identifying the needs of disaster management related organizations for weather information, advisory and warnings by DoM staff.</li> </ul>

## (2) Expected attendance of the soft component

The trainees of the soft component are listed below.

### List of trainees

No.	Organization	Guidance items	No. of required attendants
1	DMC, Early Warning Dept.	Item (1) and (2) above	2
2	DMC, Emergency Operation Center	Item (1) and (2) above	2
3	DoM, Forecasting Dept.	Item (1), (2), (3) and (4) above	2
4	Department of Irrigation, Hydrology Dept.	Item (1) and (2) above	3
5	National Building Research Organization, Landslide Studies and Services Division	Item (1) and (2) above	3
6	Police Communication Center	Item (1) above	2
7	Sri Lanka Rupavahini Corporation	Item (1) above	2
8	Sri Lanka Broadcasting Corporation	Item (2) above	2
9	District Disaster Management Coordinating Units	Item (2) above	7
Total			25

## (3) Guidance method

### A) Lectures

Lectures will be provided to disaster management related organizations concerning the weather observation data made available by introducing meteorological information network systems at DoM, its processing, time interval of acquisition, forecasting, advisory and warnings. Outline of Sri Lanka's climate and natural disasters, and past disaster cases will also be explained and introduced.

From the disaster management related organizations, we will access the website to be opened on the disaster management network, and explain the contents while displaying weather data and information. We will explain what kind of data to be provided by introducing the system for the organizations to analyze flood, landslide and evacuation areas.

### B) Joint meetings

We will invite disaster management related organizations to explain about collection of weather observation data, forecasting and warning in the case that the weather possibly leading to disaster. We will endeavor to collect opinions and needs for weather information and warning from disaster management related organizations.

### C) Guidance to the staff of DoM

We will guide the staff of DoM to explain weather information to be provided to disaster management related organizations by the personnel of DoM through making materials, providing explanation during the program A) and B) above.

After collection of information on needs of disaster management related organizations on weather information, advisory and warnings at lectures or joint meetings, the future directions will be provided through the arrangement of those information by the personnel of DoM.

### 3.2.4 Assignment method of resources to implement the soft component

The soft component requires guidance by engineer or meteorologist familiar with automatic weather observation systems and use of automatically collected observation data. No local resources are available for this purpose. Japanese engineer or meteorologist will be dispatched accordingly.

### 3.2.5 Implementation schedule of soft component

#### (1) Activities and assigning plan

Activity of the program		Number of days M/M
1. Preparation of explanation material, manuals, and joint meeting materials	(Japan)	6 (0.2)
2. Explanation and confirmation of guidance contents and schedule	(Sri Lanka)	1 (0.03)
3. Lectures and guidance		
3.1 Disaster management related organizations understand forecasts, advisory and warnings provided by DoM correctly (including preparation work of 2 joint meetings)	(Sri Lanka)	3 (0.10)
3.2 The DOI, NBRO and DMC understand the weather observation data provided by DoM to be utilized in analysis of flood, landslide and evacuation area, respectively	(Sri Lanka)	4 (0.13)
3.3 DoM will have capability to guide disaster management related organizations, to let them understand weather information and data	(Sri Lanka)	2 (0.13)
3.4 DoM will have capability to identify and respond to the needs of disaster management related organizations for weather information and observation data	(Sri Lanka)	Included in the above
4. Report (including preparation)	(Sri Lanka)	2 (0.07)
Material arrangement, review of materials and other necessary activities on soft component.		3 (0.10)
Total		20 (0.67)

#### (2) Each item of the program

##### A) Preparation of explanation material, draft materials for joint meetings, and schedule

Explanation material, draft material for joint meeting, achievement tests, and work record formats, and schedule will be prepared in Japan

**B) Explanation and confirmation of guidance contents and schedule**

The guidance contents, training venue, trainees, schedule and other necessary arrangement will be discussed and confirmed.

**C) Guidance and lectures**

The guidance and lectures will be provided as indicated in 3.2.3(1) Soft component program.

**D) Report**

The final report containing the guidance dates, contents, results and future subject will be submitted to DoM and JICA Sri Lanka Office.

**E) Expert assignment schedule**

The expert for implementing the soft component will be the same person in charge of analysis and forecast relating to the soft component of operation and maintenance of meteorological information network system.

Expert	MM	2008	2009		
		Dec.	Jan.	Feb.	Mar.
Analysis and forecast	0.67	0.2M <input type="checkbox"/>		0.47M <input checked="" type="checkbox"/>	

- Work in Japan
- Work in Sri Lanka

The guidance contents and trainees trained by the analysis and forecasting expert are described below.

(1) Analysis and forecasting expert

The expert will provide lectures for disaster management related organizations concerning significance of observation data, analysis data, forecasts and warnings made available by DoM with introduction of the meteorological information network system and guide them to understanding information to be provided. Guidance for the personnel of DOI, NBRO, and DMC on how to set up warning criteria of DoM will be provided based on the weather observation data.

Further, the staff of DoM will give lectures by themselves on the weather information provided to disaster management related organizations, and after the lecture and joint meetings, the orientation will be provided for the personnel of DoM on how to meet the needs of disaster management related organizations for weather information and warnings. The trainees are all disaster management related organizations.

### **3.2.6 Deliverables**

The deliverables of the soft component will be a “instruction manual concerning weather observation data, forecasts and warnings.” The achievement will be confirmed by paper test or equivalent method after completion of guidance, lectures and joint meetings. And it will be attached to the deliverables.

The deliverables will be also include the needs of disaster management related organizations for weather forecasts, warnings and other weather information, and the direction of meeting the needs also.

## **4 Responsibility of the Executing Agency of Sri Lanka**

In order that the equipment to be introduced by the project will be effectively and continuously utilized, DoM is required to implement the following items: Each item will be explained to DoM upon implementing the soft component:

- DoM is required to revise the “instruction manual concerning weather observation data, forecasts and warnings if necessary;
- DoM is required to grasp the needs of disaster management related organizations on weather information and data, and explain to them periodically about the provided information and observation data; and
- DoM is required to endeavor to develop human resources continuously to keep the sustainability of the above mentioned activities.

## **Appendix 6 Meteorological Observation Data**



Three - minutes mean Maximum Wind Speed (m/s) – 2005

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Anuradhapura	2.4	1.9	2.8	3.1	3.9	5.2	4.8	4.0	4.4	3.0	2.7	3.0
Bandarawela	3.9	5.1	6.9	5.8	4.6	9.9	9.3	9.4	9.8	4.7	4.6	4.4
Batticaloa	6.6	6.6	5.2	4.9	5.8	6.8	5.8	6.3	6.8	6.7	8.9	9.1
Colombo	11.1	12.5	6.7	8.9	13.3	12.2	10.3	8.3	10.6	12.5	15.0	13.1
Hambantota	11.2	12.2	11.7	12.7	13.7	14.3	13.2	13.3	13.0	13.8	13.0	11.3
Jaffna	4.1	5.0	4.4	5.0	6.7	6.7	7.5	5.8	6.9	5.5	4.4	5.6
Katugaslota	2.0	3.6	2.5	2.4	2.4	3.0	4.0	3.9	4.2	3.9	3.6	1.8
Katunayake	7.2	7.8	7.4	7.0	6.2	7.2	6.2	9.2	9.7	7.8	8.3	9.2
Kurunegala	3.5	3.7	2.4	1.9	2.8	4.1	3.7	3.5	4.1	2.6	2.3	2.7
Mailuppallama	4.2	5.4	5.7	6.9	5.6	6.8	6.4	6.7	8.3	5.1	4.4	3.8
Mannar	4.4	5.6	3.9	4.4	6.1	6.1	6.7	5.0	6.1	4.4	3.9	4.4
Nuwara Eliya	7.8	8.9	9.4	6.7	5.0	12.8	15.6	12.8	13.3	8.9	3.9	7.8
Pottuvil	X	X	X	X	3.3	2.9	6.6	10.2	9.6	8.7	X	4.7
Puttalam	4.1	4.1	4.9	4.9	4.5	8.2	7.1	6.6	5.6	4.2	3.9	3.5
Ratnapura	3.8	2.7	6.7	2.6	2.5	4.3	2.2	3.4	5.3	3.6	4.4	5.4
Trincomalee	5.9	5.5	5.5	4.0	5.0	7.5	8.0	7.5	7.0	5.8	5.4	8.5
Vavunia	1.9	2.7	2.8	2.4	3.0	4.0	3.9	3.9	4.5	2.4	3.2	3.1

X - Data not available

### Rainfall (mm)

station-id	stn-name	year	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
00043404	JAFFNA	2005	43.3	0	0	150.1	8.2	0	30	0.2	8.2	177	554.9	263.4
00043413	MANINAR	2005	72.5	0	67.3	202	60.8	0.3	4.8	0	0	197.5	497.5	88.1
00043415	VAVUNIYA	2005	166.5	1	23	184.6	11.5	1.5	49.9	82.3	2.4	166.7	381.2	96.6
00043418	TRINCOMALEE	2005	280.3	0	15	211.7	68.1	0	17.8	85.7	6	235.2	731.8	140
00043421	ANURADHAPURA	2005	49.6	0	68.3	113.3	42.3	2.4	52.6	12.1	0	314.7	339	104.5
00043422	LAMA	2005	51.1	2.7	31.5	180.4	107.3	1.6	29.9	9.2	3.2	267	368.3	82.2
00043424	PUTTALAM	2005	65.7	43.8	73.3	175.8	18.2	7.4	19.9	0	3.3	170	324.5	88.1
00043436	BATTICALOA	2005	163.5	29.6	50.3	96.5	13.8	0	9.1	38.2	74.8	135.5	408.7	203.2
00043441	KURUNEGALA	2005	49	59.3	214.7	160.2	101.5	105	115.4	8	52.6	562.7	478.6	99
00043444	KATUGASTOTA	2005	73.5	97.4	111.1	169.8	98.1	130.9	131.6	52.4	109.3	250	398.1	161.4
00043450	KATUNAYAKA	2005	119.1	59.6	154.5	153	206.9	102.3	95.3	30.2	61.1	560.5	652.6	199.9
00043466	COLOMBO	2005	167	8.6	120.3	212.4	285.6	220.2	165.8	21.8	85.3	504	760.4	262.6
00043467	RATMALANA	2005	187.9	11.7	165.8	179.5	412.1	313.7	129	29.2	103.1	556.4	912.6	206.1
00043473	NUWARA ELIYA	2005	54.8	26.7	53.7	104.2	117.6	106.9	160.4	60.4	156.6	140.3	291.2	74.3
00043479	BADULLA	2005	151.7	32.4	138.2	177.4	158.4	15.8	72.4	58.2	47.9	276.7	385.8	168.5
00043486	RATNAPURA	2005	52.2	92.8	284.1	302.9	226.5	313.7	262.4	243.3	309.3	609.8	503.3	204.5
00043495	GALLE	2005	108.8	58.2	216.4	120.8	205.2	163.3	156.3	18.4	88.2	342.8	262.1	139.2
00043497	HAMBANTOTA	2005	57.5	3	42.8	129.4	69.1	7.9	47.7	7.2	40.2	148.4	329	95.7
00043999	POTTUVIL	2005	*****	*****	*****	*****	101.8	0	34.1	*****	6.3	29.1	208.4	50.8
00143476	BANDARAWELA	2005	79.4	44.5	87.7	150.4	198.5	18.5	33.1	49.7	47.6	281.3	436.6	88.2

Maximum Temperature (°C)

station-id	stn-name	year	Jan	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov	Dec
00043404	JAFFNA	2005	29.8	31.5	33.6	32.4	33.1	32.6	31.7	32.7	31.4	31.1	28.4	29
00043413	MANNAR	2005	29.7	31.6	32.8	32.4	32.6	31.4	30.6	31.1	30.6	31.2	28.9	29.5
00043415	VAVUNIYA	2005	30.1	32.5	35.2	33.9	35.1	34.7	34.5	35.8	34.9	33.5	30.1	29.9
00043418	TRINCOMALEE	2005	28.7	30.7	31.9	32.1	35.3	35.6	35.1	36	35.7	33	28.8	28.7
00043421	ANURADHAPURA	2005	30.4	32.9	35.2	33.6	34.4	33.4	33	34.8	34.2	32.9	30.1	29.7
00043422	IAMA	2005	29.9	32.4	34.8	33.5	33.5	32.7	32.4	34.2	33.9	32.6	29.9	29.2
00043424	PUTTALAM	2005	30.8	32.5	33.9	32.4	32.8	31.8	31.3	31.9	31.4	31.3	29.2	29.5
00043436	BATTICALOA	2005	29.2	30.8	32.5	33	34.9	36.1	35	34.4	33.8	32.4	29.9	29.6
00043441	KURUNEGALA	2005	31.2	33.5	34.5	33.2	32.9	30.8	30.6	32.5	31.7	31.4	29.8	29.8
00043444	KATUGASTOTA	2005	29	31	31.8	30.9	30.6	28.3	27.9	29.2	28.1	29	27.7	27.6
00043450	KATUNAYAKA	2005	32.1	32.7	32.4	32	32	30.8	30.4	31.4	30.7	30.3	29.5	30.3
00043466	COLOMBO	2005	31.5	31.8	32.1	31.8	31.7	30.6	30	30.8	30.4	30.1	29.5	30.1
00043467	RATMALANA	2005	31.8	32.3	32.6	32.5	32.3	30.7	30.7	31.4	30.9	30.8	29.9	30.6
00043473	NUWARA ELIYA	2005	20.2	21.4	23	22.1	22.2	18.7	18	19.9	18.5	19.3	19.5	19
00043479	BADULLA	2005	26.2	29	31	30.9	31.9	32.3	31.9	33	31.4	30.6	28.1	27.4
00043486	RATNAPURA	2005	32	34.2	33.9	32.8	32.5	30.7	30.4	31.3	30.7	30.9	30.2	31
00043495	GALLE	2005	29.9	31.4	31.8	31	30.3	29.2	29	29.5	29.2	29.3	29	29.3
00043497	HAMBANTOTA	2005	30.5	32.1	32.6	31.7	31.1	31.4	31.4	31.8	31.1	31	30.3	31.1
00043999	POTTUVIL	2005	****	****	****	****	34.4	35.1	34.2	****	34	32.3	30.9	30.5
00143476	BANDARAWELA	2005	22.6	25.3	26.4	25.7	26.9	26.5	26.7	27.1	25.7	25.1	23.7	23.4

## Minimum Temperature (°C)

station-id	stn-name	year	Jan	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov	Dec
00043404	JAFFNA	2005	21.7	21.1	23.9	25.5	28	27.8	26.8	26.7	26.5	25.2	23.4	22.4
00043413	MANNAR	2005	24.5	24.3	25.3	26.1	28.1	28.1	26.7	26.6	26.8	26	24.7	24.3
00043415	VAYUNIYA	2005	19.5	19.4	22.9	23.8	24.9	25.1	24.4	24.1	24.2	23	21.9	21
00043418	TRINCOMALEE	2005	24.4	24.9	25.5	25.4	26.3	26.8	26.2	25.6	25.8	24.4	23.5	23.5
00043421	ANURADHAPURA	2005	22.4	22.6	24.4	24.7	25.7	25.9	25.3	25.2	25.3	24.3	23.1	22.5
00043422	AMA	2005	21.5	21.4	23.1	23.7	25	25.3	24.6	24.6	24.6	23.5	22.4	21.4
00043424	PUTTALAM	2005	22.3	21.9	23.9	24.7	26.3	27.3	26.3	26.2	26.4	25.3	23.1	24.3
00043436	BATTICALOA	2005	23.9	24.1	25.2	25.6	26.2	26	25.7	25.4	25.2	24.7	24	23.4
00043441	KURUNEGALA	2005	22.3	21.9	23.6	23.9	25.3	25.1	24.6	24.8	24.2	23.4	22.8	22
00043444	KATUGASTOTA	2005	19.1	18.8	20.2	21.2	21.1	21.5	21.2	20.4	20.4	20.2	19.9	18.7
00043450	KATUNAYAKA	2005	22.8	22.9	23.9	24.3	25.3	26	25.5	25.8	25.1	24	23.3	22.7
00043466	COLOMBO	2005	23.6	23.7	25.1	25	25.8	26.3	25.7	26.2	25.5	24.5	23.8	23.4
00043467	RATMALANA	2005	23.7	23.8	25	25	25.9	24.4	26.1	26.5	25.7	24.4	23.9	23.5
00043473	NUWARA ELIYA	2005	11.5	11.4	10.9	13.5	13.1	14.4	13.9	13.1	13.4	13	12.9	11.1
00043479	BADULLA	2005	19.2	17.7	19.7	20.3	20.4	19.1	19.3	18.6	18.9	20	20.1	18.6
00043486	RATNAPURA	2005	22.6	21.8	23.4	23.7	24.5	24.4	24	23.7	23.4	23	22.9	22.5
00043495	GALLE	2005	24.2	23.9	25.1	25.6	26.6	26	25.6	26.2	25.7	24.7	24.1	23.9
00043497	HAMBANTOTA	2005	23.5	23.5	24.8	25.4	26.3	25.6	24.9	24.9	24.8	24.6	23.9	23.8
00043999	POTTUVIL	2005	*****	*****	*****	*****	25.9	25.9	24.7	*****	25.3	23.6	23	23.2
00143476	BANDARAWELA	2005	16	15	16	17.5	17.7	18.7	18.7	17.9	17.6	17	16.6	15

## Mean Temperature (°C)

station-id	sin-name	year	Jan	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov	Dec
00043404	JAFFNA	2005	25.7	26.3	28.7	29	30.6	30.2	29.2	29.7	29	28.2	25.9	25.7
00043413	MANNAR	2005	27.1	27.9	29	29.3	30.4	29.7	28.7	28.9	28.7	28.6	26.8	26.9
00043415	VAVUNIYA	2005	24.8	26	29	28.8	30	29.9	28.4	30	29.5	28.3	26	25.5
00043418	TRINCOMALEE	2005	26.5	27.8	28.7	28.8	30.8	31.2	30.7	30.8	30.7	28.7	26.1	26.1
00043421	ANURADHAPURA	2005	26.4	27.7	29.8	29.1	30	29.6	29.2	30	29.7	28.6	26.6	26.1
00043422	LAMA	2005	25.7	26.9	28.9	28.6	29.3	29	28.5	29.4	29.2	28.1	26.2	25.3
00043424	PUTTALAM	2005	26.5	27.2	28.9	28.6	29.6	29.5	28.8	29.1	28.9	28.3	26.1	26.9
00043436	BATTICALOA	2005	26.6	27.5	28.9	29.3	30.5	31.1	30.3	29.9	29.5	28.6	26.9	26.5
00043441	KURUNEGALA	2005	26.8	27.7	29	28.5	29.1	28	27.6	28.7	28	27.4	26.3	25.9
00043444	KATUGASTOTA	2005	24	24.9	26	26	25.9	24.9	24.5	24.8	24.2	24.6	23.8	23.2
00043450	KATUNAYAKA	2005	27.4	27.8	28.2	28.1	28.6	28.4	27.9	28.6	27.9	27.2	26.4	26.5
00043466	COLOMBO	2005	27.5	27.8	28.6	28.4	28.7	28.5	27.9	28.5	28	27.3	26.6	26.8
00043467	RATMALANA	2005	27.8	28	28.8	28.8	29.1	27.5	28.4	28.9	28.3	27.6	26.9	27.1
00043473	NUWARA ELIYA	2005	15.8	16.4	17	17.8	17.7	16.6	16	16.5	15.9	16.1	16.2	15
00043479	BADULLA	2005	22.7	23.3	25.3	25.6	26.2	25.7	25.6	25.8	25.2	25.3	24.1	23
00043486	RATNAPURA	2005	27.3	28	28.7	28.3	28.5	27.5	27.2	27.5	27	27	26.6	26.7
00043495	GALLE	2005	27	27.7	28.5	28.3	28.4	27.6	27.3	27.9	27.5	27	26.6	26.6
00043497	HAMBANTOTA	2005	27	27.8	28.7	28.5	28.7	28.5	27.3	28.3	27.9	27.8	27.1	27.5
00043999	POTTUVIL	2005	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
00143476	BANDARAWELA	2005	19.3	20.2	21.2	21.6	22.3	22.6	22.7	22.5	21.7	21.1	20.2	19.2

## **Appendix 7 References**

**1. Department of Meteorology (DOM)**

No.	Title	Date
1	The Need for a National Policy for Disaster Management	061120
2	Strategy and Action Plan for Implementation of Master Plan for Development of Department of Meteorology, Sri Lanka 2006-2010	061120
3	The Gazette of the Democratic Socialist Republic of Sri Lanka	061120
4	Sri Lanka Disaster Management Act. No.13 of 2005	061120
5	General Information of DOM	061120
6	Organization Chart	061120
7	Meteorological Data 2005	061120
8	Staff Data	061120
9	Budget Estimates 2001-2006	061120

**2. Disaster Management Centre (DMC)**

No.	Title	Date
1	Towards a Safer Sri Lanka Road Map for Disaster Risk Management	061029

**3. Department of Irrigation (DOI)**

No.	Title	Date
1	Flood Ordinance	070308
2	Organization Chart	070308

**4. National Building Research Organization (NBRO)**

No.	Title	Date
1	Cabinet Memorandum	070214
2	Meteorological Data	070213
3	22 <sup>nd</sup> Anniversary Commemoration	070213

**5. Police Command Room & Com. Center (Police)**

No.	Title	Date
1	Brochure of 119 Emergency System	070212
2	Information of 119 Emergency System	070212

**6. Sri Lanka Rupavahini Corporation (SLRC)**

No.	Title	Date
1	Sri Lanka Rupavahini Corporation Act, No.6 of 1982	070227

**7. Sri Lanka Broadcasting Corporation (SLBC)**

No.	Title	Date
1	Building Layout Plan	070228

**8. Information Communication Technology Agent (ICTA)**

No.	Title	Date
1	Lanka Government Network (Summary of Action Plan)	070220

**9. Institute for Construction Training and Development (ICTAD)**

No.	Title	Date
1	Specification for Building Works Vol. I, II	061107
2	Specification for Electrical and Mechanical Works Associated with Building and Civil Engineering	061107
3	Specifications for Site Investigation for Building Works and Sample Bill of Quantities	061107
4	Building Construction Contractors	061107
5	Constriction Statistics	061107
6	Quality Control of Cement	061107

**10. Central Bank of Sri Lanka (CBSL)**

No.	Title	Date
1	Socio Economic Data 2006	061110
2	Economic and Social Statistics of Sri Lanka 2005	061110
3	Economic Progress of Independent Sri Lanka	061110
4	Monthly Bulletin, August 2006	061110
5	Annual Report 2005	061110

**11. Japan External Trade Organization (JETRO)**

No.	Title	Date
1	Guidebook for Investment in Sri Lanka	061110
2	Survey on Actual Management of Japanese Company in SAFTA, March 2005	061110
3	Comparison of Investment Expenses among Asia, March 2006	061110



**Appendix 8 Meteorological Information Network and  
Disaster Management Communication  
Network undertaken by Japan's ODA**

**8. Meteorological Information Network and Disaster Management Communication Network undertaken by Japan's ODA**

