METEOROLOGICAL, CLIMATOLOGICAL AND GEOPHYSICAL AGENCY
INDONESIAN INSTITUTE OF SCIENCES
REPUBLIC OF INDONESIA

PREPARATORY SURVEY REPORT
ON
THE PROJECT FOR
IMPROVEMENT OF EQUIPMENT
FOR DISASTER RISK MANAGEMENT
IN
REPUBLIC OF INDONESIA

JULY 2014

JAPAN INTERNATIONAL COOPERATION AGENCY

ORIENTAL CONSULTANTS CO., LTD.
PACIFIC CONSULTANTS CO., LTD.

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Preface

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey on the Project for Improvement of Equipment for Disaster Risk Management in Republic of Indonesia, and entrust the survey to the joint venture consist of Oriental Consultants Co., Ltd and Pacific Consultants Co., Ltd.

The survey team held a series of discussions with the officials concerned of the Government of the Republic of Indonesia, and conducted field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the survey team.

July, 2014

Masahumi FUWA
Director General,
Global Environment Department
Japan International Cooperation Agency

Summary

Summary

1. Outline of Indonesia

Indonesia is a country of islands, which are distributed over more than 5,000 km east-west across the equator. Almost all the area belongs to the Tropical Rainfall Climate zone, and there is high-temperature and humidity throughout the year with yearly average temperature of 27℃ and yearly average humidity 80%. It is not affected by tropical cyclones since it is located between latitude 10 degrees N and 10 degrees S. However, it is divided into a rainy season and dry season, and annual precipitation is 1,800～3,200 mm in low-flat areas and more than 6,000 mm in mountain areas.

Also it is located on the Pacific orogenic belt and has many active volcanos and remote islands, and it has suffered damage by tsunami due to earthquakes and eruptions of volcanos. Especially, a trench, which has been hit by huge inter-plate earthquakes, is situated along the south side of Indonesia, therefore, the tsunami arrival time is short after occurrences of an earthquake.

In the Sumatra Earthquake 2004 disaster that had worldwide affects, more than 100,000 people were killed in Indonesia.

2. Background of the Project and Overview

The project is being carried out according to the "Basic Guidelines for Reconstruction in response to the Great East Japan Earthquake" to contribute to the promotion of industry for the affected area. It is requested that the products of specific disaster areas will be included for procurement as far as possible and disaster prevention related equipment for earthquakes/tsunami with Japanese advanced technology will also be included in the procurement.

On the other hand, Indonesia enacted the "Law of the Republic of Indonesia Number 24 of 2007 Concerning Disaster Management" (hereinafter referred to as the "Disaster Management Law") taking into consideration the 2004 Sumatra Earthquake, central and local governments were designated as responsible organizations for disaster management. Meteorological, Climatological and Geophysical Agency (hereinafter referred to as “BMKG”) and the Indonesian Institute of Sciences (hereinafter referred to as “LIPI”). which are counterparts of the Project (hereinafter referred to C/P) are also national level disaster management agencies directly controlled by the president, and have played a role in observation and monitoring of disaster management.

BMKG set a "Medium-term strategic plan" (hereinafter referred to "RENSTRA") under the disaster Management Law and is promoting the strengthening of the earthquake observation

network (number of strong motion seismometer sites increased to 500). To support RENSTRA and improve the technology of ground analysis for LIPI, the updating of existing equipment, installation of new observatories and procurement of ground exploration equipment were requested in the Project.

3. Outline of the Survey Results and Contents of the Project

The site survey for this project started in June 2012. Initially, BMKG had been in charge of performing the site survey for close investigation and confirmation about all candidate sites. Since review of the study method, all site surveys have been conducted by a joint survey team with BMKG staffs, a local consultant (field measurement and drawing) and the Japanese Consultant. Totally, four surveys are conducted before implementing the DOD explanation.

The main contents of the surveys and implementation periods are as follow.

No	Name	Period	Contents
1	First Site Survey	1 Jul. 2012 – 29-Jul. 2012	Existing facility confirmation, requested contents evaluation and M/D signing
2	Pre-Second Site Survey	1 Jun. 2013 – 5-Jul. 2012	Verification of DOD implementation for LIPI Policy explanation of site survey for BMKG
3	Second Site Survey	21 Jul. 2013 – 19-Nov. 2013 4 Dec. 2013 – 14-Dec. 2013	DOD explanation and M/D signing for LIPI Survey regarding procurement and construction for BMKG, sites survey
4	Pre DOD Explanation	2 Mar. 2014 – 9 Mar. 2014	Confirmation of selected sites and systems which will be introduced
5	DOD Explanation	24 May 2014 – 1 Jun. 2014	DOD explanation and M/D signing for BMKG

【BMKG】

BMKG has expanded its earthquake observation network and 236 strong motion seismograph stations are currently installed. Data from the broadband seismographs have been used for identifying earthquake sources, determination of magnitude, earthquake mechanism analysis, etc. A total of 162 broadband seismograph stations have been installed up to now. The "Ina-TEWS"; earthquake and tsunami information system introduced by Germany, "ICDSN" introduced by China and "JISNET" supported by National Research Institute for Earth Science and Disaster Prevention (NIED), Japan, are included. A total of 110 stations within these 162 have been installed with strong motion seismographs. Regarding the JISNET, it was introduced in 1997 and some of the equipment malfunctions and it has become time for renewal.

LIPI does not have the equipment for analyzing the vibration characteristics of the ground. Therefore, PS logging equipment and array microtremor measurement equipment were requested.

Considering the above mentioned situation and requested contents, the following are decided for procurement.

【BMKG】

Items	JISNET	BMKG existing	New Site	BMKG HQ	Total
Broadband seismograph (velocity meter)	15	5	―	―	20
Broadband strong motion seismograph (velocity meter)	15	5	―	―	20
Strong motion seismograph (accelerometer)	―	―	93	―	93
BMKG HQ equipment	―	―	―	1	1
Facility construction	6	―	67	―	73
Solar power system	1	2	6	―	9
Satellite communication system	15	5	73	―	93
IT seismic intensity meter					200

【LIPI】

- PS logging equipment 1 set
- Array microtremor measurement equipment 1 set
- Strong motion seismograph (accelerometer) 10 sets

4. Implementation Schedule and Project Cost

(1) Schedule

The Project has two Implementing Agencies (BMKG and LIPI). Since the procurement contents are different, two separate tender packages will be conducted.

Regarding the BMKG package, since the target sites are dispersed throughout Indonesia, 75 days are expected for the tender preparation period. At the stage of implementation, first, the seismic station (shelter) will be constructed and subsequently equipment will be installed. A total of 20 months are expected for the entire period. The summary of the schedule after the commencement of implementation is as follows.

- Implementation design, Tender, Contract 6.5 months
- Procurement and installation of equipment 13.5 months

Regarding the LIPI package, it is equipment procurement only without installation, except for two strong motion seismographs (accelerometers), which will be installed with guidance by the Japan side. A total of 30 days are expected for the tender period. The LIPI package will be completed when the equipment is handed over. The hand over will be conducted promptly after

the arrival of the equipment. Therefore, 13 months are expected for the entire period. The summary of the schedule after the commencement of implementation is as follows.

- Implementation design, Tender, Contract 4.5 months
- Procurement of equipment 8.5 months

(2) Project Cost Estimation

Cost to be borne by the Indonesia Side 3.34 million Japanese Yen (382 million IDR)

5. Project Evaluation

(1) Relevance

1) Contribution to Disaster Prevention and Mitigation

The assistance for BMKG under the Project contributes to early realization of the plan to install 500 seismographs throughout the country. This plan is set in the RENSTRA 2010-2014 established by BMKG.

Regarding the earthquake observation network, it will be enhanced and contribute to high accuracy real-time observation, earthquake source analysis and creating a seismic intensity map.

Improvement of observation density of the high seismicity areas and populated areas is expected using the data obtained from the equipment procured by the Project. The implementation of the Project will not only bear direct benefits for strengthening the capacity of disaster prevention and mitigation all across Indonesia, but also collect and accumulate data that will be used for review and analysis for early warning systems which are being considered for the future.

With respect to the assistance for LIPI, it will contribute to LIPI's scientific research and survey regarding the ground characteristics for estimating ground strength, understanding ground properties, acquisition of seismic wave and seismic waveform and understanding the earthquake characteristics.

2) Contribution to National Policies and Strategies in Indonesia

The above mentioned Disaster Management Law is the fundamental law for disaster risk management and countermeasures in Indonesia and a number of disaster management countermeasure acts and regulations are established under this law. The "National Disaster Management Plan (2010-14)" is one of the plans under the Disaster Management Law. A part of this National Disaster Management Plan is reflected in the "Mid-term National Disaster Management Plan (herein after referred to as the "RP JMN")". The Project, through earthquake observation and analysis, will contribute to "natural disaster management" which is one of the development priority areas of RP JMN.

3) Utilization of Japan's Technologies in Disaster Risk Management Sector and Lessons Learned from the Great East Japan Earthquake

Regarding the technologies in the disaster prevention sector, they have been newly developed and improved based on the lessons learned from the Great East Japan Earthquake. Even in Japan, introduction of such newly developed and/or improved equipment for disaster monitoring and response have been promoted. One of the most remarkable cases is introduction of Japan-made broadband strong motion seismographs (velocity meters). In Indonesia, since trenches lie along the island arc of Sumatra and Java, large-scale earthquakes occur frequently similar to Japan. Therefore, introduction of the above mentioned equipment is significant and sufficient results can be expected.

4) Information Sharing between Japan and Neighboring Countries

The data obtained with the equipment provided by the Project is expected to contribute to enhancing the accuracy of earthquake and tsunami observation, and forecasting and warning in Japan and other neighboring countries.

(2) Effectiveness

1) Quantitative Outputs

By carrying out the Project, the earthquake information system will be expanded and observation of strength of tremors, identifying the epicenter, and magnitude calculation will be performed swiftly. In addition, by the introduction of seismic intensity meters, a seismic intensity network will be constructed. Expected effects are as follow.

Indicator	Baseline (2014)	Target (2019)
Time required to determine the earthquake source of large-scale earthquakes	5 min.	3 min.
Time required to announce publicly tsunami warning	5 min.	3 min.
Time required to prepare seismic intensity maps (by shake map) ※1	7 min.	5 min.
Time required to announce publicly isoseismal map ※2	60 min.	30 min.
Collection rate of observed seismic data	70 %	90 %

※1: It is announced by BMPB.
※2: It is uploaded to BMKG web site.

2) Qualitative Outputs

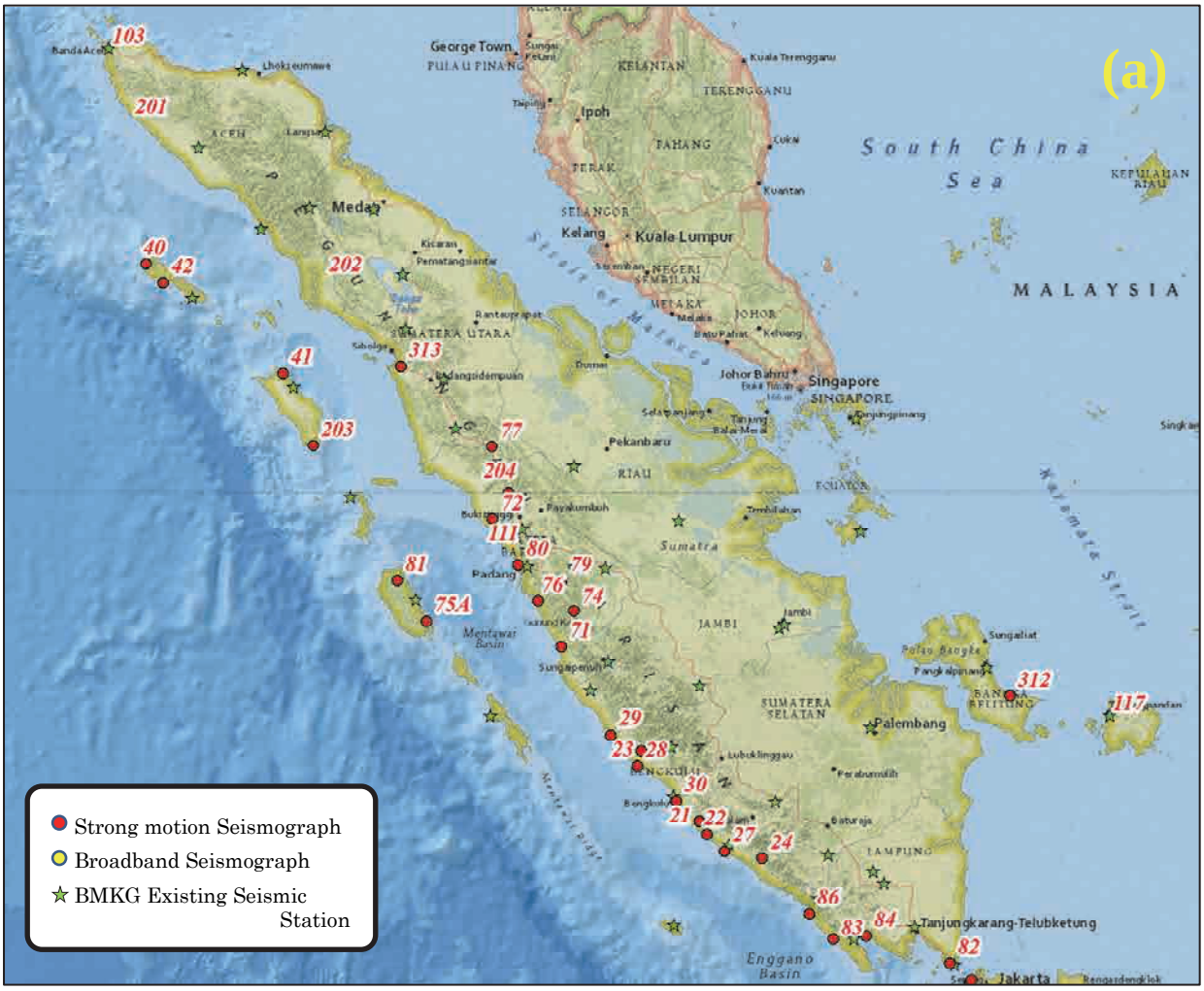
- Improvement of earthquake observation accuracy
- Observation of seismic intensity will make early damage estimation possible
- Improvement of magnitude calculation accuracy

- Improvement of disaster emergency and restoration measures capacities by sharing the earthquake information with disaster prevention related institutions such as BNPB
- Collect and accumulate data for review and analysis for earthquake early warning systems which are expected in the future.

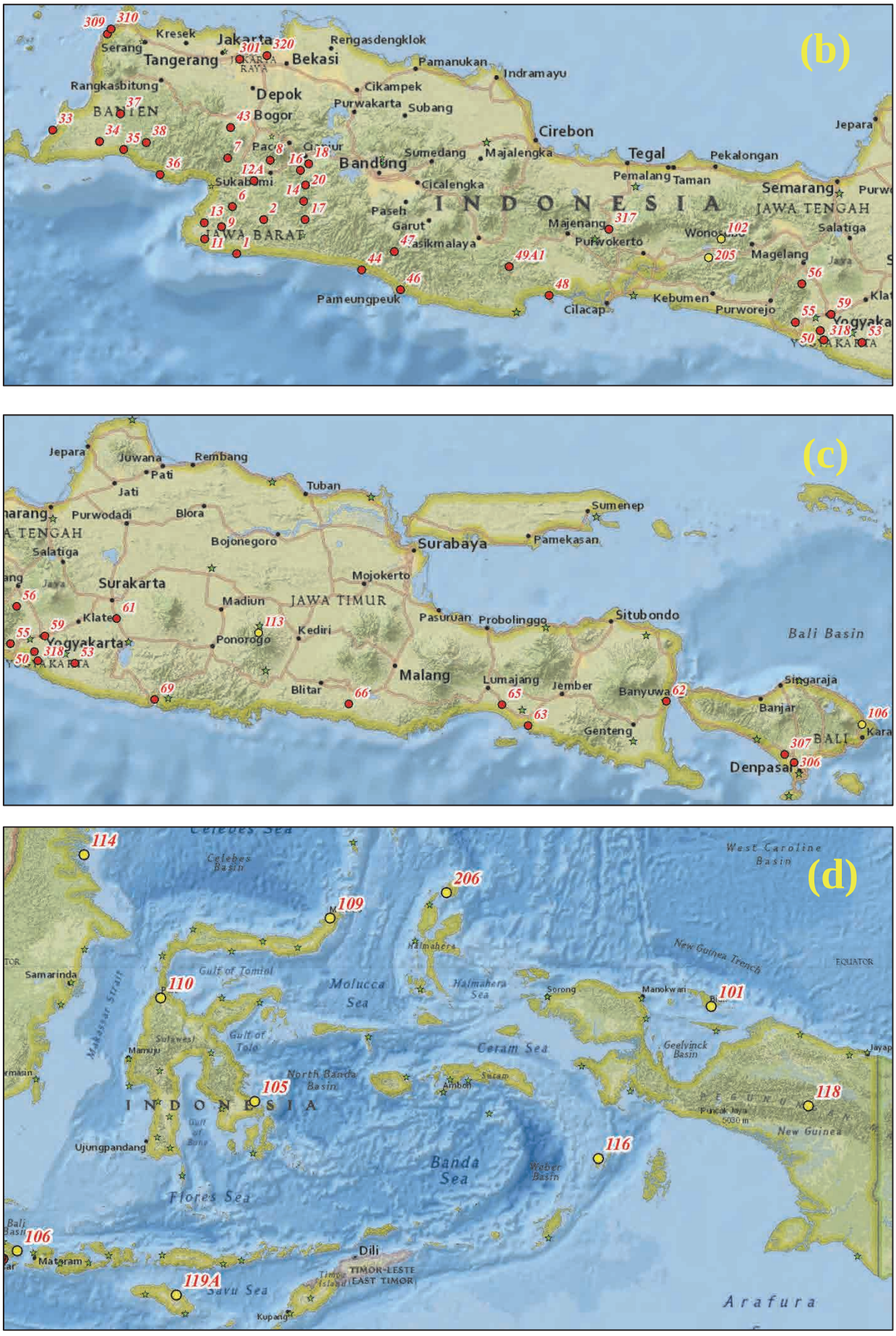
Contents

Appendices

Key Map for BMKG



Project Location Map for BMKG (I)



Project Location Map for BMKG (II)

No	Name	Province	Kabupaten	Latitude	Longitude	System*	Site Type
1	TEGALBULEUD	West Java	Sukabumi	−7.423360	106.719130	SMS	NEW
2	SAGARANTEN	West Java	Sukabumi	−7.211490	106.883970	SMS	NEW
6	LENGKONG	West Java	Sukabumi	−7.131200	106.692160	SMS	NEW
7	KALAPANUNGGAL	West Java	Sukabumi	−6.831450	106.662150	SMS	NEW
8	KADUDAMPIT	West Java	Sukabumi	−6.846050	106.924340	SMS	NEW
9	JAMPANG KULON	West Java	Sukabxumi	−7.257060	106.625110	SMS	NEW
11	CIRACAP	West Java	Sukabumi	−7.330710	106.519780	SMS	NEW
12A	BOJONG	West Java	Sukabumi	−6.972780	106.824600	SMS	NEW
13	CIEMAS	West Java	Sukabumi	−7.232770	106.518690	SMS	NEW
14	SUKANAGARA	West Java	Cianjur	−7.097800	107.131750	SMS	NEW
16	PT PASIR KELAPA	West Java	Cianjur	−6.906400	107.111070	SMS	NEW
17	PAGELARAN	West Java	Cianjur	−7.210870	107.139960	SMS	NEW
18	CILAKU	West Java	Cianjur	−6.866370	107.162390	SMS	NEW
20	CAMPAKA	West Java	Cianjur	−6.998200	107.142670	SMS	NEW
21	SELUMA	Bengkulu	Seluma	−4.061390	102.581940	SMS	NEW
22	ILIR TALO	Bengkulu	Seluma	−4.227110	102.674570	SMS	NEW
23	NAPAL PUTIH	Bengkulu	North Bengkulu	−3.192270	101.868930	SMS	NEW
24	MUARA SAHUNG	Bengkulu	Kaur	−4.528150	103.360280	SMS	NEW
27	MANNA	Bengkulu	South Bengkulu	−4.440950	102.893830	SMS	NEW
28	KETAHUN	Bengkulu	North Bengkulu	−3.382440	101.820210	SMS	NEW
29	IPUH	Bengkulu	Mukomuko	−3.000910	101.492190	SMS	NEW
30	BENGKULU	Bengkulu	Central Bengkulu	−3.819420	102.299940	SMS	NEW
33	SUMUR	Banten	Pandeglang	−6.659160	105.582790	SMS	NEW
34	CIKEUSIK	Banten	Pandeglang	−6.728590	105.872060	SMS	NEW
35	MALINGPING	Banten	Lebak	−6.778620	106.019510	SMS	NEW
36	BAYAH	Banten	Lebak	−6.933180	106.245670	SMS	NEW
37	BANJARSARI	Banten	Lebak	−6.557640	105.999720	SMS	NEW
38	CIGEMBLONG	Banten	Lebak	−6.735010	106.159180	SMS	NEW
40	LANGI	Aceh	Simeuleu	2.824560	95.747520	SSG	NEW
41	TUHEMBERUA	North Sumatera	North Nias	1.469330	97.441520	SMS	NEW
42	KAMPUNG AIE	Aceh	Simeuleu	2.589410	95.963520	SMS	NEW
43	LEGOK LEMANG	West Java	Bogor	−6.641890	106.680650	SMS	NEW
44	CARINGIN	West Java	Garut	−7.523180	107.489310	SMS	NEW
46	PAMEUNGPEUK	West Java	Garut	−7.645540	107.728420	SMS	NEW
47	PMULIHAN	West Java	Garut	−7.409800	107.691600	SMS	NEW
48	PANGANDARAN	West Java	Ciamis	−7.682090	108.647970	SMS	NEW
49A1	LANGKAPLANCAR	West Java	Ciamis	−7.503910	108.401680	SMS	NEW
50	BANTUL	Yogyakarta	Bantul	−7.899170	110.321900	SMS	NEW
53	GUNUNG KIDUL 2	Yogyakarta	Gunung Kidul	−7.972510	110.579350	SSG	NEW
55	KULON PROGO	Yogyakarta	Kulon Progo	−7.847730	110.168580	SMS	NEW
56	MAGELANG	Central Java	Magelang	−7.610270	110.207500	SMS	NEW
59	KOTA YOGYAKARTA	Yogyakarta	Kota Yogyakarta	−7.799150	110.387260	SMS	NEW
61	SUKOHARJO	Central Java	Sukoharjo	−7.687400	110.845410	SMS	NEW
62	BANYUWANGI	East Java	Banyuwangi	−8.216840	114.361810	SMS	NEW
63	PUGER	East Java	Jember	−8.371460	113.478270	SMS	NEW
65	YOSOWILANGUN	East Java	Lumajang	−8.239510	113.312910	SMS	NEW
66	BINANGUN	East Java	Blitar	−8.233880	112.334440	SMS	NEW
69	BPBD PACITAN	East Java	Pacitan	−8.204570	111.088010	SMS	NEW

No	Name	Province	Kabupaten	Latitude	Longitude	System*	Site Type
70	BONJOL	West Sumatera	Pasaman	−0.000830	100.221340	SMS	NEW
71	KUMPULAN BANANG	West Sumatera	South Pesisir	−1.907960	100.877430	SMS	NEW
72	LUBUK BASUNG	West Sumatera	Agam	−0.326570	100.029770	SMS	NEW
74	MUARA LABUH	West Sumatera	South Solock	−1.462490	101.029860	SMS	NEW
75A	MUARA SIBERUT	West Sumatera	Mentawai	−1.595900	99.213390	SMS	NEW
76	PAINAN	West Sumatera	South Pesisir	−1.341340	100.586460	SMS	NEW
77	RAO	West Sumatera	Pasaman	0.561630	100.017720	SMS	NEW
79	TALANG BABUNGO	West Sumatera	Soloc	−1.098320	100.880390	SMS	NEW
80	UNP-PADANG	West Sumatera	Padang	−0.894960	100.346440	SMS	NEW
81	PASIGOPPA	West Sumatera	Mentawai	−1.088380	98.852600	SMS	NEW
82	ARGO PANCURAN	Lampung	South Lampung	−5.830280	105.676480	SMS	NEW
83	BENGKUNAT	Lampung	West Lampung	−5.524060	104.233890	SMS	NEW
84	KOTA AGUNG	Lampung	Tanggamus	−5.488600	104.640860	SMS	NEW
86	KRUI	Lampung	West Lampung	−5.210580	103.938790	SMS	NEW
101	LUWI BUDI	Papua	Biak Numfor	−1.162494	136.088560	BBS	JISNET
102	BJI (BANJARNEGARA)	Central Java	Banjarnegara	−7.332933	109.709580	BBS	JISNET
103	BSI (BANDA ACEH)	Aceh	Aceh Besar	5.496420	95.296170	BBS	JISNET
105	KDI (KENDARI)	Southeast Sulawesi	Kendari	−3.957480	122.619220	BBS	JISNET
106	KHK (KAHANG KAHANG)	Bali	Karang Asem	−8.364460	115.609800	BBS	JISNET
107	KSI (KEPAHYANG)	Bengkulu	Kepahyang	−3.650980	102.592890	BBS	JISNET
109	MNI (MANADO)	North Sulawasi	Manado	1.443680	124.838920	BBS	JISNET
110	PCI (PALU)	Central Sulawesi	Palu city	−0.905540	119.836660	BBS	JISNET
111	PPI (PADANG PANJANG)	West Sumatera	Padang Panjang	−0.454730	100.396450	BBS	JISNET
113	SWH (SAWAHAN)	East Java	Naganjuk	−7.780810	111.759120	BBS	JISNET
114	TARA (TARAKAN)	East Kalimantan	Tarakan	3.313570	117.582620	BBS	JISNET
116	TLE2 (MALUKU)	Maluku	Southeast Maluku	−5.637410	132.749830	BBS	JISNET
117	TPI (TANJUNG PANDAN)	Bangka-Belitung	Belitung	−2.756700	107.652490	BBS	JISNET
118	WAMI (WAMENA)	Papua	Jayawijaya	−4.095590	138.950040	BBS	JISNET
119A	WSI (WAINGAPU) 2	East Nusa Tenggara	East Sumba	−9.670580	120.297160	BBS	JISNET
201	CALANG	Aceh	Aceh Jaya	4.628790	95.576680	BBS	BMKG
202	SUBULUSSALAM	Aceh	Subulussalam	2.674920	97.970770	BBS	BMKG
203	TELUK DALAM	North Sumatera	South Nias	0.579220	97.816020	SMS	BMKG
204	SIMPANG EMPAT	West Sumatera	West Pasaman	0.124110	99.875370	BBS	BMKG
205	JAWA TENGAH	Central Java	Banjarnegara	−7.448920	109.632430	BBS	BMKG
206	MOROTAI	North Maluku	North Halmahera	2.198020	128.275850	BBS	BMKG
301	JOGLO	Jakarta	West Jakarta	−6.220670	106.735450	SMS	NEW
306	BADUNG	Bali	Badung	−8.606990	115.177780	SMS	NEW
307	TABANAN	Bali	Tabanan	−8.557010	115.116280	SMS	NEW
309	ANYER	Banten	Serang	−6.063900	105.920930	SMS	NEW
310	GUNUNG SUGIH	Banten	Cilegon	−6.034450	105.942130	SMS	NEW
312	KOBA	Bangka Belitung	Central Bangka	−2.518340	106.422220	SMS	NEW
313	Pinangsori Sibolga	North Sumatera	Central Tapanuli	1.553340	98.896860	SMS	NEW
317	BUMIAYU	Central Java	Brebes	−7.272260	109.016810	SMS	NEW
318	PUNDONG	Yogyakarta	Bantul	−7.955830	110.343330	SMS	NEW
320	PULOGADUNG	Jakarta	East Jakarta	−6.198370	106.904270	SMS	NEW

* BBS:Broad Band Site、SMS: Strong Motion Site

Code	No	Province	City	Latitude	Longitude	Altitude (m)
BA	901	ACEH	Banda Aceh	5.553881	95.285725	4
PDG-02	902	West Sumatera	Padang	-0.785733	100.304822	2
PDG-05	903	West Sumatera	Padang	-0.856836	100.332375	3
PDG-01	904	West Sumatera	Padang	-0.895081	100.346828	4
PDG-06	905	West Sumatera	Padang	-0.913131	100.465072	5
PDG-04	906	West Sumatera	Padang	-0.965481	100.352536	4
LW	908	Lampung	Liwa	-5.003244	104.101275	825
RCG	909	West Java	Bandung	-6.882267	107.611192	799
GP	910	West Java	Bandung	-6.816820	107.599850	1198
UPT	911	West Java	Sukabumi	-7.097217	106.590950	720

Project Location Map for LIPI

Image of Completion (without fence)
No.20 CAMPAKA Seismic Station

Image of Completion (with fence)
No.70 BONJOL Seismic Station

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Abbreviations

ASTM	American Society of Testing and Materials
A/M	Agreed Minutes
B/A	Banking Arrangement
BAKORNAS PB	Based on the law, the National Coordinating Board for Disaster Management
BMKG	Meteorological, Climatological and Geophysical Agency
BNPB	National Agency for Disaster Management
C/P	Counter parts
E/N	Exchange of Notes
G/A	Grant Agreement
GADPR	Grand Aid for Disaster Prevention and Reconstruction
GOJ	Government of Japan
GOI	Government of Indonesia
HQ	Headquarters
IDR	Indonesian Rupiah
IISEE	International Institute of Seismology and Earthquake Engineering under Building Research Institute (Japan)
Ina-TEWS	Indonesia Tsunami Early Warning System
IRIS	Incorporated Research Institutions for Seismology
JASS	Japanese Architectural Standard Specification
JICA	Japan International Cooperation Agency
JICS	Japan International Cooperation System
JIS	Japanese Industrial Standards
LIPI	Indonesian Institute of Sciences
M/D	Minutes of Discussions
MMI	Modified Mercalli Intensity
MOFA	Ministry of Foreign Affairs of Japan
NIED	National Research Institute for Earth Science and Disaster Prevention (Japan)
O&M	Operation and Maintenance
PERDA	Local Government Regulations
RP JMN	Mid-term National Disaster Management Plan
RENSTRA	Medium-Term Strategic Plan
SNI	Standard National Indonesia

Chapter 1 Background of the Project

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1-1 Overall Goal and Project Objective

Indonesia, like the Japanese archipelago, is an island country which is formed along an undersea trench. Therefore, huge earthquakes (ocean-trench earthquakes) occur frequently. Huge earthquakes (greater than magnitude 7) that occurred in 2000 or later off the coast of Sumatra are shown in the following table.

Table 1-1 Earthquakes that occurred in 2000 or later off the coast of Sumatra

Date	Name	Epicenter		Magnitude (Deaths)
		Latitude	Longitude	
4 Jun 2000	Sumatera earthquake (2000)	3°43'21"S	102°4'48"E	7.9 (100)
26 December 2004	Sumatera earthquake (2004)	3°18'58"N	95°51'14"E	9.1 (220,000)
28 March 2005	Sumatera earthquake (2005)	2°4'26"N	97°0'47"E	8.6 (2,000)
12 December 2007	Sumatera earthquake (2007)	4°31'12"S	101°22'26"E	8.5 (17)
30 September 2009	Sumatera earthquake (2009)	0°43'30"S	99°51'22"E	7.5 (1,100)
25 October 2010	Sumatera earthquake (October 2010)	3°29'2"S	100°6'50"E	7.7 (400)
11 Avril 2012	Sumatera earthquake (April 2012)	2°18'40"N	93°3'47"E	8.6 (5)

Source: Wikipedia

Among the above mentioned huge earthquakes, especially the Sumatera earthquake (2004) which occurred offshore of northern Sumatera resulted in extensive damage not only to Indonesia but also to the countries of the Indian Ocean.

The "Law of the Republic of Indonesia Number 24 of 2007 Concerning Disaster Management (hereinafter referred to as the "Disaster Management Law"), which was enacted with full consideration of the effects of the Sumatera earthquake (2004), is the fundamental law for disaster risk management and countermeasures in Indonesia. Under the Disaster Management Law, both central and local governments are responsible for disaster management. The law provides for the establishment of disaster risk management organizations in both central and local levels. Based on the law, the National Coordinating Board for Disaster Management (hereinafter referred to as "BAKORNAS PB") was strengthened in May 2008, and as a result, the National Agency for Disaster Management (hereinafter referred to as "BNPB") was newly established as an organization that is directly responsible to the president.

Counter parts (hereinafter referred to as "C/P") of this project are Meteorological, Climatological and Geophysical Agency (hereinafter referred to as "BMKG") and the Indonesian Institute of Sciences (hereinafter referred to as "LIPI"). They both are organizations for disaster management of national level under direct control of the President. They each are ordained by the law mentioned above in their roles as observation and monitoring for disaster management and research.

After enactment of the Disaster Management Law, many acts or regulations related to disaster management countermeasures were established. In 2009, the "National Disaster Management Plan (2010-14)" was formulated through coordination between the agencies related to BNPB. The plan is important, since it becomes the basis for cross-agency activities on disaster management. There are mainly two objectives of the plan. One is to identify high risk areas that are vulnerable to disasters and then to formulate priority activity plans in those areas and their budgeting plans. The other is to provide standards for conducting activities on disaster mitigation in a well-planned, integrated and comprehensive manner through the coordination of all the agencies and people concerned with disaster management.

A part of this National Disaster Management Plan is reflected in the "Mid-term National Disaster Management Plan (RP JMN)". RP JMN presents a mid-term development plan in the development policy of the Indonesian government and the natural disaster management is mentioned as one of the preferential fields to be developed in this plan.

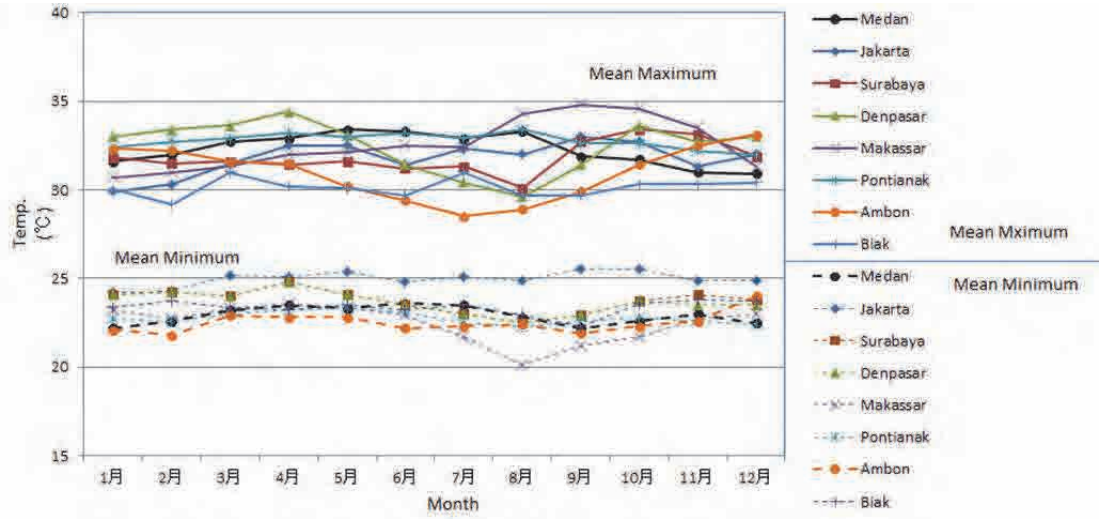
Under the above upper level plan of Indonesia, the project carried out cooperation that will contribute to (a) improvement of the earthquake monitoring capacity of BMKG and effective utilization of accurate earthquake information by the departments and agencies related to disaster risk management, and (b) enhancing the quality of LIPI'S scientific research and study on earthquake disaster management, through the procurement of the equipment and establishment of relevant systems. Through this cooperation, the project is aiming to put in place the disaster countermeasure equipment related to monitoring and warning systems regarding earthquake in Indonesia. The project is also aiming to contribute to the improvement of disaster prevention capacity with a focus on earthquakes in Indonesia as its overall goal.

1-2 Natural Conditions

Indonesia, which is an island county spanning 5,000 km east-west across the equator, has coastlines that total more than 50,000km, which is among the longest of all the nations in the world. Most of the country has a tropical rainforest climate with high temperature and humidity all year long. Although the temperature varies slightly depending on the region, there are very few seasonal effects; an average temperature of 27°C, mean maximum temperature of 30 - 34°C, and mean minimum temperature of 22 - 24°C. Regarding the humidity, annual average humidity is very high even when compared to Japan and with 80%[1] or more. Latitude is within 10° North and 10° South, and it is not affected by tropical cyclones. Rainy season and dry season exist in Indonesia, and dry season is from July to September. In Java Island and western Sumatra, precipitation doesn't differ much between these seasons. On the other hand, there is a distinct dry season at Denpasar, Makassar and Surabaya. Annual rainfall varies depending on the region; average of 1,800 to 3,200 mm in the low lying areas and 6,000 mm or more in some

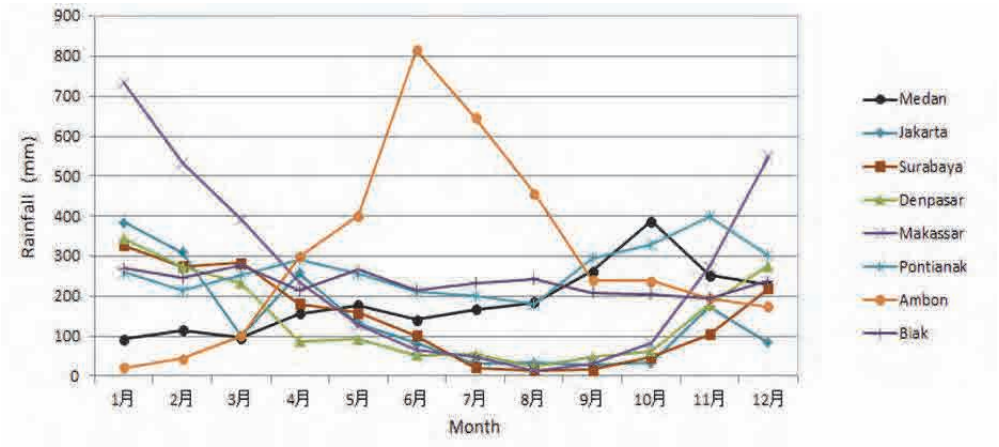
[1] Temperature and humidity data for 2010, source: Stasitik Indonesia 2012 (Statistical Yearbook of Indonesia 2012)

mountainous areas. Figure 1-1 and Figure 1-2 show temperature and precipitation throughout Indonesia.



Source: http://www2m.biglobe.ne.jp/~ZenTech/world/infomation/kion/indonesia.htm

Figure 1-1 Temperature of Indonesia



Source: http://www2m.biglobe.ne.jp/~ZenTech/world/infomation/kion/indonesia.htm

Figure 1-2 Precipitation of Indonesia

Indonesia is formed along the circum-Pacific organic belt and the Java trench (Sunda Trench) extends over 2,600 km along the south coast. Therefore, there are many active volcanoes and also innumerable active faults, running in the same direction as the greatest length of Indonesia. Indonesia is one of the countries that experience the most natural disasters such as earthquakes, landslips, slope failures, volcanic eruptions and forest fires. In addition, large scale ocean-trench earthquakes (between plates) occur frequently. Tsunamis generated by the large scale earthquakes that occur in the sea around Indonesia reach the land in a short period of time and they have often caused enormous damage to coastal areas.

1-3 Environmental and Social Considerations

There will be no significant negative impact on the natural environment or social issues: for instance no huge alterations of natural environment and resettlement of local residents. The above mentioned grant will be realized for LIPI and BMKG through this project.

Some civil work such as construction of concrete foundations to install strong motion seismographs (accelerometer) will be required and implemented under LIPI's responsibility. However it will not create significant negative impacts since the scale of construction works is very small. An equipment plan shall be prepared in compliance with the related legislations, such as building codes and standards, regulations for communication and other environmental restrictions.

Chapter 2　Contents of the Project

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

The Project will donate earthquake observation equipment to BMKG and LIPI which are an earthquake observation agency and research institution respectively. This will contribute to strengthen the analysis capacities regarding earthquakes and tsunami, and improvement of the accuracy of seismic source and seismic intensity analysis.

Through the above mentioned donation, the Project will contribute to the improvement of the disaster prevention ability of Indonesia.

An outline of the Project is described below.

(1) BMKG

Hardware and its related software contributing to the expansion and updating of the earthquake observation network will be put in place. This implementation is aiming to mainly contribute to the improvement of the earthquake observation capacity and of information analysis accuracy of BMKG which is carrying out the earthquake and tsunami observations.

BMKG is an organization under the direct control of the President which does not belong in any particular ministry. This organization implements the observation, data collection and research on meteorology, climatology and geophysics including earthquake and tsunami and it plays a role in carrying out monitoring of particularly vulnerable areas. BMKG are seeking to improve the capacity of disaster prevention technology in light of the lessons learned from the experience of the Sumatra Earthquake in 2004. However, a part of the earthquake monitoring equipment has reached time to renew and one of the strategic plans of Indonesia[2] which is aiming to install 500 strong motion seismographs (accelerometers) throughout Indonesia is still in the middle of implementation. In view of the current situation, based on the lessons learned of the Great East Japan Earthquake of 2011, this cooperation aims to expand the earthquake observation network of BMKG and to contribute to the construction of an earthquake observation network. In particular, broadband seismographs (velocity meters), broadband strong motion seismographs (velocity meters), strong motion seismographs (accelerometers) and seismic intensity meters will be procured. Equipment and software are also procured through this cooperation; these are required for real time transmission of observed seismic data and to connect with existing seismic information systems such as the seismic analysis and monitoring

[2] In the medium-term strategic plan of 2010-2014 (RENCANASTRATEGIS: RENSTRA) developed by BMKG, placing of 600 sites that are able to display the strength of the earthquake is mentioned as one of the goals. According to the interview with BMKG, originally, broadband seismographs (velocity meters), broadband strong motion seismographs (velocity meters) and strong motion seismographs (accelerometers) were included as the equipment to be installed. But BMKG aims to install 500 strong motion seismographs (accelerometers) with their latest plan.

system of BMKG HQ. Equipment procurement will include installation (with the exception of seismic intensity meters) and partly involve civil works.

In the Project, improving seismic analysis, magnitude calculation and accuracy of seismic intensity nationwide mapping are expected.

In Indonesia, as with the Japanese archipelago, there are trenches that lie along the Sumatra-Java Island arc. Therefore, large-scale earthquakes occur frequently in this area. Implementing the earthquake early warning currently operated in Japan in Indonesia can be expected to reduce of damage caused by the earthquake in Indonesia. Therefore, introducing multi-function strong motion seismographs (accelerometers) which are the core technology of earthquake early warning has been additionally requested during the survey in Indonesia. However, the introduction of multi-function strong motion seismographs (accelerometers) itself cannot be intended for issuing earthquake early warning. To issue earthquake early warnings, other factors are required such as educational activities about the seismic intensity concept to the Indonesian general public who will be recipients of the warning, improving the accuracy of the estimated seismic intensity of each region based on the accumulation and analysis of seismic intensity observed data, construction of a system with which earthquake early warnings can be issued, coordination with the relevant ministries and etc. Thus, in order to operate multi-function strong motion seismographs (accelerometers), it is essential to introduce the system and also engage in vigorous capacity building activities by BMKG.

Under the present situation of Indonesia, even though multi-function strong motion seismographs will be introduced, it would not be possible to issue the earthquake early warning. Therefore, it is decided do not include multi-function strong motion seismographs (accelerometers) in the Project.

The following components will be procured through the Project to BMKG.

Table 2-1 Outline of the Project (BMKG)

Type of Equipment	Expected Outcome	Input
1. Existing broadband seismic station installed by National Research Institute for Earth Science and Disaster Prevention (NIED), Japan (JISNET site) (15) (supply of equipment and replacement)	Equipment of JISNET site that has reached renewal time will be replaced and the analysis accuracy of earthquakes and seismic intensity information can be improved.	• Broadband seismograph (velocity meter) (15) • Broadband strong motion seismograph (velocity meter) (15) • Strong motion seismograph (accelerometer) (15) *Solar power system (1) *Seismic station construction (6)
2. Existing shelter constructed by Indonesian government (BMKG existing site) (5) (supply of equipment and installation)	Equipment will be installed in BMKG existing site and the analysis accuracy of earthquakes and seismic intensity information can be improved.	• Broadband seismograph (velocity meter) (5) • Broadband strong motion seismograph (velocity meter) (5) • Strong motion seismograph (accelerometer) (5) *solar power system (2)
3. New Station for Strong Motion Seismograph including Civil Works and Installation (73) (supply of equipment, civil works and installation)	It will contribute to the early realization of the plan of Indonesia which is aiming to install 500 strong motion seismographs throughout Indonesia. It will also contribute to the rapid response to an earthquake in the case of a large-scale earthquake predicted to occur in Sumatra in the future.	• Strong motion seismograph (accelerometer) (73) *Solar power system (6) *Seismic station construction (67)
4. New installation of satellite communication system (for data transmission from each site to the BMKG HQ)	Observed data of each site will be sent and obtained in real time at the BMKG HQ.	• Satellite communication system (93) (for all target sites)
5. Seismic intensity meter (supply of equipment only)	Accuracy of seismic intensity observation will be improved.	• Seismic intensity meter (200)
6. BMKG HQ (seismic intensity information system server, earthquake waveform information acquisition server)	Seismic intensity information will be collected and it will contribute to creating a data base and analysis for earthquake early warning in future.	• Seismic intensity information system server (1) • Earthquake waveform information acquisition server (2)

(2) LIPI

LIPI is an organization under the direct control of the President which does not belong in any particular ministry and assumes scientific survey and research related to general disaster management including the earthquake and tsunami. However, LIPI has not been equipped sufficiently and does not have the equipment such as PS logging equipment, which is very effective for the surveys related to disaster prevention.

In order to improve the research activities related to earthquake by LIPI, the following equipment will be procured through the Project.

Table 2-2 Outline of the Project (LIPI)

Type of Equipment	Expected Outcome	Input
1 PS logging equipment	Relation between the geology of well drilling point and S-wave velocity will be determined by PS logging. Consequently, the geological structure can be estimated by S-wave velocity structure result of the elastic wave exploration and microtremor measuring.	• PS logging equipment (including geophones of elastic wave exploration) (1)
2 Array microtremor measurement equipment	S-wave structure of the ground over a wide area will be determined and vibration characteristics of the ground can be analyzed	• Array microtremor measurement equipment (1)
3 Strong motion seismograph (accelerometer) (supply of equipment and installation)	Resonance characteristics (frequency characteristics of the ground will be determined by the observation of a fixed period.	• Strong motion seismograph (accelerometer) (10)

2-2 Outline Design of the Requested Japanese Assistance

2-2-1 Design Policy

2-2-1-1 Basic Policies

(1) Principles

Japan International Cooperation Agency (hereinafter referred to as "JICA") had conducted basic information collection and confirmation studies on disaster risk management mainly in countries of the Asia and Pacific-rim regions, where there are high risks of earthquake and tsunami, from the end of September to the middle of November, 2011, for future assistance in the disaster risk management sector. Considering the results of the studies, the Ministry of Foreign Affairs of Japan (hereinafter referred to as "MOFA") instructed JICA to conduct "Preparatory Surveys on the Project for Improvement of Equipment for Disaster Risk Management" (hereinafter referred to as "the Project") pursuant to the "Basic Guidelines for Reconstruction in response to the Great East Japan Earthquake (July 29, 2011, by Reconstruction Headquarters in response to the Great East Japan Earthquake)" in order to formulate Japan's Grant Aid projects to be implemented by the fiscal 2011 third supplementary budget of the government of Japan (hereinafter referred to as "GOJ").

In implementing the Project, equipment and materials are planned to be principally procured from Japan and/or locally. Moreover, details of procurement conditions are discussed and determined based on the said Basic Guidelines.

(2) Scope of the Project

During the field survey, discussions on the requested items, reasons and priorities were undertaken, and the background of the request was confirmed through the survey on the existing equipment. After the survey, further studies and analyses were made in Japan, based on the above-mentioned basic policies, to determine the equipment specifications and quantities. Since the Exchange of Notes (hereinafter referred to as "E/N") of the Project had been signed already, it was required to determine the scope of the Project to make it within the grant shown in the E/N.

Details of each equipment component determined through discussions with the Implementing Agencies, the field survey, study and analysis, are described in "2-2-2 Basic Plan (Equipment Plan)" hereinafter.

2-2-1-2 Policy towards Natural Conditions

In the isolated islands, there are limits to the electricity feeding time or the voltages are unstable. Therefore, the solar power systems will be installed which ensure independent and stable power supplies. The solar power systems will be also installed in the sites of Java Island

if the sites are located far from the existing power grid. In Indonesia, there are many rainy days and the average of the number of rainy days per year has been recorded as more than 60%. However, the number of days without sunshine is not so many. It can be considered that solar power systems will function well. The following table shows the amount of solar radiation around the sites on which the solar power systems will be installed.

Table 2-3 Amount of Solar Radiation around the Sites (Solar Power System Installation Sites)

(kWh/m^2/d)

Site No.	40	41	42	75A	81	113	203	205	206
	Langi	Tuhembrua	Kampung Aie	Muara Siberut	Pasigoppa	SWH (Sawahan)	Teluk Dalam	Java Tenga	Morotai
Latitude°N	2.825	1.469	2.589	-1.596	-1.088	-7.781	0.579	-7.449	2.198
Longitude°E	95.748	97.442	95.964	99.213	98.853	111.759	97.816	109.632	128.276
January	4.85	5.05	4.85	4.77	4.79	4.81	4.90	4.33	5.40
February	5.21	5.27	5.21	5.21	5.28	4.85	5.25	4.52	5.65
March	4.93	5.07	4.93	5.10	5.05	5.04	4.97	4.58	5.96
April	4.66	4.77	4.66	4.97	4.97	5.12	4.78	4.65	6.19
May	4.86	4.95	4.86	4.97	5.04	5.04	4.98	4.61	5.75
June	4.73	4.83	4.73	4.82	4.84	4.82	4.87	4.43	5.34
July	4.46	4.61	4.46	4.69	4.64	5.17	4.56	4.65	5.52
August	4.51	4.60	4.51	4.75	4.59	5.68	4.54	4.94	5.97
September	4.46	4.58	4.46	4.77	4.52	6.07	4.51	5.19	6.25
October	4.31	4.48	4.31	4.69	4.59	6.02	4.51	4.96	5.99
November	4.16	4.32	4.16	4.36	4.24	5.46	4.26	4.46	5.70
December	4.66	4.68	4.66	4.54	4.50	5.09	4.57	4.60	5.40
Minimum Radiation	4.16	4.32	4.16	4.36	4.24	4.81	4.26	4.33	5.34

Source: https://eosweb.larc.nasa.gov/cgi-bin/sse/grid.cgi?email=na

Designs have been made as specified in consideration of the tropical climate specific conditions, such as high temperature and high humidity, heavy rain and lightning. The geological condition of Indonesia that belongs to the plate type earthquake-prone zone should be also considered, since target sites of the Project are scattered nationwide in Indonesia.

2-2-1-3 Policy towards Socio-economic Conditions

In order to minimize the financial burden on the Implementing Agencies (BMKG and LIPI), the equipment plan is designed with consideration to the least practical operation and maintenance costs. And, regarding the site selection and facilities planning, considerations are made on protection from theft.

2-2-1-4 Policy towards Local Procurement Conditions and Commercial Practice

Among the equipment that is planned to be installed in the Project, the earthquake observation equipment, such as sensors, and data transmission equipment contain products that

are defined under Japan's Foreign Exchange and Foreign Trade Act as goods or technologies that are subject to regulation. When the products are exported from Japan, due formalities, based on the Act, need to be followed to obtain permission for export. The procurement of the aforementioned equipment will not be any problem after obtaining permission for export. However, in formulating the operation plan, the necessary time periods for the aforementioned formalities to obtain export permission and other required export procedures need to be taken into account.

2-2-1-5 Policy towards Employing Local Contractors and Consultants

The procurement in the Project will be basically done with the principal policy of buying products made in Japan. However, the civil works such as concrete foundation work for equipment installation and the construction of new seismic stations, electrical equipment work and a part of the materials such as anti-theft fences, will be procured locally. Regarding unpacking, loading, assembly and installation of all equipment, they will be performed by local workers under the guidance of engineers of a Japanese firm.

2-2-1-6 Policy towards Operation and Maintenance

Since the Implementing Agencies (BMKG and LIPI) are operating similar equipment and systems with the equipment and systems covered by the Project, they have organizational abilities on operation and maintenance, and the financial status of each Implementing Agency is sound. Thus, each agency is deemed to have capability for operation and maintenance of the new equipment procured by the Project.

According to the above mentioned medium-term strategic plan of 2010-2014 (RENSTRA), development and improvement of the Indian Ocean tsunami early warning system and progress of earthquake engineering (strong motion analysis) are mentioned as a part of priority development points related to the disaster management of earthquake and tsunami. The following are also to be performed.

- Creation of standard operating procedures regarding the tsunami warning, contribution to the establishment of reliable operation of the tsunami warning for domestic and the Indian Ocean Rim
- Enhancement of information services for data transmission systems and for the rural areas
- Observation of aftershocks, and the prevention of confusion through the provision of information to government authorities and local communities in the affected areas

For Carrying out the above mentioned activities, BMKG staffs require highly specialized knowledge. The department in charge of the Project is the Earthquake and Tsunami Department (Pusat Gempa Bumi dan Tsunami) and the Seismological Technique, Geophysical Potential and

Time Signal Department (Pusat Seismologi Teknik, Geofisika Potensial dan Tanda Waktu) under the Deputy for Geophysics (Deputi Bidang Geofisika). Many of affiliated staffs have professional education at universities in foreign countries including Japan or in their own country. Some of them have obtained doctorates. In addition, there are many staffs who have taken the training in the International Institute of Seismology and Earthquake Engineering (IISEE) at Tsukuba in various programs that were between two months and one year in duration and Staffs with high technical capabilities are located in seismic stations. Therefore, the Organizational structure of BMKG can be said to be fully equipped for the related operations.

For BMKG, the training on the initial operation about operation method, operational procedures, maintenance and inspection method will be conducted by the manufacturer's technicians, after equipment installation under the Project. Technical assistance is not considered to be required, since BMKG staffs obtain decent technical skills and they have experience to accurately operate and maintain the existing earthquake observation equipment which is similar to the equipment to be procured in the Project.

Trainings on the initial operation will be provided after the installation of the equipment. LIPI does not have any past experience of owning the PS logging equipment and array microtremor measurement equipment procured in the Project. However, Technical assistance is not considered to be required, since LIPI staffs obtain decent technical skills and research abilities and they are capable of conducting research on earthquakes with the equipment procured in the Project.

2-2-1-7 Policy towards Grades for Equipment

Grade and specifications of the equipment to be provided by the Project are to meet with Japan's and/or international standards. Equipment which has been developed based on lessons learned from the Great East Japan Earthquake and state-of-art technology in Japan will be procured as much as practical.

2-2-1-8 Policy towards Method of Procurement and Project Implementation Period

The Procurement Agency (Japan International Cooperation System: JICS) will conduct the procurement services for the Project on behalf of the Implementing Agencies, and the equipment will be procured through open competitive tender(s).

As described above, the Project has two Implementing Agencies (BMKG and LIPI). Since the types of equipment and required procurement time period for BMKG and LIPI are quite different, two separate tender packages will be conducted.

The Project aims at disaster prevention and disaster risk mitigation with urgent needs. It is essential to procure such equipment as soon as possible in order to contribute to improvement of disaster prevention and disaster risk mitigation. Based on the above policy, implementation schedules will be set in the most rational and economical manner.

2-2-2 Basic Plan (Equipment Plan)

2-2-2-1 Principles

Through the procurement of the equipment, the Project will be contribute to (a) improvement of the earthquake monitoring capacity of BMKG and effective utilization of accurate earthquake information by the departments and agencies related to disaster risk management, and (b) enhancing the quality of LIPI's scientific research and study on earthquake disaster management, and it is aiming to put in place the disaster countermeasure equipment related to surveys and observations of earthquakes in Indonesia.

To attain the above-mentioned project goals, discussions with the Implementing Agencies, the field survey and technical study / analysis were properly conducted. Since the E/N of the Project has been signed already, it was required to determine the scope of the Project to make it fit within the grant shown in the E/N.

The following table shows a comparison of the requested items confirmed in the Minutes of Discussions (hereinafter referred to as "M/D") and the Project components determined through discussions with the Indonesian side, the field survey and technical study and analysis.

Table 2-4 Comparison of Requested Items and Project Components for BMKG

Requested Items			Project Components		Note
Items	Qty	Pri*	Items	Qty	
1. Existing Broadband Seismic Station installed by National Research Institute for Earth Science and Disaster Prevention (NIED), Japan (Supply of Equipment and Replacement Works)			1. Existing Broadband Seismic Station installed by National Research Institute for Earth Science and Disaster Prevention (NIED), Japan (Supply of Equipment and Replacement Works)		
a. Broadband Seismograph (Velocity meter)	15	A	a. Broadband Seismograph (Velocity meter)	15	No change
b. Broadband Strong Motion Seismograph (Velocity meter)	15	A	b. Broadband Strong Motion Seismograph (Velocity meter)	15	No change
c. Strong Motion Seismograph (Accelerometer)	15	A	c. Strong Motion Seismograph (Accelerometer)	15	No change
d. Communication	15	A	d Communication	15	No change
2-1. Existing Station installed by Indonesian Government (Supply of Equipment and Installation Works)			2-1. Existing Station installed by Indonesian Government (Supply of Equipment and Installation Works)		
a. Broadband Seismograph (Velocity meter)	5	A	a. Broadband Seismograph (Velocity meter)	5	No change
b. Broadband Strong Motion Seismograph (Velocity meter)	5	A	b. Broadband Strong Motion Seismograph (Velocity meter)	5	No change
c. Strong Motion Seismograph (Accelerometer)	5	A	c. Strong Motion Seismograph (Accelerometer)	5	No change
d. Communication	5	A	d. Communication	5	No change

Requested Items			Project Components		Note
Items	Qty	Pri*	Items	Qty	
2-2. Existing Station installed by Indonesian Government (Supply of Equipment only)					Excluded. (Procurement of equipment including installation work is high priority)
a. Broadband Seismograph (Velocity meter)	10	B			
b. Broadband Strong Motion Seismograph (Velocity meter)	10	B			
c. Strong Motion Seismograph (Accelerometer)	10	B			
d. Communication	10	B			
3. New Station for Strong Motion Seismograph including Civil Works and Installation (Supply of Equipment, Civil Works and Installation)			3. New Station for Strong Motion Seismograph including Civil Works and Installation (Supply of Equipment, Civil Works and Installation)		There was a limited number of Sites met the installation criteria
c. Strong Motion Seismograph (Accelerometer)	85	A	c. Strong Motion Seismograph (Accelerometer)	73	
d. Communication	85	A	d. Communication	73	Adjust according to the Strong Motion Seismograph site numbers
4. New Station for Strong Motion Seismograph (Supply of Equipment only)					Excluded. (Procurement of equipment including installation work is high priority)
c. Strong Motion Seismograph (Accelerometer)	85	B			
d. Communication	85	B			
5. Intensity Meter (Supply of Equipment only)	200	A	5. Intensity Meter (Supply of Equipment only)	200	No change
6. Data Processing System (Supply of Equipment and Installation Works)	1 Lot	A	6. Data Processing System (Supply of Equipment and Installation Works)	1 Lot	No change
7. Digitizer for Spare (Supply of Equipment only)	15	B			Excluded. (Procurement of earthquake observation equipment and construction of related system are high priority)

*【Priority】 A: High, B:Middle

Table 2-5 Comparison of Requested Items and Project Components for LIPI

Requested Items			Project Components		Note
Items	Qty	Pri*	Items	Qty	
1. PS Logging Equipment	1 Lot	A	1. PS Logging Equipment	1 Lot	No change
2. Array Microtremor Measurement Equipment	1 Lot	A	2. Array Microtremor Measurement Equipment	1 Lot	No change
3. Strong Motion Seismograph (Accelerometer) (Including installation)	10 pcs	A	3-1. Strong Motion Seismograph (Accelerometer) (Including installation)	2 pcs	LIPI has sufficient capacity of equipment installation.
			3-2. Strong Motion Seismograph (Accelerometer) (Without installation)	8 pcs	

*【Priority】 A: High, B:Middle

As mentioned above, equipment and materials are planned to be principally procured from Japan and/or locally. Moreover, details of procurement conditions are discussed and determined based on the said Basic Guidelines. Thus, the equipment plan for the Project is decided through technical studies in line with this basic policy.

The major changes from the initially requested items are as follows.

(1) BMKG: Existing Station installed by Indonesian Government (Supply of Equipment only)

In addition to the equipment procurement including installation for 5 seismic stations constructed by Indonesian side (BMKG existing sites), it was requested initially to donate equipment such as broadband seismographs (velocity meters), broadband strong motion seismographs (velocity meters), strong motion seismographs (accelerometers) and satellite communication systems for the 10 new seismic stations which will be constructed by the Indonesian side. However, the priority for these 10 sites are determined as inferior compared to the equipment procurement including installation for 5 sites.

The Project has a high urgency and procurement needs to be implemented as early as possible. In consideration of this nature of the Project, the receptive capacity of the Indonesian side and the procurement framework of the Japanese side, it is planned to implement only the high priority items. Therefore, the equipment procurement for these 10 sites will not be included in the Project and this was confirmed in the M/D dated July 6 2012, through the meeting with BMKG

(2) BMKG: New Station (Strong Motion Seismograph Site) for Strong Motion Seismograph (Supply of Equipment and Replacement Works)

In the initial request, it was planned for 85 sites. As a result of the site survey carried out by the Consultant, BMKG staffs and the subcontracted local consultant, some of the sites had insufficient installation space. The sites located close to a source of vibration causing noise such as busy roads were also identified. Therefore, 78 sites are selected excluding the sites which are not appropriate for the Project. Five sites are classified as relatively low priority candidate sites, and 73 sites are selected as project target sites. The number of satellite communication systems is also modified in accordance with the number of new seismic stations.

(3) BMKG, New Station for Strong Motion Seismograph (Supply of Equipment only)

85 sets of strong motion seismographs (accelerometers) and satellite communication systems were requested initially as equipment for the new seismic station which will be arranged in the future by BMKG. However, since the priority is lower than the equipment procurement including installation, this request will not be included in the Project.

(4) BMKG, Digitizer for Spare

Digitizers as replacement parts for the strong motion seismographs (accelerometers) were requested initially. However, since the life of this equipment is about 10 years and replacement of parts is not particularly required in this period, placing the priority on procurement of earthquake observation equipment and formulation of earthquake observation systems, digitizers will not be included in the Project.

(5) LIPI, Strong Motion Seismograph (Accelerometer) (including installation)

The strong motion seismographs (accelerometers) is equipment which will be moved and installed in other locations to collect necessary observed data in each of several years. In the initial request, it was planned to donate 10 strong motion seismographs (accelerometers) with installation by the Japanese side. However, LIPI staffs should have knowledge of installation of this equipment and they have sufficient capacity for this issue. Therefore, 2 of the 10 provided strong motion seismographs (accelerometers) which are for Bandung will be installed by the Japan side under the presence of LIPI staffs and the other 8 strong motion seismographs (accelerometers) will be provided by the Japan side but the installation will be carried out by LIPI staffs. LIPI staffs will check on the setting method during the equipment installation by the Japan side for 2 sites.

2-2-2-2 Equipment Plan

Details of the equipment plan of the Project for BMKG and LIPI are mentioned below.

(1) Equipment Plan for BMKG Package

Seismic stations of BMKG have been installed in more than 200 sites across the country; strong motion seismographs (accelerometers) and broadband seismographs (velocity meters) have been introduced for each site. BMKG aims to install 600 strong motion seismograph (accelerometer) stations (500 stations according to the interview with BMKG) in the Medium-term strategic plan of 2010-1014 (RENSTRA). The Project allows BMKG to strengthen their seismic network, improve the observation density by increasing the seismic station and it will contribute to the improvement of analysis accuracy of the earthquake epicenter mechanism and earthquake scale.

1) Equipment Procured in the Project

Procured equipment was decided to be broadband seismograph (velocity meter), broadband strong motion seismograph (velocity meter), strong motion seismograph (accelerometer), intensity meter, BMKG HQ equipment and satellite communication systems with accessories for the reasons indicated below. Installation and civil works associated with the installation was also including in the Project.

a. Broadband Seismograph (Velocity Meter)

Broadband seismograph (velocity meter) observes long period vibration, and is used for elucidation of earthquake generation mechanism, determination of epicenter and calculation of magnitude. Obtained analysis result is using for decision making for Tsunami forecast and warning. Some of the earthquake observation equipment installed in the JISNET site, which is a seismic station with a broadband seismograph (velocity meter) is not working properly because of aging. To improve this condition, the equipment will be updated in the JISNET site. Five of the BMKG existing sites will also be provided with broadband seismographs (velocity meters) the same as the JISNET site.

b. Broadband Strong Motion Seismograph (Velocity Meter)

During the Great East Japan earthquake, a seismic station with a broadband seismograph close to the epicenter, could not properly measure because the scale was beyond its limits and it could not accurately calculate the magnitude. Based on this experience, broadband strong motion seismographs (velocity meters) which can observe stronger vibrations than the broadband seismograph (velocity meter) have been developed and are being installed nationwide to prepare for future massive earthquakes in our country. Indonesia is a country with massive subduction earthquakes that occur frequently the same as Japan. Therefore, installation of broadband strong motion seismographs (velocity meters) was requested since introduction of broadband strong motion seismographs (velocity meters) is effective. Broadband strong motion seismographs (velocity meters will be introduced to JISNET sites and BMKG existing sites (total 20 sites). In addition, this equipment was originally developed in Japan, and it is considered to be appropriate equipment for the Grant Aid Project.

c. Strong Motion Seismograph (Accelerometer)

Strengthening of the strong motion seismograph network is described in the Medium-term strategic plan of 2010-2014 (RENSTRA) and is following the Indonesian National Strategy. Commencement of the Project will raise the number of strong motion seismograph seismic stations from 236 to more than 300 and contribute to early achievement of the earthquake seismic station network development goal.

In the planed strong motion seismograph, the function of intensity scale calculation will be attached, and after the Project, it will be the first nationwide observation network for seismic intensity. It is expected that seismic intensity data accumulation and its study and analysis will be started for the Earthquake Early Warning in the future.

BMKG is using the MMI (Modified Mercalli Intensity Scale), which divides earthquake strength into 12 ranks and is adapted in the USA. The formula for the intensity scale calculation, which is shown by BMKG, will be installed for strong motion seismographs.

The concept of the seismic intensity scale is not familiar to the public in Indonesia. In the future, the parameters of the formula shall be adjusted so that the intensity scale can show actual disaster damage. For that reason, the parameters will be rewritten and a program for the new formula will be installed.

In addition the rewritten parameter function also will be installed in the seismic intensity meter.

d. Satellite Communication System

The JISNET seismic station already has a satellite communication system for telemeter, however unit cost of this system is high compare to the main system BMKG is using, therefore, this is a reason for the increase in maintenance cost. Based on this, the existing satellite communication system will be used for the Project.

BMKG is now using two (2) satellite communication systems; however, neither of them has any expansion range. BMKG has already started budget preparation for the expansion of the satellite communication contract. In the Project, seismic stations will use the satellite communication network which was prepared by BMKG. For the BMKG HQ communication network, the existing BMKG equipment will be used, except for some of the equipment such as the line card for the satellite hub, which will be procured in this project. For satellite communication, the equipment for each site such as satellite router and satellite antenna will be included in the Project. In consideration of the connectivity, satellite communication equipment will specify the brand i-Direct (Third country product) which is used in the BMKG satellite network.

Satellite: Palapa D
Location of Satellite: Longitude 113°
Provider: Indosat
Equipment for satellite communication: i-Direct

e. Power Supply System

At BMKG seismic stations, the existing power outlet can be used. However, at the new construction sites, in general, BMKG shall enter into a new power supply contract. However, if the site is located far from the existing power grid, or located on an isolated island which does not have stable power supply, a solar power system will be installed by the Project to provide a stable power supply.

In consideration of sunshine fluctuation, the solar power system has a battery which can operate the facility for 5 days without power generation from the solar power system (TN: July 6, 2012). However, even in the seismic stations which have a commercial power supply, to prepare for a power failure, a battery is necessary. Therefore a battery which capacity can operate the system for two days will be installed (TN: July, 6, 2012).

The power consumption of a normal router is higher than that of a power saving type router. If there is commercial power available, we will use a normal router, however, if there is no commercial power available we will have to the operate router with power from solar panels. To reduce the number of solar panels we will use a power saving type router.

f. Wireless Communication Facility (119A: Waingapu Seismic Station)

In the Project, the observed earthquake data will be sent to BMKG HQ directory. On the one hand, the seismic station which is located at the BMKG operation center will be connected to the operation center and earthquake information can be confirmed at the local BMKG office, as well. At the Waingapu seismic station, a previous JISNET was installed inside of the office area, however, according to the geological condition (alluvial soft soil) and traffic condition (in front of an airport road), it was noisy. For that reason, a new seismic station will be constructed on the top of the hill (120m from the BMKG office). For the data transmission, a wireless communication system will be installed.

g. Intensity Meter

For the selected sites in this project strong motion seismograph which have a seismic intensity calculation function will be introduced, however, they cannot cover the vast expanse of Indonesia. A total of 200 intensity meters were requested to raise the earthquake observation accuracy.

The seismic intensity meter is a simple seismic intensity meter, and was developed by "IT Strong motion Consortium" joint research with private companies and research institutes conducted by Tokyo UN Earthquake Laboratory. Accuracy is not high because of its simple type, however the price is not expensive compared to a strong motion seismograph (accelerometer). Regarding the installation, although there is a basic installation standard, it is easy to just bolt them to a concrete floor or pillars. Special techniques for installation and adjustment are not required. Therefore BMKG staff can install it easily and it is expected to contribute to the expansion of the intensity observation network and to collect and interpolate data. For this reason, procurement of 200 intensity meters is decided to follow the request.

Seismic intensity values will be sent through the internet to BMKG seismic intensity information system server by the Intensity meters. Since this equipment has a DHCP client function, if the DHCP server is connected to the internet, the IP address will be sent automatically when the equipment is connected to the internet with a cable. Because the equipment has a specification that the transmission of observed data to the intensity information system server starts automatically, no special setting of the equipment is required.

h. Observation Equipment and BMKG HQ Equipment (Earthquake Information System)

Components of the equipment at the seismic station are a seismograph, digitizer, GPS (time adjustment), UPS, AVR (Automatic Voltage Regulator)/charge controller, satellite modem and satellite antenna. These are necessary and sufficient systems to collect data and transfer the data to BMKG HQ. The system diagram is shown in Figure 2-1, Figure 2-2. Power system configuration is divided in to two types for a commercial power site and a solar power site.

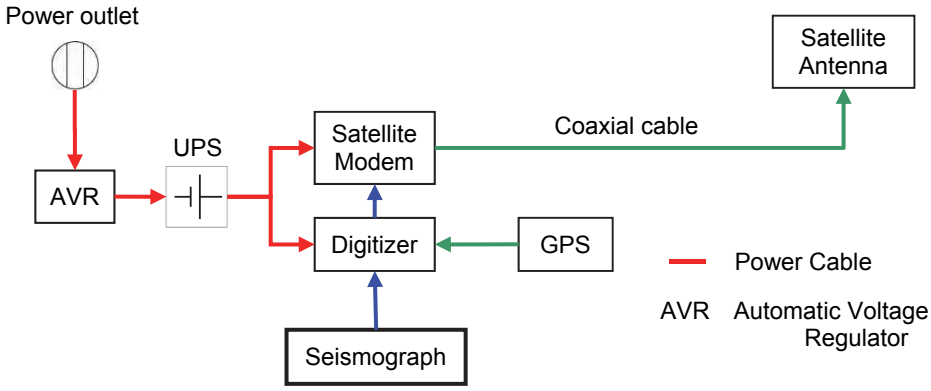


Figure 2-1 System Configuration of the Seismic Station (Commercial Power Supply)

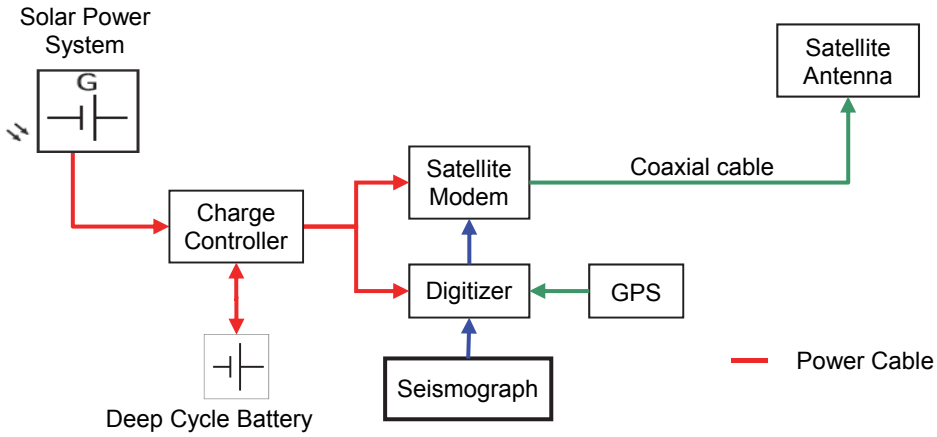


Figure 2-2 System Configuration of the Seismic Station (Solar Power Supply)

In the Project, it is required to transmit waveform data to the existing system of BMKG HQ.

The BMKG existing system is composed mainly of Seiscomp3 granted by Germany. The SEED format which was established by Incorporated Research Institutions for a Seismology (IRIS) Consortium is used as the waveform format, and Seedlink is used for the transmission method.

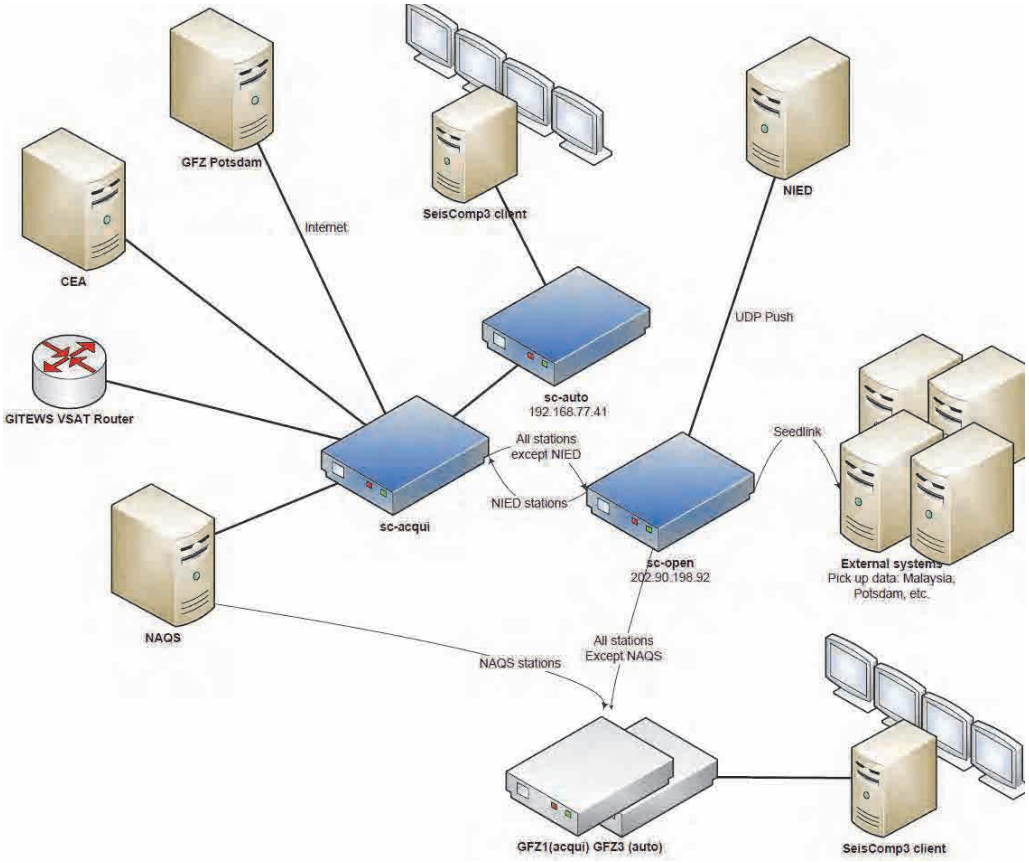


Figure 2-3 Monitoring System Configuration of BMKG

On the other hand, most equipment made in Japan is compatible with the WIN formula, which has been developed by the University of Tokyo; which has been used at the meteorological agency and NIED, and the equipment which is compatible with the above mentioned SEED format and Seedlink formula is very rare. Therefore, until now, the data from the equipment introduced in JISNET sites has been collected with the WIN formula and translated with a WIN/SEED conversion program.

Considering the above mentioned condition, the following compatibility studies have been conducted.

1. Connect seismograph of Japan and digitizer of third countries which is compatible with Seedlink formula
2. Introduce seismograph of Japan which is compatible with Seedlink formula
3. Introduce seismograph of Japan which is compatible with WIN formula and translated to SEED format using WIN/SEED conversion program at Seiscomp3 side (same method currently used at JISNET sites)

In the method 1, even though the digitizers that are compatible with the Seedlink formula are widely used, since the connection performance between this type of digitizer and the

seismographs of Japan are very rare, verification about reliability of the connection and data transmission will be required.

In the method 2, it is confirmed that Japanese seismograph manufactures have a worldwide point of view and existence of the equipment compatible with Seedlink format was confirmed.

In the method 3, some difficulty will occur when data is missing because of the difference between Siscomp3 and the WIN server. In Seiscomp3, the data is collected basically in the pull type (the data is transmitted by the request from Seiscomp3), whereas in the WIN server, the data is collected in the push type which is asynchronously a UDP. When these two systems are combined, if the data is missing, the retransmission process cannot be performed well. The WIN system has a function to retransmit the data just before the batches but this function alone is insufficient for acquisition of missing data.

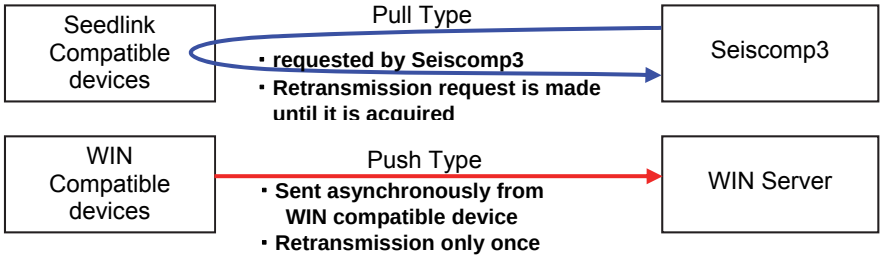


Figure 2-4 Communication Method of Seiscomp3 and WIN formula

From the results of the above mentioned studies, method 2. (Introducing seismograph compatible with Seedlink formula) will be employed in the Project. For accumulation of the data collected in the Project, an earthquake waveform information acquisition server (2 Sets; 1 for velocity and 1 other for acceleration) will be installed the same as the projects performed by other donors. The collected data corresponding to Seedlink will be transmitted to Seiscomp3 of BMKG HQ via these servers.

Regarding seismic intensity information which will be collected with strong motion seismographs (accelerometers) and seismic intensity meters, since the system is different from the BMKG existing system, new monitoring systems of seismic intensity will be required.

To accumulate and display seismic intensity information on the map, a seismic intensity information system server will be introduced by the Project.

The following figure shows the data flow diagram.

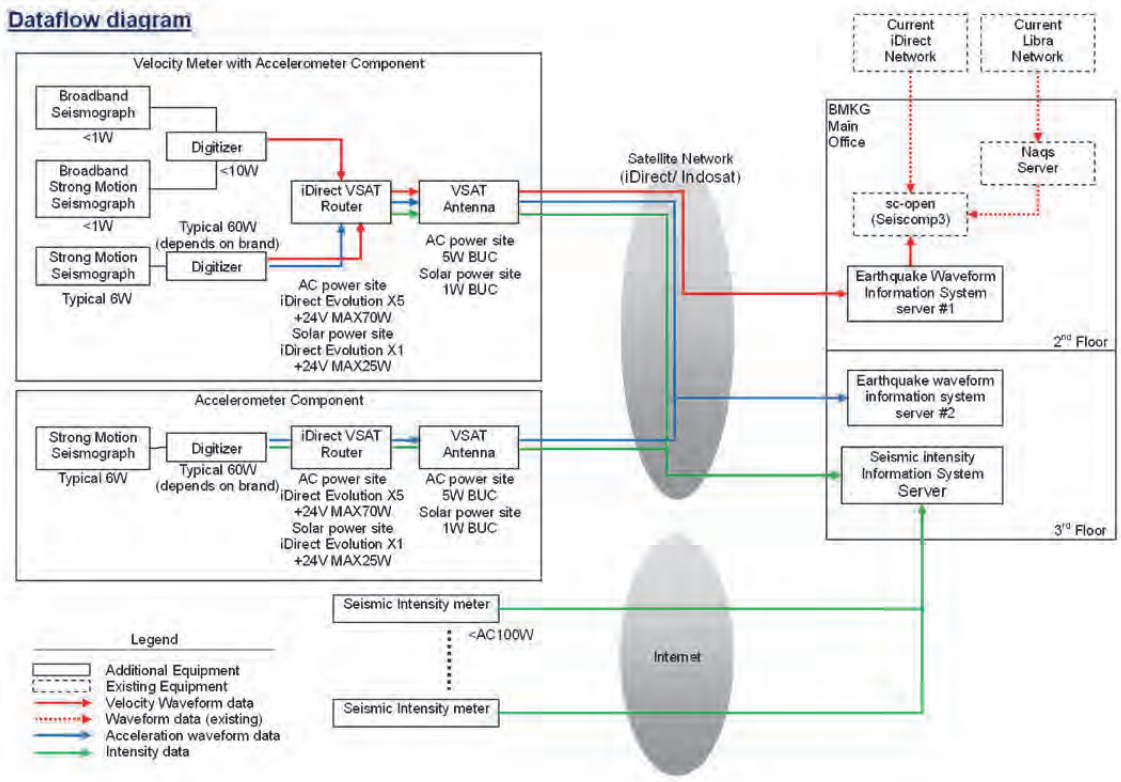


Figure 2-5 Data Flow Diagram

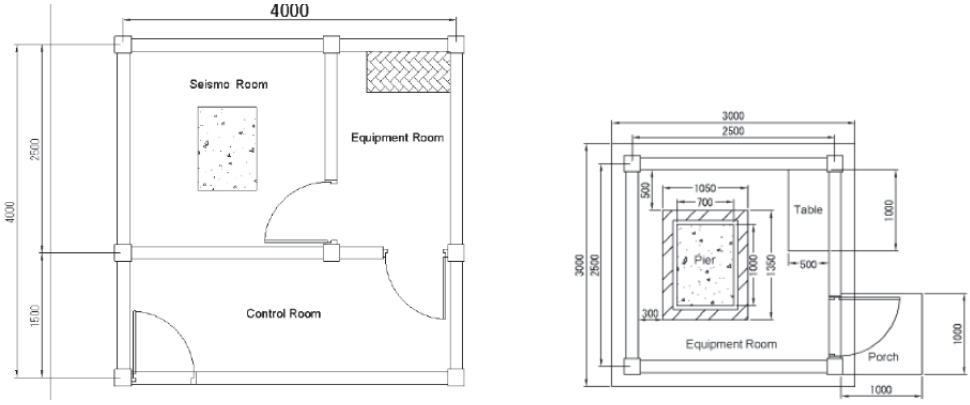
i. Construction of Seismic Stations

At the new seismic station construction sites such as the strong motion seismograph (accelerometer) sites and BMKG existing sites, all necessary observation and communication equipment can be installed in the seismic station (shelter) which will be constructed in the Project. In addition, if a room or a space in the existing facilities will be provided, since the site selection was provided with adequate criteria, all necessary equipment can be installed.

JISNET sites and BMKG existing sites are seismic stations of BMKG. Therefore, the place to install the observation equipment is basically secured. On the other hand, since there is no facility for equipment installation at the new seismic stations, which will be established in the Project, new seismic stations (shelters) will be required. Many of the seismic stations that BMKG has installed are 4m x 4m shelters on land of 10m x 10m surrounded by mesh fences. However, since most new seismic stations in the Project will be constructed on the land provided by the local government, it is difficult to secure enough space to set up a seismic station of BMKG standard (see "2) Site selection"). Therefore, it was decided to design and use shelters of 2.5m x 2.5m for the Project.

BMKG standard is a double structure and it is different from the specifications of the shelter which will be used in the Project. The advantage of the double structure is less

susceptibility to changes in outside air temperature and it is required to function as a seismic shelter especially for the broadband seismograph because of sensitivity to temperature changes of the equipment. However, the small shelter which will be constructed in the Project has been determined to have no problems with the temperature control because the seismographs will be covered with heat-insulating covers or the pit for broadband seismograph (velocity meter) will be filled with heat-insulating material in order to avoid the influence of the temperature change. These methods for responding to temperature change were confirmed by the Japanese expert.



(a) BMKG Standard (b) Shelter in the Project

Figure 2-6 Comparison of plan of Seismic Station (Shelter)

2) Site Selection

The Japanese Consultant (hereinafter referred to as "the Consultant") and BMKG jointly conducted field surveys on 130 target sites submitted by BMKG and made a target site selection. Regarding the JISNET sites which were introduced by Japan, and which are currently co-managed by National Research Institute for Earth Science and Disaster Prevention (NIED) and BMKG, broadband seismograph (velocity meter) and strong motion seismograph (accelerometer) (for some sites) are installed in those JISNET sites; more than 15 years have passed from the installation and it is now time to renew the equipment. Therefore, renewal of equipment for JISENT sites is determined as the highest priority. In addition, procurement of equipment for BMKG existing sites for which the construction works have been already finished is also considered as a high priority. For the strong motion seismograph (accelerometer) sites, most sites will be provided by local government in a corner of their facility site and a few sites will be provided by private land owners or other public facilities owners.

Table 2-6 Summary of Site Selection

Site Classifications		No.	Target Sites	
			Type of Equipment	No.
1	JISNET Site	17	Broadband *1	15
2	BMKG Existing Site	6	Broadband	5
			Strong motion seismograph*2	1
3	New Site (Strong Motion Seismograph Site)	107	Strong motion seismograph	72
	Total	130		93

*1 Type of Equipment "Broadband" includes broadband seismograph (velocity meter), broadband strong motion seismograph (velocity meter) and strong motion seismograph (accelerometer).

*2 Among the proposed BMKG existing sites for the Project, one site was selected as the target site for the New Site (Strong Motion Seismograph Site).

Site selection was performed under the following conditions.

a. Site Conditions

- At least 4 m x 4 m space is secured in case of installations that need new seismic station (shelter) construction
- At least 2.7 m x 2.5 m space can be provided in case of installation in the existing facilities such as offices
- Not located near cliffs or steep slopes
- No necessity of facility removal or significant repair

b. Natural Conditions

- No concern for the impact of the volcano
- Not located on soft ground

c. Noise Condition

- Not facing busy roads (distance: 30 m or more)
- No event which causes vibration

d. No overlap with other similar projects

The site survey results are attached in appendix 6. The target site locations are shown in the map in the preface.

3) Equipment installation plan for seismic stations

The system which will be implemented in the Project is divided into two types; 1) broadband seismograph stations (broadband seismograph (velocity meter), broadband strong motion seismograph (velocity meter) and strong motion seismograph (accelerometer) will be installed) and 2) strong motion seismograph stations (strong motion seismograph (accelerometer) will be

installed). For each type, there are two cases; a case using commercial power supply or a case using a solar power system.

Broadband seismograph stations are to be established on JISNET sites and BMKG existing sites where there is basically existing shelter. It is planned as a replacement of the existing system for JISNET sites and a new system installation for BMKG existing sites.

Regarding the strong motion seismograph stations, most sites are located on local government land (a few sites are located on private land or other public land) and the construction of seismic stations (shelters) for installation of equipment will be required (there are some cases that a room or a corner in an existing building will be provided).

At the new seismic station construction sites such as strong motion seismograph sites and BMKG existing sites, all necessary observation and communication equipment can be installed in the seismic station (shelter) which will be constructed in the Project. In addition, if a room or a space in existing facilities will be provided, since the site selection provided adequate criteria, all necessary equipment can be installed.

On the other hand, a variety of facilities conditions exist at JISNET sites and installation method will be different for each site. The following table shows the equipment installation policy. At JISNET sites, satellite communication antennas are already installed. However, since these antennas are also used to send data from other than JISNET equipment, they cannot be replaced. Therefore, satellite communication antennas will be installed for all sites including JISNET sites.

Table 2-7 Equipment installation policy for JISNET sites

No.	Name	Existing System		Replaced System		Power/ Others
		Place	Equipment	Place	Equipment	
101	BAKI (Luwi Budi)	Interior	BS & CS			Commercial power supply
				New shelter	All system	
102	BJI (Banjar Negara)	Bunker	BB	Same bunker	BB, BS, SM	Commercial power supply
		Interior	CS	Same interior	CS	
103	BSI (Banda Aceh)	Pit	BB	Same pit	BB	Commercial power supply
				New shelter	BS, SM	
		Interior	SM, CS	Same interior	CS	
105	KDI (Kendari)	Shelter	BB	Same shelter	BB, BS, SM	Commercial power supply
		Interior	CS	Same interior	CS	
106	KHK (Kahang)	shelter	BB	Same shelter	BB, BS, SM	Commercial power supply
		Interior	CS	Same interior	CS	
107	KSI (Kepahiang)	Pit	BB			Commercial power supply
				New shelter	All System	
109	MNI (Manado)	Pit	BB	Same pit	BB, BS, SM	Commercial power supply
		Interior	CS	Same interior	CS	
110	PCI (Palu)	Pit	BB	Same pit	BB	Commercial power supply
		Bunker		Same bunker	BS, SM	
		Interior	CS	Same interior	CS	

No.	Name	Existing System		Replaced System		Power/ Others
		Place	Equipment	Place	Equipment	
111	PPI (Lubuk Mata Kucing)	Pit 1	BB	Same pit 1	BB	Commercial power supply
		Pit 2		Same pit 2	BS, SM	
		Interior	CS	Same interior	CS	
113	SWH (Sawahan)	Pit 1	BB	Same pit 1	BB	Commercial power supply
		Pit 2	CS	Same pit 2	BS,SM	
				Unit box	CS	
114	TARA (Tarakan)	Closed (noise)				
				New shelter	All System	
116	TEL2 (Maluku)	Pit	BB	Same pit	BB, BS	Commercial power supply
		Shelter		Same shelter	SM	
		Interior	CS	Same interior	CS	
117	TPI (Tanjung Pandan)	Bunker	BB	Same bunker	BB, BS, SM	Commercial power supply
		Interior	CS	Same interior	CS	
118	WAMI (Wamena)	Shelter	BB, SM	Same shelter	BB, BS, SM	Commercial power supply
		Interior	CS	Same interior	CS	
119A	WSI (Waingapu)	Bunker	BB			Commercial power supply
				New shelter	All system	
		Interior	CS			

BB: Broadband seismograph (velocity meter)
BS: Broadband strong motion seismograph (velocity meter)
SM: Strong motion seismograph (accelerometer)
CS: Satellite communication system (digitizer, modem, UPS, GPS)

(2) Equipment Plan for LIPI Package

LIPI performs a role in conducting scientific research and study on natural disaster risk management including earthquake and tsunami risk management. Regarding earthquake risk management, they are implementing research activities on estimation of earthquake damages and collateral damages, physical and social vulnerability to earthquakes, and community-level disaster risk management. Through the equipment provided in the Project, the qualities of the outcomes of these reach activities will be improved.

The equipment plan for the LIPI package is as follows.

Table 2-8 List of Equipment for LIPI Package

Items	Major Specification/Contents	Purpose of Use	Project Site
1 PS logging equipment (1 set)	• PS logging equipment • Geophone • Analyses software	Understanding of ground characteristics (estimation of strength, setup dynamic elastic modules, etc.)	LIPI HQ
2 Array microtremor measurement equipment (1 set)	• Array microtremor Measurement equipment • Analyses software	Monitoring of micromotion, Estimation of S-wave velocity structures	LIPI HQ
3-1. Strong motion seismograph (accelerometer) (supply of equipment and installation) (2 sets)	• Strong motion seismograph (accelerometer) (10) • Digitizer (10) • Power equipment (10) • Display software (1set)	Understanding about strength of ground motion and characteristics of earthquake through collecting seismic waveform and calculation of peak ground acceleration (PGA).	Bandung: 2 sites
3-2. Strong motion seismograph (accelerometer) (supply of equipment) (8 sets)			Padang: 5 sites Liwa (Lampung): 1 site Banda Aceh: 1 site Sukabumi: 1 site

1) PS Logging Equipment

PS logging equipment (elastic wave velocity logging) is an instrument that measures elastic wave velocity. PS logging and elastic wave exploration can be implemented with this instrument.

With this equipment, the velocity distribution in the depth direction of elastic waves (P-wave/longitudinal waves and S-wave/transverse waves) can be measured with high precision. For this measurement, the propagating elastic waves in the ground are measured directly by using a borehole.

Regarding the elastic wave velocity exploration, an elastic wave is generated artificially and the refracted wave is observed with geophone installed on the ground. The velocity structures underground can be analyzed by measuring the travel time of the refracted waves propagating through the different propagation speed layers.

This is utilized to figure out sectional underground structures.

PS logging data is indispensable to the dynamic analysis of the ground. However, currently, LIPI does not have any PS logging equipment.

LIPI is implementing research activities such as damage estimation and secondary damage by earthquake. Through the provision of the equipment, LIPI can conduct PS logging and elastic wave velocity exploration in each region of Indonesia. Consequently, characteristics of grounds which are utilized for estimation of ground strength and earthquake-resisting design can be identified. These data can also be utilized for liquefaction judgment, setting of engineering bedrock surface, understanding of the soft layer deposition (estimation of site amplification),

micro-zoning of earthquake, etc. In addition, the identification of these characteristics will contribute to future improvement of disaster mitigation in large-scale earthquakes. Therefore, it is planned to provide PS logging machines through the Project.

2) Array Microtremor Measurement Equipment

Array microtremor measurement is a geophysical search method of the ground using only the wave in the natural tremor signals and does not need an artificial wave source. The multiple array microtremor measurement equipment will be installed on the surface of the ground and they will measure micromotion of the ground promptly. It is not necessary to drill into the ground for using this equipment.

Consequently, deep S-wave velocity structure can be figured out by analyzing the measuring data with this equipment. With this deep S-wave velocity structure of the ground, the propagating characteristics of the seismic waves can be estimated.

Array microtremor measurement has a feature that can be applied in urban areas with a great deal of noise. Therefore, it will be effective in the underground structure survey in urban areas such as in Jakarta and in Bandung.

It is planned to provide 1 set as 4 array microtremor measurement equipment units through the Project, since LIPI does not have this useful equipment for their research activities related to earthquake.

3) Strong Motion Seismograph (Accelerometer)

LIPI has requested installing strong motion seismographs (accelerometers) in 10 sites; 2 sites in Bandung, 5 sites in Padang, 1 site in Liwa, 1 site in Banda Aceh and 1 site in Sukabumi.

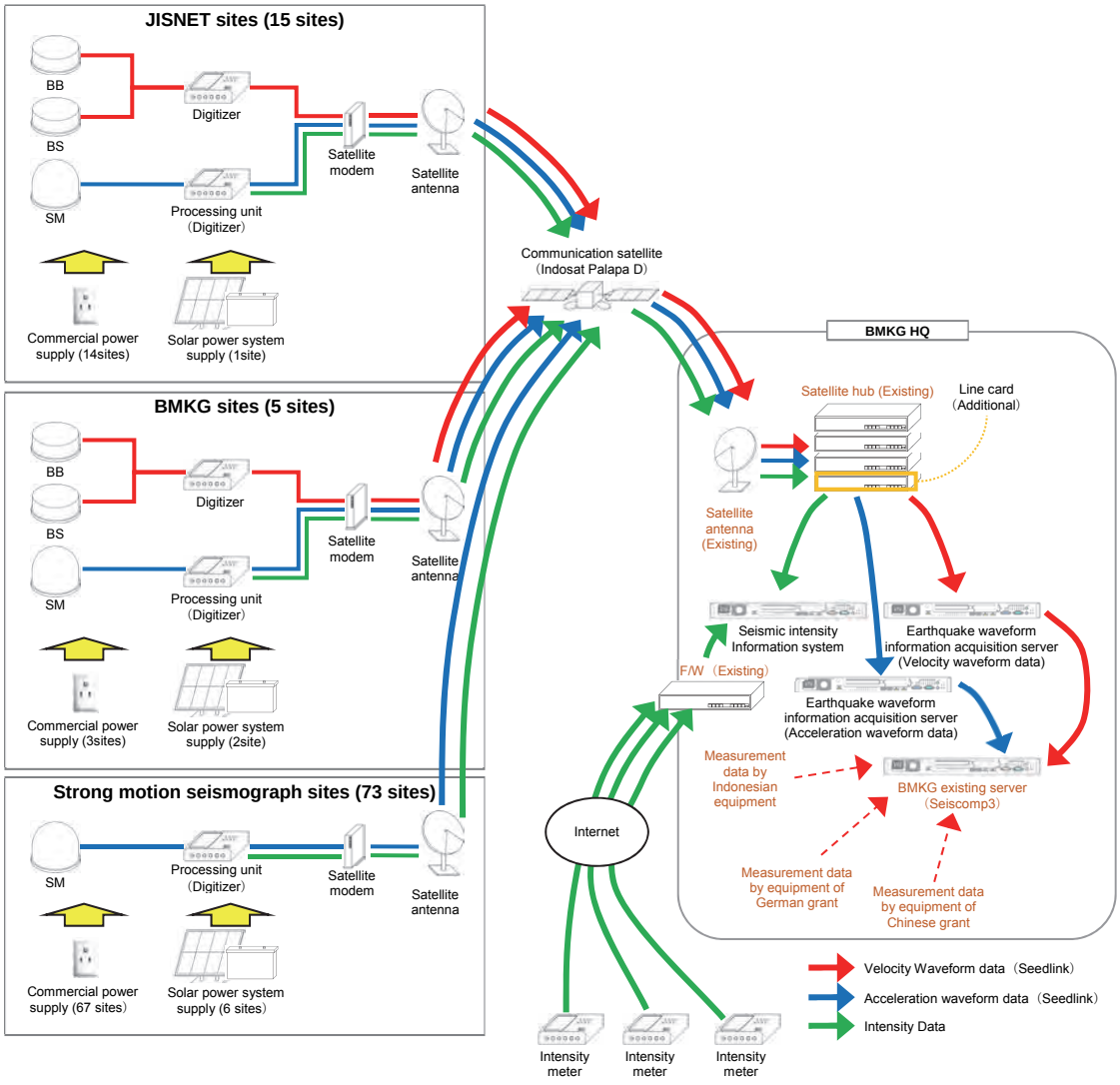
The strong motion seismograph (accelerometer) is equipment to measure and accumulate the seismic waveform data in the event of an earthquake squeezing in a relatively large scale. With this seismic waveform data, peak ground acceleration (PGA) can be calculated and the strength of ground motion at the point of equipment installation can be figured out.

Some special skills are required for installation and adjustment of a strong motion seismograph (accelerometer). However, it can be determined that LIP staffs have sufficient technical capabilities for this equipment installation from the result of their activities. Therefore, installation of equipment by introducing manufactures will be limited only at Bandung (two places). Installation of equipment at Padang (five places), Liwa, Banda Ache and Sukabumi (one place for each) will be conducted under the supervision of LIPI staffs who witness the installation at Bandung.

From the above, it is planned to provide 10 strong motion seismographs (accelerometers) to LIPI.

2-2-3 Outline Design

The following shows the conceptual diagram of the system and drawings of a new construction seismic station.



BB: Broadband seismograph (velocity meter)
BS: Broadband strong motion seismograph (velocity meter)
SM: Strong motion seismograph (accelerometer)

Figure 2-7 Conceptual Diagram of Earthquake Observation System and Satellite Communication Network

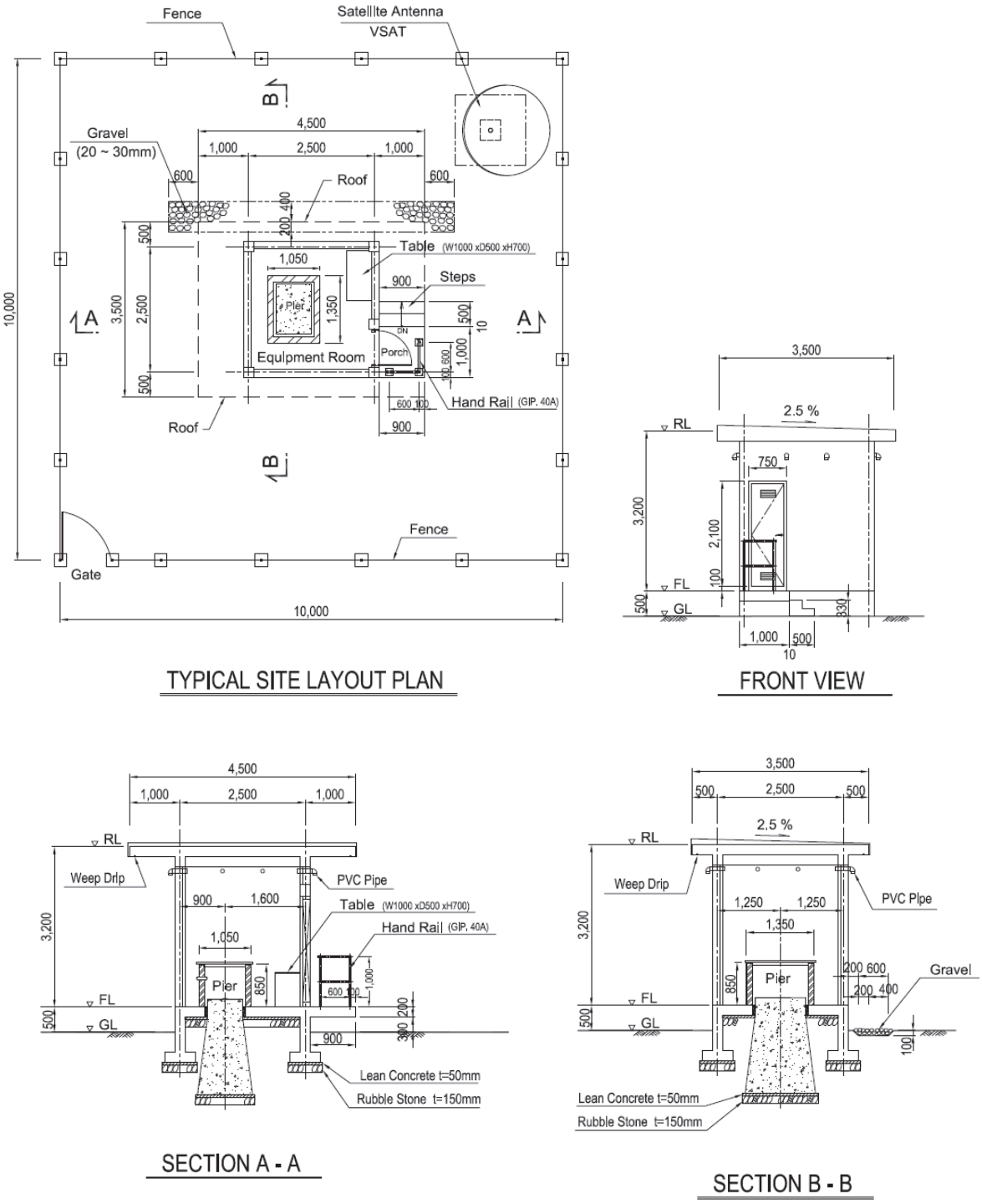


Figure 2-8 Drawings of Seismic Station (Shelter)

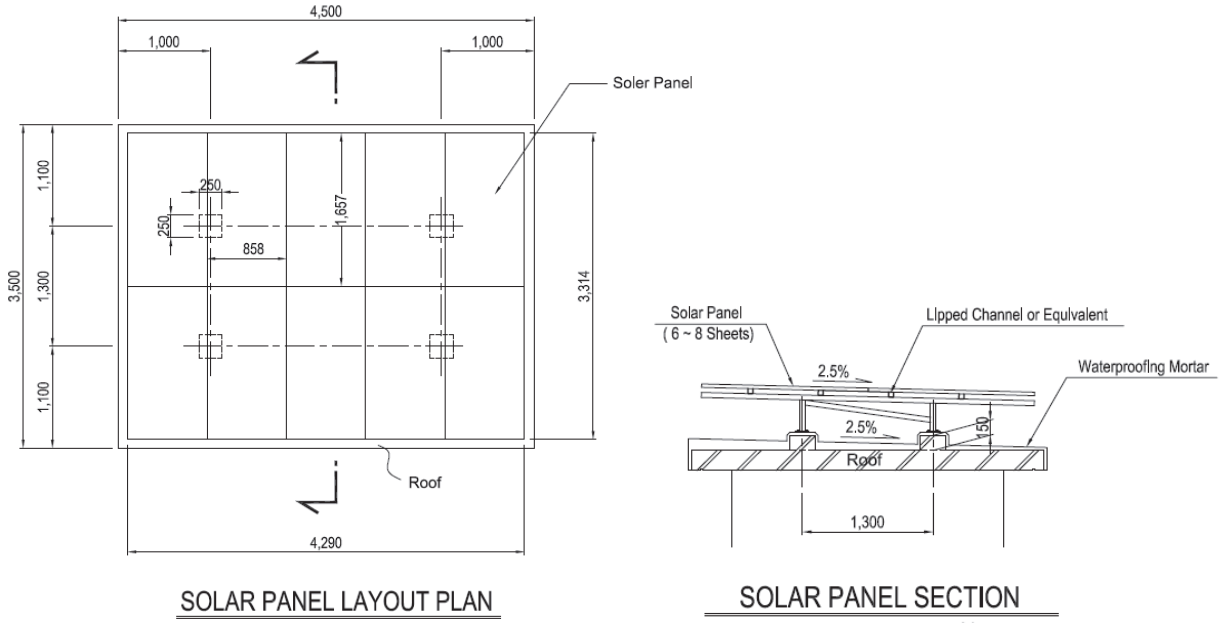


Figure 2-9 Solar Panels (on the Roof of Seismic Station (Shelter))

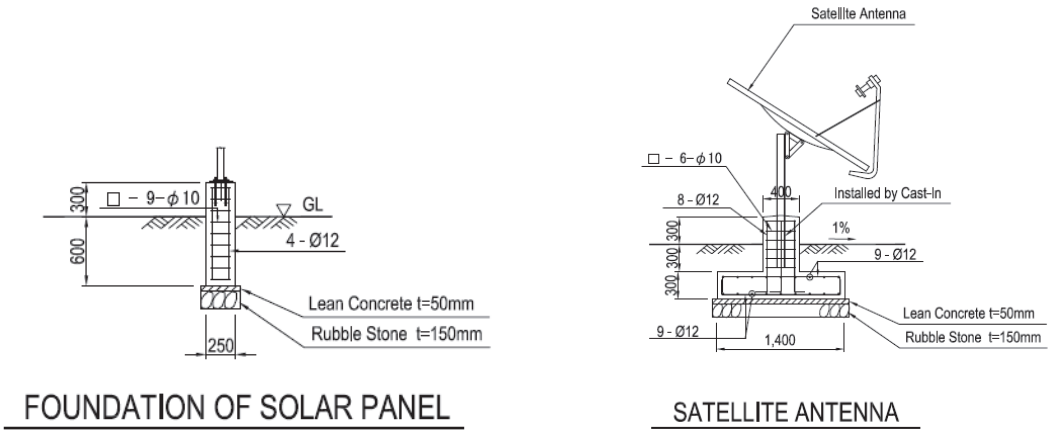


Figure 2-10 Base of Solar Panel and Satellite Antenna (on the Ground)

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

(1) Principles

1) Organizational Arrangements

Since there are two Implementing Agencies for the Project: namely BMKG and LIPI as shown in the Figure 2-11, BMKG will act as Responsible Agency to coordinate between the two Implementing Agencies. For implementation of the Project, a Consultative Committee will be established, and the representative from the Indonesian side will be BMKG.

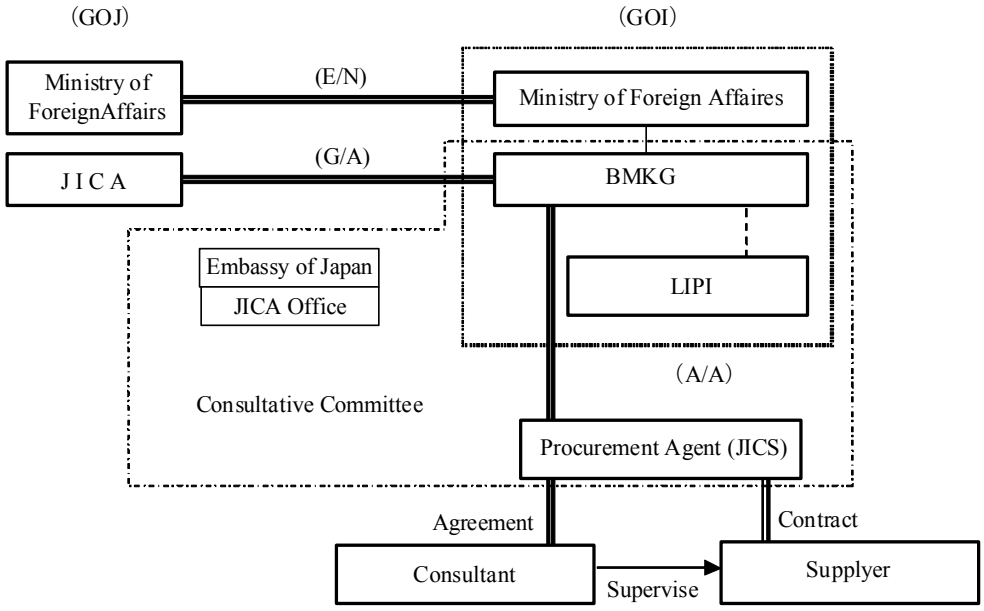


Figure 2-11 Organizational Arrangements for the Project

2) Exchange of Notes（E/N）

The contents of Grant Aid for Disaster Prevention and Reconstruction (hereinafter referred to as "GADPR") are decided by the E/N signed between Government of Japan (hereinafter referred to as “GOJ”) and Government of Indonesia (hereinafter referred to as “GOI”). The E/N enumerated the Project objectives, implementation schedule, terms and conditions, the amount of the grant, and so on. The E/N in the Project was signed on 26 of March, 2013

3) Grant Agreement（G/A）and Procurement Guidelines

Detailed procedures on procurement and services under GADPR were agreed between the authorities of the two governments upon signing of the G/A. The G/A in the Project was signed on 29 of November, 2013. However, because of the problem of the B/A processing, it was not possible to transfer funds from the national treasury in due time.

Essential points which have been agreed on the G/A are as follows.

- JICA will supervise the implementation of the Project
- Products and services shall be conducted in accordance with “The Procurement Guidelines of Japan’s GADPR (Type I-D)” established by JICA
- The Recipient will conclude an Agent Agreement with the Procurement Agent (hereinafter referred to as “the Agent”)
- The Agent is the representative acting in the name of the Recipient concerning all transfer of funds to the Consultant and the Supplier.

4) Procurement Agent

The Agent is designated to conduct the procurement services for products and services (including fund management, preparation for tenders and contracts) for GADPR on behalf of the Recipient. The Agent is an impartial and specialized organization that will render services according to the Agent Agreement with the Recipient. The Agent is recommended to the Recipient by GOJ and agreed between the two governments in the Agreed Minutes (hereinafter referred to as "A/M").

5) Consultant

The Japanese Consultant that will be employed to do detailed design and supervise the work for the Project shall fulfill its roles in order to implement the Project smoothly and achieve the purpose of the cooperation under the "Guidelines for Consulting Services concerning Grant Aid" issued by JICA. The consulting firm therefore shall conduct all necessary work and make efforts to be trusted by the Agent, the Responsible Agency and the Implementing Agencies of the Project, considering fairness and neutrality for the Japanese Supplier (hereinafter referred to as "the Supplier").

(2) Utilization of Local Consultants and Contractors

BMKG's seismic stations (93 sites) are dispersed throughout much of Indonesia. The construction work for the seismic stations (shelters) and equipment installation will be conducted at the same time on multiple sites throughout the country and it will be difficult to manage all field work with Japanese staffs only. Therefore, Japanese staffs will supervise field work utilizing local consultants.

Regarding the strong motion seismograph (accelerometer) (10 units) for LIPI, it can be determined that LIPI staffs have sufficient capacity to install this equipment once the appropriate technical guidance has been performed for them. Therefore, only two strong motion seismographs (accelerometers) will be installed at Bandung by the Japan side and through this installation, the engineers of the Japanese prime contractor company will instruct LIPI staffs on how to install and adjust this equipment. Eight remaining strong motion seismographs (accelerometers) will be installed by LIPI staffs and therefore a local contractor will not be used for the LIPI package.

2-2-4-2 Implementation Conditions

(1) Equipment Procurement

1) Procurement based on the "Basic Guidelines for Reconstruction in Response to the Great East Japan Earthquake"

In the Project, the procurement of equipment is required to contribute to the promotion of industry in "Specified Disaster Areas" (hereinafter as Affected Areas described in the "Law

related to the special financial assistance and grants to deal with the Great East Japan Earthquake". Therefore, the equipment procured will be products manufactured in Affected Areas as much as possible. These products should be 1) finished products or 2) products in which the major part is manufactured in Affected Areas.

2) Products from the Third Countries

As mentioned above, the procurement in the Project will be basically done with the principal policy of made in Japan. However, the satellite communication equipment will be procured as brand specified products manufactured in the third countries, since the satellite communication system facilitated by BMKG, which is composed of i-Direct's equipment, is planned to be utilized and it is necessary to consider the connectivity with this existing satellite equipment. The satellite communication system such as satellite antenna and satellite modem (router) will be procured as brand specified products of i-Direct manufactured in the third countries.

In addition, the broadband seismograph (velocity meter) will be procured in the third countries because it is not manufactured in Japan.

The following table summarizes the classifications of the sources of equipment and products manufactured in Affected Areas including the products in which only its main part is produced in the Affected Areas.

Table 2-9 Source of equipment (BMKG)

Items			Source				
			Japan		Local	Third Countries	
			Affected Area	Other			Origin
1	Broadband seismograph (velocity meter)					●	The United States, the United Kingdom, Canada, Switzerland
2	Broadband strong motion seismograph (velocity meter)		●				
3	Strong motion seismograph (accelerometer)		●				
4	Satellite communication system	Modem /Parabola				●	Singapore
		UPS / Battery			●		
5	Solar power system		●				
6	Seismic intensity meter		●				
7	Earthquake information system	Relay server	●				
		Seismic intensity server	●				
		PC	●				
		Monitor		●			
		Cabinet		●			
8	Civil engineering materials	Shelter, fence			●		
		Electrical equipment			●		

Table 2-10 Source of equipment (LIPI)

Items			Source				
			Japan		Local	Third Countries	
			Disaster Area	Other			Origin
1	PS logging equipment			●			
2	Array microtremor measurement equipment			●			
3	Strong motion seismograph (accelerometer)	Seismograph	●				
		Digitizer, Software	●				
		UPS /AVR			●		

(2) Transportation, Installation and Adjustment

For BMKG equipment, since the Supplier spans a number of locations, it is assumed that equipment will be packed by each equipment type at the time of marine transportation. Factory inspection will be conducted prior to the shipment and unpacking, numerical inspections, initial calibration and repacking for each site will be conducted for each piece of equipment procured from Japan and the third countries in the presence of the Consultant after customs clearance

In the Project, it is necessary to transport several pieces of equipment scattered across 93 sites all over Indonesia. Therefore, making an efficient transportation plan linked with process planning of equipment installation is of paramount importance. A total of 8 base camps at Jakarta, Yogyakarta, Surabaya, Bandung, Padang, Bandar Lampung, Bengkulu and Medan will be established and the equipment will be re-packaged for each base camp. The equipment will be transported by air from Jakarta to each base camp. The transportation will be performed collectively for each camp and stored at each camp. From base camp to each site, the equipment will be transported basically with land transportation, with air transportation and ocean transportation as well as ferry for some of the sites.

Engineers having the necessary expertise will be dispatched for transportation; installation and adjustment of the equipment since the procurement includes precision equipment.

Regarding the strong motion seismograph (accelerometer) (10 units), it can be determined that LIPI staffs have sufficient capacity to install this equipment once the appropriate technical guidance has been given to them. Therefore, only two strong motion seismographs (accelerometers) will be installed at Bandung by the Japan side and through this installation, the engineers of the Japanese prime contractor company will instruct LIPI staffs on how to install and adjust this equipment. At the same time, the guidance for equipment transportation, including required considerations, will be given to LIPI staffs. Eight remaining strong motion seismographs (accelerometers) will be transported to the installation site under the LIPI's responsibility. Equipment installation and adjustment will be conducted by the LIPI staffs who will have received the guidance by Japanese engineers.

Regarding PS logging equipment and array microtremor measurement equipment, it requires some special skills for setup and adjustment. However, LIPI staffs can manage them after receiving the initial operation training.

PS logging equipment, array microtremor measurement equipment and strong motion seismographs (accelerometers) (10 units), all will be handed over to LIPI through BMKG at a warehouse in Jakarta. Unpacking and numerical inspection will be conducted in the warehouse under the presence of LIPI and BMKG before the equipment delivery from the Japan side. Repacking for each site including the two strong motion seismographs (accelerometers) which will be installed by the Japan side shall be conducted under the LIPI's responsibility.

2-2-4-3 Scope of Works

The following table summarizes the responsibilities to be borne by GOJ and GOI for the Project.

Table 2-11 Major Undertakings to be Borne by Each Government

Items	To be Covered by Grant Aid	To be covered by the Recipient Side
1. To secure lots of land and/or space necessary for the implementation of the Project and to clear the sites		●
2. To construct the facility if necessary and install the equipment (construction of seismographic stations, fences and etc.)	●	(●)
3. To clear the sites if necessary		●
4. To obtain necessary permissions for implementation of the Project		●
5. 1) Marine or Air transportation from Japan to the Recipient country	●	
2) Tax assumption and customs clearance of the products at the port of disembarkation		●
3) Internal transportation from the port of disembarkation to the project site	●	(●) LIPI
6. To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the Recipient country with respect to the purchase of the products and the services as well as the employment of the Agent are to be borne by the Authority without using the Grant and its accrued interest		●
7. To accord Japanese nationals and/or nationals of third counties, including such nationals employed by the Agent, whose services may be required in connection with the supply of the products and the services for such facilities, all assistance that they may need for their entry into the Recipient country and stay therein for the performance of their work		●
8. To ensure that the products are maintained and used properly and effectively for the implementation of the Project		●
9. To bear all the expenses, other than those covered by the Grant and its accrued interest, necessary for the implementation of the Project		●
10. To bear bank commission paid to the Japanese bank for banking services based upon the B/A		●
11. To give consideration to the environmental and social conditions in the implementation of the Project		●
12. To Securing necessary frequency for the data communication systems		●
13. To supply electricity for the procured equipment	(●) Solar power system	(●) Commercial power supply

Details of the responsibilities for each Implementing Agency are described below.

(1) BMKG

Undertakings to be taken by BMKG are as follows.

- To secure land and/or space for preparation and installation of the equipment to be procured by the Project (especially for the following cases; new seismic stations will be constructed by Japanese side / installation of provided equipment will be conducted by the Japanese side)
- To obtain necessary permission from competent authorities for installation works for the equipment
- To secure electricity supply to all installation sites except for the sites which use solar power systems
- To secure the budget or take any necessary procedures for bearing the Value Added Tax (VAT), custom duty, and any other taxes
- To secure the budget to conduct proper operation and maintenance for the equipment / System to be procured by the Project.
- To secure frequency band and necessary payment for the communication system
- To prepare witness inspections and initial trainings regarding the equipment / System to be procured by the Project and to cover all necessary expenses of the Indonesian side

(2) LIPI

The equipment will be basically handed over at the warehouse in Jakarta from the Japan side to BMKG, which is the focal point and responsible for the coordination of the Project. LIPI will be given the related equipment from BMKG. BMKG is responsible for any taxes that are imposed, customs duties at the disembarkation port, custom clearance procedures, and procedures to obtain any required permissions.

Undertakings to be taken by LIPI are as follows.

- To transport the equipment provided in the Project from the Jakarta bonded warehouse
- To install 8 strong motion seismographs (accelerometers)
- To secure the budget to conduct proper operation and maintenance for the equipment to be procured by the Project.

2-2-4-4 Consultant Supervision

(1) BMKG

The Consultant will dispatch a Japanese expert as resident procurement supervising engineer and will perform the overall supervision of all installation work performed by the multiple construction groups including civil works.

The target sites of the Project are scattered nationwide in Indonesia. Construction work on the seismic stations (shelters), installation of equipment, commissioning and initial training will be conducted in series. One local technician will be dispatched for each working group because construction and installation work will be conducted in parallel at multiple sites. The Consultant will monitor the work progress sequentially through these local technicians. The Consultant will dispatch two other Japanese building engineers for supervision of civil works. A total of three engineers (two building engineers and a resident procurement supervising engineer) will supervise the construction process and its quality in each of their regions.

In addition, the Consultant will dispatch two test engineers who will attend the acceptance inspections and equipment handover.

The details of the consulting services during the implementation period are as follows.

- Confirmation and approval of shop drawings and necessary documents for the equipment and the civil works
- Technical meetings with BMKG
- Confirmation of the results of the initial performance and connectivity tests for the equipment to be installed in the seismic stations, which was conducted by the manufactures in Japan
- Confirmation of the results of the comprehensive performance tests for the entire systems, which was conducted by the manufactures in Japan
- Attending to factory inspections / pre-shipment inspection
- Arrangement of collation inspections prior to shipment in Japan
- Attending to the initial calibration and repacking for each site in Indonesia
- Supervising the progress and safety control of the Supplier
- Attending to the installation, the adjustment and the commissioning
- Approval of documents regarding acceptance test procedures and test implementation plans
- Supervising the acceptance tests (final inspection) and issuing completion certificates
- Supervising the initial operation and maintenance training conducted by the Supplier

- Preparation of progress reports and completion report to be submitted to the related organizations

(2) LIPI

The Consultant will dispatch a Japanese expert and will perform the following services; issuance of the completion certificate, procedure for handing over, preparation of the completion report, and being present at the inspections and the initial trainings. Upon completion of the acceptance inspections and handing over, the chief consultant will be dispatched to be present at the final inspections and the initial trainings. The Consultant will engage in the supervision of the Project pursuant to the following policies:

- Confirmation and approval of shop drawings and necessary documents for the equipment
- Technical meetings with LIPI
- Attending to factory inspection/ collation inspections in Japan prior to shipment
- Supervising the progress and safety control of the Supplier
- Attending to initial operation and maintenance training conducted by the Supplier
- Attending to acceptance tests (final inspection) and issuing completion certificates
- Preparation of progress reports and completion report to be submitted to the related organizations

2-2-4-5 Quality Control

(1) Inspection and Acceptance Test Implementation Plan (Equipment)

1) Principles

During the period of manufacturing of the equipment, the Consultant shall review all shop drawings for the equipment to be submitted by the Supplier in terms of conformity with the contract documents and technical specifications and shall give necessary approvals. In addition, during the equipment installation work, the Consultant shall review the construction plan (including implementation structure), implementation schedule, and installation procedures submitted by the Supplier and give necessary approvals.

2) Inspections

As for the quality assurance of the equipment, the following inspections and acceptance tests shall be conducted prior to the handover of the equipment.

- Initial Performance and Connectivity Tests, Comprehensive Performance Tests (only for BMKG)

  The initial performance and connectivity tests and the comprehensive performance tests are required to be carried out by the manufactures. The test result certificates shall be checked and confirmed by the Consultant. Regarding digitizers and satellite communications equipment which will be procured from the other countries, the above mentioned process will be conducted in Jakarta.

- Factory Inspections (for both BMKG and LIPI packages)

  Prior to the shipment of the equipment out of the factory, each and all pieces of equipment shall be inspected as to their conformity with required specifications and performance tests for the system shall also be conducted.

- Collation Inspections prior to Shipment (for both BMKG and LIPI packages)

  Although quantities of the principal equipment shall be confirmed at the time of the factory inspection, quantities of all equipment shall be confirmed during the collation inspections prior to shipment to be conducted by a third party inspection agency. Place of inspection shall be at the Port of Yokohama.

- Initial Calibration and Repacking for Each Site (only for BMKG package)

  For the equipment procured from Japan, the third countries and/or Indonesia, unpacking, numerical inspections, initial calibration and repacking for each site will be conducted in the presence of the Consultant at Jakarta.

- Performance and Connectivity Tests (only for BMKG package)

  Performance and connectivity tests will be conducted immediately after the installation of the equipment at each site. Especially, regarding the equipment installed at each seismic station, the data transmission between the equipment and the existing seismic information system and earthquake information system at BMKG HQ will be checked and confirmed. The tests will be conducted in the presence of the Consultant, if at all possible. The specifications and the number of pieces of equipment will be checked and confirmed prior to the installation except for Intensity Meters.

- System Operation Tests (for BMKG)

  After the completion of all the equipment installation, the system operation tests will be conducted at the BMKG HQ in the presence of the Consultant. After the implementation of tests, the Supplier will issue the test result certificates, and the Consultant will confirm them.

- Acceptance Test and Handover (only for BMKG package)

  In the presence of BMKG, the Consultant and the Supplier, the equipment and the systems will be inspected to determine if they satisfy the required performance and

functions. After the inspection, the test results will be confirmed by BMKG, the Consultant and the Supplier, and then the equipment and the systems will be handed over to BMKG.

- Acceptance Test and Handover (or LIPI package)

  LIPI in the presence of BMKG, the Consultant and the Supplier shall verify the required efficiency/performance and functions of the equipment.

  After completion of the acceptance tests, results of the test shall be confirmed among LIPI, BMKG, the Consultant and the Supplier. Then, the equipment will be handed over to BMKG. LIPI will be given the related equipment from BMKG.

(2) Quality Control Plan (Construction Works for BMKG package)

1) Principals

In preparation of the tender documents, the drawings will be developed considering the conditions of the construction industry in Indonesia, and the maintenance costs. As for the technical specifications, reference will be made to the Indonesia Building Code, and National Structural Code of Indonesia, Local Government Regulations (PERDA), Japanese Architectural Standard Specifications (JASS), Japanese Industrial Standards (JIS), National Standard of Indonesia (SNI) and the standards of the American Society for Testing and Materials (ASTM), for the purpose of securing high quality construction.

During the construction periods, the Consultant will examine whether the construction plans including the implementing structure, construction and installation schedules, and the shop drawings that will be submitted by the Supplier satisfy the conditions of the contract documents and technical specifications, and give necessary approvals.

2) Inspections

On site, the Consultant will review the construction plans and material samples, which will be submitted by the Supplier prior to the commencement of each category of the construction work in terms of the conformity of construction materials and construction quality with the relevant technical specifications and will give necessary approvals. After the commencement of each category of the construction work, the Consultant will conduct inspections based on the approved construction plans according to the needs, and will give necessary approvals. For conducting such inspections, the Consultant will develop check sheets highlighting important check points that are identified based on the approved construction plans. In the Project, all the construction materials can be procured in Indonesia. To ensure the required quality, random inspections will be conducted as needed, as well as obtaining warranties issued by the manufacturers.

The construction work for the Project will be limited to very small scale works, such as construction of equipment foundations, new seismic stations (shelters) and fences. Thus, both the Consultant and the Supplier will manage the construction work through local engineers and supervisors.

- Earth Work

  The work plans considering appropriate methodologies for excavation, curing of excavated surfaces, backfilling, compaction and concrete will be prepared, and the works shall be conducted accordingly.

- Re-bar Work

  The confirmation of mill sheets submitted by the Supplier and random tension tests will be conducted to ensure the required quality. In addition, the shop drawings (re-bar placing plan and bending schedules) will be reviewed for approval and inspection on re-bar arrangement regarding joints, anchorage, quantities and concrete coverage for each element of the reinforced concrete structures.

- Concrete Work

  The Project site areas are located nationwide across Indonesia, and the site conditions diversely vary place by place. Therefore, the concrete will be basically on-site mixed concrete. The major quality control items of concrete work are as follows. The following inspections will be implemented by the Supplier in the presence of the Consultant.

(a) Concrete Materials

Material	Item	Method of Inspection
Cement	Hydration heat	Heat of solution method
Sand/Gravel/Crushed stone	Grading	Sifting test
	Absolute dry specific gravity	Specific gravity and water absorption test
	Alkali aggregate reaction	Alkali-silica reaction test
Water	Saline content, organic impurities etc.	Water quality test

(b) Trial Mix Concrete

Material	Method of Inspection
Estimated concrete strength test	Compression tester
Slump	Slump cone
Concrete temperature	Thermometer
Air content	Air content measuring equipment
Chloride content	Salinity meter

(c) Pre-inspection prior to Placing Concrete

Material	Method of Inspection
Time from mixing to completion of placing concrete	Cross-check of time for concrete mixing and placing
Slump	Slump cone
Concrete temperature	Termometer
Air content	Air content measuring equipment
Chloride content	Salinity meter

(d) As-built Management (Accuracy of Concrete Placing)

Material	Method of Inspection
Estimated concrete strength test	Compression tester
Finishing accuracy (vertical)	Transit and tape measure
Finishing accuracy (horizontal)	Level and tape measure
Finishing	Visual inspection

2-2-4-6 Procurement Plan

(1) Sources of Equipment

As mentioned above, the equipment procured by the Project will be principally from Japan.

However, the foundations for the observation and communication equipment, the security fences for preventing burglaries, and the power supply equipment will be procured locally. Regarding satellite communication equipment, brand specified products manufactured in the third countries, which are compatible with the existing systems in Indonesia, will be procured either locally or from the third countries since services of local commercial satellite communication companies are adopted. In addition, some of the equipment and software that are indispensable for the connection with the existing system will be procured as brand specified products from the third countries.

The lists of sources of the major equipment procured by the Project are show below.

Table 2-12 List of Sources of Equipment (BMKG)

Items			Source			
			JAPAN	Indonesia	Third Countries	
1	Broadband seismograph (velocity meter)				●	The United States, the United Kingdom, Canada, Switzerland
2	Broadband strong motion seismograph (velocity meter)		●			
3	Strong motion seismograph (accelerometer)		●			
4	Satellite communication system	Modem /Parabola			●	Singapore
		UPS / Battery		●		
5	Solar power system		●			
6	Seismic intensity meter		●			

Items			Source			
			JAPAN	Indonesia	Third Countries	
7	Earthquake information System	Relay server	●			
		Seismic intensity server	●			
		PC	●			
		Monitor	●			
		Cabinet	●			
8	Civil engineering materials	Shelter, Fence		●		
		Electrical Equipment		●		

Table 2-13 List of Sources of Equipment（LIPI）

Items			Source			
			JAPAN	Indonesia	Third Countries	
1	PS logging equipment		●			
2	Array microtremor measurement equipment		●			
3	Strong motion seismograph (accelerometer)	Seismograph	●			
		Digitizer, Software	●			
		UPS /AVR		●		

(2) Transportation Plan

1) Equipment Procured from Japan (for both BMKG and LIPI Package)

The equipment to be procured in Japan will be shipped from the port of Yokohama and unloaded at the Jakarta port. It takes about twenty days from Yokohama to Jakarta for marine transport, and another 10 days will be required for landing, custom clearance at Jakarta and land transportation. After the custom clearance, the equipment for BMKG will be unpacked and numerical examination and system operation check will be conducted. Then they will be re-packaged for each site.

For BMKG, it is necessary to transport several pieces of equipment scattered across 93 sites all over Indonesia in the Project. Therefore, making an efficient transportation plan linked with process planning of equipment installation is of paramount importance. The equipment will be transported basically with air transportation and land transportation form Jakarta to each site. Ocean transportation such as ferry will also be used for isolated islands.

Regarding the LIPI, after the custom clearance, the equipment will be delivered to LIPI through BMKG and transported from Jakarta port to LIPI HQ located in Bandung under the responsibility of LIPI.

2) Equipment Procured from the Third Countries (BMKG Package)

Some of equipment, software and satellite communication equipment will be procured as brand specified products manufactured in the third countries because it is necessary to introduce the products made by the same company as used existing systems in order to connect to the existing earthquake observation system of BMKG. Satellite communication equipment will be shipped from the port of Singapore and the others will be procured from any of Switzerland, the United States, Canada or the United Kingdom and shipped from the port of the procurement country. This equipment will be unloaded at the Jakarta port, unpacked and numerical examination and system operation checks will be conducted after the custom clearance. Then they will be re-packaged for each site.

3) Equipment Procured Locally (for both BMKG and LIPI Packages)

Some of equipment such as UPS and AVR equipment for communication and power supply, and general construction materials (foundations for equipment installation, new seismic station construction, anti-theft fences and electrical equipment and materials) are expected to be local procurement.

Locally procured equipment will be procured in Jakarta. They will be temporarily transferred into the central warehouse in Jakarta city, re-packed for each site, and transported to each site in conjunction with the Japan procured equipment.

Regarding the general construction materials, they will be basically procured near the site. For the case of isolated islands where construction materials are almost unavailable, construction materials will be procured at a relatively large city near the site and transported by car ferry and land transportation.

2-2-4-7 Initial Operation and Maintenance Training Plan

(1) BMKG Package

For all of the BMKG equipment except the seismic intensity meters, it is assumed that the initial operation and maintenance training will be conducted by a technician who is a member of the equipment installation work team. Once the installation work for all sites has been completed, the initial operation and maintenance training for the staffs of BMKG HQ regarding the earthquake observation system and earthquake information system will be conducted for about three days at BMKG HQ and at seismic stations in Jakarta (or near Jakarta). The above mentioned initial training will be carried out for each site in conjunction with the installation works. Adjustment and commissioning of PC clusters will also be conducted at the same time.

(2) LIPI Package

Prior to handover of the equipment, the engineers that will be dispatched from the Supplier (practically, engineers from the manufacturer) will conduct the initial operation and

maintenance training for the use of the equipment. For PS logging equipment and array microtremor measurement equipment, the initial training shall be held in the LIPI HQ site or another adequate place around LIPI HQ. Regarding the strong motion seismographs (accelerometers), the Japan side will install the equipment for two seismograph sites in Bandung. The training will be held in these seismograph sites after the equipment installation.

2-2-4-8 Soft Component (Technical Assistance) Plan

BMKG has experience in accurately operating and maintaining the earthquake observation equipment and systems which are similar to the equipment to be procured in the Project. The maintenance system of BMKG is well established and BMKG's financial conditions have no problems. It is recognized that BMKG has adequate capacity to operate and maintain the equipment which will be procured by the Project.

Regarding the PS logging equipment and array microtremor measurement equipment, LIPI does not have any past experience in owning this equipment. It is necessary to plan the initial operation training schedule taking into account the LIPI's technical officers, since the operation of both types of equipment may be handled by them.

LIPI staffs have a high technical and research capacity and the maintenance system of LIPI is well established, and LIPI's financial conditions have no problems. It is recognized that LIPI has adequate capacity to operate the equipment related to the earthquake survey procured through the Project. Therefore, it is determined that no soft component and/or technical cooperation regarding the equipment procured through the Project is necessary.

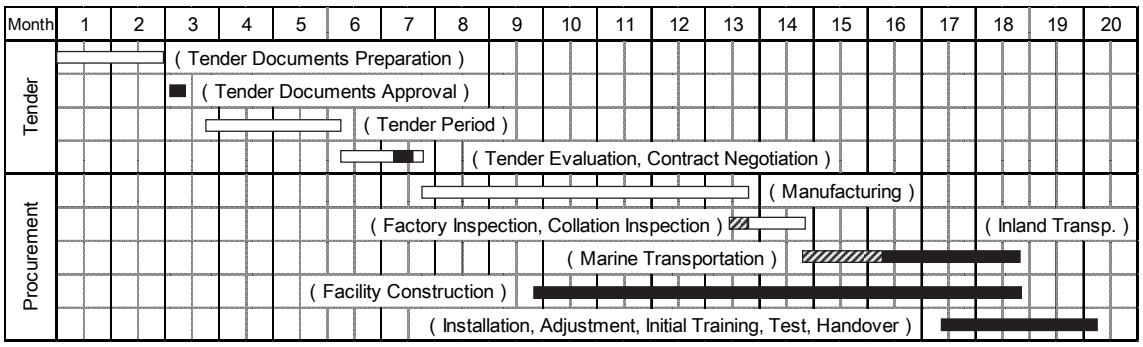
2-2-4-9 Implementation Schedule

Procurement for the Project will be conducted by the Agent (JICS) on behalf of the Recipient, by the method of open competitive tender. Since there are two Implementing Agencies (BMKG and LIPI), and since the types and implementation schedules are quite different depending on the equipment, it was determined to separate the tender into two packages

The Project aims at disaster prevention and disaster risk mitigation. It is essential to procure such equipment as soon as possible in order to contribute to the improvement of disaster prevention and disaster risk mitigation. Therefore, it must be possible to conduct procurement of the LIPI package quickly without waiting for the BMKG package which requires final confirmation of the site (getting a signature on the final plan drawing from the entity responsible for the site after verification of the contents of the drawings). The final confirmation of the site for BMKG is one of the conditions of the tender. Therefore, Implementation schedules are to be prepared separately between the BMKG package and LIPI packages.

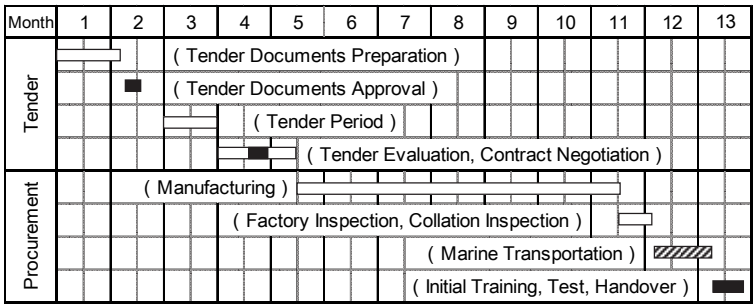
It has been decided to conduct procurement of the LIPI package first, while detailed and technical studies for the BMKG package are carefully carried out.

Table 2-14 Implementation Schedule (BMKG)



The implementation schedules for LIPI are shown in Table 2-15.

Table 2-15 Implementation Schedule (LIPI)



The total implementation period for the BMKG package is 20 months; 6.5 months for the tender stage and 13.5 months for the procurement stage. The total implementation period for the LIPI package is 13 months; 4.5 months for the tender stage and 8.5 months for the procurement stage.

2-3 Obligations of Recipient Country

(1) Land Acquisition (for BMKG package)

1) Ensure the space for installing the seismometers at JISNET site.

In principle, the earthquake observation system which is installed in the local office of BMKG will be relocated to the JISNET site. Therefore, no major problems will occur regarding the acquisition of land. However, it is necessary to ensure additional space for equipment installation because the broadband strong motion seismograph (velocity meter) and strong motion seismograph (accelerometer) will be additionally installed whereas the broadband seismograph (velocity meter) is installed in the existing system. To secure a space for the new equipment installation, the new seismic station (shelter) will be constructed on a premise, or, spaces will be ensured in existing facilities in the same site. Therefore, there is no need for new site acquisition. (The planned equipment installation places are indicated in Appendix 7.)

2) Ensure the land for the new seismic station

Land-use permission for the new seismic stations is necessary, since the candidate sites are mainly locating inside of local government offices and also schools and private land. As a minimum requirement for space, in the case of installation inside of an existing building, at least 2.5m×2.7m will be required and in the case of an outside installation, at least 4m×4m is necessary. In addition, for security, some of them require a mesh fence and land-use permission is also necessary. In addition, the sites which are located in remote areas will be operated by solar power systems; the solar panels will be laid on the roof of the shelter. Therefore, additional land acquisition is not necessary.

3) Ensure the place for Seismic Intensity Meter Installation

Seismic intensity meters will be installed in local government offices. BMKG office engineers have sufficient capability for installation. Therefore, seismic intensity meter installation is not contained in the Project. BMKG itself shall select the installation sites and get permission from each land owner.

4) Ensure the place for Earthquake Information System

Earthquake information system will be installed in the BMKG HQ, therefore, land acquisition is not necessary. However, it is necessary to ensure the space in the office (initially the 2nd floor or 3rd floor in the Ina-TEWS operation building is considered as the place for installation).

(2) Land Acquisition（for LIPI package）

Both the PS logging equipment and array microtremor measurement equipment are portable, spaces for the equipment stored are required to be secured within LIPI HQ office or in its compound.

On the other hand, strong motion seismographs (accelerometers) are assumed to be located at national universities and/or local government offices. LIPI needs to select the sites and to obtain necessary permission from the land/facility administrator of such sites. LIPI also needs to carry out civil work for installation of the strong motion seismographs (accelerometers) if necessary and to ensure the required power for the operation of the concerned equipment.

(3) Customs Clearance（for both BMKG and LIPI packages）

Prompt customs clearance of the products imported from Japan and/or third countries at the ports of disembarkation in the Recipient country shall be facilitated by the Implementing Agencies for smooth implementation of the Project, and customs duties and other necessary taxes and charges shall be exempted ,which are the responsibility of the Implementing Agencies.

(4) Tax Exemption（for both BMKG and LIPI packages）

Exemptions of customs duties, internal taxes and other fiscal levies which may be imposed in the Recipient country with respect to the purchase of the products and the services as well as the employment of the Agent shall be taken care of by the Implementing Agencies without using the Grant or its accrued interest.

(5) Expediencies（for both BMKG and LIPI packages）

Expediencies shall be granted to allow Japanese nationals and/or nationals of third counties, including such nationals employed by the Agent, whose services may be required in connection with the supply of the products and the services for such facilities, for their entry into the Recipient country and stay therein for the performance of their work.

(6) Proper Operation and Maintenance（for both BMKG and LIPI packages）

The products procured and installed by the Project shall be maintained and used properly and effectively for the implementation of the Project.

(7) Expenditures other than the Grant

All the expenses, other than those covered by the Grant and/or its accrued interest, necessary for the implementation of the Project shall be borne by the Implementing Agencies.

1) Inland Transportation, Installation and Adjustment Works for Seismic Intensity Meters（for BMKG package）

Inland transportation, installation and adjustment work for seismic intensity meters which will be hand over to BMKG shall be done at BMKG HQ. Installation and adjustment works are carried out on the basis of the installation reference provided by the Japan side and installation demonstration.

2) Obtaining Permits（for both BMKG and LIPI packages）

Application for and acquisition of all permits with regard to the Project shall be carried out by the Implementing Agencies without delay, and necessary costs shall be borne by the Implementing Agencies.

3) Travel Expenses for Initial Operation and Maintenance Training for the Participants （for both BMKG and LIPI packages）

For BMKG, a brief guidance shall be made by the Supplier at the same time of equipment installation at each site. Other initial operation and maintenance trainings shall be held by the Supplier in Jakarta or Bandung. The Implementing Agencies shall be responsible for travel arrangements and costs for the participants dispatched for the trainings from the Implementing Agencies, if necessary.

4) Securing frequency（for BMKG package）

BMKG shall secure the frequency band of the satellite communication and bear the cost for satellite communication expenses for the future.

5) Electric Bill for Observation

Power will be supplied from an outlet if the site is inside of the BMKG local office. However, in case of a local government or private site, it is necessary to establish a new power supply contract by BMKG. The contract cost and monthly electric bills shall be paid by BMKG.

6) Site Selection Cost, Ensure the land and Installation for Seismic Intensity Meters

Site selection, permission for land-use and equipment installation for seismic intensity meters shall be done by BMKG. In addition, the electric bills and communication cost by internet are also BMKG's obligation.

(8) Banking Arrangement (B/A) （for both BMKG and LIPI packages）

The Recipient will open a bank account in its own name at a Japanese bank. Based on the B/A, the Recipient should make payments of commissions to the bank.

(9) Environmental and Social Considerations

Environmental and social considerations in the implementation of the Project shall be taken into account, and necessary procedures and costs shall be borne by the Implementing Agencies, if necessary.

2-4 Project Operation Plan

(1) Project Operation Plan for BMKG

1) Operating Structure

BMKG is the president's directly controlled organization and does not belong to a specific ministry. BMKG plays a role in the observation and monitoring of disaster management for weather, climate and geophysics (earthquake and tsunami) as a national disaster management organization.

The departments in charge of the Project are the Center of Earthquake and Tsunami Department (Pusat Gempa Bumi dan Tsunami) (73 staffs) and the Seismological Technique, Geophysical Potential and Time Signal Department (Pusat Seismologi Teknik, Geofiska Potential dan Tanda Waktu) (18 staffs) under the Deputy for Geophysics (Deputi Bidang Geofiska).

BMKG requires highly specialized knowledge for its staff and the staffs have received special education in Indonesia, Japan or other foreign universities. Some of them have master's degrees. Many staffs have also taken two month to one year training at IISEE (International Institute of Seismology and Earthquake Engineering) in Tsukuba city. Each staff has high scientific knowledge and they have rich knowledge in observation equipment and data communication systems. The staffs with high technical capability are assigned not only to BMKG HQ but also local seismic stations. Therefore, it can be said that a sufficient organization structure is established for the Project management.

2) Operation and Maintenance Plan

Observed data which is obtained by the Project will be sent in real time to BMKG HQ by satellite communication system or internet and be monitored constantly, the same as the existing seismic station.

In the Project, broadband seismographs, (velocity meters), broadband strong motion seismographs (velocity meters), strong motion seismographs (accelerometers) with a seismic intensity calculation function and seismic intensity meters which are not used much in BMKG are to be procured. However, the data collection system is the same as the usual BMKG system. Therefore, it is determined that the existing organization structure and O/M budget are adequate for the operation and maintenance.

When technical troubles such as accidents causing damage to peripheral devices and/or trouble with data transfer occur, BMKG can identify the problem immediately and send the related site contractor that holds the maintenance contract, if necessary.

Seismic intensity meters will be installed in local government offices throughout the country. Therefore, instruction regarding the management method for seismic intensity meters shall be provided by BMKG at the time of installation. In addition, this equipment uses the internet for real-time data transfers to BMKG HQ. Observed data will be stored in an earthquake intensity information system server installed in BMKG HQ with intensity scale information which will collect the observed data from the strong motion seismographs (accelerometers). The operational status will be monitored constantly from BMKG HQ. When there is trouble, BMKG will order an inspection to be undertaken by the local government officer in charge of the seismic intensity meter or send BMKG staff from the nearest BMKG station.

Observed seismic intensity information will be compared with the Indonesian intensity scale, and the seismic intensity calculation formula shall be up dated for the improvement of accuracy of seismic intensity information. Regarding the parameters of the seismic intensity calculation formula, a remote update system through the internet from BMKG HQ will be employed.

3) Operation and Maintenance Cost

Operation of the Equipment at the JISNET station is an extension of the usual operation, therefore, it is expected that the operation will be the same as before. Procurement of new observation stations is a part of the BMKG medium-term strategic plan of 2010-2014 (RENSTRA), therefore, operation and maintenance cost is expected to be covered by the operating structure, maintenance capacity and budget enhancement plan for operation and maintenance.

(2) Project Operation Plan for LIPI

1) Operating Structure

The department within LIPI that is related to the Project is the Research Center for Geotechnology, which is under the control of the Deputy of Earth Sciences. The departments which assume the research related to disaster management for earthquake and tsunami are the Engineering Geology and Earth Conservation Division and the Earth Dynamics and Geological Hazards Division with 24 staffs. The majority of them have PhDs.

LIPI staffs have advanced technical knowledge regarding earthquake and tsunami disaster prevention and they have an eagerness to make an effective use of the equipment procured through the Project. Considering the motivation of the staffs and actual storage method and situation, LIPI seems to be able to conduct appropriate operation and maintenance for the procured equipment.

2) Operation and Maintenance Plan

Among all the equipment provided by the Project, PS Logging equipment and array microtremor measurement equipment will be stored in LIPI HQ and be carried and used around

the survey area as needed. Regarding the strong motion seismographs (accelerometers), they will be allocated in public facilities in the target areas, and LIPI will be in charge of operation and maintenance.

LIPI does not have any past experience with owning the PS logging equipment or array microtremor measurement equipment procured in the Project. Trainings on the initial operation need to be conducted sufficiently after the installation of the equipment. The trainings will not be held in Jakarta, but in the headquarters located in Bandung, for the purpose of enabling a great many staff engaged in operation and maintenance (herein after referred as to "O&M") activities to participate in them. It has been confirmed that LIPI will make travel arrangements and bear costs for the participants dispatched for the trainings.

3) Operation and Maintenance Cost

It should be noted that O&M costs, especially the equipment maintenance costs of LIPI, were not secured in 2007, 2008 or 2012. However, this issue was caused by factors outside of LIPI. For 2007 and 2008, it was caused by the large scale community development projects implemented at the initiative of the National Development Planning Agency (BAPPENAS). In the Project, LIPI had to place the core of their activities on the disaster management of earthquakes and tsunami. Therefore, it was difficult to ensure the budget for other things. As for 2012, it was caused by the impact of budget-cutting measures by the Indonesian government. The O&M costs have been sufficiently allocated to now, except for the above-mentioned three years. Regarding the management of the new equipment procured through the Project, neither an allocation of extra staffs nor budget for staffing are necessary. Operation, maintenance and management of the procured equipment including the management expenses will be conducted without any difficulty.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

(1) Cost to be borne by the Indonesia Side

382 million IDR (Approx. 3.34 million Japanese Yen)

1) BMKG

① Bank Commissions

151 million IDR (Approx. 1.30 million Japanese Yen)

② Contract Cost with PLN (State Electricity Company) for Power Supply

In case of the sites not belonging to BMKG, which use commercial power, BMKG has to enter into a power supply contract with PLN for preparation of a power connection. Consumption Rate is approximately 250 w, therefore, a minimum contract, which is 900W, is enough for a station. There is some possibility that the local office will allow the use of their power, however, the contract cost is estimated assuming that all sites which will use commercial power shall have a power contract established by BMKG, at the present moment. Power supply contracts with PLN are necessary for 67 sites. The initial contract cost is estimated at 1,000,000 IDR/site.

67 million IDR (Approx. 0.58 million Japanese Yen)

③ Contract Cost for Satellite Communication

All observed data from 93 sites are sent to BMKG HQ by a satellite communication system. However, it is not necessary to enter into new contracts because it can correspond by only expansion of the communication band. Therefore, there will be no initial contract cost.

④ Inspection Cost for Installation Works

After installation of the equipment, site inspections shall be carried out in the presence of BMKG specialists. Specialists will come from the BMKG local office rather than BMKG HQ in Jakarta. Inspection cost shall consist of transportation (service cost of car and fuel cost) and daily allowance for the inspectors. The cost is estimated for 93 sites using approximately 1,000,000 IDR/site as an average.

93 million IDR (Approx. 0.80 million Japanese Yen)

⑤ The Cost of Transportation, Installation and Adjustment for Seismic Intensity Meters

A seismic intensity meter is simple equipment and easy to install, therefore, they do not generate special cost for installation and adjustment. The equipment will be sent to the BMKG local office by express courier service. Site selection and installation will be

done by area by area by BMKG local staff. Site selection and installation shall be done in the regular routine work. Therefore, only the shipping charge is counted for this work. Installation sites are scattered across the whole of Indonesia. According to this situation, transfer cost is estimated by average transportation cost (175,000 IDR/equipment package) of all JISNET sites. Seismic intensity meters will be installed at 200sites.

35 million IDR (Approx. 0.30 million Japanese Yen)

2) LIPI

① Bank Commissions

12 million IDR (Approx. 0.12 million Japanese Yen)

② Inland Transportation, Installation

All the equipment shall be handed over to LIPI through BMKG at the warehouse in Jakarta. Land and air transportation costs will be incurred from the warehouse in Jakarta to LIPI HQ or the equipment installation sites. Regarding the land transportation, it shall be included in the normal operating cost of LIPI expecting delivery by LIPI staffs. For the air transportation, delivery by LIPI staffs shall be also expected and the transportation costs were estimated as round-trip airfare for LIPI staffs; About 0.07 million yen to Banda Aceh, which is the farthest from Bandung, about 0.04 million yen to Padang, and about 0.03 million yen to Liwa.

14.0 million IDR (Approx. 0.14 million Japanese Yen)

③ Installation and Construction Costs

In order to install a strong motion seismograph (accelerometer), a concrete foundation about 50 cm below ground level will be required. About 1 million IDR per unit is required for the cost for construction of the foundation and protection of the seismograph. The installation and construction costs are estimated for 10 units based on this unit cost.

10.0 million IDR (Approx. 0.1 million Japanese Yen)

④ Travel Expenses for Initial Operation and Maintenance Training Participants

Additional costs for travel expenses for initial operation and maintenance training of the participants will be incurred since the training will not be held at the LIPI in Bandung.

(2) Condition of Estimate

1) BMKG

① Date of Estimate : March, 2014

② Exchange Rate : 1US$ = JPY 104.18, 1IDR= JPY 0.0086、

③ Implementation Period : as shown in "2-2-4-9 Implementation Schedule"

④ Others : The Project shall be implemented in accordance with the Grant Aid scheme of Japan

2) LIPI

① Date of Estimate : June, 2013

② Exchange Rate : 1US$ =JPY 98.92, 1IDR=JPY 0.010

③ Implementation Period : as shown in "2-2-4-9 Implementation Schedule"

④ Others : The Project shall be implemented in accordance with the Grant Aid scheme of Japan

2-6 Operation and Maintenance Cost

Estimated operation and maintenance costs for the equipment procured by the Project are as follows;

(1) BMKG

- Personnel Costs :

  Number of all project sites is 93. A total of 16 sites are locating inside of BMKG offices or very close to the BMKG premises. Another 77 sites are located mainly in local government offices. All seismic stations send observed data to BMKG HQ automatically. And they are maintenance free and without periodical data collection. Therefore, operation is carried out in the routine work. Data processing is also carried out as a part of the routine work. Because if this, increasing of the staff is not necessary and there is no increase in personnel cost.

- Cost of Electricity

  Cost of electricity is estimated for the 67 seismic stations which will be contracted with PLN as 200,000 IDR/station/month.

  160.0 million IDR/year (Approx. 1.38 million Japanese Yen/year)

  For the seismic stations which are located in the BMKG existing offices, power will be supplied from the BMKG office. Consumption is low such as 250 W. Therefore electricity cost is not counted. In addition, for the 9 sites which are operated by solar power systems, no electricity cost will be incurred.

- Satellite Communication Cost

  For the data transmission, a satellite communication charge will be incurred. It is different between the stations using commercial power (84 stations) and solar power (9 stations). The sites which utilize solar power systems are using a power saving type of router because of the power limitation. Therefore, to send the same amount of data as with a normal router which uses commercial power a wide range frequency band is required and this is also rather expensive.

  Unit cost of satellite communication calculated by the current BMKG contract is 900 million IDR/1MHz/year. In the Project, 2.4MHz for commercial power sites, 0.8MHz for solar power sites and 0.6MHz for maintenance from BMKG HQ, totally 3.8MHz should serve all systems.

  3420.0 million IDR/year (Approx. 29.4 million Japanese Yen/year)

  It should be noted that seismic intensity meters have a system to send data through the internet. However, the installation sites have not been decided yet and therefore, the

requirements of the necessary systems cannot be estimated at present. Therefore, communication cost is not shown here.

- Cost for Consumables :

  No additional costs for consumables will be incurred by implementing the Project.

(2) LIPI

1) Personnel Costs

There are 10 target sites for installation of strong motion seismographs (accelerometers). For the monitoring of the equipment, LIPI staffs will check them at regular intervals and collect data. No staff will reside in the monitoring place. Regarding the survey using PS logging equipment and array microtremor measurement equipment, it will be conducted as a part of the current study and survey. Newly introduced equipment will not require additional staff, and therefore, there will not be any increase in personnel costs. In addition, transportation expenses required for data collection will be included in the normal operating cost of LIPI.

2) Electric Power Charges, Use of Land and Facilities

Electric power is need for 10 strong motion seismographs (accelerometers) installed in different locations. However, the impact on electric power charges can be estimated as being very low since required power to operate a strong motion seismograph (accelerometer) is only about 10 to 20 Wh per unit. In addition, strong motion seismographs (accelerometers) will be installed under a mutual agreement between LIPI and cooperative universities or local institutions. Under these agreements, no additional costs for electric power charges and use of land and facilities will be incurred.

3) Cost for Consumables

No additional costs for consumables will be incurred by implementing the Project.

Chapter 3 Project Evaluation

Chapter 3 Project Evaluation

3-1 Preconditions

Preconditions for the smooth implementation of the Project are as follows.

- Land Acquisition (for BMKG package)

  Necessary land or space for the installation of the equipment will be secured without delay by acquiring land or obtaining permission for the use of land or space.

- Tax Assumption (for both BMKG and LIPI packages)

  Customs duties, internal taxes and other fiscal levies which may be imposed in the Recipient country for the Japanese entities, including the Agent, engaged in the Project with respect to the purchase of the products and the services shall be assumed by the Implementing Agencies without delay.

- Expediencies (for both BMKG and LIPI packages)

  Prompt customs clearance of the products imported from Japan and/or third countries at the ports of disembarkation in the Recipient country shall be facilitated by the Implementing Agencies for smooth implementation of the Project. And, necessary expediencies shall be granted to allow Japanese nationals and/or nationals of third counties, including such nationals employed by the Agent, whose services may be required in connection with the supply of the products and the services for such facilities, for their entry into the Recipient country and stay therein for the performance of their work.

- Budgetary Allocation for Proper Operation and Maintenance (for both BMKG and LIPI packages)

  The budget for proper operation and maintenance of the equipment provided by the Project will be secured by the Indonesian side.

- Expenditure other than the Grant

  All the expenses, other than those covered by the Grant and/or its accrued interest, necessary for the implementation of the Project shall be borne by the Implementing Agencies, and the following work shall be conducted by the Indonesian side without delay.

  - Inland transportation for PS logging equipment and array micro tremor measurement equipment (for LIPI Package)
  - Inland transportation, installation and adjustment works for the strong motion seismographs (velocity meters) (for LIPI Package)

- Inland transportation, installation and adjustment works for the seismic intensity meters (for BMKG Package)
- Obtaining Permits（for both BMKG and LIPI packages）
- Travel Expenses for Initial Operation and Maintenance Training Participants（for both BMKG and LIPI packages）

3-2 Necessary Inputs by Recipient Country

The inputs or undertakings of the Indonesian side required for maintaining the outputs of the Project are as follows.

- Budgetary Allocation for Electricity Contract (for BMKG Package)

  In case of installation of new seismic stations which are located on other than BMKG office sites, BMKG will establish electricity contracts with PLN. The budget for these new electricity contracts will be secured by the Indonesian side for operation of the equipment procured by the Project.

- Budgetary Allocation for Data Communication (for BMKG Package)

  The budget for data communication costs, such as for satellite communication and the internet, will be secured by the Indonesian side for transmission of the data obtained with the earthquake observation equipment procured by the Project.

- Enhancement of Operation and Maintenance of Earthquake Observation Systems (for BMKG Package)

  The methods of operation and maintenance for the existing seismic stations have already been put into practice. Similar methods will be applied for the equipment to be provided by the Project. In addition, BMKG will monitor the operational status of the equipment at all times, through real-time data satellite communication systems.

- Enhancement of Operation and Maintenance of Earthquake Observation Systems (for LIPI Package)

  The methods of operation and maintenance for the currently owned equipment, such as seismic observation and/or survey equipment, have already been put into practice. Similar methods will be applied for the equipment to be provided by the Project. In addition, an adequate transportation method and equipment storage management system will be established at LIPI in accordance with the characteristics of the portable type geophysical survey equipment procured by the Project.

- Proper Operation and Maintenance after Handing Over (for both BMKG and LIPI packages)

  The equipment provided by the Project will be operated and maintained properly and effectively.

3-3 Important Assumptions

The important assumptions for maintaining the outputs of the Project are as follows.

- The policies and strategies of the disaster risk management sector in the Indonesia will not be changed.
- Emergency incidents, such as acts of terrorism, will not occur.

3-4 Project Evaluation

3-4-1 Relevance

(1) Contribution to Disaster Prevention and Mitigation

The Indonesia is one of the countries in Southeast Asia with high risk of natural disasters, and the country has often experienced natural disasters, such as earthquakes, volcanic eruptions and huge tsunami waves caused by big earthquakes in the Pacific Rim. In addition, the damage caused by the Sumatra earthquake in 2004 was horrendous. The Project contributes to the strengthening of the disaster management system and the improvement of earthquake disaster management through procurement of equipment and establishment of the system and it will contribute to disaster prevention and mitigation in Indonesia.

The assistance for BMKG under the Project contributes to early realization of the plan to install 500 seismographs throughout the country. This plan is set in the Medium-term strategic plan of 2010-1014 (RENSTRA) established by BMKG which continually attempts to improve its disaster prevention capacity. Furthermore, with the strengthened BMKG earthquake observation network, it will make it possible to collect high accuracy earthquake information in real-time. Consequently, the improvement of seismic analysis such as the determination of earthquake source and magnitude calculations, and accuracy of the nationwide seismic intensity mapping are expected.

Regarding the earthquake observation network, installation of broadband seismographs (velocity meters), broadband strong motion seismographs (velocity meters), strong motion seismographs (accelerometers) and seismic intensity meters will expand the BMKG's real-time earthquake observation networks, collecting of data and improvement of analysis accuracy, by coordinating with existing Ina-TEWS.

Improvement of observation density of the high seismicity areas and populated areas is expected using the data obtained from the equipment procured by the Project. The implementation of the Project will not only bear direct benefits for strengthening the capacity of disaster prevention and mitigation all across Indonesia, but also collect and accumulate data that will be used for review and analysis for the earthquake early warning system which is expected in the future.

With respect to the assistance for LIPI, it will contribute to LIPI's scientific research and survey about ground characteristics for estimating ground strength, understanding ground properties, acquisition of seismic wave and seismic waveform and understanding the earthquake characteristics. It is appropriate as assistance for the institutions responsible for research regarding earthquake damage estimation, secondary damage and vulnerability to earthquakes.

(2) Contribution to National Policies and Strategies in Indonesia

The "Law of the Republic of Indonesia Number 24 of 2007 Concerning Disaster Management (hereinafter referred to as the "Disaster Management Law")" is the fundamental law for disaster risk management and countermeasures in Indonesia and a number of disaster management countermeasure acts and regulations are established under this law. The "National Disaster Management Plan (2010-14)" is one of the plans under the Disaster Management Law. A part of this National Disaster Management Plan is reflected in the "Mid-term National Disaster Management Plan (herein after referred to as "RP JMN")". The Project, through earthquake observation and analysis, will contribute to "natural disaster management" which is one of the priority development areas of RP JMN. In addition, since the implementing agencies of the Project such as BMKG and LIPI are classified as disaster management agencies at the national level by the "Disaster Management Law", the Project will contribute to the implementation of the "National Disaster Management Plan" and it is in line with the framework of the overall goal of Indonesia.

(3) Utilization of Japan's Technologies in the Disaster Risk Management Sector and Lessons Learned from the Great East Japan Earthquake

Japan has been providing assistance in the disaster risk management sector of Indonesia for more than 50 years, beginning in the 1960s, assistance for earthquake disaster management and reconstruction are also carried out, and thus, has acquired technologies, know-how and broad networks in the sector. Since the Project is categorized in the series of such assistance in the disaster risk management sector of Indonesia, these acquired technologies, know-how and broad networks can be utilized sufficiently.

Especially, regarding the technologies in the sector, they have been newly developed and improved based on the lessons learned from the Great East Japan Earthquake. Even in Japan, introduction of such newly developed and/or improved equipment for disaster monitoring and response have been promoted. One of the most remarkable cases is introduction of Japan-made broadband strong motion seismographs (velocity meters), which can work for giant earthquakes, since it was learned that the broadband seismographs (velocity meters) went off scale when the Great East Japan Earthquake hit. In Indonesia, since trenches are lying along the island arc of Sumatra and Java, large-scale earthquakes occur frequently similar to in Japan. Therefore, introduction of the above mentioned equipment is significant and sufficient results can be expected.

(4) Information Sharing between Japan and Neighboring Countries

Earthquake and tsunami observed data are not only transmitted within Indonesia, but also shared with the following external agencies. Thus, the data obtained with the equipment provided by the Project is also expected to contribute to enhancing the accuracy of earthquake and tsunami observation, and forecasting and warning in Japan and other neighboring countries.

- GEOFON: Global earthquake monitoring network of the German Research Centre for Geosciences (GFZ), a public research institute of Germany
- Japan's National Research Institute for Earth Science and Disaster Prevention (NIED): The data obtained from the 15 unmanned seismic stations where the broadband seismographs and the strong motion seismographs have been installed by SATREPS is transmitted to Japan via the internet. Operating the NIED-developed system (SWIFT) in both Japan and Indonesia, analyzing earthquake focal mechanisms and determining earthquake intensities and tsunami have all been conducted.
- Other agencies:
  The Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Earthquake Research Institute of the University of Tokyo, Japan Agency for Marine-Earth Science and Technology (JAMSTEC) and etc.

Based on the fact findings above mentioned, it is considered that the relevance of the Project will be high.

3-4-2 Effectiveness

The following outputs are to be expected from the Project. It is confidently considered that the Project will be effective.

(1) Quantitative Outputs

- Expansion and Improvement of Earthquake Information System

  The Earthquake data processing system will be expanded and improved through the provision of the following equipment; 1) broadband seismographs (velocity meters), broadband strong motion seismographs (velocity meters) and strong motion seismographs (accelerometers) for the 15 JISNET sites and the 5 BMKG existing sites, 2) strong motion seismographs (accelerometers) for 73 new seismic stations. Consequently, monitoring of seismic intensities, identification of epicenters and calculation of magnitudes can be conducted swiftly. In addition, through 93 strong motion seismographs (accelerometers) and 200 seismic intensity meters procured by the Project, the seismic intensity monitoring network will be established.

Table 3-1 Quantitative Outputs

Indicator	Baseline (2014)	Target (2019)
Time required to determine the earthquake source of large-scale earthquakes	5min.	3min.
Time required to announce publicly tsunami warning	5 min.	3 min.
Time required to prepare seismic intensity maps (by shake map) ※1	7 min.	5 min.
Time required to announce publicly isoseismal map ※2	60 min.	30 min.
Collection rate of observed seismic data	70 %	90 %

※1: It is announced by BMPB.
※2: It is uploaded to BMKG web site.

(2) Qualitative Outputs

- Strengthening of the earthquake data processing system and establishment of the seismic intensity observation network will make it possible to improve the accuracy of the analysis of earthquakes and observations of Indonesia
- Seismic intensity information will be transmitted directly to the BMKG headquarters from strong motion seismographs (accelerometers) and seismic intensity meters, and rough damage estimations will be possible at an early stage.
- Observed data will be collected and accumulated, and accuracy of the earthquake source and magnitude calculation will be improved.
- By sharing the above mentioned information and data with disaster related institutions such as BNPB, expedited initial response and improvement of response capacity to deal with effective disaster emergency and restoration measures will be expected.
- The implementation of the Project will not only bear direct benefits for strengthening the capacity of disaster prevention and mitigation all across Indonesia, but also collect and accumulate data that will be used for review and analysis for earthquake the early warning system which is expected in the future.

Appendices

Appendix 1

Member List

First Site Survey

Mr. Minoru MIYASAKA Team Leader	Global Environment Department, Japan International Cooperation Agency (JICA)
Mr. Shoji HASEGAWA Plannig Management / Grant Aid for Disaster Prevention & Reconstruction	Disaster Management Division2, Water Resources and Disaster Management Group, Global Environment Department, Japan International Cooperation Agency (JICA)
Mr. Shunichi KUDO Grant Aid Program / Procurement Agent	Japan International Cooperation System (JICS)
Mr. Shouzo KAWASAKI Chief Consultant/Operation & Maintenance Planning	Oriental Consultants Co., Ltd.
Mr. Michio TAKAHASHI Earthquake & Tsunami Warning System/Information Communication System	Pacific Consultants Co., Ltd.
Mr. Kengo KAWASHIRO Earthquake & Tsunami Monitoring Equipment/Installation Planning	Pacific Consultants Co., Ltd.
Mr. Hironori HONMA Procurement Planning/Estimation	Oriental Consultants Co., Ltd.
Mr. Hiroto YAMAUCHI Coordinator	Oriental Consultants Co., Ltd.
Mr. Yusuke UEMURA Coordinator	Pacific Consultants Co., Ltd.

Pre-Second Site Survey

Mr. Shouzo KAWASAKI Chief Consultant/Operation & Maintenance Planning	Oriental Consultants Co., Ltd.
Mr. Toru YORITATE Deputy Chief Consultant/Operation & Maintenance Planning (2)	Oriental Consultants Co., Ltd.

Second Site Survey

Mr. Shiro NAKASONE Team Leader	Disaster Management Division1, Water Resources and Disaster Management Group, Global Environment Department, Japan International Cooperation Agency (JICA)
Mr. Kota KATSUMATA Planning Management/Grant Aid for Disaster Prevention & Reconstruction	Disaster Management Division1, Water Resources and Disaster Management Group, Global Environment Department, Japan International Cooperation Agency (JICA)
Mr. Shouzo KAWASAKI Chief Consultant/Operation & Maintenance Planning	Oriental Consultants Co., Ltd.
Mr. Toru YORITATE Deputy Chief Consultant/Operation & Maintenance Planning (2)	Oriental Consultants Co., Ltd.
Mr. Michio TAKAHASHI Earthquake & Tsunami Warning System/Information Communication System	Pacific Consultants Co., Ltd.
Mr. Kengo KAWASHIRO Earthquake & Tsunami Monitoring Equipment/Installation Planning	Pacific Consultants Co., Ltd.
Mr. Tetsuya SANO Procurement Planning/Estimation	Oriental Consultants Co., Ltd.
Mr. Mamoru NAKAMURA Construction Planning/Estimation (1)	Oriental Consultants Co., Ltd.
Ms. Keiko OTOGURO Construction Planning/Estimation (2) Site Survey	Oriental Consultants Co., Ltd.
Mr. Kunio KIMATA Construction Planning/Estimation (3)	Oriental Consultants Co., Ltd.
Ms. Moroyo ARAKI Site Survey (2)	Oriental Consultants Co., Ltd.

Pre-DOD Explanation

Mr. Kota KATSUMATA Planning Management/Grant Aid for Disaster Prevention & Reconstruction	Disaster Management Division1, Water Resources and Disaster Management Group, Global Environment Department, Japan International Cooperation Agency (JICA)
Mr. Shouzo KAWASAKI Chief Consultant/Operation & Maintenance Planning	Oriental Consultants Co., Ltd.
Mr. Toru YORITATE Deputy Chief Consultant/Operation & Maintenance Planning (2)	Oriental Consultants Co., Ltd.
Mr. Kengo KAWASHIRO Earthquake & Tsunami Monitoring Equipment/Installation Planning	Pacific Consultants Co., Ltd.
Ms. Keiko OTOGURO Construction Planning/Estimation (2)	Oriental Consultants Co., Ltd.

DOD Explanation

Ms. Kai KIKUIRI Team Leader / Planning Management	Disaster Management Division1, Water Resources and Disaster Management Group, Global Environment Department, Japan International Cooperation Agency (JICA)
Mr. Shouzo KAWASAKI Chief Consultant/Operation & Maintenance Planning	Oriental Consultants Co., Ltd.
Mr. Toru YORITATE Deputy Chief Consultant/Operation & Maintenance Planning (2)	Oriental Consultants Co., Ltd.
Mr. Kengo KAWASHIRO Earthquake & Tsunami Monitoring Equipment/Installation Planning	Pacific Consultants Co., Ltd.
Ms. Keiko OTOGURO Construction Planning/Estimation (2)	Oriental Consultants Co., Ltd.

Appendix 2

Site Survey Schedule

First Site Survey Schedule

	Date (Year 2012)		Team Leader	Planning Management / Grant Aid for Disaster Prevention & Reconstruction	Grant Aid Program / Procurement Agent	Chief Consultant / Operation & Maintenance Planning	Earthquake & Tsunami Warning System / Information Communication System	Earthquake & Tsunami Monitoring Equipment / Installation Planning	Procurement Planning / Cost Estimate	Administrate (OC's own cost)	Assistance (PCKK's own cost)
			Mr. MIYASAKA Minoru	Mr. HASEGAWA Syoji	Mr. KUDO Syunichi	Mr. KAWASAKI Syozou	Mr. TAKAHASHI Michio	Mr. KAWASHIRO Kengo	Mr. HONMA Hironori	Mr. YAMAUCHI Yosito	UEMURA Yuske
			JICA	JICA	JICS	OC	PCKK	PCKK	OC	OC	PCKK
0	30-Jun	Sat		Istanbul - Jakarta							
1	1-Jul	Sun	Narita - Jakarta	Preparation for Survey	Narita - Jakarta						
2	2-Jul	Mon	Courtesy call for Embassy & JICA Jakarta, Courtesy call for recipient agency (BAPPENAS, BMKG, LIPI)								
3	3-Jul	Tue	Discussion with BMKG								
4	4-Jul	Wed	Discussion with LIPI				Discussion with Dr. INOUE		Discussion with LIPI		
5	5-Jul	Thu	Discussion for M/D (BMKG, LIPI)								
					Discussion with MoF						
6	6-Jul	Fri	M/D signing. Report to Embassy and JICA			M/D Discussion and M/D Signing					
			Jakarta								
7	7-Jul	Sat	Narita			Data collection and Assembling					
8	8-Jul	Sun				Data collection and Assembling					
9	9-Jul	Mon				Discussion with BMKG for Equipment Planning			Discussion with BMKG for Procurement Condition		
10	10-Jul	Tue				Discussion with BMKG for Equipment Planning			Discussion with BMKG for Procurement Condition		
11	11-Jul	Wed				Discussion with BMKG for Equipment Planning			Discussion with BMKG for Procurement Condition		
12	12-Jul	Thu				Discussion with BMKG for Equipment Planning			Discussion with BMKG for Procurement Condition		
13	13-Jul	Fri				Discussion with BMKG for Equipment Planning			Discussion with BMKG for Procurement Condition		
14	14-Jul	Sat				Data collection and Assembling					Narita - Jakarta
15	15-Jul	Sun				Data collection and Assembling					
16	16-Jul	Mon				Discussion with BMKG for Equipment Planning			Discussion with BMKG for Procurement Condition		Discussion with BMKG for Equipment Planning
17	17-Jul	Tue				Preparation of Technical Notes for LIPI	Discussion with BMKG for Equipment Planning		Discussion with BMKG for Procurement Condition	Site survey in Bandon	Discussion with BMKG for Equipment Planning
18	18-Jul	Wed				Site Survey in Bandon (Lembang station) , Discussion of Technical Notes and Signing with LIPI					
19	19-Jul	Thu				Operation & Maintenance Planning Survey	Discussion with BMKG for Equipment Planning	Equipment Planning Survey	Procurement Condition Survey		Equipment Planning Survey
								Site Survey Preparation (to Banda Aceh)			
20	20-Jul	Fri				Operation & Maintenance Planning Survey	Equipment Planning Survey	Equipment Planning Survey	Procurement Condition Survey		Equipment Planning Survey
								Site Survey Preparation (to Banda Aceh)			
21	21-Jul	Sat				Document Arrangement		Jakarta - Banda Aceh			
								Site Survey in Banda Aceh (Seismic station inspection)			
22	22-Jul	Sun				Document Arrangement		Site Survey in Banda Aceh (Operation system)			
								Banda Aceh - Jakarta			
23	23-Jul	Mon				Discussion with BMKG for Equipment Planning			Discussion with Local Consultant about cost estimation	Discussion with BMKG for Procurement	Discussion with BMKG for Equipment Planning
24	24-Jul	The				Preparation of Technical Notes for BMKG	Discussion with BMKG for Equipment Planning		Discussion with BMKG for Procurement Condition		Discussion with BMKG for Equipment Planning
25	25-Jul	Wed				Preparation of Technical Notes for BMKG	Discussion with BMKG for Equipment Planning		Discussion with Local Consultant about cost estimation	Discussion with BMKG for Procurement Condition	Discussion with BMKG for Equipment Planning
						Preparation of Technical Notes for BMKG					
26	26-Jul	Thu				Technical Notes Sinning with BMKG					
27	27-Jul	Fri				Report to JICA Indonesia			Document Preparation for Debriefing Session		
28	28-Jul	Sat				Collected Document Arrangement					
						Jakarta				Collected Document Arrangement	Jakarta
29	29-Jul	Sun				Narita				Collected Document Arrangement	Narita

Pre-Second Site Survey Schedule

	Date (Year 2013)		Chief Consultant / Operation & Maintenance Planning	Deputy Chief Consultant / Operation & Maintenance Planning (2)
			Mr. KAWASAKI Syozou	Mr. YORITATE Toru
			OC	OC
1	30-Jun	Sun	Narita Jakarta	
2	1-Jul	Mon	Cortecy Call for JICA Indonesia Discussion with BMKG	
4	2-Jul	Sun	Discussion with BMKG Jakarta⇒Bandon (Transport)	
6	3-Jul	THJ	Discssion with LIPI	
7	4-Jul	THJ	Bandon - Jakarta Discussion with BMKG &LIPI	
8	5-Jul	Fri	Document Arrangement Jakarta	

Second Site Survey Schedule

	Date (Year 2013)		Team Leader	Planning Management / Grant Aid for Disaster Prevention & Reconstruction	Chief Consultant / Operation & Maintenance Planning	Deputy Chief Consultant / Operation & Maintenance Planning (2)	Earthquake & Tsunami Monitoring Equipment / Installation Planning	Earthquake & Tsunami Warning System / Information Communication System	Procurement Planning / Cost Estimation	Construction Planning / Cost Estimation (1)	Construction Planning / Cost Estimation (3)	Construction Planning / Cost Estimation (2) /Site Survey	Site Survey (2)
			Mr. NAKASONE Siro	Mr. Katsumata Kota	Mr. KAWASAKI Syozou	Mr. YORITATE Toru	Mr. KAWASHIRO Kengo	Mr. TAKAHASHI Michio	Mr. SANO Tetsuya	Mr. NAKAMURA Mamoru	Mr. KIMATA Kunio	Ms. OTOGURO Keiko	Ms. ARAKI Motoyo
			JICA	JICA	OC	OC	PCKK	PCKK	OC	OC	OC	OC	OC
1	21-Jul	Sun	Narita – Jakarta									Narita – Jakarta	
			Internal Meeting									Internal Meeting	
2	22-Jul	Mon	Discussion with BMKG・LIPI									Discussion with BMKG・LIPI	
3	23-Jul	Tue	Discussion with BMKG・LIPI									Discussion with BMKG・LIPI	
4	24-Jul	Wed	M/D signing with LIPI Discussion with BMKG									M/D signing with LIPI Discussion with BMKG	
5	25-Jul	Thr	Report to Embassy and JICA			Discussion with BMKG						Discussion with BMKG	
			Jakarta		Discussion with BMKG								
6	26-Jul	Fri	Narita		Discussion with BMKG							Discussion with BMKG	
7	27-Jul	Sat			Internal Meeting			Narita – Jakarta				Internal Meeting	
								Internal Meeting					
8	28-Jul	Sun			Document Arrangement							Document Arrangement	
9	29-Jul	Mon			Discussion with BMKG							Construction and Cost Survey	
10	30-Jul	Tue			Discussion with BMKG							Construction and Cost Survey	
11	31-Jul	Wed			Discussion with BMKG							Construction and Cost Survey	
12	1-Aug	Thr			Discussion with BMKG							Arrangement	
					Jakarta	Discussion with BMKG						Jakarta	
13	2-Aug	Fri			Narita	Internal Meeting						Narita	
14	3-Aug	Sat				Document Arrangement		Arrangement					
								Jakarta					
15	4-Aug	Sun				Discussion with BMKG		Narita					
						Discussion with BMKG	Jakarta						
16	5-Aug	Mon				Discussion with BMKG	Narita						
|	|				Site Survey							
22	11-Aug	Sun				Discussion with BMKG			Narita – Jakarta	Narita – Jakarta		Narita – Jakarta	
									Internal Meeting	Internal Meeting		Internal Meeting	
|	|				Tender Preparation			Procurement Survey	Preparation for Tender		Construction Plan Survey		
34	23-Aug	Fri				Tender Opening for Site Survey			Tender Opening for Site Survey			Tender Opening for Site Survey	
|	|				Site Survey			Procurement Survey	Site Survey		Construction Plan Survey		
41	30-Aug	Fir				Site Survey			Procurement Survey	Site Survey		Construction Plan Survey	
												Jakarta	
42	31-Aug	Sat				Site Survey			Document Arrangement	Site Survey		Narita	
|	|				Site Survey			Arrangement	Site Survey			
48	6-Sep	Fri				Site Survey			Discussion with BMKG	Site Survey			
									Jakarta				
49	7-Sep	Sat				Site Survey			Narita	Site Survey			
|	|				Site Survey				Site Survey			
63	21-Sep	Sat				Site Survey				Site Survey	Narita – Jakarta		
											Internal Meeting		
|	|				Site Survey				Site Survey	Site Survey		
70	28-Sep	Sat				Site Survey				Discussion with BMKG	Site Survey		
										Jakarta			
71	29-Sep	Sun				Site Survey				Narita	Site Survey		
|	|				Site Survey					Site Survey		
82	10-Oct	Thr				Site Survey					Site Survey	Narita – Jakarta	
												Internal Meeting	
|	|				Site Survey					Site Survey	Output Control	
98	26-Oct	Sat				Site Survey					Site Survey	Output Control	
												Jakarta	
99	27-Oct	Sun				Site Survey					Site Survey	Narita	
|	|				Site Survey					Site Survey		
114	11-Nov	Mon				Site Survey					Site Survey		
											Jakarta		
115	12-Nov	Fri				Site Survey					Narita		
|	|				Site Survey							
121	18-Nov	Mon				Site Survey							
						Jakarta							
122	19-Nov	Tue				Narita							
123	4-Dec	Wed											Narita – Jakarta
													Output Control
|	|											Output Control
132	13-Dec	Fri											Output Control
													Jakarta
133	14-Dec	Sat											Narita

Pre DOD Explanation Schedule

	Date (Year 2014)		Planning Management / Grant Aid for Disaster Prevention & Reconstruction	Chief Consultant / Operation & Maintenance Planning	Deputy Chief Consultant / Operation & Maintenance Planning (2)	Earthquake & Tsunami Monitoring Equipment / Installation Planning	Construction Planning / Cost Estimation (2)
			Mr. Katsumata Kota	Mr. KAWASAKI Syozou	Mr. YORITATE Toru	Mr. KAWASHIRO Kengo	Ms. OTOGURO Keiko
			JICA	OC	OC	PCKK	OC
1	2-Mar	Sun		Narita – Jakarta			
				Internal Meeting			
2	3-Mar	Mon		Discussion with BMKG			
3	4-Mar	Tue	Narita – Jakarta	Discussion with BMKG / Internal Meeting			
			Internal Meeting				
4	5-Mar	Wed	Discussion with BMKG / TN signing with BMKG				
5	6-Mar	Thu	Discussion with BMKG		Site Survey	Discussion with BMKG	
			Jakarta	Discussion with BMKG			
6	7-Mar	Fri	Narita	Discussion with BMKG	Site Survey	Discussion with BMKG	
7	8-Mar	Sat		Document Arrangement			
				Jakarta			
8	9-Mar	Sun		Narita			

DOD Explanation Schedule

	Date (2014)		Team Leader	Chief Consultant / Operation & Maintenance Planning	Deputy Chief Consultant / Operation & Maintenance Planning (2)	Earthquake & Tsunami Monitoring Equipment / Installation Planning	Construction Planning / Cost Estimation (2)
			KIKUIRI Kai	Mr. KAWASAKI Syozou	Mr. YORITATE Toru	Mr. KAWASHIRO Kengo	Ms. OTOGURO Keiko
			JICA	OC	OC	PCKK	OC
1	24-May	Sat		Narita – Jakarta			
				Internal Meeting			
2	25-May	Sun		Internal Meeting / Discussion with BMKG			
			Narita				
3	26-May	Mon	Jakarta	Discussion with BMKG			
			Courtesy Call to Japan Embassy		Discussion with BMKG		
			Discussion with BMKG				
4	27-May	Tue	Discussion with BMKG				
5	28-May	Wed	Discussion with BMKG / M/D Signing				
			Jakarta	Discussion with BMKG			
6	29-May	Thu	Narita	Discussion with BMKG			
7	30-May	Fri		Courtesy Call to JICA Indonesia	Discussion with BMKG		
8	31-May	Sat		Document Arrangement			
				Jakarta			
9	1-Jun	Sun		Narita			

Appendix 3

Participant List

1. **Embassy of Japan in the Indonesia**

Mr. Kazushi FURUMOTO	:	Secretary

2. **JICA Indonesia Office**

Mr. Tomoyuki TADA	:	Senior Representative
Ms. Dinur Krismasari	:	Senior Representative
Mr. Hideki KATAYAMA	:	Representative

3. **National Development Planning Agency (BAPPENAS)**

Mr. Firdo Favzan	:	Planner

4. **Meteorological, Climatological and Geophysical Agency (BMKG)**

Dr. Prih Harjadi	:	Deputy Director-General of Geophysics (Former)
Dr. Masturyono M. Sc.	:	Deputy Director-General of Geophysics
Mr. Suhardjono	:	Director of Earthquake and Tsunami Center (Former)
Mr. Mochammad Riyadi	:	Director of Earthquake and Tsunami Center
Dr. Jaya Murjaya	:	Director of Engineering Seismology, Potential Geophysics and Time Signal Center
Mr. Budi Waluyo	:	Director of Engineering Seismology, Potential Geophysics and Time Signal Center Time Signal (Former)
Mr. Edward Trihadi	:	Director of Networking Communication Center
Mr. JC Bambang K	:	Head of Earth Magnetism and Air Electricity Sub Division
Dr. Wandono	:	Head of Earthquake Information and Tsunami Warning Division
Mr. Taufik Gunawan	:	Head of Earthquake Information and Tsunami Warning Operational Management Division
Mr. I Nyoman Sukanta	:	Head of Earthquake and Tsunami Mitigation Division
Dr. Sugeng Pribadi	:	Staff, Earthquake and Tsunami Information Division
Mr, Fadly Yusuf	:	Staff, Earthquake and Tsunami Information Division
Mr. Rinto Madijono	:	Head of Engineering Seismology Division
Mr. Bambang S. Prayitno	:	Head of Engineering Seismology Division (Former)
Mr, Bambang Sulistyo	:	Staff, Engineering Seismology Operational Management Sub Division
Mr, Budiarta	:	Head of Engineering Seismology Operational Management Sub Division (Former)
Mr. Karyono	:	Head of Earthquake Operational Management Sub Division
Mr. Muchlis	:	Staff, Engineering Seismology Sub Division (Former)
Mr. Sigit Pramono	:	Head of Engineering Seismology Information Sub Division

Dr. Muzli	:	Staff, Engineering Seismology Information Sub Division
Ms. Isabella Nindya.	:	Staff, Engineering Seismology Information Sub Division
Mr. Rahmat Triyono	:	Head of Engineering Seismology and Potential Geophysics Operational Management Division
Ms. Istiyanati	:	Head of Engineering Seismology Operational Management Sub Division
Mr. Rakhindro Pandhu	:	Head of Engineering Seismology Data Sub Division
Ms. Nur Hidayati Oktavia	:	Staff, Engineering Seismology Data Sub Division
Ms. Istofiyah	:	Staff, Engineering Seismology Data Sub Division
Mr. Edy Santoso	:	Staff, Engineering Seismology Data Sub Division
Mr. Wijayanto	:	Head of Earthquake Mitigation Sub Division
Mr. Urip Setiyono	:	Staff, Earthquake Mitigation Sub Division
Dr. Iman Suardi	:	Staff, Earthquake Information Sub Division
Mr. Hanif Andi	:	Head of Network & Internet Infrastructure Division
Mr. Arief Karyadi P	:	Staff, Infrastructure of Network Sub Division
Mr. Faisal Adnan	:	Staff, Program & Planning Division
Mr. Eka Edi Susanta	:	Staff, Program & Planning Division
Mr. Jumadi	:	Head of Bandung observation Station in Bandung (Former)
Mr. Syachnan	:	Head of Banda Aceh Observation Station in Aceh (Former)
Mr. Muhaimin Albaar	:	Administrative Staff, Banda Aceh Observation Station
Mr. Satrio Happrobo	:	Observation Staff, Banda Aceh Observation Station
Mr. Abdi Jihad	:	Observation Staff, Banda Aceh Observation Station
Ms. Weniza	:	Head of Tsunami Mitigation Sub Division
Mr, Sujabar	:	Head of Tsunami Operational Management Sub Division
Mr, Anton Sugihart	:	Staff, Operational Tsunami Development Sub Division
Mr. Yohanes Tasar	:	Head of Instrumentation, Engineering and Calibration Geophysical Equipment Division
Mr. Ahmad Kadarisman	:	Head of Instrumentation and Geophysical Calibration Sub Division
Mr. Dibyo Susanto	:	Head of Instrumental Calibration Sub Division at Regional II
Mr. Mahmud Yusuf	:	Staff, Geophysical Instrumentation Sub Division
Mr. FachriZal	:	Head of Geophysics Research and Development Division
Mr. Yudha Mardyansyah	:	Staff, Engineer
Mr. Hamdani	:	Head of Network Communication Sub Division
Mr. Aripin	:	Staff, Geomagnetic

5. **Indonesian Institute of Sciences（LIPI）**

Dr. Akmadi ABBAS	:	Head of Bureau
Mr. Iskandar ZULKARNAIN	:	Deputy Chairman for Earth Science
Dr. Haryadi PERMANA	:	Director, Research Center for Geotechnology
Dr. Adrin TOHARI	:	Senior Engineer/Head, Engineering Geology Division
Ms. Diffi FORTUNA.H.	:	Head. Planning Sub Division

6. **National Agency for Disaster Management (BNPB）**

Dr. Akmadi ABBAS	:	Head of Bureau

7. **Ministry of Finance of Republic of Indonesia**

Mr. HIDAYANA S.	:	Head, DGOM Section

8. **Ache Disaster Mitigation Agency（BPBA）**

Mr. ISKANDAR	:	Staff, Prevention and Preparedness Division

Appendix 4

Minutes of Discussion

Appendix 4-1

Minutes of Discussion (signed on July 6, 2012)

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY
ON THE PROJECT FOR IMPROVEMENT OF EQUIPMENT
FOR DISASTER RISK MANAGEMENT

In response to the request from the Government of the Republic of Indonesia (hereinafter referred to as "Indonesia"), the Japan International Cooperation Agency (hereinafter referred to as "JICA"), in consultation with the Government of Japan (hereinafter referred to as "the GOJ") decided to conduct a Preparatory Survey on the Project for Improvement of Equipment for Disaster Risk Management (hereinafter referred to as "the Project").

JICA sent to Indonesia the Preparatory Survey Team (hereinafter referred to as "the Team"), which is headed by Mr. Minoru Miyasaka, Senior Advisor to the Director General, Global Environment Department, JICA, and is scheduled to stay in the country from 1st to 6th July, 2012.

The Team held discussions with the officials concerned of the Government of Indonesia (hereinafter referred to as "the GOI") and conducted a field survey at the survey area.

In the course of discussions and field survey, both sides confirmed the main items described in the attached sheets. The Team will proceed to further works and prepare the Preparatory Survey Report.

Jakarta, 6th July, 2012

宮坂 実

Mr. Minoru Miyasaka
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Mr. Suhardjono
Director of Earthquake and Tsunami Center
For Deputy of Geophysics
Meteorological, Climatological and Geophysical Agency (BMKG)
Republic of Indonesia

Dr. Haryadi Permana
Director of Research Center for Geotechnology
For Deputy of Earth Sciences
Indonesian Institute of Sciences (LIPI)
Republic of Indonesia

ATTACHMENT

1. Current Situation

The Great East Japan Earthquake, occurred on 11th of March, 2011, resulted in tremendous damages to Japan, and it reminded the international community of importance of disaster prevention. Meanwhile, the countries, seriously affected by the Sumatra Earthquake and the Indian Ocean Tsunami in 2004, are strategically addressing to improve their disaster management systems, including earthquake monitoring and tsunami warning systems. In those countries, however, monitoring networks, data analysis systems and warning systems for earthquake and tsunami are not yet well-developed.

Indonesia is one of the countries most severely damaged by natural disasters in the Southeast-Asia Region, and the county suffers from variety of natural disasters, such as earthquakes, tsunami, landslides, slope collapse, volcanic eruptions, floods, forest fires, storms and high tidal waves. The country is an archipelago of islands, which lies along the circum-Pacific orogenic zone, and it has thousands of faults and its coast lines are over 50,000-km-long. Due to such geographical nature, the country has been frequently affected by earthquakes, volcanic eruptions and tsunamis caused by great earthquakes occurred in the Pacific Rim. And also, it is emphasized that most of earthquakes developed around Indonesia are plate-type and generate big tsunami, and kill many people.

2. Objective of the Project

The objective of the Project is to contribute toward improving disaster risk management in Indonesia through the provision and installation of equipment in the facilities of the Meteorological, Climatological and Geophysical Agency (hereinafter referred to as "BMKG") and the Indonesian Institute of Sciences (hereinafter referred to as "LIPI").

3. Project site

The candidate sites of the Project proposed by each implementing agency are confirmed as shown in **Annex-1** respectively.

4. Responsible and Implementing Agency

The Responsible and Implementing Agencies are the Meteorological, Climatological and Geophysical Agency (BMKG) and the Indonesian Institute of Sciences (LIPI). The organization charts of BMKG and LIPI are shown in **Annex-2.**

5. Items requested by the Government of Indonesia

After discussions between the Indonesian side and the Team (hereinafter referred to as "both sides"), the items described in **Annex-3** were finally requested by the Indonesian side.
Both sides confirmed that the appropriateness of the request would be examined in accordance with

the further studies and analysis, and the final components, the design including the sites of the Project would be explained by the Japanese side.
Both sides confirmed the equipment directly relating to the disaster risk management on earthquake and tsunami would be given high priority for procurement in case that there would be remaining fund after tendering.

6. Japan's Grant Aid for Disaster Prevention and Reconstruction (GADPR)

6-1. Outline of GADPR

The Grant Aid provides a recipient country (hereafter referred to as "the Recipient") 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 relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.
The Japan's Grant Aid for Disaster Prevention and Reconstruction (hereinafter referred to as "GADPR") was introduced in 2006, in the context of worldwide greater interest in disaster management after the Sumatra Earthquake and the Asian Tsunami in December 2004. Japan can contribute assistance in disaster prevention and reconstruction sector, based on our experience and knowledge, to the international community.

6-2. This Project will be implemented under GADPR. The Indonesian side understands the Japan's Grant Aid scheme explained by the Team, as described in **Annex-4**.

6-3. The Indonesian side will take the necessary measures, as described in **Annex-5**, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

7. Special Consideration

When the Grant Aid for this Project is extended in Indonesia, it would be required (1) to procure products which can contribute to reconstruction of industry in "Specified Disaster Affected Area" stipulated in "the Act on Special Fiscal Aid and Subsidy for Recovery from the Great East Japan Earthquake", and (2) to procure equipment for disaster management especially for earthquake and tsunami, which developed out based on lessons learnt and technologies in Japan, including Japan's advanced technologies, as public properties to the international community. Therefore, equipment covered by this Grant shall be made in and procured from Japan principally, while it may not apply for installation works which locally procured, manufactured and/or built.

Since the Project components may include equipment with Japan's advanced technologies, soft components will be appropriately considered to encourage sustainable operation and maintenance of the equipment, together with considerations to the present situation and needs in Indonesia.

8. Schedule of the Survey

8-1. The consultant members of the Team will proceed to further studies in Indonesia until July 29,

2012.

8-2. JICA will prepare the draft preparatory survey report in English and dispatch a mission in order to explain its contents to Indonesian side around November 2012.

8-3. In case that the contents of the report are accepted in principle by Indonesian side, JICA will finalize the report and send it to Indonesian side around January 2013.

8-4. Both sides confirmed the Project would be carried out in accordance with the tentative schedule as shown in **Annex-6**.

8-5. Both sides confirmed the Agent Agreement would be concluded after the presentation of the Draft Final Report to the Government of Indonesia by the Team around in February 2013, as shown in **Annex-6**.

9. Consultative Committee

BMKG shall be the focal point for the Project and responsible for the coordination with related organizations. The Indonesian side agreed to establish a consultative committee in order to coordinate with the Japanese side which consists of the JICA office in Jakarta as a member, the Embassy of Japan as an observer, and the procurement agent as an advisor. The Terms of Reference and members of the Consultative Committee are referred to **Annex-7.**

10. Other relevant issues

The following issues were discussed and confirmed by both sides.

10-1. Operation and Maintenance

The Team explained that the operation and maintenance of the equipment procured under the Japan's Grant Aid would be important to enhance effectiveness and ensure sustainability of the Project and should be managed properly by Indonesian implementing agencies, BMKG and LIPI. BMKG and LIPI pronounced to allocate and/or recruit necessary staff and budget for operation and maintenance of the equipment to be procured by the Project.

10-2. Undertakings of the Indonesian Side

(a) To secure land for preparation and installation of the equipment to be procured by the Project,
(b) To ensure the required electricity supply for the equipment to be procured and installed under the Project,
(c) To obtain necessary permission from competent authorities for installation works for the equipment,
(d) To clear necessary procedures for social and environmental considerations and obtain an approval of environmental related regulations by relevant authorities before commencement of the procurement of equipment in accordance with the relevant guidelines in Indonesia, including Environmental Impact Assessment (EIA) if required, and

(e) To improve disaster risk management with the equipment procured by the Project.

10-3. Arrangement for the Survey

As a response to the request by the Team, the Indonesian side agreed to arrange the followings:

(a) To provide the Team with available relevant data, information and materials necessary for the execution for the Project,
(b) To prepare the answers for the Questionnaires presented by the Team,
(c) To assign full-time counterparts to the Team during their stay in Indonesia and play the following roles as the coordinator to the Team:
    1. To make the appointments and set up the meetings with authorities, departments and all other factories and firms whenever the Team intends to visit,
    2. To attend the site survey and any other visiting places with the Team and to make any convenience on accommodation, working room, adequate transportation, getting the permissions if required, etc. and,
    3. To assist and advice the Team for their collection of data and information as much as possible.
(d) To secure the permission to photograph and enter into private properties and restricted areas for the Team for proper execution of the Project, if necessary,
(e) To take any necessary measures deemed necessary to secure safety of the Team Members,
(f) To obtain necessary permission for the Team to bring back to Japan necessary data, maps and materials related to the Survey, subject to approval of the GOI, in order to prepare the report,

10-4. Tax Assumption

BMKG and LIPI will secure the budget or take any necessary procedures for bearing Value Added Tax (VAT), custom duty, and any other taxes and fiscal levies in Indonesia which is to be arisen from the Project activities at their responsibility.

10-5. Overlapping with Other Projects

The Indonesian side explained that the Project would not be overlapped with any other project supported by other donor agencies, NGOs, and Indonesian official organization(s).

10-6. Visibility of the Project

The Team explained that the visibility of the Project should be ensured as a token of cooperation from the Japanese people if the Project was realized. The following ideas could be considered to enhance publicity of the Project:

(a) To display commemoration panels and/or stickers on the equipment procured and at the facilities where the equipment installed by the Grant Aid, and
(b) To publicize the Project in the mass media after the Project is approved by both governments

10-7. Confidentiality of the Survey Report

The Team explained that the preparatory survey report to be prepared at the end of the Survey, which is agreed by Indonesian side, would be disclosed to the public in principle in Japan. However the Team also explained that a confidential part which might affect tendering process such as cost estimation should be kept undisclosed until the tendering has completed.

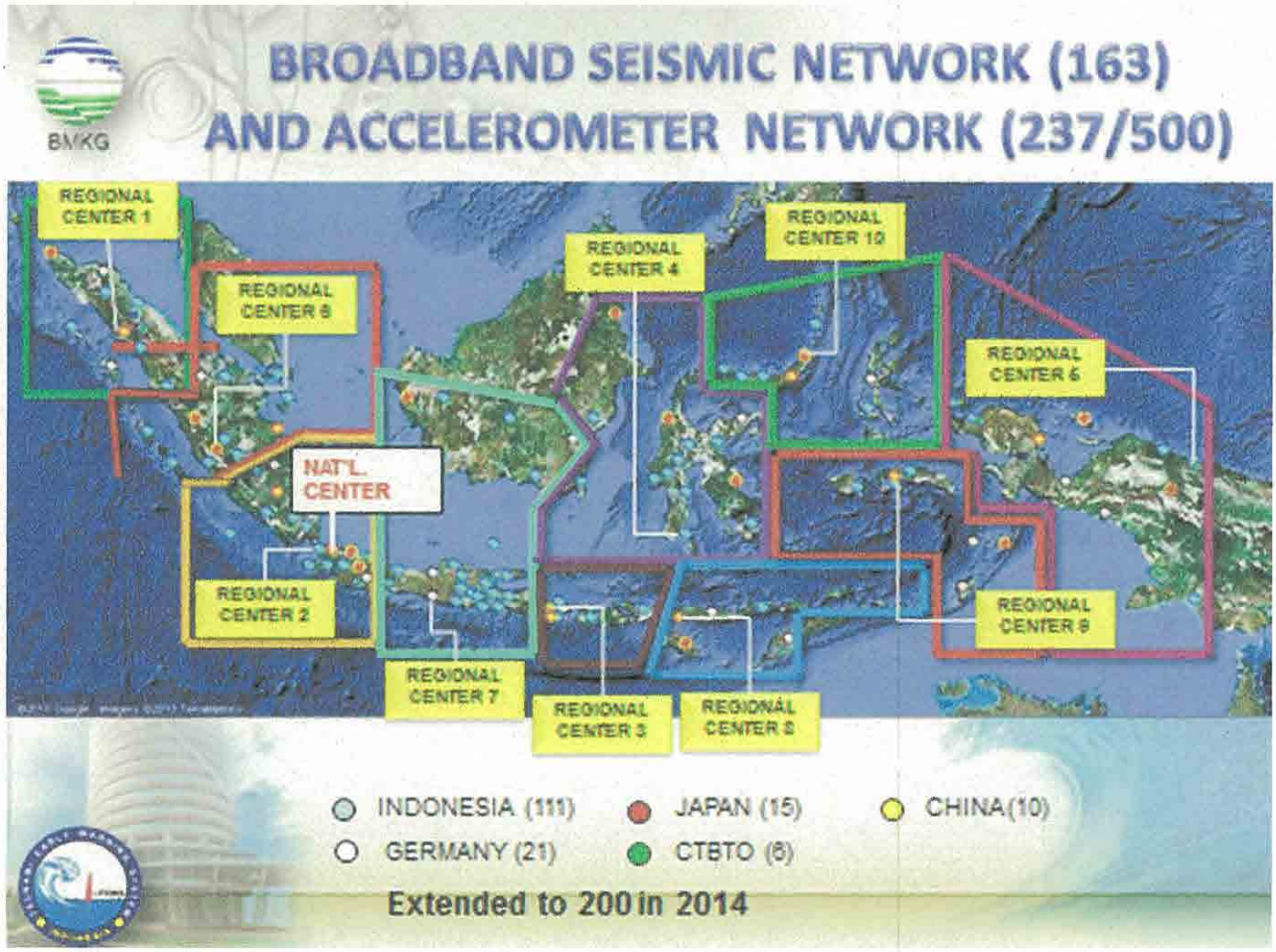
10-8. Identification of Installation Sites

The Team, BMKG and LIPI agreed that BMKG and LIPI shall prepare and submit the list of locations where the equipment shall be installed by Japanese side to the Team by 30th September, 2012.

Annex-1	Project Locations
Annex-2	Organization Charts
	BMKG, LIPI
Annex-3	Items Requested by the Indonesian Side
Annex-4	Japan's Grant Aid Scheme
Annex-5	Major Undertakings to be taken by Each Government
Annex-6	Tentative Implementation Schedule
Annex-7	Terms of Reference and Members of the Consultative Committee

Annex-1: Project Locations

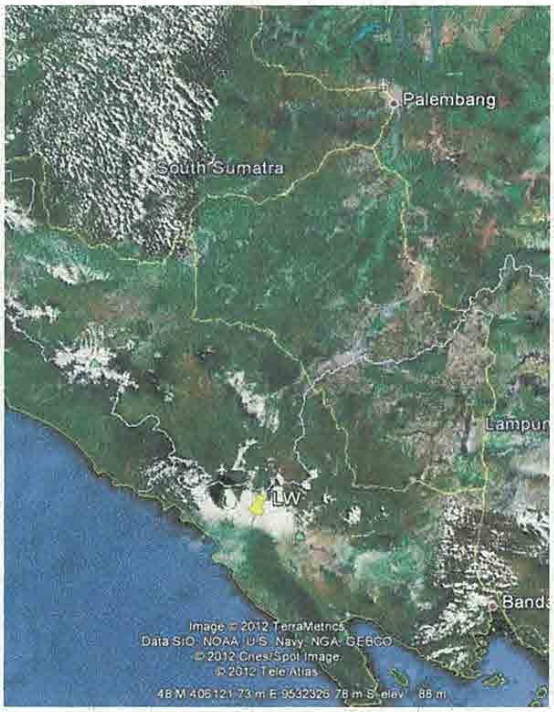
The broadband seismographs provided by Japan before (●) shall be replaced by the Project.
Details of equipment installation locations shall be informed later to the Team.



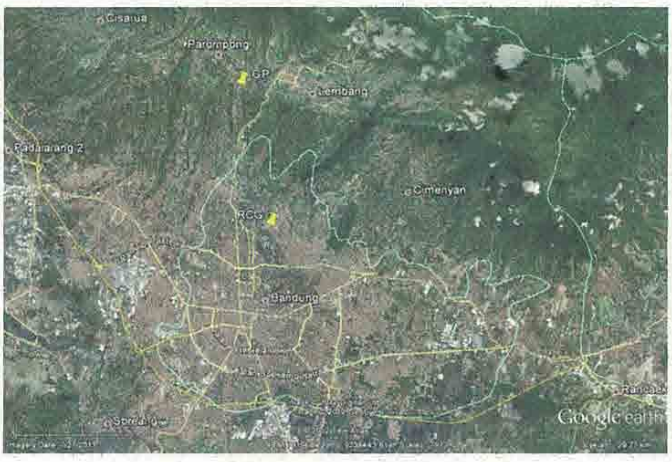
Proposed Site Location for LIPI

The accelerometer requested by LIPI shall be installed in 4 regions, Padang, Lampung, Bandung, and Banda Aceh. The following maps show the candidate sites for accelerometers in each region.

Padang



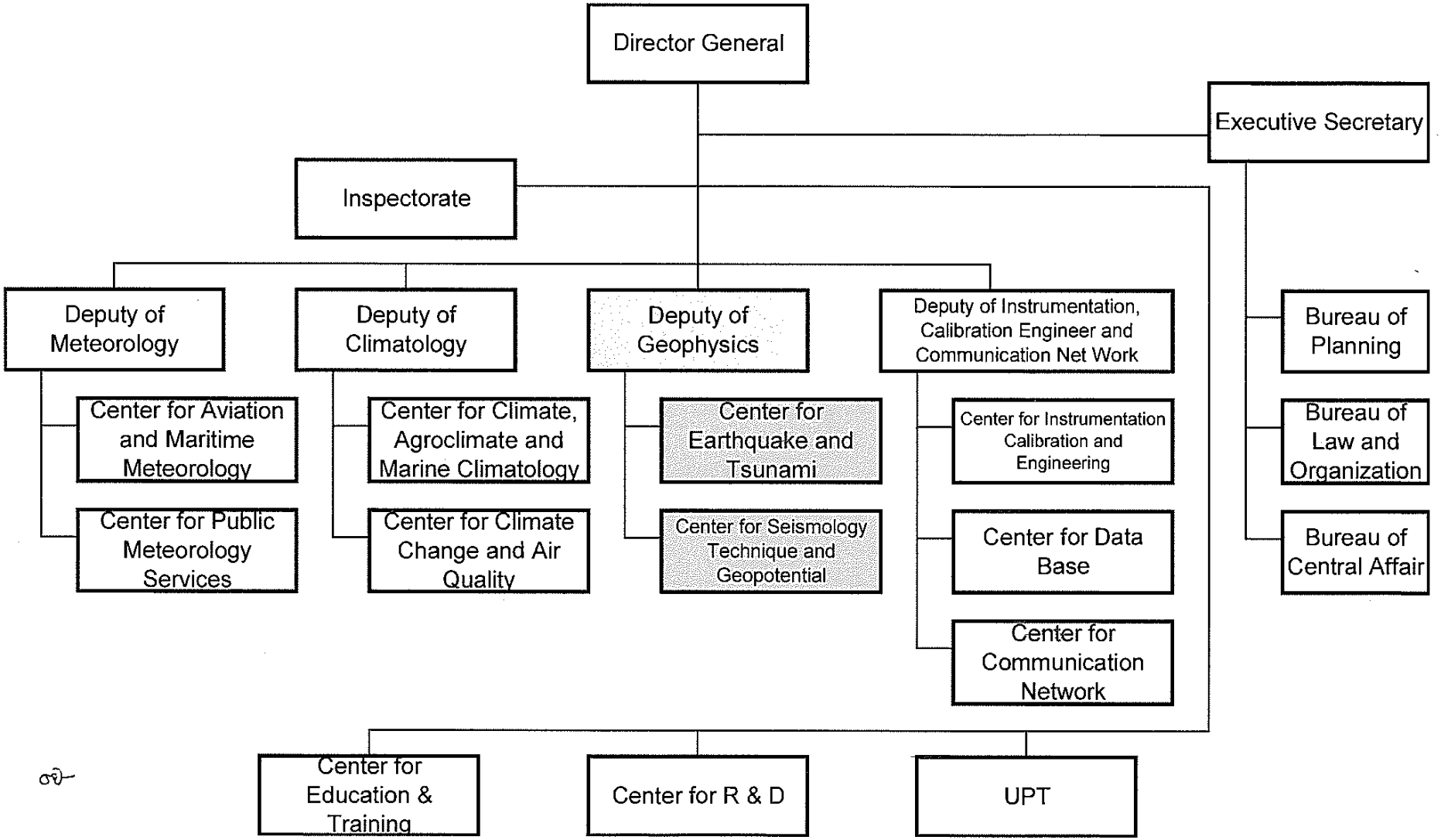
Liwa (Lampung)



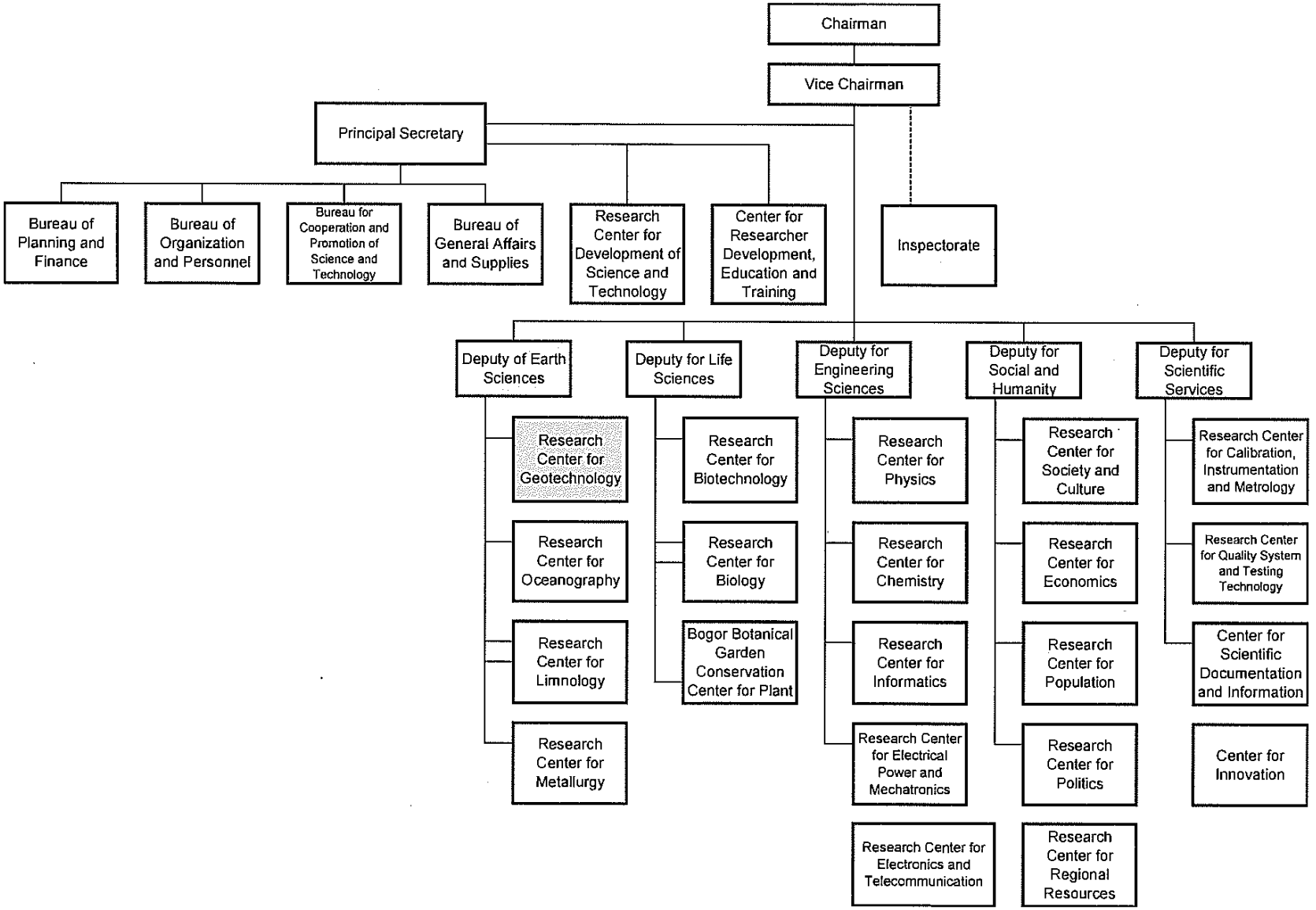
Bandung

Banda Aceh

Annex-2: Organization Charts
(Meteorological, Climatological and Geophysical Agency : BMKG)



Annex-2: Organization Charts
(Indonesian Institute of Sciences : LIPI)



Annex-3: Items Requested by Indonesian Side

BMKG

Number of Equipment requested

	Station Name	Requested Items	Number of Equipment requested							Priority
			Accelerometer	Velocity meter		Intensity Meter	Communication	Data Processing System	Digitizer for Spare	
			Strong Motion Seismograph	Broadband Seismograph	Broadband Strong Motion Seismograph					
1.	Existing Broadband Seismic Station installed by National Research Institute for Earth Science and Disaster Prevention (NIED), Japan	Supply of Equipment and Replacement Works	15	15	15		15			A
2.	Existing Station installed by Indonesian Government *	Supply of Equipment and Installation Works	5	5	5		5			A
	Existing Station installed by Indonesian Government **	Supply of Equipment only	10	10	10		10			B
3.	New Station for Strong Motion Seismograph including Civil Works and Installation	Supply of Equipment, Civil Works and Installation	85				85			A
4.	New Station for Strong Motion Seismograph **	Supply of Equipment only	85				85			B
5.	New Station for Intensity Meter	Supply of Equipment only				200				A
6.	BMKG HQ	Supply of Equipment and Installation Works						1		A
7.	BMKG HQ	Supply of Equipment only							15	B
Total			200	30	30	200	200		15	

* Neeessary civil works shall be managed by BMKG.

** Necessary civil and installation works shall be managed by BMKG.

Priority

A: High

B: Moderate

Number of Stations equipped by Japan's Grant and their target year of installation by the Indonesian side

	Station Name	Requested Items	Target Year of Installation / Number of Station				Total Number of Station
			2013 by GOJ	2013 by GOI	2014 by GOI	2015 by GOI	
1.	Existing Broadband Seismic Station installed by National Research Institute for Earth Science and Disaster Prevention (NIED), Japan	Supply of Equipment and Replacement Works	15				15
2.	Existing Station installed by Indonesian Government *	Supply of Equipment and Installation Works	5				5
	Existing Station installed by Indonesian Government **	Supply of Equipment only			5	5	10
3.	New Station for Strong Motion Seismograph including Civil Works and Installation	Supply of Equipment, Civil Works and Installation	85				85
4.	New Station for Strong Motion Seismograph **	Supply of Equipment only			45	40	85
5.	New Station for Intensity Meter (Installation)	Supply of Equipment only		100	100		200
Total Number of Station by Year			105	100	150	45	400

* Necessary civil works shall be managed by BMKG.
** Necessary civil and installation works shall be managed by BMKG.

LIPI

Indonesian Institute of Sciences (LIPI)			
	Item	QTY	Priority
1.	PS Logging Equipment *	1	A
2.	Array Microtremor Measurement Equipment *	1	A
3.	Accelerometer * *	10	A

Priority

A : High

B : Moderate

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* Location of Delivery : Bandung :

	QTY
Bandung :	2
Padang :	6
Liwa (Lampung) :	1
Banda Aceh :	1

* * Location of Installation :

Annex-4: JAPAN'S GRANT AID SCHEME FOR DISASTER PREVENTION AND RECONSTRUCTION

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

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. Grant Aid for Disaster Prevention and Reconstruction (GADPR) is one of the several types of the scheme designed to assist disaster affected countries in disaster prevention and / or disaster reconstruction. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

Japanese Grant Aid is supplied through following procedures:

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

2. Preparatory Survey

(1) Contents of the Survey

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

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

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

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the

Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

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

(3) Result of the Survey

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

3. Japan's Grant Aid for Disaster Prevention and Reconstruction Scheme

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

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

(2) Selection of Consultants

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

(3) Banking Arrangements (B/A)

The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"), and shall notify JICA in the written form prescribed in the G/A of the completion of the procedures for the opening the account. JICA will execute the Grant Aid by making payments in Japanese yen to the account during the period referred to in the G/A and on or after the date of receipt of the written notification above.

(4) Contract with Procurement Agent

The recipient country will conclude an Agent Agreement with the Designated Procurement Agent stipulated in the E/N in order to secure smooth implementation of the Project.

(5) Details of Procedures

Details of procedures on procurement and services under GADPR will be agreed between the authorities of the two governments concerned at the time of the signing of the G/A.

Essential points to be agreed are outlined as follows:

a) JICA will supervise the implementation of the Project.
b) Products and services will be procured and provided in accordance with JICA's "Procurement Guidelines of Japan's Grant Aid for Disaster Prevention and Reconstruction (Type I-D) ."
c) The Recipient will conclude a contract with the Agent.
d) The Agent is the representative acting in the name of the Recipient concerning all transfers of funds for the Project.

(6) Focal points of "Procurement Guidelines of Japan's Grant Aid for Disaster Prevention and Reconstruction (Type I-D)

a) The Agent

The Agent is the organization, which provides procurement of products and services on behalf of the Recipient according to the Agent Agreement with the Recipient. The Agent is recommended to the Recipient by the Government of Japan and agreed between the two Governments in the Agreed Minutes (A/M).

b) Agent Agreement

The Recipient will conclude the Agent Agreement, in principle, within two months after the signing of the G/A, in accordance with the A/M. The scope of the Agent's services will be clearly specified in the Agent Agreement.

c) Approval of the Agent Agreement

The Agent Agreement is prepared as two identical documents and the copy of the Agent Agreement will be submitted to JICA by the Recipient through the Agent. JICA confirms whether the Agent Agreement is concluded in conformity with the E/N, A/M, and G/A and the Procurement Guidelines of Japan's Grant Aid for Disaster Prevention and Reconstruction (Type I-D) then approves the Agent Agreement.

The Agent Agreement concluded between the Recipient and the Agent will become effective after the approval by JICA in a written form.

d) Payment Methods

The Agent Agreement will stipulate that "Regarding all transfers of the fund to the Agent, the Recipient will designate the Agent to act on behalf of the Recipient and issue a Blanket Disbursement Authorization ("the BDA") to conduct the transfer of the fund (hereinafter referred to as "the Advances") to the Procurement Account from the Recipient Account.

The Agent Agreement will clearly state that the payment to the Agent will be made in Japanese yen from the Advances and that the final payment to the Agent will be made when the total remaining amount become less than three percent (3%) of the Grant and its accrued interests excluding the Agent's fees.

(1) Blanket Disbursement Authorization (BDA)

By issuing the "Blanket Disbursement Authorization (BDA)" to the Bank, the Government of the recipient country designates a procurement agent as the representative authorized to act in the name of the recipient country concerning all transfers of the Grant to an account in the name of the procurement agent.

e) Products and Services Eligible for Procurement

Products and services to be procured will be selected from those defined in the G/A.

f) Method of Procurement

When conducting the procurement, sufficient attention will be paid to transparency in selecting the firms and for this purpose, competitive tendering will be employed in principle.

g) Additional procurement

If there is any remaining balance after the competitive and/or selective tendering and/or direct negotiation for a contract, and if the Recipient would like to procure additional items, the Agent is allowed to conduct this additional procurement, following the points mentioned below:

(1) Procurement of same products and services

When the products and services to be additionally procured are identical with the initial tender and a competitive tendering is judged not efficient, additional procurement can be conducted by a negotiated contract with the successful tenderer of the initial tender.

(2) Other procurements

When products and services other than those mentioned above in (1) are to be procured, the

procurement should be conducted through competitive tendering. In this case, the products and services for additional procurement will be selected from among those in accordance with the G/A.

h) Conclusion of the Contracts

In order to procure products and services in accordance with the guideline, the Agent will conclude contracts with firms selected by tendering or other methods.

(7) Eligible source country

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

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

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex-5.

(9) Proper Use

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

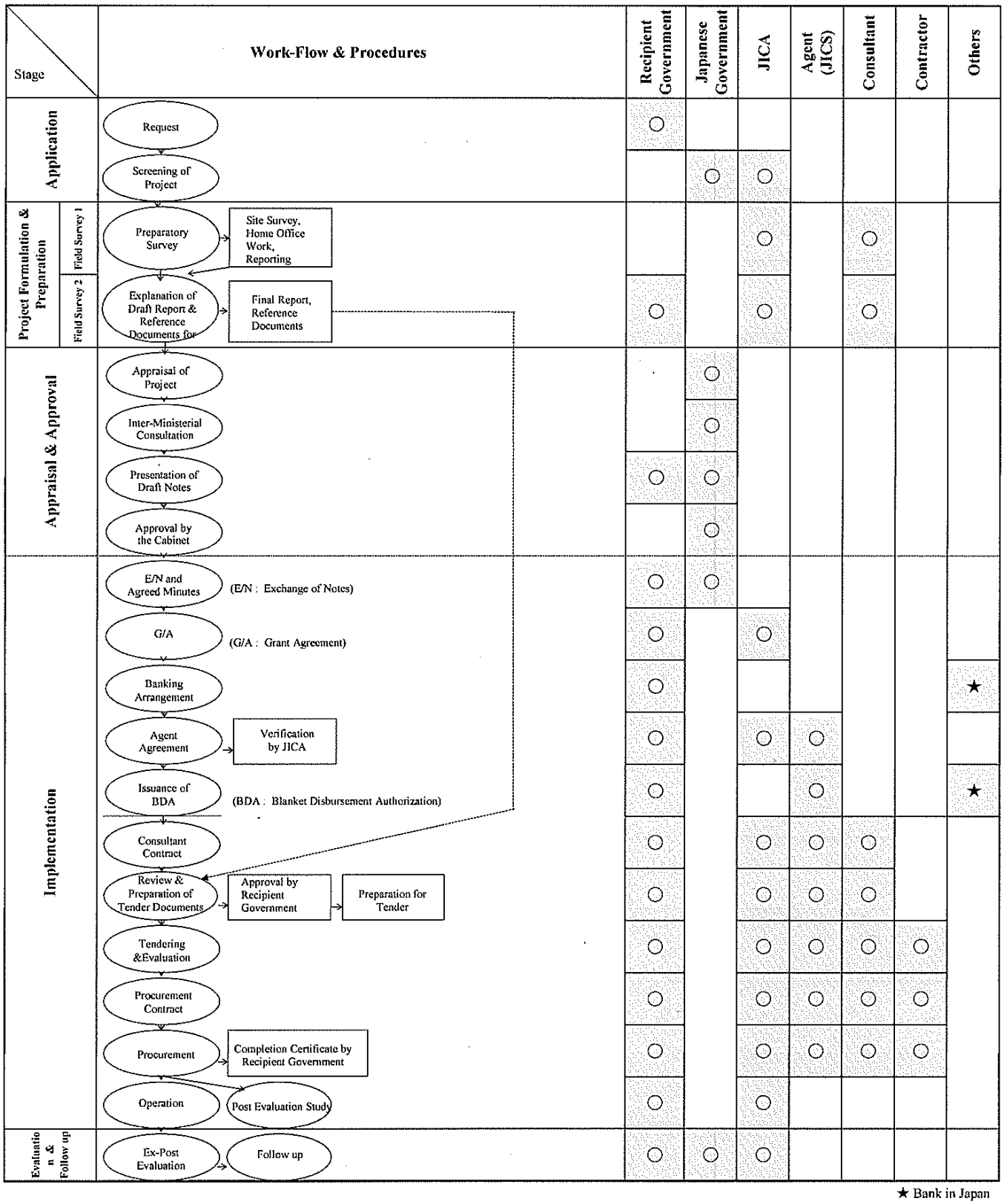
(10) Export and Re-export

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

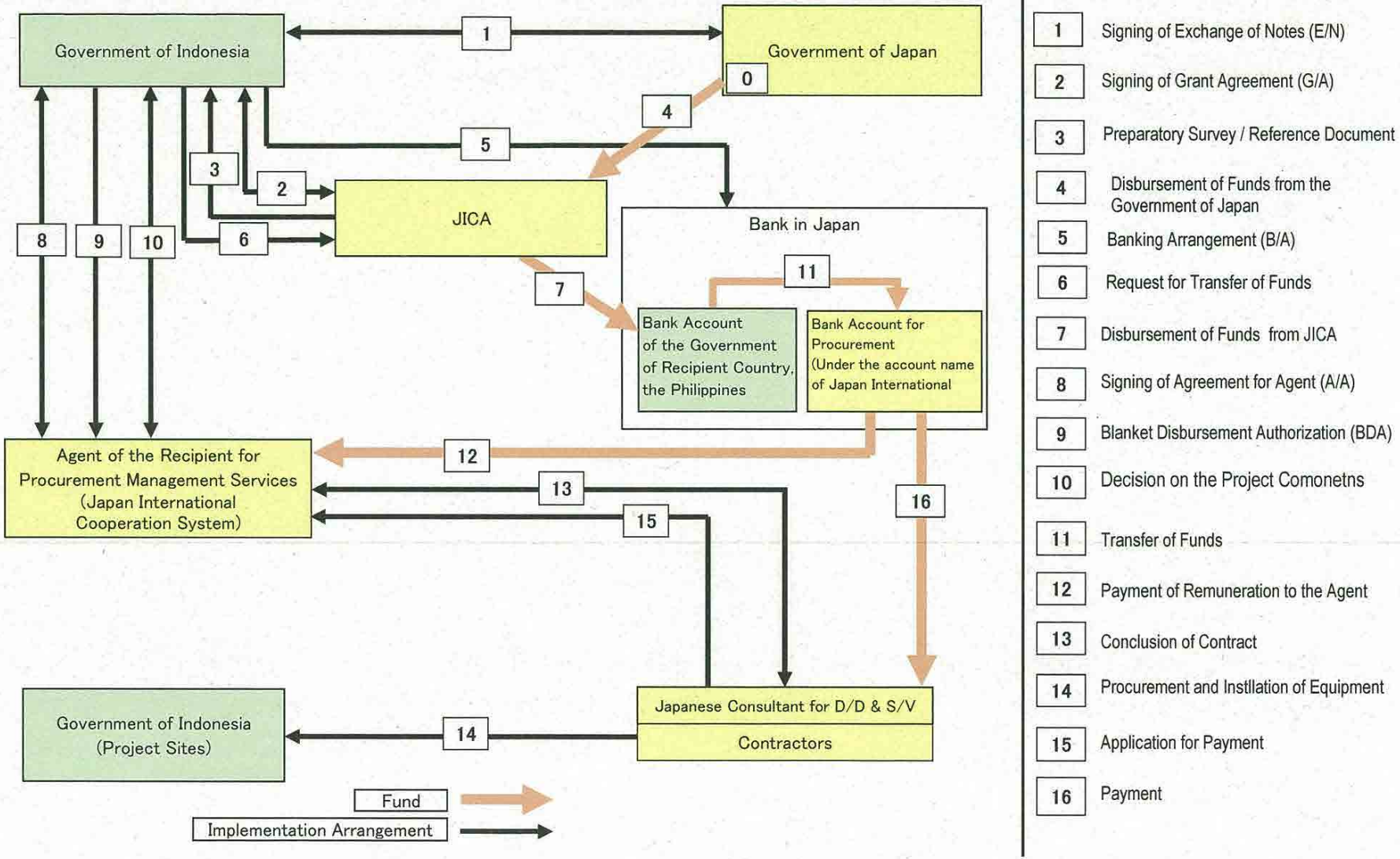
(11) Social and Environmental Considerations

A recipient country must carefully consider the social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

FLOW CHART OF JAPAN's GRANT AID PROCEDURES



FLOW OF FUNDS AND SERVICES FOR THE IMPLEMENTATION OF JAPAN'S GRANT AID (Exceptional Version for this Project)



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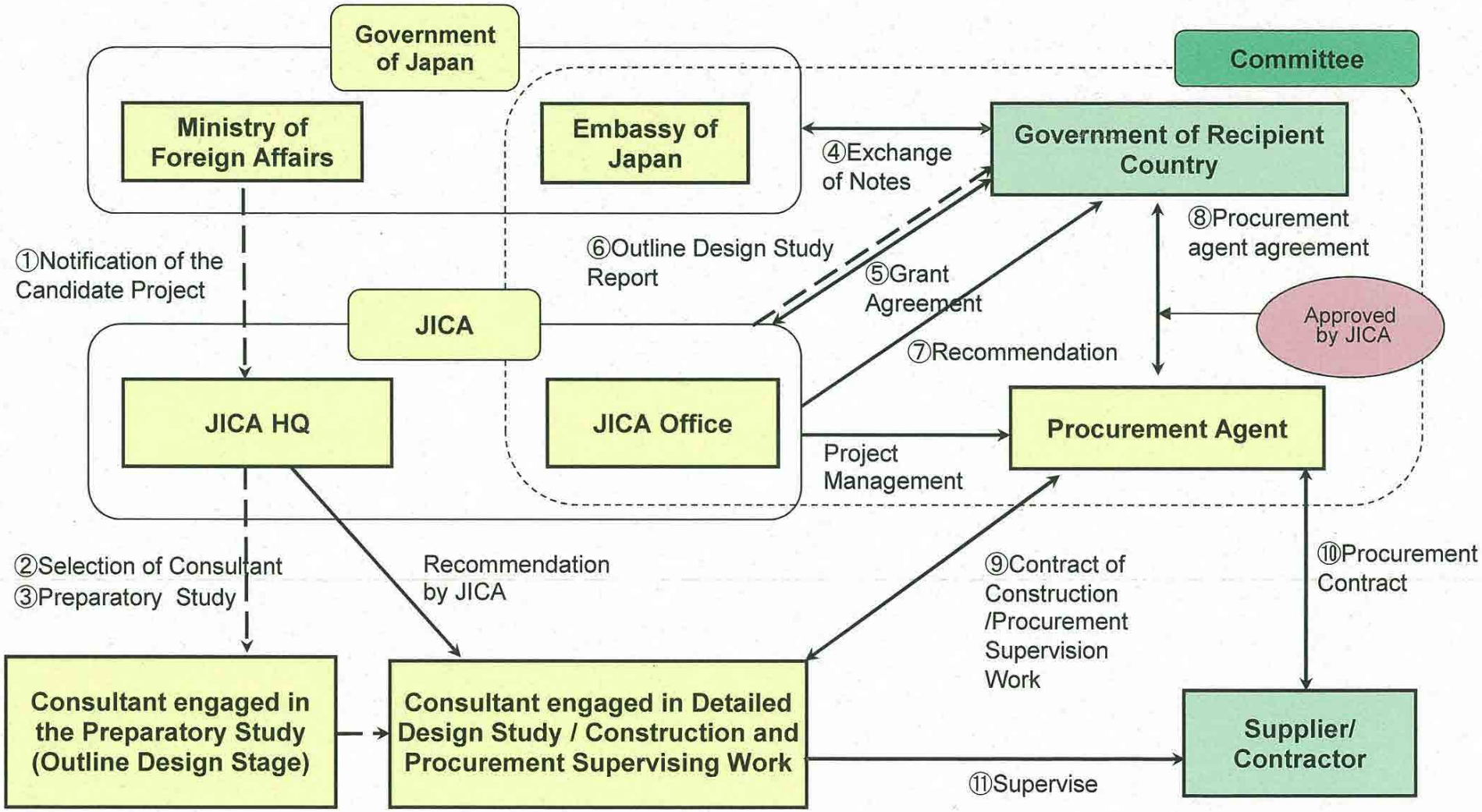
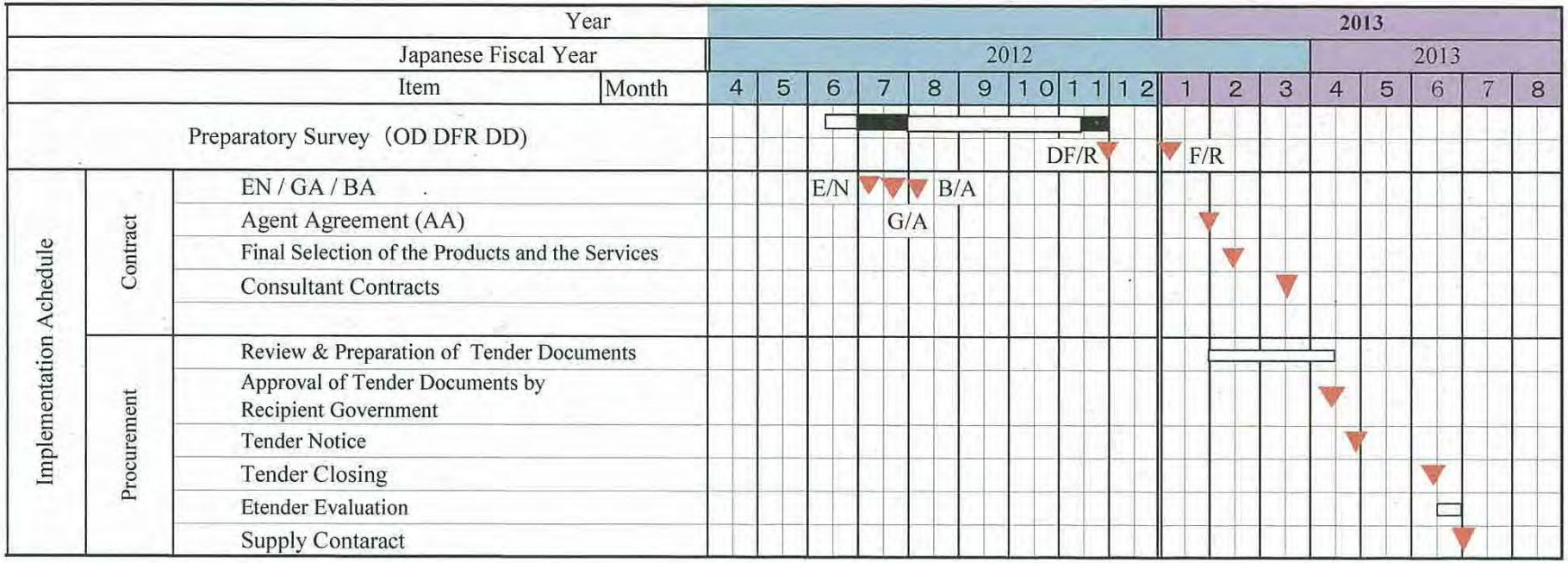
IMPLEMENTATION STRUCTURE ON USE OF PROCUREMENT AGENT
(Exceptional Version for this Project)



Annex-5: Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure lots of land necessary for the implementation of the Project and to clear the sites		●
2	To construct the facility if necessary and install the equipment	(●)	(●)
3	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	●	
	2) Tax assumption and custom clearance of the Products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	(●)	(●)
4	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services as well as the employment of the Agent be borne by the Authority without using the Grant and its accrued interest.		●
5	To accord Japanese nationals and / or nationals of third countries, including such nationals employed by the Agent, whose services may be required in connection with the supply of the products and the services such facilities may be necessary for their entry into the recipient country and stay therein for the performance of their work (The term "nationals" whenever used in the G/A means Japanese physical persons or Japanese juridical persons controlled by Japanese physical persons in the case of Japanese nationals, and physical or juridical persons of third countries in the case of nationals of third countries.)		●
6	To ensure that the products be maintained and used properly and effectively for the implementation of the Project		●
7	To bear all the expenses, other than those covered by the Grant and its accrued interest, necessary for the implementation of the Project		●
8	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Payment of bank commission		●
9	To give due environmental and social consideration in the implementation of the Project		●

Annex-6: Tentative Implementation Schedule



Annex-7. Terms of Reference and Members of the Consultative Committee

Terms of Reference of the Consultative Committee

1. To confirm an implementation schedule of the Project for the speedy and effective utilization of the Grant and its accrued interest;
2. To discuss modifications of the Project, including modifications of designs of the Facilities;
3. To exchange views on allocations of the Grant and its accrued interest as well as on potential end-users;
4. To identify problems which may delay the utilization of the Grant and its accrued interest, and to explore solutions to such problems;
5. To exchange views on publicity related to the utilization of the Grant and its accrued interest; and
6. To discuss any other matters that may arise from or in connection with the G/A.

Members of the Consultative Committee

The Focal Point	BMKG
Indonesia Side	BMKG
	LIPI
	BNPB (as an Observer)
	BAPPENAS (as an Observer)
	Ministry of Finance (as an Observer)
Japanese Side	JICA
	Embassy of Japan (as an Observer)
Advisor	The Procurement Agent

Appendix 4-2

Minutes of Discussion (signed on July 24, 2013)

MINUTES OF DISCUSSIONS
ON
THE PREPARATORY SURVEY
ON
THE PROJECT FOR IMPROVEMENT OF EQUIPMENT FOR DISASTER RISK MANAGEMENT
IN
THE REPUBLIC OF INDONESIA
(Explanation of the Draft Preparatory Survey Report for LIPI)

In July 2012, Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Survey Team on the Project for Improvement of Equipment for Disaster Risk Management (hereinafter referred to as "the Project") to the Republic of Indonesia (hereinafter referred to as "Indonesia"), and through discussions, field survey and technical examination of the results in Japan, JICA prepared the Draft Preparatory Survey Report of the Project.

In order to explain and to consult with the officials concerned of the Government of Indonesia (hereinafter referred to as "the GOI") on the components of the Draft Preparatory Survey Report for Indonesian Institute of Science (hereinafter referred to as "LIPI"), JICA sent the Preparatory Survey Team (hereinafter referred to as "the Team"), which is headed by Shiro Nakasone, Director, Disaster Management Division 1, Water Resources and Disaster Management Group, Global Environment Department, JICA to Indonesia, from July 21th to 25th, 2013. As a result of discussions, both sides confirmed the main items described in the attached sheets.

Jakarta, 24th July, 2013

Shiro Nakasone
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Hadiyadi Permana
Director of Research Center for Geotechnology
For Deputy of Earth Sciences
Indonesian Institute of Sciences (LIPI)
Republic of Indonesia

Suhardjono
Director of Earthquake and Tsunami Center
For Deputy of Geophysics
Meteorological, Climatological and Geophysical Agency (BMKG)
Republic of Indonesia

ATTACHMENT

1. Components of the Draft Preparatory Survey Report (Draft Outline Design Report)

The Indonesian side agreed and accepted in principle the components of the Draft Preparatory Survey Report (Draft Outline Design Report) on LIPI as explained by the Team. The project sites and the project components on LIPI are shown in Annex-1 and Annex-2 respectively.

2. Cost Estimation of the Project

2-1. The Team explained the cost estimation of the Project on LIPI as described in Annex-3.

2-2. Both sides agreed that cost estimation of the Project on LIPI as attached in Annex-3 should never be duplicated or released to any third parties before the signing of all the contract(s) for the Project.

2-3. The Indonesian side understood that cost estimation of the Project on LIPI described in Annex-3 is a provisional one as a result of the Survey and could be subject to change according to further examination or situation changed.

3. Special Consideration of the Project

3-1. Both sides reconfirmed the contents of article 7 "Special Consideration" in the Minutes of Discussions signed on 6th July 2012.

3-2. The Indonesian side accepted that the equipment described in Annex-2 will be procured under the Special Consideration in order to contribute to reconstruction of industry in "Specified Disaster Affected Area" in Japan.

3-3. The Indonesian side understood that the cost of equipment on LIPI described in Annex-3 was estimated under the Special Consideration.

4. Undertakings to be taken by the Indonesian side

Both sides confirmed that the Indonesian side through LIPI shall complete the following undertakings shown in accordance with the implementation schedule of the Project, in addition to Annex-5 of the Minutes of Discussions signed on 6th July 2012;

- To obtain an agreement letter(s) from the owner of site(s) for installation of the Seismometer about approval of its use by the middle of December 2013 in order to secure necessary land;
- To conduct foundation and electrical work for the sites of seismometers to be installed by Japanese side;
- To conduct inland transportation, foundation and electrical work, and installation of the instruments for the sites of seismometers to be installed by the Indonesian side;
- To prepare a borehole for training of PS Logging Equipment; and
- To conduct proper operation and maintenance.

5. Scheme of Japan's Grant Aid for Disaster Prevention and Reconstruction

Both sides reconfirmed the Scheme of Japan's Grant Aid for Disaster Prevention and Reconstruction (hereinafter referred to as "GADPR") and major undertakings to be taken by each side under GADPR, as described in article 6 in the Minutes of Discussions signed on 6th July 2012.

6. Implementation Structure

6-1. Both sides reconfirmed that there is no change in the responsible agency and implementation agencies which were confirmed in the Minutes of Discussions signed on 6th July 2012.

6-2. Both sides reconfirmed that Meteorological, Climatological and Geophysical Agency (hereinafter referred to as "BMKG") shall be the focal point for the coordination with implementation and related agencies in the Consultative Committee which was agreed to be established in the Minutes of Discussions signed on 6th July 2012. The Indonesian side explained that the Consultative Committee shall be held properly to accomplish the terms of reference of this committee described in Annex-7 in the Minutes of Discussions signed on 6th July 2012.

7. Tentative Schedule of the Project

7-1. The Team shall complete the Preparatory Survey Report for LIPI in English and send it to Indonesia in September 2013.

7-2. Both sides confirmed the Project shall be carried out in accordance with the tentative schedule as shown in Annex-4.

7-3. Both sides confirmed that the tender notice would be delayed or the exclusion of the Project components would be considered if undertakings by the Indonesian side mentioned in Article 4 are not met by the designated timing.

8. Other Relevant Issues

8-1. Social and Environmental Considerations

The Indonesian side through LIPI promised to clear necessary procedures for social and environmental considerations and obtain a necessary approval by relevant authorities before commencement of the procurement in accordance with the relevant guidelines in Indonesia, including Environmental Impact Assessment (EIA), if required.

8-2. Responsibility for the Tender Documents

The Team promised to send the Technical Specifications for the equipment to be procured in the Project as a result of the Survey to the Indonesian side.

The Indonesian side understood that the Indonesian side shall review and complete the entire Tender Documents including the Technical Specifications of the equipment in cooperation with the procurement agent. The Indonesian side is responsible for project implementation and the output of the Project being executed.

8-3. Tax Assumption

The Indonesian side through LIPI shall secure the budget or take any necessary procedure for bearing Value Added Tax (VAT), custom duties, and any other taxes and fiscal levies in Indonesia which may arise from the Project activities at their responsibility.

8-4. Confidentiality of the Draft Preparatory Survey Report and the Preparatory Survey Report

The Team explained that the Draft Preparatory Survey Report and the Preparatory Survey Report to be prepared at the end of the Survey shall be disclosed to the public in principle in Japan. However, the Team also explained that a confidential part which might affect tendering process such as cost estimation should be kept undisclosed until the tendering has been completed.

8-5. Schedule of the survey for components on BMKG

The Team explained that the Survey for components of BMKG shall be separated to JISNET seismometers and the remaining seismometers. The tentative schedule of the Survey is shown in Annex-4 and both sides confirmed the Project shall be carried out in accordance with the tentative schedule. Site survey shall be conducted by BMKG with a support of local consultant contracted by the Japanese side.

8-6. Conclusion of Grant Agreement

The Team explained that Grant Agreement (hereinafter referred to as "G/A") must be concluded with JICA before proceeding to Agent Agreement (hereinafter referred to as "A/A"). The Indonesian side shall encourage Ministry of Finance to conclude G/A with JICA before the date of conclusion of A/A as shown in Annex-4. Both sides confirmed that the tender notice would be delayed if G/A is not concluded by the designated timing.

8-7. Visibility of the Project

The Team explained that the visibility of the Project should be ensured as a token of cooperation from the Japanese people if the Project was realized. The following ideas could be considered to enhance publicity of the Project:

(a) To display commemoration panels and/or stickers on the equipment procured and at the facilities where the equipment installed by the Grant Aid, and
(b) To publicize the Project in the mass media after the Project is approved by both governments.

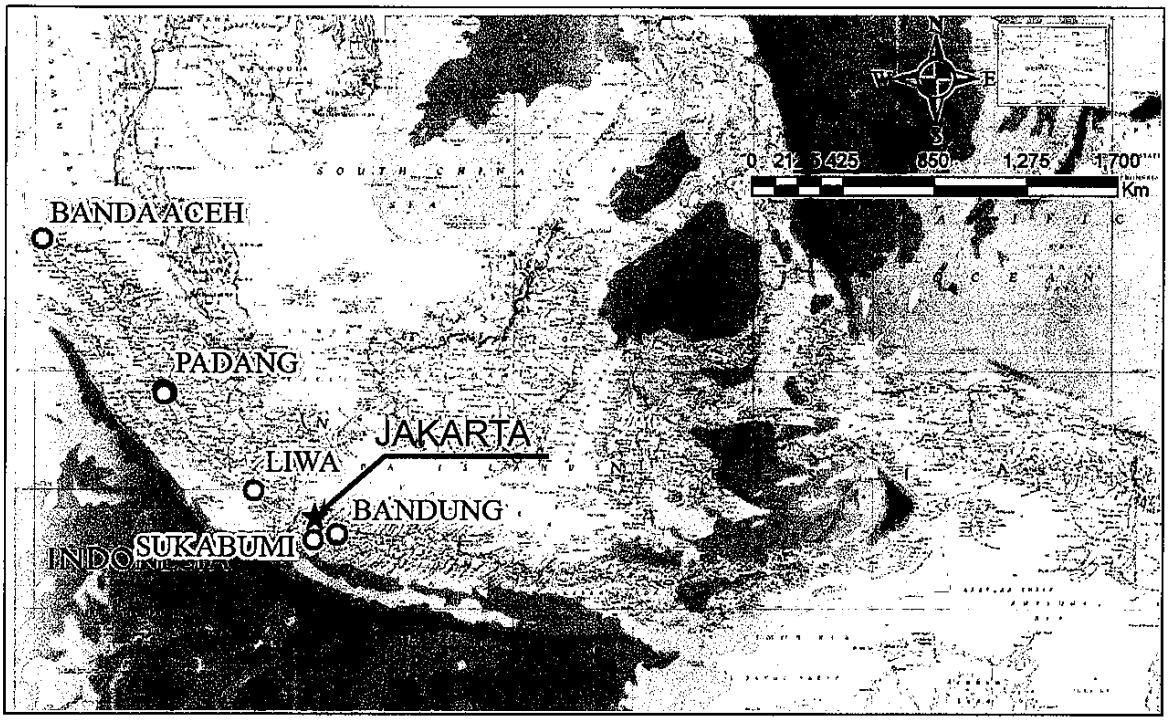
Annex-1 Project Sites Map

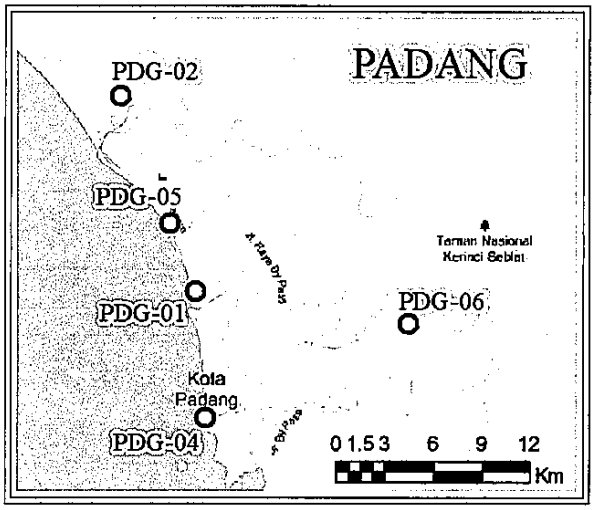
Annex-2 Project Components

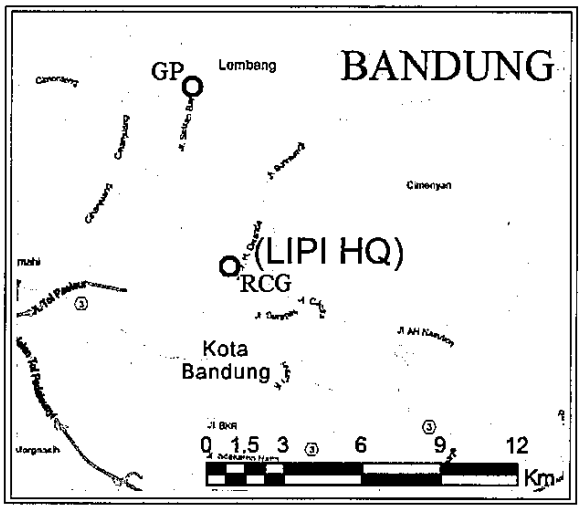
Annex-3 Project Cost Estimate

Annex-4 Tentative Implementation Schedule (LIPI and BMKG)

Annex-1: Project Sites Map







Code	No	Province	City	Latitude	Longitude	Altitude (m)
BA	901	ACEH	Banda Aceh	5.553881	95.285725	4
PDG-02	902	West Sumatera	Padang	-0.785733	100.304822	2
PDG-05	903	West Sumatera	Padang	-0.856836	100.332375	3
PDG-01	904	West Sumatera	Padang	-0.895081	100.346828	4
PDG-06	905	West Sumatera	Padang	-0.913131	100.465072	5
PDG-04	906	West Sumatera	Padang	-0.965481	100.352536	4
LW	908	Lampung	Liwa	-5.003244	104.101275	825
RCG	909	West Java	Bandung	-6.882267	107.611192	799
GP	910	West Java	Bandung	-6.816820	107.599850	1198
UPT	911	West Java	Sukabumi	-7.097217	106.590950	720

Legend
LIPI_sites

Location Map of LIPI Sites

Annex-2 Project Components (LIPI)

Items	Major Specification/Contents	**Purpose of Use**
1. PS Logging Equipment (1 set)	· PS Logging Equipment · Analyses software	Understanding of ground characteristics (estimation of foundation strength, setup dynamic elastic modules and etc.)
2. Array Microtremor Measurement Equipment (1 set)	· Array Microtremor Measurement Equipment · Analyses software	Monitoring of microtremor, Estimation of S-wave velocity structure
3-1. Strong-Motion Seismograph (Accelerometer) (Supply of Equipment and Installation) 3-2. Strong-Motion Seismograph (Accelerometer) (Supply of Equipment) (8 sets)	· Strong-Motion Seismograph (Accelerometer) (10) · Digitizer (10) · Power equipment (10) · Display software (1set)	Understanding about strength of ground motion and characteristics of earthquake through collecting seismic waveform and calculation of peak ground acceleration (PGA).

Annex-3 Project Cost Estimate

<Confidential>

The Project cost to be financed by the Japan's Grant Aid and the required capital cost for the Project to be borne by LIPI have been estimated and are show in the following table.

However, the Project cost estimates are provisional and would be further examined by Government of Japan for the approval of the Grant.

Cost borne by Government of Japan

Items		Initial project cost (million Japanese Yen)
BMKG Equipment	Equipment costs	This part is closed due to the confidentiality
	Transport packaging costs	
	Installation and construction costs	
	Procurement management costs	
	Administrative expenses	
LIPI Equipment	Equipment costs	
	Transport packaging costs	
	Installation and construction costs	
	Procurement management costs	
	Administrative expenses	
Procurement agency costs	BMKG	
	LIPI	
design and supervision costs	BMKG	
	LIPI	
Total		

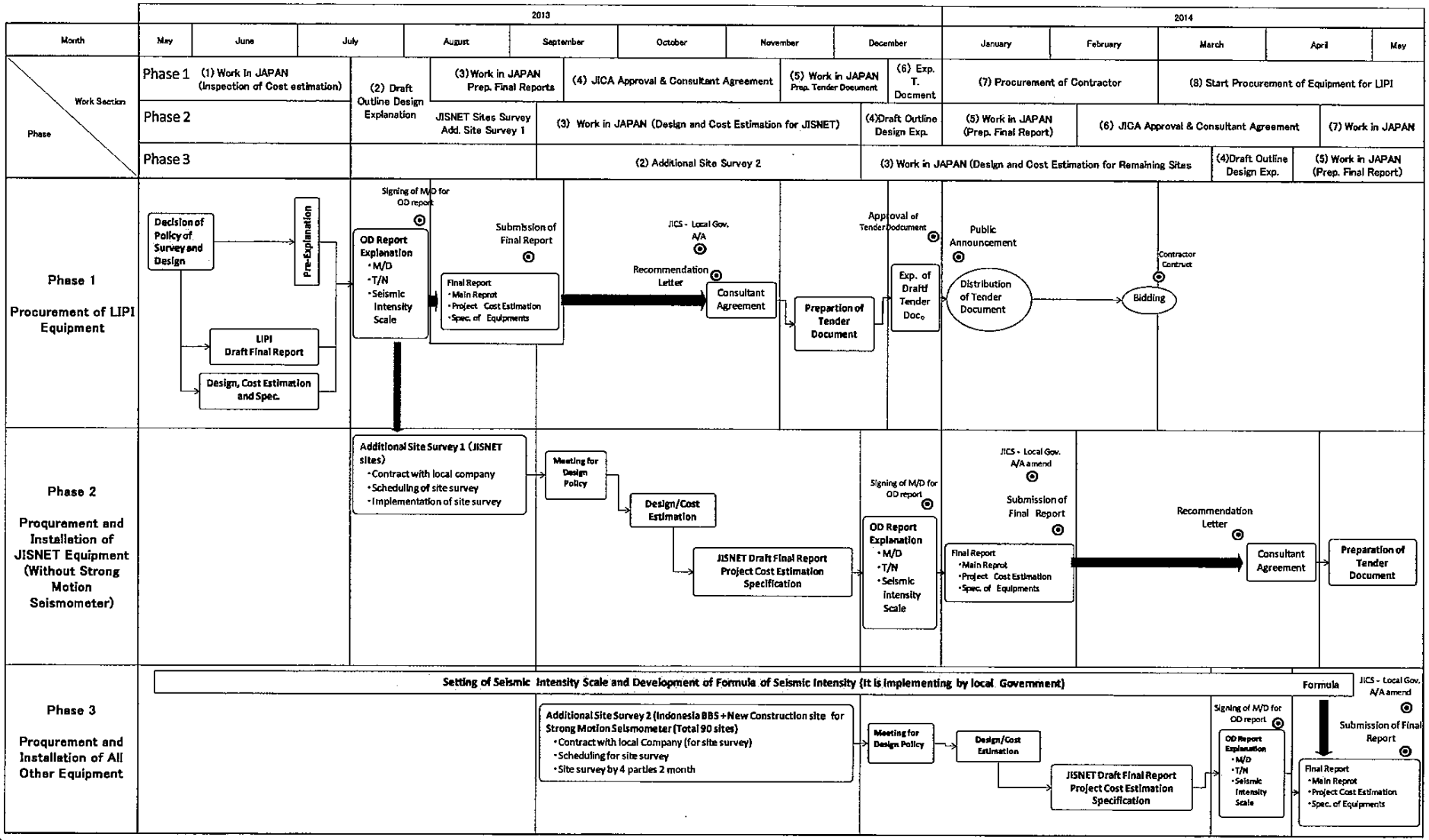
Cost borne by Government of Indonesia

Items		Initial project cost (million IRD)
Inland Transportation, Installation and Adjustment Works for Earthquake Intensity Meters	BMKG	-*
	LIPI	14.0
Installation and construction costs	BMKG	-*
	LIPI	10.0
Travel Expenses for Initial Operation and Maintenance Training Participants	BMKG	
	LIPI	Necessary travel expenses pursuant to LIPI's regulations
Operation and Maintenance Cost	BMKG	-*
	LIPI	-
Total		24.0

In addition, Government of Indonesia shall have the responsibility for the payment of banking commission for the Japan's Grant Aid.

* Cost for BMKG portion, to be prepared after further study.

Annex-4 Tentative Implementation Schedule (LIPI and BMKG)



Appendix 4-3

Minutes of Discussion (signed on May 28, 2014)

MINUTES OF DISCUSSIONS
ON
THE PREPARATORY SURVEY
ON
THE PROJECT FOR IMPROVEMENT OF EQUIPMENT FOR DISASTER RISK MANAGEMENT
IN
THE REPUBLIC OF INDONESIA
(Explanation of the Draft Preparatory Survey Report for BMKG)

In July 2012, Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Survey Team on the Project for Improvement of Equipment for Disaster Risk Management (hereinafter referred to as "the Project") to the Republic of Indonesia (hereinafter referred to as "Indonesia"), and through discussions, field survey and technical examination of the results in Japan, JICA prepared the Draft Preparatory Survey Report of the Project.

In order to explain and to consult with the officials concerned of the Government of Indonesia (hereinafter referred to as "the GOI") on the components of the Draft Preparatory Survey Report for Meteorological, Climatological and Geophysical Agency (hereinafter referred to as "BMKG"), JICA sent the Preparatory Survey Team (hereinafter referred to as "the Team"), which is headed by Kai Kikuiri, Deputy Director, Disaster Management Division 1, Water Resources and Disaster Management Group, Global Environment Department, JICA to Indonesia, from 25th to 31st May 2014. As a result of discussions, both sides confirmed the main items described in the attached sheets.

Jakarta, 28th May, 2014

Kai Kikuiri
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Masturyono
Deputy of Geophysics
Meteorological, Climatological and Geophysical Agency (BMKG)
Republic of Indonesia

ATTACHMENT

1. Components of the Draft Preparatory Survey Report (Draft Outline Design Report)

The Indonesian side agreed and accepted in principle the components of the Draft Preparatory Survey Report (Draft Outline Design Report) on BMKG as explained by the Team. The project sites and the project components on BMKG are shown in Annex-1 and Annex-2 respectively.

2. Cost Estimation of the Project

2-1. The Team explained the cost estimation of the Project on BMKG as described in Annex-3.

2-2. Both sides agreed that cost estimation of the Project on BMKG as attached in Annex-3 should never be duplicated or released to any third parties before the signing of all the contract(s) for the Project.

2-3. The Indonesian side understood that cost estimation of the Project on BMKG described in Annex-3 is a provisional one as a result of the Survey and could be subject to change according to further examination or situation changed.

3. Special Consideration of the Project

3-1. Both sides reconfirmed the contents of article 7 "Special Consideration" in the Minutes of Discussions signed on 6th July 2012.

3-2. The Indonesian side accepted that the equipment described in Annex-2 will be procured under the Special Consideration in order to contribute to reconstruction of industry in "Specified Disaster Affected Area" in Japan.

3-3. The Indonesian side understood that the cost of equipment on BMKG described in Annex-3 was estimated under the Special Consideration.

4. Undertakings to be taken by the Indonesian side

Both sides confirmed that the Indonesian side through BMKG shall complete the following undertakings shown in accordance with the implementation schedule of the Project, in addition to Annex-5 of the Minutes of Discussions signed on 6th July 2012;

- to obtain an agreement from the owner of site(s) for installation of the seismometer, and issue a letter to JICA about approval of all sites by the end of June 2014, and clear the land to enable installation of the equipment;
- to secure electricity supply to all installation site except for the sites which uses solar power system by the end of November 2015. The budget will be secured by January 2015; and
- to secure frequency band and necessary payment for satellite communication system by the end of November 2015. The budget will be secured by January 2015.

5. Scheme of Japan's Grant Aid for Disaster Prevention and Reconstruction

Both sides reconfirmed the Scheme of Japan's Grant Aid for Disaster Prevention and Reconstruction (hereinafter referred to as "GADPR") and major undertakings to be taken by each side under GADPR, as described in article 6 in the Minutes of Discussions signed on 6th July 2012.

6. Implementation Structure

6-1. Both sides reconfirmed that there is no change in the responsible agency and implementation agencies which were confirmed in the Minutes of Discussions signed on 6th July 2012.

6-2. Both sides reconfirmed that Meteorological, Climatological and Geophysical Agency (hereinafter referred to as "BMKG") shall be the focal point for the coordination with implementation and related agencies in the Consultative Committee which was agreed to be established in the Minutes of Discussions signed on 6th July 2012. The Indonesian side explained that the Consultative Committee shall be held properly to accomplish the terms of reference of this committee described in Annex-7 in the Minutes of Discussions signed on 6th July 2012.

7. Tentative Schedule of the Project

7-1. The Team shall complete the Preparatory Survey Report for BMKG in English and send it to Indonesia in June 2014.

7-2. Both sides confirmed the Project shall be carried out in accordance with the tentative schedule as shown in Annex-4.

7-3. Both sides confirmed that the tender notice would be delayed or the exclusion of the Project components would be considered if undertakings by the Indonesian side mentioned in Article 4 are not met by the designated timing.

8. Other Relevant Issues

8-1. Seismic Intensity Calculate Formula

BMKG submitted seismic intensity calculate formula to the Team as Annex-5 that is to be installed into strong seismograph and seismic intensity meter.

8-2. Social and Environmental Considerations

The Indonesian side through BMKG promised to clear necessary procedures for social and environmental considerations and obtain a necessary approval by relevant authorities before commencement of the procurement in accordance with the relevant guidelines in Indonesia, including Environmental Impact Assessment (EIA), if required.

8-3. Responsibility for the Tender Documents

The Team promised to send the Technical Specifications for the equipment to be procured in the Project as a result of the Survey to the Indonesian side.

The Indonesian side understood that the Indonesian side shall review and complete the entire Tender Documents including the Technical Specifications of the equipment in cooperation with the

procurement agent. The Indonesian side is responsible for project implementation and the output of the Project being executed.

8-4. Tax Assumption

The Indonesian side through BMKG shall secure the budget or take any necessary procedure for bearing Value Added Tax (VAT), custom duties, and any other taxes and fiscal levies in Indonesia which may arise from the Project activities at their responsibility.

8-5. Confidentiality of the Draft Preparatory Survey Report and the Preparatory Survey Report

The Team explained that the Draft Preparatory Survey Report and the Preparatory Survey Report to be prepared at the end of the Survey shall be disclosed to the public in principle in Japan. However, the Team also explained that a confidential part which might affect tendering process such as cost estimation should be kept undisclosed until the tendering has been completed.

8-6. Visibility of the Project

The Team explained that the visibility of the Project should be ensured as a token of cooperation from the Japanese people if the Project was realized. The following ideas could be considered to enhance publicity of the Project:

(a) To display commemoration panels and/or stickers on the equipment procured and at the facilities where the equipment installed by the Grant Aid, and
(b) To publicize the Project in the mass media after the Project is approved by both governments.

Annex-1 Project Sites List

Annex-2 Project Components

Annex-3 Project Cost Estimate

Annex-4 Tentative Implementation Schedule (BMKG)

Annex-5 Seismic Intensity Calculate Formula

Annex-1: Project Sites list

Site Identification Number	Name	Province	Kabupaten	Latitude	Longitude	System*	Site Type
1	TEGALBULEUD	West Java	Sukabumi	-7.423360	106.719130	SMS	NEW
2	SAGARANTEN	West Java	Sukabumi	-7.211490	106.883970	SMS	NEW
6	LENGKONG	West Java	Sukabumi	-7.131200	106.692160	SMS	NEW
7	KALAPANUNGGAL	West Java	Sukabumi	-6.831450	106.662150	SMS	NEW
8	KADUDAMPIT	West Java	Sukabumi	-6.846050	106.924340	SMS	NEW
9	JAMPANG KULON	West Java	Sukabxumi	-7.257060	106.625110	SMS	NEW
11	CIRACAP	West Java	Sukabumi	-7.330710	106.519780	SMS	NEW
12A	BOJONG	West Java	Sukabumi	-6.972780	106.824600	SMS	NEW
13	CIEMAS	West Java	Sukabumi	-7.232770	106.518690	SMS	NEW
14	SUKANAGARA	West Java	Cianjur	-7.097800	107.131750	SMS	NEW
16	PT PASIR KELAPA	West Java	Cianjur	-6.906400	107.111070	SMS	NEW
17	PAGELARAN	West Java	Cianjur	-7.210870	107.139960	SMS	NEW
18	CILAKU	West Java	Cianjur	-6.866370	107.162390	SMS	NEW
20	CAMPAKA	West Java	Cianjur	-6.998200	107.142670	SMS	NEW
21	SELUMA	Bengkulu	Seluma	-4.061390	102.581940	SMS	NEW
22	ILIR TALO	Bengkulu	Seluma	-4.227110	102.674570	SMS	NEW
23	NAPAL PUTIH	Bengkulu	North Bengkulu	-3.192270	101.868930	SMS	NEW
24	MUARA SAHUNG	Bengkulu	Kaur	-4.528150	103.360280	SMS	NEW
27	MANNA	Bengkulu	South Bengkulu	-4.440950	102.893830	SMS	NEW
28	KETAHUN	Bengkulu	North Bengkulu	-3.382440	101.820210	SMS	NEW
29	IPUH	Bengkulu	Mukomuko	-3.000910	101.492190	SMS	NEW
30	BENGKULU	Bengkulu	Central Bengkulu	-3.819420	102.299940	SMS	NEW
33	SUMUR	Banten	Pandeglang	-6.659160	105.582790	SMS	NEW
34	CIKEUSIK	Banten	Pandeglang	-6.728590	105.872060	SMS	NEW
35	MALINGPING	Banten	Lebak	-6.778620	106.019510	SMS	NEW
36	BAYAH	Banten	Lebak	-6.933180	106.245670	SMS	NEW
37	BANJARSARI	Banten	Lebak	-6.557640	105.999720	SMS	NEW
38	CIGEMBLONG	Banten	Lebak	-6.735010	106.159180	SMS	NEW
40	LANGI	Aceh	Simeuleu	2.824560	95.747520	SMS	NEW
41	TUHEMBERUA	North Sumatera	North Nias	1.469330	97.441520	SMS	NEW
42	KAMPUNG AIE	Aceh	Simeuleu	2.589410	95.963520	SMS	NEW
43	LEGOK LEMANG	West Java	Bogor	-6.641890	106.680650	SMS	NEW
44	CARINGIN	West Java	Garut	-7.523180	107.489310	SMS	NEW
46	PAMEUNGPEUK	West Java	Garut	-7.645540	107.728420	SMS	NEW
47	PMULIHAN	West Java	Garut	-7.409800	107.691600	SMS	NEW
48	PANGANDARAN	West Java	Ciamis	-7.682090	108.647970	SMS	NEW
49A1	LANGKAPLANCAR	West Java	Ciamis	-7.503910	108.401680	SMS	NEW
50	BANTUL	Yogyakarta	Bantul	-7.899170	110.321900	SMS	NEW
53	GUNUNG KIDUL 2	Yogyakarta	Gunung Kidul	-7.972510	110.579350	SMS	NEW
55	KULON PROGO	Yogyakarta	Kulon Progo	-7.847730	110.168580	SMS	NEW
56	MAGELANG	Central Java	Magelang	-7.610270	110.207500	SMS	NEW
59	KOTA YOGYAKARTA	Yogyakarta	Kota Yogyakarta	-7.799150	110.387260	SMS	NEW
61	SUKOHARJO	Central Java	Sukoharjo	-7.687400	110.845410	SMS	NEW
62	BANYUWANGI	East Java	Banyuwangi	-8.216840	114.361810	SMS	NEW
63	PUGER	East Java	Jember	-8.371460	113.478270	SMS	NEW
65	YOSOWILANGUN	East Java	Lumajang	-8.239510	113.312910	SMS	NEW
66	BINANGUN	East Java	Blitar	-8.233880	112.334440	SMS	NEW
69	BPBD PACITAN	East Java	Pacitan	-8.204570	111.088010	SMS	NEW
70	BONJOL	West Sumatera	Pasaman	-0.000830	100.221340	SMS	NEW
71	KUMPULAN BANANG	West Sumatera	South Pesisir	-1.907960	100.877430	SMS	NEW

Site Identification Number	Name	Province	Kabupaten	Latitude	Longitude	System*	Site Type
72	LUBUK BASUNG	West Sumatera	Agam	-0.326570	100.029770	SMS	NEW
74	MUARA LABUH	West Sumatera	South Solock	-1.462490	101.029860	SMS	NEW
75A	MUARA SIBERUT	West Sumatera	Mentawai	-1.595900	99.213390	SMS	NEW
76	PAINAN	West Sumatera	South Pesisir	-1.341340	100.586460	SMS	NEW
77	RAO	West Sumatera	Pasaman	0.561630	100.017720	SMS	NEW
79	TALANG BABUNGO	West Sumatera	Soloc	-1.098320	100.880390	SMS	NEW
80	UNP-PADANG	West Sumatera	Padang	-0.894960	100.346440	SMS	NEW
81	PASIGOPPA	West Sumatera	Mentawai	-1.088380	98.852600	SMS	NEW
82	ARGO PANCURAN	Lampung	South Lampung	-5.830280	105.676480	SMS	NEW
83	BENGKUNAT	Lampung	West Lampung	-5.524060	104.233890	SMS	NEW
84	KOTA AGUNG	Lampung	Tanggamus	-5.488600	104.640860	SMS	NEW
86	KRUI	Lampung	West Lampung	-5.210580	103.938790	SMS	NEW
101	LUWI BUDI	Papua	Biak Numfor	-1.162494	136.088560	BBS	JISNET
102	BJI (BANJARNEGARA)	Central Java	Banjarnegara	-7.332933	109.709580	BBS	JISNET
103	BSI (BANDA ACEH)	Aceh	Aceh Besar	5.496420	95.296170	BBS	JISNET
105	KDI (KENDARI)	Southeast Sulawesi	Kendari	-3.957480	122.619220	BBS	JISNET
106	KHK (KAHANG KAHANG)	Bari	Karang Asem	-8.364460	115.609800	BBS	JISNET
107	KSI (KEPAHYANG)	Bengkulu	Kepahyang	-3.650980	102.592890	BBS	JISNET
109	MNI (MANADO)	North Sulawasi	Manado	1.443680	124.838920	BBS	JISNET
110	PCI (PALU)	Central Sulawesi	Palu city	-0.905540	119.836660	BBS	JISNET
111	PPI (PADANG PANJANG)	West Sumatera	Padang Panjang	-0.454730	100.396450	BBS	JISNET
113	SWH (SAWAHAN)	East Java	Naganjuk	-7.780810	111.759120	BBS	JISNET
114	TARA (TARAKAN)	East Kalimantan	Tarakan	3.313570	117.582620	BBS	JISNET
116	TLE2 (MALUKU)	Maluku	Southeast Maluku	-5.637410	132.749830	BBS	JISNET
117	TPI (TANJUNG PANDAN)	Bangka-Belitung	Belitung	-2.756700	107.652490	BBS	JISNET
118	WAMI (WAMENA)	Papua	Jayawijaya	-4.095590	138.950040	BBS	JISNET
119A	WSI (WAINGAPU) 2	East Nusa Tenggara	East Sumba	-9.670580	120.297160	BBS	JISNET
201	CALANG	Aceh	Aceh Jaya	4.628790	95.576680	BBS	BMKG
202	SUBULUSSALAM	Aceh	Subulussalam	2.674920	97.970770	BBS	BMKG
203	TELUK DALAM	North Sumatera	South Nias	0.579220	97.816020	SMS	BMKG
204	SIMPANG EMPAT	West Sumatera	West Pasaman	0.124110	99.875370	BBS	BMKG
205	JAWA TENGAH	Central Java	Banjarnegara	-7.448920	109.632430	BBS	BMKG
206	MOROTAI	North Maluku	North Halmahera	2.198020	128.275850	BBS	BMKG
301	JOGLO	Jakarta	West Jakarta	-6.220670	106.735450	SMS	NEW
306	BADUNG	Bari	Badung	-8.606990	115.177780	SMS	NEW
307	TABANAN	Bari	Tabanan	-8.557010	115.116280	SMS	NEW
309	ANYER	Banten	Serang	-6.063900	105.920930	SMS	NEW
310	GUNUNG SUGIH	Banten	Cilegon	-6.034450	105.942130	SMS	NEW
312	KOBA	Bangka Belitung	Central Bangka	-2.518340	106.422220	SMS	NEW
313	Pinangsori Sibolga	North Sumatera	Central Tapanuli	1.553340	98.896860	SMS	NEW
317	BUMIAYU	Central Java	Brebes	-7.272260	109.016810	SMS	NEW
318	PUNDONG	Youyakarta	Bantul	-7.955830	110.343330	SMS	NEW
320	PULOGADUNG	Jakarta	East Jakarta	-6.198370	106.904270	SMS	NEW
Alternative Sites							
15	Sidang Barang	West Java	Cianjur	-7.451840	107.134720	SMS	NEW
31	Panimbang	Banten	Pandeglang	-6.499320	105.792410	SMS	NEW
57	Purwarejo	Central Java	Purworejo	-7.710840	110.003050	SMS	NEW
68	Watulimo	East Java	Trenggalek	-8.271970	111.716510	SMS	NEW
314	Cikalong	West Java 2	Bandung	-6.734700	107.439200	SMS	NEW

*BBS: Broadband Site
*SMS: Strong Motion Site

Annex-2 Project Components (BMKG)

Type of Equipment	Expected Outcome	Input
1. Existing broadband seismic station installed by National Research Institute for Earth Science and Disaster Prevention (NIED), Japan (JISNET site) (15) (Supply of equipment and replacement)	Equipment of JISNET site that has reached to time to renewal will be replaced and the analysis accuracy of earthquakes and seismic intensity information can be improved.	• Broadband seismograph (velocity meter) (15) • Broadband strong motion seismograph (velocity meter) (15) • Strong motion seismograph (accelerometer) (15) *Solar power system (1) *Seismic station construction (6)
2. Existing shelter constructed by Indonesian government (BMKG existing site) (5) (Supply of equipment and installation)	Equipment will be installed in BMKG existing site and the analysis accuracy of earthquakes and seismic intensity information can be improved.	• Broadband seismograph (velocity meter) (5) • Broadband strong motion seismograph (velocity meter) (5) • Strong motion seismograph (accelerometer) (5) *solar power system (2)
3. New Station for Strong Motion Seismograph including Civil Works and Installation (73) (Supply of equipment, civil works and installation)	It will contribute to the early realization of the plan of Indonesia which is aiming to install 500 strong motion seismographs in throughout of Indonesia. It will also contribute to the rapid response of earthquake in the case of a large-scale earthquake predicted to occur in Sumatra in future.	• Strong motion seismograph (accelerometer) (73) *Solar power system (6) *Seismographic station construction (67)
4. New installation of satellite communication system (for data transmission from each site to the BMKG HQ)	Observed data of each site will be sent and obtained in real time at the BMKG HQ.	• Satellite communication system (93) (for all target site)
5. Seismic intensity meter (Supply of equipment only)	Accuracy of seismic intensity observation will be improved.	• Seismic intensity meter (200)
6. BMKG HQ (seismic intensity information system server, earthquake waveform information acquisition server)	Seismic intensity information will be amassed and it will contribute to amassment and analysis for earthquake early warning in future.	• Seismic intensity information system server (1) • Earthquake waveform information acquisition server (1)

Annex-3 Project Cost Estimate

<Confidential>

The Project cost to be financed by the Japan's Grant Aid and the required capital cost for the Project has been estimated and are show in the following table.

Cost borne by Government of Japan

Items		Initial project cost (million Japanese Yen)
BMKG Equipment	Equipment costs	This part is closed due to the confidentiality
	Transport packaging costs	
	Installation and construction costs	
	Procurement management costs	
	Administrative expenses	
LIPI Equipment	Equipment costs	
	Transport packaging costs	
	Installation and construction costs	
	Procurement management costs	
	Administrative expenses	
Procurement agency costs	BMKG	
	LIPI	
design and supervision costs	BMKG	
	LIPI	
Total		

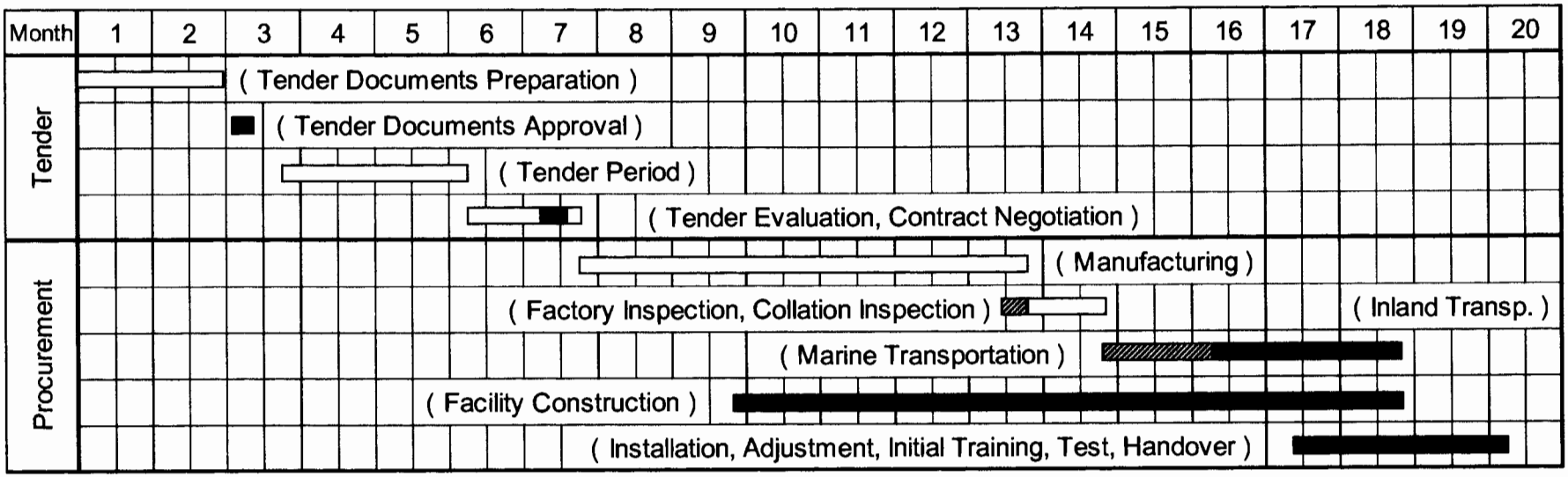
Cost borne by Government of Indonesia

Items		Initial Project cost (million IRD)
Inland Transportation, Installation and Adjustment Works for Earthquake Intensity Meters	BMKG	35.0
	LIPI	14.0
Installation and construction costs	BMKG	93.0
	LIPI	10.0
Travel Expenses for Initial Operation and Maintenance Training Participants	BMKG	Necessary travel expenses pursuant regulations
	LIPI	
Contract Cost (Power)	BMKG	67.0
	LIPI	0.0
Banking Commission	BMKG	151.0
	LIPI	12.0
Total		382.0

Items		Yearly cost (million IRD)
Operation and Maintenance Cost	BMKG	3,580.0
	LIPI	0.0

In addition, Government of Indonesia shall have the responsibility for the payment of banking commission for the Japan's Grant Aid.

Annex-4 Tentative Implementation Schedule (BMKG)



Annex-5 Seismic Intensity Calculate Formula

BMKG

BADAN METEOROLOGI, KLIMATOLOGI, DAN GEOFISIKA

Jl. Angkasa I No. 2, Kemayoran, Jakarta 10720, Telp. : (021) 424 6321 Fax. : (021) 424 6703
P.O. Box 3540 Jkt, Website : http://www.bmkg.go.id

Jakarta, 26 May 2014

Dear JICA Team,

We confirm that we have decided to use the following equations for the intensity conversion:

I_{mmi} = 1.55*log(PGA)+1.78

in case log(PGA) <= 1.57,

I_{mmi} = 3.7*log(PGA)-1.6

in case log(PGA) >= 1.57

Thank you,

Regards,

Dr. Jaya Murjaya, M.Si

Appendix 5

Technical Notes

Appendix 5-1

Technical Notes (signed on July 18, 2012) (LIPI)

TECHNICAL NOTES

Preparatory Survey on the Project for Improvement of Equipment for Disaster Risk Management in the Republic of Indonesia

1. General

Regarding the preparatory survey on the Project for Improvement of Equipment for Disaster Risk Management in the Republic of Indonesia (hereinafter referred to as "the Project"), the Minutes of Discussions (hereinafter referred to as "M/D") was signed on 06 July, 2012 by and between the Government of Indonesia (hereinafter referred to as "the Indonesia") and the Preparatory Survey Team (hereinafter referred to as "the Team") sent by Japan International Cooperation Agency (hereinafter referred to as "JICA").

This Technical Notes is made to confirm the results of discussions and field survey works for the items requested by the Indonesian Institute of Sciences (hereinafter referred to as "LIPI").

2. Project Components for LIPI

Through a series of discussions and considering, LIPI and the Team understood that the following items, which were deemed as high prioritized items, categorized as "Priority A", in the M/D, would be considered as the project components.

(1) PS Logging Equipment

- One (1) set of PS logging equipment to be procured to obtain Vs profiles until the base rock inside the borehole.

(2) Array Microtremor Measurement Equipment

- One (1) set of Array Microtremor Measurement Equipment consist 4 units of Servo-Accelerometers with wireless transmission to be procured to obtain Vs profile survey without drilling and artificial seismic source.

(3) Accelerometer

- Ten (10) numbers of Accelerometer to be procured to determine peak ground acceleration.

3. Considerations to PS Logging

(1) Type and Quantity

- LIPI explained that there is no PS Logging Equipment owned by LIPI actually, however LIPI possess various geophysical survey equipment and well utilized and maintained them by engineers, researchers and operators of the responsible department, therefore

they have enough capacity for proper utilization and maintenance of PS Logging Equipment, since initial training for O/M shall be needed.

- LIPI explained and the Team agreed that PS Logging Equipment to be procured by the project will be portable type seismograph with 48 receiver channels and deployed to the Research Center of Geotechnology, LIPI, Bandung.

- The Team explained and LIPI agreed that detailed specifications to be procured by the Project shall be determined as results of further study and analysis to be conducted in Japan.

(2) Handing Over

- PS Logging Equipment shall be handed over at the LIPI in Bandung.

- LIPI and the Team confirmed that LIPI shall be responsible for necessary procedure as well as purchases, such as for custom duties, custom clearance, internal transportation after handing over.

(3) Operation and Maintenance

- LIPI and the Team confirmed that the O&M training for the equipment by the Supplier shall be held in Bandung, and that participants of the O&M training will be the engineers, researchers and operators who belong to the operation and maintenance.

- LIPI and the Team confirmed that LIPI shall be responsible for the necessary travel arrangements and per-diems of personnel who will join the O&M training in Bandung.

- LIPI and the Team confirmed that all necessary costs for O&M of the Equipment procured by the Project shall be borne by LIPI.

4. Considerations to Array Microtremor Measurement Equipment

(1) Type and Quantity

- LIPI explained that there is no Array Microtremor Measurement Equipment owned by LIPI actually, however LIPI possess various geophysical survey equipment and well utilized and maintained by engineers, researchers and operators of the responsible department, therefore they have enough capacity for proper utilization and maintenance of the equipment, since initial training for O/M shall be needed.

- LIPI explained and the Team agreed that Array Microtremor Measurement Equipment to be procured by the project will be portable type array microtremor station equipped 3ch Servo accelerometers and GPS module and deployed to the Research Center of Geotechnology, LIPI, Bandung.

- The Team explained and LIPI agreed that detailed specifications to be procured by the Project shall be determined as results of further study and analysis to be conducted in Japan.

(2) Handing Over

- This equipment shall be handed over at the LIPI in Bandung.
- LIPI and the Team confirmed that LIPI shall be responsible for necessary procedure as well as purchases, such as for custom duties, custom clearance, internal transportation after handing over.

(3) Operation and Maintenance

- LIPI and the Team confirmed that the O&M training for the equipment by the Supplier shall be held in Bandung, and that participants of the O&M training will be the engineers, researchers and operators who belong to the operation and maintenance.
- LIPI and the Team confirmed that LIPI shall be responsible for the necessary travel arrangements and per-diems of personnel who will join the O&M training in Bandung.
- LIPI and the Team confirmed that all necessary costs for O&M of the equipment procured by the Project shall be borne by LIPI.

5. Considerations to Accelerometer

(1) Type and Quantity

- LIPI and the Team agreed that ten (10) Sets of Accelerometer to be procured by the monitoring and study for geophysical survey.
- LIPI explained and the Team agreed LIPI shall complete necessary preparatory works such as civil works, electrical works, etc. for equipment installation at least two months before the equipment shipping. The each system is stand alone type, so that data communication system construction works will not be included in the project.
- LIPI explained and the Team agreed that LIPI shall inform exact location to be installed the ten accelerometers being procured by the project until 30 September, 2012. LIPI also understood that copies of written evidences regarding Building/Space acquisition, Building/Space use rights or office use permission shall be submitted to Japanese side before the tender announcement for the Project.
- LIPI explained and the Team agreed that the ten accelerometers being procured shall be installed by Japanese side, two for Bandung, six for Padang, one for Liwa in Lampung and one for Banda Aceh, respectively.
- The Team explained and LIPI agreed that detailed specifications to be procured by the Project shall be determined as results of further study and analysis to be conducted in Japan.

(2) Handing Over

- Ten Accelerometers shall be installed and handed over at each designated site.
- LIPI and the Team confirmed that LIPI shall be responsible for necessary procedure as well as purchases, such as for custom duties, custom clearance, internal transportation after handing over.

(3) Operation and Maintenance

- LIPI and the Team confirmed that the O&M training for accelerometers by the Supplier shall be held in Bandung, and that participants of the O&M training will be the engineers and researchers who belong to the regional offices where the accelerometers are procured by the Project.
- LIPI and the Team confirmed that LIPI shall be responsible for the necessary travel arrangements and per-diems of personnel who will join the O&M training in Bandung.
- LIPI and the Team confirmed that all necessary costs for O&M of the accelerometer procured by the Project shall be borne by LIPI.

Annex-1 : Site Data Sheet

Bandung, 18th July, 2012

Dr. Haryadi Permana	Shozo Kawasaki
Director	Chief Consultant
Research Center for Geotechnology	Preparatory Survey Team
Indonesia Institute of Sciences (LIPI)	Japan International Cooperation Agency
Republic of Indonesia	Japan

Annex-1

Site Data Sheet

SITE DATA SHEET

Station Name		
Date and Time of Survey		
Surveyor in Charge LIPI officials	Name : Name : Name : Name :	E-Mail: Phone No. :

1. Site Location

City, Province	
Address of Site	
Accesibilty to the Site	about _____-minute walk after _____-hour drive from _____ (city or airport or port)
Latitude (of the sensor)	
Longitude (of the sensor)	
Altitude (of the sensor)	
Landowner	

2. Survey and Inspection of Land for construction of new station by LIPI

Availability of Land	Is 5.0m x 6.0m land for Station available? Yes / No
	Does the land have flat conditions? Yes / No Sloping area should be avoided. If No, describe / attach observation of the natural conditions of the land.
	Does the land have firm soil conditions? Yes / No Swampy or reclamation area should be avoided.
Owner / Responsible Org.	
Soil Condition	Filled / Reclamation Area Yes / No
Distance from Tall Tree	Should be more than twice of height Yes / No
Source of Noise to be affected	Distance from Major Road : m Traffic Condition : * Heavy / Medium / Light Road surface Condition: ** Good / Dameged * heavy : 1 car or more per 1 minute thoughout almost daytime light : 1 car or less per 10 minutes thoughout almost daytime ** good : as if newly constructed damaged : person in the running car can aware of the damage
	Distance from Generator if there is : m
	Distance from A/C Outdoor Unit, if there is m
	Distance from Underground Structure such as Septic Tank, if there is
	Others If any, (Railway, Factory, River, High Voltage Power Cable, etc.)
Availability of Existing Power	Yes / No Commercial / Generator / Solar System / Others.

3. Survey and Inspection for Existing Facility (Building) for installation of Seismometer

Owner of Building	
Year of Construction	
Type of Structure	Reinforced Concrete / Steel / Masonry / Other ( )
Type of Roof	Flat Concrete Roof / Shaped Roof with Truss / Other ( )
Stories	Single / Double / More (stories)
	Basement / Banker : Yes / No If yes, show section drawing
Availability of space in the Building	2.4m x 2.4m x 2.1m height space for station is available? Yes / No
	If yes, describe sketch of the space with attached sheet.
Condition of Floor	Concrete / Stone / Wood / Other ( ) Is the Floor Solid Yes / No
Condition of Wall	Concrete / Masonry / Wood / Other ( )
Source of Noise to be affected	Distance from Major Road : m Traffic Condition : Heavy / Medium / Light Road surface Condition: Good / Dameged
	Distance from Generator if there is : m
	Distance from A/C Outdoor Unit, if there is : m
	Is there Basement Floor, Banker and / or Septic Tank Yes / No
	Others If any, (High Voltage Power Cable, etc.)
Availability of Existing Power	Yes / No Commercial / Generator / Solar System / Others.( )

Indicate Area Map

- **Scale : 1/1500～ 1/2500**
- **Describle surrounding Facilities**
- **Any other notable matters**

Area of Site	m2

Indicate Site Plan

□ **Scale : 1/250 ～ 1/500**

- **Describle condition of Site**
- **Any other notable matters**

Area of Site	m2

Indicate Building Plan, Elevation, etc.

☐ **Total area**

☐ **Possible area to install necessary Equipment**

☐ **Any other notable matters**

Area of Site	m2

6. Photograph
Photograph record shall be attached to this Site Data Sheet.

Appendix 5-2

Technical Notes (signed on July 26, 2012) (BMKG)

TECHNICAL NOTES

Preparatory Survey on the Project for Improvement of Equipment for Disaster Risk Management in the Republic of Indonesia

1. General

Regarding the preparatory survey on the Project for Improvement of Equipment for Disaster Risk Management in the Republic of Indonesia (hereinafter referred to as "the Project"), the Minutes of Discussions (hereinafter referred to as "M/D") was signed on 6th July, 2012 by and between the Government of Indonesia (hereinafter referred to as "GOI") and the Preparatory Survey Team (hereinafter referred to as "the Team") sent by Japan International Cooperation Agency (hereinafter referred to as "JICA").

This Technical Notes is made to confirm the results of discussions and field survey works for the items requested by Meteorological Climatological and Geophysical Agency (hereinafter referred to as "BMKG").

2. Project Components for BMKG

Through a series of discussions, BMKG and the Team understood that the following items, which were categorized as "Priority A" and "Priority B" in the M/D, would be considered as the project components.

(1) Velocity Meter with Accelerometer Component

- This component consists of sets of: one Broadband Seismograph; one Broadband Strong Motion Seismograph; one Accelerometer; and one Satellite Communication System.
- BMKG and the Team agreed that this component shall be divided into the following three sub components.
  - a) Supply and installation of Fifteen (15) sets of the equipment to replace the existing JISNET equipment installed by NIED as Priority A.
  - b) Supply and installation of Five (5) sets of the equipment in the existing stations as Priority A.
  - c) Supply of Ten (10) sets of the equipment for existing stations as Priority B.
- Tentative Project Site Location map for Sub Component-**a** and -**b** is shown in Annex-1 "Proposed Project Site Location Map (for Velocity Meter)" hereunder.

(2) Accelerometer Component

- This component consists of sets of: one Accelerometer; and one Satellite Communication System.
- BMKG and the Team agreed that this component shall be divided into the following two sub components.

d) Supply and installation including civil works of Eighty Five (85) sets of equipment in new stations as Priority A.

e) Supply of Eighty Five (85) sets of equipment in new stations as Priority B.

- Tentative Project Site Location Map for Sub Component-**d** and **-e** is shown in Annex-2 "Proposed Project Site Location Map (for Accelerometer)" hereunder.

(3) Intensity Meter Component

- BMKG and the Team confirmed that Two Hundred (200) Intensity Meters were Priority A in the M/D.

(4) Data Processing System Component

- BMKG and the Team confirmed that Data Processing System for the Real-time Earthquake Information System (REIS) was Priority A in the M/D.

- Data Processing System Diagram for Real-time Earthquake Information System is shown in Annex-3.

(5) Digitizer Component

- BMKG and the Team confirmed that Fifteen (15) Digitizers shall be procured as spare and considered Priority B in the M/D.

3. Design Considerations

The Team explained and BMKG agreed that detailed specifications and number of the equipment to be procured by the Project shall be determined as a result of further study and analyses to be conducted in Japan.

The Team explained and BMKG understood the possible options for real-time earthquake information system shown in Annex-3 "Data Processing System", and BMKG agreed that further study and analyses shall be conducted in Japan to determine the final design of the systems to be adopted for the Project.

The Team requested and BMKG agreed that BMKG shall select and inform the Team all exact site locations using the Site Data Sheet for Sub Component-**a**, **-b**, and **–d** until 30th September, 2012.

The Team requested and BMKG agreed that BMKG shall submit the list of locations to be installed for Sub Component-**c**, **-e** and Intensity Meters to the Japanese side before the tender announcement for the Project.

(1) Velocity Meter with Accelerometer Component

- BMKG explained and the Team confirmed that the existing satellite data communication systems for existing stations shall be utilized for real-time monitoring system of the velocity broadband strong motion seismographs newly procured and installed through the Project. Both sides agreed that bandwidth of the existing satellite communication system of TELKOM shall be widened and utilized for data communication.

- The Team explained and BMKG agreed that the data format for observational data shall be either in mini-SEED format or WIN format while data communication protocol shall be either

Seedlink or WIN/UDF respectively.

- BMKG explained and the Team accepted that the existing foundations at each existing JISNET site shall be available for installation of the set of equipment procured by the Project as Sub Component-**a**.

- BMKG explained and the Team accepted that existing foundations at each existing Velocity Station site established by BMKG shall be available for installation of the set of equipment procured by the Project as Sub Component-**b**

- The Team requested and BMKG agreed that BMKG shall remove existing equipment such as satellite antenna, seismograph, battery, etc., from the foundations on which new equipment will be installed. The costs for disposal shall be borne by BMKG.

- The Team requested and BMKG agreed that the land and facility to install the equipment should be in good condition. The Site Data Sheet presented in Annex-4 shall be used to select good observation stations.

- BMKG and the Team agreed that electricity for the equipment shall be supplied by commercial power where it is available and by solar power if not. A storage battery shall be placed in both cases. The storage battery for commercial power shall be able to supply electricity for 48 hours to avoid interruption of the observation during power outage, whereas the storage battery for solar power shall be able to supply electricity for five consecutive days under conditions without sunshine. The type of power supply for each station, either commercial power or solar power, shall be specified in the Site Data Sheet and submitted the Team by 30th September, 2012.

(2) Accelerometer Component

- BMKG and the Team agreed that BMKG shall notify the stations to be connected to REIS within the stations of sub component-**d** and -**e**.

- BMKG and the Team agreed that satellite data communication systems for REIS network for the target stations in Sub Component-**d** shall be established. Further study and analyses shall be conducted in Japan to determine the design of the systems to be adopted for the Project. Possible options for the satellite data communication systems are shown in Annex-3.

- BMKG explained and the Team confirmed that the existing satellite data communication systems for existing stations shall be utilized for real-time monitoring system of the strong motion seismographs newly procured and installed through the Project. Both sides agreed that bandwidth of the existing satellite communication system of TELKOM shall be widened and utilized for data communication.

- The Team explained and BMKG agreed that the data format for observational data shall be either in mini-SEED format or WIN format while data communication protocol shall be either Seedlink or WIN/UDF respectively.

- The Team explained and BMKG agreed that seismographs and digitizers for REIS shall be equivalent as those used by Japan Meteorological Agency (JMA). The type of data transmitted shall be the same as that of JMA, which is waveform data (acceleration waveform, velocity waveform), real-time earthquake data and intensity data. Data communication protocol shall be the same as that adapted by JMA.

- BMKG explained and the Team agreed that existing equipment in the BMKG headquarters

shall be utilized. New Line Cards shall be provided by the Japanese side to compensate for the anticipated lack of channels as the number of stations increases in number.

- BMKG explained and the Team agreed that the Japanese side shall provide the Data Collection Server when using the WIN/UDP protocol for data communication. Data shall be transmitted to Seiscomp3 utilizing this Data Collection Server. Both sides confirmed that, when using the Seedlink protocol, data shall be transmitted directly to seiscomp3 without the Data Collection Server.

- The Team requested and BMKG agreed that BMKG secure available land for the stations of Sub Component-**d**, and that BMKG shall be responsible for the costs for land acquisition, land lease and/or office rental. BMKG also understood that copies of written evidences regarding land acquisition, land-use rights or office use permission shall be submitted to the Japanese side before the tender announcement for the Project.

- The Team requested and BMKG agreed that the land and facility for installation of the equipment should be in good condition (e.g. enough space, firm soil, low artificial noise, no obstruction for satellite communication). The Site Data Sheet presented in Annex-4 shall be used to select good observation stations.

- BMKG and the Team agreed that electricity for the equipment shall be supplied by commercial power where it is available and by solar power if not. A storage battery shall be placed in both cases. The storage battery for commercial power shall be able to supply electricity for 48 hours to avoid interruption of the observation during power outage, whereas the storage battery for solar power shall be able to supply electricity for five consecutive days under conditions without sunshine. The type of power supply for each station, either commercial power or solar power, shall be specified in the Site Data Sheet and submitted the Team by 30th September, 2012.

(3) Intensity Meter Component

- BMKG and the Team agreed that all intensity meters shall be handed over to BMKG headquarters, and that BMKG shall be responsible for delivery and installation of the equipment to each monitoring location.

- Both sides confirmed that the Japanese side shall provide an installation manual to BMKG at the implementation stage, and that technical knowledge and skills for installation and adjustment works are not required for intensity meters.

- The Team requested and BMKG agreed that BMKG shall provide the formula for calculating the scale of intensity and that the Japanese side shall incorporate the formula into the system.

- BMKG and the Team agreed that the Japanese side shall provide a new server to the BMKG headquarters to collect and display intensity data measured by the intensity meters located across the country.

(4) Data Processing System Component

- The Team explained and BMKG understood that the delay time of transmission from accelerometer station to the Data Processing System installed in the BMKG Headquarters have to be very short, and that operation rate of accelerometer must be high in order to release the real-time earthquake information regularly and effectively.

- BMKG and the Team agreed that the Japanese side shall provide a new server for REIS to be

installed in the BMKG Headquarters.

- The Team explained and BMKG agreed that the new server shall be the same as that used by JMA and that the Japanese side shall establish a system to collect real-time earthquake data and display information.

(5) Digitizer Component

- BMKG and the Team agreed that this component shall include the providing the following equipment.
  - Digitizer for Velocity meter (Three (3) units)
  - Digitizer for Accelerometer (Nine (9) units)
  - Digitizer for Accelerometer connected to REIS (Three (3) units)

4. Considerations of Operation and Maintenance

(1) Operation and Maintenance Costs after handover

- BMKG and the Team confirmed that BMKG shall be responsible for all necessary costs and services in operation and maintenance for the systems procured by the Project.
- BMKG and the Team confirmed that BMKG shall have intent of ensuring the necessary communication bandwidth and secure additional operation costs.

(2) Operation and Maintenance Trainings

- BMKG and the Team confirmed that the operation and maintenance trainings that would be carried out by the Supplier for the equipment and systems shall be held at the BMKG headquarters in Jakarta, and that BMKG shall be responsible for all necessary arrangements and costs for its personnel joining the operation and maintenance training.

5. Other Considerations

(1) Undertakings of BMKG

- While major undertakings of the recipient side were confirmed in the M/D, the Team emphasized and BMKG agreed that the following items shall be undertaken by BMKG.
  - Securing the required lands and/or spaces for the Project, especially for the sites for sub component-**b** and -**d**.
  - Clearance or relocation of existing obstacles on the sites, if required.
  - Obtaining necessary permissions from the relevant authorities for implementation of the Project.
  - Securing necessary frequency for the data communication systems.
  - All other items stipulated in Annex-5 of the M/D

(2) Upgrade and effective use of Real-time Earthquake Information System

- The Team explained and BMKG understood that the following policies and activities are necessary to upgrade and effectively utilize the Real-time Earthquake Information System (REIS) to integrate in the future Comprehensive Earthquake Information and/or Early Warning System such as the Earthquake Early Warning (EEW) in Japan.

  - Transmission delay time between the accelerometer stations and the Data Processing System must be kept very short because it causes a delay in the delivery of information. Furthermore, operation rate of the accelerometers must be kept high because the level of errors within the focal parameters depends on the number of accelerometers concerned.

  - Since the software for EEW is new and no set standard software is available to date, JMA, which operates the main server of EEW, has made considerable efforts to code and revise the software especially to reduce mal-warning caused by artificial noise and irregular signals. Such efforts have continuously been taking place since the official commencement of EEW in 2007. It is important that BMKG understands the present state of this technology and the necessity to continuously improve it in order to develop REIS that best suits the circumstance in Indonesia. In doing so, BMKG should pay a special attention to maintaining its software and tuning its parameters.

  - The Law of Indonesia on Disaster Management requests for not a solely technical approach but for a more comprehensive one that accommodates the country's social and other conditions. Effective use of the information collected from REIS is a good starting point in managing disasters in Indonesia. Yet, it is crucial for BMKG and Indonesia as a whole to understand the importance of, and to take necessary measures to, developing an overall social system of its own that renders REIS and other management approaches truly effective.

Annex-1 Proposed Project Site Location Map (for Velocity Meter)

Annex-2 Proposed Project Site Location Map (for Accelerometer)

Annex-3 System Diagrams

Annex-4 Site Data Sheet

Jakarta, 26th July, 2012

Mr. Suhardjono
Director of Earthquake and Tsunami Center
Meteorological, Climatological and Geophysical Agency
Republic of Indonesia

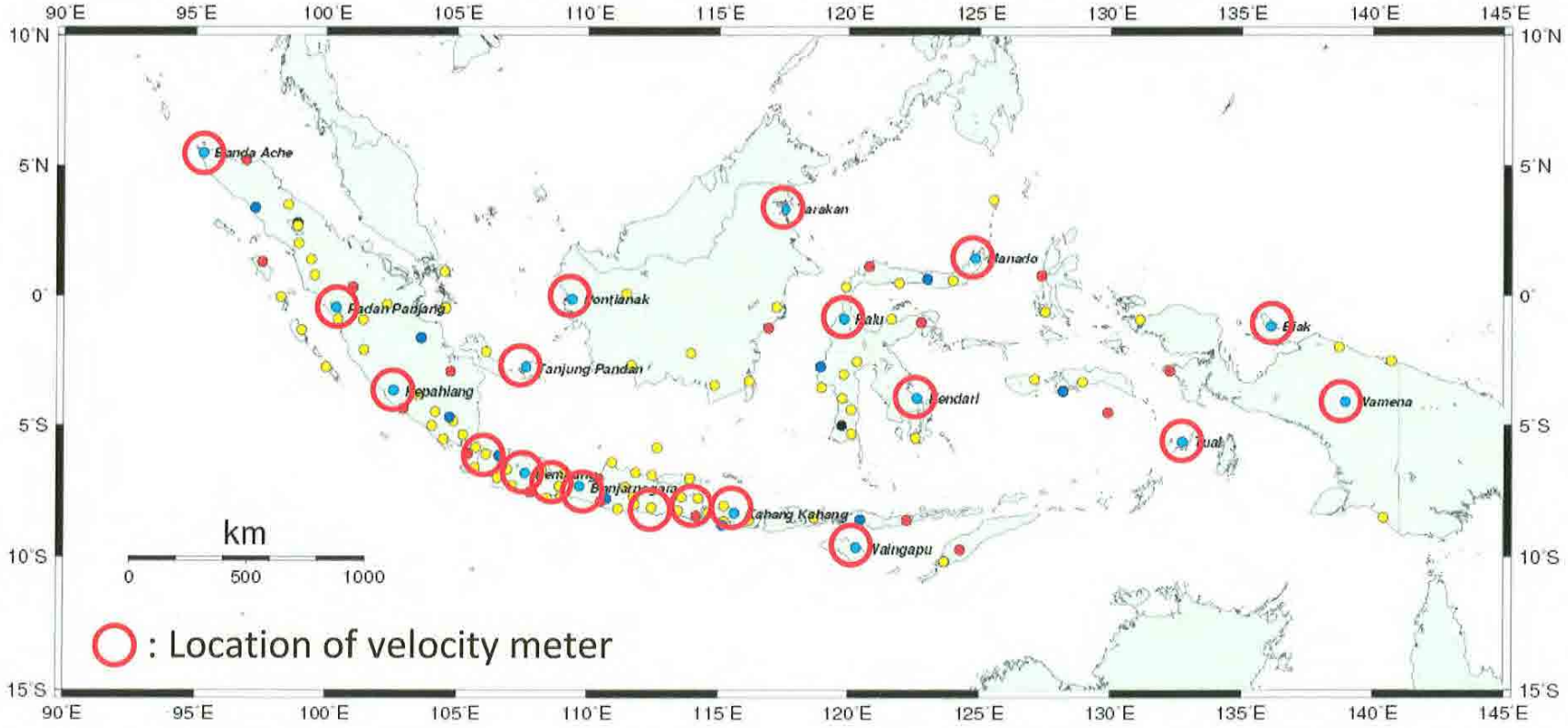
Shozo Kawasaki
Chief Consultant
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Annex -1

Proposed Project Site Location Map

(for Velocity Meter)

Proposed Project Site Location Map for Sub Component-a and -b (Velocity Meter)



Japan (NIED) (16)
Indonesia (BMG) (79)
Germany (GFZ & BGR) (18)
CTBTO (3)
China (CEA) (10)
USA (0)

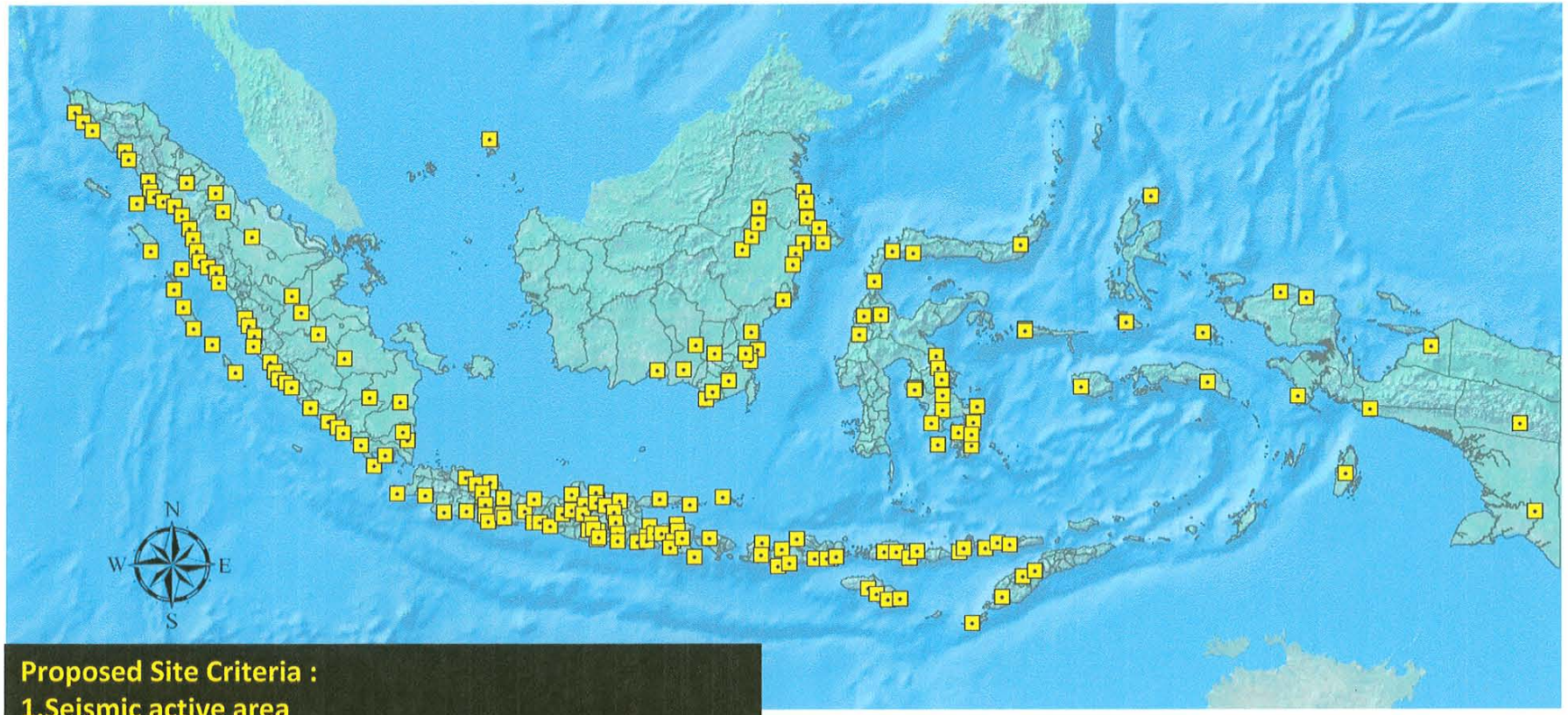
(As of December 01, 2008)

Annex-2

Proposed Project Site Location Map

(For Accelerometer)

Proposed Project Site Location Map to be selected for Sub Component-d and -e (Accelerometer)

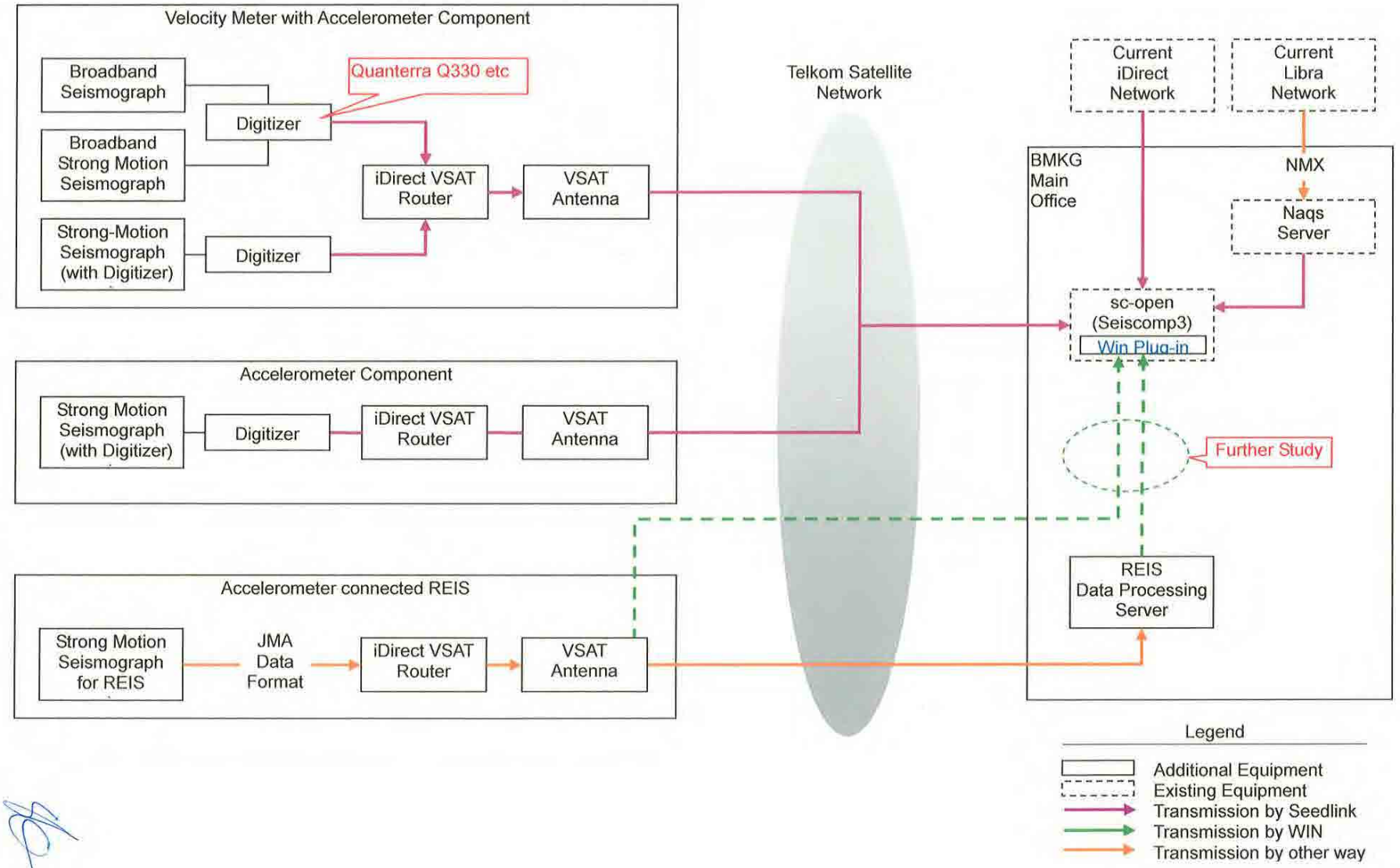


Proposed Site Criteria :
1. Seismic active area
2. Tsunami prone area
3. Highly populated
4. Vital object
(*inter island bridge, petrochemical, power plant*)
5. Accessibility

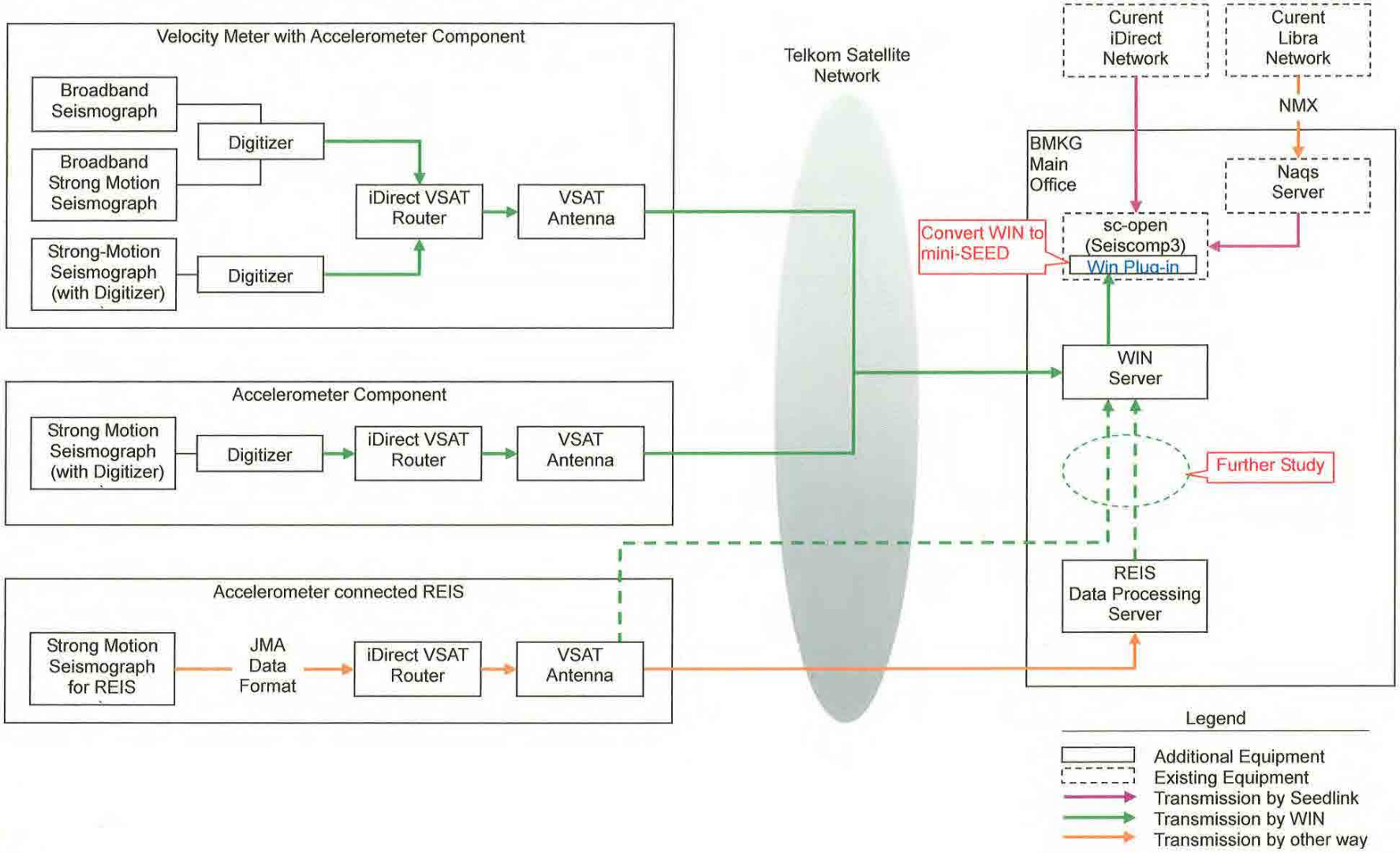
Annex-3

System Diagrams

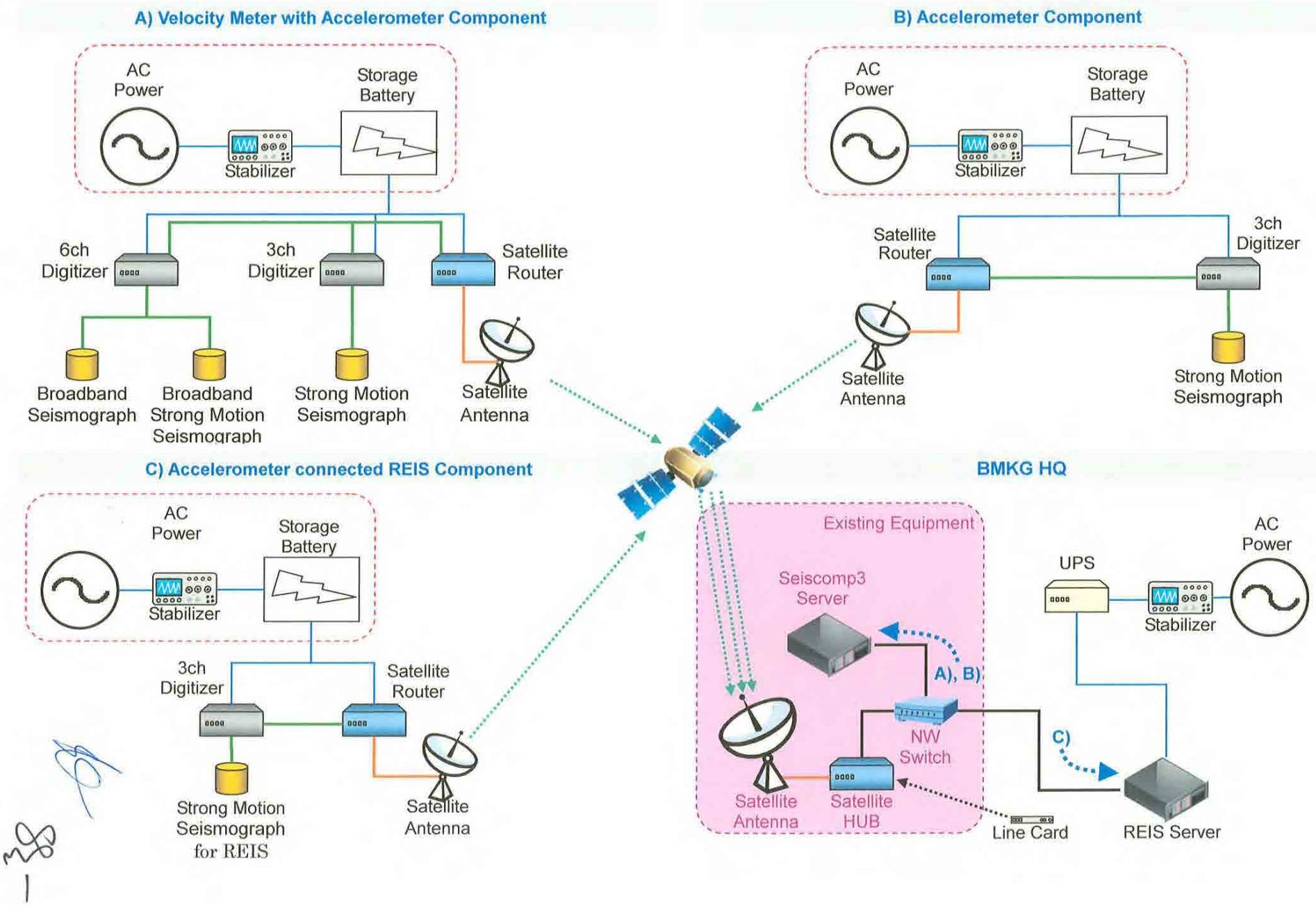
Dataflow diagram (Case of transmission by Seedlink)



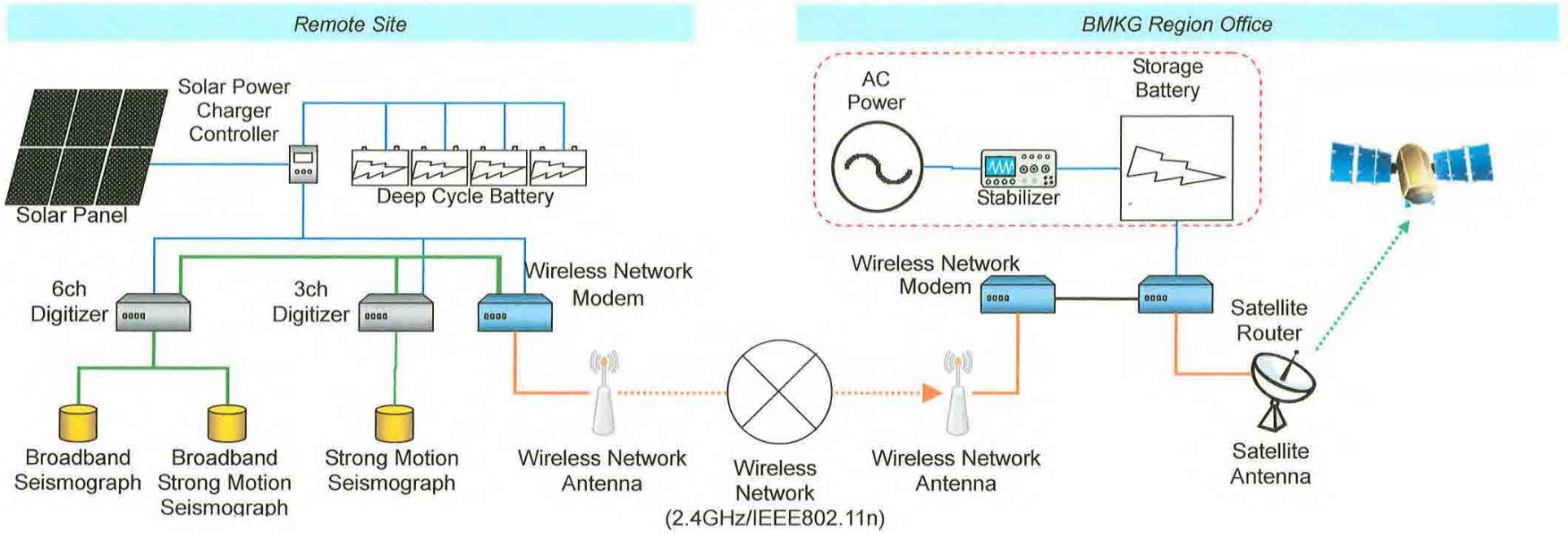
Dataflow diagram (Case of transmission by WIN)



Equipment structure diagram



A') Velocity Meter with Accelerometer Component (Option: Connection with Remote Location by Wireless Network)



Annex-4

(Site Data Sheet)

SITE DATA SHEET

Station Name		
Type of Station	(1) Velocity meter + Accelerometer (2) Accelerometer to connect Realtime Earthquake Information System (3) Accelerometer to connect Existing Network System	
Date and Time of Survey		
Surveyor in Charge BMKG officials	Name :	E-Mail:
	Name :	
	Name :	Phone No. :
	Name :	

1. Site Location

City, Province		
Address of Site		
Accesibilty to the Site	about _____-minute walk after _____-hour drive from _____ (city or airport or port)	
Latitude (of the sensor)		
Longitude (of the sensor)		
Altitude (of the sensor)		
Landowner		
Necessity of wireless communication between Seismograph and Transmission Point. (2.4GHz/IEEE802.11n)	Is wireless communication necessary ? Yes / No	
	If yes, the distance needed is : m	
	If yes, is visibility between both antennas assured : Yes / No	

2. Survey and Inspection for *Land* to construct new station

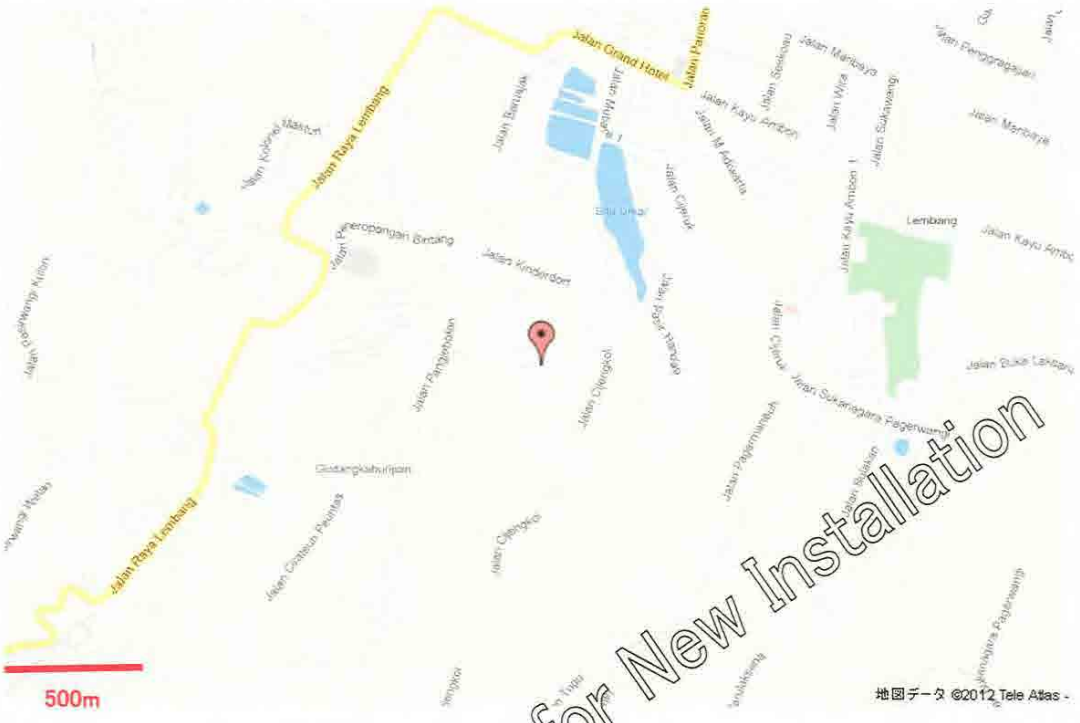
		score
Owner / Responsible Org.		
Availability of Land	Is 10m x 10m land for Station available? Yes / No	
	Does the land have flat conditions? Yes / No Sloping area should be avoided. If No, describe / attach observation of the natural conditions of the land.	
	Does the land have firm soil conditions? Yes / No Swampy or reclamation area should be avoided.	
Distance from Tree	Should be more than twice of height Yes / No	
Source of Noise to be affected	Distance from Major Road : m Traffic Condition : * Heavy / Medium / Light Road surface Condition: ** Good / Dameged * heavy : 1 car or more per 1 minute thoughout almost daytime light : 1 car or less per 10 minutes thoughout almost daytime ** good : as if newly constructed damaged : person in the running car can aware of the damage	
	Distance from Generator if there is : m	
	Distance from A/C Outdoor Unit, if there is m	
	Distance from Underground Structure such as Septic Tank, if there is m	
	Others If any, (Railway, Factory, River, High Voltage Power Cable, etc.) m m	
Artificial Seismic Noise	Should be measured, if you have to choose noisy land (point), and if you can	
Availability of Existing Power	Yes / No Commercial / Generator / Solar System / Others.	
Availability of Satellite	open to the top (GPS and transmission) Good / NG	

3. Survey and Inspection Existing Facility (*Building*) to install Seismometer

Owner of Building		
Year of Construction		
Type of Structure	Reinforced Concrete / Steel / Masonry / Other ( )	
Type of Roof	Flat Concrete Roof / Shaped Roof with Truss / Other ( )	score
Stories	Single / Double / More (stories)	
	Basement and / or bunker : Yes / No If yes, show section drawing	
Availability of space in the Building	4m x 4m space for station is available? Yes / No If yes, describe sketch of the space with attached sheet.	
Condition of Floor	Concrete / Stone / Wood / Other ( ) Is the Floor Solid Yes / No	
Condition of Wall	Concrete / Masonry / Wood / Other ( )	
Source of Noise to be affected	Distance from Major Road : m Traffic Condition : Heavy / Medium / Light Road surface Condition: Good / Dameged * heavy : 1 car or more per 1 minute thoughout almost daytime light : 1 car or less per 10 minutes thoughout almost daytime ** good : as if newly constructed damaged : person in the running car can aware of the damage	
	Distance from Generator if there is : m	
	Distance from A/C Outdoor Unit, if there is : m	
	Is there Basement Floor and / or Septic Tank Yes / No	
	Others If any, (Railway, Factory, River, High Voltage Power Cable, etc.) m m	
Artificial Seismic Noise	Should be measured, if you have to choose noisy land (point), and *if you can*	
Availability of Existing Power	Yes / No Commercial / Generator / Solar System / Others.	
Availability of Satellite	open to the top (GPS and transmission)	

4-1.Indicate Area Map

- Scale : 1/1500 ～ 1/2500
- Describle surrounding Facilities
- Any other notable matters

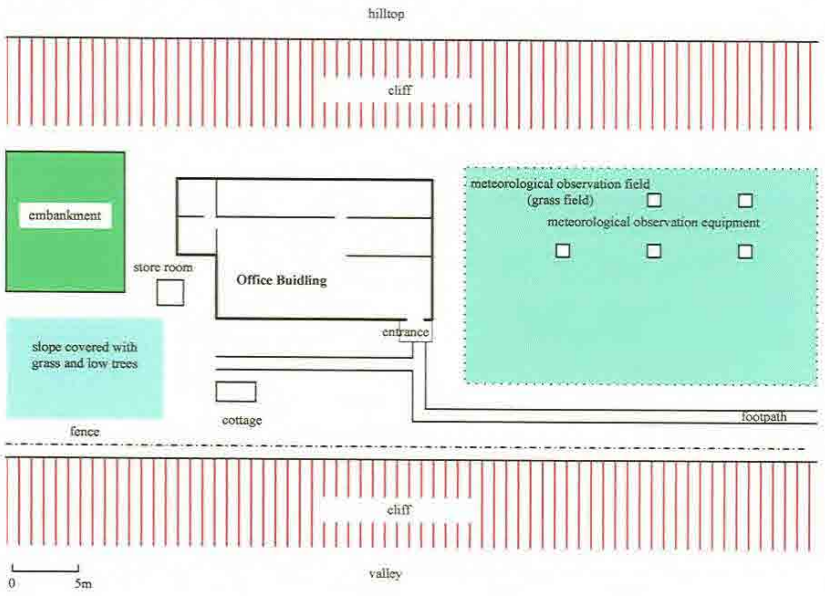


Sample for New Installation

Area of Site	. m2

4-2.Indicate Site Plan

- Scale : 1/250～ 1/500
- Describle condition of Site
- Any other notable matters

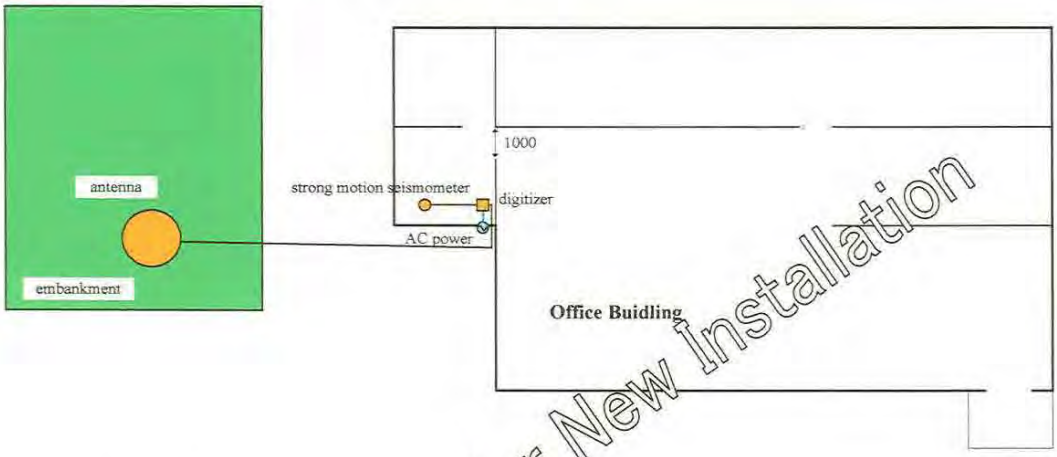


Area of Site	m2

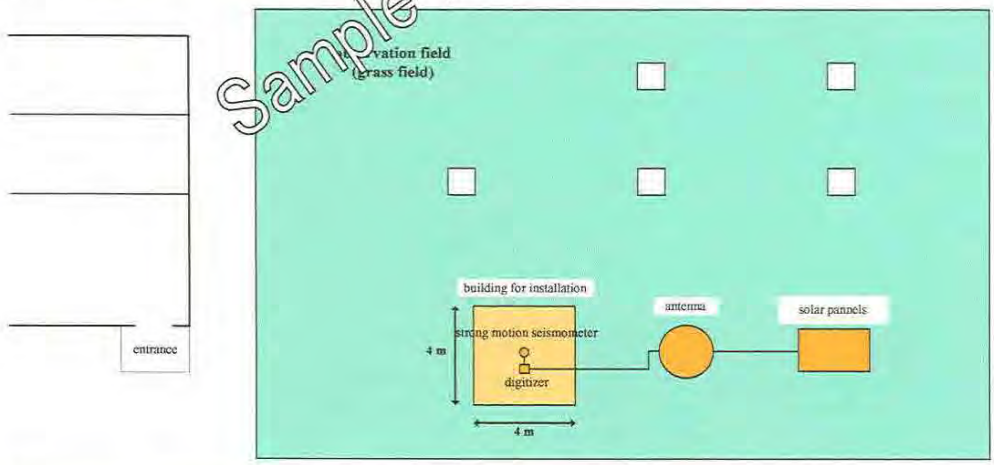
5.Indicate Building Plan, Elevation, etc.

- ☐ **Total area**
- ☐ **Possible area to install necessary Equipment**
- ☐ **Any other notable matters**

Sample 1: Installation inside the building



Sample 2: Installation outside the building



Area of Site	. m2

6. Photograph

Photograph record shall be attached to this Site Data Sheet.

①

②

③

overview of the site

④

⑤

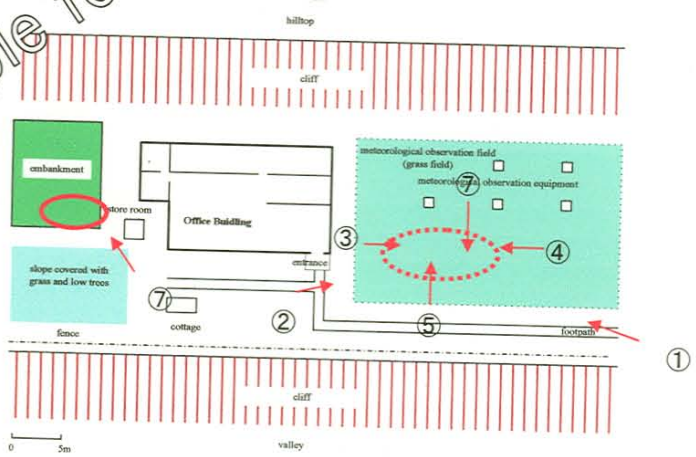
seismometer will be installed here

⑥

seismometer will be installed here

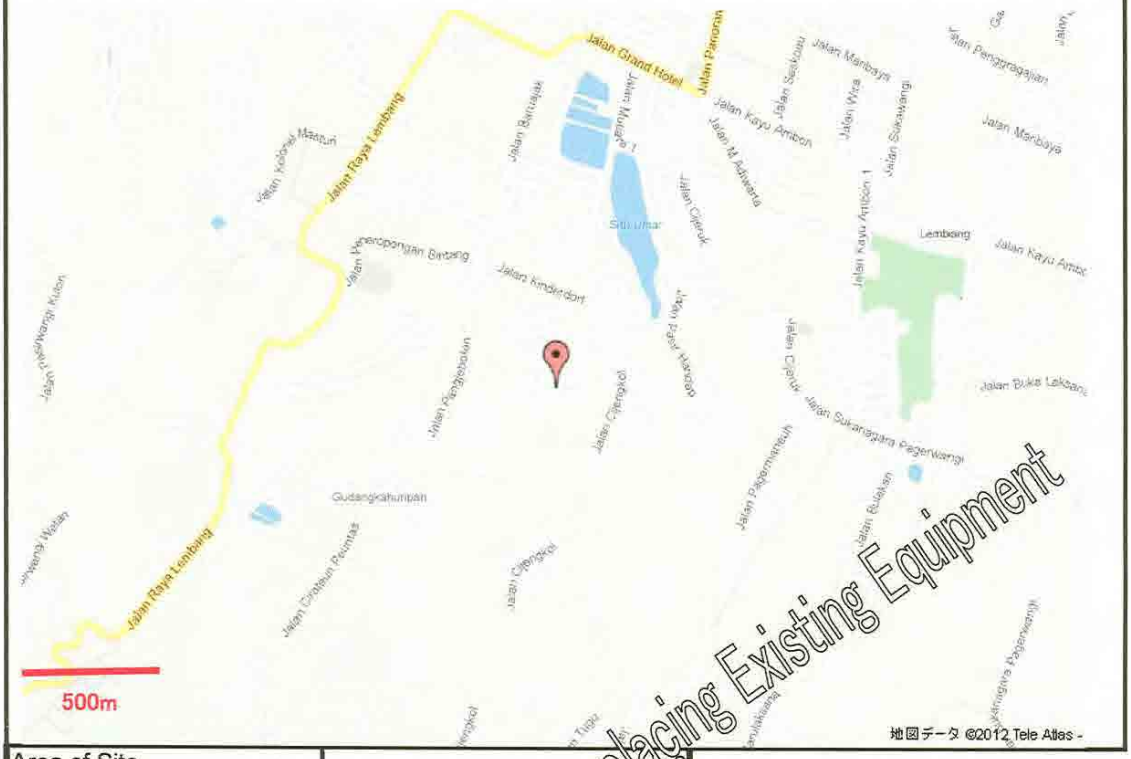
⑦

antenna will be placed here



4-1.Indicate Area Map

- Scale : 1/1500 ～ 1/2500
- Describle surrounding Facilities
- Any other notable matters

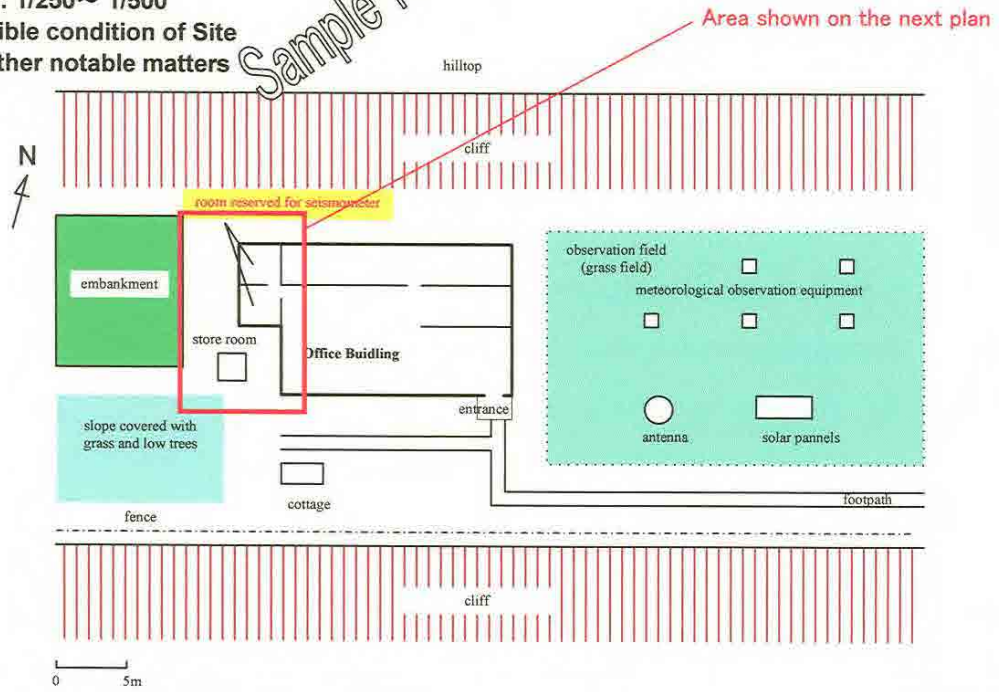


Area of Site m2

Sample for Replacing Existing Equipment

4-2. Indicate Site Plan

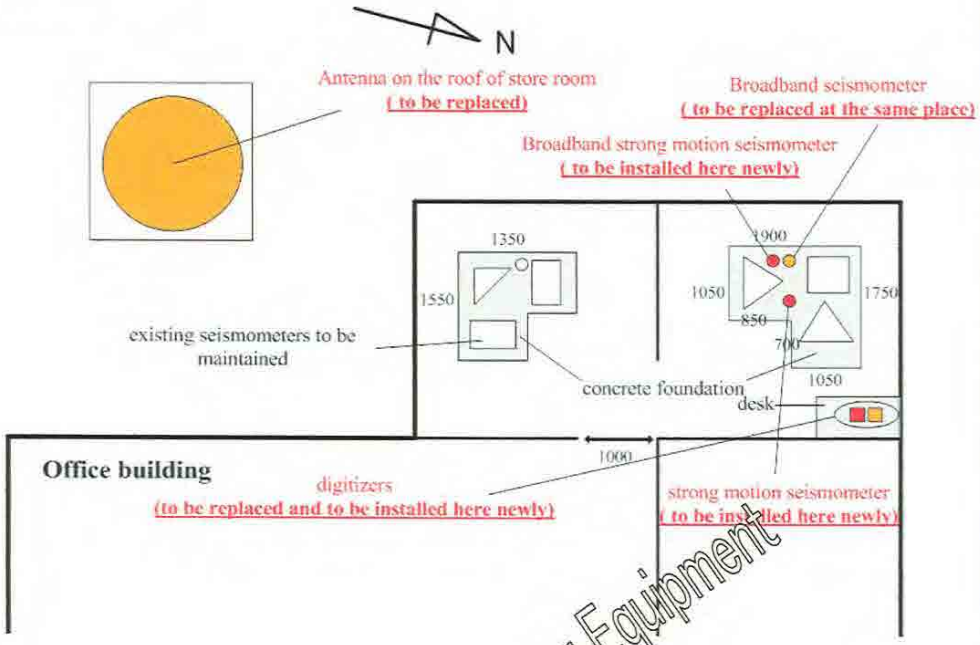
- Scale : 1/250～ 1/500
- Describle condition of Site
- Any other notable matters



Area of Site m2

5. Indicate Building Plan, Elevation, etc.

- Total area
- Possible area to install necessary Equipment
- Any other notable matters



Area of Site	. m2

6. Photograph

Photograph record shall be attached to this Site Data Sheet.

①

②

overview of the site

③

new seismometer to be installed

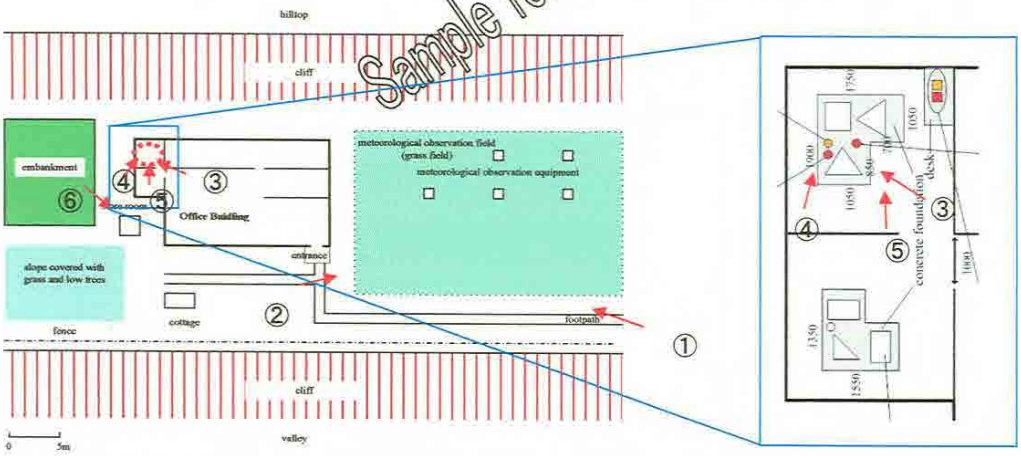
④

seismometer to be replaced

⑤

⑥

antenna to be replaced



Appendix 5-3

Technical Notes (signed on March 5, 2014) (BMKG)

TECHNICAL NOTES

Preparatory Survey on the Project for Improvement of Equipment for Disaster Risk Management in the Republic of Indonesia

1. General

Regarding the preparatory survey on the Project for Improvement of Equipment for Disaster Risk Management in the Republic of Indonesia (hereinafter referred to as "the Project"), the Minutes of Discussions (hereinafter referred to as "M/D") was signed on 6th July, 2012 by and between the Government of Indonesia (hereinafter referred to as "GOI") and the Preparatory Survey Team (hereinafter referred to as "the Team") sent by Japan International Cooperation Agency (hereinafter referred to as "JICA").

This Technical Notes is made to confirm the results of field survey and study in Japan.

2. Project Components for BMKG

The Team explains the present progress of study and BMKG understood that the Project would be composed of following items. Outline specifications of the system which will be installed is shown in Appendix.

(1) Velocity Meter with Accelerometer Component

- This component consists of sets of: one Broadband Seismograph; one Broadband Strong Motion Seismograph; one Accelerometer; and one Satellite Communication System.
- BMKG and the Team agreed that this component shall be divided into the following two sub components.
  a) Supply and installation including civil works of Fifteen (15) sets of the equipment to replace the existing JISNET equipment.
  b) Supply and installation of Five (5) sets of the equipment in the existing BMKG shelter.

(2) Accelerometer Component

- This component consists of sets of: one Accelerometer; and one Satellite Communication System.
- BMKG and the Team agreed that this component consist of supply and installation including civil works of Seventy eight (78) sets of equipment for new sites.
- Number of new sites will be finalized based on the final cost estimation which will be informed with draft Final Report it will be provided on Draft Outline Design (DOD) explanation team (it supposed to be middle of May, 2014).

(3) Intensity Meter Component

- BMKG and the Team confirmed that Two Hundred (200) Intensity Meters initially. The number will be finalized based on the final cost estimation and also reduce or increase according to the

difference between tender sealing price and bidding price.

(4) Earthquake Intensity Information System Component

- BMKG and the Team confirmed that Earthquake Intensity Information System for Strong motion seismograph and Intensity meter.

(5) REIS System

- The Team explained and BMKG agreed that the REIS system is not included in the Project.

3. Undertakings of BMKG

The Team explained and BMKG agreed that the following items shall be undertaking by BMKG.

(1) Confirmation and Signing for Land Preparation

- BMKG responsible person shall sign on the site drawings. In addition, BMKG bring the site drawings to all sites and confirm the shelter and parabola installation space, and get approved signature from land responsible person by middle of May, 2014 (before dispatch of DOD explanation team).

(2) Preparation of Power Supply

- Power outlet shall be prepared at the point marked on the Site Drawings by BMKG. The sites which will be operated by solar system are out of this matter.

Jakarta, 5th March, 2014

Mr. Mochammad Riyadi	Mr. Shozo Kawasaki
Director of Earthquake and Tsunami Center	Chief Consultant
Meteorological, Climatological and Geophysical Agency	Preparatory Survey Team
Republic of Indonesia	Japan International Cooperation Agency
	Japan

Appendix

Outline Specifications

Outline Specifications of Earthquake Information System (1)

1. Equipment of Broadband Seismic Station		
1) Components		
A. Broadband seismograph (velocity meter)		
B. Broadband strong-motion seismograph (velocity meter)		
C. Digitizer for velocity meters		
D. Strong motion seismograph (accelerometer)		
E. Digitizer for strong motion seismograph (processor)		
F. Satellite communication system		
G. Power system		(Site available to the commercial power supply)
H. Solar power system		(Site unavailable to the commercial power supply)
I. Wireless communication system		(WAINGAPU site)
2) Major Specifications		
A. Broadband seismograph (velocity meter)		
(1) Sensor type	:	Force balance feed-back
(2) Mode of operation	:	Triaxial
(3) Output signal	:	Analog signal
(4) Frequency Response	:	Flat ground velocity from 8.33mHz (120s) to 50Hz or more
(5) Sensor noise level	:	Less than the USGS Low-Noise Model between 100s an 10Hz
(6) Dynamic range	:	Not less than 140dB
(7) Protection of sensor	:	By the sensor cover or sand filling
B. Broadband strong-motion seismograph (velocity meter)		
(1) Sensor type	:	Servo velocity meter
(2) Mode of operation	:	Triaxial
(3) Output signal	:	Analog signal
(4) Frequency Response (+/- 3 dB)	:	Including 0.01～70Hz
(5) Max. measuring range	:	Not less than ±2m/s (±200kine)
(6) Dynamic range	:	Not less than 145dB
(7) Protection of sensor	:	By the sensor cover
C. Digitizer for velocity meters		
(1) Sampling frequency	:	Selectable (should include 100hz)
(2) ADC resolution	:	Not less than 24bit
(3) ADC modulation	:	Delta-sigma modulation
(4) Waveform data format	:	mSeed
(5) Data transmission protocol for waveform	:	Seedlink
(6) Power consumption	:	Less than 3W
D. Strong motion seismograph (accelerometer)		
(1) Sensor type	:	Servo accelerometer
(2) Mode of operation	:	Triaxial
(3) Output signal	:	Digital
(4) Max. measuring range	:	Not less than ±3,000gal
(5) Sampling frequency	:	100Hz (JMA SPEC)
(6) ADC resolution	:	Not less than 24bit
(7) ADC modulation	:	Delta-sigma modulation
E. Digitizer for strong motion seismograph (processor)		
(1) Result of the processing	:	a. Intensity (MMI) b. Maximum acceleration and maximum velocity (triaxial) c. Peak acceleration cycle (triaxial) d. SI (Spectral Intensity) e. Prevailing frequency f. Signal detection time
(2) Waveform data format	:	mSeed
(3) Data transmission protocol for waveform	:	Seedlink
(4) Intensity data format	:	JMA Format
(5) Data transmission protocol for intensity	:	JMA Protocol
F. Satellite communication system		
(1) Satellite router	:	iDirect X3 or X5 Satellite Router (Brand earmarked)
(2) Satellite antenna	:	1.8m VSAT antenna
G. Power system		
(1) Storage Battery System	:	Lead-acid Battery or Lithium Battery
(2) Voltage Stabilizer	:	220V (50Hz)

Outline Specifications of Earthquake Information System (2)

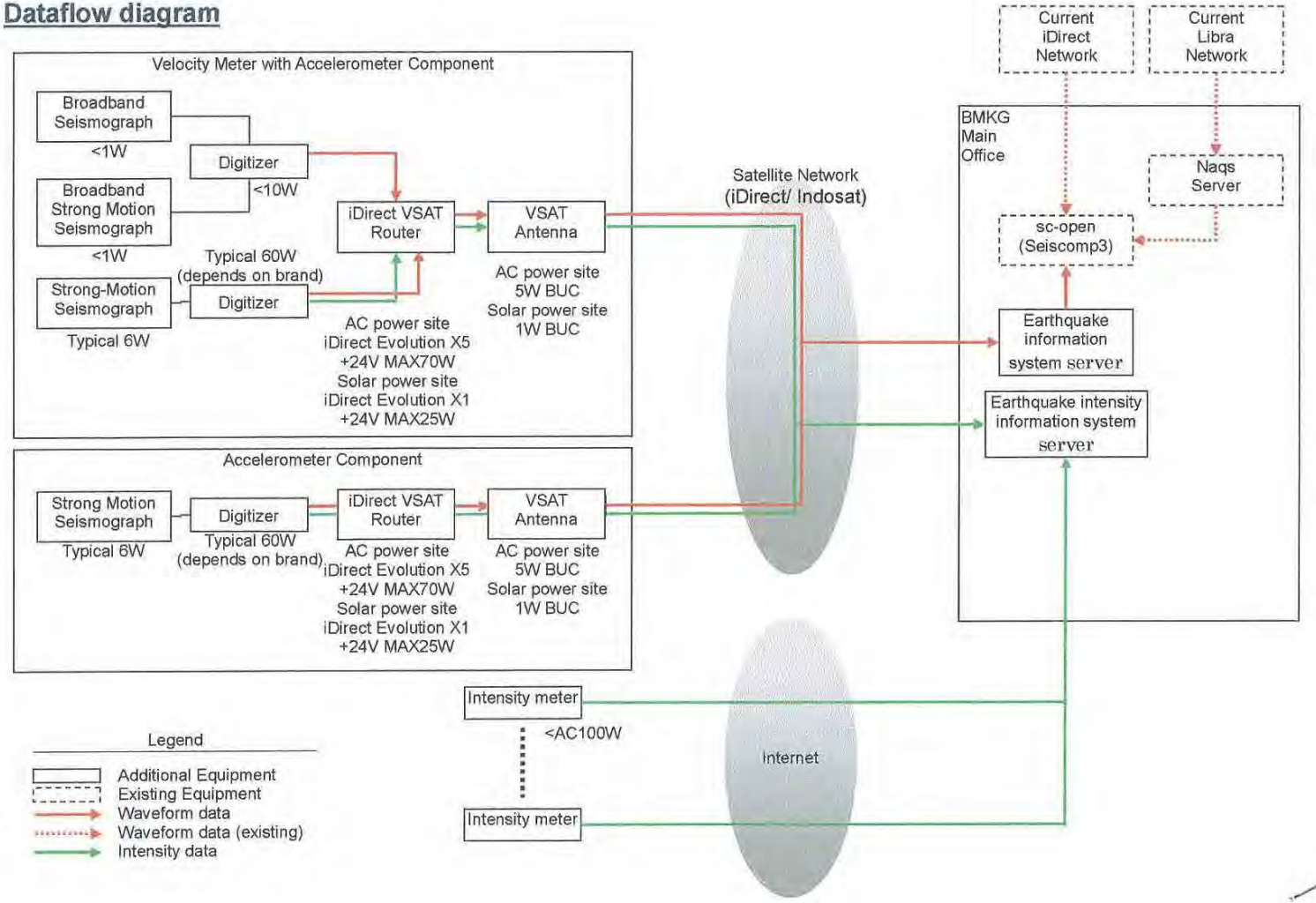
H. Solar power system	:	
(1) Solar Panel	:	
a) Type	:	Monocrystalline or Polycrystalline Solar Panel
b) Performance	:	Not Less Than 14% by Module Conversion Efficiency
(2) Charge Controller Assembly		
a) Control Method	:	MPPT Control
b) System Voltage	:	12V/24V (Selectable)
(3) Battery		
a) Type	:	Deep Cycle Battery
b) Nominal Voltage	:	12V
(4) Arrester	:	Installation for protecting the equipment from lightning
I. Wireless communication system	:	2.4GHz wireless communication system
2. Equipment of Strong Motion Seismograph site		
1) Components		
A. Strong Motion seismograph (Accelerometer)		
B. Digitizer (Processor)		
C. Satellite Communication System		
D. Power System		(Site available to the commercial power supply)
E. Solar Power System		(Site unavailable to the commercial power supply)
2) Major Specifications		
A. Strong Motion seismograph (Accelerometer)		
(1) Sensor type	:	Servo Accelerometer
(2) Mode of operation	:	Triaxial
(3) Output signal	:	Digital
(4) Max. measuring range	:	Not less than ±3,000gal
(5) sampling frequency	:	100Hz (JMA SPEC)
(6) ADC resolution	:	Not less than 24bit
(7) ADC modulation	:	Delta-sigma modulation
B. Digitizer (Processor)		
(1) Result of the processing	:	a. Intensity (MMI) b. Maximum acceleration and maximum velocity (triaxial) c. Peak acceleration cycle (triaxial) d. SI (Spectral Intensity) e. Prevailing frequency f. Signal detection time
(2) Waveform data format	:	mSeed
(3) Data transmission protocol for waveform	:	Seedlink
(4) Intensity data format	:	JMA Format
(5) Data transmission protocol for intensity	:	JMA Protocol
C. Satellite Communication System	:	Same as 1-1 2) G
D. Power System	:	Same as 1-1 2) H
3. Intensity meter		
1) Components		
A. Intensity meter		
B. Uninterrupted Power Supply (UPS)		
2) Major Specifications		
A. Earthquake intensity meter		
(1) Sensor type	:	Accelerometer
(2) Self noise	:	Not more than 0.2gal (rms)
(3) Mode of operation	:	Triaxial
(4) Output signal	:	Digital
(5) Max. measuring range	:	Not less than ±1,500gal
(6) Result of the processing	:	Intensity (MMI)
(7) Intensity data format	:	JMA Format
(8) Data transmission protocol for intensity	:	JMA Protocol
(9) Data acquisition	:	SD Card (not less than 16GB), acquisition data can be collected from the remote

Outline Specifications of Earthquake Information System (3)

4. HQ Earthquake Information System		
1) Components		QTY
A. Earthquake Intensity Information System Server		2 unit
B. Earthquake Information System Server		2 unit
C. Uninterrupted Power Source (UPS)		4 unit
D. KVM		1 unit
E. Earthquake Intensity Information System Software		1 set
F. Earthquake Information System Software		1 set
G. Server Rack (Option)		1 set
H. Large Monitor		1 set
2) Major Specifications		
A. Earthquake Intensity Information System Server		
(1) CPU	:	Not less than xeon 4core Processor 2.0GHz
(2) Memory	:	Not less than 8GB
(3) Hard disk drive	:	Not less than 1TB (RAID1)
(4) Chassis	:	Rack mount
(5) OS	:	Windows or Linux (depends on the earthquake information software)
(6) Server configuration	:	Redundant configuration
B. Earthquake Information System Server		
(1) CPU	:	Not less than xeon 4core Processor 2.0GHz
(2) Memory	:	Not less than 8GB
(3) Hard disk drive	:	Not less than 2TB (RAID1)
(4) Chassis	:	Rack mount
(5) OS	:	Windows or Linux (depends on the earthquake information software)
(6) Server configuration	:	Redundant configuration
E. Earthquake Intensity Information System software		
(1) Management of earthquake intensity data	:	Data acquisition, Recording, Monitoring Grouping of seismic intensity deta Display of seismic intensity data : table, map Logging
(2) Management of strong motion seismograph and intensity meter	:	Operations monitoring Diagnosis, Examination
	:	Status management (enable and disable)
(3) System management	:	Time synchronization Database synchronization
F. Earthquake Information System Software		
(1) Management of earthquake intensity data	:	Acquisition of 3-component seismic waveform data, recording, monitoring Display of waveform data : graph
(2) System management	:	Time synchronization
5. Satellite Communication Equipment for HQ		
1) Components		QTY
A. Line Card for Satellite Hub		1 unit
2) Major Specifications		
A. Line Card for Satellite Hub		
(1) Brand Name	:	iDirect Evolution Line Cards XLC-M (Brand earmarked) Install on existing satellite communications hub in BMKG HQ

Outline Specifications of Earthquake Information System (4)

Dataflow diagram



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Appendix 5-4

Technical Notes (signed on May 28, 2014) (BMKG)

TECHNICAL NOTES

Preparatory Survey on the Project for Improvement of Equipment for Disaster Risk Management in the Republic of Indonesia

1. General

Regarding the preparatory survey on the Project for Improvement of Equipment for Disaster Risk Management in the Republic of Indonesia (hereinafter referred to as "the Project"), the Minutes of Discussions (hereinafter referred to as "M/D") was signed on 28th May, 2014 by and between the Government of Indonesia (hereinafter referred to as "GOI") and the Preparatory Survey Team (hereinafter referred to as "the Team") sent by Japan International Cooperation Agency (hereinafter referred to as "JICA").

This Technical Notes is made to confirm mutual understanding of the Draft Report Explanation by the Team.

2. Additional Acquisition Server for Acceleration Waveform Data

To avoid the complexity of main SC-Open server to introduce new seismic intensity information system, BMKG requested to increase capacity of seismic intensity information system server to incorporate acceleration waveform data. The team understood that such increasing of capacity is effective for the active data utilization and research of intensity. BMKG HQ Earthquake System will be modified as attached.

3. Selection of the Project Sites

The Team showed 93 project sites to BMKG and explained that 5 sites were excluded from 98 sites which are shown in the pre-DOD explanation. However, BMKG already confirmed and got owners signature for these 5 sites. On the other hand, site confirmation work is still under the progress and not get signature for another 5 sites. With a view to the condition, the Team explained that the final project site will be considered in the implementation stage according to the land availability discussion with BMKG. BMKG understands the policy of the process to site selection and agreed it.

4. Adjustment of Number of Sites and Seismic Intensity Meters

According to the tender result, number of seismic intensity meter and number of project site will be adjusted compare with total budget based on the discussion with BMKG and Tenderer. The Team will be support this discussion in terms of site condition and cost estimation.

5. Request to BMKG regarding to the Seismic Intensity Meter

As for the Seismic Intensity Meter, the Team does not request to show the site where seismic intensity meter will be installed, this time. However, to ensure that usage of the seismic intensity meter, the Team requested to BMKG to submit the site list where seismic intensity meter will be installed before hand over the equipment. BMKG understood that point and promised that candidate sites list for seismic intensity meter installation will be prepared and submitted before the time when the seismic intensity meter will be handed over.

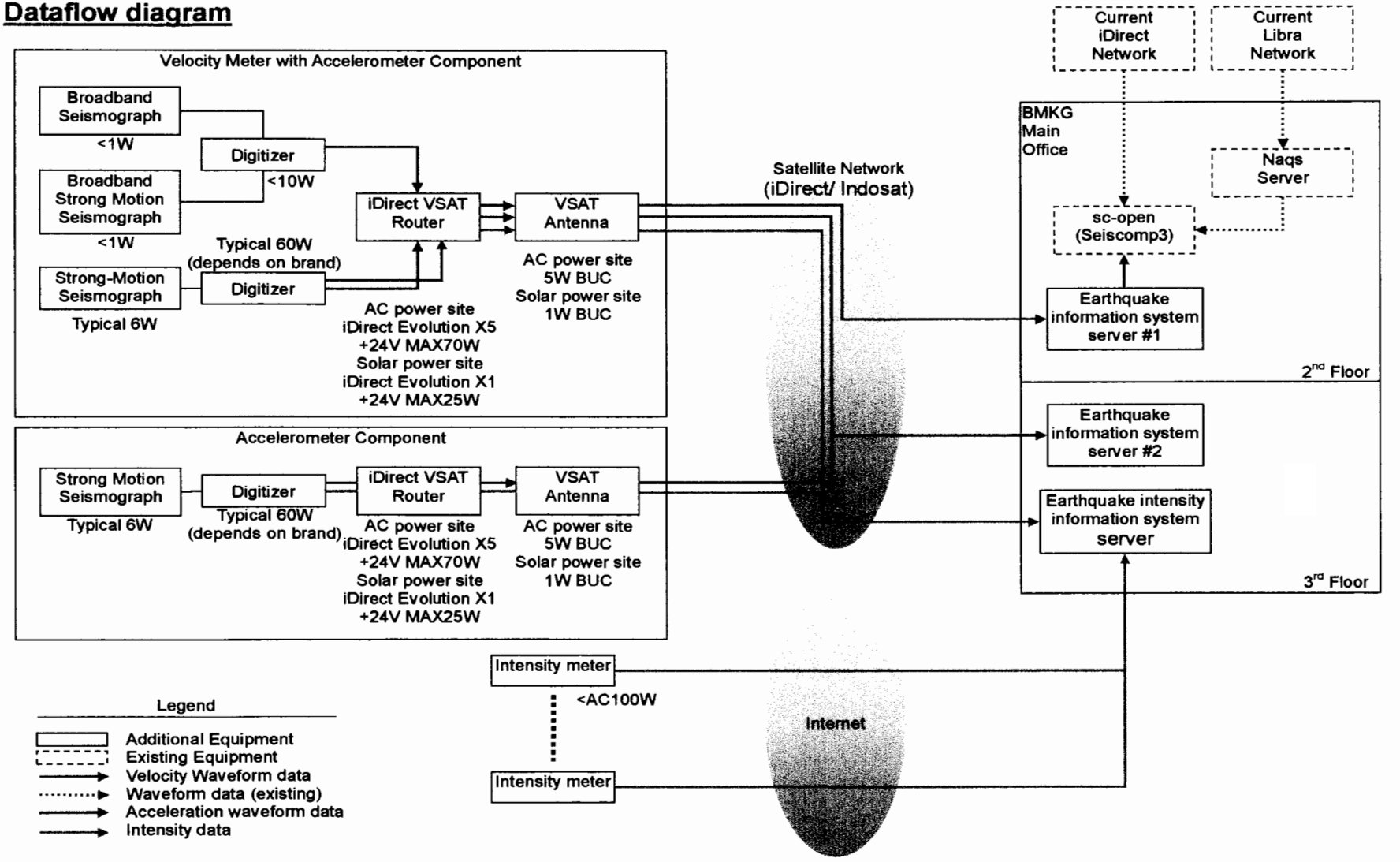
Jakarta, 28th May, 2014

MASTURYONO
Deputy of Geophysics
Meteorological, Climatological and Geophysical Agency
Republic of Indonesia

Shozo KAWASAKI
Chief of Consultant
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Attachment

Dataflow diagram



Modified BMKG Earthquake Information System

Appendix 6

Survey Results

Site Sruvey Result （1／8）

No	Name	Location	Land Owner	Instration Type		Condition of Installation Space						Temporaly Works and Others			Solar Necessity		Remarks	Primary Decision Good：○ Considerable：△
				A	B	Inside of Outside				Space for Parabola	Ground Condition	Proximity Structures	Access Condition	Necessity of Fence	Necessity Need：○ No：—	Space Availability		
				Broadband Seismograph	Strong Motion Seismograp	Inside Room	Inside Shelter	Outside New	Outside Avairable area									
1	TEGAL BULEUT	WEST JAVA	Local Government		✓			✓	5.05x5.56m	North side of the area	Sandiy clay	Elevated Tank (H=3m)	Vehicle access OK	—	—	—	Need to cut trees	○
2	SUB DISTRICT CISOLOK	WEST JAVA	Local Government		✓			✓	10x10m	Inside of fence	Loam	Elevated Tank (3m)、Tower Antenna	Vehicle access OK	Need	—	—	Antenna ancur is close to the candidate area. Site surface is gentry inclined.	○
3	BMKG PALABUHAN RATU	WEST JAVA	BMKG		✓	✓		✓	Inside：3.9×2.35m Outside：10×10m	Inside: front of building Outside: inside of	Collubiun	—	carry in 20m by man power	Need if outside	—	—	Landslide area. Sliding soil mass is move when it is heavy rain. Outside site is not on the sliding soil mass. Selected office might be on the sliding soil mass. Ina-TEWS site.	×
4	~~PALABUHAN RATU~~	WEST JAVA	Local Government		✓				Non								No space and close to No.3 BMKG site.	×
5	NYALINDUNG	WEST JAVA	Local Government					✓	4x4m	North side of Tower	Loam	Garage (Removable),	Vehicle access OK	—	—	—	6m to antenna(H=40m), 20m to Telocom tower (H=60m).	△
6	LENGKONG	WEST JAVA	Local Government					✓	4x4m	Roof or Ground	Loam	Window Roof	In the site carry in by man power	—	—	—	10m3 soil cutting is necessary. Existing roof will be overlap and rain watre will pour to the shelter. 10 m distance from H=20m antenna.	○
7	SUB DISTRICT KALAPANUNGGAL	WEST JAVA	Local Government					✓	8x8m	Inside of fence	Loam	Antenna: H=35m Distance:30m	In the site carry in by man power	Need	—	—	Cassava field. 30m distance to the heavy traffick road.	○
8	SUB DISTRICT KADUDAMPIT	WEST JAVA	Local Government		✓			✓	(5.0, 4.3) x12m	On the grass	Loam	Window Roof	In the site carry in by man power	—	—	—	10m x 10m area is exist at the mountain behind office. However, it is a forest with big trees. It is difficult to cut them and can not use this space. Site is narrow space between office and retaining wall.	○
9	SUB DISTRICT JAMPANG KULON	WEST JAVA	Local Government					✓	5.5x8.0m	Roof	Loam	Antenna:H=40m, Distance:15m	In the site carry in by man power	—	—	—	The local office has a plan to extend office 3m. There is no space to make fence. Small shelter can be installed.	○
10	SUB DISTRICT CISOLOK	WEST JAVA	Local Government					✓	2.5×5.8m	Roof	Sandy silt	Antenna:H=40m, Distance:15m	Path the inside of house	—	—	—	Not enough space for BMKG standard shelter. Small shelter shall be designed.	×
11	SUB DISTRICT CIRACAP	WEST JAVA	Local Government					✓	3.6x5.7m	Esat side of new shelter	Loam	Well and Pump are inside of	In the site carry in by man power	—	—	—	Not enough space for BMKG standard shelter. Small shelter shall be designed.	○
12	SUB DISTRICT CIKEMBAR	WEST JAVA	Local Government					✓	1.8x4.0m	Biside tower	sandy silt	Antenna: H=30m、Distance:10m	In the site carry in by man power	—	—	—	Pit type such as JISNET can be apply. Elevated tank can be removed.	×
12A	DESA BOJONG	WEST JAVA	Local Government					✓	4x4m	Roof or East side of new	Loam	20m to front road (small traffic)	Vehicle access OK	—	—	—	Land cuting and leveling (approximately 5m3) is necessary.	○
13	SUB DISTRICT CIEMAS	WEST JAVA	Local Government					✓	4mx4m	North side of new shelter	Sandy silt	Should remove TV antenna	Vehicle access OK	Need (6x6m)	—	—	Need to cut tree. Tree cutting and relocation of TV antenna are acceptable.	○
14	SUB DISTRICT SUKANEGARA	WEST JAVA	Local Government		✓			✓	(7, 7.5)× 6.7m	North corner of area	Loame	BMKG Rainfall Gauge	Vehicle access OK	—	—	—	Position of ceptic tank should be confirmed (covered by turf).	○
15	SUB DISTRICT SINDANG BARANG	WEST JAVA	Local Government		✓			✓	8.7x7.1m	Between area and neighbor	Sandy soil	TV, Parabola antenna	Vehicle access OK	—	—	—	Liquefaction is concerned but no affected histry of liquefaction.	△
16	PT PASIR KELAPA	WEST JAVA	Privarte		✓			✓	10x10m	Inside of fence	Loam	—	Vehicle access OK	Need	—	—	PVC pipe has been laid inside of candidate area. However it is not used currently. Therefore it can be removed. Owner's final confirmation is necessary.	○
17	SUB DISTRICT PAGELARAN	WEST JAVA	Local Government					✓	12x18.5m	Inside of fence	Sandy sil\	Tree: H=20m、12m to fish pond	In the site carry in by man power	Need	—	—	Tree cutting is necessary.	○
18	SUB DISTRICT CLIAKU	WEST JAVA	Local Government		✓			✓	5.4x6m	On the grass	Loam	—	Vehicle access OK	—	—	—	Space is slope of 30 degrees. Soil cutting is necessary.	○

Site Sruvey Result （2／8）

No	Name	Location	Land Owner	Instration Type		Condition of Installation Space						Temporaly Works and Others			Solar Necessity		Remarks	Primary Decision Good：○ Considerable：△
				A	B	Inside of Outside				Space for Parabola	Ground Condition	Proximity Structures	Access Condition	Necessity of Fence	Necessity Need：○ No：—	Space Avairability		
				Broadband Seismograph	Strong Motion Seismograp	Inside Room	Inside Shelter	Outside New	Outside Avairable area									
19	SUB DISTRICT CAMPAKA MULYA	WEST JAVA	Local Government		✓			✓	Site 1: 8.8x6m Site 2: 3.9x6m	South-east couner of the fornt of	Weatherd Rock	Tree, Banboo bench, small cut ground	Carry in from car park by man power	No space for fence	—	—	Valley side of candidate site is cutting almost vertically. Therefore it is not suitable for shelter construction site.	△
20	SUB DISTRICT CAMPAKA	WEST JAVA	Local Government		✓			✓	5x13m	North part of area	Loam and Hard weatherd rock	Slop protection for cut land	In the site carry in by man power	No space for fence	—	—	—	○
21	SELMA	BENGKULU	Local Government		✓			✓	10x10m	Inside of fence	Silty soil	—	Vehicle access OK	Need	—	—	—	○
22	ULUTALO	BENGKULU	Local Government		✓			✓	10x10m	Inside of fence	Silty soil	—	Vehicle access OK	Need	—	—	—	○
23	NAPAL PUTIH	BENGKULU	Local Government		✓			✓	10x10m	Inside of fence	Laterite	—	Vehicle access OK	Need	—	—	—	○
24	MUARA SAHUNG	BENGKULU	Local Government		✓			✓	10x10m	Inside of fence	Laterite	—	Vehicle access OK	Need	—	—	—	○
25	MUKOMUKO	BENGKULU	Local Government		✓			✓	10x11m	Inside of fence	Organic soil	—	Vehicle access OK	Need	—	—	There is 2m of soft layer on the surface. Soil boring to confirm ground condition is necessary.	×
26	BARHAU	BENGKULU	Local Government		✓			✓	10x10m	Inside of fence	Silty soil	—	Vehicle access OK	—	○	○	No commercial power service. Ina-TEWS site.	×
27	MANNA	BENGKULU	Local Government		✓			✓	10x10m	Inside of fence	Silty soil	—	Vehicle access OK	Need	—	—	—	○
28	KETAHUN	BENGKULU	Local Government		✓			✓	10x10m	Inside of fence	Silty soil	—	Vehicle access OK	Need	—	—	Groundwater level is GL-0.5m. Parabola will be installed at outside of fence.	○
29	IPUH	BENGKULU	Local Government		✓			✓	10x10m	Inside of fence	Silty soil	—	Vehicle access OK	Need	—	—	—	○
30	BENGKULU	BENGKULU	Local Government		✓			✓	10x10m	Inside of fence	Silty soil	—	Vehicle access OK	—	—	—	Candidate site is selected in front of local government office, therefore, fence is not necessary.	○
31	PANIMBANG	BANTEN	Local Government					✓	8x8m	Inside of fence	Sandy sil	—	Vehicle access OK	—	—	—	There is a water tank adjacent to the candidate site. It is already not used. However 90cm depth of water still remaining. Tree cutting is necessary.	△
32	WARINGINJAYA	BANTEN	Local Government			✓			2.5x4.1m	Front of Office	Concrete	—	In the site carry in by man power	—	—	—	Currently, this office not be used. However, it will be renovated and it can be used for the project.	×
33	SUMUR	BANTEN	Local Government					✓	4X4m	Roof	Sandy silt	—	Vehicle access OK	—	—	—	Candidate site is selected in front of local government office, therefore, fence is not necessary.	○
34	CIKEUSIK	BANTEN	Local Government					✓	4X4m	Front of Office	Sandy silt	—	Vehicle access OK	Need 6×6	—	—	Candidate site is selected in front of local government office, therefore, fence is not necessary.	○
35	MALINGPING	BANTEN	Local Government					✓	Behind of Main office 4x4m	Besid of new shelter	Sandy Clay	—	Vehicle access OK	—	—	—	To AC 8m. To septic tank 5m.	○
36	BAYAH	BANTEN	Local Government					✓	7x7m	Roof	Sandy soil GWL-2m	—	Vehicle access OK	Exist （7x7m）	—	—	Site is adjacetnt to the road. However, traffic is very small (3 motorcycle per hour in the day time).	○
37	BANJARARSARI	BANTEN	Local Government		✓			✓	4X4m	Beside of new shelter	Sandy GWL-2m	—	Vehicle access OK	—	—	—	Remove brick concrete thickness 30cm. Antenna can be installed along fence of kindergarten.	○
38	~~KAMPUNG PARIGI~~ Change to CIGEMBLONG	BANTEN	Local Government					✓	10x10m	Inside of fence	Weatherd Rock	—	In the site carry in by man power	Need	—	—	Land is gently sloping and leveling is necessary.	○
39	BONJONG MANIK	BANTEN	Local Government		✓			✓	10x5~8m	Inside of fence	Sandy silt GWL-2m	—	Vehicle access OK	Need	—	—	The land was made by filling paddy field. Next space is still paddy field.	×
40	LANGI	ACEH	Local Government		✓			✓	10x10m	Inside of fence	Sandy silt	—	In the site carry in by man power	Need	—	—	—	○

Site Sruvey Result （3／8）

No	Name	Location	Land Owner	Instration Type A Broadband Seismograph	Instration Type B Strong Motion Seismograp	Condition of Installation Space: Inside of Outside: Inside: Room	Inside: Shelter	Outside: New	Outside: Avairable area	Space for Parabola	Ground Condition	Temporaly Works and Others: Proximity Structures	Access Condition	Necessity of Fence	Solar Necessity: Necessity (Need: ○ No: —)	Solar Necessity: Space Avairability	Remarks	Primary Decision Good: ○ Considerable: △
41	TUHEMBERUA	NORTH SUMATERA	Local Government		✓			✓	10x10m	Roof or inside of fence	Loarm	Tlecom Tower, Water hose of Rural water supply	Vehicle access OK	Need	—	—	Take care water supply hose pass the boundary of candidate site. Cut and fill is necessary.	○
42	KAMPUNG AIE	ACEH	Local Government		✓			✓	10x10m	Inside of fence	Sand	Tree: H=11m locating at site boundary	In the site carry in by man power	Need	—	—	Sand ground however, no liquefaction in the histry. Sand is volcanic sand instead of beach sand	○
43	LEGOK LEMANG	WEST JAVA	Privarte		✓			✓	10x10m	Inside of fence	Sandy silt	—	In the site carry in by man power	Need	—	—	100m extention of power line is necessary.	○
44	CARINGIN	WEST JAVA 2	Local Government		✓			✓	4x4m	Inside of Site	Sandy silt	—	Vehicle access OK	—	—	—	—	○
45	CIKALONG	WEST JAVA 2	Local Government					✓	5x10m	Inside of Site	Sandy silt	—	In the site carry in by man power	Need	—	—	Site is used for discharge pond. Fill up the pond and drainage system relocation are necessary.	△
46	PAMEUNGPEUK	WEST JAVA 2	Local Government		✓			✓	6x6m	Roof	Sandy silt	—	Vehicle access OK	Need	—	—	Close to streem (3m).	○
47	PAMULIHAN	WEST JAVA 2	Local Government		✓			✓	6x6m	Inside of site	Sandy silt	—	Vehicle access OK	Need	—	—	—	○
48	PANGANDARAN	WEST JAVA 2	Local Government		✓			✓	4.7x10m	Inside of fence	Silty soil	—	Vehicle access OK	Need	—	—	Parking is adjacent.	○
49	SALOPA	WEST JAVA 2	Local Government		✓			✓	5x5m	Roof or Inside of Fence	Sandy silt	—	Vehicle access OK	Need	—	—	6m to the main road.	×
49A	LANGKAPLANCAR	WEST JAVA 2	Local Government		✓			✓	6X8M	Inside of site	Sandy silt	—	Vehicle access OK	Need	—	—	Alternative site of 49.	○
50	BANTUL	YOGYAKARTA	BPBD		✓	✓			4x4m	Top of under ground tank in front of		—	Vehicle access OK	—	—	—	Currently used for warehouse. Next door is a office.	○
51	BPBD CILACAP	CENTRAL JAVA	BPBD		✓	✓			2.3x2.3m	In the court yard		—	Vehicle access OK	—	—	—	Generator is exist at entrance of the room. Relocation of generator is necessary. Next door is warehouse.	△
~~52~~	~~GUNUNG KIDUL 1~~	~~YOGYAKARTA~~			~~✓~~													
53	GUNUNG KIDUL 2	YOGYAKARTA	BPBD		✓			✓	10x10m	Biside new	Limestone	—	Vehicle access OK	Exist 10x10m	—	—	No commercial power service. 10m extention of power line is necessary.	○
54	KEBUMEN	CENTRAL JAVA	BPBD		✓			✓	4x4m	Biside new shelter	Sandy Clay GWL-1m	—	Vehicle access OK	—	—	—	Currentry paddy field. It will fill up 1m for the office expantion. Space is enough. However, paddy field is not good for seismograph installation.	×
55	KULON PROGO	YOGYAKARTA	BPBD		✓			✓	4x4m	Biside new shelter	Gravel GWL-5 m	Vanana tree	In the site carry in by man power	—	—	—	To septic tank 6m. Motorcycle parking is adjacent but nobody does not use now.	○
56	MAGELANG	CENTRAL JAVA	BKPB		✓			✓	3x3m	Biside new shelter	Clayey Sand GWL-2m	—	Vehicle access OK	—	—	—	Owner is concerned about landscape and request to make facility as small as possible. Solar system is recommended since power failure occurs often.	○
57	PURWOREJO	CENTRAL JAVA	BPBD		✓	✓			5.0x1.9m	Front gate of office		—	Vehicle access OK	—	—	—	Currently warehouse. Next room is office.	△
58	SLEMAN	YOGYAKARTA	BMKG		✓			✓	4x4m	Biside new shelter	Surface :0.5m Below 0.5am is Limestone	—	In the site carry in by man power	—	—	—	Candidate site is back side of staff dormitory. Ina-TEWS site.	×

Site Sruvey Result （4／8）

No	Name	Location	Land Owner	Instration Type A Broadband Seismograph	Instration Type B Strong Motion Seismograp	Condition of Installation Space: Inside of Outside: Inside: Room	Inside: Shelter	Outside: New	Outside: Avairable area	Space for Parabola	Ground Condition	Temporaly Works and Others: Proximity Structures	Access Condition	Necessity of Fence	Solar Necessity: Necessity Need：○ No：—	Solar Necessity: Space Avairability	Remarks	Primary Decision Good：○ Considerable：△
59	KOTA YOGYAKARTA	YOGYAKARTA	Local Government		✓	✓			3.5x3.5m	Roof of BPBD office		—	Vehicle access OK	—	—	—	Next room is disaster exhibition room.	○
60	WONOGIRI	CENTRAL JAVA	Local Government		✓			✓	4x4m	Biside new shelter	Clayey sand GWL-3m	Remove concrete:4x 4x0.2m	Vehicle access OK	—	—	—	—	△
61	SUKOHARJO	CENTRAL JAVA	BPBD		✓			✓	4x4m	Biside new shelter	Clayey sand GWL-5.0m	—	In the site carry in by man power	—	—	—	—	○
62	BANYUWANGI SITE	EAST JAVA	BPBD		✓	✓			4.2x3.1m	Front of Office, on the grass		—	Vehicle access OK	—	—	—	Currently the room is used for warning system operation. The room will be sheard with warning system operation.	○
63	PUGER SITE	EAST JAVA	Local Government		✓			✓	4x4m	Biside new shelter	Clyey Sand GWL-4m	Roof of existing house: Remove	In the site carry in by man power	—	—	—	—	○
64	KEPANJEN	EAST JAVA	BPBD		✓			✓	4x4m	Biside new shelter	Sandy Clay GWL-1m	—	アクセス有	—	—	—	Candidate site is next to paddy field. Geological condition must be confirmed. 0.5m raising is necessary.	×
65	YOSOWILANGUN SITE	EAST JAVA	Local Government		✓	✓			4.8x1.8m	Back yard		—	Vehicle access OK	—	—	—	Next room is office.	○
66	BINANGUN SITE	EAST JAVA	Local Government		✓	✓			3x1.8m	Outside of the room		—	Vehicle access OK	—	—	—	Next room is office.	○
~~67~~	~~KALIDAWIR SITE~~	~~EAST JAVA~~			~~✓~~												No space.	×
68	WATULIMO	EAST JAVA	Local Government		✓	✓			1.8x1.8m	Outside of the room		—	Vehicle access OK	—	—	—	PDAM office. Next room is warehose.	△
69	BPBD PACITAN	EAST JAVA	BPBD		✓			✓	4 x 4m	roof	Clayey Sand GWL-1.0m	Cut 2 tree	Vehicle access OK	—	—	—	20cm raising is necessary.	○
70	BONJOR	WEST SUMATRA	Local Government		✓			✓	10x10m	Inside of fence	Silty Sand	—	Vehicle access OK	Need	—	—	—	○
71	KUMPULAN BANANG/ LINGGAU （CAMAT）	WEST SUMATRA	Local Government		✓			✓	10x10m	Inside of fence	Sandy Silt	—	Vehicle access OK	Need	—	—	Water accumulates in the site when it is hard rain. Embankment or raising of base is necessary.	○
72	LUBUK BASUNG	WEST SUMATRA	Local Government		✓			✓	4x4m	Ground	Sandiy clay	—	Vehicle access OK	—	—	—	—	○
73	LUBUK MATA KUCING Same location to 111 JISNET	WEST SUMATRA	BMKG		✓													
74	MUARA LABUH	WEST SUMATRA	Local Government		✓			✓	4x4m	Ground	Laterite	Remove existing parabola	Vehicle access OK	—	—	—	Shelter will be constructed adjacent to fence.	○
75A	MUARA SIBERUT	WEST SUMATRA	Local Government		✓			✓	4x4m	Ground	Silty soil	—	Vehicle access OK	—	○	○	Loading onto ferry boat shall be done by man power. Electricity is supplied for 24 hours by generator.	○
76	PAINAN	WEST SUMATRA	Local Government		✓			✓	10x9m	Inside of fence	Laterite	—	Vehicle access OK	Need	—	—	4 palm tree locating parabola direction can be cut. Site is next to the car parking paved by concrete, however nobody does not use car	○
77	RAO	WEST SUMATRA	Local Government		✓			✓	5.5x7m	Ground	Silty Sand	—	Vehicle access OK	Need	—	—	—	○
~~78~~					✓												This site number was deleted since the site is same place as 204BMKG site.	
79	TALANG BABUNGO	WEST SUMATRA	Local Government		✓			✓	10x10m	Inside of fence	Back fill in 2002（10m）	—	Vehicle access OK	Need	—	—	—	○
80	UNP- PADANG	WEST SUMATRA	State University		✓			✓	4x4m	Ground	Silty Sand	—	Vehicle access OK	—	—	—	—	○

Site Sruvey Result （5／8）

No	Name	Location	Land Owner	Instration Type A: Broadband Seismograph	Instration Type B: Strong Motion Seismograp	Condition of Installation Space: Inside of Outside: Inside: Room	Inside: Shelter	Outside: New	Outside: Avairable area	Space for Parabola	Ground Condition	Temporaly Works and Others: Proximity Structures	Access Condition	Necessity of Fence	Solar Necessity: Necessity (Need: ○ No: —)	Solar Necessity: Space Avairability	Remarks	Primary Decision (Good: ○ Considerable: △)
81	PASIGOPPA	WEST SUMATRA	Local Government		✓			✓	4x4m	Ground	Silty Sand	—	Vehicle access OK	—	○	○	Loading onto ferry boat shall be done by man power. Electricity is supplied from 17:00 to 7:00.	○
82	ARGO PANCURAN SITE	LAMPUNG	ESDM PVMBG		✓			✓	6x6m	Ground	Weatherd Rock	—	Vehicle access OK	Need	—	—	Land permission shall be done by HQ.	○
82A1	KALIANDA	LAMPUNG	BNPB		✓			✓	10x10m	Inside of fence	Sandy Clay Previously Rice Field	Elevated tank: H=5m, Small pump	Vehicle access OK	Need	—	—	50cm of surface soil might be rubble. Depression shall be fill up with about 5m3 soil. Banana tree should cut.	△
82A2	KATAPANG	LAMPUNG	Local Government		✓			✓	6x6m	ground	Sandy Clay	Cut mango tree	Vehicle access OK	Need	—	—	Site is next to road, however, road traffic is very small. 2 mango tree shall be cut.	△
83	BENGKUNAT SITE	LAMPUNG	Local Government		✓			✓	10x10m	Inside of fence	Sandy Clay	—	Vehicle access OK	Need	—	—	Depression shall be filled up by 5m3 soil.	○
84	KOTA AGUNG SITE	LAMPUNG	Islamic Center		✓			✓	10x10m	Inside of fence	Sandy Clay	—	In the site carry in by man power	Need	—	—	Arownd 10 vanana tree shall be cut.	○
85	KRAKATAU SITE	LAMPUNG	Ministry of Forestry		✓			✓	6x6m	Close to beach	V olcanic Ash	—		—	○	Sunshine hours are limited by 2 PM	Distance from site to parabola is about 80m. Cutting of tree is prohibited since the place is nature conservation area. Fence shall be constructed at shelter site and solar parabola site. Charter boat is necessary for transpotation. All work shall be done by man	×
86	KRUI SITE	LAMPUNG	Air Port		✓			✓	10x10m	Inside of fence	Silty Sand	—		Need	—	—	Next to the site, BMKG has a plan to establish weather observation station (20mx20m area) in the future.	○
87	LIWA SITE	LAMPUNG	BMKG		✓			✓	10x10m	Inside of fence	Sandy Clay	—		—	—	—	Part of area is using for cavege farm. Land leveling is necessary because there is uneven.	×

A6-5

JISNET

No	Name	Location	Land Owner	Instration Type A: Broadband Seismograph	Instration Type B: Strong Motion Seismograp	Condition of Installation Space: Inside of Outside: Inside: Room	Inside: Shelter	Outside: New	Outside: Avairable area	Space for Parabola	Ground Condition	Temporaly Works and Others: Proximity Structures	Access Condition	Necessity of Fence	Solar Necessity: Necessity (Need: ○ No: —)	Solar Necessity: Space Avairability	Remarks	Primary Decision (Good: ○ Considerable: △)
101	BAKI Change to LUWI BUDI	Papua	BMKG	✓				✓	10x10m	Inside of fence	Sandy Clay	—		—	—	—	Power will be taken from radar tower.	○
102	BJI	Central Java	BMKG	✓			✓		Inside of Pit Stage:1.5m ×0.6m	Ground	Hard Rock	—	In the site carry in by man power	—	—	—	—	○
103	BSI	Aceh (Nanggro Aceh Darusalam)	BMKG	✓			✓		Existing Pit	Inside of site or Roof	Hard Rock	—		—	—	—	1.2x1.2m pit locating middle of the mountain slope, 80m far from BMKG offce. It has stage 0.5x0.5m size.	○
~~104~~				✓										—				
105	KDI	Southeast Sulawesi	BMKG	✓			✓		3.8×1.98 Existing Shelter	Inside of site	Hard Rock (Limestone)	—	In the site carry in by man power	—	—	—	JISNET seismograph is setting on the stage of 1.30×1.35m。	○
106	Kahang Kahang	Bali	BMKG	✓			✓		4x5m Existing Shelter	Inside of site	Hard Rock	—	150m climb in by man power	Exist	—	—	JISNET shelter is located 150m far from BMKG office.	○
~~106A~~	Kahang Kahang	Bali	BMKG	✓				✓	4x4m	Inside of site	Sasndy Silt	—	Vehicle access OK	Exist	—	—	Inside of weather station. Road nize is large.	△
107	KSI	Bengkulu	BMKG	✓				✓	10x10m	Inside of fence	Sandy silt	—	Vehicle access OK	—	—	—	Existing pit is full of another equipment. New shelter construction is necessary.	○
~~108~~	~~LSI~~	~~West Jawa~~		✓													Already updated by BMKG. Therefore, delete from candidate site.	

Site Sruvey Result （6／8）

No	Name	Location	Land Owner	Instration Type A Broadband Seismograph	Instration Type B Strong Motion Seismograp	Condition of Installation Space: Inside of Outside: Inside: Room	Inside: Shelter	Outside: New	Outside: Avairable area	Space for Parabola	Ground Condition	Temporaly Works and Others: Proximity Structures	Access Condition	Necessity of Fence	Solar Necessity: Necessity Need：○ No：—	Solar Necessity: Space Avairability	Remarks	Primary Decision Good：○ Considerable：△
109	MNI	North Sulawesi	BMKG	✓		✓			Inside：3x3m x2 Rooms Outside：Bunker for	Replace existing antenna	Hard Rock (Lava)	Generator（will be moved）	In the site carry in by man power	—	—	—	Inside:two rooms are avairable. Outside: Underground bunker is avairable. There is a stage 70×70cm。	○
110	PCI	Central Sulawesi	BMKG	✓			✓		Pit: 1.2x1.2m. Stage:0.5x0.	Replace existing antenna	Hard Rock	—	In the site carry in by man power	—	—	—	New pit construction is necessary.	○
111	PPI （Lubuk Mata Kucing）	West Sumatra	BMKG	✓				✓	Existing Pit	Inside of site	Laterite	—	In the site carry in by man power	—	—	—	JISNET is operating with new BB seismograph. However, it wil replace by new equipment.	○
112	PTK （Newly constructed）	West Kalimantan	BMKG	✓				✓	10×10m	Inside of fence	Alvium GWL-0.5m	—	In the site carry in by man power	—	—	—	Soft soil. Other office are using 4m pile for foundation. Drainage is also nexessary.	×
113	SWH	East Jawa	BMKG	✓			✓		6x8m	Beside of new shelter	Hard Rock	—	300m climb in by man power	Need	—	—	Shelter doesn't have roof. All equipment set up in the pit.	○
114	TARA（Newly Constructed）	East Kalimantan	Local Government	✓				✓	10×10m	Inside of fence	Sandy soil GWL-1.0m	—	In the site carry in by man power	—	—	—	It is an alternative site. Existing facility will be destructed because of airport expansipn.	○
~~115~~																		
116	TLE2	Maluku	BMKG	✓			✓		Outside: Pit Inside: Existing AC	Roof or inside of site	Volcanic Rock	Wireless antenna & support wire, 30m to traffic road	In the site carry in by man power	—	—	—	Stage for JISNET is 38x38cm size. Therefore, remake is necessary. New shelter construction is also one of selection. Road is close about 15m distance.	○
117	TPI	Bangka Belitung	BMKG	✓			✓		Bunker: 2x6m	Reeplace or inside of site	Granite	—	Vehicle access OK	—	—	—	Existing shelter is avairable. It has a stage 1.0 x2.0m×0.5（H）size.	○
118	WAMI	Papua	BMKG	✓			✓		Shelter: 2.3x2.3m	North corner of aite	Sandy Silt	—		—	—	—	Stage size is 0.7x1.0m	○
119	WAINGAPU	Nusa Tenggara	BMKG	✓			✓		Existing Pit	front of office	Haed Rock	—	Vehicle access OK	—	○	○	Road is close and has a problem with noize.	×
119A	WAINGAPU (Newly Constructed)	Nusa Tenggara	BMKG	✓				✓	Existing Shelter	front of office	Haed Rock	—	Vehicle access OK	Exist	○	○	TDS設置済み。データは無線で事務所まで200m飛ばす。	○
BMKG Existing																		
201	CALANG	Aceh	BMKG	✓			✓		Existing Shelter with fence: 7.5x7.5m	Inside of fence	Andesite Lava	—	In the site carry in by man power	Exist	—	—	No door, at fence. Lader is necessary to enter. New power contract is necessary.	○
202	SUBULUSSALAM	Aceh	BMKG	✓			✓		Existing Shelter with fence: 10x7m	Inside of fence	Sandy Silt	—	Vehicle access OK	Exist	—	—	Existing shelter. Gate of fence is broken. Inside door is not exist. Pit is under the construction. Wall has some crack however not significant problem for strength of shelter.	○
203	Teluk Dalam	North Sumatra	BMKG	✓			✓		Existing Shelter no fence: 10x10m	Inside of fence	Hard Rock (Limestone)	Many trees, 60m to stone mining	In the site carry in by man power	—	—	—	130m far from power survice line. New power contract is necessary. Shelter has some crack however not structure problem.	○
204	Simpat Empat	WEST SUMATRA	Local Government Shelter:BMKG	✓			✓		Existing Shelter with fence: 10x10m	Inside of fence	Silty Sand	—	Vehicle access OK	Exist	—	—	Existing shelter constructed for 7 years. After construction nobody use. Key shall be changed.	○
205	Banjarnegara Jawa Tengah	Central Java	BMKG	✓		✓			Existing Shelter with fence: 10x12m	Inside of fence	Andesite Lava	—	Vehicle access OK	Exist	○	○	Local BMKG request 300m power line extention.	○

Site Sruvey Result （7／8）

No	Name	Location	Land Owner	Instration Type A: Broadband Seismograph	Instration Type B: Strong Motion Seismograp	Condition of Installation Space: Inside of Outside: Inside: Room	Inside: Shelter	Outside: New	Outside: Avairable area	Space for Parabola	Ground Condition	Temporaly Works and Others: Proximity Structures	Access Condition	Necessity of Fence	Solar Necessity: Necessity (Need: ○ No: —)	Solar Necessity: Space Avairability	Remarks	Primary Decision Good: ○ Considerable: △
206	Morotai	North Maluku	BMKG	✓			✓		Existing Shelter with fence: 11×11m	Inside of fence	Weatherd taff	stone mining located along main road. Almost finish and never expand	100m climb in by man power	Exist	—	—	Shelter has 1x0.7m stage in the pit. Two equipment can be installed. Almost 100m far from main road. 6 hour power supply per day.	○

Additional Sites

301	Kelurahan Joglo Jakbar	West Jakarta	Local Government		✓			✓	4x4m or 3x3m	Roof or front of office	Silt Alluval	70m from main road	In the site carry in by man power	—	—	—	Did not get even verbal agreement. Confirmation after site layout plan, reconfirm is necessary.	○
302	Kelurahan Cilandak Barat	South Jakarta	Local Government		✓			✓	3×8m	Roof	Silte	100~200m to 4 skyskreper. 20~30 floor	In the site carry in by man power	—	—	—	Later, confirmation for land usage is necessary.	△
303	Museum Purna Bakti Pertiwi TMII Change to Kelurahan DUKUH	East Jakarta 1	Local Government		✓			✓	4.5×3.7m	North East coner	Sandyu Silt	Pond: Removable	Vehicle access OK	—	—	—	Limitted for parabola placement since there is very dense area.	×
304	Kelurahan DUREH SAWIT	East Jakarta 2	Local Government		✓			✓	3×3m	Roof	Silt	—	In the site carry in by man power	—	—	—	12m water tower is located in 12 far from site.	×
305	Kelurahan Kapuk Muara Change to Kelurahan PENJARINGAN	North Jakarta 1	Local Government		✓			✓	7×9m	Esat side of new shelter	Silt	Close to fuel station	In the site carry in by man power	—	—	—	20m far from very busy traffic road.	×
306	KABUPATEN BADUNG	Bali	Local Government		✓			✓	6X6m	Inside of site	Silty Sand	—	In the site carry in by man power	Exist	—	—	Request letter from BMKG is necessary.	○
307	TABANAN	Bali	Local Government		✓			✓	4x4m	Inside of site	Silty Sand	—	In the site carry in by man power	—	—	—	Groundwater level : GL-2m	○
308	Krakatau Steel Change to Kecamatan CITANGKIL	Cilegon 1	Local Government		✓			✓	5×7m	Inside of fence	Loam	—	Vehicle access OK	Need	—	—	Corner of the parking paved by concrete block	△
309	Kelurahan Gunung Sugih	Selat Sunda Bridge 1 Anyer	Local Government		✓			✓	5×5m	Roof	Loam	Many trees (H=10 ~15m), Ancour of tower	In the site carry in by man power	Exist	—	—	Tree cutting is necessary. Land is gentry sloping therefroe soil cutting is necessary.	○
310	PLN UPJ Anyer Change to Kelurahan ANYER	Cilegon 2	Local Government		✓			✓	3×3m	Roof	Sandy Silt	Power trensmission tower and transformer station	In the site carry in by man power	—	—	—	Very close to power line/electric tower and transformer. However no electical noize problem. Close to the Snda big bridge start point. Therefore important area for observatory.	○
~~311~~	~~Kelurahan Bakauheni~~	~~Selat Sunda Brid~~	Could not find														Could not find the space.	
312	Bangka Belitung 3 thermal power station Change to BMKG KOBA	Kab.BangkaTenga	Province Bangka Belitung		✓			✓	10x10m	Inside of fence	Coas sand	—	Vehicle access OK	Need	—	—	Backfill a dipression is necessar. Inside of BMKG observatory.	○
313	Kelurahan Sibolga ilir Change to PINANGSORI SIBOLGA	Sibolga Sumatera Utara	BMKG		✓			✓	10x10m	Inside of fence	Sandy silt	wireless Antenna: H=15m、Runway: 250m、Generator: 50m、Airport car park: 20m	In the site carry in by man power	Need	—	—	While hard rain, water accumulate at candidate area. At least 25cm rising is necessary.	○
314	Cikubang	West Java 2	Local Government		✓			✓	6X10m	Inside of fence	Soil	—	In the site carry in by man power	Need	—	—	Cut soil at slope is necessary.	△

Site Sruvey Result （8／8）

No	Name	Location	Land Owner	Instration Type A: Broadband Seismograph	Instration Type B: Strong Motion Seismograp	Condition of Installation Space: Inside of Outside: Inside: Room	Inside: Shelter	Outside: New	Outside: Avairable area	Space for Parabola	Ground Condition	Temporaly Works and Others: Proximity Structures	Access Condition	Necessity of Fence	Solar Necessity: Necessity (Need: ○ No: —)	Solar Necessity: Space Avairability	Remarks	Primary Decision (Good: ○ Considerable: △)
315	PLTA Peusangan Change to REMBLE AIRPORT	Aceh Tengah SFZ	BMKG		✓	✓			3.88×3.27m	Front of office	Silt stone	—	Vehicle access OK	Need	—	—	BMKG building. However, nobody assained to this office long time. Gardener is using and very dirty now. Renovation is necessary.	×
316	Desa Talang Leak, embong panjang, Lebong	Sesar Sumatra dekat Bengkulu	BMKG		✓	✓			Existing BB site	Can use existing parabola?	Bank	—	100m人力	—	○	—	Ina-TEWSサイト	×
317	Kelurahan/Desa Kalisumur, Bumiayu-Brebes	Bumiayu Fault Central Java	Local Government		✓			✓	7×7m	Beside of new shelter	Gravel	—	Vehicle access OK	Need	—	—	Tree cut is necessary. (5 thin tree)	○
318	Kelurahan Giriasih, Pundong Bantul	YOGYAKARTA	Local Government		✓			✓	4×4m	Beside of new shelter	Sand GWL-2.5 m	cut tree	Vehicle access OK	—	—	—	There is a plan to build new office in the next to candidate site, Fence is not necessary.[	○
319	Kelurahan Palmerah	West Jakarta	Local Government		✓			✓	5.4×6m	Roof or beside shelter	Sandy Silt	—	Vehicle access OK	Need	—	—	Cnadidate are can not enter without pass the office entrance. However, it is better to built fence cause of unperceived area.	△
320	Kecamatan Palogadung	East Jakarta	Local Government		✓			✓	5×5m	Beside of new shelter	Sandy Silt	Telecom Tower: H=45m, Distance:	In the site carry in by man power	—	—	—	To keep distance from hydrant.	○