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NATIONAL DISASTER
MANAGEMENT AUTHORITY

**DATA COLLECTION SURVEY
ON
DISASTER RISK REDUCTION**

FINAL REPORT

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JAPAN INTERNATIONAL COOPERATION AGENCY
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YACHIYO ENGINEERING CO., LTD
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DATA COLLECTION SURVEY
ON
DISASTER RISK REDUCTION
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Table of Contents

Table of Contents

List of Figures and Tables

Abbreviation

Chapter 1.	Background, Purpose and Outline of the Survey	1-1
1.1	Background of the Survey	1-1
1.2	Purpose of the survey	1-1
1.3	Survey Overview	1-1
1.3.1	Member of Study Team	1-2
1.3.2	Work Process	1-2
Chapter 2.	Natural Disaster and Damage in Indonesia.....	2-1
2.1	Main Natural Disasters and Damage.....	2-1
2.2	Economic Loss of Natural Disaster.....	2-2
2.3	Recent Major Natural Disasters	2-3
2.3.1	Lombok Earthquake (2018).....	2-4
2.3.2	Earthquake and Tsunami Disaster in Central Sulawesi	2-7
2.3.3	Volcanic Disaster in Banten Province	2-8
Chapter 3.	Present Situation and Problems on Disaster Management Fields in Indonesia and the International Regional Context.....	3-1
3.1	International and Regional Context.....	3-1
3.1.1	Global Trends on DRR.....	3-1
3.1.2	Cooperation at the Regional Level	3-6
3.2	Historical Variation of DRR in Indonesia.....	3-7
3.3	Disaster-Related Regulations and Framework in Indonesia.....	3-7
3.3.1	DRR and Development Targets /DRR in National Plans	3-7
3.3.2	DRR Related Regulations	3-8
3.3.3	Other Regulations Related to Local DRR	3-8
3.4	DRR Governance in Indonesia.....	3-8
3.4.1	Development Plan, DRR Strategy and Guideline	3-8
3.4.2	Organizational Structure of Disaster-related Institutions	3-9
3.4.3	DRR Implementation in Indonesia.....	3-13
3.4.4	DRR Implementation & Budget.....	3-18
3.4.5	Efforts of DRR by Local Governments.....	3-20
3.5	JICA Assistance in DRR.....	3-23
3.6	Other Donor's Assistance in DRR	3-25
3.7	Challenges in DRR Sector in Indonesia	3-26
Chapter 4.	Data Collection and Analysis Based on Disaster Types.....	4-1
4.1	Earthquake and Tsunami	4-1
4.1.1	Characteristics of Recent Earthquake and Tsunami Damage	4-1
4.1.2	The effort of the Government of Indonesia	4-4
4.1.3	Cooperation by JICA.....	4-19
4.1.4	Cooperation by Other Donors	4-21
4.1.5	Evaluation of Disaster Risks and Identified Challenges.....	4-23
4.2	Meteorology & Early Warning Systems.....	4-33

4.2.1	Characteristics of Recent Meteorology	4-33
4.2.2	Efforts of the Government of Indonesia	4-38
4.2.3	Cooperation by JICA.....	4-46
4.2.4	Cooperation by Other Organizations	4-46
4.2.5	Evaluations of Disaster Risks and Identified Challenges	4-50
4.3	Water Induced Disasters	4-55
4.3.1	Characteristics of Recent Water Induced Disasters	4-55
4.3.2	Efforts by the Government of Indonesia	4-58
4.3.3	Cooperation by JICA.....	4-61
4.3.4	Cooperation by Other Donors	4-62
4.3.5	Evaluations of Disaster Risks.....	4-67
4.3.6	Identified Challenges on Floods.....	4-85
4.3.7	Identified Challenges on Landslides	4-90
4.4	Coastal Disasters (Storm surge and Coastal Erosion)	4-92
4.4.1	Characteristics of Recent Storm Surge and Coastal Erosion.....	4-92
4.4.2	Efforts by the Government of Indonesia	4-93
4.4.3	Cooperation by Donors	4-96
4.4.4	Actions of Private Sectors	4-96
4.4.5	Evaluation of Disaster Risks and Identified Challenges.....	4-96
4.5	Volcanic Eruptions	4-97
4.5.1	Characteristics of Recent Volcanic Disasters	4-97
4.5.2	Efforts by the Government of Indonesia	4-99
4.5.3	Cooperation by JICA.....	4-104
4.5.4	Cooperation by Other Donors	4-106
4.5.5	Evaluation of Disaster Risks and Identified Challenges.....	4-107
4.6	Forest and Peatland Fire	4-126
4.6.1	Characteristics of Recent Forest and Peatland Fire	4-126
4.6.2	Cooperation by JICA.....	4-127
Chapter 5.	Direction of Problem Solving on DRR.....	5-1
5.1	Outline of Problem Solving on DRR.....	5-1
5.1.1	Problem Solving on DRR.....	5-1
5.1.2	Summary of Problems Solving on DRR	5-4
5.2	Direction for Problem Solving in Disaster Management	5-5
5.2.1	International Targets and Indonesian Goals.....	5-5
5.2.2	Basic Concepts for Problem Solving in Disaster Management Sector.....	5-6
5.2.3	Recommendations for RPJMP and NDMP (Efforts needed for DRR).....	5-7
5.2.4	Necessary DRR Budget in Indonesia	5-9
5.3	Japanese DRR Technologies Applicable to Indonesia.....	5-10
Chapter 6.	Development of the Tentative Cooperation Policy by JICA for Disaster Risk Reduction in Indonesia.....	6-1
6.1	Overview	6-1
6.2	The direction of Cooperation Policy	6-2
6.3	Tentative Cooperation Policy for the Solutions to the Challenges by Each Disaster Variety.....	6-12
6.3.1	Earthquake and Tsunami	6-15
6.3.2	Meteorology & Early Warning Systems.....	6-22
6.3.3	Water Induced Disasters (Floods and Landslides).....	6-25
6.3.4	Coastal Disasters (Storm Surge and Coastal Erosion).....	6-34
6.3.5	Volcanic Eruption	6-34
6.3.6	Forest and Peatland Fire Control.....	6-38
Chapter 7.	Formulating DRR Risk Index/ Sub-Index	7-1
7.1	Current Situation and Problem of Risk Index	7-1
7.1.1	Current Situation of Risk Index.....	7-1
7.1.2	Current Problem of RI.....	7-6
7.2	Direction of Improvement for Risk Index	7-7
7.2.1	Basic Concept for Improvement of Risk Index (Formulating Sub-Index).....	7-8
7.2.2	Outline of Formulating Sub-index.....	7-9
7.3	Formulating Sub-index as a Case Study.....	7-9

7.3.1	Manado City (Flood)	7-9
7.3.2	Banda Aceh City (Flood, Tsunami)	7-15
7.4	A Study on Indexing.....	7-22
7.4.1	The basic concept of indexing.....	7-22
7.4.2	Method of Indexing.....	7-23
7.5	Future Challenges for Subindex Construction	7-26
7.5.1	Issues in hazard assessment and assessment of structural countermeasures	7-26
7.5.2	Issues in Indexing.....	7-27

List of Figures

Figure 2-1	Occurrence Number of Disasters.....	2-1
Figure 2-2	Economic Loss by Disasters.....	2-1
Figure 2-3	Affected People Ratio.....	2-1
Figure 2-4	Death Toll Ratio.....	2-1
Figure 2-5	Recent Major Natural Disasters.....	2-4
Figure 2-7	Impact map by BNPB (August 11, 2018).....	2-5
Figure 2-8	Collapsed Mosque soon after praying time	2-5
Figure 2-9	Figure 4: Collapsed Mosque in North Lombok (2)	2-5
Figure 2-10	Damaged Public Hospital (RSUD) Tanjung, North Lombok District (no more function)	2-6
Figure 2-11	Evacuated patients in RSUD Tanjung on August 5, 2018	2-6
Figure 2-12	Partially damaged Office of BPBD North Lombok District.....	2-6
Figure 2-13	Partially damage of building in Mataram University	2-6
Figure 2-14	Collapsed house due to poor construction methods (1).....	2-6
Figure 2-15	2-15 Collapsed house due to poor construction methods (2).....	2-6
Figure 2-16	Indonesia Earthquake Source and Hazard Map (Peta Gempa Bumi 2017)	2-7
Figure 2-17	Pantoloan Tidal Station (JICA Study Team - 2018).....	2-7
Figure 2-18	Sediment Flow in Petobo.....	2-8
Figure 2-19	Local people confirmed the mosque is originally located around 400 meters from this site....	2-8
Figure 2-20	Missing part of “Anak Krakatau” Volcano based on satellite image analysi.....	2-8
Figure 3-1	International Trend of Disaster Prevention.....	3-2
Figure 3-2	International Trend of DRR and Major Disasters.....	3-3
Figure 3-3	Outline of APEC DRR framework	3-6
Figure 3-4	Organization Chart of BNPB.....	3-10
Figure 3-5	Organization Chart of BPBD North Sulawesi Province	3-10
Figure 3-6	Organization Chart of BPBD Banda Aceh City.....	3-11
Figure 3-7	Disaster Management Cycle.....	3-13
Figure 3-8	Multi-Hazard Risk Map (IRBI 2013, BNPB).....	3-13
Figure 3-9	Residents in Klaten repair river embankments	3-15
Figure 3-10	National DRR Budget as Advanced Investment.....	3-19
Figure 3-11	Ratio of DRR Budget to National Budget	3-19
Figure 3-12	CCTV installed in Dendengan Luar district, Manado City CCTV	3-21
Figure 3-13	DRR Budget of BPBD Banda Aceh City (2017).....	3-23
Figure 3-14	Amounts of ODA Loans and Grant Aid (E/N basis) and the number of Projects.....	3-23
Figure 4-1	Tectonic Plate Setting around Indonesia.....	4-1
Figure 4-2	Death and Missing due to Earthquakes and Tsunami in Indonesia after 1990 (April 2019)	4-3
Figure 4-3	Mentawai~Siberut Plate Segment.....	4-4
Figure 4-4	Process for Construction and Inspection of Buildings in Indonesia	4-6
Figure 4-5	Earthquake Hazard Map	4-7
Figure 4-6	Seismic Sources in Indonesia 2017	4-8
Figure 4-7	Tsunami Hazard Map 2012 (Tsunami Height by Kabupaten / Kota with 500-year return period)	4-10
Figure 4-8	TES Construction Sites (2014 Budget).....	4-11
Figure 4-9	Outline of InaTEWS.....	4-11
Figure 4-10	Earthquake Observation Network of Indonesia.....	4-12

Figure 4-11 Three Pillars of Safe School Program.....	4-12
Figure 4-12 Process of Stimulant Aid for Self-Help Houses.....	4-14
Figure 4-13 Role of Facilitator of Stimulant Aid for Self-Help Houses.....	4-14
Figure 4-14 Subsidized Housing Loan for Low-Income Group.....	4-15
Figure 4-15 Build Back Better Planning of Banda-Aceh.....	4-16
Figure 4-16 Public Buildings with Base isolation Structure Constructed after Off Smatra Island Earthquake	4-18
Figure 4-17 Tsunami Memorial Poles Built at Banda-Aceh	4-21
Figure 4-18 Tsunami Evacuation Shelters (TES) Built at Banda Aceh.....	4-27
Figure 4-19 Tsunami Evacuation Map of Banda Aceh.....	4-28
Figure 4-20 Improvement Plan for Coastal Areas of Banda Aceh considering Tsunami DRR (Spatial Plan of Banda Aceh 2009-2029)	4-29
Figure 4-21 Cross-section View of Break Water (Spatial Plan of Banda Aceh 2009-2029)	4-29
Figure 4-22 Break Water and Mangrove Forest	4-30
Figure 4-23 Fault Map around Aceh	4-30
Figure 4-24 2010 Seismic Hazard Map.....	4-31
Figure 4-25 2017 Seismic Hazard Map.....	4-31
Figure 4-26 Share of DRR Budget in Total Budget of Banda Aceh (Oktari et al)	4-32
Figure 4-27 Major Tsunami Ruins in Banda Aceh.....	4-32
Figure 4-28 Aceh Tsunami Museum Visitors (Source: Aceh Tsunami Museum).....	4-32
Figure 4-29 Monthly Average Temperature in Indonesia.....	4-34
Figure 4-30 Monthly Average Precipitation in Indonesia	4-35
Figure 4-31 MCCOE Radar Buoy Network in SATREPS	4-35
Figure 4-32 Variation of Average Maximum Temperatures in Mid-term and Long-term (top: RCP 4.5, bottom: RCP 8.5).....	4-36
Figure 4-33 Agricultural Vulnerability Map on Climate Change.....	4-37
Figure 4-34 Average River Basin Discharge Trend Map on Climate Change.....	4-37
Figure 4-35 Mortality by Disaster Types.....	4-38
Figure 4-36 Annual Disaster Occurrence and Mortality	4-38
Figure 4-37 Disaster management organization structure by administrative level	4-40
Figure 4-38 infoBMKG interface.....	4-42
Figure 4-39 Framework of MEWS	4-43
Figure 4-40 Interface of FEWEAS Citarum River.....	4-43
Figure 4-41 Information Transmission Flow of InaTEWS	4-49
Figure 4-42 Overview of Rainy Season and Dry Season in Indonesia.....	4-55
Figure 4-43 Disaster Occurrences by Type over 10 Year (DIBI, BNPB).....	4-56
Figure 4-44 Flood Disaster Occurrences by Province over 10 Year (DIBI, BNPB)	4-56
Figure 4-45 Flood with Landslide Disaster Occurrences by Province over 10 Years (DIBI, BNPB).....	4-57
Figure 4-46 Profiles by Major Statistics on Floods (1980-2017, EM-DAT).....	4-57
Figure 4-47 Information Communication Flow on Disasters between PUPR and BNPB	4-59
Figure 4-48 Command System for DRR in PUPR.....	4-60
Figure 4-49 Provincial Region Flood Disaster Risk Exposure Amount Matrix.....	4-68
Figure 4-50 Provincial Region Landslide Disaster Risk Exposure Amount Matrix	4-68
Figure 4-51 Damage Risks due to Floods by Province (IRBI: Index Rawan Bencana Indonesia)	4-68
Figure 4-52 Damage Risks due to Landslides by Province (IRBI, 2013)	4-69
Figure 4-53 Regencies for Disaster Management Priority Zone (ZPPBA) in Aceh Province.....	4-70
Figure 4-54 Location of the Floodway and Diversion Point in the Krueng Aceh.....	4-71
Figure 4-55 Current Situations at Diversion, Floodway and Krueng Aceh (February 2017).....	4-72
Figure 4-56 Inundation Areas and Picture in Manado by Flood Event in January 2014.....	4-73
Figure 4-57 Current Situations in Tondano and Sario River (February 2018).....	4-74
Figure 4-58 Automatic Water Level Recorder in Tondano River (Assistance by JICA).....	4-74
Figure 4-59 Water Level Monitoring Station in Tondano River (Water Front City).....	4-75
Figure 4-60 Disaster Risk Areas by Floods and Landslides.....	4-75
Figure 4-61 Affected Ares by Floods in Surakarta.....	4-76
Figure 4-62 Inundation Situations during Floods (2013-2016).....	4-76
Figure 4-63 River Improvement Works in Surakarta	4-77
Figure 4-64 Flood Early Warning System in Community Based Flood Mitigation.....	4-78

Figure 4-65 Daily Rainfall and Geology Map in Jemblung, Central Java	4-79
Figure 4-66 Landslide and Mudflow Occurrences in Banjarnagra (December 2014)	4-80
Figure 4-67 Earthquake Induced Rock Falls in Bantul Regency, DI Jogjakarta (May 2006)	4-80
Figure 4-68 Classifications in Landslide Susceptibility Map.....	4-81
Figure 4-69 Landslide Susceptibility Map in Central Java	4-81
Figure 4-70 Landslide Susceptibility Map and Risk Map (Gunung Kidul, Jogjakarta).....	4-82
Figure 4-71 GPS Networks for Landslide Monitoring in Java Island	4-82
Figure 4-72 Extensometer for Landslide Monitoring.....	4-82
Figure 4-73 Drills for Landslide in Central Java.....	4-83
Figure 4-74 Factors and Elements of Landslide Hazard and Risk Evaluation (GAR)	4-83
Figure 4-75 Classification of Works for Landslide by Public Works Research Institute (PWRI), Japan... 4-84	4-84
Figure 4-76 GW Drainage Works, Embankment Loading and Pile Works (PWRI, Japan)	4-84
Figure 4-77 Target Areas for Relocation by River Works in Kali Pepe	4-89
Figure 4-78 Typical Cross Section for Parapet Facility in Bengawan Sola.....	4-89
Figure 4-79 Parapet Facilities in Bengawan Solo	4-90
Figure 4-80 Landslide Warning System Installed by UGM in Manado	4-91
Figure 4-81 Trace of Typhoon and Cyclone Occurrence (1945-2006).....	4-93
Figure 4-82 Breakwater with cobble stones Pantai Tanjung Bunga, Kabupaten Konawe Utara.....	4-94
Figure 4-83 Concrete Steps Revetment.....	4-94
Figure 4-84 Concret Blocks Revetment Desa TukadMungga, Bali North	4-94
Figure 4-85 Cobble Stones RevetmentMorotai Is., North Maluku	4-95
Figure 4-86 Natural Stone Revetment Pengaman Pantai Pulau Rupa Kab.Bengkalis BWS SUMATERA III RIAU, 2011.....	4-95
Figure 4-87 Concrete Beach Embankment Pantai Wameo, Kabupaten Bau-Bau, PUPR	4-95
Figure 4-88 Concrete Blocks Revetment Pantai Banding BBWS Mesuji Sekampung.....	4-95
Figure 4-89Offshore Breakwater Pantai Bahari, Kanupaten Buton Selatan (source: PUPR)	4-95
Figure 4-90 Mangrove restoration permeable structure (Hybrid engineering permeable structurek at Demak, Semaran) "Building with Nature" by NGO Wetland International.....	4-95
Figure 4-91 Aerial view of changes after sand nourishment, case of Sanur Beach, Bali	4-96
Figure 4-92 Location of Plates and Major Volcanoes around Indonesia.....	4-97
Figure 4-93 Distribution of Volcanoes in the World.....	4-97
Figure 4-94 Disaster Occurrences by Type over 10 years	4-98
Figure 4-95 Disaster Characteristics on Volcanic Eruption by Type	4-98
Figure 4-96 Location Map for Type A Volcanoes	4-100
Figure 4-97 Risk Assessment by Province on Volcanic Eruptions.....	4-101
Figure 4-98 Updated Risk Map on Volcanic Eruption Disasters.....	4-101
Figure 4-99 Risk Map on Volcanic Eruption Disasters at Mt. Merapi	4-102
Figure 4-100 Information Flow among the Related Agencies on Disaster Response	4-103
Figure 4-101 Situation of Sabo Dam broken by Debris Flow in 2010.....	4-110
Figure 4-102 Monitoring Post and Location of Monitoring Devices for Mt. Merapi	4-111
Figure 4-103 Monitoring Volcanic Activities at BBPTKG for Mt. Merapi.....	4-112
Figure 4-104 Historical Eruption Record of Mt. Merapi (BBPTKG, UGA).....	4-113
Figure 4-105 Disaster Hazard Map in Mt. Merapi	4-113
Figure 4-106Target Population for Evacuation for Each Hamlet.....	4-114
Figure 4-107 Target Population for Each Hamlet in Evacuation Area within 10 km from the Crater	4-114
Figure 4-108 Location of the Evacuation Centers for Each Evacuation Designated Area (Kab. Sleman).....	4-115
Figure 4-109 Evacuation Center in Desa Kepuharjo (Mt. Merapi Area)	4-115
Figure 4-110 Target Population for Evacuation, Capacity of Evacuation Center and Deficiency of Population for the Capacity (Desa Kepuharjo)	4-116
Figure 4-111 Target Population, Capacity of Evacuation Center and Deficiency of Population for the Capacity at each Shelter (Extracted from Figure Above)	4-116
Figure 4-112 Volcanic Eruption Hazard Map in Sakurajimam Japan	4-117
Figure 4-113 Debris Flows by Erupted Materials at Mt. Merapi in 2010 Event.....	4-119
Figure 4-114 Debris Flows and Pyroclastic Flow Occurrences in the Basins of Mt. Merapi	4-120
Figure 4-115 Outline of Urgent Disaster Reduction Project for Mount Merepi.....	4-121
Figure 4-116 River Works in Putih River (Normalization and Diversion Channel).....	4-121

Figure 4-117 River Works for Diversion Channel in the Putih River	4-122
Figure 4-118 Sand Pocket Works in the Gendol River.....	4-122
Figure 4-119 Sand Pocket Works in downstream of the Gendol River	4-123
Figure 4-120 Construction Example of Open Type SABO Dam	4-123
Figure 4-121 Ash Pouring of Volcanic Ash by Mt. Kelud Eruption.....	4-124
Figure 4-122 Hazard Areas of Mt. Kelud and Its Location	4-124
Figure 4-123 Houses Damaged by Eruptions.....	4-125
Figure 4-124 Outline of Past MoEF-JICA Corporation on Forest and Peatland Fire Control	4-127
Figure 5-1 Ratio of DRR Budget in the National Budget	5-9
Figure 5-2 Ratio of Flood Control Budget in the National Budget	5-10
Figure 6-1 Flowchart and Relation among the Tentative Priority Activities	6-11
Figure 6-2 Number of Base-Isolation Buildings in the World (Martelli et al, 2012)	6-19
Figure 6-3 Image of Countermeasures for Excess Flooding and Climate Change Adaptation	6-30
Figure 6-4 Flood Water Level Monitoring Station (Water Front City) in Tondano River.....	6-31
Figure 6-5 Draft Strategies in Cooperation for forest and Peatland Fire Control.....	6-39
Figure 6-6 Draft Midterm Strategic Program in Cooperation for Forest and Peatland Fire Control.....	6-40
Figure 6-7 Outline of Stakeholder Concerned with Forest and Land Fire Control (As of Dec. 2016)	6-42
Figure 6-8 Outline of TPD Model	6-45
Figure 7-1 Calculation Method for Flood Hazard.....	7-1
Figure 7-2 4 Questions of Indicator No.1.....	7-3
Figure 7-3 Result of Capacity Evaluation for Each Priority in Manado City in 2017	7-3
Figure 7-4 Risk Index map (IRBI 2013, BNPB)	7-4
Figure 7-5 Multi-Hazard Risk Index Map (IRBI 2013, BNPB).....	7-4
Figure 7-6 Weighting by Disaster Types	7-5
Figure 7-7 Target for RI reduction	7-5
Figure 7-8 DRR investment in Aceh and Capacity Evaluation	7-7
Figure 7-9 Formulating Sub-Index Based on Four Quantitative Indicators of SFDRR	7-7
Figure 7-10 An Example of Data and Analysis to Evaluate	7-8
Figure 7-11 Three Step for Sub-Index.....	7-8
Figure 7-12 Annual Plan for the Sophistication of Analysis Method.....	7-8
Figure 7-13 Position of Existing RI and Sub-index	7-9
Figure 7-14 PDNA Conducted in 2014 Flood in Manado.....	7-10
Figure 7-15 Inundation area Map of 2014 Flood in Manado	7-10
Figure 7-16 Comparison between the Actual Inundation Depth in 2014 and the Height of the Planned Embankment of MP	7-11
Figure 7-17 Outline of Master Plan.....	7-13
Figure 7-18 Result of Inundation Analysis (1/25 Possibility Rainfall)	7-14
Figure 7-19 Estimation of Flood Discharge by Creager 's Equation.....	7-15
Figure 7-20 Reproduction of Aceh River Flood Channel Effect.....	7-16
Figure 7-21 Assumption of Flood Discharge in the November 2000 Flood	7-17
Figure 7-22 Runoff Effect and Damage Estimation in the November 2000 Flood	7-17
Figure 7-23 Calculation Range	7-18
Figure 7-24 Comparison of Tsunami Height Occurred by Earthquakes around Banda Aceh City	7-19
Figure 7-25 Ring Road Plan in Banda Aceh City.....	7-19
Figure 7-26 Topography and Ring Road (Redline).....	7-20
Figure 7-27 Case 1 (Without Structure)	7-20
Figure 7-28 Case 2 (With Structure - broken at the same with overflow)	7-21
Figure 7-29 Case 3 (With Structure - no broken even after overflow)	7-21
Figure 7-30 Building Point Data in Banda Aceh City (Greened Area)	7-21
Figure 7-31 Average Annual Damage and Score.....	7-23
Figure 7-32 Manado City, Tondano River Basin.....	7-24
Figure 7-33 Score Comparison between Permanent Method and Interim Method and Temporary Method..	7-

List of Tables

Table 1-1 Study Team Member and Survey Fields	1-2
Table 1-2 Work Process.....	1-3
Table 2-1 Main Disasters in Indonesia.....	2-2
Table 2-2 Economic Loss of Natural Disaster in Indonesia (1,000US\$)	2-3
Table 2-3 Main Natural Disasters and Economic Loss	2-3
Table 3-1 DRR related Ministries & their Respective Roles.....	3-11
Table 3-2 Sample of major activities supported by the Japanese government in DRR sector	3-24
Table 3-3 Summary of projects/activities with the related units in BNPB.....	3-25
Table 4-1 Major Earthquakes and Tsunamis in Indonesia after 1990.....	4-2
Table 4-2 Building and Special Laws / Regulations.....	4-5
Table 4-3 Building Codes.....	4-5
Table 4-4 Details of Building Construction and Inspection in Indonesia.....	4-6
Table 4-5 Development of Disaster Hazard Maps (Extract of Presidential Decree No.9 / 2016)	4-8
Table 4-6 BNPB Tools for Disaster Information Management	4-9
Table 4-7 TES Construction Plan in Tsunami Master Plan	4-10
Table 4-8 Governing Laws and Regulations of “One Million Housing Program”	4-13
Table 4-9 Land-use Classification in Spatial Plan of Banda Aceh	4-16
Table 4-10 JICA Cooperation on Earthquake & Tsunami	4-19
Table 4-11 Typical Epigraph of Tsunami Memorial Pole.....	4-20
Table 4-12 Other Donors’ Cooperation on Earthquake & Tsunami	4-21
Table 4-13 Challenges on Earthquake and Tsunami.....	4-23
Table 4-14 Challenges of Banda-Aceh.....	4-27
Table 4-15 Applications for Recording Aceh Tsunami Reconstruction (CIAS, Koto University)	4-33
Table 4-16 Laws and Regulations Related with DRR and DRR Information	4-39
Table 4-17 Institutions taking charge on Non-structural Countermeasures	4-41
Table 4-18 Policy and Strategy on Early Warning in National Disaster Management Plan.....	4-45
Table 4-19 Projects Related to Early Warning Supported by JICA.....	4-46
Table 4-20 Problems/Gaps in Weather and Early Warning Disaster Management	4-50
Table 4-21 Indonesia’s Top Ten Rivers in Length.....	4-55
Table 4-22 Major Disasters on Floods, Flood with Landslides, Landslides (2013-2017).....	4-58
Table 4-23 Legal Systems (Laws, Decrees and Regulations) on Water Resources.....	4-61
Table 4-24 Cooperation Projects in Water Resources Sector by JICA.....	4-62
Table 4-25 Cooperation Projects by the World Bank	4-63
Table 4-26 Cooperation Projects by the World Bank	4-64
Table 4-27 Cooperation Projects by the Asian Development Bank (ADB)	4-65
Table 4-28 Cooperation Projects for BNPB from International Donors (All Projects/Programs)	4-66
Table 4-29 Cooperation Projects for PUPR from International Donors (DRR, WRD).....	4-67
Table 4-30 Selected Ten (10) Provinces for Implementation of Flood Mitigation Projects.....	4-69
Table 4-31 Disasters y Floods in Aceh Province.....	4-69
Table 4-32 Five (5) Strategies and Key Measures (Foci) in DMP in Aceh	4-70
Table 4-33 Implementation Plans on Rivers in BWS Sumatra I (RPJMN).....	4-71
Table 4-34 Monitoring Situations for Rainfall, Water level and Climate in BWS Sumatra I.....	4-72
Table 4-35 Status of Formulation for POLA and RENCANA in BWS Sumatera I	4-73
Table 4-36 Disasters in North Sulawesi (2013-2017)	4-73
Table 4-37 Implementation Plans on Rivers and Coastal in BWS Sulawesi I (RPJMN).....	4-75
Table 4-38 Status of Formulation for POLA and RENCANA in BWS Sulawesi I.....	4-76
Table 4-39 Outline of the River Improvement Works in Surakarta.....	4-77
Table 4-40 Classification of Landslides (VSI)	4-78
Table 4-41 Overall Issues on Floods under Four Fields in SFDRR	4-85
Table 4-42 Overall Issues on Landslides under Four Fields in SFDRR.....	4-90
Table 4-43 Major Volcanic Eruptions in Indonesia	4-99
Table 4-44 Classification on Volcanic Types in Indonesia	4-100
Table 4-45 Classification on Volcanic Alert Levels in Indonesia.....	4-102

Table 4-46 Status of Issuing on Volcanic Alert Levels at Mt. Agung.....	4-103
Table 4-47 Legal System on Sediment Disasters including Volcanic Eruptions.....	4-104
Table 4-48 Major Projects Implementing on “Volcanic SABO Projects”.....	4-105
Table 4-49 Master Plan Study on Sediment Disaster Mitigation Projects Implemented by JICA	4-105
Table 4-50 Major Volcanic SABO Projects Implemented by JICA	4-106
Table 4-51 SATREPS Projects Implemented by JICA-JCT.....	4-106
Table 4-52 Cooperation Programs by International Donors.....	4-106
Table 4-53 Overall Issues on Volcanic Eruptions under Four Fields in SFDRR.....	4-107
Table 4-54 Overview of Evacuation Center (Capacity, Target Population for Evacuation).....	4-109
Table 4-55 Summary of Volcanic SABO Projects in Mt. Merapi	4-117
Table 4-56 Damage Summary of Mt. Kelud Eruption (2014).....	4-125
Table 4-57 Urgent Aids by IFRC for Mt. Kelud Eruption (2014).....	4-126
Table 5-1 Challenges of DRR in Indonesia.....	5-1
Table 5-2 Targets related to Disaster Management in SDGs.....	5-5
Table 5-3 Priorities for Actions and Global Targets under Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR).....	5-5
Table 5-4 Vision and Mission for Disaster Management Year 2015-2045 (Final Version (May 2019)).....	5-6
Table 5-5 Matching Indonesian needs with Japanese Seeds for in DRR	5-10
Table 6-1 Vision and Mission for Disaster Management Year 2015-2045 (Final Version May 2019).....	6-2
Table 6-2 Relation among the Tentative Cooperation Policy in this Study, IDMMMP2015-2045(Final Version (May 2019)) and SFDRR.....	6-3
Table 6-3 Contents of Tentative Priority Activity (Comprehensive DRR) (1/2).....	6-9
Table 6-4 Contents of Tentative Priority Activity (Comprehensive DRR) (2/2).....	6-10
Table 6-5 Priority Activity in Each Specific Field and in the Tentative Cooperation Policy	6-13
Table 6-6 Directionality of Problem Solution about Earthquake, Tsunami DRR Field, the Directionality of Future Support	6-16
Table 6-7 Strategy for Tackling Challenges in Banda Aceh.....	6-20
Table 6-8 Direction for DRR and Future Support on Meteorology & Early Warning Systems	6-22
Table 6-9 Discharge of Aceh River before the Project.....	6-26
Table 6-10 Discharge of Aceh River after the Project.....	6-26
Table 6-11 Floods Related Disaster Management Policies and Strategies.....	6-27
Table 6-12 Directions on Solution for Issues and Assistance on Water Induced Disasters	6-28
Table 6-13 Direction for DRR and Future Support on Landslides.....	6-32
Table 6-14 Direction for Problem Solution and Future Support on Coastal Disasters.....	6-34
Table 6-15 Direction for DRR and Future Support on Volcanic Eruption	6-36
Table 6-16 Priorities for Prevention against Forest and Peatland Fires.....	6-40
Table 6-17 Examples of Re-Wetting Activities in Indonesia.....	6-43
Table 7-1 Four Elements to Evaluate Vulnerability	7-2
Table 7-2 7 Priority Items of 71 Indicator	7-2
Table 7-3 Evaluation Methodology for each Indicator.....	7-3
Table 7-4 3 Strategies and Related Agencies for RI Reduction.....	7-6
Table 7-5 Calculation Conditions of Temporary Method in Manado City.....	7-11
Table 7-6 Result of Temporary Method	7-11
Table 7-7 Comparison Current Data Situation in Manado City and Ideal Data Situation for Analysis	7-12
Table 7-8 Supplement Method for missing part of data	7-12
Table 7-9 Outline of Master Plan	7-13
Table 7-10 Comparison of Economic Loss with/without Structure Countermeasures.....	7-14
Table 7-11 Simulation Case.....	7-20
Table 7-12 Simulation Result & Economic Loss	7-22
Table 7-13 Poor accuracy of Temporary Method (engineering / scientific).....	7-24
Table 7-14 Image of Extra due to Poor Accuracy	7-25

Abbreviation

Abbreviation	English	Indonesian
ADB	Asian Development Bank	
AIFDR	Australia-Indonesia Facility for Disaster Reduction	
AusAID	Australian Agency for International Development	
BAKORNAS PB	National Coordinating Board for Disaster Management	Badan Koordinasi Nasional Penanganan Bencana
BAPPENAS	National Development Planning Agency	Badan Perencanaan Pembangunan Nasional
BIG	Geospatial Information Agency	Badan Informasi Geospasial
BMKG	Agency for Meteorology, Climatology, and Geophysics	Badan Meteorologi Klimatologi dan Geofisika
BNPB	National Disaster Management Authority	Badan Nasional Penanggulangan Bencana
BPBD	Regional Disaster Management Agency	Badan Penanggulangan Bencana Daerah
BPPT	Agency for Assessment and Application of Technology	Badan Pengkajian dan Penerapan Teknologi
BRG	Indonesian Peatlands Restoration Body	Badan Restorasi Gambut
DIBI	Data and Information of Disaster in Indonesia	Data dan Informasi Bencana Indonesia
DMI	DMInnovation (Australian Government project)	
DMIS	Disaster Management Information System	
DRR	Disaster Risk Reduction	
ESDM/KEMEN ESDM	Ministry of Energy and Mineral Resources	Kementerian Energi dan Sumber Daya Mineral
FEWS	Flood Early Warning System	
GIS	Geographic Information System	
InaTEWS	Indonesia Tsunami Early Warning System	
InAWARE	Indonesia All-hazards Warning and Risk Evaluation	
JCC	Joint Coordinating Committee	
JICA	Japan International Cooperation Agency	
KEMEN ATR	Ministry of Agricultural and Spatial Planning	Kementerian Agraria dan Tata Ruang
KEMENAG	Ministry of Religious Affairs	Kementerian Agama
KEMENDAGRI	Ministry of Home Affairs	Kementerian Dalam Negeri
KEMENDES PDPT	Ministry of Village, Development of Disadvantaged Regions, and Transmigration	Kementerian Desa, Pembangunan Daerah Tertinggal dan Transmigrasi
KEMENDIKDASBUD/ KEMENDIKBUD	Ministry of Education and Culture	Kementerian Pendidikan dan Kebudayaan
KEMENKES	Ministry of Health	(Kementerian Kesehatan)
KEMENKEU	Ministry of Finance	Kementerian Keuangan
KEMENRISTEKDIKTI	Ministry of Research Technology and Higher Education	Kementerian Riset Teknologi Dan Pendidikan Tinggi
KEMENSOS	Ministry of Social Affairs	Kementerian Sosial
KEMENTAN	Ministry of Agriculture	Kementerian Pertanian
KKP	Marine and Fisheries Ministry	Kementerian Kelautan dan Perikanan
KLHK	Ministry of Environment and Forestry	Kementerian Lingkungan Hidup dan Kehutanan
KOMINFO	Ministry of Communication and Informatics	Kementerian Komunikasi dan Informatika
LAPAN	National Institute of Aeronautics and Space	Lembaga Penerbangan dan Antariksa Nasional
MEWS	Meteorological Early Warning System	
EWS	Early Warning System	
M/M	Minutes of Meeting	
MoU	Memorandum of Understanding	
NCICD	National Capital Integrated Costal Development	
PDM	Project Design Matrix	
POLRI	Indonesian National Police	(Kepolisian Negara Republik Indonesia)
PUPR	Ministry of Public Works and Housing	Kementerian Pekerjaan Umum dan Perumahan Rakyat
PUSAIR	Research Centre for Water Resources	Pusat Penelitian dan Pengembangan Sumber Daya Air
PVMBG	Centre of Volcanology and Geological Hazard Mitigation	Pusat Vulkanologi dan Mitigasi Bencana Geologi
R/D	Record of Discussion	
SOP	Standard Operation Procedure	
TNI	Indonesian National Armed Forces	Tentara Nasional Indonesia
UNDP	United Nations Development Program	
USAID	United States Agency for International Development	

Chapter 1. Background, Purpose and Outline of the Survey

1.1 Background of the Survey

Since the 1960s, JICA has continued its cooperation on disaster risk reduction (hereinafter referred to as "DRR") with the Republic of Indonesia (hereinafter referred to as "Indonesia"), a country with frequent disasters. In the establishment of the National Disaster Management Agency (BNPB), the central disaster management authority of Indonesia, JICA has provided support since its planning stage. JICA has also supported the Ministry of Public Works & National Housing (hereinafter "PUPR"), and Ministry of Meteorological Climatological, Geophysical Agency, (Hereinafter referred to as "BMKG"), in order to strengthen the capacity of their disaster-related organizations. In addition to strengthening the capacity of administrative authorities, it is necessary to build cooperation among relevant organizations and to mainstream DRR.

"DRR" is described in the section of "Natural Resources, Living Environment and Disaster Management" in the sector of "Realization of Economic Independence by Mobilizing the Strategic Sector in the Domestic Economy". It is one of 9 national priority issues (NAWA CITA), among the National Medium-term Development Plan 2015-2019 (RPJMN). In National Disaster Management Plan (2015-2019), roles of 37 ministries and agencies related with DRR are clarified in order to tackle mainstreaming of DRR, led by BNPB. The presidential election is scheduled in 2019 and it is expected that these plans will be revised when the new administration is launched.

As an international framework, in March 2015, Sendai Framework for Disaster Risk Reduction was adopted at the 3rd United Nations World Conference on DRR. In September of that year, the Sustainable Development Goals (SDGs) were adopted, and DRR was recognized as an essential element in development. In the framework, the concrete goal setting was established. In order to achieve sustainable development, each country needs to make efforts in the DRR. JICA focuses on supporting the implementation of the Sendai Framework for disaster risk reduction reflecting SDGs and Japan's experiences and knowledge. It is required to develop even more strategic and effective support.

1.2 Purpose of the survey

The purpose of this survey is organizing disaster prevention measures implemented by the Indonesian government, collecting the achievements of JICA's / other donors' disaster prevention cooperation to Indonesia, analyzing how they will reduce disaster damage economically / socially in Indonesia, and proposing the following 3 items indicating profitability of disaster risk analysis in local area; 1) Increasing the DRR investment including structural measures, 2) Improving the cooperation & coordination between line-ministries in both central and local government, 3) Improving / upgrading the Risk Index. Then, in order to spread these 3 items to the whole of Indonesia, the following should be conducted;

- Making a recommendation for the next National Plan, National Medium Term Development Plan 2020-2024 and National Disaster Management Plan 2020-2024
- Making JICA's Cooperation Policy for Disaster Risk Reduction in Indonesia
- Preparing and cooperating to utilize and publish the result of this study through events and a seminars related to disaster risk reduction taken place by the Indonesian government or JICA.

1.3 Survey Overview

The target area of the basic survey is the whole of Indonesia, but the target areas of the disaster risk analysis in rural areas are Aceh province (mainly Banda Aceh) and North Sulawesi province (mainly Manado). Disaster types to be investigated are as follows.

- Flood (Including flood of external water, a flood of internal water, sediment-related disasters)

- Storm surge
- Earthquake/tsunami
- Volcanic eruption
- Forest and peatland fire

1.3.1 Member of Study Team

In this study, the members shown in Table 1-1 are in charge of each field.

Table 1-1 Study Team Member and Survey Fields

Name	Potsition
Takashi TOYODA	Team Leader/Comprehensive Disaster Management Plan
Junji YOKOKURA	Deputy Team Leader/ Comprehensive Disaster Management Plan
Takeshi WATANABE	DRR Administration and Organization (1)
Hajime WATANABE	DRR Administration and Organization (2)/DRR Awareness/Risk Index(1)
Hiromasa AOKI	Meteorology, Early Warning
Toru TAKAHASHI	Flood, Water related Disaster/Volcano DRR
Masanori KOBAYASHI	Earthquake and Tsunami DRR/Risk Index(3)
Ryohei KUDO	Project Arrangement/DRR Awareness /Risk Index(2)
Junichi FUKUSHIMA	Project Arrangement/DRR Awareness /Risk Index(4)
Naoto MIZUNO	Project Arrangement/DRR Awareness /Risk Index(5)
Teruo KURUMADA	Earthquake and Tsunami (2) Architecture, Earthquake Resistance
Hisayuki YAMAMOTO	Earthquake and Tsunami (2) Architecture, Earthquake Resistance 2
Toyohiro TKAGI (Predecessor)	Earthquake and Tsunami (3) Civil Engineering Structures and Civil Engineering Earthquake Resistance
Yoshihiko TAKEDA (Successor)	Earthquake and Tsunami (3) Civil Engineering Structures and Civil Engineering Earthquake Resistance
Toshihiko AIZAWA	Earthquake and Tsunami (3) Civil Engineering Structures and Civil Engineering Earthquake Resistance 2
Sadao ORISHIMO	Earthquake and Tsunami (4) Coastal dike
Masaaki GOSHIMA	Earthquake and Tsunami (4) Coastal dike 2
VU Thi Lan Huong	Earthquake and Tsunami (4) Coastal dike 3
Toyohiro TKAGI	Earthquake and Tsunami (5) Road, Bridge
Yasuo IJIMA	Flood, Water related Disaster DRR(2) Liquefaction/Groundwater
Masato TAKASAKI	Flood, Water related Disaster DRR(2) Liquefaction/Groundwater 2
Hisashi FURUICHI	Flood, Water related Disaster DRR(2) Liquefaction/Groundwater 3
Akiyoshi HIGUCHI	Flood, Water related Disaster DRR(2) Liquefaction/Groundwater 4
Akira NAKAMURA	Flood, Water related Disaster DRR(3) Irrigation
Hiroshi SHIMOOSAKO	Flood, Water related Disaster DRR(3) Flood Control
Kahori HIRANO	Reconstruction plan
Hiroyasu KUDO	Reconstruction plan (2)
Hisako KOBAYASHI	Reconstruction plan (3)
Shinji TAKEDA	Geotechnical Survey

1.3.2 Work Process

Table 1-2 mentions the work process in this study.

Chapter 2. Natural Disaster and Damage in Indonesia

2.1 Main Natural Disasters and Damage

Indonesia is one of the most disaster-prone countries. Natural disasters such as earthquakes, floods, tsunamis and landslides occur frequently every year. According to the data obtained from the disaster list of EM-DAT from 1980 to 2017, the number of deaths due to the disaster was 190,000 and the number affected was 24.45 million. The disasters accounted for an economic loss of about 29.4 billion US dollars. About 170 thousand deaths / missing people occurred during the Indian Ocean Tsunami on December 26, 2004, which is one of the most serious disasters in human history.

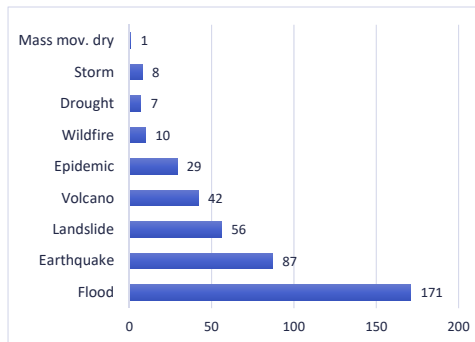


Figure 2-1 Occurrence Number of Disasters (1980~2017)

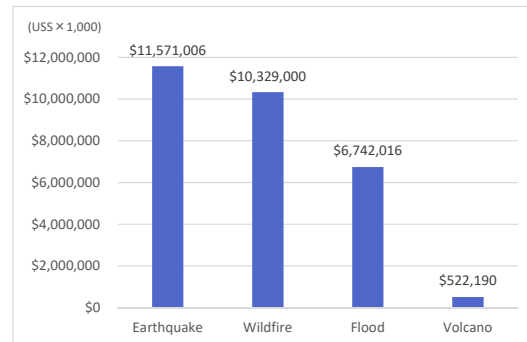


Figure 2-2 Economic Loss by Disasters (1980~2017)

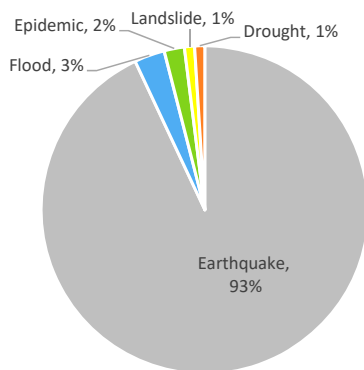


Figure 2-3 Affected People Ratio (1980~2017)

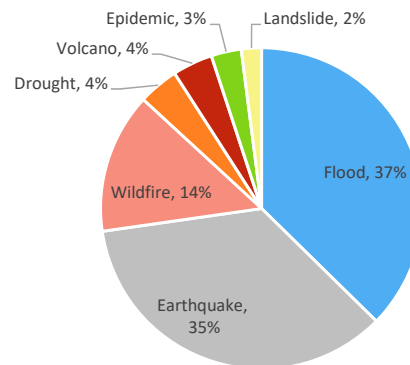


Figure 2-4 Death Toll Ratio (1980~2017)

On the website of ADRC (Asian Disaster Reduction Center), the following disasters are treated as representative disasters; Sumatra Offshore Earthquake and Indian Ocean tsunami in December 2004 (165,708 dead), Sumatra Earthquake in March 2005 (905 deaths), and The Java Earthquake in May 2006 (death toll 5,788 people).

According to the data of EM-DAT¹, 78 disaster events with more than 50 death tolls were confirmed within last 111 years between 1907 and 2017. Of these, there were seven large-scale disasters that killed more than 500 people since the 1980s, and six disasters due to earthquake and tsunami; December 1992 (2,500 deceased), March 2005 (915 people), March 2006 (915 deaths), May 2006 (5,778 deaths), July 2006 (802 deaths), September 2009 (1,195 deaths), October 2010 (530 people dead). There was only one flood of the identical death toll scale (May 1981 (500 dead).

The Infrastructure Development Institute produces a flood report for the floods of more than 50 people dead in principle. Since 2006 there have been 8 disasters in the report; 2006 January (154 dead), June

¹ EM-DAT: CRED(The Centre for Research on the Epidemiology of Disasters)

2006 (219 dead), December 2006 (260 dead), January-February 2007 (more than 80 dead), December - January 2007, March 2009 (101 dead), December 2014 (95 dead), June 2016 (64 dead).

Among those floods, floods/ landslides caused by the torrential rain that occurred in June 2016 affected Central Java Province, North Sulawesi Province, and West Sumatera Province, with 64 death 3 missing people, 26 injured people, 2,687 evacuees, 3,192 damaged houses and the total damage amounted up to 302.37 billion IDR (about 22.98 million US dollars = 2.32 billion yen)².

A list of major disasters that occurred in Indonesia is shown in Table 2-1. There were no disasters which caused more than 50 death toll in Indonesia during 2017.

Table 2-1 Main Disasters in Indonesia

No.	Year	Month	Deaths	Disaster Type	Location	Source
1	1981	5	500	Flood	Mont Semeru	1)
2	1992	12	2,500	Earthquake	Sikka, East Flores, Ende	1)
3	2004	12	165,708	Earthquake & Tsunami		2)
4	2005	3	905	Earthquake		2)
-	2005	3	915	Earthquake	Simeule, Nias, Banyak Isl	1)
5	2006	1	154	Earthquake & Landslide	East Java Province (Jember, Banjarnegara)	3)
6	2006	5	5,778	Earthquake		2)
-	2006	5	5,778	Earthquake	Yogyakarta, Central Java	1)
7	2006	6	219	Flood & Landslide	South Sumatra Province	3)
8	2006	7	802	Earthquake & Tsunami	Tasikmalaya, Ciamis, Suka	1)
9	2006	12	260	Flood & Landslide	Aceh Province, North Sumatra Province, Riau Province	3)
10	2007	1~2	80 以上	Flood & Landslide	80 districts including in Jakarta	3)
11	2007	12~1	83	Flood & Landslide	Central Java, East Java	3)
12	2009	3	101	Flood	South West Jakarta	3)
13	2009	9	1,195	Earthquake	Padang, Buki	1)
14	2010	10	11,864	Earthquake & Tsunami	Kepulauan Mentawi (Sumatra)	1)
15	2014	12	95	Landslide	Gembrunn Village in Central Java Province	3)
16	2016	6	64	Flood & Landslide	Central Java Province, North Sulawesi Province, West Sumatera Province	3)
17	2016	9	53	Flood	Garut, Sumedang districts (Jawa Barat)	1)

1) EM DAT (supported by USAID)2) ADRC Disaster Information3) A report by The Infrastructure Development Institute

2.2 Economic Loss of Natural Disaster

According to the summary of EM-DAT, the number of economic damages caused by natural disasters is shown in Table 2-2 from 2000 to 2017. As for floods, disasters causing enormous economic damages occurs almost every year. With the floods in Jakarta caused by the heavy rain on January 16, 2013, major damage was caused. Although the frequency of occurrence is low, earthquake and tsunami caused enormous economic damages one it occurs.

² 2016.6.19 BNPB “24 Tewas dan 26 Orang Hilang Akibat Banjir dan Longsor di Jawa Tengah (24 Dead and 26 Missing Persons by Flood and landslide in Central Java)”

Table 2-2 Economic Loss of Natural Disaster in Indonesia (1,000US\$)

Year	Earthquake	Tsunami	Flood	Flash Flood	Landslide	Drought	Volcano	Extreme weather	Forest Fire
2000	73,000		34,000	79,000	54,600				
2001				10,000	10,000				
2002			351,600						
2003					3,961	1,000			
2004	68,000	4,451,600	60,000		3,500				
2005					5,000				
2006	3,100,000	55,000	27,100	80,200	37,943				14,000
2007	700,000		971,000						
2008			1,733						
2009	2,381,430								
2010				78,000					
2011	5,850								
2012								1,000	
2013	130,000		3,006,000						
2014			928,000				186,000		
2015			235,000						1,000,000
2016	100,000		108,000		25,000				
2017			19,000	2,000	13,000				
Total	6,558,280	4,506,600	5,741,433	249,200	153,004	1,000	186,000	1,000	1,014,000

Source: EM DAT (supported by USAID)

As for the amount of economic damage caused by individual disasters in the 2000s, the damage amount of public facilities and individual facilities are published as shown in Table 2-3. After all, the economic damage of the 2004 Sumatra Offshore Earthquake and Indian Ocean Tsunami is prominent, totaling 41 IDR trillion. The economic damage caused by the earthquake is also enormous. Especially in the earthquake that occurred in Yogyakarta and Central Java Province in May 2006, the total economic damage amounted to 29 IDR trillion. Regarding floods, damages caused a loss of 5 IDR trillion in the flood that occurred in Jakarta in 2007. The characteristic of economic damage in Indonesia is that the damage to the private sector is greater than the damage to public facilities.

Table 2-3 Main Natural Disasters and Economic Loss³

No	Disaster	Date of event	DALA (in billion IDR)		
			Public	Private	Total
1	Earthquake & Tsunami Aceh & Nias	Dec 2004	9,208	32,192	41,400
2	Earthquake DI Yogyakarta & Central Java Province	May 2006	2,763	26,386	29,149
3	Earthquake West Sumatera	March 2007	939	1,512	2,451
4	Flood Jakarta	Feb 2007	649	4,535	5,184
5	Earthquake Bengkulu & West Sumatera	Sept 2007	939	943	1,882
6	Earthquake West Sumatera	Sept 2009	2,397	18,470	20,867
7	Earthquake & Tsunami Mentawai Island	Oct 2010	128	220	348
8	Mount Merapi Eruption DI Yogyakarta & Central Java Province	Oct 2010	963	2,665	3,628
	TOTAL DALA (in Billion IDR)		17,986	86,923	104,909
	TOTAL DALA (in million USD)		2,067	9,991	12,059

Source: EM DAT (supported by USAID)

2.3 Recent Major Natural Disasters

Major disasters that occurred in recent years are listed in Table 2-1. Among them, the earthquake in Lombok Island in August 2018, the earthquake and tsunami disaster in Central Sulawesi in September 2018 and the volcanic disaster in Banten Province in December 2018 are summarized as follows.

³ Dr. Suprayoga Hadi (2011), Indonesia's Experiences in DRR Investment Accounting in National Budget



Figure 2-5 Recent Major Natural Disasters

2.3.1 Lombok Earthquake (2018)

Lombok Island (West Nusa Tenggara Province), one of the famous tourist destinations in Indonesia, was hit by series of earthquakes in July-August 2018 causing 436 fatalities, 352,793 displaced person and estimated direct economic loss of IDR 5 trillion.

On August 5, 2018, an M 7.0 earthquake occurred at 18.46 hrs (UTC+7), with epicenter at a 10 km in depth and located at 8°22'12.0" S & 116°28'48.00" E (inland). This earthquake was felt in Lombok, Bali and Sumbawa Islands. A tsunami warning was issued but canceled 2 hours later after only a minor tsunami (10-13 cm) was observed by BMKG. This earthquake occurred after a strong M 6.4 earthquake, with almost the same epicenter that hit the same area one week before (July 29) and followed by a series of aftershocks.

Soon after the earthquake, central government led by BNPB, PUPR and other related ministries, join their forces to conduct the emergency response activities at the sites. In fact, many of their staffs were on the sites for responding to the previous earthquake that occurred a week before, when this main earthquake struck. Although this is not an official national scale disaster, central government committed to support and to arrange necessary supply for the victims. During the emergency stage, no foreign assistance was requested nor accepted, so only the government, domestic NGOs and volunteers actively participated. Governor of West Nusa Tenggara Province announced the emergency response phase was to be held until August 25, 2018.

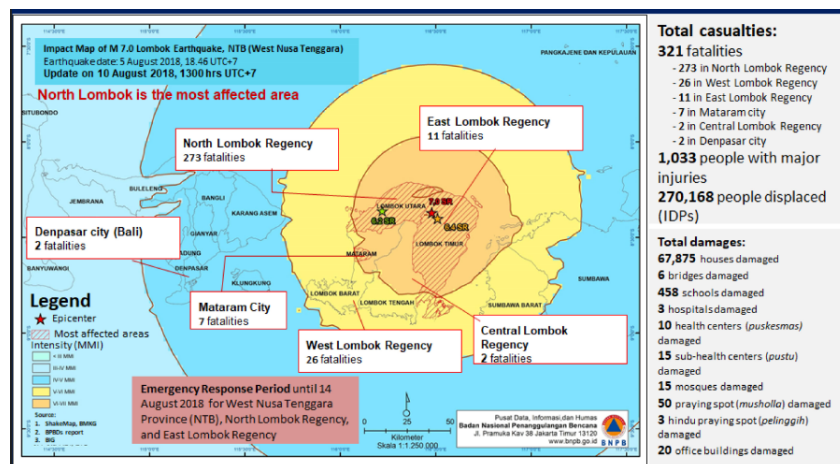


Figure 2-6 Impact Map by BNPB (August 10th, 2018).

One day after, BNPB update the data and release the following information:

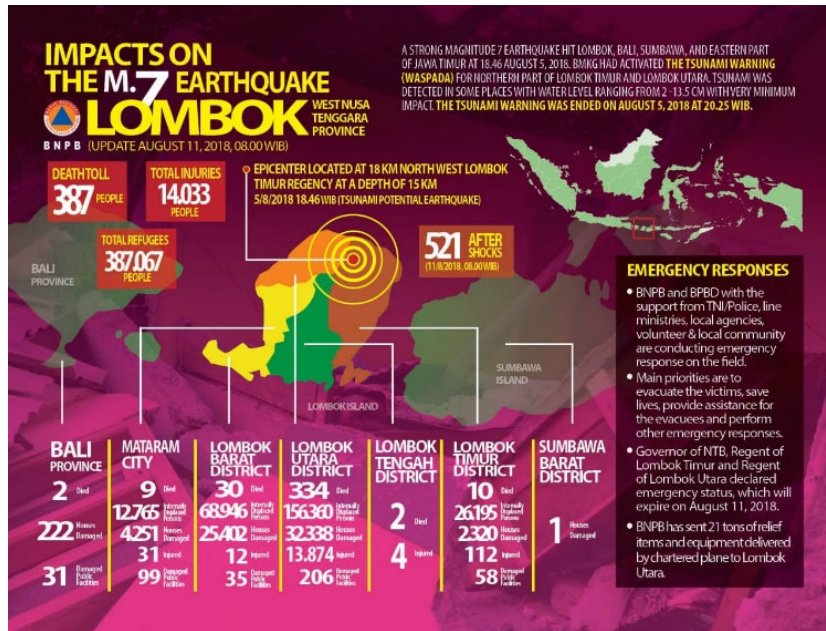


Figure 2-7 Impact map by BNPB (August 11, 2018)

With Magnitude 7 and depth of 15 km, the shaking intensity was declared by BNPB as MMI VII-VIII in Mataram City and the District of North Lombok. Main damaged areas were North and West Lombok District. The strong and shallow earthquakes create huge damage to people houses, which are commonly very poorly constructed. In the past, these areas had already experienced (less serious) earthquakes in 2013 and 2004.

These incidents show the importance of structural mitigation for earthquake, especially for public facilities that attract many visitors who could be the potential victims, also need to function during emergency phases. Hospitals, schools, government buildings, the office of disaster-related institutions, etc. needs to be earthquake resistant to avoid many victims and to make sure that these facilities can be utilized to support the emergency response operation as well.



Figure 2-8 Collapsed Mosque soon after praying time

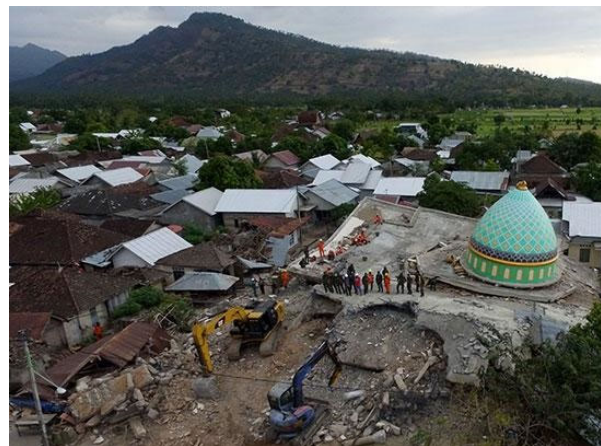


Figure 2-9 Figure 4: Collapsed Mosque in North Lombok (2)



Figure 2-10 Damaged Public Hospital (RSUD) Tanjung, North Lombok District (no more function)



Figure 2-11 Evacuated patients in RSUD Tanjung on August 5, 2018



Figure 2-12 Partially damaged Office of BPBD North Lombok District



Figure 2-13 Partially damage of building in Mataram University



Figure 2-14 Collapsed house due to poor construction methods (1)



Figure 2-15 Collapsed house due to poor construction methods (2)