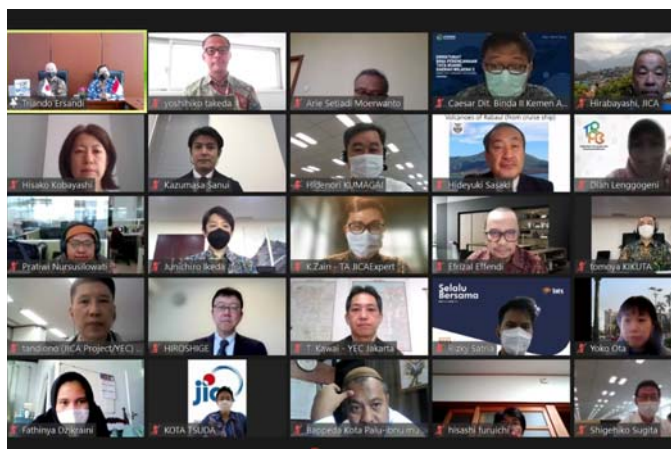


## Lead-off Photos (5/7)

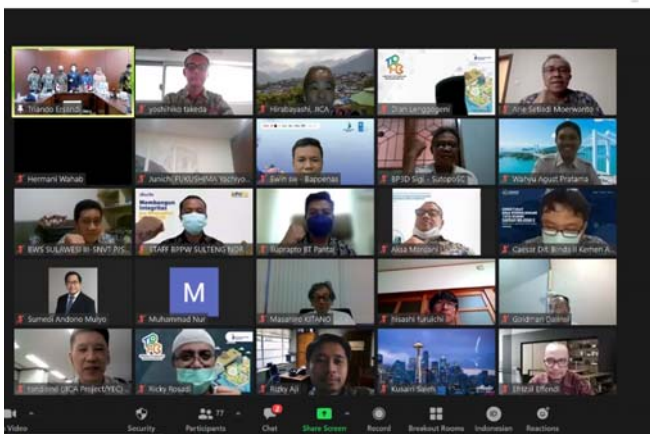
### Stakeholder Discussions and Field Surveys



The Final Joint Coordinating Committee (October 6, 2021)  
In Bappenas Meeting Room (Onsite participation)



The Final Joint Coordinating Committee (October 6, 2021)  
By web communication tool (Online participation-1)



The Final Joint Coordinating Committee (October 6, 2021)  
By web communication tool (Online participation-2)



The Final Joint Coordinating Committee (October 6, 2021)  
By web communication tool (Online participation-3)



Closing Ceremony – Handover report (October 6, 2021)

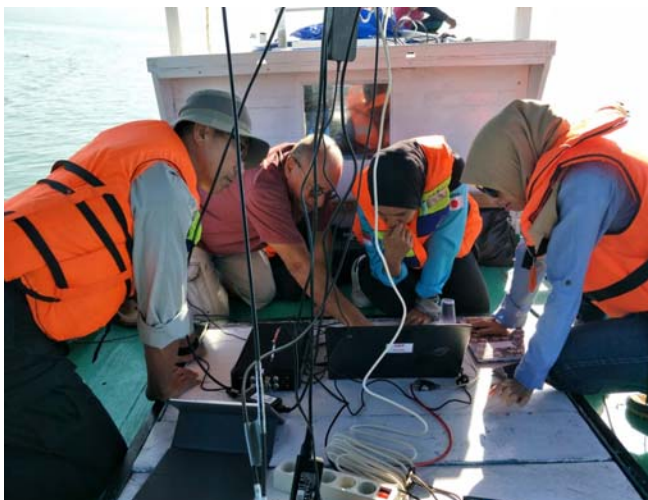


Closing Ceremony – Group picture (October 6, 2021)  
(left-right); Mr. Ikeda; Mr. Kikuta; Mr. Fukushima; Mr. Tsuda, Mr. Sumedi,  
Ms. Lenggo



## Lead-off Photos (6/7)

### Stakeholder Discussions and Field Surveys



Reflection seismic survey of Palu Bay (Output 1 Activity)

A survey conducted to understand the geological composition and structure of the seabed at the southern of the Palu Bay, including the area around the Palu River Estuary (total 29.6 km).



Discussion with the Ministry of Land and Spatial Planning (ATR)

(Output 1 and Output 2 Activities, April 11, 2019)



Discussion with Local Government (Central Sulawesi)

(Output 2 Activity, March 18, 2019)



Discussion on Anutapura Hospital Design Review

(Output 3 Activity- Public Facilities Sector, April 9, 2019)



Palu IV Bridge Field Survey (Output 3-Road and Bridge Sector)

Survey for reconstruction of the collapsed Palu IV Bridge (January-May 2019).



Pilot Project Activities in Balaroa Shelter (Output 4 Activity)

Training was conducted twice to introduce Silar leaves weaving as an activity to obtain income in a short term.



## Lead-off Photos (7/7)

### Stakeholder Discussions and Field Surveys



Pilot Project Activities in Balaroa Shelter (Output 4)

Small culinary business activities were carried out by the groups of victims of the Balaroa evacuation shelter



Pilot Project Activities in M'panau Village (Output 4)

Training was conducted to improve the construction skills for the victims in the community in collaboration with vocational schools in the Province



Pilot Project Activities in M'panau Village (Output 4)

A MSMEs Centre was built to support the improvement of livelihood through micro business entities



Pilot Project Activities in Lero Tatari Village (Output 4)

20 fishing boats were provided to support the recovery of livelihood activities of a group of 40 fishermen.



Pilot Project Activities in Lero Tatari Village (Output 4)

Training on new processing technology of *Ikan Teri* (White bite) was conducted in cooperation with the department of SMEs in Central Sulawesi Province.



Pilot Project Activities in Lero Tatari Village (Output 4)

DRR education seminar was conducted for the pilot project beneficiaries by BPBD together with inviting BMKG and BASARNAS as lecturers

## List of Abbreviation

Abbreviation	Indonesian Language	English
<b>Organization / Institution</b>		
AASHTO	—	American Association of State Highway and Transportation Officials
ACT	Aksi Cepat Tanggap	Quick Response Action
ADB	Bank Pembangunan Asia	Asian Development Bank
ADRA	—	Adventist Development and Relief Agency
AMC	—	Anutapura Hospital Medical Center
ASB	—	Arbiter Samariter Bund
ATR	Kementerian Agraria dan Tata Ruang	Ministry of Land and Spatial Planning
AusAID	—	Australian Agency for International Development
BAPPEDA	Badan Perencanaan Pembangunan Daerah	Regional Development Planning Agency
BAPPENAS	Badan Perencanaan Pembangunan Nasional	National Development Planning Agency
BG	Badan Geologi	Geological Agency
BIG	Badan Informasi Geospasial	Agency for Geospatial Information
BM	Bina Marga	Directorate General of Highways
BMKG	Badan Meteorologi, Klimatologi dan Geofisika	Agency for Meteorology, Climatology and Geophysics
BNPB	Badan Nasional Penanggulangan Bencana	National Disaster Management Authority
BPBD	Badan Penanggulangan Bencana Daerah	Regional Disaster Management Authority
BPN	Badan Pertanahan Nasional	Provincial land agency
BPPW	Balai Prasarana Permukiman Wilayah	Regional Settlement Infrastructure Center
BSN	Badan Standardisasi Nasional	National Standardization Agency
BWS	Balai Wilayah Sungai	River Basin Development Agency
Cipta Karya	—	Directorate General of Human settlements
CRS	—	Catholic Relief Services
CWS	—	Inanta Church World Service
DGST	Direktorat Jenderal Perhubungan Laut (DirJen Hubla)	Directorate General of Sea Transportation
Dinas	—	Agency
DKP	Dinas Kelautan dan Perikanan	Agency of Marine Affairs and Fisheries (at regional level) <sup>1</sup>
DLH	Dinas Lingkungan Hidup	Environmental Agency (at regional level)
DPMPSTSP	Dinas Penanaman Modal dan Perijinan Terpadu Satu Pintu	One-stop office of integrated Investment and Permit Services
DPRP	Dinas Penataan Ruang dan Pertanahan	Local Spatial Planning and Land Service Agency
EA	—	Executing Agency
ESDM	Energi dan Sumber Daya Mineral	Ministry of Energy and Mineral Resources
FAO	Organisasi Pangan dan Pertanian Dunia	Food and Agriculture Organization
GOI	Pemerintah Negara Republik Indonesia	Government of Indonesia
HAKI	Himpunan Ahli Konstruksi Indonesia	Association of Indonesia construction expert
HATTI	Himpunan Ahli Teknik Tanah Indonesia	Indonesian Society For Geotechnical Engineering <sup>2</sup>

<sup>1</sup> Note: DKP at regional level (D = Dinas); KKP at national level (K=Kementerian/Ministry).

<sup>2</sup> Source: <https://www.hatti.or.id/>



Abbreviation	Indonesian Language	English
IFRC	—	International Federation of Red Cross and Red Crescent
ILO	Organisasi Pekerja Internasional	International Labour Organization
INGO	Lembaga Swadaya Masyarakat Internasional	International Non-Governmental Organization
INKINDO	Ikatan Nasional Konsultan Indonesia	National association of Indonesian Consultant
JCC	Komite Koordinasi	Joint Coordinating Committee
JFPR	—	Japan Fund for Poverty Reduction
JICA	—	Japan International Cooperation Agency
JST	Tim Studi JICA	JICA Study Team
KfW	Lembaga Pendanaan untuk Rekonstruksi - Jerman (Kreditanstalt für Wiederaufbau)	A German State-owned Development Bank
KKP	Kementerian Kelautan dan Perikanan	Ministry of Maritime Affairs and Fisheries
KPKPST	Kelompok Perjuangan Kesetaraan Perempuan Sulawesi Tengah	Central Sulawesi Women's Equality Group
LNGO	Lembaga Swadaya Masyarakat Lokal	Local Non-Governmental Organization
LTF	Satuan Tugas Lokal	Local Task Force
MCI	—	Mercy Corps Indonesia
MDMC	Pusat Manajemen Bencana Muhammadiyah	Muhammadiyah Disaster Management Center
Ministry of Cooperatives and SMEs	Kementerian Koperasi dan Usaha Kecil dan Menengah, Republik Indonesia	Ministry of Cooperatives and Small and Medium Enterprises
MOT	Kementerian Perhubungan	Ministry of Transport
NGO	Lembaga Swadaya Masyarakat (LSM)	Non-Governmental Organization
OGD	Departemen Kebidanan dan Kandungan <sup>3</sup>	Obstetrics and Gynecology Department
PARCIC	—	PARC Interpeoples' Cooperation
PMI	Palang Merah Indonesia	Indonesian Red Cross Societies
PUPR	Kementerian Pekerjaan Umum dan Perumahan Rakyat	Ministry of Public Works and Public Housing
PuSGen	Pusat Studi Gempa Nasional	National Center for Earthquake Studies
PUSKIM	Pusat Kebudayaan Indonesia	Indonesian Cultural Center
SATGAS	Satuan Tugas	Task Force
SDA	Direktorat Jenderal Sumber Daya Air	Directorate General of Water Resources
SKP-HAM	Solidaritas Korban Pelanggaran Hak Asasi Manusia	Solidarity of Victims of Human Rights Violations
TABG	Tim Ahli Bangunan Gedung	Building Construction Expert Team
TKPRD	Tim Koordinasi Penataan Ruang Daerah	Regional Spatial Planning Coordination Team
UN	Persatuan Bangsa-Bangsa (PBB)	United Nations
UNDP	—	United Nations Development Programme
UNFPA	—	United Nations Fund for Population Activities
UNHCR	—	United Nations High Commissioner for Refugees
UNICEF	—	United Nations International Children's Emergency Fund
WB	Bank Dunia	World Bank
WFP	Program Pangan Dunia	United Nations World Food Programme
WHO	—	World Health Organization
WVI	Wahana Visi Indonesia	World Vision Indonesia
YEU	Unit Gawat Darurat Yakkum	Yakkum Emergency Unit

<sup>3</sup> In private hospitals as well as universities, commonly they use the term *Obstetri dan Ginekologi*

Abbreviation	Indonesian Language	English
YPAL	Yayasan Panorama Alam Lestari Kabupaten Poso	<i>Panorama Alam Lestari</i> Foundation, Poso Regency
YPI	Yayasan Pusaka Indonesia	Indonesian Heritage Foundation
YSTC	Yayasan Sayangi Tunas Cilik	Save The Children Foundation
<b>Regulation / Plan</b>		
EPMA	Undang-Undang Tentang Perlindungan dan Pengelolaan Lingkungan Hidup	Environmental Protection and Management Law
IMB	Izin Mendirikan Bangunan	Building Permit
KDB	Koefisien Dasar Bangunan	Building Coverage Ratio
KLB	Koefisien Lantai Bangunan	Floor Area Ratio
PERDA	Peraturan Daerah	Local regulation
PP	Peraturan Pemerintah	Government Regulation
PRR	Laporan Kemajuan	Progress Report
RAB	Rancangan Anggaran Biaya	Budget Plan
RDTR	Rencana Detail Tata Ruang	Detailed Spatial Plan
RSNI	Rancangan Standar Nasional Indonesia	Draft Indonesian National Standard
RTRW	Rencana Tata Ruang Wilayah	General Spatial Plan
RTRWN	Rencana Tata Ruang Wilayah Nasional	National spatial plan
RW	Rukun Warga	Neighbourhood unit <sup>4</sup>
SEA	Kajian Lingkungan Hidup Strategis (KLHS)	Strategic Environmental Assessment
SNI	Standar Nasional Indonesia	National Standard of Indonesia
UKL-UPL	Upaya Pengelolaan Lingkungan Hidup dan Upaya Pemantauan Lingkungan Hidup	Environmental Management Efforts and Environmental Monitoring Efforts
ZRB	Zona Rawan Bencana	Disaster Prone Zone
<b>Others</b>		
AP	Rencana Aksi	Action Plan
APBN	Anggaran Pendapatan dan Belanja Negara	State budget
ASTER	—	Advanced Space-borne Thermal Emission and Reflection
Banpem	Bantuan Pemerintah	Government Assistance
BARRATAG A	Bangunan Rumah Rakyat Tahan Gempa	Earthquake Resistant Housing
BBB	Membangun Kembali dengan Lebih Baik	Build Back Better
BCP	Rencana Kelanjutan Bisnis	Business Continuity Plan
BLM	Bantuan Langsung Masyarakat	Community Direct Assistance
BMS	Sistem Manajemen Jembatan	Bridge Management System
BoQ	—	Bill of Quantity
BTP	—	Brownian Passage Time
BUMDes	Badan Usaha Milik Desa	Village-Owned Company
BWP	Bagian Wilayah Perencanaan	Part of the Planning Area
C/P	—	Counter Part
CBD	Kawasan Niaga Terpadu	Central Business District
CCT	Pembayaran Tunai Bersyarat	Conditional Cash Payment
CRED	—	Centre for Research on the Epidemiology of Disasters
CSO	Organisasi Masyarakat Sipil (ORMAS)	Civil Society Organization
CSR	Tanggungjawab Sosial Korporat	Corporate Social Responsibility

<sup>4</sup> In urban area (especially Java Island), RW is a neighbourhood unit below Village Level. Smaller unit is RT (Rukun Tetangga). 1 RT consist of 10-50 Households and 1 RW consist up to 10 RT.



Abbreviation	Indonesian Language	English
DED	—	Detail Engineering Design
DEM	—	Digital Elevation Model
DFR	Draf Laporan Akhir	Draft Final Report
DG	Direktur Jenderal (Dirjen)	Director General
DRR	Pengurangan Risiko Bencana (PRB)	Disaster Risk Reduction
DTM	—	Digital Terrain Model
EIA	Analisis Mengenai Dampak Lingkungan (AMDAL)	Environmental Impact Assessment
EMP	Rencana Pengelolaan Lingkungan	Environmental Management Plan
EMoP	Rencana Pemantauan Lingkungan	Environmental Monitoring Plan
ER	Tanggap Darurat (TD)	Emergency Response
ESMF	—	Environmental and Social Management Framework
EWS	Sistem Peringatan Dini	Early Warning System
EXPO	—	Exposition
FGD	—	Focus Group Discussion
FLSH		
FR	Laporan Akhir	Final Report
F/S	Studi Kelayakan	Feasibility Study
G/A	Perjanjian Hibah	Grant Agreement
GBV	—	Gender-Based Violence
GC	Kondisi Umum	General Conditions
GERTASKIN	Program Gerakan Pengentasan Kemiskinan	Poverty Alleviation Program
GIS	Sistem Informasi Geografis (SIG)	Geographic Information System
GL	Panduan	Guide Line
GRP	Produk Regional Bruto	Gross Regional Product
HIV	—	Human Immunodeficiency Virus
Huntap	Hunian Tetap	Permanent Relocation Site
Huntara	Hunian Sementara	Temporary Housing Site
ICR	Laporan Awal	Inception Report
IDR	Rupiah	Indonesian Rupiah
ITR	Laporan Sementara	Interim Report
IKM	Industri Kecil Menengah	Small and Medium Industries
IMB	Ijin Mendirikan Bangunan	Procedures of building permit
IPAL	Instalasi Pengolahan Air Limbah	Wastewater Treatment Plant
IPLT	Intalasi Pengelolaan Limbah Tinja	Faecal sludge treatment plant
ITB	—	Instructions to Bidders
IUMK	Izin Usaha Mikro Kecil	Micro Small Business Permit
JET	—	Japan Exchange and Teaching
KRK	Keterangan Rencana Kota	City Plan Description
L/A	Perjanjian Pinjaman	Loan Agreement
LGBTQ+	—	Lesbian, Gay, Bisexual, Transgender, Questioning, etc.
LLC	—	Level Luffing Crane
Linsek	Lintas Sektor	Inter Sector
LPG gas	—	Liquefied Petroleum gas
MD	Risalah Diskusi	Minutes of Discussion
MEP	Mekanikal, Elektrikal dan Perpipaan	Mechanical, Electrical and Plumbing
M/M	Risalah Rapat	Minutes of Meeting
MKK	Mengawasi Kondisi Konstruksi	Construction supervising works

Abbreviation	Indonesian Language	English
MOU	Nota Kesepahaman	Memorandum of Understanding
M/P	Rencana Induk	Master Plan
MSMEs	UMKM	Micro Small and Medium Enterprises
MTU	Unit Pelatihan <i>Mobile</i>	Mobile Training Unit
ODA	—	Official Development Assistance
OP	Keluaran	Output
PASIGALA	Kota Palu, Kabupaten Sigi dan Kabupaten Donggala	Palu city, Sigi Regency and Donggala Regency
PGA	—	Peak Ground Acceleration
PTHA	—	Probabilistic Tsunami Hazard Assessment
PC	Konsultasi Publik	Public Consultation
Persub	Persetujuan Substansi	Substantial Approval (on the Spatial Plan)
POKJA	Kelompok Kerja	Working Team
POKMAS	Kelompok Masyarakat	
PPP	Kebijakan, Rencana dan Program	Policies, Plans and Program
PPs	Proyek Percontohan	Pilot Projects
PQ	Prakualifikasi	Pre-qualification
PRR	Laporan Perkembangan	Progress Report
PSHA	—	Probabilistic Seismic Hazard Assessment
PV	—	Photo Voltaic System
QGC	—	Quay Gantry Crane
RB	Rusak Berat	Severely damaged
RD	Risalah Diskusi	Record of Discussion
R/D	Riset dan Pembangunan	Research and Development
RKPD	Rencana Kerja Perangkat Daerah	Regional Government Work Plans
LARAP	Rencana Aksi Pembebasan Lahan dan Pindahan Pemukiman	Land Acquisition and Resettlement Action Plan
RRI	—	Rainfall Runoff Inundation
RS	Rusak Sedang	Moderately damaged
RT	Rukun Tetangga	Neighbor Association
SD	Sekolah Dasar	Primary school
SHMs	—	Stakeholder meetings
SLF	Sertifikat Laik Fungsi	Certificate of Building Performance and Function
SMEs	Usaha Kecil dan Menengah (UKM)	Small and medium-sized enterprises
SMP	Sekolah Menengah Pertama	Middle School
SNS	Layanan Jejaring Sosial	Social Networking Service
SOP	Standar Prosedur Operasi	Standard Operational Procedure
SPPL	Pernyataan Kesanggupan Pengelolaan dan Pemantauan Lingkungan Hidup	Statement of Environmental Management and Monitoring Undertaking
TA	Bantuan Teknis (Bantek)	Technical Assistance
ToR	Kerangka Acuan Kerja (KAK)	Terms of Reference
TPA	Tempat pembuangan akhir	Landfill
WASH	Air, Sanitasi, Kebersihan	Water, Sanitation, Hygiene



---

---

## ***Table of Contents***

---

---

Chapter-1 Outline of Activities .....	IV-1
Chapter-2 Determining Target Sectors of Infrastructure and Public Facility .....	IV-2
Chapter-3 Analysing Damage Conditions in the Target Sectors .....	IV-3
3-1 Outline of Damaged Feature .....	IV-3
3-1-1 Damage Analysis on the Road and Bridge Sector .....	IV-3
3-1-2 Damage Analysis in the Water Resources Sector .....	IV-4
3-1-3 Damage Analysis in the Public Facility Sector .....	IV-5
3-2 Details of Damaged Feature .....	IV-6
3-2-1 Road and Bridge Facilities .....	IV-6
3-2-2 Water Resources Facilities .....	IV-15
3-2-3 Public Building Facilities .....	IV-30
3-2-4 Needs for Reconstruction .....	IV-38
Chapter-4 Reviewing the Laws, Guidelines, and Manuals related to Structural Design and Construction .....	IV-39
Chapter-5 Formulating a Reference Manual on Structural Design to Strengthen the Infrastructure and Public Facility .....	IV-40
5-1 Outline .....	IV-40
5-1-1 Basic Concept and Implementation Method .....	IV-40
5-1-2 Outline of the Reference Manual (Draft) .....	IV-40
5-2 Contents of Reference Manual (Draft) .....	IV-41
Chapter-6 Assisting the Local Government and PUPR on Formulation of Basics Reconstruction Concept .....	IV-44
6-1 Formulation of Basic Reconstruction Concept .....	IV-44
6-1-1 Outline of Basic Reconstruction Concept .....	IV-44
6-1-2 Details of Basic Reconstruction Concept .....	IV-46
6-2 Coordination of the Target Sub-projects .....	IV-53
Chapter-7 Assisting the Local Government and PUPR on Basic Design in the Target Sector .....	IV-56
7-1 Outline Plan for Target Projects .....	IV-57
7-1-1 Target Sub-Projects .....	IV-57
7-1-2 Basic Concept of Planning .....	IV-60
7-1-3 Outline of Sub-projects .....	IV-89
7-2 Draft Detail Design for 1st Package Sub-Projects .....	IV-97
7-2-1 Outline of Activity .....	IV-97
7-2-2 Design Details of 1st Package Sub-Projects .....	IV-98
7-3 Technical Assistance .....	IV-122
7-4 Outline Design of Grant Aid Project (Palu IV Bridge) .....	IV-127

7-4-1 Outline .....	IV-127
7-4-2 Outline Design for Palu IV Bridge .....	IV-128
Chapter 8 Assisting the Local Governments, PUPR and MOT on the Construction of the Infrastructure and Public Facilities .....	IV-142
8-1 TA on Infrastructure Reconstruction Supervision in the Road and Water Resource Sectors .....	IV-144
8-2 TA on Infrastructure Design in the Road Sector .....	IV-144
8-3 TA on Infrastructure Design in the Water Resource Sector.....	IV-149
8-4 TA on Infrastructure Design in the Public Facilities Sector.....	IV-151
Chapter 9 Finalization of the Reference Manual .....	IV-152
9-1 Outline of Final Reference Manual.....	IV-152
9-2 Contents of Final Reference Manual.....	IV-153
Chapter 10 Assisting the related Ministries and Agencies on Improvement of the Current Manuals .....	IV-158
Chapter 11 Assisting Facilitation of the National Expert Panel.....	IV-160
Chapter 12 Support for Implementation of Strategic Environmental Assessment (SEA)/ Environmental Impact Assessment (EIA) .....	IV-162
12-1 Assistance for Preparation of Environmental and Social Considerations and Resettlement/Land Acquisition Framework.....	IV-162
12-2 SEA concept for the Project (Output 3) .....	IV-162
12-3 Environmental Laws and Regulations .....	IV-162
12-4 Assistance for Implementation of Environmental Impact Assessment (EIA) for Grant Aid Project.....	IV-164
12-4-1 Project Outline.....	IV-164
12-4-2 Project Category .....	IV-165
12-4-3 Scoping of Impacts .....	IV-166
12-4-4 Schedule of UKL-UPL .....	IV-168
12-4-5 Stakeholder Consultation.....	IV-168
12-5 Environmental Impact Assessment (EIA) for Sector Loan Project .....	IV-173
12-5-1 Sorting of the Target Sector Loan Projects .....	IV-173
12-5-2 Result of EIA approval .....	IV-177
12-5-3 Lessons and Recommendation.....	IV-179
Chapter 13 Assistance for Implementation of Resettlement and Land Acquisition Plan (LARAP) .....	IV-181
13-1 Land Acquisition Laws and Regulations.....	IV-181
13-2 Necessity of Land Acquisition for the Project .....	IV-183
13-3 Land Donation .....	IV-183
13-4 Assisting the Land Acquisition in the Coastal Areas.....	IV-187
13-5 Points to be considered for Resettlement and Compensation under the Disaster Recovery Project .....	IV-189



13-6 Recommendation .....	IV-192
Chapter 14 Lessons and Recommendations.....	IV-193

---

---

## *List of Tables*

---

---

Table 2-1	List of Target Sector .....	IV-2
Table 3-1	Damage to Infrastructures related to the Road and Bridge Sector .....	IV-3
Table 3-2	Damage to Infrastructures related to the Water Resources Sector.....	IV-4
Table 3-3	Damage to Infrastructure related to the Public Facility Sector .....	IV-5
Table 3-4	Numbers and Rates of the Damaged Bridge .....	IV-7
Table 3-5	Legend of Damage Level .....	IV-7
Table 3-6	Summary of Coastal Facilities with Descriptions .....	IV-11
Table 3-7	Irrigation Facility Damage Status.....	IV-15
Table 3-8	Damages of School Buildings .....	IV-30
Table 3-9	Damages of the Public Building.....	IV-30
Table 3-10	Damage Level of Other Public Facilities .....	IV-30
Table 3-11	Needs for Reconstruction .....	IV-38
Table 4-1	Summary of the Review of existing Regulations and Guidelines .....	IV-39
Table 5-1	Contents of the Reference Manual (Draft) .....	IV-40
Table 5-2	Content of the Countermeasure for Tsunami.....	IV-41
Table 5-3	Content of Countermeasure for Seismic Wave for Building Structures .....	IV-41
Table 5-4	Content of Road Reconstruction Manual .....	IV-42
Table 5-5	Content of Bridge Repair and Reinforcement Manual.....	IV-43
Table 6-1	Consideration Points for Improvement of Infrastructure .....	IV-50
Table 6-2	Basic Criteria for Infrastructure under Disaster .....	IV-52
Table 6-3	List of Sub-projects for Each Target Sector .....	IV-54
Table 7-1	Expected effects on vegetation in coastal areas .....	IV-64
Table 7-2	Tsunami characteristics to be considered in evacuation planning .....	IV-67
Table 7-3	Basic evacuation plan.....	IV-67
Table 7-4	Classification of Hazard Level for Nalodo.....	IV-71
Table 7-5	Concept of individual countermeasures .....	IV-72
Table 7-6	Risk Category and Importance Factor.....	IV-79
Table 7-7	Structural Design Codes in Indonesia .....	IV-79
Table 7-8	Bridge Importance Category .....	IV-81
Table 7-9	Additional Seismic Measures and Installation Targets.....	IV-81
Table 7-10	Flood Damage History in Palu River .....	IV-83
Table 7-11	Outline of Sub-Projects (1.5 and 2 packages) .....	IV-89
Table 7-12	Advice for 1.5 and 2 Package Projects .....	IV-93
Table 7-13	List of the Draft Detail Design .....	IV-97
Table 7-14	Road Classification and Design Speed.....	IV-99

Table 7-15	Geometric Design Criteria .....	IV-103
Table 7-16	Unit Weight of Material .....	IV-108
Table 7-17	Site Classification.....	IV-108
Table 7-18	Earthquake Loading System for Each Structural Performance .....	IV-110
Table 8-1	Outline of TA Activities in the Infrastructure Reconstruction.....	IV-143
Table 9-1	Content of the Countermeasure for Tsunami.....	IV-153
Table 9-2	Content of Countermeasure for Seismic Wave for Building Structures .....	IV-155
Table 9-3	Content of Road Reconstruction Manual .....	IV-155
Table 9-4	Content of Bridge Repair and Reinforcement Manual.....	IV-156
Table11-1	Outline of Japanese Advisory Committee Activities on Tsunami and Liquefaction Landslide (Coastal Area).....	IV-160
Table11-2	Outline of Japanese Advisory Committee Activities on Liquefaction Landslide (Inland Areas) .....	IV-161
Table 12-1	Regulations related to AMDAL .....	IV-163
Table 12-2	EIA Procedure and associated Public Participation Activities in Indonesia.....	IV-163
Table 12-3	Summary of the Project.....	IV-165
Table 12-4	Scoping.....	IV-166
Table 12-5	Stakeholder meetings for JICA on Grant Aid project.....	IV-169
Table 12-6	List of invitation distribution and constitution of participants .....	IV-170
Table 12-7	Agenda of SHM.....	IV-171
Table 12-8	Opinion from participants and response from Palu city .....	IV-171
Table 12-9	Contents of minutes of meeting with signature .....	IV-172
Table 12-10	List of JICA Sector Loan Project (As of end of November 2019) .....	IV-173
Table 12-11	Type of Project Subject to AMDAL .....	IV-174
Table12-12	Classification of Business and/or Activity which Required to Compile UKL-UPL Document in Sigi Regency.....	IV-177
Table 12-13	Status of Environmental and Social Considerations Procedure for Grant Aid Project and Sector Loan Projects (As of January 2021) .....	IV-178
Table 13-1	National Regulations related to Land Acquisition for the Development for the Public Interest.....	IV-181
Table 13-2	Implementation Procedure of Land Acquisition for the Development for the Public Interest .....	IV-181
Table 13-3	Gap comparison with JICA Guideline.....	IV-187

---

---

## *List of Figures*

---

---

Figure 3-1	Damage Situation on the Road and Bridge Sector.....	IV-3
Figure 3-2	Damage Situation on the Rivers Sector .....	IV-4
Figure 3-3	Damage to the Public Facilities.....	IV-5
Figure 3-4	Damages on Roads .....	IV-6
Figure 3-5	Damages on Roads (Liquefaction and Landslide).....	IV-6
Figure 3-6	Damages on Bridges.....	IV-7
Figure 3-7	Tsunami Inundated Area in Palu Bay .....	IV-8
Figure 3-8	Tsunami Inundated Area in Palu Bay .....	IV-8
Figure 3-9	Wide View of Damaged Bay Area.....	IV-9
Figure 3-10	Location of Liquefaction along Coastline .....	IV-9
Figure 3-11	Ground Height along South Coastal Area.....	IV-10
Figure 3-12	Ground Settlement by 2018 Earthquake.....	IV-10
Figure 3-13	Location of Coastal Land Slides in the vicinity of Palu River Estuary .....	IV-10
Figure 3-14	Location of Photographs and Coastal Land Slides along South Coast of Palu Bay ..	IV-10
Figure 3-15	Existing Drainage Plan at South Coast of Palu Bay .....	IV-13
Figure 3-16	Existing Box Culverts along South Coast of Palu Bay.....	IV-14
Figure 3-17	Picture of Damaged Irrigation Facilities.....	IV-16
Figure 3-18	Existing Gumbasa Irrigation System.....	IV-17
Figure 3-19	Current Irrigation Condition in Petobo- Jono Oge Area.....	IV-18
Figure 3-20	Picture of Damaged River Facilities.....	IV-19
Figure 3-21	Flash Flood in Banggah River .....	IV-20
Figure 3-22	Flood and Sediment disasters in Paneki, Banggah, Poi, and Salua River.....	IV-21
Figure 3-23	Flood and Sediment Disaster Condition in a. Bangga River .....	IV-22
Figure 3-24	Sediment Disaster in Bangga River.....	IV-23
Figure 3-25	Flood and Sediment Disaster Condition in Omi River .....	IV-24
Figure 3-26	Sediment Disaster in Omi River .....	IV-25
Figure 3-27	Flood Disaster Area in Gumbasa Area.....	IV-26
Figure 3-28	Location of Landslide in Gumbasa –Saula Area.....	IV-27
Figure 3-29	Landslide condition at Landslide-1 in Gumbasa –Saula Area .....	IV-28
Figure 3-30	Landslide condition at Landslide-2 in Gumbasa –Saula Area .....	IV-28
Figure 3-31	Landslide condition at Landslide-3 in Gumbasa –Saula Area .....	IV-29
Figure 3-32	Landslide condition at Landslide-4 in Gumbasa –Saula Area .....	IV-29
Figure 3-33	Location of the Surveyed Public Buildings .....	IV-31
Figure 3-34	Spectral Acceleration for Palu City .....	IV-31
Figure 3-35	City Apartment House and Gasoline Station (sample of damaged structure).....	IV-32



Figure 3-36	Applied Foundation Type for the Hospital Building .....	IV-32
Figure 3-37	Building-B which slid away and totally collapsed .....	IV-33
Figure 3-38	Examples of Construction Failure .....	IV-33
Figure 3-39	Wrong Re-bar Lapping Position of Beams and Columns.....	IV-34
Figure 3-40	Distorted Stirrups and Hoops.....	IV-34
Figure 3-41	No Hoop Bar for Column .....	IV-35
Figure 3-42	No Hoop and Stirrup for Intersecting Parts of Structure .....	IV-35
Figure 3-43	PVC Pipe embedded in a Main Column.....	IV-35
Figure 3-44	Poor Quality Concrete .....	IV-36
Figure 3-45	Round Bar used as Main Reinforcement .....	IV-36
Figure 3-46	Comparison of Response Spectrum Values for Design and Actual Earthquake .....	IV-37
Figure 6-1	Image of Complex Resilience Infrastructure .....	IV-45
Figure 6-2	Basic Concept for Regional Reconstruction.....	IV-46
Figure 6-3	Japan's Experience on Reconstruction Plan .....	IV-49
Figure 6-4	Japan's Experience on Reconstruction Plan .....	IV-49
Figure 6-5	Procedure of Basic Reconstruction Plan for Infrastructures.....	IV-49
Figure 7-1	Location Map of the Sub-projects (Road and Bridges Sector).....	IV-58
Figure 7-2	Location Map of the Sub-projects (River and Public Facilities) .....	IV-59
Figure 7-3	Major earthquakes recorded in Sulawesi .....	IV-60
Figure 7-4	Selection of priority areas for tsunami countermeasures.....	IV-60
Figure 7-5	Basic policy for tsunami countermeasure.....	IV-61
Figure 7-6	Multi-layer countermeasure in Palu Bay South.....	IV-61
Figure 7-7	Image of tsunami setup.....	IV-62
Figure 7-8	Flow for setting the height of the elevated road .....	IV-62
Figure 7-9	Cross section and design condition of Elevated road .....	IV-63
Figure 7-10	Situation of the physical model test.....	IV-63
Figure 7-11	Situation of the simulation analysis .....	IV-63
Figure 7-12	Seabed condition of Palu Bay South.....	IV-64
Figure 7-13	Proposed vegetation layout plan for Palu Bay south (west side).....	IV-65
Figure 7-14	Proposed vegetation layout plan for Palu Bay south (east side).....	IV-66
Figure 7-15	Example of slope protection block .....	IV-68
Figure 7-16	Example of the flap gate.....	IV-68
Figure 7-17	Comparison of Alternatives Tsunami Mitigation Countermeasures .....	IV-69
Figure 7-18	Process for Design Code Application for Liquefaction Landslide Countermeasure ..	IV-70
Figure 7-19	Nalodo and Active Fault Map.....	IV-71
Figure 7-20	Target Location and Image of Irrigation Channel Lining .....	IV-73
Figure 7-21	Image of Sabo Dam & Water Intake Structure .....	IV-74
Figure 7-22	Image for Flowing Well.....	IV-75
Figure 7-23	Gravel Drain Plan on Hazard Level 3 (Tentative) .....	IV-75
Figure 7-24	Underdrain Pipe Plan (Tentative) .....	IV-76

Figure 7-25	Groundwater and Surface Water Analysis in Patobo & Jono Oge.....	IV-77
Figure 7-26	Fact and Development Policy for Earthquake Countermeasure.....	IV-78
Figure 7-27	Process for Design Code Application for Earthquake Countermeasure.....	IV-78
Figure 7-28	Image of Strengthening of Road Networks.....	IV-80
Figure 7-29	Image for Elevated Road Plan.....	IV-82
Figure 7-30	Disaster Status in Palu River Basin.....	IV-84
Figure 7-31	Assumed Countermeasure Section and Applicable Facilities.....	IV-86
Figure 7-32	Flow to determine the Amount of Sediment for Planning.....	IV-86
Figure 7-33	Palu Urban Area Liquefaction Landslide Site Map.....	IV-88
Figure 7-34	Target Section of the Project.....	IV-98
Figure 7-35	Calculation of Pocket Width of Retaining Wall.....	IV-100
Figure 7-36	Typical Type of Retaining Wall.....	IV-100
Figure 7-37	Existing Conditions (Valley side slope failure).....	IV-101
Figure 7-38	Road Plan.....	IV-102
Figure 7-39	Cross section Structure of Access Road to Tondo Permanent Housing.....	IV-104
Figure 7-40	Stable Cut Slope of Access Road to Tondo Permanent Housing.....	IV-105
Figure 7-41	Surface Protection Measure of Access Road to Tondo Permanent Housing.....	IV-106
Figure 7-42	Selection Flow of Reconstruction Structure Type.....	IV-107
Figure 7-43	The Peak Acceleration Map in Basic Rock (PGA) for Probability Exceeded 7% in 75 years.....	IV-109
Figure 7-44	Response Spectra Map 0.2 Seconds Acceleration in Bedrock for 7% Probability of Exceeding in 75 years.....	IV-110
Figure 7-45	Map of Response Spectra 1-second Acceleration in Bedrock for Probability Exceeded 7% in 75 years.....	IV-110
Figure 7-46	Comparison of Construction Methods in the River.....	IV-111
Figure 7-47	Procedure of Construction (Talise1, Lompio1, Lompio2).....	IV-112
Figure 7-48	Procedure of Construction (Bululi bridge).....	IV-112
Figure 7-49	Image of Small Compactors.....	IV-113
Figure 7-50	Application of Steel Support Pipe to Box Culvert.....	IV-113
Figure 7-51	Disaster features on Poi River.....	IV-114
Figure 7-52	Countermeasure for Poi River.....	IV-115
Figure 7-53	Features of Banggah River.....	IV-116
Figure 7-54	Countermeasure for Banggah River.....	IV-117
Figure 7-55	Disaster features on Salua River.....	IV-118
Figure 7-56	Countermeasure for Banggah River.....	IV-119
Figure 7-57	Disaster features on Paneki River.....	IV-120
Figure 7-58	Countermeasure for Paneki River.....	IV-121
Figure 7-59	Measures to Mitigate Tsunami Damage.....	IV-123
Figure 7-60	Image of Strengthening the Road Networks.....	IV-124
Figure 7-61	Image to Mitigate the Bridge's Damage.....	IV-124

Figure 7-62	Image to Mitigate Nalodo Damage .....	IV-125
Figure 7-63	Image to Mitigate Sediment-related Disaster .....	IV-125
Figure 7-64	Outline of TA on the Public Facilities (Hospital) .....	IV-126
Figure 7-65	Palu IV Bridge General Plan Map .....	IV-127
Figure 7-66	Alternative 1 .....	IV-129
Figure 7-67	Alternative 2 .....	IV-130
Figure 7-68	Alternative 3 .....	IV-131
Figure 7-69	Alternative 4 .....	IV-132
Figure 7-70	New Location of the Palu IV Bridge, end of June, 2019 .....	IV-133
Figure 7-71	Comparison of Bridge Type.....	IV-134
Figure 7-72	Palu IV Plan (1/2), end of June, 2019.....	IV-136
Figure 7-73	Palu IV Plan (2/2), end of June, 2019.....	IV-137
Figure 7-74	Palu IV Profile (1/2),end of June 2019 .....	IV-138
Figure 7-75	Palu IV Profile (2/2), end of June 2019 .....	IV-139
Figure 7-76	Palu IV Typical Cross Section (1/2), end of June 2019 .....	IV-140
Figure 7-77	Palu IV Typical Cross Section (2/2), end of June 2019 .....	IV-141
Figure 8-1	Example of Explanation Material Used for TA in the Infrastructure Reconstruction in the Road Sector (Slope Collapse at Road Embankment) .....	IV-146
Figure 8-2	Example of Explanation Material Used for TA in the Infrastructure Reconstruction in the Road Sector (Emergency Countermeasure against Slope Collapse at Road Embankment) .....	IV-146
Figure 8-3	Example of Explanation Material Used for TA in the Infrastructure Reconstruction in the Road Sector (Field Survey Material for Scouring at Road Shoulder on River Bank)..	IV-148
Figure 8-4	Example of Explanation Material Used for TA in the Infrastructure Reconstruction in the Water Resource Sector (Overall Situation of Disaster) .....	IV-150
Figure 8-5	Example of Explanation Material Used for TA in the Infrastructure Reconstruction in the Water Resource Sector (Outline of Disaster Damage to Paneki River).....	IV-151
Figure 10-1	Particular Specification (extract from the 1st Package Bidding Document) .....	IV-159
Figure 10-2	Bill of Quantities (extract from the 1st Package Bidding Document) .....	IV-159
Figure 12-1	Outline of the Project as of end of June, 2019 .....	IV-165
Figure 12-2	State of SHM .....	IV-172
Figure 13-1	Sample of Land Donation Letter(1).....	IV-185
Figure 13-2	Sample of Land Donation Letter(2).....	IV-186

---

---

## **VOLUME IV Resilient Infrastructure and Public Facilities**

---

---

### **Chapter-1 Outline of Activities**

Major infrastructures including roads and bridges, irrigation facilities, water supply and sewerage systems, airport and port facilities, and other public facilities such as schools and hospitals were damaged by the earthquake, tsunami, Nalodo and landslide. This revealed the vulnerability of infrastructures and public facilities, and a paralysis of transportation and public facilities function in the isolated villages were observed. As a result, the reconstruction M/P included “Recovery of infrastructure and public facility for a resilient society” as one of its five missions. To realize this mission, this activity focuses on assistance of the recovery and reconstruction of infrastructures and public facilities based on the disaster risk assessment result (Output 1) and the spatial plan (Output 2). The main activities in Output 3 are as follows:

- Determining target sector for the infrastructure and public facility
- Analyzing damage condition in the target sector
- Reviewing the laws, guidelines, and manuals related to structural design and construction
- Formulating a reference manual on structural design to strengthen the infrastructures and public facilities
- Assisting the local government and PUPR on formulation of basics reconstruction concept
- Assisting the local government and PUPR on basic design in the target sector
- Assisting the local government and PUPR on construction of the infrastructures and public facilities
- Assisting the related ministries and agencies on improvement of the current manuals
- Assisting on the facilitation of the National Expert Panel
- Assisting on Implementation of Strategic Environmental Assessment (SEA)/ Environmental Impact Assessment (EIA)



## Chapter-2 Determining Target Sectors of Infrastructure and Public Facility

Based on the discussions with Bappenas and PUPR, the implementing agencies of the infrastructure project, road and bridge, river and public facility sectors are selected as the target of the Project. These sectors are under the jurisdiction of PUPR Directorate General of Highways (Bina Marga), Directorate General of Water Resources (Sumber Daya Air) and Directorate General of Human Settlements (Cipta Karya), respectively.

The above three sectors were selected because before the Project, the JICA experts played a leading role in providing advice on realization of BBB concept during the formulation of the reconstruction M/P; and there was a discussion on assisting infrastructures that should be revised to reflect the results of the disaster risk analysis. The discussion inherited as the content of the Project.

Table 2-1 List of Target Sector

PUPR Organization	Target Sector and Main Projects
	<u>Road and Bridge Sector</u>
Directorate General of Highways (Bina Marga)	<ul style="list-style-type: none"> <li>➤ Road and bridge reconstruction projects to recover the livelihood and logistics</li> <li>➤ Elevated road including tsunami countermeasures</li> </ul>
	<u>Water Resources Sector</u>
Directorate General of Water Resources (Sumber Daya Air)	<ul style="list-style-type: none"> <li>➤ Nalodo countermeasure projects</li> <li>➤ Irrigation recovery projects which are closely related to the local industry</li> <li>➤ Flood and sediment countermeasures projects</li> </ul>
	<u>Public Facilities Sector</u>
Directorate General of Human Settlements (Cipta Karya)	<ul style="list-style-type: none"> <li>➤ Hospital reconstruction project</li> </ul>

## Chapter-3 Analysing Damage Conditions in the Target Sectors

### 3-1 Outline of Damaged Feature

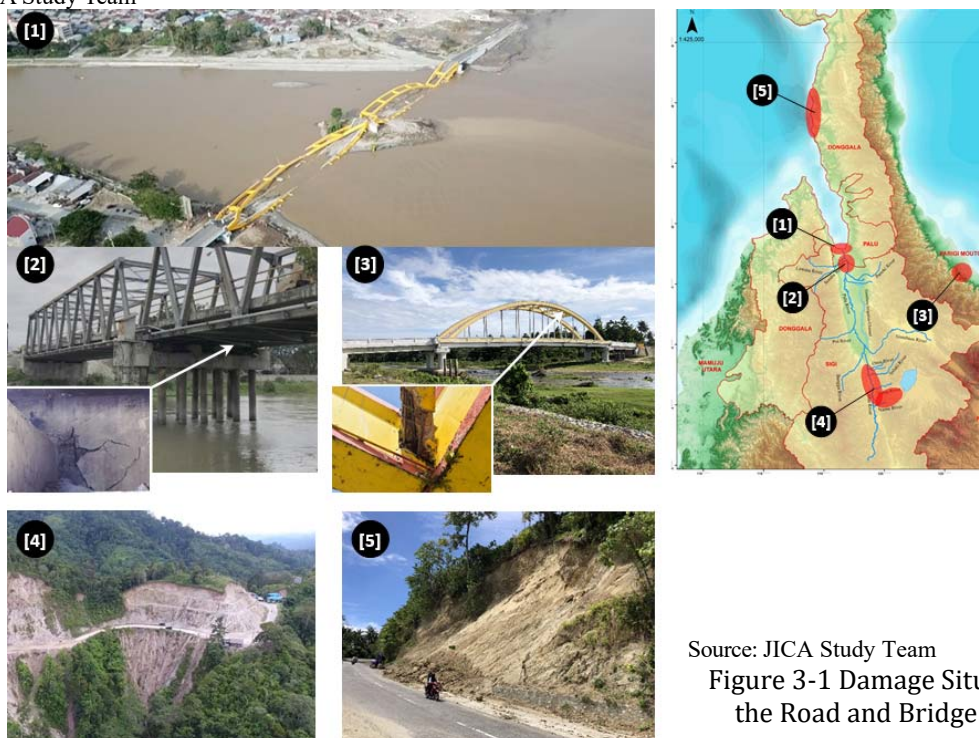
#### 3-1-1 Damage Analysis on the Road and Bridge Sector

Table 3-1 and Figure 3-1 show the situation of damage to infrastructures related the road and bridge sector.

Table 3-1 Damage to Infrastructures related to the Road and Bridge Sector

Location, District	Damage Situation	Damage Analysis
[1] Palu Bay South Coast Area	Flooding of the area up to about 350m from the coast. The Collapse of Palu IV Bridge at the estuary of the river, and washing away of people and houses.	The collapse of the Palu IV bridge and flood damage to the road paralyzed the traffic and logistics functions of the coastal highways. There were no structural measures for disaster prevention and mitigation against tsunami. Building regulation based on the risk zone, early warning system, and facilities such as evacuation shelter were not maintained.
[2] Palu City Roads	Girder movement and damage to parts of Palu II and III bridges.	There measure against the girder movement by the seismic waves that caused the collapse of the bridge was not sufficient.
[3] Parigi Moutong District Roads	Girder movement and damage to superstructure and bearing, exposure of substructure foundation, etc., of Dolago Bridge.	Same as above.
[4] Kalawara-Kulawi, Lindu Lake Access Roads	Collapse of slope in the mountain roads, and traffic blockage.	Safety evaluations were not conducted and necessary measures were not taken for the roadside slopes.
[5] Tombu-Tompe Roads	Collapse of slope in the coastal arterial roads, and traffic blockage.	Same as above.

Source: JICA Study Team



Source: JICA Study Team

Figure 3-1 Damage Situation on the Road and Bridge Sector

### 3-1-2 Damage Analysis in the Water Resources Sector

Table 3-2 and Figure 3-2 show the situation of damage to infrastructures related to the water resources sector.

**Table 3-2 Damage to Infrastructures related to the Water Resources Sector**

Location, District	Damage Situation	Damage Analysis
[1] Nalodo Damage Area	Damage and collapse of numerous houses in Balaroa, Petobo, Jono Oge, and Sibaraya districts, and damage of irrigation canals in the agriculture areas.	Safety evaluations were not conducted, and necessary measures against Nalodo were not taken.
[2] Palu River Midstream - Downstream	River sediment caused by collapse of the slopes and flooding. (Midstream – downstream of Palu River, Lewara River, Paneki River, Poboya River).	Sediment from the collapsed slope in the upstream mountainous areas repeatedly fell down and accumulated during the rain. It is expected to increase in the future.
[3] Palu River Upstream	Same as above. (Upstream of Poi River, Bannga River, Salua River, Miu River, Namo River, Kalawi River, Omu River, Tuva River, Gumbasa River)	Same as above.
[4] Sirenja Area	Flooding of houses and blockage of traffic on the arterial roads by the storm surge caused by subsidence in coastal area.	Although it was affected by the storm surge, the land subsidence after the earthquake will cause more damage.

Source: JICA Study Team



Source: JICA Study Team

**Figure 3-2 Damage Situation on the Rivers Sector**



### 3-1-3 Damage Analysis in the Public Facility Sector

Table 3-3 and Figure 3-3 show the situation of the damage to the infrastructure related to the public facilities such as schools, hospitals, and similar government facilities.

**Table 3-3 Damage to Infrastructure related to the Public Facility Sector**

Location, District	Damage Situation	Damage Analysis
[1] Palu City	School damage: damage to 273 of 424 buildings (about 64%), of which 113 buildings (about 26%) were seriously damaged (in Palu City, Sigi Regency). Other public facilities: damage to 101 of 130 buildings (about 78%), of which 20 buildings (about 15%) were seriously damaged.	Building damage might be caused by the vibration of the earthquake, but it was influenced by other factors such as lack of appropriate seismic design, and a poor construction quality.
[2] Sigi District		
[3] Donggala District		

Source: JICA Study Team



City Apartment house  
(Partially Damaged)



PERTAMINA Gasoline Station  
(Partially Damaged)



Anutapura Hospital  
Completely destroyed because different foundations  
were used on the same site



Column reinforcement exposed by the damage  
There was an error in the reinforcing bar  
arrangement in the columns

Source: JICA Study Team

**Figure 3-3 Damage to the Public Facilities**



### 3-2 Details of Damaged Feature

In order to strategize how to formulate a master plan, it is important to understand current status of disaster damage and its features in the target region. The following section summarizes damage and current status of critical infrastructure, transportation, irrigation and social service infrastructures.

#### 3-2-1 Road and Bridge Facilities

##### (1) Roads

Damages of the arterial roads in the central area of Palu City are a little except sidewalks. Curbstones and pavement are still crushed without restoring. However, there are many affected sections by the earthquake observed on the arterial road along the coastal line heading for Donggala and Pantoloan. Cracked and waved roads due to earthquake are seen, even though some section were restored. The damage of the road becomes serious so as to approach the stricken area, cracked and partially turned into gravel.



Collapse of Road near Liquefaction Area



Damaged Road Surface by Tsunami

Source: JICA Study Team

Figure 3-4 Damages on Roads

Liquefaction landslide is occurred in Balaroa, the road section are still not connected. The temporary diversion route is prepared after earthquake. Landslides along the roads are also occurred in Tompe area, the access road to Lake Lindu, Kalawara-klawi road, etc. Soils on the road due to the landslide were removed to secure the road access as the emergency measure.



Liquefaction in Balaroa



Landslides in Tompe

Source: JICA Study Team

Figure 3-5 Damages on Roads (Liquefaction and Landslide)

## (2) Bridges

The table below shows the numbers and rate of the damaged bridges. Bridges that have collapsed or lost are due to the effects of the earthquake, but damage in other categories includes effects other than earthquakes, such as aging. Number of bridges without damage includes the bridges under construction (Culvert and Steel truss bridge).

Table 3-4 Numbers and Rates of the Damaged Bridge

Item	Collapsed or Lost	Heavy Damage	Moderate Damage	Minor Damage	No Damage	Total
Number	3 (Palu IV, Talise2, East Coast Bri.)	3 (Donggala, Talise1, Tompe Bri.)	15	34	32	87
Rate	3.4	3.4	17.2	39.1	36.8	100%

Source: JICA Study Team

Table 3-5 Legend of Damage Level

Damage Level	Description
Collapsed or Lost	Bridge that original shape is not kept, or it was lost by tsunami.
Heavy Damage	Damage such as cracks with heavy deformation, buckling, break of re-bar rod. Recovery of traffic requires much time.
Moderate Damage	Partial or local cracks, buckling, partial break of re-bar, separation of concrete. Traffic for rescue operation and transportation of help supplies is kept without restoring or within emergency treatment.
Minor Damage	By simple repair, restoring of original functions is possible.

Source: JICA Study Team

### ➤ Damages

Most of the bridges in Palu City and its perimeter were damaged by the earthquake. However, very little bridges were damaged compared with a damage rate in Japan. There are possibility that loosen sand layers, which triggered liquefaction, has been softened by the move of earthquake. Nevertheless the damages of revetment around bridges were observed everywhere. Twelve (12) steel truss bridges, which are very strong structure, keeps their shape without heavy damages. However, small damages to concrete structures have occurred because of the moves of their heavy weights. One steel arch structure (Jembatan Palu IV) was destroyed by the earthquake move in north-south direction.



Collapsed Jembatan Palu IV

Source: JICA Study Team



Hit of Girder on Abutment

Figure 3-6 Damages on Bridges



### (3) Coastal Facilities

#### 1) Palu Bay East and West Coast

Tsunami inundation was rather limited to the areas close to the shoreline in the east and west coasts of Palu Bay, thanks to the topographical characteristics where the elevation quickly reaches 10m within tens of meters away from the shoreline. However, many houses and buildings located in the low elevation areas were devastated by tsunami.



Source: JICA Study Team

Figure 3-7 Tsunami Inundated Area in Palu Bay



Source: JICA Study Team

Figure 3-8 Tsunami Inundated Area in Palu Bay

There are many areas that have suffered damage such as lost and fallen down. In addition, in areas such as the Pal estuary and Donggala port, earthquakes caused large-scale seabed slides along the coastline, which caused not only coastal revetments, coastal roads and bridges, but also the piers of Donggala port and Wani port and Cargo handling equipment of Pantoloan Port. The seabed were submerged collapsed and disappears.



Source: JICA Study Team

Figure 3-9 Wide View of Damaged Bay Area

## 2) Palu City Coastal Zone

The coastal part of Palu City has experienced significant structural damage and loss of life due to tsunami inundation and liquefaction landslide. Based on the observed liquefaction landslide (orange lines in below figure), it was judged that the areas within 120m from the coast line are suspicious for potential liquefaction landslide (Red colored zone in below figure). The tsunami inundation was observed within 100 to 350m from the coast line (red + yellow colored zones in below figure).



Source: JICA Study Team

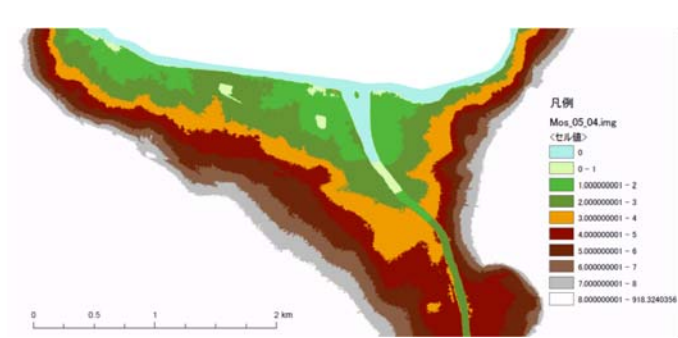
Figure 3-10 Location of Liquefaction along Coastline

In the existing revetments and areas behind them, not only the damage caused by the waves of the tsunami, but also the ground has been sunk by 1 to 2 m due to the earthquake. (See Figures)

In particular, along the Jl. Cumi-Cumi Street in the Pal Estuary Left / Right Bank and the Pal Bay South West area, due to the settlement, there were places that were submerged below sea level at high tide. In order to return to pre-earthquake functions, not only the construction of tsunami dike, but also raising ground is necessary, it was considered that not only coastal levees but also repairs including nearby rainwater drainage facilities and low land reclamation fill are necessary.

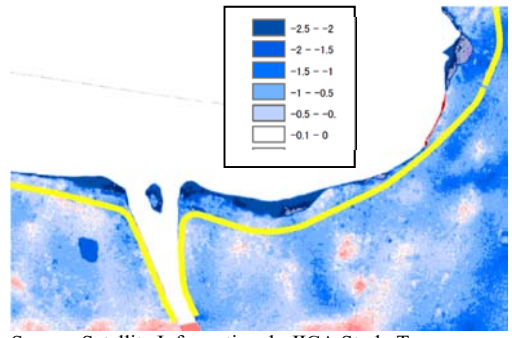
In addition, since a fault called Palu-Koro occurred on the west side of the southern coast of Pal Bay and a Horizontal deflection of 3 to 5 m occurred on the ground surface, attention should be paid to the planning of earthquake and tsunami countermeasures facilities such as levees.





Source: Satellite Information by JICA Study Team

Figure 3-11 Ground Height along South Coastal Area



Source: Satellite Information by JICA Study Team

Figure 3-12 Ground Settlement by 2018 Earthquake



Source: Photo taken by JICA Study Team on 6th, Feb., 2019

Figure 3-13 Location of Coastal Land Slides in the vicinity of Palu River Estuary



① : Location of Photographs by JICA Team

Figure 3-14 Location of Photographs and Coastal Land Slides along South Coast of Palu Bay

Table 3-6 Summary of Coastal Facilities with Descriptions









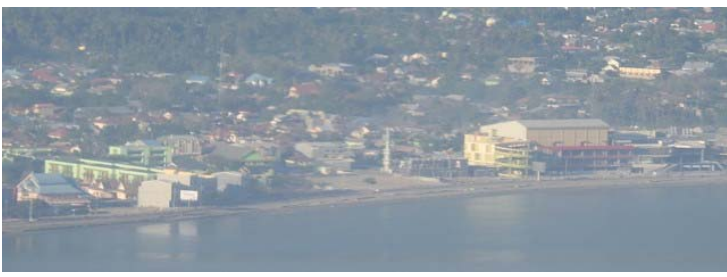


Photo No	Photograph	Description
1		<ul style="list-style-type: none"> <li>✓ East Coast</li> <li>✓ Right side concrete wall barely standing by the help of foundation concrete and toe protection stone.</li> <li>✓ Asphalt pavement was damaged by Tsunami</li> </ul>
2		<ul style="list-style-type: none"> <li>✓ East Coast near salt-pan</li> <li>✓ Sea-side half of the Road was washed away by Tsunami with asphalt pavement.</li> <li>✓ Provably due to the weak slope protection.</li> </ul>
3		<ul style="list-style-type: none"> <li>✓ Land Slide site ①</li> <li>✓ Coastal Road/ Bridge and land was lost by liquefaction and Tsunami</li> <li>✓ Bridge abutment was remained at distant view</li> </ul>
4		<ul style="list-style-type: none"> <li>✓ South Coast</li> <li>✓ The slope surface stone was scored by Tsunami</li> <li>✓ Top concrete barely remained but immediate repair is required.</li> </ul>
5		<ul style="list-style-type: none"> <li>✓ Land Slide Site ② at right bank of Palu River estuary.</li> <li>✓ Sea wall and Sea-side road pavement were sliding and lost.</li> </ul>



Photo No	Photograph	Description
6		<ul style="list-style-type: none"> <li>✓ Right bank estuary of Palu River</li> <li>✓ Mangrove forest was lost by Tsunami wave. Only roots were remained.</li> </ul>
7	 <p style="text-align: center;">Palu 4 Bridge approach slope</p> 	<ul style="list-style-type: none"> <li>✓ Left bank estuary of Palu River (Left-side is sea-ward)</li> <li>✓ This Photo was taken at high water spring tide on March 26<sup>th</sup> 2019.</li> <li>✓ Left bank land was submerged and only approach slope to Palu IV Bridge was left in the water.</li> <li>✓ The submerged area is required land filling.</li> </ul>
8		<ul style="list-style-type: none"> <li>✓ South coast</li> <li>✓ ISIN (Islamic Agama National Institute): Green colour buildings on left side and shopping mall on right side.</li> <li>✓ Narrow seaside space for sea dike.</li> </ul>
9		<ul style="list-style-type: none"> <li>✓ South coast</li> <li>✓ Narrow sea-side space at shopping mall</li> </ul>
10		<ul style="list-style-type: none"> <li>✓ South Coast</li> <li>✓ Some part of Jl. Cumi Cumi and box culverts were submerged during high water spring tide</li> <li>✓ Photo taken March 26<sup>th</sup> 2019.</li> </ul>

Source: JICA Study Team

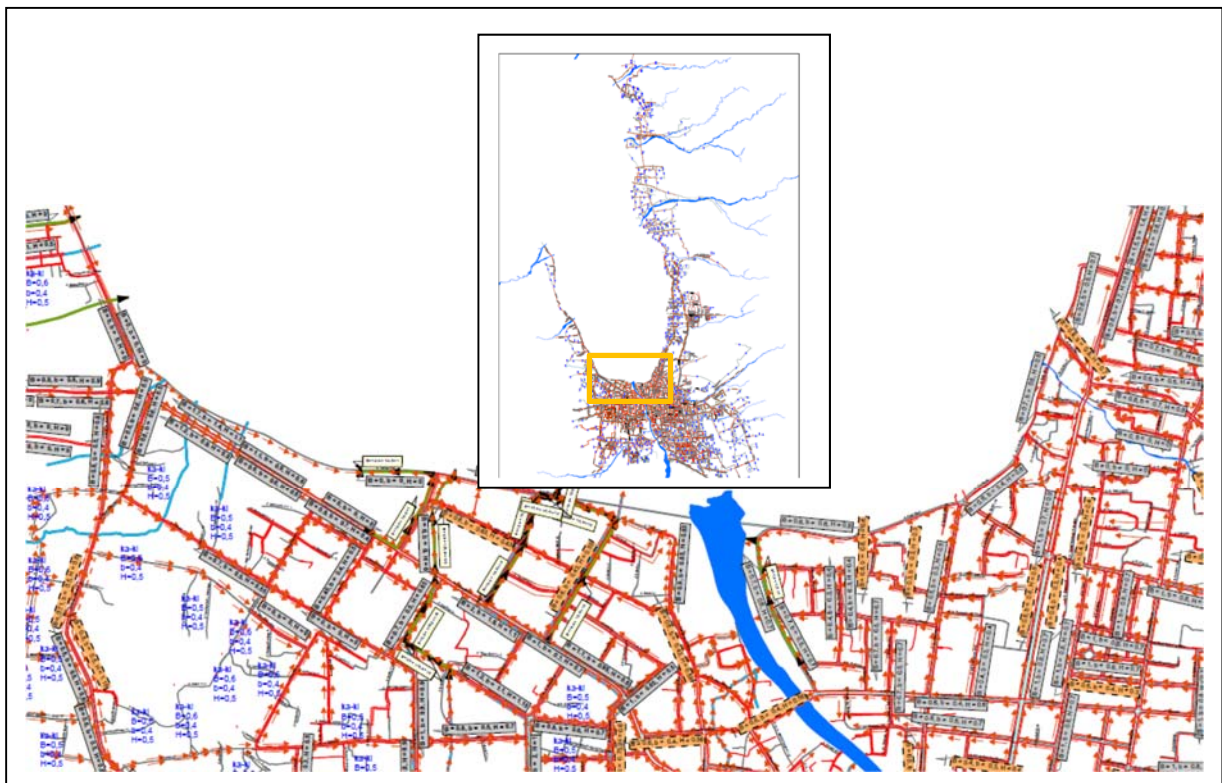
### 3) Present Condition of Storm Drainage System

The existing drainage network as shown in the Figure below is established in Palu city area on the southern coast of Palu Bay. Among these, Figure shows the location, width, etc. of the main existing drainage culverts that lead to the sea. It is necessary to provide a culvert crossing the dike for drainage within the tsunami dike including these existing culverts.

In order to secure drainage by gravity flow even at high tide, it is necessary to restore the ground height by soil filling in the area protected by dike. If land filling was difficult, measures such as reservoir pond and pumping facility will be necessary.

In addition, depending on the tide level at the time of the tsunami, installation of flap gates, is necessary at the sea side exit of each culvert to prevent the backflow of sea water to the land side.

The present conditions of existing box culverts along the south coast of Palu Bay are summarized in the Figure below.



Source: Information collected in the Pre-study of this Project

Figure 3-15 Existing Drainage Plan at South Coast of Palu Bay





Source: JICA Study Team

Figure 3-16 Existing Box Culverts along South Coast of Palu Bay

### 3-2-2 Water Resources Facilities

#### (1) Irrigation

Irrigation facilities in Sigi Prefecture and Palu City received serious damages due to the earthquake. In the Gumbasa irrigation scheme, the total length main canal and secondary canals is approximately 90 km and the irrigation area is 8,180ha, however the supply of irrigation water had been stopped because the facility is broken by the earthquake. Approximately 5,000 farmers had no access to irrigation for planting season in January 2019. Summary of damaged facilities are shown in the table below.<sup>1</sup>

Table 3-7 Irrigation Facility Damage Status

Facilities	Damage situation
Weir (river water intake) <sup>2</sup>	There is no serious damage.
Main Canal <sup>3</sup> Total length: 36,047m	The original form of the canal is lost in and around liquefied damage area. Huge number of cracks occur along 27km of the canal. <ul style="list-style-type: none"> <li>• Lightly damage: 11,608m (32.2%)</li> <li>• Heavy damage: 15,149m (42.0%)</li> </ul>
Secondary Canal <sup>3</sup> Total length: 54.904m	There are 20 secondary canals. 16 secondary canals have been damaged. <ul style="list-style-type: none"> <li>• Lightly damage: 16,282m (29.7%)</li> <li>• Heavy damage: 26,359m (48.0%)</li> </ul>
Diversion Works <sup>2</sup> Total number of works: 58	There are 58 diversion works along main canal. More than half number of diversion works are serious damaged.
River Crossing Works <sup>2</sup>	Paneki river crossing works (BGKn48a point) have been damaged. The works cannot be conveyed irrigation water to down streams irrigation area.
Irrigable farm Land <sup>3</sup>	Irrigated farm lands were lost due to liquefaction in below three areas <ul style="list-style-type: none"> <li>• Petobo : 14ha</li> <li>• Jono Oge : 1,788ha</li> <li>• Sibalaya : 388ha.</li> </ul>
Other <sup>2</sup>	Many number of tertiary canals, small diversion boxes are damaged

Source: JICA Study Team

<sup>1</sup> Source: Interview survey for Balai Wilayah Sungai III (Nov. 27)

<sup>2</sup> Source: REHABILITATION D.I. Gumbasa post-earthquake and liquefaction, BWS Palu

<sup>3</sup> Source: Filed survey by JICA study team





The main canal located in the liquefaction damaged area had been lost the original form and slopes between the field and the main canal had collapsed on a large scale.



There are many places where such large cracks occur in the main canal, and there are uncountable small cracks.



Many secondary canals serious damaged by land subsidence. There are many cracks in the secondary canals same as main canal.



Diversion works in the liquefaction damaged area had been destroyed. In addition, many small-scale diversion works located in the tributary canals are also damaged.



Crossing work on the Paneki River near the JonoOge area. There is a big crack in the lower part of the water canal and water cannot convey



There are many big bumps in the field and the ridge between paddy fields has been destroyed in liquefaction areas.

Source: JICA Study Team

Figure 3-17 Picture of Damaged Irrigation Facilities

## (2) Gumbasa Irrigation System

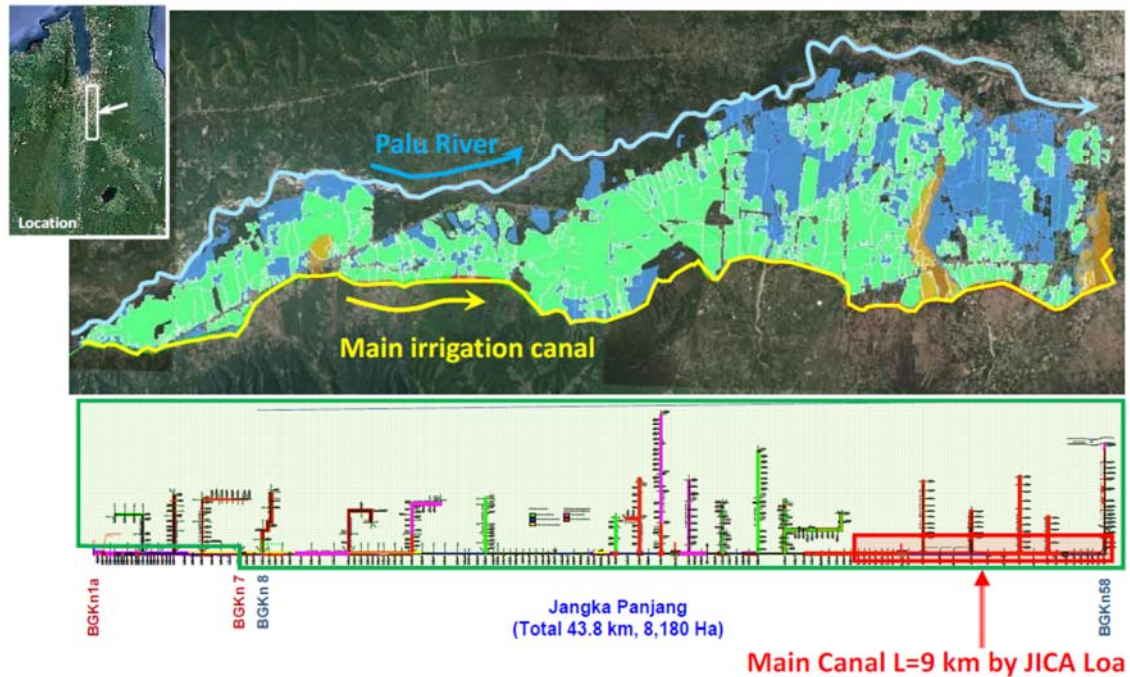
The target area of Gumbasa Irrigation System is about 8,180 ha. (Refer to Figure 3-18)

At present, the main irrigation channel is in a state of destruction all along the line due to ground deformation and its water supply is stopped.

The main irrigation channel reach about 43.8 km of the total length and passes through large and small liquefied landslide areas in addition to the Sibaraya, Jonoge and Petovo areas.

### Gumbasa Irrigation System

- Covered Area : A= 8,180 Ha
- Total Length : L= 43.8 km



Source: JICA Study Team

Figure 3-18 Existing Gumbasa Irrigation System

Figure 3-19 shows that the main irrigation channel is devastated. It is necessary to improve the main irrigation channel as same as new construction.

The main irrigation channel is unsupported excavation and may have been the groundwater supply source along with irrigation water.

It is thought that liquefaction landslide occurred due to groundwater level rise and vibration by the earthquake in this time but the groundwater supply by this irrigation channel water does not contribute to the main cause.



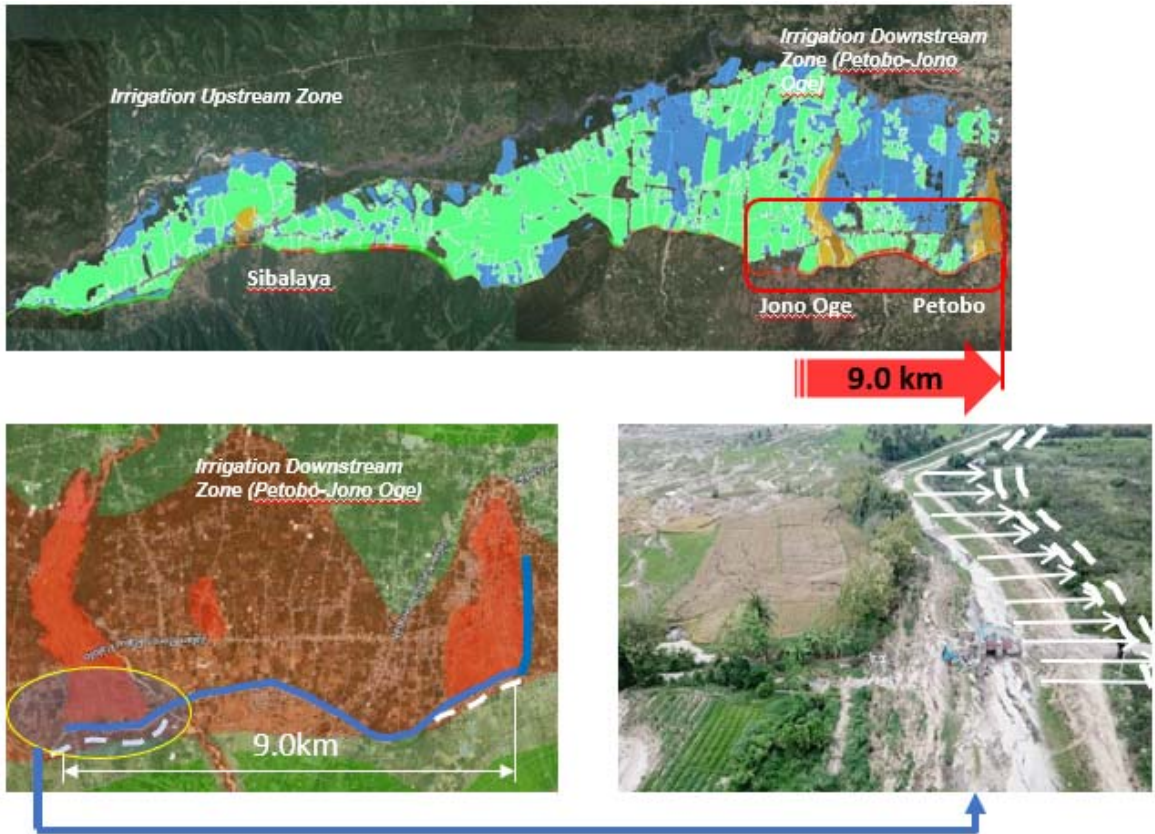


Figure 3-19 Current Irrigation Condition in Petobo- Jono Oge Area

### (3) River Facilities

Most of the revetments along Palu River were damaged: cracked concrete walls, waved tops of bank, collapsed promenade of concrete bricks and lost walls. The small rivers are similar, too, and the same phenomena are seen.



Cracks on Top of Bank



Collapse of Revetment



Flash flood inundated area from liquefaction-landslide area of Jono Oge

Source: JICA Study Team

Figure 3-20 Picture of Damaged River Facilities

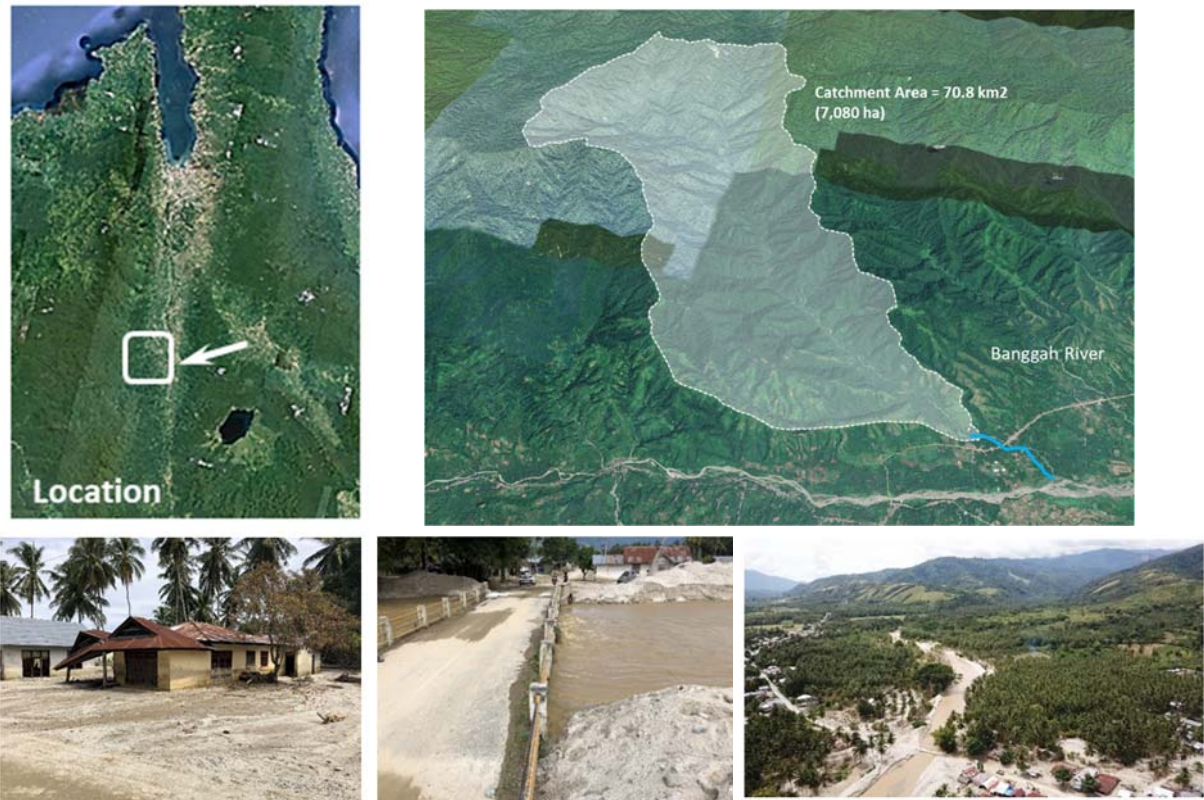


#### (4) Flood and Sediment Disaster

On the 18<sup>th</sup> of November, 2018, a flash flood occurred upstream of Palu River, called Banggah River. According to Kompas newspaper (regional version), 1,443 people have evacuated due to this disaster. The characteristics of disaster are summarized below.

##### <Status>

- It is a small tributary, but there is particularly a lot of sediment supply
- Even in the middle reaches, the particle size of the riverbed material is fine (no weir)
- The riverbed is so high that there is no room under the bridge girder. Water flows out from the right bank side, and a new flow path is formed.



Source: JICA Study Team

Figure 3-21 Flash Flood in Banggah River

#### 1) Characteristics of flood and Sediment disasters in Major River

##### a. Paneki River

Fluidized sediments generated by liquefaction-landslide flowed into the river, and sediment flooding has occurred.

##### b. Bangah River

The unstable sediment generated by the slope failure in the mountainous area and the sediment flow generated by the flood caused a flood.

##### c. Pio River

Large-scale Landslide (mountain collapse) has occurred. There is a high risk of sediment disaster caused by earthquakes and heavy rainfall.

d. Salua River

The unstable sediment generated by the slope failure which occurred extensively in the mountain area and the debris flow generated by the flood were flooded while engulfing the driftwood



**Fluidized sediments** generated by liquefaction-landslide flowed into the river, and sediment flooding has occurred.



**The unstable sediment generated** by the slope failure in the mountainous area and the sediment flow generated by the flood caused a flood.



**Large-scale Landslide** (mountain collapse) has occurred. There is a high risk of sediment disaster caused by earthquakes and heavy rainfall.



**The unstable sediment generated** by the slope failure which occurred extensively in the mountain area and the debris flow generated by the flood were flooded while engulfing the driftwood.

Source: JICA Study Team

Figure 3-22 Flood and Sediment disasters in Paneki, Banggah, Poi, and Salua River



## 2) Secondary Damage Disaster on April, 28-30, 2019

Flood and sediment disasters occurred on April 28 to 30, 2019 after the Central Sulawesi Earthquake disaster.

Hereinafter, Flood and sediment disaster in Bangga River, Ombi River, Gumbasa Area ,and Gummbasa – Saula Area are described.

### a. Bangga River ( Bangga Village Kec.Dolo)

Rainfall continued from dawn on April 27, and several flood and sediment disasters occurred on the Bangga River from the evening of April 28 to the morning of April 30.

Flood victims in Kab. Sigi is below based on the temporary data from BPBD Kab.Sigi at 15:00 on April 29, 2019.

- Location: Desa Bangga, Kec. Dolo Selatan
- House: 500 units submerged by mud
- 551 households or 2259 inhabitants



Source: JICA Study Team

Figure 3-23 Flood and Sediment Disaster Condition in a. Bangga River

Sediment disaster in Bangga River is below

- Sediment Runoff Area is approximately 1,000,000 m<sup>2</sup>.
- Average Sediment deposition depth is about 1.0m.
- The material is almost sand ( $\phi < 0.5$  cm).



**【Emergency matters in infrastructure development】**

- It is urgently necessary to transport emergency supplies. Since the main roads and bridges are in a state where they can not pass by sediment deposition, the sediment on the roads is removed and temporary road opening is necessary.
- The rise of the riverbed due to sediment deposition is a fundamental problem of disasters. It is necessary to excavate the riverbed temporarily and secure the flow capacity of the river.

**【Next stage by JICA Loan Project】**

- Sand pockets, sabo dams, and channel work will be maintained as emergency measures (*Phase I*).
- As long-term countermeasures (*Phase II*), the unstable sediment amount in the basin is estimated, and the MP of the erosion control and the selection of priority facilities are selected with a target of 100% sediment improvement rate.



Source: JICA Study Team

Figure 3-24 Sediment Disaster in Bangga River

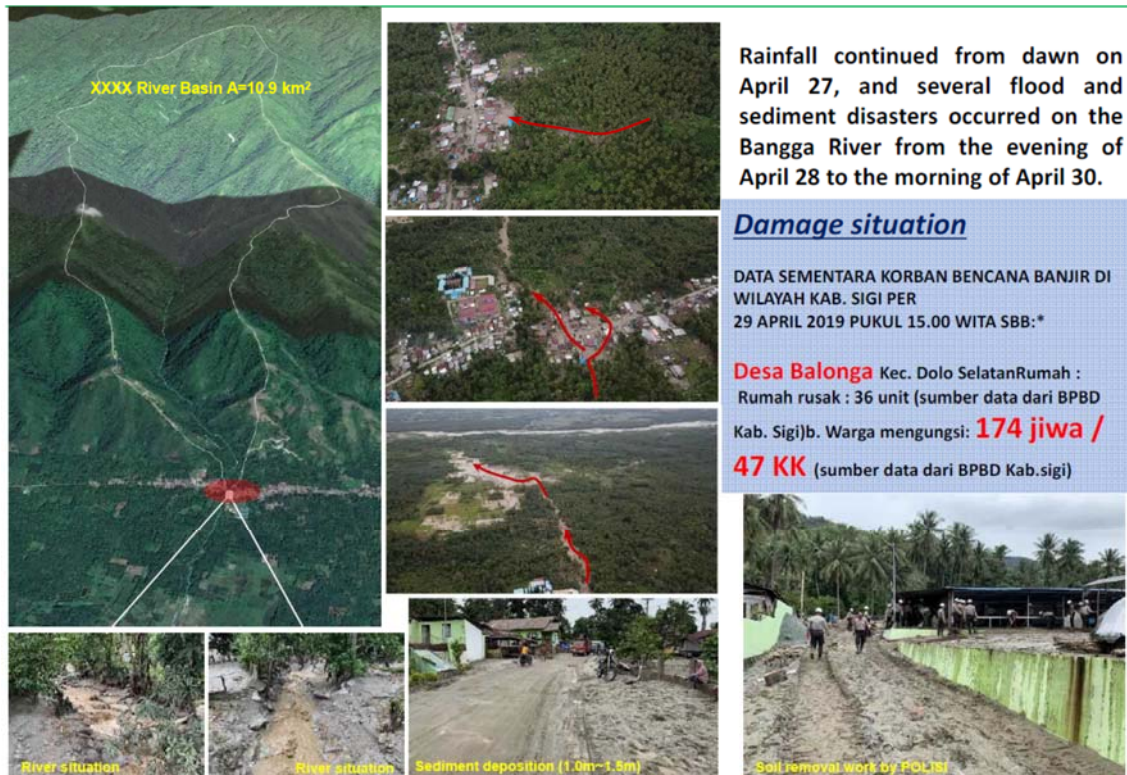


b. Ombi River ( Balongga Village Kec.Dolo Selatan)

Rainfall continued from dawn on April 27, and several flood and sediment disasters occurred on the Omi River from the evening of April 28 to the morning of April 30.

Flood victims in Kab. Sigi is below based on the temporary data from BPBD Kab.Sigi at 15:00 on April 29, 2019.

- Location: Desa Balonga, Kec. Dolo Selatan
- Damaged house: 36 units
- Evacuated residents: 174 people / 47 families

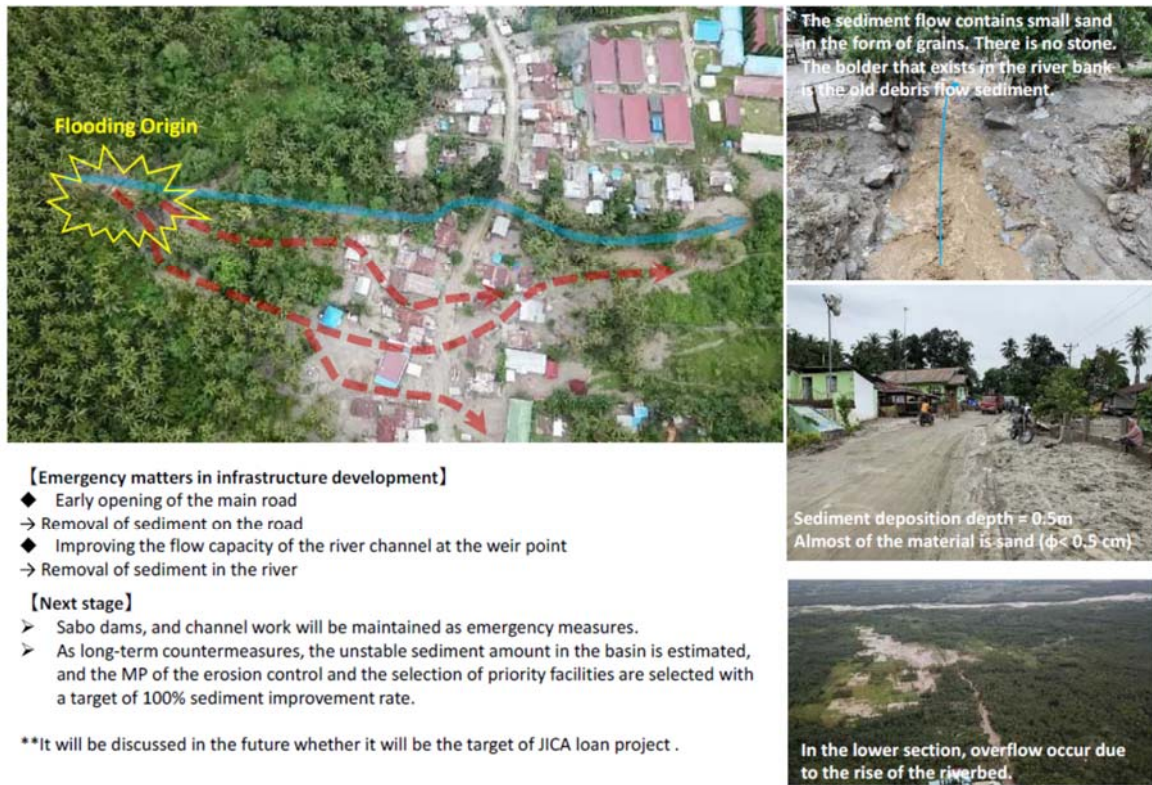


Source: JICA Study Team

Figure 3-25 Flood and Sediment Disaster Condition in Omi River

Sediment disaster in Ombi River is below

- The sediment flow contains small sand in the form of grains without stone. The boulder in the river bank is the old debris flow sediment.
- Sediment deposition depth equals 0.5m and the material is almost sand ( $\phi < 0.5$  cm).
- In the lower section, overflow occurred due to the rise of the riverbed.



Source: JICA Study Team

Figure 3-26 Sediment Disaster in Omi River

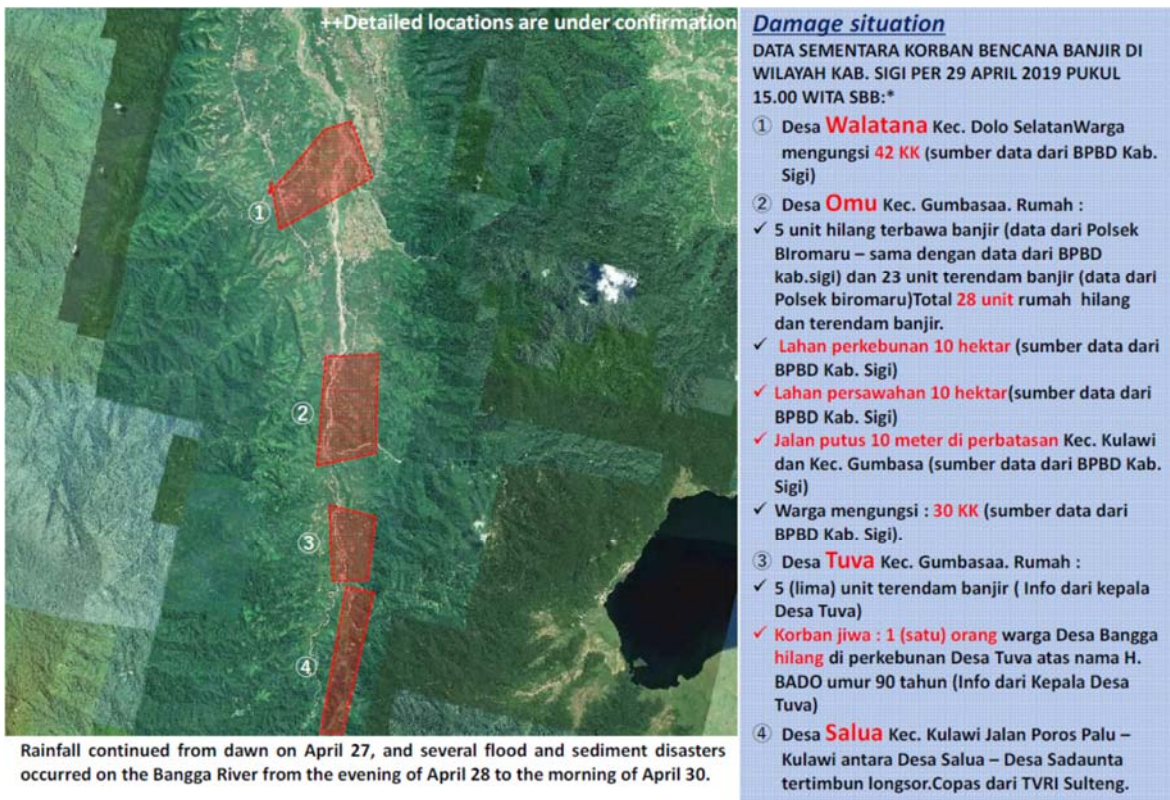


c. Gumbasa Area (Walatana, Omu, Tuva, Salua Village)

Rainfall continued from dawn on April 27, and several flood and sediment disasters occurred on the Bangga River from the evening of April 28 to the morning of April 30.

Flood victims in Kab. Sigi is below based on the temporary data from BPBD Kab.Sigi at 15:00 on April 29, 2019.

- ①Desa Walatana Kec. Dolo Selatan Warga
  - Evacuated residents: 42 families
- ②Desa Omu Kec. Gumbasaa
  - House : 5 units loss by flood and 23 units flooded
  - Plantation: 10 ha
  - Paddy field: 10 ha
  - Road: 10 m broken up at the border of Kec. Lulawi and Kec. Gumbasa
  - Evacuated Residents : 30 families
- ③Desa Tuva Kec. Gumbasaa
  - House: 5 units submerged by flood
  - Casualties: 1 people
- ④Desa Salua Kec. Kulawi
  - Road: Jalan Poros Palu – Kulawi antara Desa Salua, Desa Sadaunta is buried by landslides.

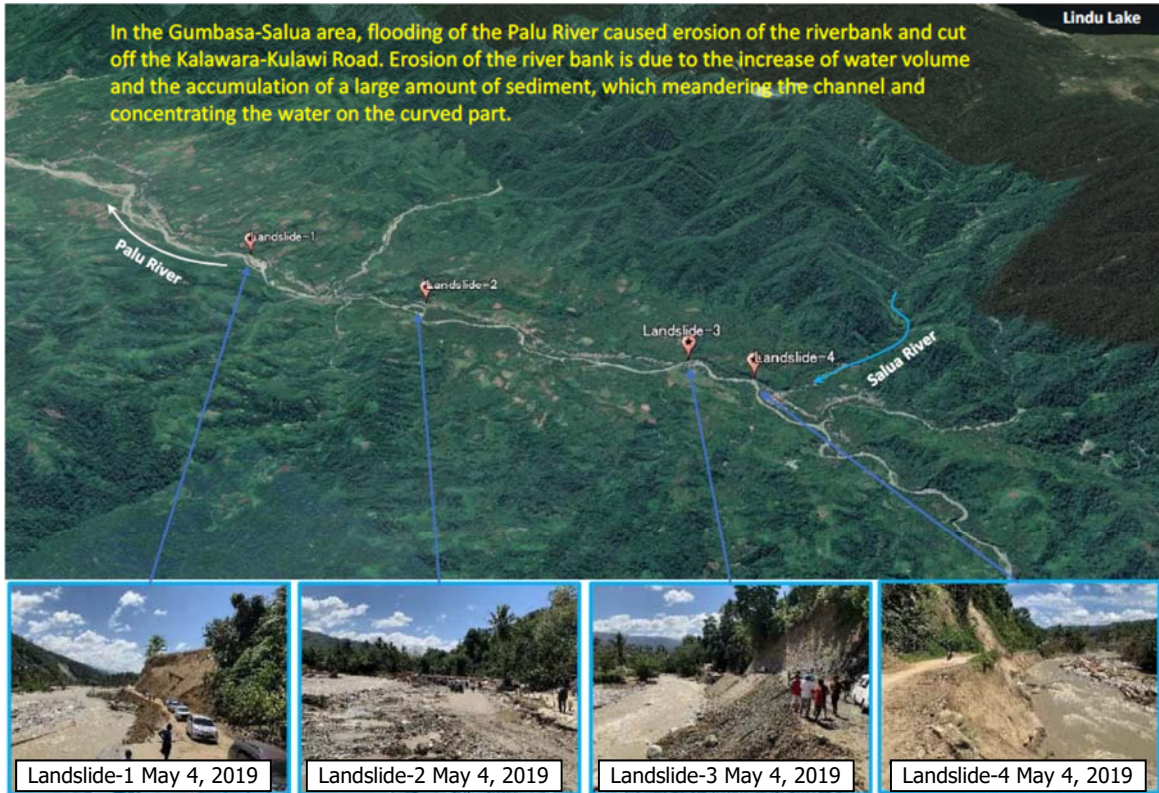


Source: JICA Study Team

Figure 3-27 Flood Disaster Area in Gumbasa Area

d. Gumbasa –Saula Area (Walatana, Omu, Tuva, Salua Village)

In the Gumbasa-Salua area, flooding of the Palu River caused erosion of the riverbank and cut off the Kalawara-Kulawi Road. Erosion of the riverbank is due to the increase of water volume and the accumulation of a large amount of sediment, which meandering the channel and concentrating the water on the curved part.

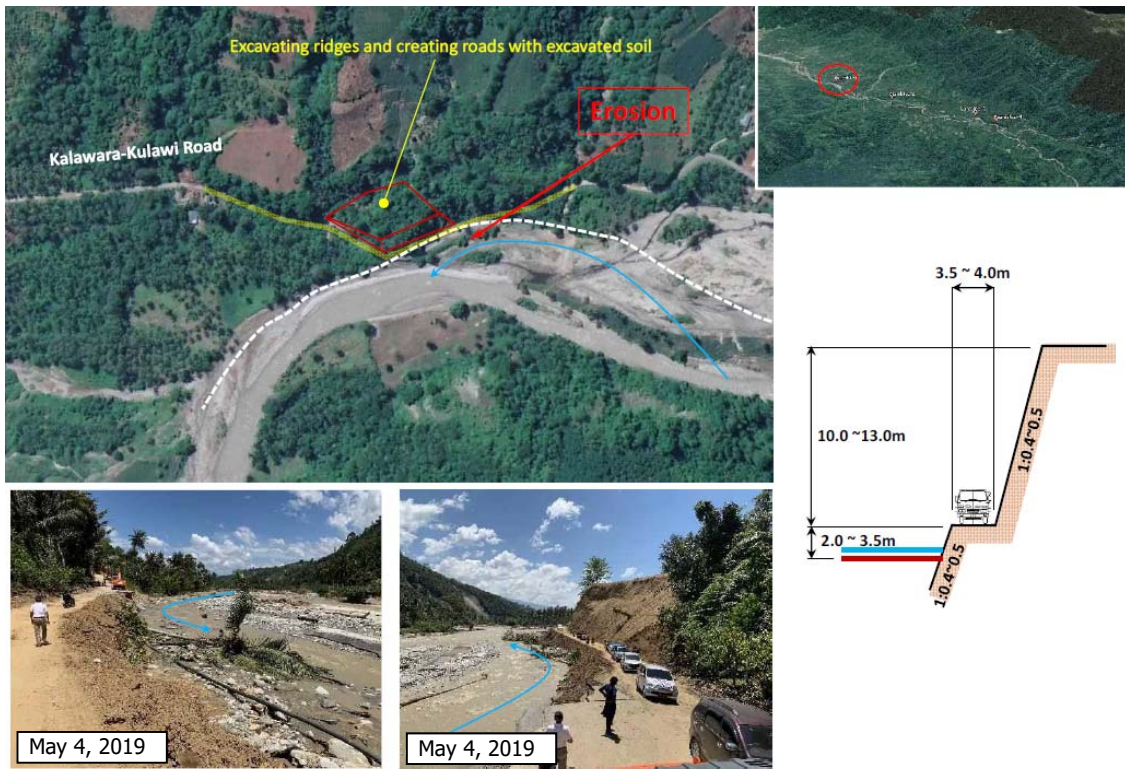


Source: JICA Study Team

Figure 3-28 Location of Landslide in Gumbasa –Saula Area

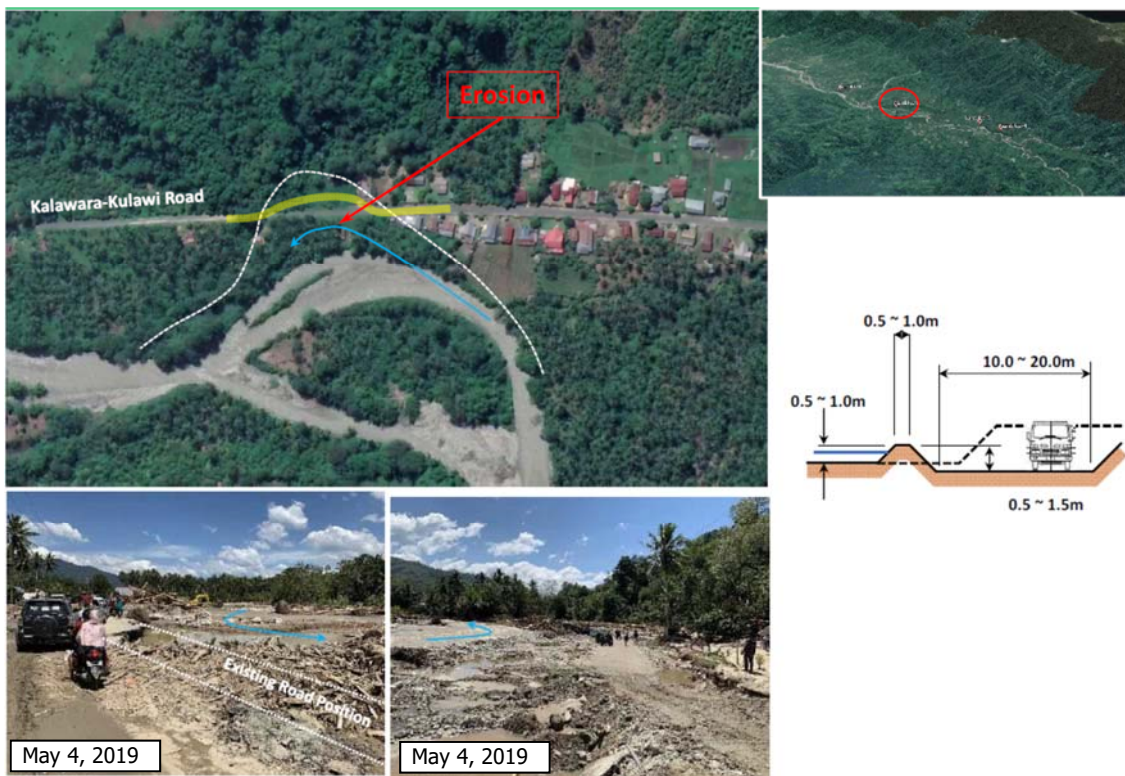
Figure II-3.32 to Figure II-3.35 show the detailed landslide disaster condition at landslide -1 to landslide-4.





Source: JICA Study Team

Figure 3-29 Landslide condition at Landslide-1 in Gumbasa –Saula Area



Source: JICA Study Team

Figure 3-30 Landslide condition at Landslide-2 in Gumbasa –Saula Area



Occurrence of flood and Sediment disasters after the Central Sulawesi Earthquake disaster  
**Gumbasa - Salua Area ( Walatana, Omu, Tuva, Salua Village) April 28 – 30, 2019 Landslide-3**



Source: JICA Study Team

Figure 3-31 Landslide condition at Landslide-3 in Gumbasa –Saula Area

Occurrence of flood and Sediment disasters after the Central Sulawesi Earthquake disaster  
**Gumbasa – Salua Area ( Walatana, Omu, Tuva, Salua Village) April 28 – 30, 2019 Landslide-4**



Source: JICA Study Team

Figure 3-32 Landslide condition at Landslide-4 in Gumbasa –Saula Area

### 3-2-3 Public Building Facilities

#### (1) Damage status of public facilities

Large number of the public facilities in Palu City, Sigi Regency and Donggala Regency had received major damages due to earthquake, liquefaction and tsunami. Not only coastal area but also inland area, such as Sigi Regency, indicate devastating building damages as well. In particular, damages of the public facilities due to liquefaction and landslide is very obvious cases.

The following tables summarize the damages of the public facilities in Palu City, Sigi Regency and Donggala Regency.

Table 3-8 Damages of School Buildings

Area	Classification	Decree of the Damages			Total
		Heavy Damage	Slight to moderate Damage	No Damage	
Palu Area	Primary School (SD)	32	73	24	129
	Junior High School (SMP)	3	13	6	22
	<b>Sub-Total</b>	<b>35</b>	<b>86</b>	<b>30</b>	<b>151</b>
Sigi Area	Primary School (SD)	68	54	98	220
	Junior High School (SMP)	10	20	23	53
	<b>Sub-Total</b>	<b>78</b>	<b>74</b>	<b>121</b>	<b>273</b>
<b>Total of Palu and Sigi area</b>		<b>113</b>	<b>160</b>	<b>151</b>	<b>424</b>

Source: Ministry of Education Palu and Sigi

Note: There is no Donggala data.

Table 3-9 Damages of the Public Building

No	Function	No Damage	Decree of Damage			Total
			Slight	Modelate	Heavy	
1	Public Office building		1	1		2
2	Ministry and Agency Building	2	8	8	12	30
3	District Office	1	2	5		8
4	Village office	11	25	7	3	46
5	Integrated Processing unit			1	1	2
6	Health Center	2	8	2	2	14
7	Subsidiary Helper of Community Health Center	13	10	3	2	28
	<b>Total</b>	<b>29</b>	<b>54</b>	<b>27</b>	<b>20</b>	<b>130</b>

Source: Prepared by JICA Study Team based on data provided by BAPPEDA

Table 3-10 Damage Level of Other Public Facilities

No	Name of the building	Decree of Damages
1	Palu City Hospital ANUTAPURA	Totally damaged (Main building)
2	Province Hospital UNDATA	Slightly damaged (No damage for its structure)
3	Fire station of Palu City	Totally damaged
4	Ministry of PUPR building	Moderately damaged (No damage for its structure)
5	Apartment house of Palu City	Totally damaged
6	Airport control tower	Totally damaged
7	Palu City office building	Slightly damaged (No damage for the structure)

Source: Prepared by JICA Study Team based on the site inspection



Source: JICA Study Team

Note: SDN (Primary school) SMP (Junior high school).

Survey was made by JICA Survey Team with local government staffs

Figure 3-33 Location of the Surveyed Public Buildings

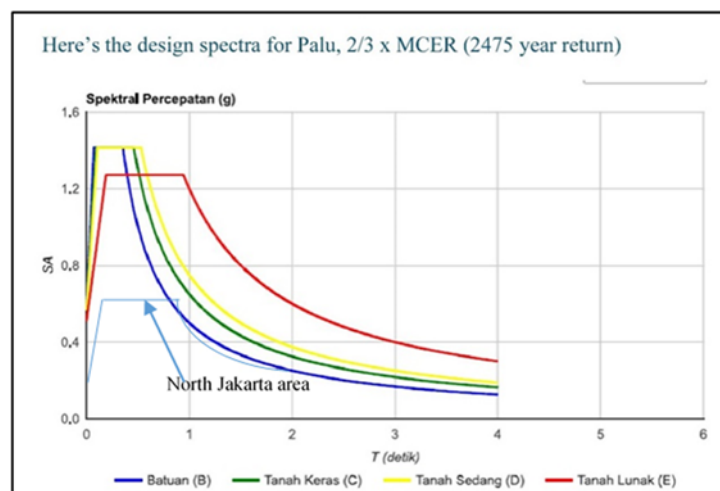
## (2) Damage inspection of public facilities

Damage inspection of public facilities have been conducted JICA Study Team. There are some major and common reason causing damage to the public buildings.

### 1) Adverse effect of Prototype Design

There are several prototype design of buildings and some buildings are designed and constructed based on the prototype design, such as a city apartment house and a gasoline station, and the buildings with the same designs are spread all over the country regardless of the seismic risk zoning and liquefaction.

In case of Palu City, it is categorized in the most critical area in the seismic risk zoning map, and as shown in the figure below, the spectral acceleration (SA) for Palu City is around 1.3g to 1.4g for the Period (T) around 0.2s to 1.0s, these values are almost twice as much as those of north Jakarta area. However, the buildings with the same design have been constructed in Indonesia even with structural design (no change in pile or concrete strength design, for instance).



Source: Prepared by JICA Study Team based on the data from BNKG

Figure 3-34 Spectral Acceleration for Palu City



In case of Jakarta area, the column dimension of five (5) story building should be at least 60 cm x 60cm or larger. However, the actual apartment column dimension is only 30cm x 50 cm in general, and only three (3) D16 re-bar was provided, in the case of Palu City apartment. Taking the seismic energy loaded to the building, the sizes of columns and beams are too small, and the size of provided re-bars are also too small and weak. Consequently it is clearly understood that the prototype design does not consider seismic risk zoning based on the Micro Zonation, and the same design was simply applied to Palu city case. This is the very fundamental problem, which caused major damages to the buildings in the region.



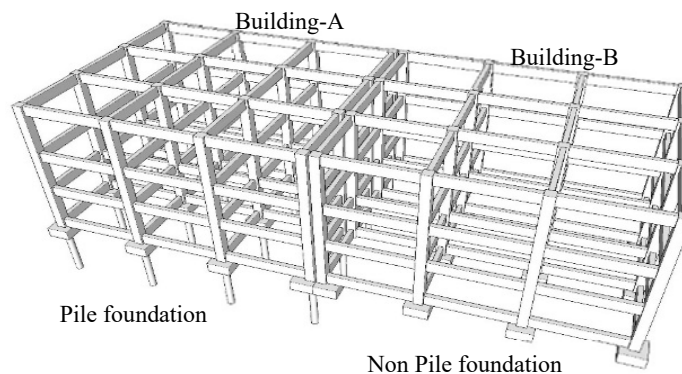
Source: JICA Study Team

Note: The left image is the city apartment house namely “Rusnawa Rumah Susun Sederhana Sewa.”

Figure 3-35 City Apartment House and Gasoline Station (sample of damaged structure)

## 2) Different types of Foundation applied for the same building

In case of a hospital building (Anutapura Hospital), the structure of the main building was split into two parts (shown as Building-A and Building-B below) by expansion joint. The Building-A has survived at the original position, however the Building-B has been pushed away about 50m from original position and has been totally collapsed due to the earthquake. Such an incident should hardly happen. Besides, structural drawing including foundation design has not been located to check the original design. It is assumed that the original foundation design was different from what was actually constructed for both buildings, and the foundation design for the Building-B could be the pile foundation same as the Building-A, although the actual foundation is independent footing. It is important to investigate why such unusual foundation construction was made to one building.



Source: JICA Study Team

Figure 3-36 Applied Foundation Type for the Hospital Building



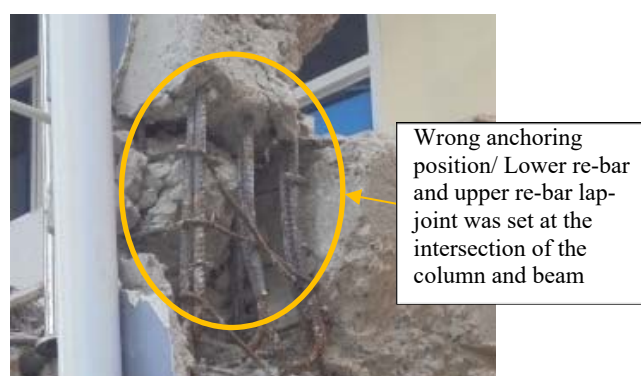
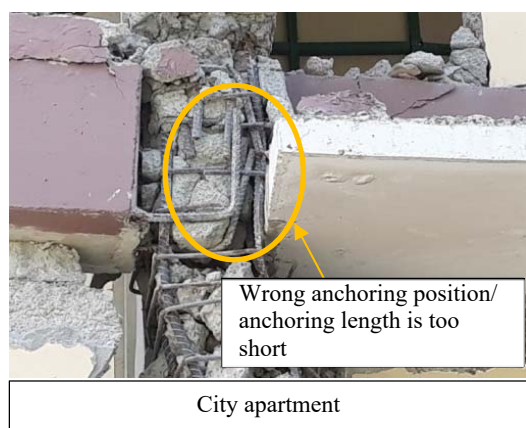
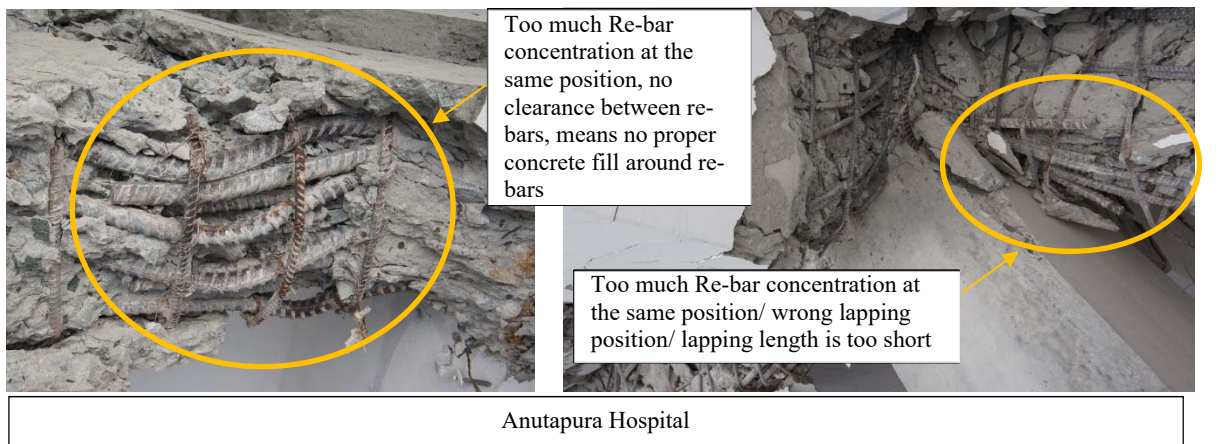
Source: JICA Study Team

Figure 3-37 Building-B which slid away and totally collapsed

### 3) Improper construction work executed on site

#### a. Wrong lapping position and method of the main re-bar assembly

The largest problem that has caused the devastating building damage by the earthquake is the improper construction work been executed. For example, incorrect bar lapping position and wrong method of the main re-bar work as shown below.



Source: JICA Study Team

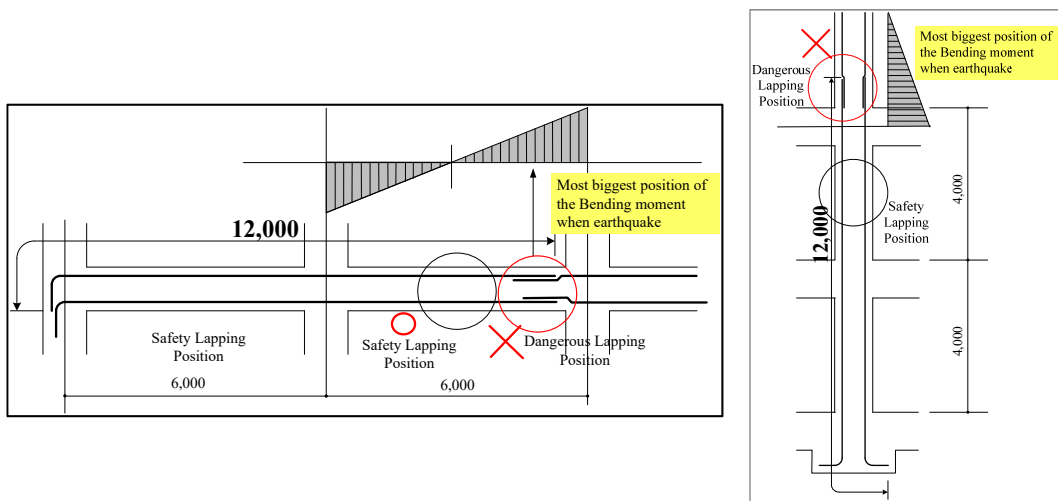
Figure 3-38 Examples of Construction Failure

Though there are some reasons to cause such construction failure, the most fundamental and serious cause could be that there is “no appropriate re-bar bending schedule in drawing set.” Normally, re-bar bending is carried out on a project site with standard re-bars produced at factory

in Indonesia.

The following concerns are identified to degrade the construction quality:

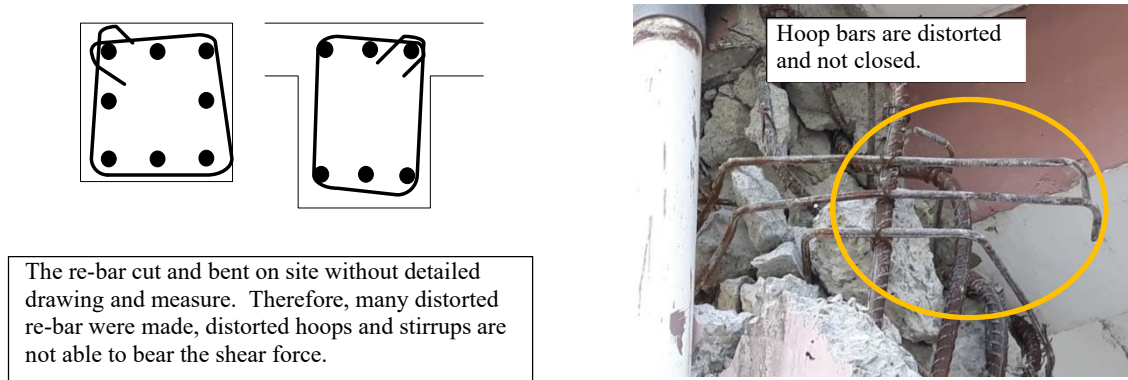
- The structural engineers do not provide re-bar bending schedule in drawing.
- Shop drawings based on the bar bending schedule are not produced on site.
- The contractors do re-bar arrangement without cutting schedule on site especially for main bar.
- Re-bars are cut and bent by re-bar worker on site without detailed bending and cutting schedule.
- Re-bars could be cut too long or too short, or bent too big or too small.
- Some re-bars are lapped at the locations where the largest structural stress (bending moment and shear force) could occur as shown below.



Source: JICA Study Team

Figure 3-39 Wrong Re-bar Lapping Position of Beams and Columns

Because of no re-bar bending schedule drawing, cut and bent on site, distorted stirrup and hoop arrangements are executed as shown below.



Source: JICA Study Team

Figure 3-40 Distorted Stirrups and Hoops

#### b. Incorrect execution of re-bar assembling

Through the damage inspection, another assumption could be made that the forms could not be closed, possibly because of wrong positioning of main re-bars in a column. In such case, the column dimension shall be enlarged in order to keep appropriate thickness of the concrete cover and form must be re-built. However, the contractor should cut away hoop bars intentionally to



close the form boards, therefore the hoop bars were not installed in principle. Thus the column could not bear shear force when the earthquake hit the building.



Source: JICA Study Team

Figure 3-41 No Hoop Bar for Column

No hoop and/or stirrup is provided, especially for intersecting parts of column and beam, almost all of the building destroyed at the intersecting part of columns and beams.



BPTP Building



City apartment

Source: JICA Study Team

Figure 3-42 No Hoop and Stirrup for Intersecting Parts of Structure

PVC pipe for rain water drain is embedded in a main column as shown in Figure 3-43, and it is common in Indonesia. However, it must reduce the concrete strength, and should cause the collapse of columns.



Fire Station

Source: JICA Study Team

Figure 3-43 PVC Pipe embedded in a Main Column

c. Poor Quality of Materials

**Quality of concrete**

The quality of concrete is poor. Concrete is mixed with small amount of cement and coarse aggregate, and large much amount of sand. Therefore compression strength is smaller than required. The compression strength shall be tested and confirmed periodically by an engineer at authorized laboratory.

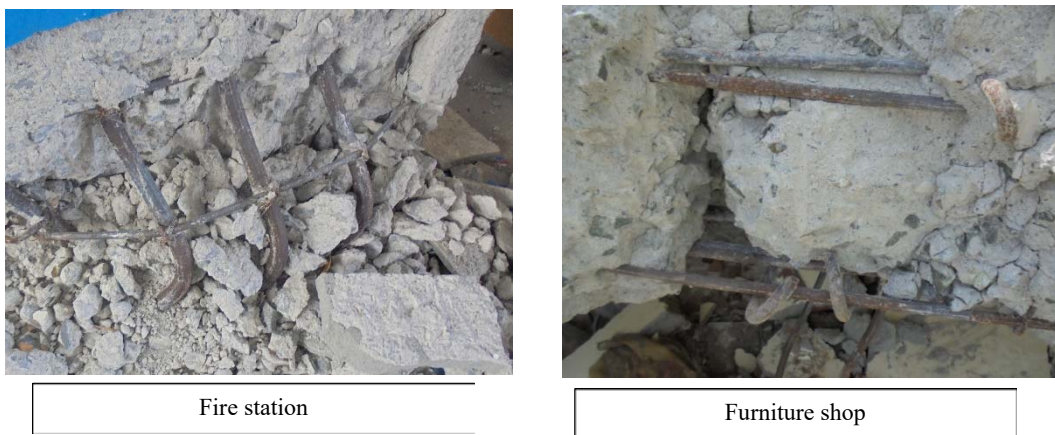


Source: JICA Study Team

Figure 3-44 Poor Quality Concrete

**Quality of re-bar**

Although SNI specifies that the deformed bar shall be applied for main reinforcement, many building structures are constructed with round bars as shown below.



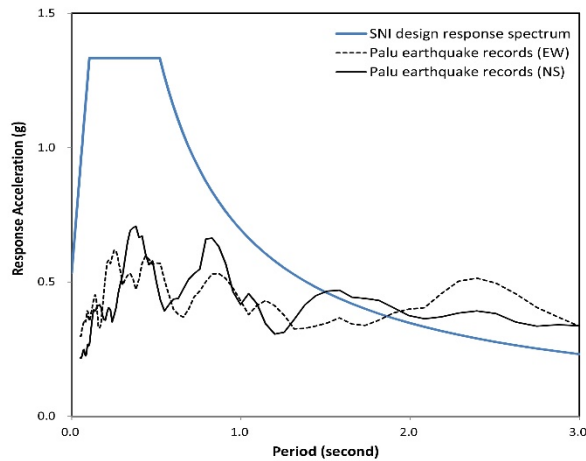
Source: JICA Study Team

Figure 3-45 Round Bar used as Main Reinforcement

### (3) Damage Assessment of Public Facilities by the Disaster

#### 1) Earthquake

As a result of the building inspection, it was realized that there were a lot of damages and collapses due to improper construction works as described above. According to our analysis of seismic load input, it is identified that comparing with the design response spectrum, the response spectrum of the last 9/28 earthquake has recorded smaller, approximately half of the level indicated by the Micro Zonation value, in the period up to about 1.5 seconds.



Source: JICA Study Team

Figure 3-46 Comparison of Response Spectrum Values for Design and Actual Earthquake

The building structural design standards are already established in Indonesia, and these are considered appropriate in terms of quality and completeness. Therefore, it is considered that there will be no major problems in the design stage if buildings are designed based on these codes, standards and regulations. However, there are many problems existing with construction quality, such as concrete works, etc., and such quality control shall be put in more attention for improvement.

#### 2) Landslide and liquefaction

In addition to the damage caused by the earthquake, some buildings were swept away several meters to tens of meters by landslides, and were damaged by land subsidence caused by liquefaction. The main cause for such damages or failure were because of ineffective foundation design, mainly a footing foundation. Besides, some buildings were damaged by the instability of the ground due to liquefaction as many buildings have adopted footing foundation and greatly affected by subsidence of ground level.

#### 3) Tsunami

Many buildings have been damaged or destroyed by the tsunami in the coastal area. It is considered that it was affected by both seismic pressure and water pressure of the tsunami, since the design was not based on the location conditions as the coastal area, and not based on the condition of the tsunami size and energy.



### 3-2-4 Needs for Reconstruction

Though the site survey and meeting with stakeholders, the following are identified as needs for reconstruction.

Table 3-11 Needs for Reconstruction

	Current issues	Needs for reconstruction
Road and Bridge	<ul style="list-style-type: none"> <li>Landslide of slope along road</li> <li>Damaged road</li> <li>Liquefaction landslide in Balaroa</li> <li>Collapsed houses</li> <li>Collapsed Palu IV bridge</li> <li>Damaged bridge</li> </ul>	<ul style="list-style-type: none"> <li>Countermeasure for landslide</li> <li>Reconstruction of road</li> <li>Reconstruction of road and embankment</li> <li>Access road for permanent housing area</li> <li>Reconstruction of Palu IV bridge</li> <li>Reconstruction or rehabilitation of bridge</li> </ul>
Coastal Facilities	<p><b><u>18<sup>th</sup> Feb, 2018 Meeting:</u></b></p> <ul style="list-style-type: none"> <li>Tsunami dike should be considered as a logistic road.</li> </ul> <p><b><u>26<sup>th</sup> Mar, 2018 Joint Field Survey comments from Mr.Arie:</u></b></p> <ul style="list-style-type: none"> <li>In order to reduce land acquisition the tsunami dike should be moved a little towards the sea side</li> <li>Connection with exiting road: a roundabout should be considered at the point where the tsunami dike connecting with the existing road on both the East side and West side.</li> <li>Make a soft dike</li> </ul>	<ul style="list-style-type: none"> <li>The crest width was set to 12m including 3.5m x 2 lanes road with 2.5m shoulder including 1.0m wide sidewalk at both sides of the road.</li> <li>Modified the alignment of tsunami dike using the standard for design alignment of vehicle road.</li> <li>Shifted the tsunami dike closer to the coast compared with the one proposed on 18<sup>th</sup> Feb, 2018.</li> <li>Then, proposed the countermeasures against landslide in the area where the tsunami dike crossing the landslide area.</li> <li>Added roundabout on both the East side and West side.</li> <li>Proposed to plant small scale tree (Ex: local flowers) on the front slope of the tsunami dike to reduce the impact of dike to surrounding landscape.</li> </ul>
Water Resources Facilities	<b>Irrigation</b>	
	<ul style="list-style-type: none"> <li>5,000 farmers cannot access irrigation water in the Gumbasa irrigation scheme, all most the farmers can conduct only rain fed low productivity agriculture.</li> <li>Water leakage from irrigation canals is one of the causes of liquefaction.</li> </ul>	<ul style="list-style-type: none"> <li>It is necessary to reconstruct irrigation facilities in the Gumbasa irrigation scheme in order to recover irrigable area before the earthquake,</li> <li>It is necessary to reduce water leakage from irrigation facilities in order to mitigate future liquefaction disaster risks.</li> </ul>
	<b>River facilities</b>	
	<ul style="list-style-type: none"> <li>Severe damage was made on river facilities including coastal protection and dike.</li> <li>It is essential to secure safety of areas prone to landslide liquefaction.</li> <li>Due to the loosening of ground caused by the last earthquake, risk of landslide /sediment disaster is now higher than before.</li> </ul>	<ul style="list-style-type: none"> <li>At the same time with the redevelopment of river facilities such as coastal protection, river development against future flooding is necessary.</li> <li>Construction method for decreasing groundwater-level in the affected areas of liquefaction landslide should be implemented along with river development.</li> </ul>

	Current issues	Needs for reconstruction
		<ul style="list-style-type: none"> <li>Measures against sediment disaster to prepare for secondary disaster are necessary.</li> </ul>
Public Building Facilities	<ul style="list-style-type: none"> <li>A number of public buildings damaged and there is a need for assistance for rehabilitation and reconstruction</li> </ul>	

Source: Information collected by JICA Study Team

## Chapter-4 Reviewing the Laws, Guidelines, and Manuals related to Structural Design and Construction

Indonesia has laws, guidelines and manuals that have be referred when providing technical supports and capacity buildings related to the basic design of reconstruction and repairing to each target sector. Through discussions with related Indonesian organizations, the JICA Study Team collected these materials and checked whether they were used or followed and how they were used.

By reviewing the existing regulations and guidelines, the JICA Study Team confirmed their current situation and issues as summarized in Table 4-1.

Table 4-1 Summary of the Review of existing Regulations and Guidelines

Sector Type		Summary of Review Results
Road and Bridge Sector		<ul style="list-style-type: none"> <li>➤ Current status: The design standard for geometric structures, seismic design, etc. have been developed and are being used.</li> <li>➤ Issue: There is lack of guidance on pavement inspection methods, liquefaction countermeasures, slope excavation and countermeasure based on the soil characteristic, prevention of collapse of existing bridges, and seismic reinforcement methods.</li> </ul>
Water Resources Sector	Tsunami Countermeasure	<ul style="list-style-type: none"> <li>➤ Current status: The design standards for port facilities are in place and being used.</li> <li>➤ Issue: The design standard for tsunami has not been developed. There is lack of guidelines on design policy, conditions, and countermeasures.</li> </ul>
	Irrigation, Nalodo, and Sediment Countermeasures	<ul style="list-style-type: none"> <li>➤ Current status: The design standards for irrigation facilities and sediment-related disaster countermeasure have been developed and are being used. Indonesian National Agency is developing seismic standards for irrigation facilities.</li> <li>➤ Issue: The design standard for Nalodo has not been developed. There is lack of guidelines on design policy, conditions, and countermeasures.</li> </ul>
Public Facility Sector		<ul style="list-style-type: none"> <li>➤ Current status: The design standards for public facilities building, including earthquake resistance standard, have been developed. The standards have been compared and verified with other countries such as Japan and the United States.</li> <li>➤ Issue: The damage factor analysis indicates that the design standard might not be serving properly.</li> </ul>

Source: JICA Study Team

# Chapter-5 Formulating a Reference Manual on Structural Design to Strengthen the Infrastructure and Public Facility

## 5-1 Outline

### 5-1-1 Basic Concept and Implementation Method

Based on the result of the review of the existing manuals in each target sector (road and bridge, river, and public facility sectors), the JICA Study Team prepared a summary of the design policy, conditions, etc., that are not included in the current manuals as a reference manual (draft). Its aim is to help in realization of the “Recovery of infrastructure and public facility for a resilient society” mission of the reconstruction M/P.

In the Project, the reference manual (draft) formulated by the JICA Study Team was used by PUPR for the basic design and construction. The contents of the reference manual (draft) could be understood by PUPR and reflected in the promotion of basic design and construction of each infrastructure and public facility. Finally, based on the knowledge obtained from the assistance activities related to the basic design and construction (the detail is shown in IV-7, IV-8), this reference manual was finalized (the detail is shown IV-9).

### 5-1-2 Outline of the Reference Manual (Draft)

Table 5-1 shows the contents of the reference manual (draft) formulated based on the above preparation policy.

Table 5-1 Contents of the Reference Manual (Draft)

Classification	Table of Contents
1. Countermeasure against Tsunami	1-1. Selection of Tsunami Countermeasures 1-2. Selection of Tsunami Dike Layout 1-3. Design of Cross-section of Tsunami Dike
2. Countermeasure against Seismic Wave for Building Structures	2-1. Earthquake Hazard 2-2. Design Earthquake 2-3. Basic Concept of Seismic Design 2-4. Best Practices for Seismic Design of Building Structures 2-5. Building Design Guideline 2-6. Quality Control Manual for Reinforced Concrete Work
3. Road Reconstruction	3-1. Pavement 3-2. Road Reconstruction in Liquefaction Area 3-3. Cut Slope 3-4. Introduction to Japanese Methods
4. Bridge Repair and Reinforcement	4-1. General Provisions 4-2. Investigation 4-3. Example of Damage and Deterioration 4-4. Repair and Reinforcement: Execution Principle 4-5. Repair and Reinforcement Method 4-6. References

Source: JICA Experts and JICA Study Team

The reference manual (draft) consists of four parts with an aim to realize a resilient society through infrastructure and public facility recovery plan: 1. countermeasure against tsunami, 2. countermeasure against seismic wave for building structures, 3. road reconstruction, and 4. bridge repair and reinforcement. The following points, which are not in the existing manuals, are included in the reference



manual (draft):

1. Countermeasure against tsunami: target design, scope of countermeasure, elevated-road height setting, inundation depth setting, fault consideration, management the amount of embankment subsidence, etc.
2. Countermeasure against seismic wave for building structures: explanation of seismic motions to be considered in the design, shear reinforcement method for strengthening toughness performance, concrete placement and curing method for quality improvement.
3. Road reconstruction: method for determining the degree of pavement damage, method for strengthening the subbase and subgrade in the liquefaction area, method for installing the drainage in the catchment area, method for setting the slope excavation based on the soil characteristics and the countermeasures.
4. Bridge repair and reinforcement: bridge inspection method, damage case, selection of repair and reinforcement method based on the degree of damage, seismic reinforcement method, and prevention of collapsed bridge through structure construction method.

## 5-2 Contents of Reference Manual (Draft)

The contents for each draft reference manuals is shown in Table 5-2 to Table 5-5.

Table 5-2 Content of the Countermeasure for Tsunami

Title	Table of Contents	Contents
Countermeasure for Tsunami	1-1.Selection of tsunami countermeasures	<ul style="list-style-type: none"> <li>➤ Design tsunami height</li> <li>➤ Optional tsunami countermeasures</li> </ul>
	1-2.Selection of tsunami dike layout	<ul style="list-style-type: none"> <li>➤ Avoid landslide area</li> <li>➤ To consider prominent existing facilities such as shopping mall, university</li> <li>➤ Approaching road(if necessary)</li> <li>➤ Drainage culvert and flap gate</li> <li>➤ Land lock gate(for fishery folks)</li> </ul>
	1-3.Design of cross-section of tsunami dike	<ul style="list-style-type: none"> <li>➤ Design criteria                             <ul style="list-style-type: none"> <li>- Natural condition</li> <li>- Facility planning</li> <li>- Seismic condition</li> </ul> </li> <li>➤ Structure of elevated coastal road                             <ul style="list-style-type: none"> <li>- Structure against the tsunami overflow</li> <li>- Structure against the earthquake</li> <li>- Structure against landslide</li> <li>- Reduce the impact to surrounding area</li> <li>- Easy evacuation</li> </ul> </li> </ul>

Source: JICA Study Team

Table 5-3 Content of Countermeasure for Seismic Wave for Building Structures

Title	Table of Contents	Contents
Countermeasure for Seismic Wave for Building Structures	2-1.Earthquake hazard	<ul style="list-style-type: none"> <li>➤ Seismic sources (subduction zones and active faults, magnitude and frequency, seismic source map for Central Sulawesi)</li> <li>➤ Attenuation of Earthquake</li> <li>➤ Site soil conditions and soil amplification effect</li> <li>➤ Soil liquefaction and building foundation</li> </ul>
	2-2.Design Earthquake	<ul style="list-style-type: none"> <li>➤ 2017 probabilistic seismic hazard map of Indonesia</li> <li>➤ Soil amplification factor</li> <li>➤ Maximum considered earthquake and design response</li> </ul>

		spectrum
	2-3. Basic Concept of Seismic Design	<ul style="list-style-type: none"> <li>➤ Importance factor</li> <li>➤ Strength and ductility</li> <li>➤ Structural characteristics and analysis procedure</li> <li>➤ Indonesian national standard (SNI) for structural design</li> </ul>
	2-4. Best Practices for Seismic Design of Building Structures	<ul style="list-style-type: none"> <li>➤ Practices for avoiding irregularity</li> <li>➤ Practices for avoiding discontinuity</li> <li>➤ Practices for avoiding concentration of seismic forces</li> </ul>
	2-5. Building Design Guideline	<ul style="list-style-type: none"> <li>➤ The guideline is set for small scale building and medium/large scale building as well as key disaster types of earthquake, tsunami and liquefaction landslide (Nalodo) to maximize building's disaster resilient performance even before the structural calculation incorporating Indonesian Micro Zonation factors.</li> <li>➤ Design guideline items <ul style="list-style-type: none"> <li>- Foundation</li> <li>- Above Ground Structure</li> <li>- Building Form</li> <li>- Mechanical, Electrical and Plumbing</li> <li>- Finishes</li> </ul> </li> </ul>
	2-6. Quality Control Manual for Reinforced Concrete Work	<ul style="list-style-type: none"> <li>➤ Basic knowledge <ul style="list-style-type: none"> <li>- Characteristics of Cement</li> <li>- Typical Characteristics of Concrete</li> <li>- General Definition of Reinforced Concrete</li> <li>- Trial Mixing of Concrete</li> </ul> </li> <li>➤ Execution <ul style="list-style-type: none"> <li>- Concrete Work</li> <li>- Formwork</li> <li>- Steel Bar Work</li> <li>- Material Stock and Storage</li> </ul> </li> </ul>

Source: JICA Study Team

Table 5-4 Content of Road Reconstruction Manual

Title	Table of Contents	Contents
Road Reconstruction	3-1. Pavement	<ul style="list-style-type: none"> <li>➤ Survey of Pavement <ul style="list-style-type: none"> <li>- Survey workflow</li> <li>- Road surface surveys</li> <li>- Structural surveys</li> </ul> </li> <li>➤ Evaluation for Existing Pavement <ul style="list-style-type: none"> <li>- Cracking, Rutting, Potholes, Bleeding, Reduction of surface roughness, Faulting, etc.</li> </ul> </li> <li>➤ Maintenance and Repair Methods for Pavement</li> <li>➤ Application in the Project</li> </ul>
	3-2. Road Reconstruction in Liquefaction Area	<ul style="list-style-type: none"> <li>➤ Drainage Treatment <ul style="list-style-type: none"> <li>- Groundwater Level Lowering</li> <li>- DEPP Method (Dissipation Excess Pore Water Pressure Method)</li> </ul> </li> <li>➤ Soft Ground Treatment <ul style="list-style-type: none"> <li>- Compaction Method</li> <li>- Consolidation method</li> </ul> </li> <li>➤ Application in the Project</li> </ul>
	3-3. Cut Slope	<ul style="list-style-type: none"> <li>➤ Evaluation for Existing Cut Slope along Road</li> <li>➤ Stable Gradient of Cut Slope</li> <li>➤ Cut Slope Protection Method <ul style="list-style-type: none"> <li>- Surface Protection (Sodding Work, Shotcrete, Concrete Crib)</li> <li>- Slope Stabilization (Retaining Wall, Soil Nailing, Ground Anchor)</li> </ul> </li> <li>➤ Application in the Project</li> </ul>

	3-4. Introduction of Method in Japan	<ul style="list-style-type: none"> <li>➤ Method 1: Ground Improvement with Interlayer Mixing Method</li> <li>➤ Method 2: Porous Concrete</li> <li>➤ Method 3: Chemical Grouting using Sodium Silicate</li> <li>➤ Method 4: Press-in Method</li> <li>➤ Method 5 :Stabilization of Embankment Construction Utilizing Reinforcement with Gravel</li> <li>➤ Method 6: Terra-mesh Reinforced Earth Wall</li> </ul>
--	--------------------------------------	---

Source: JICA Study Team

Table 5-5 Content of Bridge Repair and Reinforcement Manual

Title	Table of Contents	Contents
Bridge Repair and Reinforcement	4-1. General Provisions	<ul style="list-style-type: none"> <li>➤ Purpose</li> <li>➤ Scope of application</li> </ul>
	4-2. Investigation	<ul style="list-style-type: none"> <li>➤ Types of Damage State Inspection</li> <li>➤ Estimation of Damage</li> <li>➤ Sample of Field Inspection Sheet of Bridge</li> </ul>
	4-3. Example of Damage and Deterioration	<ul style="list-style-type: none"> <li>➤ Concrete Members</li> <li>➤ Metal Component</li> <li>➤ Bearing</li> <li>➤ Expansion Joints</li> <li>➤ Substructure</li> </ul>
	4-4. Repair and Reinforcement: Execution Principle	<ul style="list-style-type: none"> <li>➤ Flow of Necessity Determination</li> <li>➤ Selection of Method</li> <li>➤ Examination of Replacement</li> </ul>
	4-5. Repair and Reinforcement Method	<ul style="list-style-type: none"> <li>➤ Concrete Members <ul style="list-style-type: none"> <li>- Crack Repair Method</li> <li>- Patching Repair Method</li> <li>- Replacing Method for Deck Slab</li> </ul> </li> <li>➤ Steel Members <ul style="list-style-type: none"> <li>- Re-painting</li> <li>- Stop Hole</li> <li>- Patch Plate Work</li> </ul> </li> <li>➤ Reinstallation sequence of Bearing</li> <li>➤ Reinstallation sequence of Expansion Joints</li> <li>➤ Substructure <ul style="list-style-type: none"> <li>- Foundation Protection Method</li> <li>- Bridge Pier Reinforcing Method</li> </ul> </li> <li>➤ Bridge Fall Prevention Device</li> </ul>
	4-6. References	<ul style="list-style-type: none"> <li>➤ List of referred document</li> </ul>

Source: JICA Study Team



## Chapter-6 Assisting the Local Government and PUPR on Formulation of Basics Reconstruction Concept

### 6-1 Formulation of Basic Reconstruction Concept

#### 6-1-1 Outline of Basic Reconstruction Concept

As mentioned earlier, three target sectors have been specified (road and bridge, river, and public facility), and the JICA Study Team has analysed the infrastructure damage situation in each sector, and identified the vulnerability of various infrastructures. For the development of a resilient infrastructure, the JICA Study Team created a reference manual (draft) consisting of the information not in the existing manuals. This section describes sharing the basic reconstruction concept and outline of the sub-projects that was revised before as technical assistance activities for the local government and PUPR related to the basic design and construction as described in Chapter 7 and after.

BBB is the basic concept of reconstruction aiming at realizing a more resilient society by preparing in advance for disaster recovery, reconstruction, and revitalization, and by incorporating DRR into development measures to avoid previous vulnerabilities. The BBB concept was fully shared with the Indonesian Government agencies through JICA experts during the M/P formulation, before the Project. The BBB concept has been incorporated into the proposed M/P. In the Project, the BBB concept was shared again with the local government and PUPR, which are responsible for the planning of the infrastructures and public facilities. Necessary assistance was provided to promote resilience in the sectors rather than simply to recover from the damage. The JICA Study Team selected sub-projects for the disaster prevention and mitigation measures.

Figure 6-1 shows the most frequently used conceptual diagram in this assistance activity. The conceptual diagram is (partially updated) created by JICA experts during the assistance provided at the M/P formulation stage, before the Project. The JICA Study Team shared the following points with local governments and PUPR.

- The infrastructure recovery plan is both for recovery from the damage and developing a plan to strengthen the disaster prevention and mitigation for the target sectors based on the disaster risk assessments and spatial plans.
- For a tsunami countermeasure, the existing coastal road is elevated to a certain level. It is important to enhance the disaster prevention and mitigation functions by combining the land use regulation, building regulation, evacuation plan, etc.
- Regarding Nalodo countermeasures, it is relatively economical to focus groundwater countermeasures among the causes of liquefaction, which include earthquake, soft ground, and high groundwater level. In this regard, it is important to determine the scale of the countermeasure based on the land use plan by installing shallow well, water leakage lining in the irrigation canals, and by continuously monitoring the groundwater.
- For making the public facilities, resistant to large earthquakes, it is necessary to improve the arrangement of reinforcing bars and quality of the concrete. Quality and construction management are also important.



6-1-2 Details of Basic Reconstruction Concept

(1) Basic Concept

The goal of the reconstruction shall be in line with the national level redevelopment slogan as stated below.

**Build Back Better, Safer, More Sustainable for Resilient Indonesia**

The purpose of the reconstruction assistance project is to recover and reestablish in the region in the short-term stage, and to reinstate regional industry and bring sustainable economic activities back to the disaster damaged region in the mid to long term stage. In order to achieve such objectives, redevelopment of infrastructure and livelihood in the region is fundamental, so that the effective and well-phased reconstruction plan should be made for appropriate implementation for the regional redevelopment promotion.

Through the reconstruction of the region, resilient society should be formed in order to protect and improve the society itself on both hard (infrastructure redevelopment) and soft (relocation, emergency evacuation, livelihood recovery) aspects, because the region and lives shall be protected against future disaster and uncertainty of effects for better and continuous production and living in a safe environment.

The basic concept for the regional reconstruction will be structured by three core actions as shown below.



Source: JICA Study Team

Figure 6-2 Basic Concept for Regional Reconstruction

The expected regional reconstruction master plan shall be formulated knowing the multiple disaster occurrence mechanism, especially of earthquake, tsunami, liquefaction and landslide. As a matter of fact, this earthquake disaster is very complicated due to the combination of tsunami and liquefaction, especially liquefaction brought enormous number of deaths. People living in there have to face with how to reduce the disaster risk. In order for that, people have to combine probable



countermeasures by all means.

The master planning should be implemented taking the following strategical actions into consideration.

- To re-establish resilient society against disaster by “Build Back Better” philosophy
- To formulate effective and efficient reconstruction master plan
- To redevelop resilient region with appropriate urban and spatial development plans
- To setup risk reduction mechanism by infrastructure arrangement considering combination of multiple infrastructure.
- To implement reconstruction projects in appropriate phasing expecting step-by-step method
- To implement reconstruction by people-and-community-based perspective

The regional reconstruction plan should be formulated just after composing reconstruction master plan considering hazard, housing relocation, local industrial rehabilitation, community-based activities, overall infrastructure redevelopment, and others in Palu, Sigi and Donggala. In light of the above-described hazard and risk assessment of the target region. There are several aspects to be incorporated in order to improve the affected region.

### 1) Disaster Risk Analysis Based Planning

It is important to understand the mechanism of cascaded effect of disaster. There are several cascaded disasters which took place by mixing of different disasters. Tsunami is one kind of the results. Liquefaction-landslide also occurred in a cascaded mechanism, and made more devastating effect. Buildings noncompliance to the building code also made serial disaster effect leading casualty.

### 2) Packaged Resilient Infrastructure Redevelopment for Comprehensive DRR

In order to reduce risk of such a complicated disaster, it must be necessary to combine all countermeasures effectively. That means not to recover each infrastructure as it existed, but to make a comprehensive plan to reduce risk even if there is some difference from original purpose of each infrastructure. For example, the purpose of river improvement is considered mainly for flood or water resources, but it can contribute the risk reduction of liquefaction-landslide by groundwater level reduction in affected area through making the water level of river much lower.

### 3) Early Recovery of Community Based Livelihood

The target region has been growing by agriculture, fishery, sea port related industry and SMEs' small manufacturing industry, however there was no major regional core industry. The population has also grown by people seeking SME jobs. Most industrial activities have stalled as they have been affected by the disaster.

## (2) Redevelopment Concept of Packaged Resilient Infrastructure

### 1) Basic Policy

Realizing resilient region with effective infrastructure, experiences that Japan has been gifted even through tragic events should be referred to implement reconstruction. There would be some importance that could be brought into the region for actual action taking.

Lesson Learned by the Tohoku Great Earthquake and Tsunami in 2011 in Japan are as follows;

- There is no upper-limit of disaster hazard.
- The intensive hazard is unavoidable as long as we live in disaster-prone country.
- The victims, damage and loss cannot be perfectly prevented from the intensive hazard.

From this lesson-learned, the target to reduce intensive & extensive Risks is delivered. That is to minimize victims and economic losses, mobilize the best mix of structural and non-structural measures. To achieve this target, risk sensitive infrastructure reconstruction plan is crucial and we have to avoid re-producing same vulnerability again through reconstruction process. The reconstruction process includes;

- To identify the disaster risk (what? How big? How often?) of each area
- To list possible countermeasures
- To consider constraints (cost, time, social acceptance)
- To optimize the countermeasures in the entire region

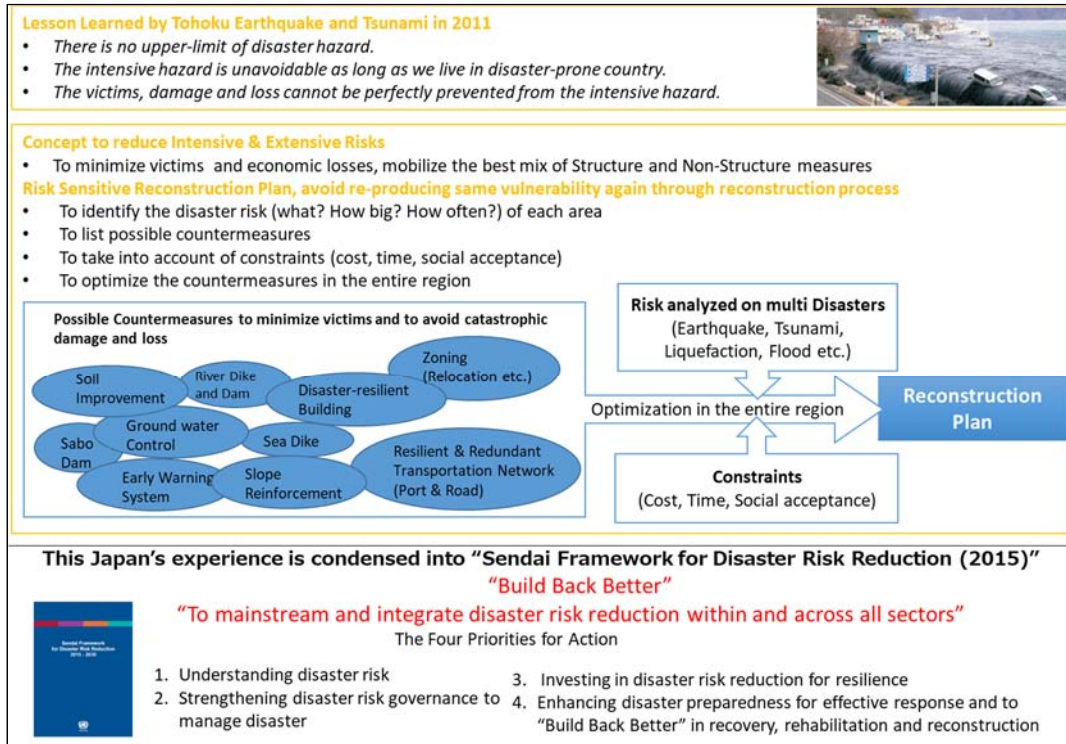
This knowledge delivered by Japan's experience is condensed into "Sendai Framework for Disaster Risk Reduction (2015)".

- Understanding disaster risk
- Strengthening disaster risk governance to manage disaster
- Investing in disaster risk reduction for resilience
- Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction

### 2) Target

Resilience means the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.

In order for the city to become disaster resilient, infrastructure also need to be resilient. Even the structure is strong, but once that is broken and difficult to recover, that is not called resilient infrastructure.



Source: JICA Study Team

Figure 6-3 Japan's Experience on Reconstruction Plan

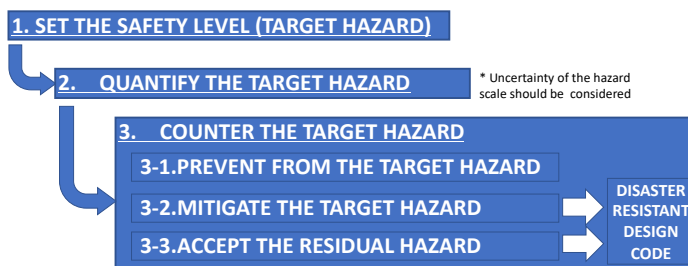
### 3) Procedure

The infrastructures are categorized into some sectors such as road and bridge, port, sea dike, river, Sabo, irrigation, water supply system, public facility, etc. It is important to perform the reconstruction basic plan of each sector to contribute to the realization of "resilient city against multiple disasters" based on the concept of "Build Back Better".



Source: JICA Study Team

Figure 6-4 Japan's Experience on Reconstruction Plan



Source: JICA Study Team

Figure 6-5 Procedure of Basic Reconstruction Plan for Infrastructures



### Setting of Target Disaster Level (Safety Level)

To design the structure, the target hazard should be determined. The target hazard is the type and scale. The safety level of structure is endured against the target hazard.

Generally, the target hazard is the biggest recorded disaster. If the data are enough accumulated, the target hazard can be set by simulation model. In the case of tsunami, the recorded tsunami will be the target hazard. But the uncertainty of hazard can be considered.

In Japan, the sea dike was designed by the biggest recorded hazard (tsunami or tide) before the Tohoku Great Earthquake and Tsunami in 2011. This tragedy was occurred by the largest tsunami extremely higher than height of sea dike. Therefore, Japan set 2 levels of tsunami. The level 2 tsunami (bigger one) is for establishing integrated disaster countermeasures focused on the evacuation of people. The level 1 tsunami (smaller one) is for designing the heights of sea dike. The level 2 tsunami is the solution for the uncertainty when the data are enough accumulated. Even it is difficult set the level 2 tsunami, the possibility of bigger target hazard should be considered the design of one structure and multiple protection by another structures.

The target disasters are composed of Earthquake, Tsunami, Liquefaction, Sediment and Flood compositely. However, these disasters don't have the influences on each sector of infrastructures equally. Therefore, safety level should be considered sufficiently based on relations and characteristics of both infrastructure and disaster as shown below.

Table 6-1 Consideration Points for Improvement of Infrastructure

Target Infrastructure	Points to consider for resistant design				
	Earthquake	Tsunami	Liquefaction landslide	Sediment	Flood
Road and Bridge	✓	Vulnerable area only	Vulnerable area only	Vulnerable area only	Vulnerable area only
Port	✓	✓	Vulnerable area only	Vulnerable area only	Vulnerable area only
Sea Dike	✓	✓	Vulnerable area only	Vulnerable area only	Vulnerable area only
River / Sabo	✓	Vulnerable area only	Vulnerable area only	✓	✓
Irrigation	✓	Vulnerable area only	Vulnerable area only	Vulnerable area only	Vulnerable area only
Water Supply system	✓	Vulnerable area only	Vulnerable area only	Vulnerable area only	Vulnerable area only
Public facility	✓	Vulnerable area only	Vulnerable area only	Vulnerable area only	Vulnerable area only
Private building	✓	Vulnerable area only	Vulnerable area only	Vulnerable area only	Vulnerable area only
Communications · Broadcasting	✓	Vulnerable area only	Vulnerable area only	Vulnerable area only	Vulnerable area only

Source: JICA Study Team

#### 4) Quantification of the Target Hazard

The selecting the target hazard level can quantify the target disaster hazard. In the case of tsunami, the hazard is inundation area, depth, or reach time. The hazard can be used for consideration of countermeasures.

#### 5) Countermeasures against Target Hazard

The design code selection should be carried out based on the procedures that first is to select of

the safety level, the second is to quantify the target hazard, and the third is to select countermeasures against the target hazard. The countermeasures are consisted in terms of “Prevention”, “Mitigation” and “Acceptation”.

➤ Prevent from the target hazard

The building control by zoning, or spatial planning can prevent people and buildings from the target hazard. In case of tsunami, the coastal zone can be prohibited for housing.

➤ Mitigate the target hazard

The disaster protection facility can mitigate or reduce the target hazard. In the case of tsunami can reduce the tsunami inundation area.

➤ Accept the residual hazard

After preventing and mitigation the target hazard, people need to accept the residual hazard. The main countermeasure is evacuation. In the case of tsunami, the tsunami early warning system and evacuation facilities such as tsunami evacuation buildings and roads are necessary. Moreover, disaster education and evacuation drill at schools or communities can secure the safe evacuation.

## 6) Design Code

The design code for the infrastructure is necessary for the mitigation and the acceptance of the hazard. In the case of tsunami, sea dike should be endured against the destructive power of the tsunami and reduce the inundation area. Also, the tsunami evacuation building should be endured in the tsunami inundation for securing the lives of evacuated people.

## 7) Inseparability of Infrastructure for Disaster Risk Reduction

Based on BBB concept, reconstruction of some infrastructures in central Sulawesi Province should be planned in inseparable manner in order to maximize both efficiency of reconstruction process and effectiveness of disaster risk reduction that requires detailed risk analysis and prudent design in order to secure resilience against disaster and/or to mitigate levels of damages from tsunami / liquefaction.

Toward formulation of the regional reconstruction master plan, the potential reconstruction components should be carefully analyzed to understand the latest condition to identify issues and challenges. Only with full understanding of the project issues, actual packages of infrastructure reconstruction in the region could be recognized to promise a better, safer and more sustainable society building. There are several infrastructure redevelopment related components considered as necessary to rebuild the region, and each concerned component is examined hereafter to identify challenges and issues toward reconstruction.

Table 6-2 Basic Criteria for Infrastructure under Disaster

		Inseparability	Detailed Risk Analysis			Timing for Construction
			Liquefaction-Landslide	Tsunami	Earthquake	
Seal Dike		●	✓	✓	✓	Long
Road & Bridge	Coastal Road (Including the Palu IV bridge)	●	✓	✓	✓	Long
	Ring Road	●		✓	✓	Long
	Ring Road in Liquefied Area	●	✓		✓	Long
	The other Roads (Simple Repair)					Short
Irrigation	Multifunctional irrigation channel	●	✓		✓	Long
	The other facilities				✓	Short
Drainage	Groundwater level control	●	✓		✓	Long
	Other facilities				✓	Short
River Improvement	Groundwater level control	●	✓		✓	Long
	The other facilities				✓	Short
Sabo	Sediment control in Liquefied Area	●	✓		✓	Long
	The other facilities				✓	Short
Water Supply System	Groundwater use	●	✓		✓	Long
	The other facilities				✓	Short
Buildings			✓		✓	Short
Sea Port			✓	✓	✓	Short
Air Port			✓		✓	Short

● Tsunami Countermeasures & Coastal Road Network Package

● Liquefaction Countermeasures Package

Source: JICA Study Team



## 6-2 Coordination of the Target Sub-projects

As mentioned earlier, the BBB concept was shared again with the local government and PUPR, which are responsible for planning the infrastructures and public facilities. It is important to choose sub-projects that will strengthen the entire sectors, rather than those simply contribute to the recovery from the damage. As a result, the sub-projects shown in Table 6-3 were selected. Regarding the selection of the sub-projects, first, at the stage of formulating the reconstruction M/P, the JICA Study Team provided advice to Bappenas and PUPR on the classification and prioritization of the sub-projects, and organized their proposals. In the Project, sub-projects proposals were finalized after the detailed analysis of the damage situation and sharing the basic reconstruction concept.

These sub-projects are both for recovery the damaged roads, bridges and river structures, and for supporting comprehensive infrastructure reconstruction projects as mitigation measures against risks, including those of tsunami, Nalodo, and flood and sediment. The chosen sub-projects have the following characteristics:

- Big effect of development
- Sub-projects for which related infrastructure was categorized based on disaster hazard analysis and spatial plans.
- Project including infrastructures that required revision on the plans to reflect future survey and measurement results.
- Project not including a large-scale land acquisition or resettlement.
- Sub-projects are organized into the following three packages based on certain conditions including their importance, damage level, ease of recovery:
- Package 1- Projects that should be promoted with the highest priority: In addition to their high degree of the importance and damage, the package refers to sub-projects that meet necessary conditions, such as those which do not need land acquisition. Target sub-projects are assisted by the Project from the preparation of draft tender document to assistance of construction supervision.
- Package 2- General projects that are not included in the package 1: This package includes sub-projects that require continuous survey such as groundwater monitoring to determine the detail conditions necessary, and also require land acquisition. For such sub-projects, the JICA Study Team should provide a rough plan for determining the scale of the sub-projects and technical advice in the Project.
- Package 1.5- General projects that are not included in package 1: At the beginning of the Project, these sub-projects were classified as Package 1, but it is necessary to review the contents of the plan based on the situation of sediment disasters that occur repeatedly during the Project implementation period. In the Project, the JICA Study Team showed sub-projects that should be implemented with additional technical advice.
- The target infrastructure projects are basically those which can be implemented under a loan-aid scheme, but as the Palu IV bridge reconstruction project at the Palu river estuary symbolizes the reconstruction of the disaster areas, it is highly prioritized and expected to be implemented under a grant aid scheme.

A Grant Agreement (G/A) was signed for the “The Programme for the Reconstruction of Palu IV

Bridges in Central Sulawesi Province” in June 2019, during the implementation of the Project. The grant aid, which targets the reconstruction of the core infrastructures in the targeted areas like the Palu IV Bridge and raising road levels, used part of the Project result as basic data. Furthermore, in January 2020, an ODA Loan Agreement (L/A) was signed for the “Infrastructure Reconstruction Sector Loan in Central Sulawesi”. The purpose of the L/A is to promote the reconstruction of infrastructures such as roads and bridges, irrigation facilities, rivers, and public facilities.

Table 6-3 List of Sub-projects for Each Target Sector

Target Sector	Project Field Classification	Sub-project	Criteria for Project Selection				Package Classification
			High Importance	High Damage	Ease of recovery	Disaster during project period	
Road and Bridge Sector	➤ Palu IV bridge reconstruction and strengthening road networks project as tsunami countermeasures	- A0 : The Programme for the Reconstruction of Palu IV Bridges in Central Sulawesi Province (Grant Aid Project, L = 260m)	Yes	Yes	No	No	Grant Aid Project
	➤ Elevated road for reduction tsunami damage and strengthen the road networks	- A1 : Rehabilitation of Palu Inner-City Roads (13.12km), Reconstruction and Management of Rajamoili-Cut Mutia Road Embankment (L=1.2km) - A2 : Reconstruction of Cumi-Cumi Road Embankments (L=2.4km)	Yes	Yes	No	No	2 <sup>nd</sup> Package
	➤ Mountain roads maintenance to strengthen the road networks for flow of people and goods	- A3 : Reconstruction Kalawara-Kulawi Road and Elevated Road in Sirenja (L = 13.8km)	Yes	Yes	Yes	No	1 <sup>st</sup> Package
		- A6 : Slope counter measure and Raising on Access Road to Lake Lindu (L=17.0km) - A9 : Slope counter measure and Raising on Tambu-Tompe road (L=4.0km)	Yes	Yes	No	No	2 <sup>nd</sup> Package
	➤ Access road maintenance for the resettlement	- A4 : Access Road and Main Road for permanent housing Tondo (Bridge & Drainage System), Duyu (L=7.1km)	Yes	Yes	Yes	No	1 <sup>st</sup> Package
		- A5 : Access Road and Main Road for permanent housing Petobo, Pombewe (L=3.4km)	Yes	Yes	No	No	2 <sup>nd</sup> Package
	➤ Ring road network strengthening	- A7 : Reconstruction Palu inner ring road 1 (L = 25.0km) - A8 : Reconstruction Palu inner ring road 2 (L = 17.0km)	Yes	Yes	No	No	2 <sup>nd</sup> Package
	➤ Strengthening the earthquake resistance of bridges on the arterial roads	- A10 : Rehabilitation, Replacement and development of bridge (Lonpio, Lonpio2, Tarise1, Buluri) (4 bridges, total L = 40m)	Yes	Yes	Yes	No	1 <sup>st</sup> Package
		- A11 : Rehabilitation of Palu II and Palu III Bridges (total L = 255m)	Yes	Yes	No	No	2 <sup>nd</sup> Package
	Water Resources Sector	Nalodo countermeasures by controlling the water level of the irrigation canal (Gumbasa) and enhancing the water leakage	- B1 : Improvement of Gumbasa Main Channel, Improvement of secondary, tertiary, drainage channels, and paddy field recovery (L = 6.65km, A = 450ha)	Yes	Yes	No	No

	➤ Nalodo countermeasures by controlling the groundwater, etc.	- B18 : Countermeasure for Liquefaction-Landslide areas (Balaroo, Petobo, Jono Oge, Sibaraya District, total 380ha)	Yes	Yes	No	No	2 <sup>nd</sup> Package
	➤ Flood and sediment disaster countermeasures by improving the rivers, sediment control dams, etc.	- B2 : Capacity Development of the Surface and Groundwater Monitoring (including telemetry system), River Improvement and Sediment control (Up stream of Palu River)	Yes	Yes	No	No	2 <sup>nd</sup> Package
		- B3 : River Improvement and Sediment control in Poi River - B4 : River Improvement and Sediment control in Bangga River - B5 : River Improvement and Sediment control in Salua River	Yes	Yes	Yes	No	1 <sup>st</sup> Package
		- B6 : River Improvement and Sediment control in Miu River - B7 : River Improvement and Sediment control in Namu River - B8 : River Improvement and Sediment control in Kalawi River - B9 : River Improvement and Sediment control in Omu River - B10 : River Improvement and Sediment control in Tuva River - B11 : Polder System Pilot Project in Lende Sirenja Village	Yes	Yes	No	Yes	1.5 Package
		- B12 : River Improvement (Downstream of Palu River considering tsunami countermeasures), River Improvement and Sediment control(Middle stream of Palu River)	Yes	Yes	No	No	2 <sup>nd</sup> Package
		- B13 : River Improvement and Sediment control in Paneki River (Down Stream)	Yes	Yes	Yes	No	1 <sup>st</sup> Package
		- B14 : River Improvement and Sediment control in Paneki River (Middle Stream, Nalodo Area) - B15 : River Improvement and Sediment control in Lewara River - B16 : River Improvement and Sediment control in Poboya River - B17 : River Improvement and Sediment control(Middle stream of Palu River and Tributary) - B19 : Flood and sediment disaster countermeasures against relocation areas (Tondo, Duyu, Petobo, Pombewe district)	Yes	Yes	No	No	2 <sup>nd</sup> Package
Public Facilities Sector		➤ Hospital reconstruction	- C1 : Reconstruction of Anutapura Hospital	Yes	Yes	No	No

Source: JICA Study Team

## Chapter-7 Assisting the Local Government and PUPR on Basic Design in the Target Sector

Based on the reference manual (draft), the JICA Study Team provided assistance to local government and PUPR on basic design in the target sector. The basic design assistance's content is classified based on the financial scheme (grant aid and loan aid). The JICA Study Team conducted the outline design for Palu IV bridge reconstruction project, which is expected to be a grant aid project. On the other hand, for other sub-projects, which are expected to be loan aid projects, the JICA Study Team conducted outline plan, draft detail design, and technical assistance (hereinafter referred to as "TA"). In addition, as a part of TA's activities, the JICA Study Team also provided advice on BBB concept implementation method in the other infrastructure projects assisted by other donors.

The basic design assistance for this reference manual (draft) enhanced the local governments and PUPR's understanding of the basic design concept for reconstruction, and the following results were obtained:

- The JICA Study Team shared the reference manual (draft) with the local governments and PUPR, and their understanding on necessary design items for disaster risk mitigation measures based on the BBB concept was improved.
- The JICA Study Team shared the project outline (purpose, design policy, estimated project cost, project schedule) for all loan aid target projects with the local governments and PUPR, and their understanding on items necessary for strengthening each infrastructure was improved. As a result, PUPR proceeded with the procedure for draft detail design, construction supervision, consultant procurement, and contractor procurement assuming a loan assistance.
- The JICA Study Team shared the design and procurement documents formulated in the draft detail design with the local governments and PUPR. The documents shared are only those of the priority projects for loan aid (Package 1). Furthermore, PUPR prepared the documents necessary for the international tender of the construction supervision consultant.
- In the TA, the JICA Study Team shared the construction supervision technology with PUPR. The technology includes the basic structure of public facilities based on the scale and type of disaster, the reinforcement method to improve earthquake resistance, the structural design for general hospital reconstruction, and the design technology required for seismic isolation design. As a result, PUPR carried out procurement procedure for consultants and contractors for the general hospital reconstruction. For the sub-projects designed and assisted by other donors such as mountain road, irrigation facility, and coastal revetment, the JICA Study Team shared BBB as the basic concept of reconstruction with the donor and PUPR, and their understanding was improved.
- The JICA Study Team shared the outline design of Palu IV Bridge, which was targeted as grant aid project, with PUPR. The reconstruction of Palu IV Bridge was expected to strengthen the road networks in the gulf area. In addition, PUPR placed a tender for Palu IV bridge reconstruction Grant Aid Project namely "The Preparatory Survey on the Programme for the Reconstruction of Palu IV Bridges in Central Sulawesi Province", and facilitated the procedure for its implementation as a symbol of the reconstruction activity.

In the future, the tender procedure for each infrastructure project is expected to be carried based on

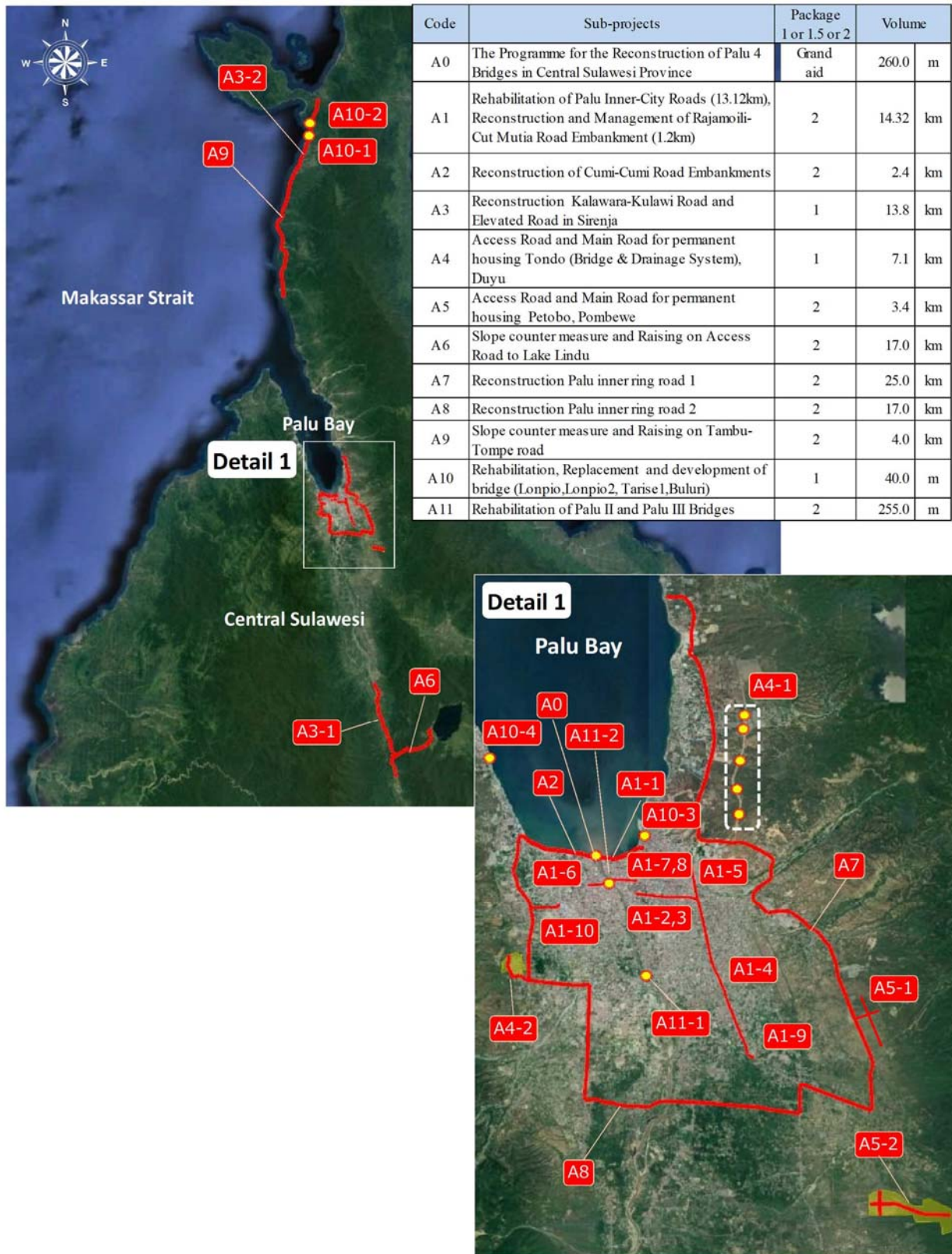


the results of the basic design assistance, and as a result the assistance is expected to contribute to the promotion of the reconstruction projects.

## 7-1 Outline Plan for Target Projects

### 7-1-1 Target Sub-Projects

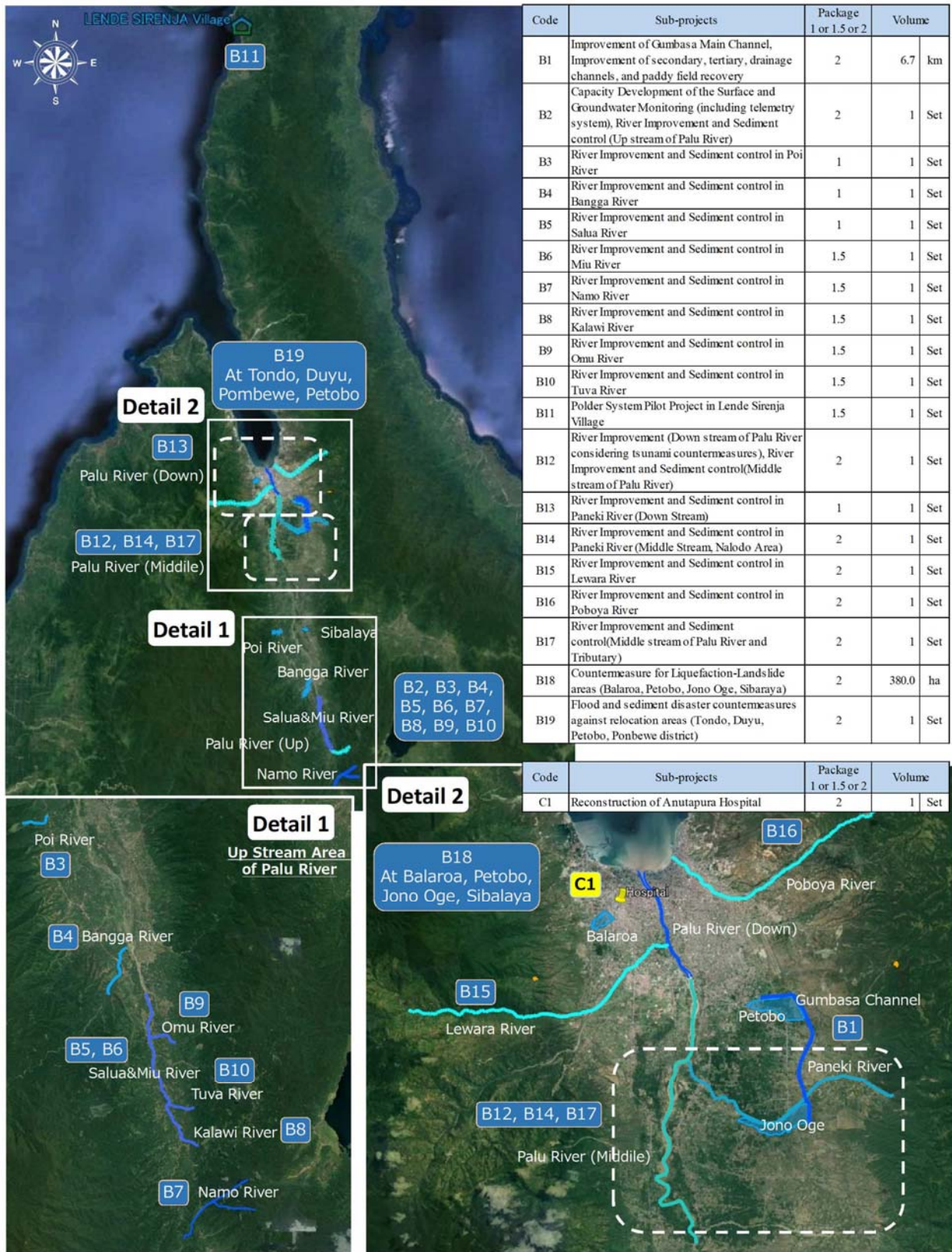
The outline plan assistance targeted sub-projects in each of the target sectors, namely road and bridge, river and public facility sectors. Figure 7-1 shows the locations of the sub-projects of road and bridge sector, and Figure 7-2 shows those of the river and public facility sector. The JICA Study Team created a summary of sub-projects (refer to Appendix II-3-1) which includes the project purpose, design policy and provision, drawing plan, estimated project cost and project schedule. The JICA Study Team also shared the outline of the disaster-resilient infrastructure plan with related organization in Indonesia.



Source: JICA Study Team

Figure 7-1 Location Map of the Sub-projects (Road and Bridges Sector)





Source: JICA Study Team

Figure 7-2 Location Map of the Sub-projects (River and Public Facilities)

## 7-1-2 Basic Concept of Planning

### (1) Tsunami Countermeasures

A summary of the tsunami countermeasures in Palu Bay is shown below. The detailed contents and supplementary information are shown in in the Appendix II-3-2 and II-3-12.

#### 1) Basic concept of tsunami countermeasure

##### a. Target Tsunami

Since tsunami countermeasures require a certain amount of cost, the tsunami to be designed was examined based on the following information. As a result, the tsunami that occurred in September 2018 was selected as the design target tsunami.

- Confirmed tsunami records for the past 100 years and set considering reliability
- Simulation by Japanese researchers indicates scale of Tsunami in 2018 corresponds to high or middle frequency

- ★ Epicenter of the earthquake in 1927
- ★ Epicenter of the earthquake in 1938
- ★ Epicenter of the earthquake in 1968

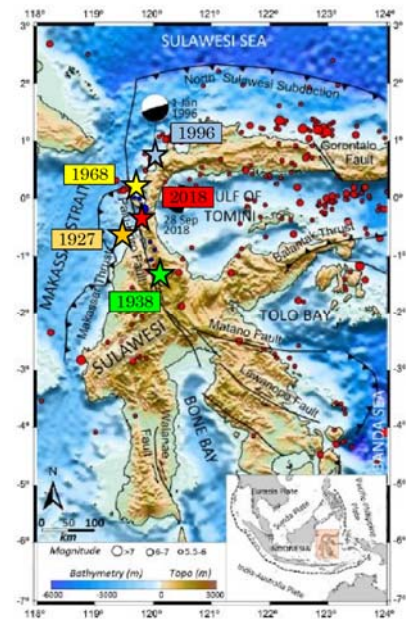
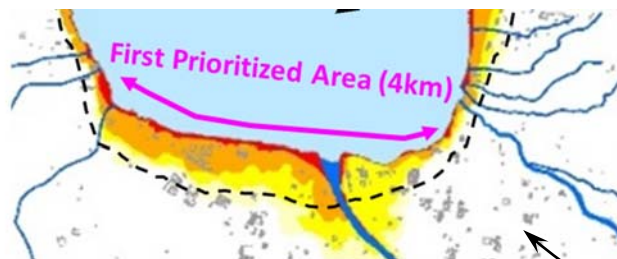
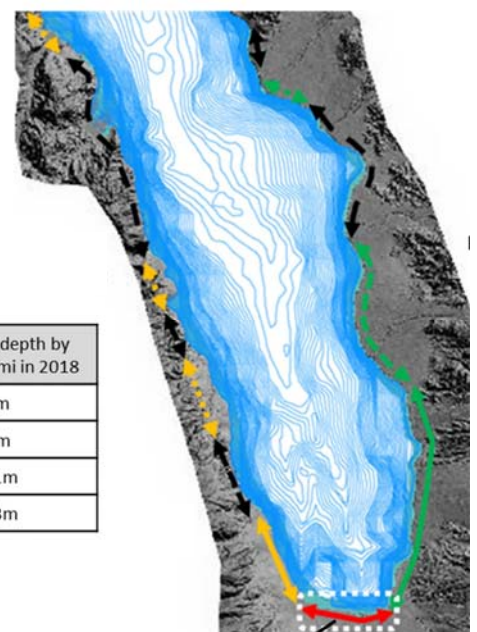


Figure 7-3 Major earthquakes recorded in Sulawesi

##### b. Tsunami Mitigation Strategy

Structural countermeasures, one of the tsunami countermeasures, will be prioritized for a 4 km extension in the Palu bay south, taking into account the distribution of population and assets and the inundation area of the 2018 tsunami (Figure 7-4).

Terrain characteristics		Flat, wide beach			Narrow beach		
		Low	Medium	High	Low	Medium	High
Land use (population)		■ ■ ■	■ ■ ■ ■	■ ■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■ ■	■ ■ ■ ■ ■
Applicable countermeasure	Inland forest, Mangrove planting	✓ ✓	✓	✓			---
	Relocation	✓ ✓	✓	✓	✓ ✓	✓	---
	Elevated road		✓	✓ ✓		✓	---
	Building code	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	---



Level	Inundation depth by actual tsunami in 2018
4	> 3m
3	1-3m
2	0.3-1m
1	0-0.3m

Source: JICA Experts, JICA Study Team

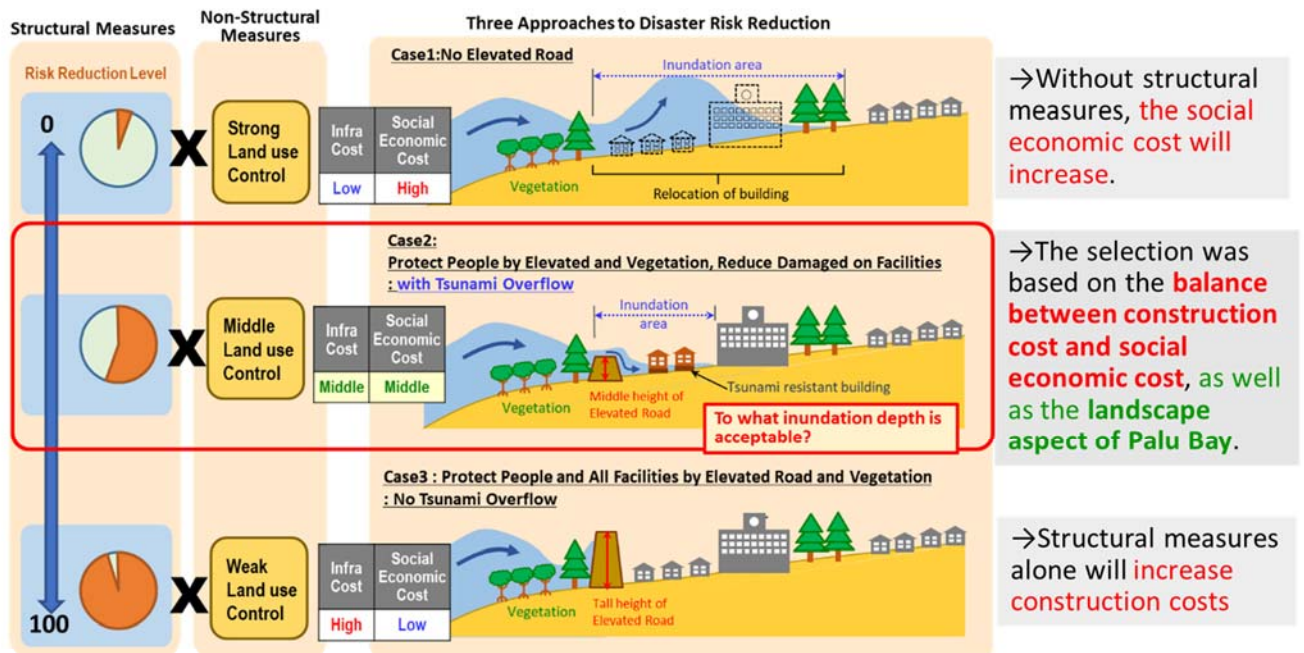
Figure 7-4 Selection of priority areas for tsunami countermeasures

Palu Bay South



### c. Basic policy for tsunami countermeasure

Considering the future occurrence of an earthquake, tsunami and coastal landslide should be taken seriously into account in order to reconstruct the affected coastal areas. In addition to the cost and schedule, the balance between land acquisition and infrastructure development cost has to be carefully examined as well to effectively reconstruct these facilities at the required quality. Countermeasures combined with structural and non-structural measures are proposed as below (Figure 7-5)

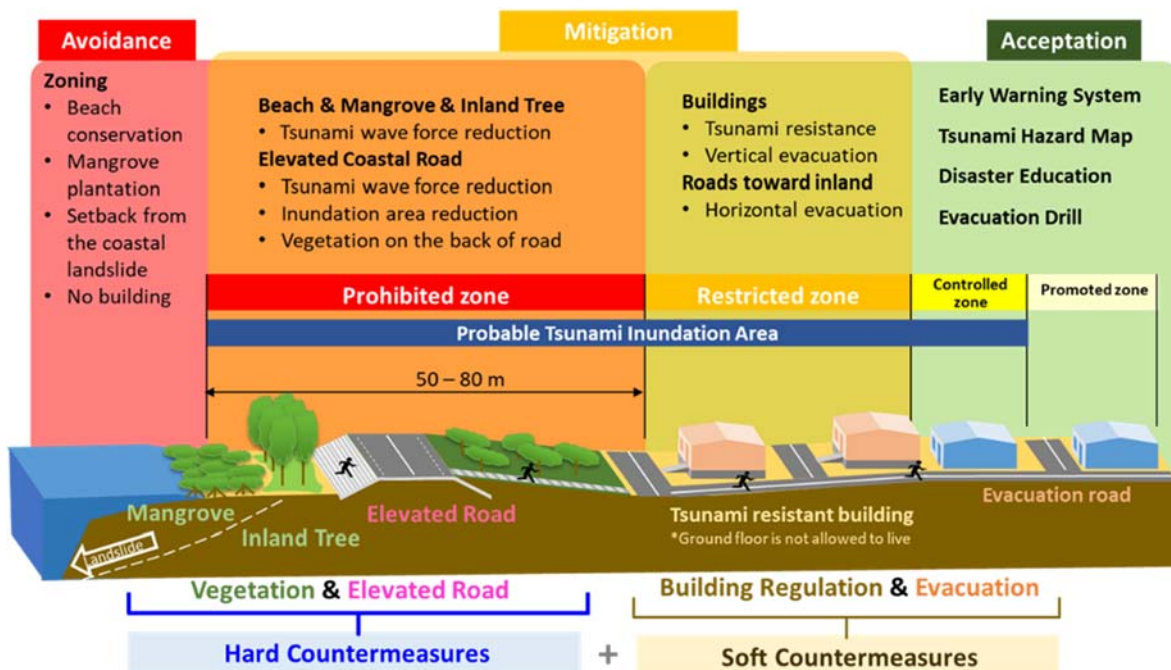


Source: JICA Experts, JICA Study Team

Figure 7-5 Basic policy for tsunami countermeasure

### d. Multi-layer countermeasure in Palu Bay South

Based on the typical characteristics of Palu Bay South and applicable countermeasures, the following multi-layer countermeasures combined with structural and non-structural measures are selected. Each layer is defined as follows (Figure 7-6).



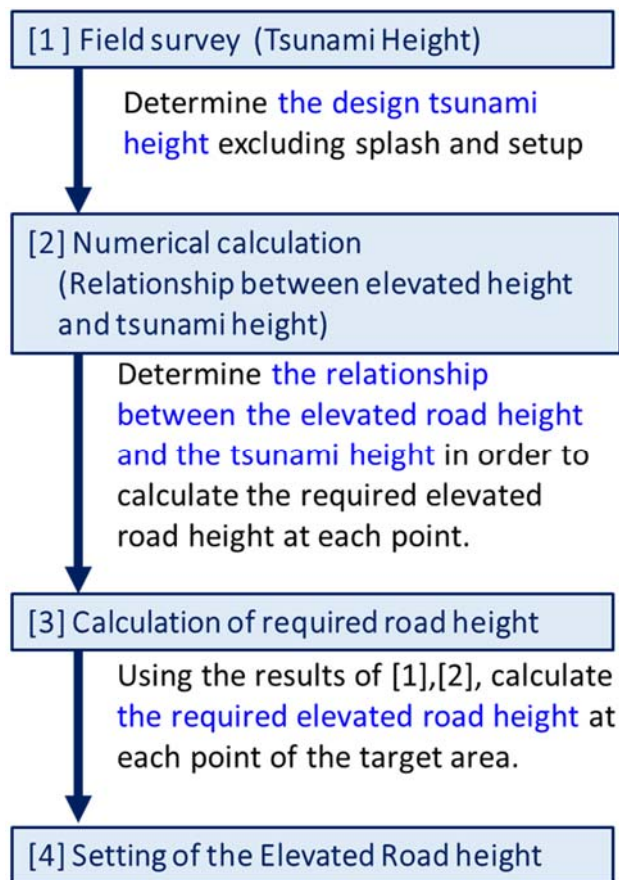
Source: JICA Experts, JICA Study Team

Figure 7-6 Multi-layer countermeasure in Palu Bay South

- Tsunami Avoidance layer: this layer is defined as an area with beach conservation and mangrove plantation. Setback from the coastal landslide area is needed and no buildings should be built in this area.
- Tsunami Mitigation layer: this layer is defined as a mitigation area. Mangrove shall be planted in order to reduce wave energy and an elevated coastal road shall be constructed with spatial planning and land use control as a part of the multi-layer countermeasure plan.
- Tsunami Acceptation layer: This layer focuses on the organizational preparation for tsunami such as disaster plans, risk maps, early-warning systems, evacuation and medical help.

## 2) Basic plan of elevated road

The design tsunami height and elevated road height were set according to the following flow (Figure 7-8).

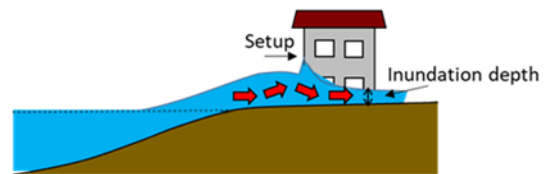


Source: JICA Study Team

Figure 7-8 Flow for setting the height of the elevated road

[4]: As a result of the tsunami height survey and numerical analysis, a height of MSL+5.0m was determined as the height of the elevated road needed to keep the inundation depth below 1.0m. Figure 7-9 shows the standard cross section of the elevated road and the design conditions of the elevated road. It is assumed that this road height can be lowered further if the vegetation in the coastal area planned as a multi-layered defense is expected to have a certain tsunami energy mitigation effect. A summary of the results of the verification of the tsunami energy reduction effect by the vegetation is described in the next section.

[1]: In the initial tsunami height survey, splashes and setups were included in the measurements. In order to confirm the accurate tsunami heights, the tsunami height survey without them was conducted again.



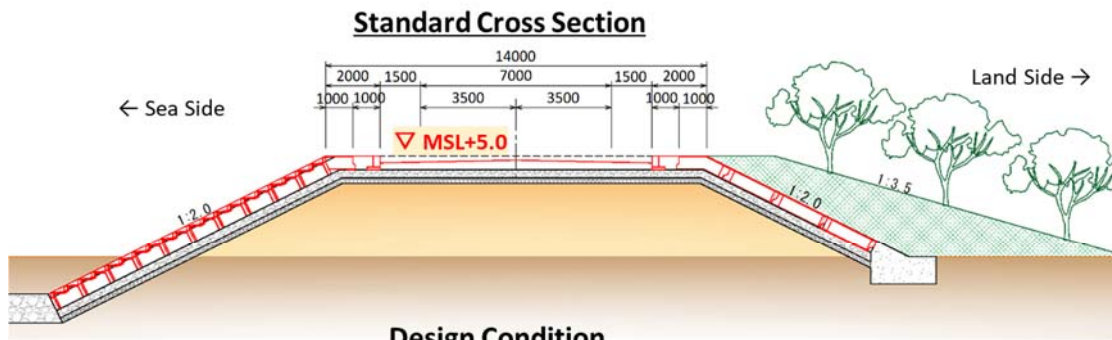
Source: JICA Experts, JICA Study Team

Figure 7-7 Image of tsunami setup

[2][3]: The coefficient  $C$  when the inundation depth is 1 m is derived using the following formula for the relationship between "elevated road height" and "tsunami height". Then, using this formula and the tsunami height measured in [1], the required elevated road height is calculated.

$$H_w = C \cdot D_i$$

Where  $H_w$ : required elevated height [m],  
 $C$ : Coefficient and  $D_i$ : Tsunami depth [m].



**Design Condition**

Road Condition		Tsunami Condition	
Road Width	14.0m	Wave Height	MSL+5.5 *
Effective Road Width	10.0m	Wave Period	3.5min *
Road Height	MSL+5.0m	Tide Level	MSL+0.7m *
Length	4.0km	Overflow for Elevated Road	Allow **
Design Speed	60km/h	Inundation Depth	Less than 1.0m **

\*: Set based on the 2018 tsunami , \*\*: Basic concept for tsunami countermeasures

Source: JICA Study Team

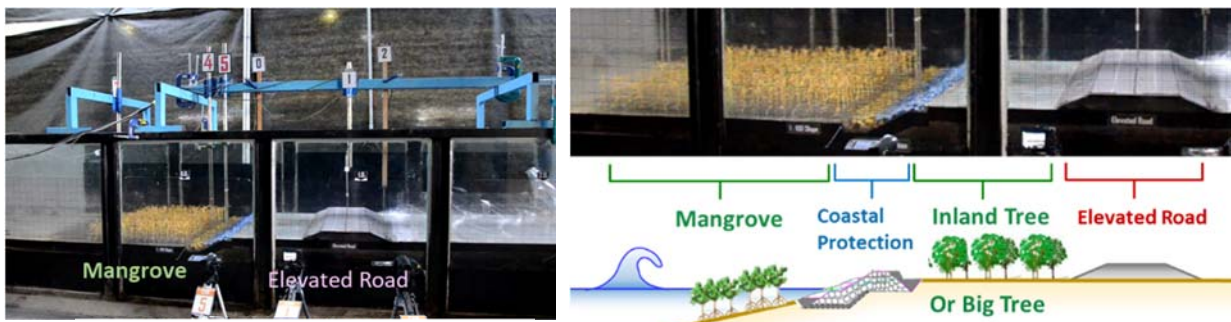
Figure 7-9 Cross section and design condition of Elevated road

### 3) Verification of the tsunami energy reduction effect by the vegetation

The effect of vegetation on tsunami energy reduction was verified by the following two methods.

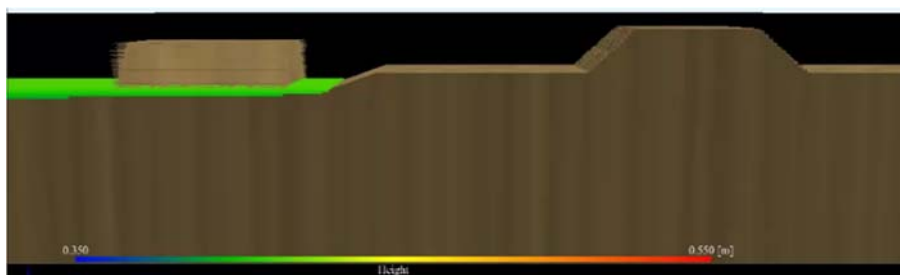
(See Appendix II-3-8 for detailed plan and results)

- Method I : Physical Model Test : conducted by Balai Pantai Laboratory (Figure 7-10)
- Method II : Simulation Analysis : conducted by Prof. Arikawa Laboratory (Figure 7-11)



Source: JICA Study Team

Figure 7-10 Situation of the physical model test



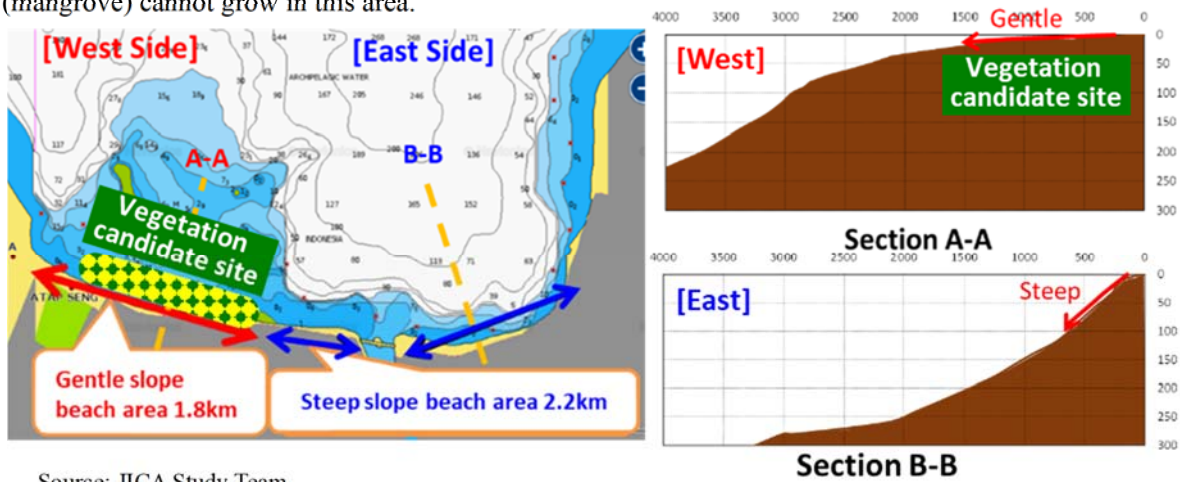
Source: Prof.Arikawa's laboratory

Figure 7-11 Situation of the simulation analysis



#### 4) Draft tsunami countermeasure plan for southern Palu Bay

The physical model test and simulation analysis described before did not show a clear tsunami energy reduction effect by vegetation enough to lower the height of the elevated road. In addition, the southern part of Palu Bay has a steep seabed topography as shown in Figure 7-12. It was also confirmed that vegetation (mangrove) cannot grow in this area.



Source: JICA Study Team

Figure 7-12 Seabed condition of Palu Bay South

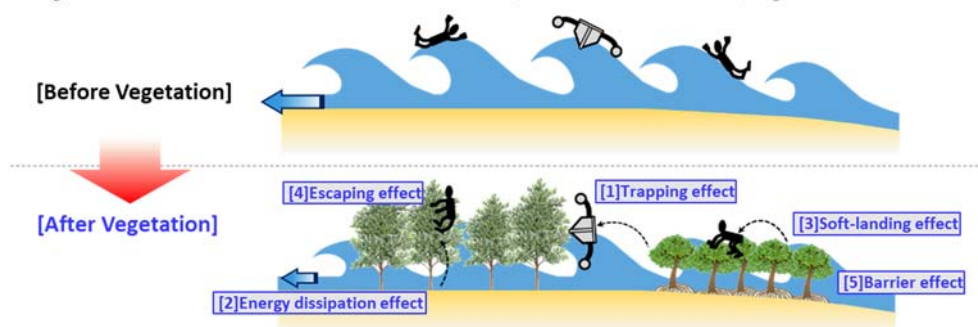
Based on the above, it was concluded that the height of the elevated road should not be lower than MSL + 5.0m in consideration of the effect of vegetation. However, it was recommended that vegetation should be planned as much as possible because vegetation can be expected to have effects other than tsunami damage reduction (shown in Table 7-1).

Table 7-1 Expected effects on vegetation in coastal areas

Vegetation Effect	Contents
[1] Trapping effect	the effect to stop driftwoods (fallen trees, etc.), debris (destroyed houses, etc.) and other floatage (boats, etc.)
[2] Energy dissipation effect	the effect to reduce water flow velocity, flow pressure and inundation water depth
[3] Soft-landing effect	the effect to provide a life-saving means for people to catch tree branches when carried off by tsunamis
[4] Escaping effect	the effect to provide "a way" of escaping by climbing trees from the ground or from the second floor of a building
[5] Barrier effect	the effect to collect wind-blown sand and raise dunes which act as natural barriers against tsunamis
[6] Good landscape effect	the effect to provide a scenic moisture and peace
[7] Habitat environment improvement effect	the effect to providing coastal fauna and flora habitat and breeding environment

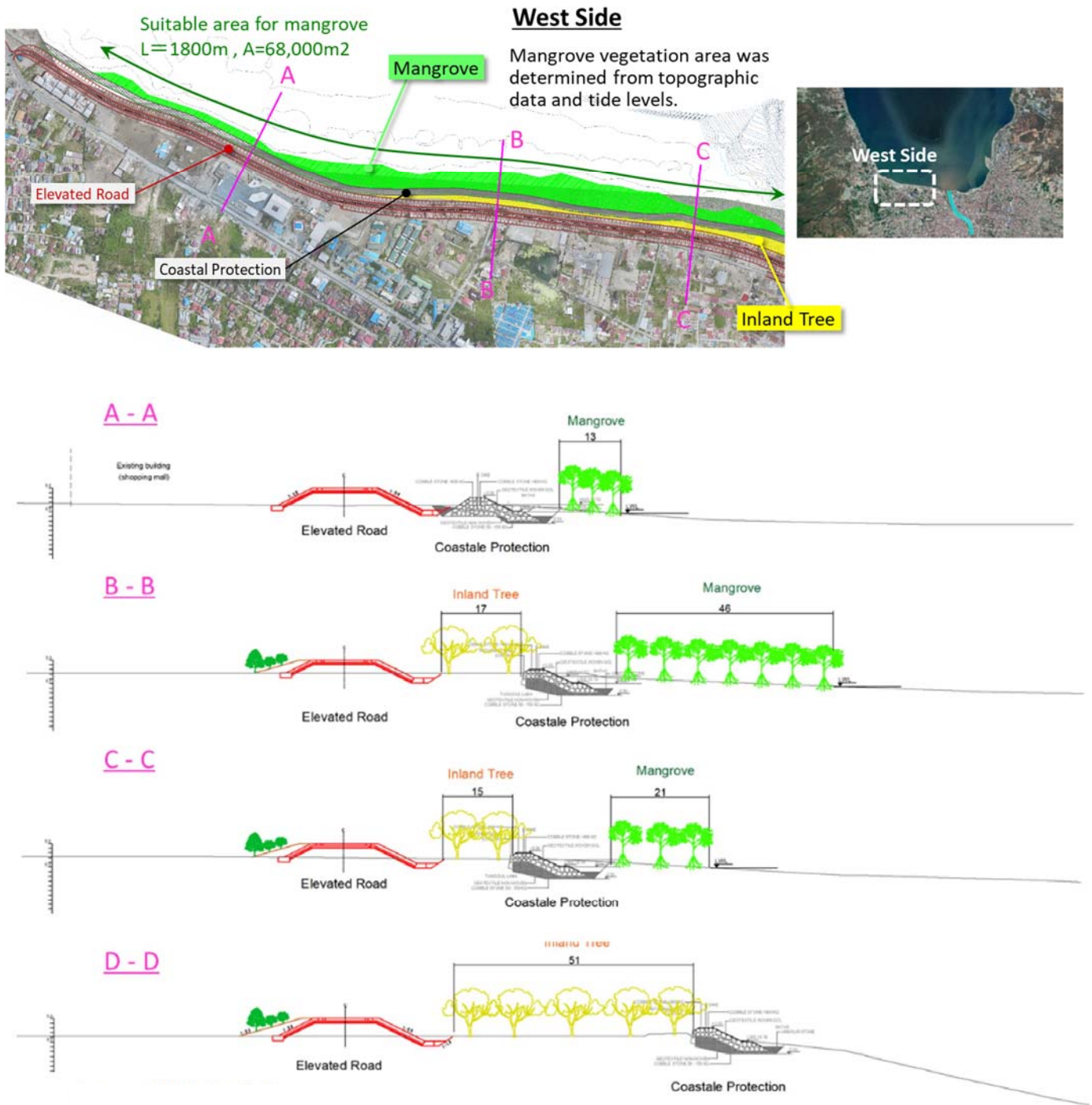
Source : ISSN 0386-5878 Technical Note of PWRI No.4177

Planning and Design of TSUNAMI-MITIGATIVE COASTAL VEGETATION BELTS, ICHARM Publication No.18, August 2010



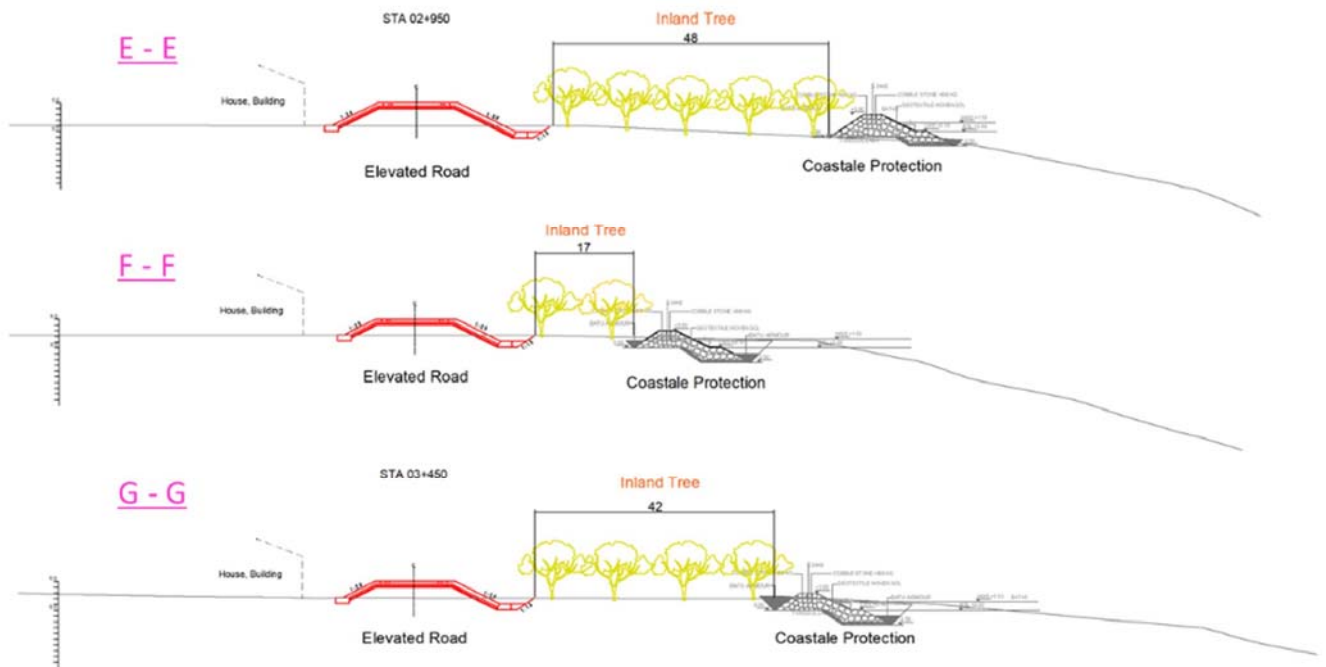


The following figure shows the area where mangroves and Inland trees are expected to grow in the west and east areas of Palu Bay South. This plan is a rough draft, and the vegetation will be studied in detail by the Indonesian side in the future.



Source: JICA Study Team

Figure 7-13 Proposed vegetation layout plan for Palu Bay south (west side)



Source: JICA Study Team

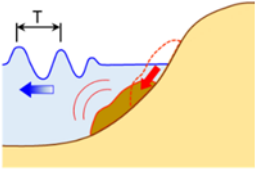
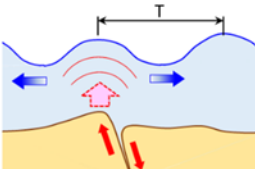
Figure 7-14 Proposed vegetation layout plan for Palu Bay south (east side)

## 5) Tsunami Evacuation Plan

### a. Basic Policy of Evacuation Plan

- The evacuation plan considers two types of tsunamis due to the coastal landslide attributed to an earthquake and fault rupture of earthquake.
- Evacuation plans can be mainly classified into two areas. Palu bay south area where elevated roads are planned and other areas.

Table 7-2 Tsunami characteristics to be considered in evacuation planning

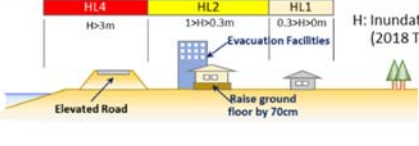
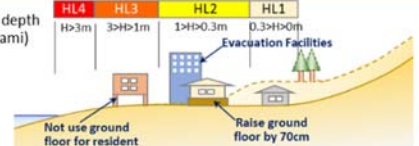
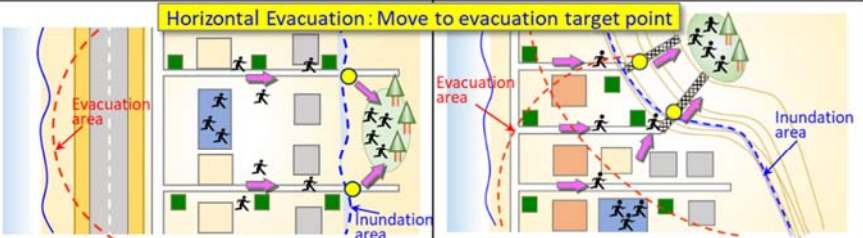
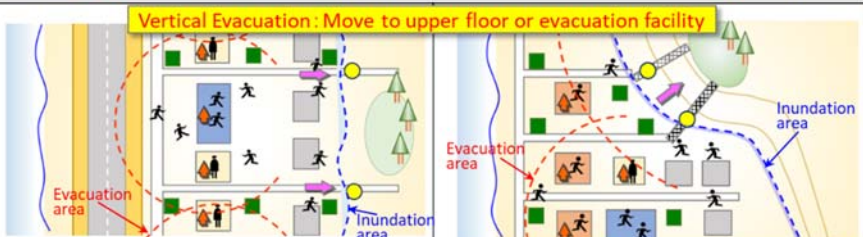
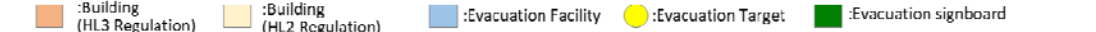
		Cause Image	Wave Length (T)	Tsunami Arrival Time	Evacuation Time
Type of Tsunami	Coastal Landslides (Sep. 2018)		Short	Quick Approx. 5min	Short
	Fault Rupture		Long	Slow Approx. 20min	Long

Source: JICA Study Team

### b. Basic Evacuation Plan [Draft]

As a basic evacuation policy, it was proposed to add vertical evacuation as an option in addition to general horizontal evacuation, taking into account the characteristics of the 2018 tsunami (the evacuation plan including evacuation facilities will be discussed in detail by Indonesia in the future).

Table 7-3 Basic evacuation plan

Area of Pal Bay	Palu Bay South	Palu Bay West, East
Side View		
<b>Basic Action</b> Just after earthquake	<b>Horizontal Evacuation: Move to evacuation target point</b>	
[Supposed Tsunami] <b>Fault Rupture</b>		
Evacuation Time - Long		
<b>Optional Action</b> If the tsunami arrival is confirmed	<b>Vertical Evacuation: Move to upper floor or evacuation facility</b>	
[Supposed Tsunami] <b>Coastal Landslides (Sep.2018)</b>		
Evacuation Time - Short		
		

Source: JICA Study Team



## 6) Considerations for future detailed design and construction stage

The following is a list of issues that need to be taken into consideration not only in the detailed design phase but also in the construction and service phases for the elevated road as a tsunami countermeasure.

### ➤ Detailed design phase

- Coordination with vegetation plan and fishing boat mooring plan
- Coordination with the drainage structure on the inner side of the elevated road
- (Installation of flap gates at the intersection of the elevated road, etc., as shown in the reference Figure 7-16)
- Coordination with the Palu river bank improvement plan and the construction schedule.
- Coordination with the the Palu 4 bridge project plan and the construction schedule.
- Coordination with the coastal protection (already constructed)
- Road surface drainage treatment
- Slope protection block structure for the elevated road (considering greening, evacuation route, resistance to tsunami, etc., as shown in the reference Figure 7-15 )

### ➤ Construction phase

- Confirmation of the required extra height as a result of settlement investigation by embankment in the detailed design
- When using locally generated materials for the main body of the elevated road, consideration should be given to prevent settlement.
- In the construction of embankments, the thickness of the embankment and the number of times of compaction should be controlled under appropriate quality control.

### ➤ Service phase

- Confirm the management system and method of the elevated road (road, embankment, height, etc.)

\* In order for the elevated road to function as a tsunami countermeasure, it is important to maintain the road surface height even after an earthquake.



Source:  
<https://www.nittokasen.co.jp/product/cat05/475/>



Source: <https://www.nikken-kogaku.co.jp/>

Figure 7-16 Example of the flap gate

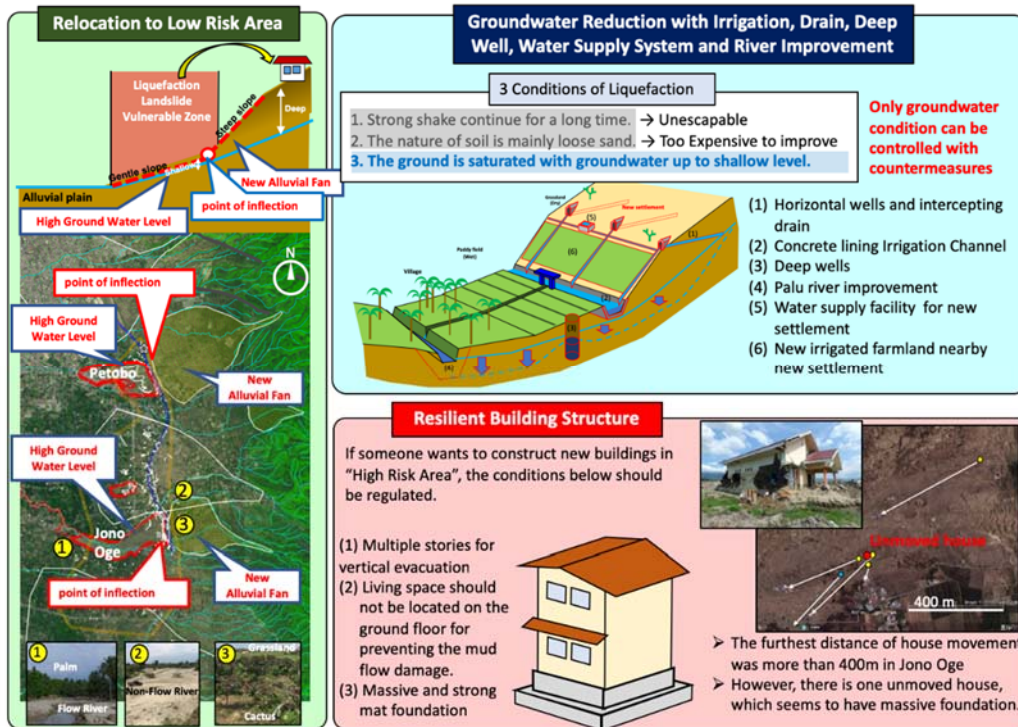
Figure 7-15 Example of slope protection block



## (2) Liquefaction Landslide Countermeasures Package

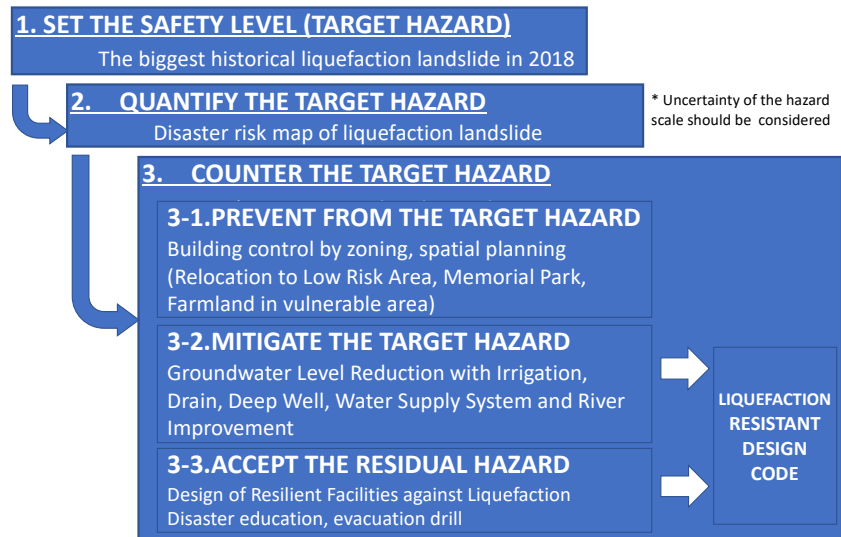
### 1) Basic policy

- The relocation from the vulnerable zone can prevent people from the liquefaction-landslide disaster hazard.
- The groundwater control is only mitigation of this hazard, because the shake by earthquake cannot be avoidable, the soil improvement in wide vulnerable area is too expensive.
- The reinforcement of the building foundations can be resilient against the liquefaction-landslide.



Source: JICA Experts, JICA Study Team

Figure 7-17 Comparison of Alternatives Tsunami Mitigation Countermeasures



Source: JICA Experts, JICA Study Team

Figure 7-18 Process for Design Code Application for Liquefaction Landslide Countermeasure

## 2) Occurrence Conditions of Nalodo

Rapid fluidized landslide induced by large scale liquefaction (Nalodo) could rarely occur with extremely specific conditions. It could be triggered by strong seismic movement, however all the following conditions are inevitable for its occurrence.

- Shallow & pressurized groundwater
- Existence of easy-liquefiable soil layer, and
- Water non-permeable layer near the ground surface

Any locations, where above conditions are all confirmed of their existence together with a strong seismic movement, could be the areas near inland faults or slope of alluvial fan, where new sediment deposits are supplied. Sediment deposits on the alluvial fan are generally supplied by debris flow, however it may not be an easy-liquefiable. Nalodo potential land could be formulated by flood deposits on depressions at the edge of alluvial fan (Ground Slope less than two degrees (2°)) with above noted three conditions are satisfied. Any water spring at the toe of alluvial fan or non-water permeable layer in a shallow layer, such as silt layer, may be the implication of the potential increase of Nalodo occurrence. Human activities, such as construction of irrigation channel or development of paddy field at surface layer, may also extend the hazard areas.

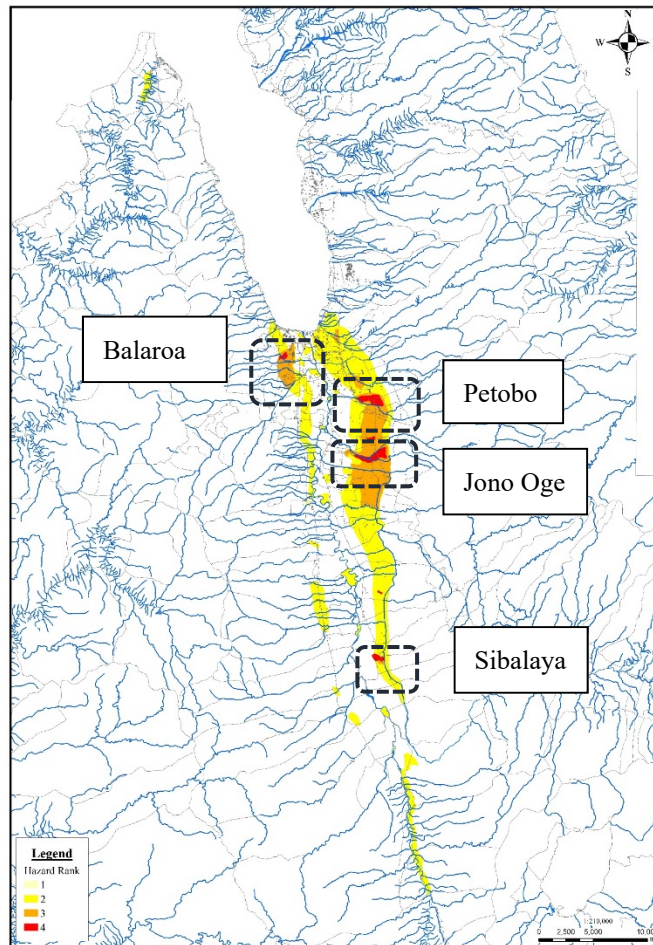
## 3) Set the Target Hazard (Create Nalodo Hazard Map)

Based on the analysis of the current disaster, create a hazard map of Nalodo and select countermeasures considering each hazard level. Relocation of facilities is recommended for Hazard Level-4 (red zone), however various countermeasures that mitigate a Nalodo risk will be considered for Hazard Level-3 (Orange Zone). Table 7-4 shows classification of hazard level for Nalodo and it is criteria for making Nalodo hazard map (see Figure 7-19).

Table 7-4 Classification of Hazard Level for Nalodo

Hazard Level	Phenomena	Outline of the zone
Hazard Level 4	If it meets all conditions <ul style="list-style-type: none"> <li>• High-speed fluid landslide</li> <li>• Mudflow</li> <li>• Movement over 10m (The area where human disaster occurred.)</li> </ul>	Lateral movement occurrence area this time
Hazard Level 3	Lateral movement 1~10m (The area which did not reach human damage, but great damage occurred to farmland.)	Creep deformation occurrence area this time
Hazard Level 2	If it meets all conditions <ul style="list-style-type: none"> <li>• Easy-liquefied soil layer</li> <li>• Shallow &amp; pressured groundwater</li> <li>• Slope gradient less than 2°</li> </ul> Water hardly permeable layer near the surface	--
Hazard Level 1	Except for hazard level 4, 3, 2	--

Source: JICA Study Team



Source: JICA Study Team

Figure 7-19 Nalodo and Active Fault Map

#### 4) Countermeasure Methods

Among mentioned occurrence conditions for Nalodo: i. Shallow & pressurized groundwater, ii. Existence of easy-liquefiable soil layer, iii. Water non-permeable layer near the ground surface, it is too expensive to improve condition ii, iii. Only handling condition i is realistic measure for mitigation of Nalodo risk. For countermeasure condition i, the groundwater reduction method and the excess pore water pressure dissipation method have been proposed as countermeasure methods. Furthermore, since it is necessary to confirm the effect of lowering groundwater, a groundwater monitoring system is also proposed.

Table 7-5 Concept of individual countermeasures

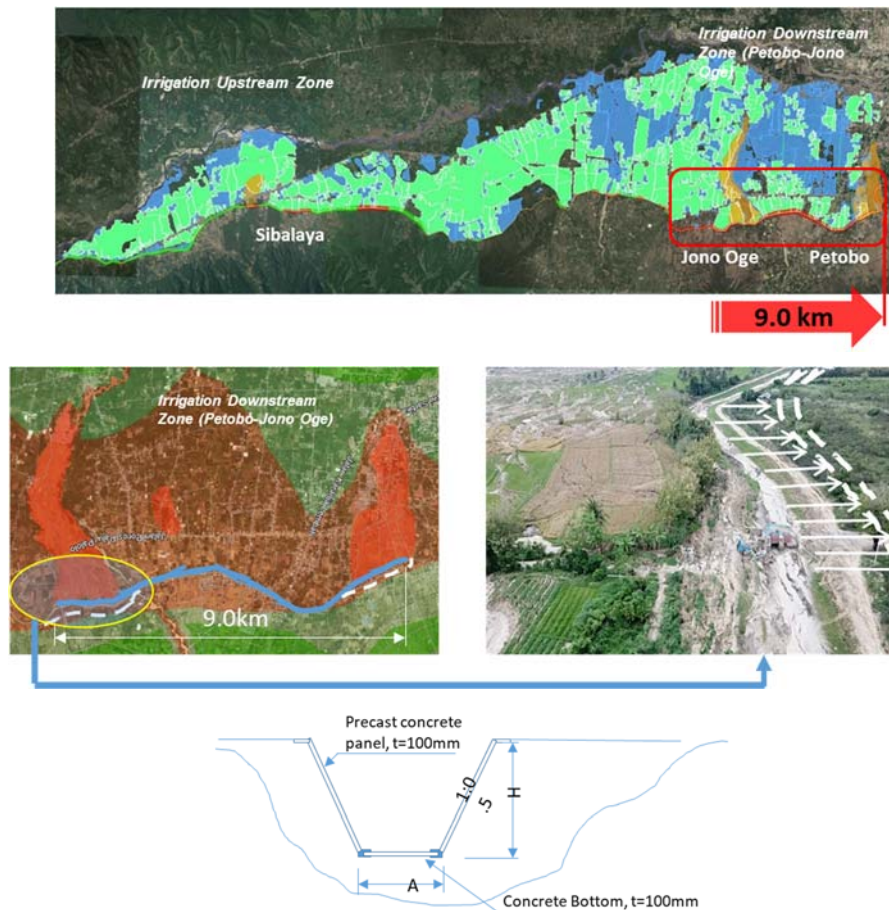
Countermeasure	Concept	Remarks
a. Irrigation channel with concrete lining	Measures to eliminate the supply of groundwater due to leakage from the irrigation channel, which is one of the factors that caused Nalodo.	Required reliable implementation
b. Sabo dam with riverbed sealing	Measures to effectively utilize the surface water in the upstream area, and controlling the supply of groundwater into the Petobo and Jono Oge areas.	Required reliable implementation
c. Flowing well and gravel drain	Measures to reduce the cause of Nalodo by dissipating excess pore water pressure generated during an earthquake.	Implemented in conjunction with spatial planning
d. Installation of underdrain pipe	Measures to reduce groundwater by installing underdrain pipes when the effects of a. to b. above are insufficient to reduce groundwater.	Implemented in conjunction with spatial planning
e. Observation system of groundwater and surface water	Observation continuously groundwater and surface water mainly in liquefaction areas.	option

Source: JICA Study Team



a. Irrigation channel with concrete lining

- The current canal slope and bottom will be filled and compacted according to the dimensions of the plan and fill in the defects/cracks caused by the earthquake.
- Reinstalling the precast panel on the left and right wall of the channel.
- Casting the concrete floor or landfill is compacted on the bottom of the channel.
- Joint line between the precast concert panels will be filled up a joint to use water leakage prevention material.

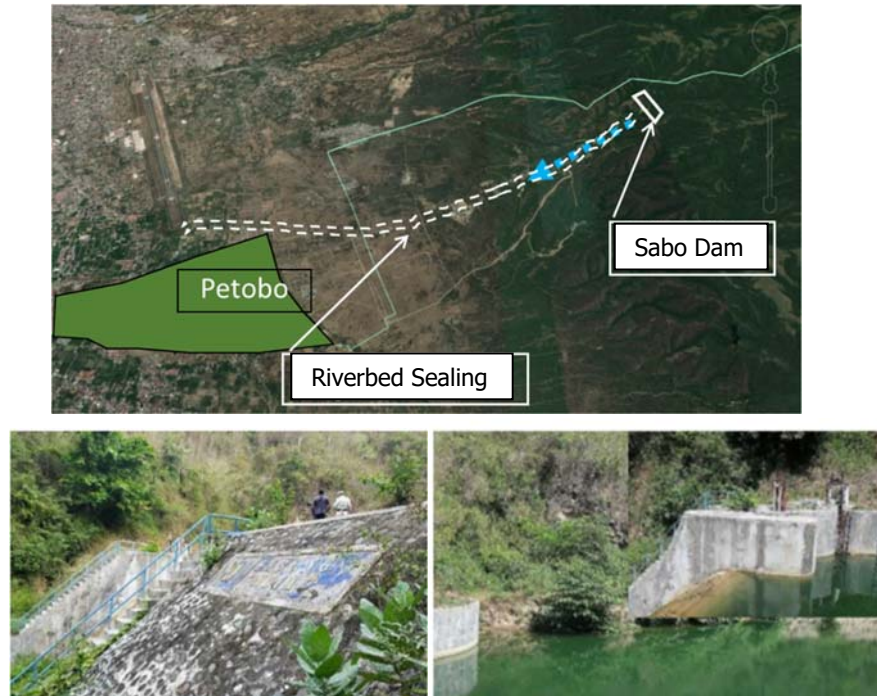


Source: JICA Study Team

Figure 7-20 Target Location and Image of Irrigation Channel Lining

b. Sabo dam with riverbed sealing

Samo dam with riverbed sealing aims for controlling the supply of groundwater into the downstream area like as Petobo and Jonoge areas. Moreover, it is expected to utilize the surface water of upstream area for intaking.



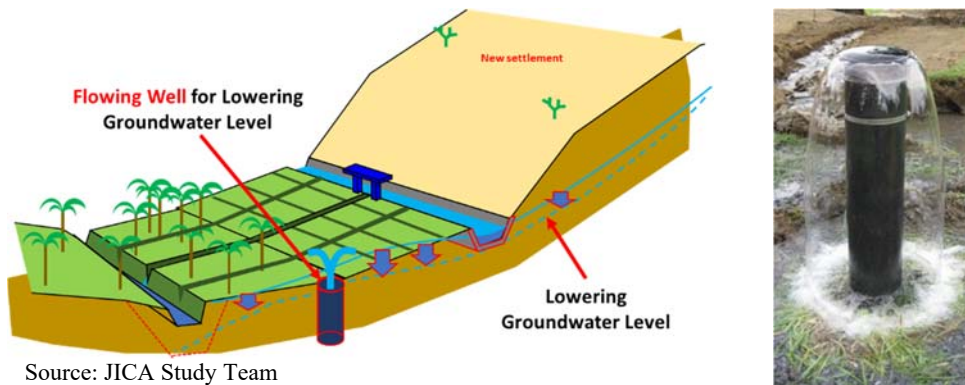
Source: JICA Study Team

Figure 7-21 Image of Sabo Dam & Water Intake Structure

c. Flowing well and gravel drain

i) Flowing well

A well drilled into such an aquifer layer is flowing well, and it is an effective measure, low cost and free maintenance for lowering groundwater level on the target area. Flowing well is planned to locate at the point of high groundwater level after analysis of boring data and geological features of each target area. The length of well has approx. 20-30m and mostly used on Hazard Level 3 and 4 areas. Figure 7-22 shows an image of flowing well.

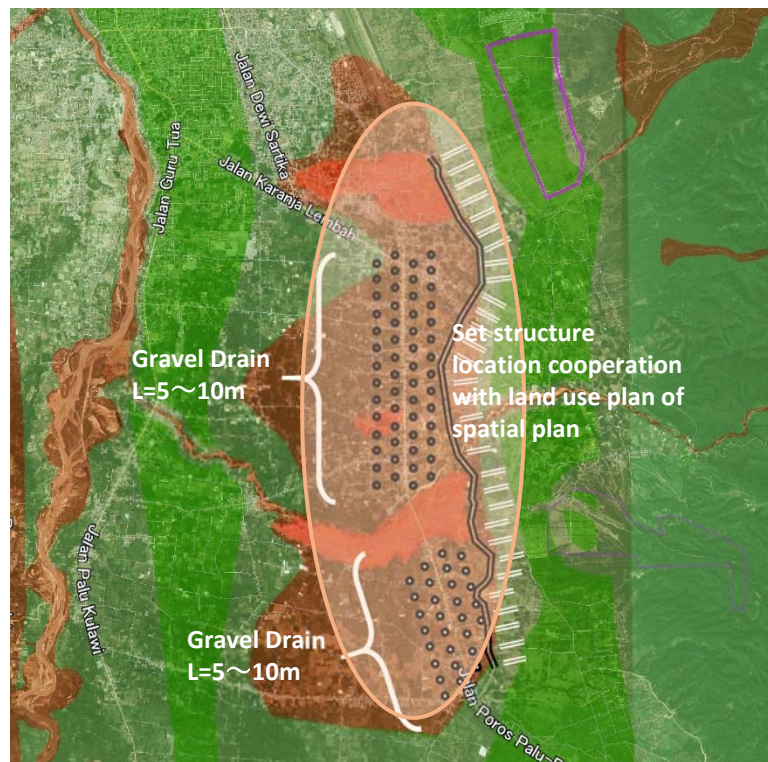


Source: JICA Study Team

Figure 7-22 Image for Flowing Well

ii) Gravel Drain

Gravel drain method drains an excess pore water generated during an earthquake by vertically placing gravel drains at predetermined intervals in sand soil. It is a liquefaction prevention method that allows it to flow into the interior early and suppress the rise in excess pore water pressure. It is assumed to have 5-10m length and mostly applied on Hazard Level 3 area (see Figure 7-23).



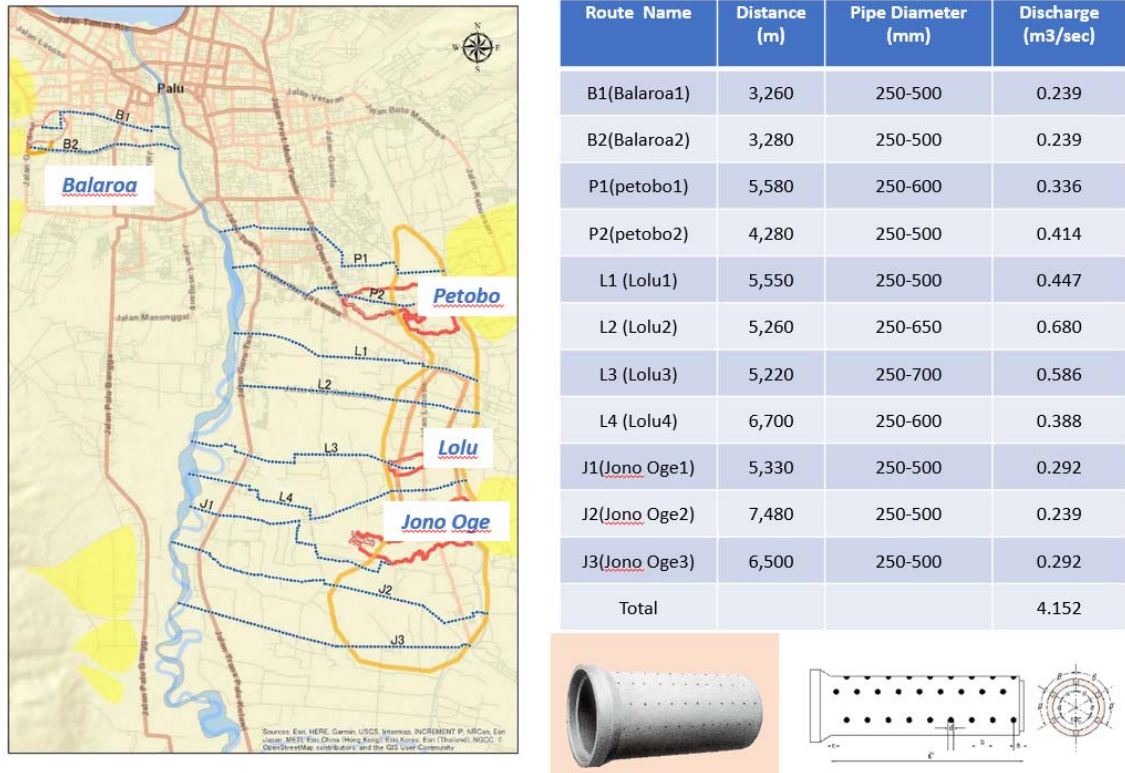
Source: JICA Study Team

Figure 7-23 Gravel Drain Plan on Hazard Level 3



d. Installation of underdrain pipe

Underdrain pipe is applied for reducing groundwater when the effect of a. Irrigation channel with concrete lining and b. Sabo dam with riverbed sealing is insufficient to reduce groundwater. When the application of this structure, it is required to implement the integrated measure in conjunction with spatial planning and other infrastructure sub-projects such as road in the target area. Since it is basically installed on slope ground and naturally flowing down, maintenance-free could be expected.



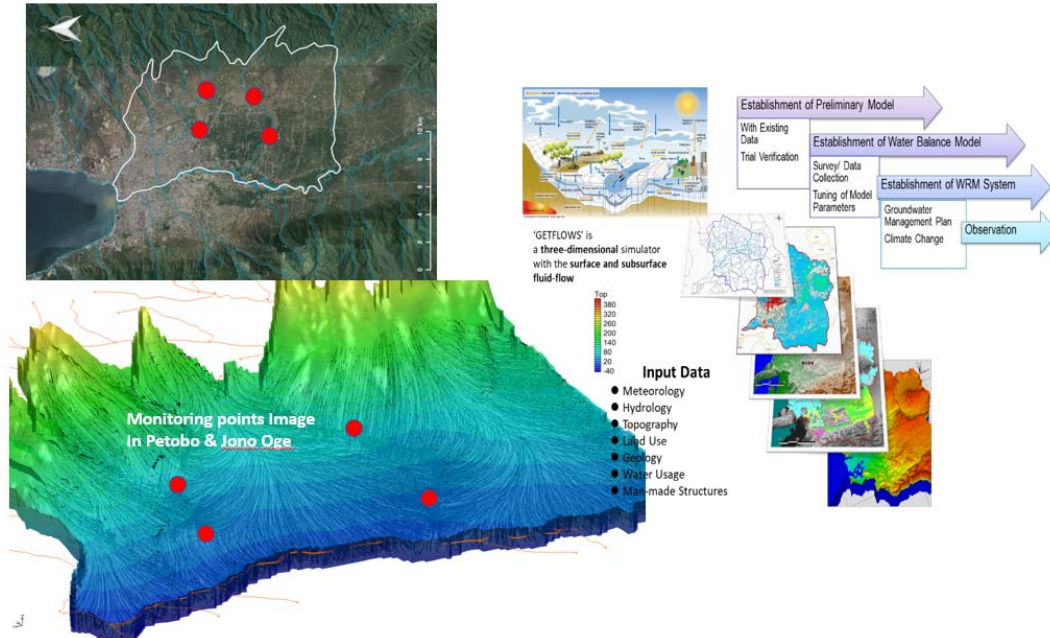
Source: JICA Study Team

Figure 7-24 Underdrain Pipe Plan



e. Observation system of groundwater and surface water

This system aims for observation continuously groundwater and surface water mainly in liquefaction area. Observation data is accumulated by the telemetry system. Figure 7-25 shows an analysis model of Patobo and Jono Oge areas.



Source: JICA Study Team

Figure 7-25 Groundwater and Surface Water Analysis in Patobo & Jono Oge

### (3) Earthquake Countermeasures Package

#### 1) Basic policy

The earthquake risk exists everywhere and cannot mitigate. Only avoidance right above active fault is necessary. Therefore, all infrastructure requires to review the earthquake-resistant design. To avoid tragedy by collapse of buildings, the construction quality should be inspected.

**Resilient and Redundant Infrastructure**

Crane at Pantoloan Port collapsed

Bridge along coastal road collapsed

Irrigation channel was broken

Airport traffic control tower and runway were broken

Hospital collapsed

**Resistance**

It depends on benefit and cost of each infrastructure

	Seismic movement	
	Level1 No structural damage	Level2 Structural damage But no victims
Critical infrastructure	200 gal	400 gal
Important Infrastructure	100 gal	200 gal
Normal Infrastructure	-	-

➢ In accordance with its importance and substitutability, each infrastructure should be sufficiently "Resilient" against shake.

➢ For example, to clarify each infra into 3 ranks and to set the regulation in each rank.

➢ Destruction of structures due to the Resonance should also be considered.

**Redundancy**

➢ In case that some infrastructure should be broken, each infrastructure should be appropriately "Redundant."

➢ To secure "Redundancy", alternative infrastructure should be prepared.

**Reinforcement of "Building Code Observance"**

A lot of buildings collapsed without observance of "Building Code".

"Inspection Board" including structural engineers should be established and inspect all important Buildings.

**Inspection Board**

< Members >

- Governor (Kota, Kabupaten)
- Dinas PU (Kota, Kabupaten)
- Structural Engineers

< Inspection timing >

- Design
- Initial, Intermediate and Final

**Avoidance Right above Active Fault**

- Buildings on the surface rupture collapsed completely.
- However, neighbor buildings, even with vulnerable structures have no damage.

Source: JICA Study Team

Figure 7-26 Fact and Development Policy for Earthquake Countermeasure



Source: JICA Study Team

Figure 7-27 Process for Design Code Application for Earthquake Countermeasure

## 2) Basic Concept of Seismic Design (Architecture)

This subsection focuses on the field of building and architecture. The following key factors shall be carefully incorporated within the structural design procedure.

### a. Importance Factor

Important buildings shall be designed with particular attention and higher seismic forces in order to secure their functionality in the event of any major earthquake. The importance factors are defined based on Risk Categories as follows, so that important buildings should be designed with higher seismic capacities.

Table 7-6 Risk Category and Importance Factor

Risk Category	Importance Factor (Ie)
I or II	1.0
III	1.25
IV	1.5

Source: JICA Study Team based on SNI1726 definition

### b. Indonesian National Standard (SNI) for Structural Design

Design and calculations of each structural element should be performed according to the relevant design standard depending on the structural type.

Table 7-7 Structural Design Codes in Indonesia

Design Code	Contents
SNI 1729:2015	Specification for steel building structure
SNI 2847:2013	Structural concrete requirements for buildings
SNI 7973:2013	Design specifications for wood construction

Source: JICA Study Team

Note: Since the SNI design codes have been developed based on the US codes, they typically apply ultimate strength design rather than allowable stress design.

“Reference Manual for Structural Planning and Seismic Design of Building Structures” is attached in Appendix PART II-3-2 for further reference to the design and evaluation work. This manual illustrates fundamental design philosophy and concept to direct designers and design evaluators including TABG members.

## 3) Seismic Structural Design Basis for Buildings

Building design related codes, regulations and standards are generally recognized with appropriate level of technicality and quality. According to the study and analysis of those existing laws, codes, regulations and standards, following and complying these norms should essentially result the good, reliable and safe structure as well as architectural functionality in Indonesia. Not only JICA Study Team but also other donor agencies with engineering consulting teams have reached to similar conclusion toward the current statutory system that there is no necessary modification or change. Therefore, it is highly important that all building designs shall comply with the concerned codes, regulations and standards so that the buildings designed in such manner shall have strong and seismically resilient structure against earthquake impact, and controlling the design

activities in line with the code compliance is the key to improve current situation in the disaster prone areas.

There are several important points to follow in order to achieve effective and appropriate building designs.

- Building must be designed (earthquake resistant) according to the Seismic Code (SNI 1726) considering site soil conditions and soil amplification effect.
- The latest source map and hazard maps issued by PuSGen (Pusat Studi Gempa Nasional) to be referred as it is representing Probabilistic Seismic Hazard Assessment (PSHA).
- Two hazard maps for different vibration priods (0.2 and 1.0 sec.) at bedrock should be referred.
  - I. Response Spectrum Acceleration at 0.2 Second with 5% damping ratio in bedrock (SB) for exceeding probability of 2% in 50 years (source: PETA SUMBER DAN BAHAYA GEMPA INDONESIA TAHUN 2017)
  - II. Response Spectrum Acceleration at 1.0 Second with 5% damping ratio in bedrock (SB) for exceeding probability of 2% in 50 years (source: PETA SUMBER DAN BAHAYA GEMPA INDONESIA TAHUN 2017)

#### (4) Road and Bridge

Basic policy for road and bridge sector is shown below.

Basic concept I: Ensuring redundancy at the time of disaster

Basic concept II: Selection of a structural form that allows early restoration at the time of disaster

Basic concept III: Ensuring seismic performance in accordance with route importance

##### **Basic policy I**

It is necessary to ensure redundancy of roads, so that the disruption of some sections or destruction of some facilities wouldn't lead to an overall malfunction at the time of failure due to natural disasters.

In particular, securing a detour at the time of disaster occurrence can be ensured through proper maintenance of road network of urban areas.

##### **Basic policy II**

From the viewpoint of securing road function at the time of disaster, it is necessary to adopt structural forms for roads / bridges that focuses on avoiding loss of function and ensuring early restoration.

In particular, early restoration of the road functions at the time of disaster can be ensured by 1) adoption of the embankment form which is easy to restore and 2) installation of the required structure for prevention of bridge failure.



Source: JICA Study Team  
Figure 7-28 Image of Strengthening of Road Networks



**Basic policy III**

Based on the field inspection, the damage status of the existing bridge and the surrounding conditions are checked and policies of rehabilitation or reconstruction are decided.

When reconstructing an existing bridge, the structure is selected from either a box culvert structure or a bridge structure considering the crossing conditions. The bridge structure is based on the PC structure, which is suitable in terms of durability.

The structures to be reconstruct will be designed in accordance with Indonesian standards. The seismic load of the bridge is classified into three risk categories shown in the table below, and the target performance is specified for each category. As the target bridge of this project is planned on important routes such as National Road and Ring Road, the risk category is classified as Critical Bridges.

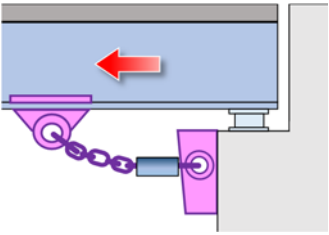
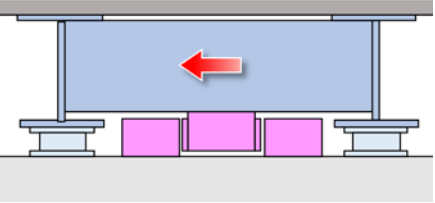
**Table 7-8 Bridge Importance Category**

Infrastructure Clarification	Type of Reconstruction Structure
Critical Bridges	Critical bridges are designed to be used by normal traffic condition, emergency vehicle and for security and defense purposes, immediately after the design earthquake
Essential Bridges	Essential bridges are designed to be used by emergency vehicle and for security and defense purposes several days after the design earthquake
Other bridges	Other Bridges, at least can be operated for emergency vehicle with limited traffic after design earthquake

Source: JICA Study Team

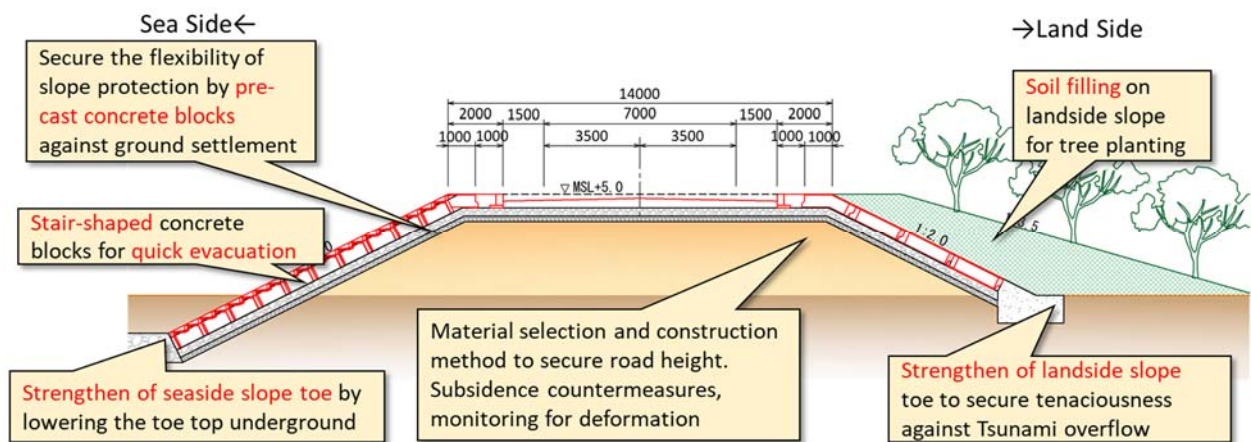
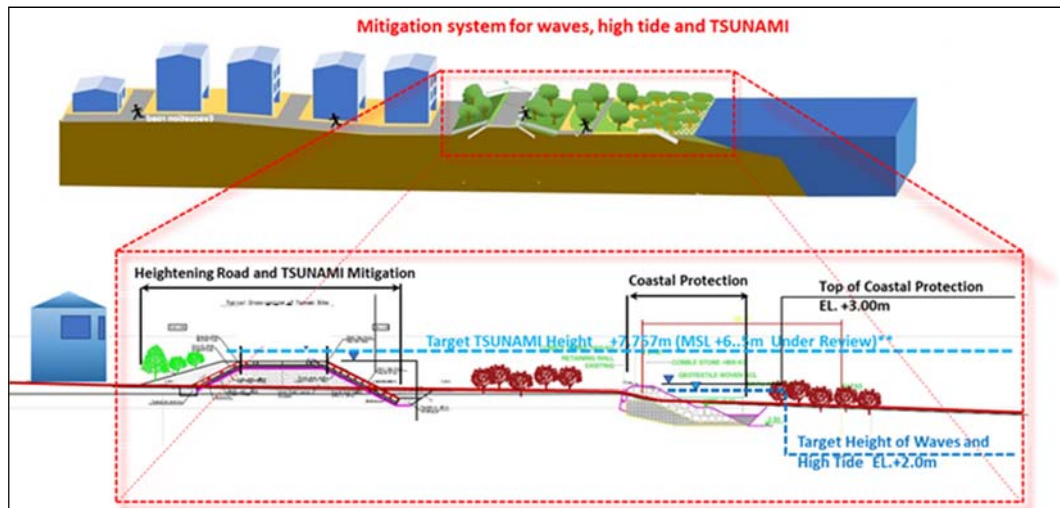
Except for Palu IV Bridge, no bridge was destroyed by the earthquake during the disaster. Therefore, rehabilitation targets recovery of functions before disaster. Based on the structural type and the cause of damage, the bridge repair should select the target members from the urgency and structural importance. Apart from the above-mentioned seismic design, in consideration of the damage status of the existing bridge, the seismic measures will be implemented according to the following table.

**Table 7-9 Additional Seismic Measures and Installation Targets**

Seismic Measures	Target Bridge	Installation Image
Axial failure prevention device	A bridge consisting of multiple spans, and a bridge that is likely to cause a bridge collapse	
Lateral movement limited device of girder	Arch bridge, truss bridge (from the damage situation)	

Source: JICA Study Team

Regarding the elevated road project, it is one of the tsunami mitigation measures for the bay area in the center of Palu city. The concept that allows overflow on the elevated road has been applied since the huge scale of facility with poor economic feasibility, difficulty in the extensive land acquisition were expected when preventing a tsunami thoroughly by this elevated road solely. In this connection, utilizing the knowledge of the Tohoku Earthquake, a combination of various measures such as the road structure that can withstand overflow and faults, the inundation depth which victims can evacuate, the building structure that can more easily avoid tsunami pressure, have been applied. In addition, coordination with vegetation plans such as mangroves discussed by the expert panel and other donor projects (coastal protection by ADB) was also implemented.



Source: JICA Experts, JICA Study Team

Figure 7-29 Image for Elevated Road Plan

## (5) Flood and Sediment Disaster Countermeasures

### 1) Basic policy

In the catchment area of the Palu River that flows through the center of the afflicted area, 9 degrees of small and medium flood damage has occurred during the last 15 years. Flood damage will be expected to expand as the river beds tend to be chronically flooded with low river width, including Mainstream and Tributary, and the riverbed is rising by permanent sediment discharge. On the other hand, the liquefaction-landslides and sediment flows occurred due to the earthquake this time, but in the mountainous area large-scale deep-layer collapse and slope failure occurred, and the amount of sediment produced increased. Due to the situation after such a disaster, the risk of secondary sediment-related disasters is very high. These flood disasters and sediment-related disasters require wide-area measures.

Table 7-10 Flood Damage History in Palu River

Date	Casualties	Evacuee	Facilities Damaged
Oct 14, 2003	0	0	0
May 7, 2007	2,112	13,280	0
Apr 24, 2008	0	0	0
Sep 17, 2008	0	0	0
Oct 24, 2008	19	98	0
Aug 25, 2012	6	101	212
Jan 16, 2014	0	0	2
Jan 17, 2014	0	1187	34
Oct 3, 2016	0	237	1

Source: BNPB [http://bnpb.cloud/dibi/xdibi\\_list](http://bnpb.cloud/dibi/xdibi_list)

Flood and sediment disaster countermeasures will be implemented based on the basic concept as follows.

- Basic concept I : Improvement of the flood control capacity of the mainstream and tributary of Palu River flowing into the urban districts and suburbs of Palu City.
- Basic concept II : Suppression of secondary sediment-related disasters after this disaster.
- Basic concept III : Thorough comprehensive sediment control.

According to the basic policy, the following countermeasures are implemented.

#### Basic policy I

- I-A: Expanding the flood capacity (**Riverbed Excavation Work**)
- I-B: Fixation of river channel (**Revetment, Series of Consolidation Dam or Ground Sill Work**)
- I-C: Reduce the constant water level of river channels (**Lower River Channel Work**)

#### Basic policy II

- II-A: Suppression and capture of secondary movement of sediment (**Check SABO Dam Work**)
- II-B: Strengthening warning evacuation system (**The Observation System, The Warning system**)

#### Basic policy III

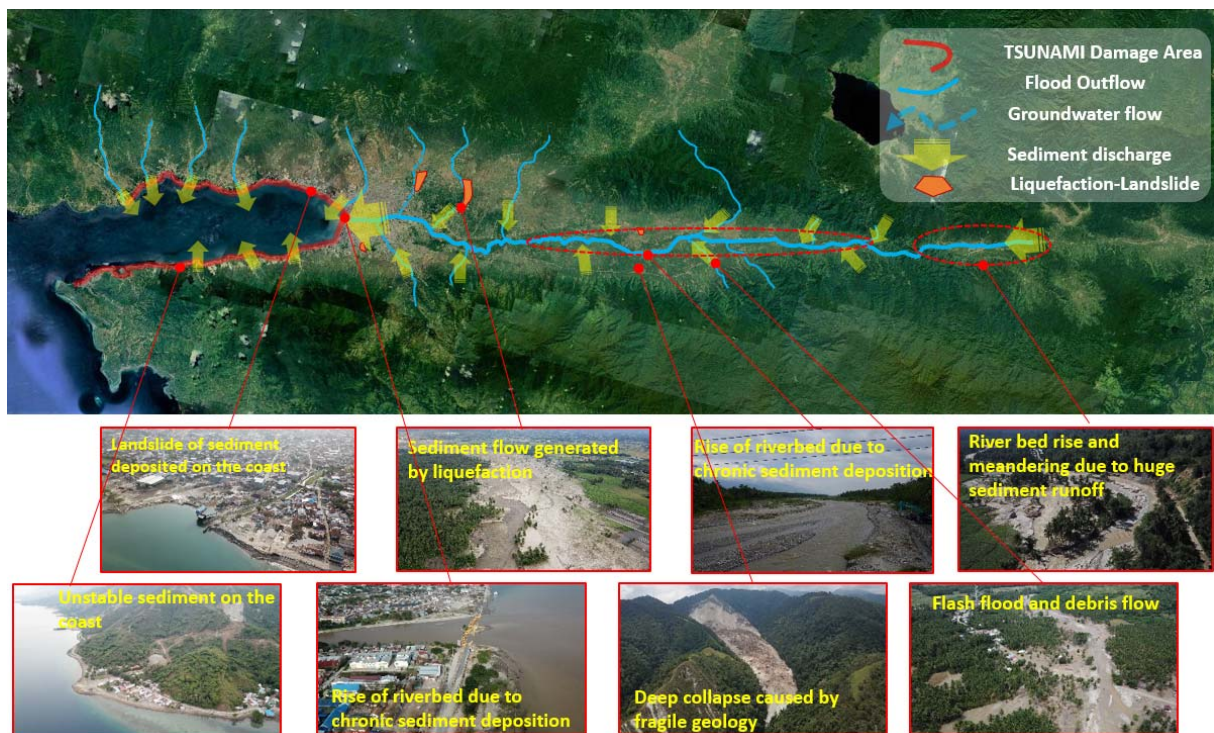
- III-A: Suppressing harmful sediment discharge into the ocean  
(**Revetment, Series of Consolidation Dam or Ground Sill Work**)
- III-B: Sediment supply balance (**Watershed Measures**)

## 2) Understanding of sediment discharge and the flooding in Palu River Basin

The influence of the tsunami caused by the earthquake, the risk of sediment discharge and the flooding are increasing in Palu River Basin. In water management, surface water and groundwater need to be considered together and comprehensive river basin measures shall be implemented.

Landslides on the seabed that caused the tsunami are areas where a large amount of sediment has flowed out of rivers. Liquefied inland areas occur in the deposition area of fine particles that flowed out of the mountain areas. The fall of the sediment flow caused by the collapse of the fragile slope, the rise of the riverbed due to the deposition of the sediment causes the flood and the sediment. Sediment is a major cause of disaster risk to the basin.

The area is a region with significant sediment runoff, and it has been a high-risk area of riverbed rise and flood inundation by Palu main river and tributaries. Earthquakes, tsunamis, liquefaction, and landslides occurred due to lateral displacement of the Palu-Koro fault that occurred on September 28, 2018. In mountain areas in the east and west and south areas of the Palu River, surface earthquakes and large-scale landslides have occurred due to earthquakes, and the risk of sediment runoff has increased. In some rivers, unstable sediment has flowed out along small rivers, causing flash floods and debris flow damage.



Source: JICA Study Team

Figure 7-30 Disaster Status in Palu River Basin

## 3) Priority and classification of project

Due to the earthquake that occurred on September 28, 2018, numerous new landslides have occurred, making it easier for more sediment to flow out than usual. Of these Palu river basins, the four sub-basins, the Paneki River, the Poi River, the Banggah River, and the Salua River, have



secondary floods and sediment disasters since the earthquake. In this project, rivers in which such secondary disasters have already occurred are regarded as an urgent priority development target (Package 1) and designated as a sub-project area where the expansion of damage and the suppression of recurrence are urgently required.

- River Improvement (Middle stream Paneki River)
- River Improvement (Upstream Poi, Bangga, Salua River)

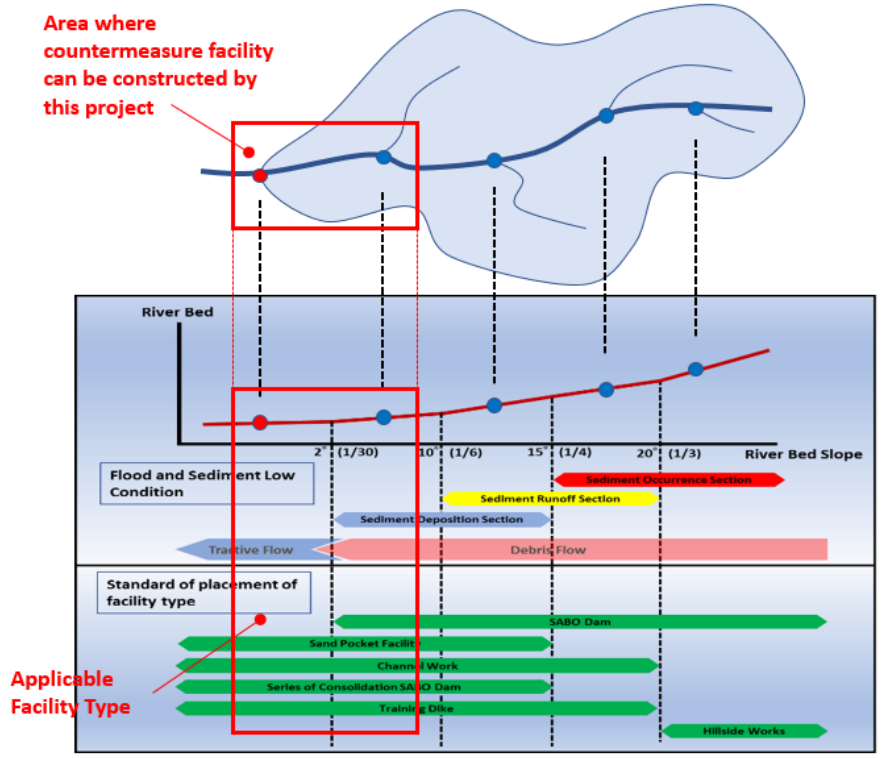
Palu River has a risk of flooding due to chronic sediment discharge. On the other hand, the risk of liquefaction is rising due to the high groundwater level in the fan area between the mountainous area and the river area. Basin sediment control and control of groundwater and river water are the major tasks to reduce future disasters. Such basin measures need to be implemented widely and continuously. Comprehensive river basin measures will be positioned as a long term project (Package 2) and the list of sub-project is described below.

- Improvement of agricultural systems in liquefaction-landslide area
- River Improvement (Downstream)
- River Improvement (Middle stream)
- River Improvement (Upstream)
- Countermeasure for Liquefaction-Landslide area
- Polder System Pilot Project in Lende Sirenja Village

Since the countermeasure for Package 2 projects listed above are currently under examination, mainly countermeasure for Package 1 projects will be described in 7-2 Draft Detail Design for 1st Package Sub-Projects.

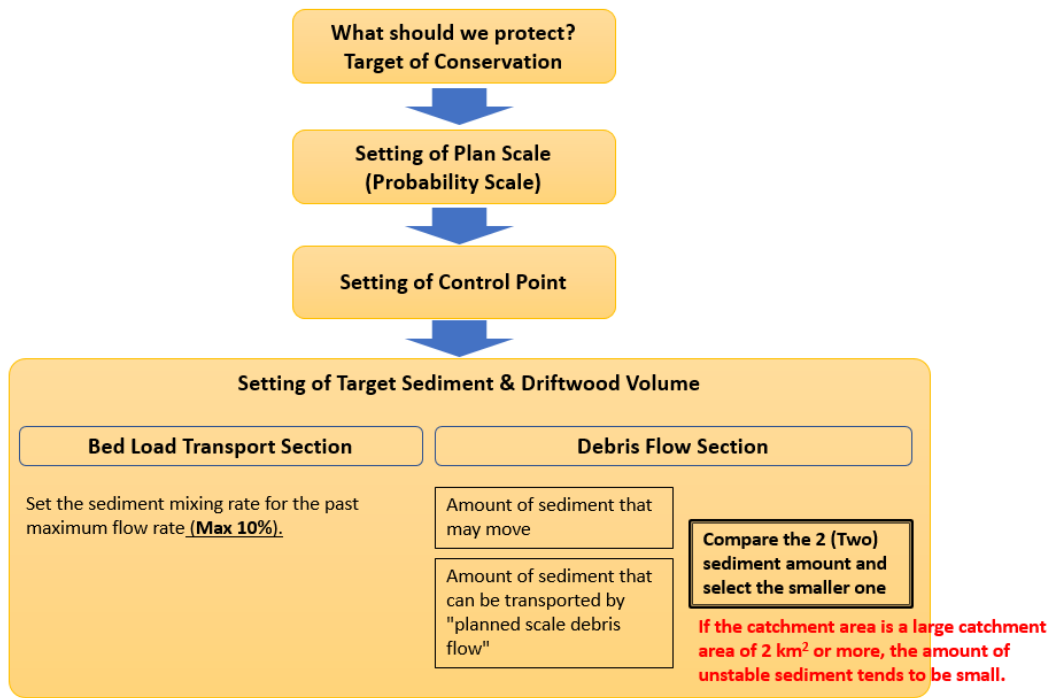
A master plan is needed to control flood and sediment completely. However, rivers designated as Phase 1 (Short Time Project) do not have an overall plan. Also, a period of six months to one year is required for each basin to formulate a master plan. This project is urgent and aims to restrict to the purpose of the control of the secondary disaster that has already occurred and the prevention of the spread of damage. From the local situation, the area where the countermeasure facilities can be built is limited. Therefore, within the limited area, plan the location and size of the facility that can achieve the maximum effect. Therefore, it should be noted that measures for each basin need further upgrading. In addition, it is recommended to use software measures together in case of a disaster more than currently expected occurs.

In ordinary SABO Project, topographical survey, survey of unstable sediment, rainfall analysis target sediment flow and debris flow are performed, and target sediment volume is calculated. However, the project designated as "Package 1" in the Project is an emergency construction project after the earthquake. It is necessary to plan priority the protection of human lives and to be recovered damaged facilities. For this reason, the amount of sediment estimated from existing data and existing disaster situations is simply calculated, and the above objective is achieved with the minimum facility. About target earth and sand amount which should be finally maintained, it is verified at the time of development of the future master plan and maintain missing facilities sequentially.



Source: JICA Study Team

Figure 7-31 Assumed Countermeasure Section and Applicable Facilities



Source: JICA Study Team

Figure 7-32 Flow to determine the Amount of Sediment for Planning

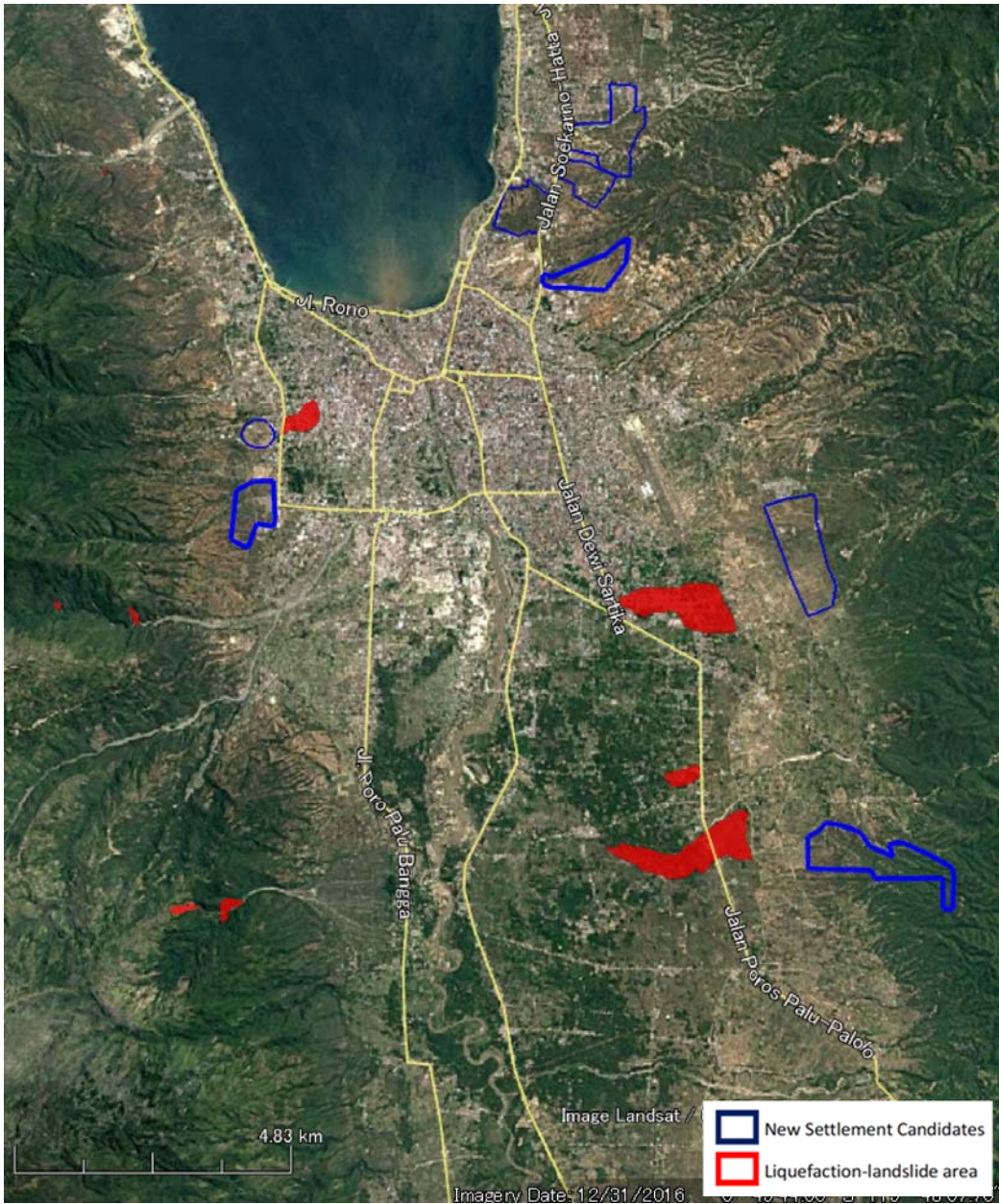
## (6) Others: Infrastructure for New Settlement

There are seven (7) major liquefaction and landslides identified in the target area, and three (3) of them are large in area, and four (4) are relatively smaller. The four of these, which are located closer or within the Palu urban area, namely Balaroa, Petobo, Lolu and Jono Oge, have more impact to the people and communities, therefore large number of families should have evacuated (refer to the figure below). And the people who live in coastal zone also lost their houses by tsunami.

The new settlements for evacuee families were nominated nearby damaged areas. The disaster risk has been already evaluated. To secure their daily lives, basic infrastructure such as road, water supply should be developed.

The settlements are located in mountain side, it is necessary to prevent isolation of settlements. The integrated road network with central Palu urban area and the new settlements should be considered.

Moreover, the settlements are located in dry areas and securing the water is the key for sustainable development of new settlements. The size of damaged farmland by liquefaction-landslide is estimated about 6,000ha, and quite large number of farmers has lost their farmland or production. New and safe farmland for relocated people should be developed nearby new settlement sites.



Source: JICA Study Team

Note: Red marked areas are disaster affected areas (tsunami and liquefaction landslide)

Figure 7-33 Palu Urban Area Liquefaction Landslide Site Map



### 7-1-3 Outline of Sub-projects

The outline of sub-projects based on the Basic Concept of Planning in 7-1-2 is shown in Table 7-11. The information for 1 package sub-projects (A3, A4, A10, B3, B4, B5, B13) are referred to 7-2-2.

Table 7-11 Outline of Sub-Projects (1.5 and 2 packages)

No	Sub-Project	Project Description	Planning Item
A1	Rehabilitation of Palu Inner-City Roads, Reconstruction and Management of Rajamoili-Cut Mutia Road Embankment	The project aims to reconstruct a road which has been destroyed by the earthquake. This road makes to secure the traffic capacity from Pantloan to Donggala along the coastal area, and to exclude unnecessary traffic from the central area. Also, it functions to provide a community space for local.	<ul style="list-style-type: none"> <li>- Elevated Road, L=4.1km, W=12.0m</li> <li>- Embankment with soil stabilization</li> <li>- Concrete block and vegetation work on slope</li> <li>- Asphalt pavement and drainage system</li> </ul>
A2	Reconstruction of Cumi-Cumi Road Embankments		
A5	Access Road and Main Road for permanen housing PETOBO, POMBEWE	The purpose of this project is to provide the main and access roads of the Permanent housing area for tsunami and earthquake victims.	<ul style="list-style-type: none"> <li>- Embankment</li> <li>- Asphalt pavement works</li> <li>- Drainage (Masonry, U-ditch) works</li> </ul>
A6	Slope counter measure and Raising on Access Road to Lake Lindu	<p>The purpose of the project is emergency restoration work of the road which is damaged by the earthquake. It aims to secure the road transportation network and ensure redundancy in the event of disaster by preventing the collapse of the road slope.</p> <p>The priority for this road is to secure accessibility for isolation of remote villages at the time of disaster. Road planning that allows early restoration and to prevent the spread of secondary disasters will be applied in accordance with this priority.</p>	<ul style="list-style-type: none"> <li>- Road length L=17km</li> <li>- Road pavement (Simple pavement for low traffic), W=3.5m</li> <li>- Slope protection</li> </ul>
A7, A8	Reconstruction Palu inner ring road 1 and 2	The purpose of this project is to secure the road transportation network and ensure redundancy in the event of disaster by restoring the damaged road pavement.	<ul style="list-style-type: none"> <li>- Length of Ring Road 1 : 25.0km, Ring Road 2 : 17.0km</li> <li>- Overlay works</li> <li>- Asphalt pavement works</li> <li>- Road Widening</li> <li>- Drainage</li> <li>- Reinforced Earth Wall works</li> <li>- Bridge works (2 bridges: length 50m, 40m)</li> </ul>
A9	Slope counter measure and Raising on Tambu-Tompe road	The purpose of this project is to secure the road transportation network and ensure redundancy in the event of disaster by preventing the collapse of the road slope.	<ul style="list-style-type: none"> <li>- Road length L=4.0km</li> <li>- Slope Protection (gravity wall, concrete crib, anchors, etc.)</li> <li>- Drainage structure (partially)</li> </ul>
A11	Rehabilitation of Palu II Bridge and Palu III Bridge	The purpose of the project is to rehabilitation the bridge that located on the main road damaged by the earthquake. This bridge is a special type of steel truss bridge, and it will be repaired appropriately against deformations and cracks that occur in each part of the superstructure and substructure. In addition, earthquake resistance measures will be implemented as a response to the Build Back Better.	<ul style="list-style-type: none"> <li>- Bridge length L=255m</li> <li>- Reconstruction of concrete wall</li> <li>- Dropout prevention device (Including girder reinforcement)</li> </ul>
B1	Improvement of Gumbasa Irrigation Channel & secondary, tertiary, drainage channels, and paddy field recovery	The Gumbasa irrigation facility was devastated during the earthquake and, as of October 2020, is not operational, except for some restored sections. Since 2018, the section from the intake point to BGKn7 has been rehabilitated by the APBN project; the IRSL sub-project covers the rehabilitation of a 2.7km irrigation	<ul style="list-style-type: none"> <li>- Irrigation Channel Work (BGKn54 – BGKn58 L= 2.65 km)</li> <li>- Drainage Channel Work (L = 4.0 km)</li> <li>- Farmland Restoration (A = 150 ha)</li> </ul>

		canal from BGKn54 to BGKn58 and a 4km drainage channel to the river.	
B2	Capacity Development of the Surface and Groundwater Monitoring	The Nalodo outbreak was estimated to be caused by the increase in groundwater pressure and the rise in groundwater pressure. Therefore, the control of groundwater is important to reduce Nalodo outbreaks. On the other hand, the target area is an agricultural area; surface water may affect the Nalodo phenomenon as agricultural inputs are supplied by the Gumbasa irrigation facility. However, the mechanism of Nalodo phenomenon is still unclear. Therefore, this package will be implemented as a Pilot Project based on the results of monitoring and analysis to be carried out separately.	- Pilot Project for Surface and Groundwater Monitoring
B6	River Improvement and Sediment control in MIU River	There are many large-scale slope failures in the basin, and the recent heavy rains have caused unstable sediment to flow out. The riverbed gradient is the section from the SIMORO Bridge to the confluence of the Salua River (L=11.9km), which is 1/30 to 50 (3% to 2%), and is the section where the debris flow section to the bed load section. Due to slope failures in the basin and secondary movement of sediment on the riverbed, the amount of sediment runoff and sediment movement is enormous. Sediment runoff and sedimentation are repeated in the river channel. Therefore, in the sedimentation section, an abnormal rise of the riverbed occurs and the river channel meanders. The meandering river channel erodes the river bank and carries new earth and sand. Such a state is continuously occurring.	- Consolidation Dam Works (5 set, MI-CD2, CD4, CD5, CD8, CD11 : H=8.0m L=80~200m) - Revetment Works (L=1,000m)
B7	River Improvement and Sediment control in NAMO River	It rained since August 13 afternoon, bridge broke up and houses destroyed, including warehouses. Five houses were washed away by Debris Flow in Namo Villages, Kulawi District. According to interviews with residents, heavy rains continued for 3 hours. This debris flow damage cut the Kalawara-Kulawi Road.	- Sabo Dam Works (2 set) - Consolidation Dam Works (1 set) - Oplit Type Dam (1 set) - Revetment Works (300m) - Road work (100m)
B8	River Improvement and Sediment control in KALAWI River Area	The Tamurai and Bagila rivers are located in the Kulawi area, which is located at the southernmost tip of the project area. Both rivers are small rivers with a basin area of about 1 km <sup>2</sup> . However, on December 12, 2019, a debris flow that killed two people occurred in the Bagila River at midnight. This is because it was swept away with the house by the direct hit of the debris flow and buried in the earth and sand. On the other hand, a debris flow also occurred on the adjacent Tamurai River on the night of August 9, 2020. Many of the debris flows contained megaliths with a diameter of 3 m or more. Both rivers have small basin areas, but there is a very high risk of similar debris flows in the future.	- Sabo Dam Works (2 set) - Consolidation Dam Works (2 set) - Channel Work (600m)
B9	River Improvement and Sediment control in OMU River	The Omu River is a small and medium-sized river with a basin area of 12 km <sup>2</sup> . Debris flow gradually occurred from around November 2019, and debris flow flowed down in May 2020, causing sediment flooding in downstream villages. There is a lot of sediment outflow mainly from the left tributary. It is presumed that the reason for this is that there is a large-scale collapsed area in the basin of the left tributary. It is probable that due to the recent heavy rain, the debris flow flowed out, causing an abnormal deposit of sediment downstream from the confluence of the left and right tributaries, and the debris flow passed over the abnormal deposit.	- Sabo Dam Works (1 set) - Consolidation Dam Works (2 set) - Training Dike Work (280m) - Revetment Works (300m) - Channel Work (200m)
B10	River Improvement and Sediment control in TUVVA River Area	The Tuva River is a small and medium-sized river with a basin area of 4 km <sup>2</sup> . The river channel has a riverbed gradient of about 1/30 (3%) from the downstream end to about 1.6 km, and the upstream is a river with a steep river gradient of 1/10 to 5. There is a large-scale	- Sabo Dam Works (1 set) - Consolidation Dam Works (3 set)

		<p>collapsed area in the basin, and the outflow of sediment is remarkable. In the 1.6km section where the riverbed slope is relatively gentle, flooding and flow of sediment are repeated, and the river channel meanders.</p> <p>In this section, farmland, plantations, and forests are mainly spread, and the infrastructure such as the main villages and roads is not maintained. Debris flows mainly occur in mountainous areas and do not reach the downstream area, so sediment flooding in the downstream area is mainly composed of sand and gravel. Since March 2020, sediment outflow has been remarkable, an abnormal rise in the river channel has occurred, and the area near the confluence of the Miu River has been repeatedly flooded with sediment.</p>	
B11	Polder System Pilot Project in Lende SIRENJA Village	<p>The Sirenja district, about 80 km north of Pal, is the closest settlement to the epicenter. Immediately after the earthquake, land subsidence of 1.5m to 3.0m occurred, causing storm surge damage twice a month. The situation of land subsidence does not show a uniform amount of subsidence and varies from place to place. This area is divided by coastline, national roads, and small rivers, and can be divided into four zones according to the situation of the settlement.</p> <p>In this project, the progress of land subsidence and analysis will be conducted, and while monitoring will be used together, the priority of countermeasures for the divided zones will be examined, and then the zone for which countermeasures will be given the highest priority will be determined. The Polder system will be developed using this high priority zone as a pilot project.</p>	<ul style="list-style-type: none"> <li>- See Dike Works (800m)</li> <li>- Pump-up System (2 set)</li> <li>- Ancillary facilities (1 set)</li> </ul>
B12	River Improvement (Down stream of PALU River considering tsunami countermeasures)	<p>This is a river improvement work for the 5km downstream section of the Palu River.</p> <p>After the earthquake, the existing embankment with a height of <math>h = 2</math> to 3 m has caused uneven subsidence and deformation due to land subsidence and liquefaction. In addition, there are some places where the revetment, which also serves as a slope protection work for the embankment, has partially collapsed. On the other hand, the riverbed has risen further due to the sediment outflow from the upper reaches of the Pal River, and the water depth is less than 1 m at the estuary.</p>	<ul style="list-style-type: none"> <li>- In order to normalize the river channel and control the damage caused by the tsunami, which is being considered separately, the river channel will be dredging, the embankment will be elevated, and the revetment will be improved.</li> </ul>
B14	River Improvement and Sediment control in PANEKI River (Middle Stream)	<p>The Paneki River is a river with a large basin area of more than 60 km<sup>2</sup> in the mountains. At the time of the earthquake, the Nalodo phenomenon occurred in the middle reaches of the Paneki River, causing the river channel to collapse, causing flooding of river water along with the fluidized sediment generated by the Nalodo phenomenon. The fluidized sediment flowed down as a sediment flow, reaching the settlements in the downstream area, and not only houses but also roads and bridges were cut off. On the other hand, as of October 2020, there is a large-scale slope failure site in the mountainous area in the upper reaches of the Paneki River, and recent heavy rains have caused sediment runoff, and river water has reached the downstream. River water is continuously flowing into the area where Nalodo occurred.</p>	<ul style="list-style-type: none"> <li>- Liquefaction landslide measures</li> <li>- Irrigation channel rehabilitation work</li> </ul>
B15	River Improvement and Sediment control in LEWARA River	<p>The Lewara River flows through the eastern mountainous region of Pal City. The basin area is 31.2km<sup>2</sup>, which is a medium-sized river in the Palu River basin. In addition, sediment production was remarkable in the Palu River basin, and a past sabo dam was installed, and although it was already full capacity, the sediment control effect was exhibited.</p> <p>However, after the earthquake, a new large-scale collapsed area has occurred in the Lewara river basin, and sediment outflow has become remarkable. Since it is a</p>	<ul style="list-style-type: none"> <li>- Check Sabo Dam (Partially Open Type) H = 14.5m (1 set)</li> <li>- Water Intake Facility (1 set)</li> </ul>

		river that flows through the center of Pal, it is a river with high maintenance priority.	
B16	River Improvement and Sediment control in POBOYA River	The Poboya River is a large river with a basin area of 62.5 km. Before the earthquake, there was no significant increase or decrease in the amount of water and sediment. However, after the earthquake, repeated heavy rains have caused significant floods and sediment outflows. Sediment flows down the river channel while meandering violently in the river through the terrace deposits accumulated due to slope failures and sediment runoff. Settlements are scattered on this terrace deposit, and the river has a very high risk of flood sediment disasters.	- Check Sabo Dam (Partially Open Type) H = 14.5m (1 set) - Water Intake Facility (1 set)
B17	River Improvement and Sediment control in GUMBASA River	As a river improvement in the middle section of the Palu River, IRSL planned to control the flood flow using a retarding basin. Although the Palu River has a huge basin area, the width of the river mouth is very narrow, about 200 m. Moreover, sediment runoff and sedimentation that have continued even after the earthquake have reduced the cross section of the river channel, increasing the risk of flooding.	- Lower Channel Work - Upper Channel Work - River-bed Girdle Work - River-bed Excavation Work - Rehabilitation Consolidation Dam (2 set) - New SABO Dam, H=10m~12m (2 set)
B18	Countermeasure for Liquefaction-Landslide area (BALAROA, PETOBO, JONO-OGE, SIBALAYA)	The main factors that caused the Nalodo phenomenon are topographical gradient, seismic motion, geological characteristics, groundwater level and pressure from groundwater. As a countermeasure against Nalodo, among these factors, countermeasures will be taken against the groundwater level and the pressure from groundwater.	- Facilities for lowering the groundwater level and reduce the pressure from groundwater
B19	Flood and sediment disaster countermeasures against HUNTAP	The development of Huntap Duyu has started as a relocation site for the affected residents. In this subproject, flood and landslide measures will be taken to ensure the safety of this Huntap. At Huntap Duyu, a sediment flow occurred upstream of the Huntap area on September 23, 2020. In recent years, more than 30 years have been disasters in areas where debris flows and floods have not occurred. Therefore, countermeasure facilities are being reviewed in light of this disaster.	- SABO Dam - mini SABO Dam - Consolidation Dam - Channel Work
C1	Reconstruction of Anutapura Hospital	The purpose of the project is to reconstruct the damaged hospital main building (Anutapura Medical Center), which has been providing Class-4 hospital medical services since 2014 including general medical consultation, surgery, ICU, emergency services, outpatient and hospitalized patient treatment, etc.	- Total floor area: approx. 12,500 sq.mt. - Size of the AMC building: 1 basement and 3 above ground floors - General treatment consultation section, administration, laboratory, 4 operation rooms, emergency treatment unit, pharmacy, obstetrics and gynecology department, ICU care center with 8 ICU units, surgical and medical supply department, patient care unit with bed rooms, medical imaging department including CT scanning room, horizontal and vertical circulation system, etc.

\*Note : Further details are referred to Appendix II-3-1 Outline of Infrastructure projects.

Source: JICA Study Team

It should be noted that the project scope on 1.5 and 2 package sub-projects is only the outline plan (conceptional design) for the urgent establishment of reconstruction plan of Sulawesi. Therefore, no drawings and specifications have been prepared in the Project. Advice for 1.5 and 2 package sub-projects



toward the implementation stage is shown in Table 7-12. The Consultant (or Contractor in case of Design-Build) to be procured in the future is recommended to refer to these advices.

Table 7-12 Advice for 1.5 and 2 Package Projects

No	Sub-Project	Advices for Detailed Design
A1	Rehabilitation of Palu Inner-City Roads, Reconstruction and Management of Rajamoili-Cut Mutia Road Embankment	<ul style="list-style-type: none"> <li>➤ The 2018 Tsunami caused by coastal landslides is characterized by immensely short time of arriving at the coast. Installation locations and structure details of stair concrete block should aim easy evacuation when Tsunami comes, and shall be closely examined with previous studies. Regarding the structural stability with tsunami overflowing the elevated road, perform a numerical simulation of the overflowing tsunami with a two-dimensional cross section to verify the degree of scouring at the bottom of the slope.</li> </ul>
A2	Reconstruction of Cumi-Cumi Road Embankments	<ul style="list-style-type: none"> <li>➤ Since the Palu-Koro fault crosses the west side of the planned road, increasing the strength of the embankment material, e.g. cement-treated soil, shall be considered.</li> <li>➤ Since the rehabilitation and reconstruction of Palu coastal protection by ADB fund is currently ongoing, the design changes during its construction shall feed into the detailed design. In particular, it is necessary to pay attention in planning an integrated structure in close proximity to the Coastal Protection and drainage plan considering tsunami countermeasures.</li> <li>➤ Besides, the design coordination with the planned SDA Section Loan Project, the river improvement for down stream of Palu river, shall be implemented. In the design, a comprehensive resilient structure against Tsunami overflow is required to be reviewed.</li> <li>➤ The drainage facility in the inland area shall be determined in compliance with the master plan prepared by Palu City. The ground around Palu bay has been confirmed to have subsided due to the 2018 earthquake, so the survey results will reflect in the drainage plan including the countermeasure, such as flap gate, of the reverse flow of seawater during high tide. In addition, the road plan allows the overflow of Tsunami, consideration will be given to the treatment of accumulated water after Tsunami comes.</li> <li>➤ To minimize land acquisition on prominent existing facilities, structures aiming not to encroach upon private land would be applied at Palu Garden Hotel, Shopping mall, which is very close to the planned road. Regarding this issue, the Consultant will provide full technical support to relevant authorities for the implementation of project with no delay.</li> </ul>
A5	Access Road and Main Road for permanen housing PETOBO, POMBEWE	<ul style="list-style-type: none"> <li>➤ In Pombewe area, a permanent housing plan accommodating approx. 1,000 units, surrounding roads, and water supply and sewerage have been conducted as a World Bank project (Loan IBRD/86360). A prompt joint consultation meeting with related organizations will be organized when the consultant service starts to clarify about updated plan of these facilities and requirements of the road.</li> </ul>
A6	Slope counter measure and Raising on Access Road to Lake Lindu	<ul style="list-style-type: none"> <li>➤ After confirming the traffic volume and site conditions of the target road, it is required to consider an appropriate road specification in consideration of the balance with the cost, but as long as we understand, full specification improvement along the whole road is not practical on this road. In the design stage, it is required to clarify the priority, e.g., securing accessibility for isolation of remote villages, and to apply flexible specifications following the determined priority.</li> <li>➤ Since the Kalawara-Kulawi road, which is part of a preceding project and located near Lindu, will be used for haul route for the constriction, not only the schedule of target road but also integrated schedule management considering the Kalawara-Kulawi road is required.</li> </ul>
A7, A8	Reconstruction Palu inner ring road 1 and 2	<ul style="list-style-type: none"> <li>➤ In order to promptly proceed with the design of the 42km long route, it is desirable to proceed with the detailed design in consideration of the outline plan and inventory survey results. In the detailed design, the design policy shall be reviewed again, e.g. improvement of intersections. From the Consultant's point of view, it is recommended to control the land acquisition as much as possible since the plan with land acquisition is not realistic considering the implementation schedule. Also, Petobo and Pue Bongo bridges located in the middle of inner ring road are required to consider earthquake countermeasures such as dropout prevention systems.</li> </ul>

No	Sub-Project	Advices for Detailed Design
		<ul style="list-style-type: none"> <li>➤ The existing road width varies a lot from approx. 22.0m to 8.0m and many private houses and shops adjoin the planned roads. A segmentalized typical cross section involving flexible specifications would be applied to section by section.</li> <li>➤ The inner ring road passes the liquefaction landslide area, Balaroa, which had the occurrence of lateral flow of the ground generated by liquefaction, and the movement reached 300 to 700 m or may be more. Since this phenomenon is very rare and no such large-scale lateral flows happened in the world, the countermeasure design shall be planned after a thorough review of previous studies.</li> <li>➤ Gumbasa Channel, Balaroa Area, and Poboya River which are related to DGWR run through the planned road, the coordination with DGWR is required.</li> </ul>
A9	Slope counter measure and Raising on Tambu-Tompe road	<ul style="list-style-type: none"> <li>➤ After confirming the traffic volume and site conditions of the target road, it is required to consider an appropriate road specification in consideration of the balance with the cost, but as long as we understand, full specification improvement along the whole road is not practical on this road. In the design stage, it is required to clarify the priority, e.g., applying flexible specifications following the determined priority.</li> </ul>
A11	Rehabilitation of Palu II Bridge and Palu III Bridge	<ul style="list-style-type: none"> <li>➤ The type of Palu II Bridge is a steel truss bridge, which are common in Sulawesi. No related drawings have been found, and even the construction year is not clear. The inspection results of the survey conducted after the 2018 earthquake have confirmed that the axial displacement limiting device at the P1 position was destroyed and entire superstructure was corroded with rust. With regard to same type bridges, substructures have been seriously damaged due to movement of superstructure. Therefore, it is necessary to plan countermeasures in consideration of such disaster cases.</li> <li>➤ The bridge type of Palu III Bridge is almost the same as that of Palu II, but detailed inspections have not been carried out yet in JICA TC Project. Since the previous study is not available, it is required to carry out inspections before the design. Since both Palu II and Palu III bridges are located on heavy traffic roads in Palu City, the construction method should be selected in view of minimizing the traffic flow restrictions.</li> </ul>
B1	Improvement of Gumbasa Irrigation Channel & secondary, tertiary, drainage channels, and paddy field recovery	<ul style="list-style-type: none"> <li>➤ The Gumbasa Irrigation System was almost completely destroyed due to the effects of seismic motion, ground movement, and liquefaction. Some parts of the recovery works have been completed using the Indonesian government budget, and the remaining works will be implemented with the ADB sector loan. In the JICA sector loan, recovery works will be carried out on the downstream of the irrigation canal, about 4km out of 64km length in total.</li> <li>➤ Petobo area has been damaged by liquefaction, it is necessary to plan the recovery of agricultural land, secondary and tertiary canals along with the primary canals.</li> <li>➤ Agricultural water from the irrigation canals is surface water which may cause liquefaction. It is necessary to fully confirm the usage of the irrigation water according to the irrigation master plan and reflect it in the canal recovery plan.</li> </ul>
B2	Capacity Development of the Surface and Groundwater Monitoring	<ul style="list-style-type: none"> <li>➤ To understand the fluctuation status of groundwater based on the reduction in the liquefaction, it is necessary to consider all factors such as weather conditions, geological conditions, and irrigation water usage status.</li> <li>➤ Based on the groundwater model, it is necessary to continuously monitor and acquire data such as groundwater data, rainfall data, and update the fluctuation analysis.</li> </ul>
B6	River Improvement and Sediment control in MIU River	<ul style="list-style-type: none"> <li>➤ Roads and houses adjacent to the river have high damage risk to sediment and flood.</li> <li>➤ Sediment inflow from many tributaries was also significant, and it is necessary to understand the movement form of the sediment.</li> </ul>
B7	River Improvement and Sediment control in NAMO River	<ul style="list-style-type: none"> <li>➤ Namo River was damaged by the debris flow.</li> <li>➤ Debris flow countermeasures and damaged road recovery are necessary.</li> </ul>
B8	River Improvement and Sediment control in KALAWI River Area	<ul style="list-style-type: none"> <li>➤ Kalawi River was damaged by the debris flow. Adjacent villages, roads and bridges have also been damaged.</li> <li>➤ Although it is a small river, it has a lot of disaster history where a debris flow hit the village directly. Debris flow and soft countermeasures are necessary.</li> </ul>

No	Sub-Project	Advices for Detailed Design
B9	River Improvement and Sediment control in OMU River	<ul style="list-style-type: none"> <li>➤ Omu River was damaged by the debris flow. The damage occurred in the adjacent village near the confluence with the downstream of the main river.</li> <li>➤ It is necessary to control the sediment that flows into Miu Main River.</li> </ul>
B10	River Improvement and Sediment control in TUVVA River Area	<ul style="list-style-type: none"> <li>➤ Tuva River was damaged by the debris flow. Damage has occurred in the adjacent village near the confluence with the main river's downstream.</li> </ul>
B11	Polder System Pilot Project in Lende SIRENJA Village	<ul style="list-style-type: none"> <li>➤ Land subsidence occurred in the area near the epicenter of the 2018 earthquake. As a result, storm surge disasters occur frequently.</li> <li>➤ It is necessary to take storm surges countermeasure because flood occurred at the same time in the inflowing rivers and villages.</li> </ul>
B12	River Improvement (Downstream of PALU River considering tsunami countermeasures)	<ul style="list-style-type: none"> <li>➤ In the 2018 earthquake, tsunami run-up, damage to embankments and revetments occurred due to the seismic motion.</li> <li>➤ Sediment inflow from the upper Palu River basin raises the riverbed and increases the risk of flooding.</li> <li>➤ River improvement for tsunamis, floods and landslides is necessary.</li> </ul>
B14	River Improvement and Sediment control in PANEKI River (Middle Stream)	<ul style="list-style-type: none"> <li>➤ Paneki River is an adjacent river to the Jono Oge area that was damaged by liquefaction.</li> <li>➤ Along with the river improvement, it is preferable to have the effect of lowering the groundwater as a liquefaction countermeasure.</li> <li>➤ Beside the flood risk, considering the increase in flow rate due to raising of groundwater and sediment inflow, improvement in the operation is necessary.</li> </ul>
B15	River Improvement and Sediment control in LEWARA River	<ul style="list-style-type: none"> <li>➤ In the 2018 earthquake, a massive landslide occurred in the upstream of Lewara River. The risk of sediment-related disasters are increased. In addition to existing Sabo facilities, it is necessary to adjust the sediment control.</li> </ul>
B16	River Improvement and Sediment control in POBOYA River	<ul style="list-style-type: none"> <li>➤ In the 2018 earthquake, a massive landslide occurred in the upstream of Poboya River. The risk of sediment-related disasters are increased. In addition to existing Sabo facilities, it is necessary to adjust the sediment control.</li> </ul>
B17	River Improvement and Sediment control in GUMBASA River	<ul style="list-style-type: none"> <li>➤ In the 2018 earthquake, a massive landslide occurred in the upstream rivers.</li> <li>➤ The risk of sediment-related disasters has increased, and there is concern about the occurrence of the disasters at Gumbasa irrigation facility (water gate) located in the downstream.</li> <li>➤ It is necessary to protect Gumbasa irrigation facility and control the inflow of sediment into the Palu River by arranging Sabo facilities with sediment control functions and temporary sediment storage facilities.</li> </ul>
B18	Countermeasure for Liquefaction-Landslide area (BALAROA, PETOBO, JONO-OGE, SIBALAYA)	<ul style="list-style-type: none"> <li>➤ There were four areas where liquefaction occurred. It was a special disaster phenomenon.</li> <li>➤ The disaster mechanism is being analyzed by the JICA-TC and related organizations in the Indonesian side. It is necessary to consider a countermeasure using the knowledge from the analysis activities.</li> <li>➤ In general, liquefaction countermeasure's scope is wide. Since it will be very difficult to determine the required range of countermeasures, an efficient and flexible countermeasure plan is necessary.</li> <li>➤ Based on the knowledge of the JICA-TC, the basic countermeasure policy is to reduce the groundwater pressure and ground water level due to the rise in groundwater during an earthquake. It is also necessary to implement wastewater countermeasures for the groundwater treatment.</li> </ul>
B19	Flood and sediment disaster countermeasures against HUNTAP	<ul style="list-style-type: none"> <li>➤ Large-scale relocation areas are planned in the areas with low disasters risk. But in the neighborhood, there are rivers with a history of floods and sediment-related disasters occurred.</li> <li>➤ It is necessary to take disaster countermeasures to improve the safety of the relocation areas.</li> </ul>
C1	Reconstruction of Anutapura Hospital	<ul style="list-style-type: none"> <li>➤ A reconstruction work of Anutapura Hospital that completely damaged during the 2018 earthquake.</li> </ul>

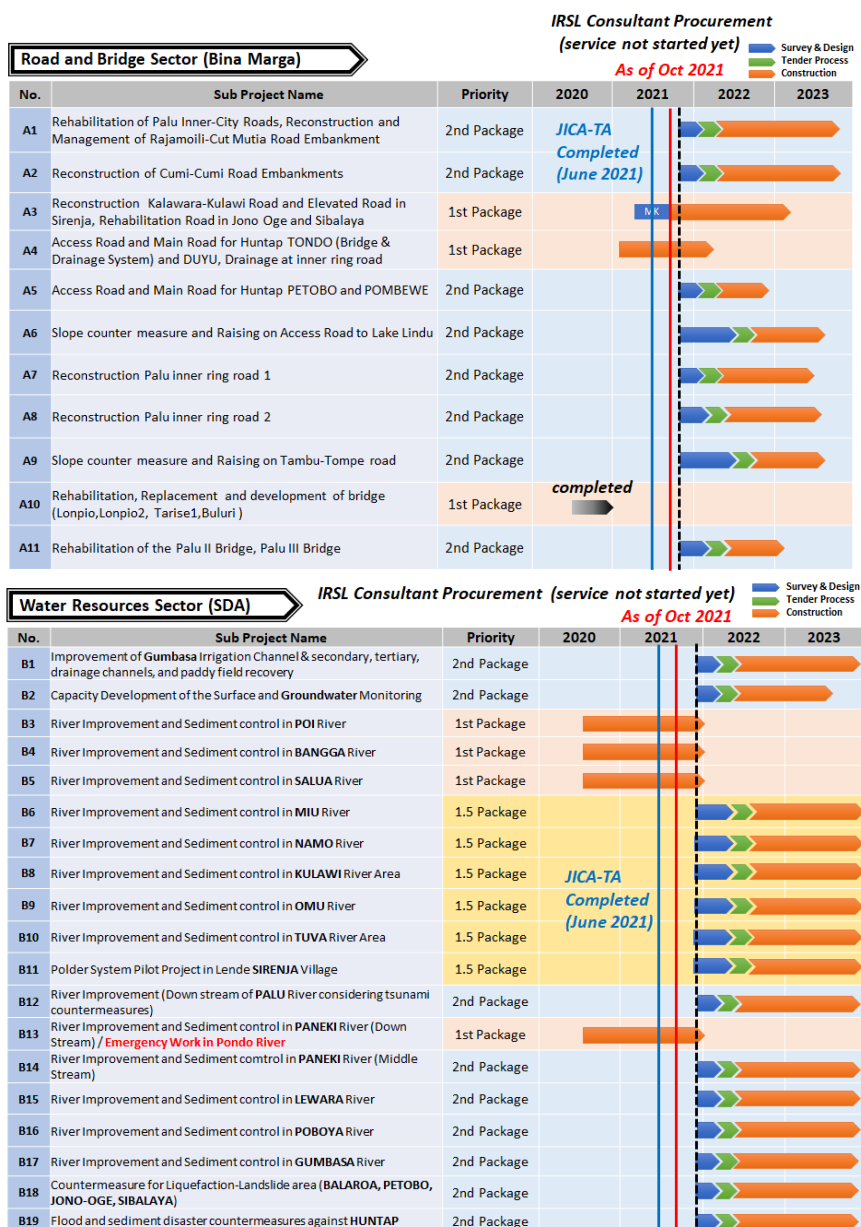


No	Sub-Project	Advices for Detailed Design
		➤ While identifying the causes of the damage, it aims to adopt a "seismic isolation" structure that has never been implemented in Indonesia.

Source: JICA Study Team

### Implementation Delay and Current Status of Sub-projects

Originally, the schedule for sub-projects was planned to be completed by the end of 2022. On the other hand, due to the delay of IRSL (Infrastructure Reconstruction Sector Loan) consultant procurement, any sub-projects of 1.5 Package and 2nd Package have not been started yet. The progress of sub-projects are shown below.



Source: JICA Study Team

Given the conditions that the construction period for each 1.5 Package and 2nd Package sub-project may need 1 year half to 2 years at least, the completion year will be in 2023. Also, there will be a blank period for consultation service about few months from the end of June 2021 when JICA-TA is completed. PUPR is requested to accelerate the IRSL consultant procurement and commence the sub-project as soon as possible.



## 7-2 Draft Detail Design for 1<sup>st</sup> Package Sub-Projects

### 7-2-1 Outline of Activity

A draft detail design for each sector was formulated for the highly prioritized sub-projects and included in 1<sup>st</sup> Package. A list of the results of the draft detail design is shown in Table 7-13:

- Mountain Road Maintenance Project to Strengthen the Road Networks: for the flow of people and goods 1 project (A3 in the Figure 7-1)
- Access Road Maintenance Project for the Relocation Areas: 1 project (A4 in the Figure 7-1)
- Earthquake-resistant Project to Strengthen Bridges on the Arterial Roads: 1 project (A4 in the Figure 7-1)
- Flood and Sediment Disaster Countermeasure Project by Improving the Rivers, Sediment Control Dams, etc.: 4 projects (B3, B4, B5, B13 in the Figure 7-2)

As a result, the JICA Study Team shared the draft documents and specifications required for tendering disaster-resilient infrastructure projects with the local governments and PUPR. After the submission, it has been confirmed that PUPR modified the submitted draft detail design (including the project scope) and implemented the 1<sup>st</sup> package sub-projects.

Table 7-13 List of the Draft Detail Design

Classification	Part	Section	Contents
Draft Bidding Documents	1	REFERENCE DOCUMENTS for BIDDING PROCEDURES	
		1	Instructions to Bidders (ITB)
		2	Bid Data Sheet (BDS)
		3	Evaluation and Qualification Criteria
		4	Bidding Forms
	5	List of Eligible Countries of Japanese ODA Loans	
	2	REFERENCE DOCUMENTS for WORKS REQUIREMENTS	
		6	Works Requirements
			- General Specification (Volume I)
			- Technical Specification (Volume II)
	- Drawings (Volume III)		
	3	REFERENCE DOCUMENTS for CONDITIONS OF CONTRACT AND CONTRACT FORMS	
7		General Conditions (GC)	
8		Particular Conditions (PC)	
9	Appendix to the Particular Conditions - Contract Forms		
Draft Detail Design Documents	4	OTHERS	
		10	Design Reports - Design criteria
		11	Design Drawing - General drawing - Plan drawing - Profile drawing - Typical cross section - Cross section - General drawing of Bridge, Box- culvert, River facilities, etc.
12	Quantity Calculation Sheet - Summary table - Detail calculation sheet		

Source: JICA Study Team

## 7-2-2 Design Details of 1<sup>st</sup> Package Sub-Projects

### (1) Reconstruction Kalawara-Kulawi Road (Project Code A3)

#### 1) Scope of the Project

Target section of the project are as follows.

Segment 1)	0.185km (KM45+200 – KM45+385)
Segment 2)	0.150km (KM47+400 – KM47+550)
Segment 3)	0.170km (KM47+750 – KM47+920)
<u>Segment 4)</u>	<u>12.097km(KM54+000 – KM66+097)</u>
Total: 12.602km	

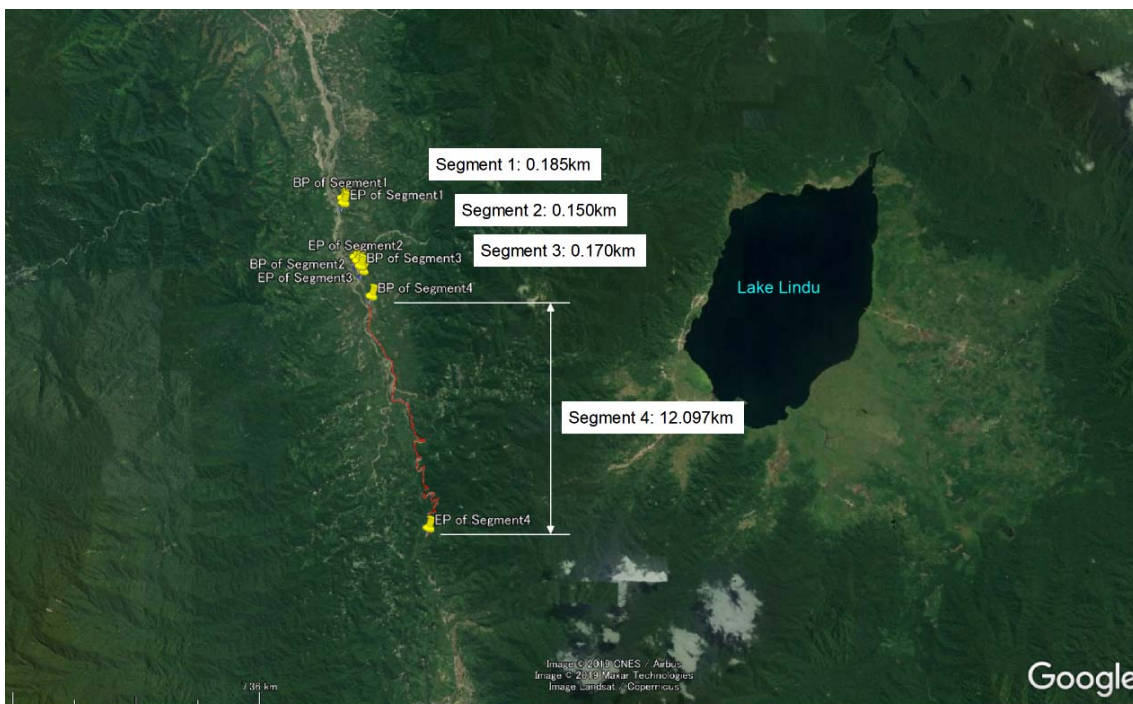


Figure 7-34 Target Section of the Project

- This project is consist of slope countermeasure and road pavement improvement for Kalawara-Kulawi road which is connected from Palu city to Kulawi as province road.
- The section of road pavement improvement are selected from damaged section. The damages are occurred by road surface water around sag section. For smooth drain of road surface water, drainage around the section is also constructed.
- Secondary damage of Kalawara-Kulawi road due to mud flow and river flood on the end of April 2019, section 4, are also included in the project.

#### 2) Design Criteria

Standard to be used in road design:

- Persyaratan teknis jalan dan kriteria perencanaan teknis jalan: Peraturan Menteri Pekerjaan Umum (Nomor: 19/PRT/M/2011)

- SNI T-14-2004 Geometri Jalan Perkotaan: Badan Standardisasi Nasional (BSN)
- Geometric Design of Highways and Streets (2018 7th Edition): AASHTO
- MANUAL DESIGN PERKERASAN JALAN, 2017, Bina Marga

### 3) Design Speed

This road corridor is classified as collector road by the Bina Marga. Road is basic infrastructure for personal trip and transportation of commodities. For road planning and designing in the Project, securing access function will be focused rather than long distance trip expecting safe, smooth and comfortable traffic functions.

Design speed is a fundamental factor to study and decide the geometric design standard. Design speed shall reflect directly to radius of curvature, cross fall or sight distance and etc. Carriageway and shoulder width shall affect to running speed (operational speed).

It means that design speed is affected by available ROW. Since the project road passes through exceptionally steep mountain terrain and has such restriction that conservation forest area and should follow to existing alignments as much as it can, it is very difficult to keep minimum design speed of 30 km/h to apply horizontal alignment. Design speed of 20 km/h is applied although classification of project road is Collector Road of which design speed is provided as 30 to 50 km/h (see Table 7-14).

Table 7-14 Road Classification and Design Speed

Fungsi	Kecepatan Rencana, $V_R$ Km/jam		
	Datar	Bukit	Pegunungan
Arteri	70 - 120	60 - 80	40 - 70
Kolektor	60 - 90	50 - 60	30 - 50
Lokal	40 - 70	30 - 50	20 - 30

Note) Fungsi = Function, Kecepatan Rencana km/jam= Design Speed km/hour, Datar = Flat, Bukit = Hill, Pegunungan = Mountains, Arteri = Arterial road, Kolektor = Collector road, Lokal = Local road  
Source: TATA CARA PERENCANAAN GEOMETRIK JALAN ANTAR KOTA, 2007, Bina Marga

When design horizontal alignment, some parts can keep design speed of 30 km/h in short distance. It is meaningless to set different design speed in particular short section. As conclusion, this Road is design as design speed of 20 km/h.

### 4) Slope Countermeasure Plan

Prerequisite: This project is only for emergency road construction, and for slopes adjacent to the road, it is only for countermeasures where is clearly collapsed. In other words, there are many slopes on the road that are steeper than the stable slope, and it is not the subject of this project to evaluate the stability of all the slopes.

However, although this road has a low daily traffic volume, less than 500 cars, it is the only road

that connects villages scattered in the south, and it is difficult to ensure redundancy in the event of a disaster. Since many tuffs are deposited and weathered tuff is widely distributed, surface layer collapse and falling rocks frequently occur, and it is indispensable to take measures to secure the roadway. Therefore, in this project, as a countermeasure work, it will be applied to install a “Separated retaining wall” on the mountain side of the road. There are various types of “Separated retaining wall”, but gravity type will be selected in consideration of easier construction and maintenance.

The depth of footing for separated retaining wall is more than 500mm, and it is placed on the earth strength (200KN / m<sup>2</sup> or more). In addition, the deposit space: flat space behind the retaining wall is set as 2.0m from the calculation assuming that the surface collapse scale is 15m height and 50cm thickness.

**[Typical Deposit Area]**

- Typical deposit space is supposed as shown below.
- In case of 0.5m at 15m height of surface soil is flown, deposit space still have enough space.

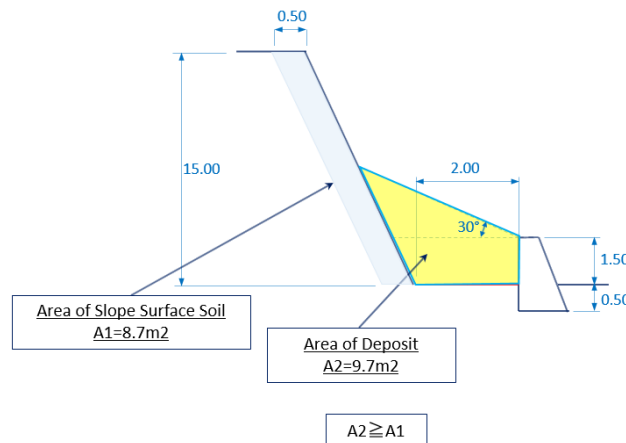


Figure 7-35 Calculation of Pocket Width of Retaining Wall

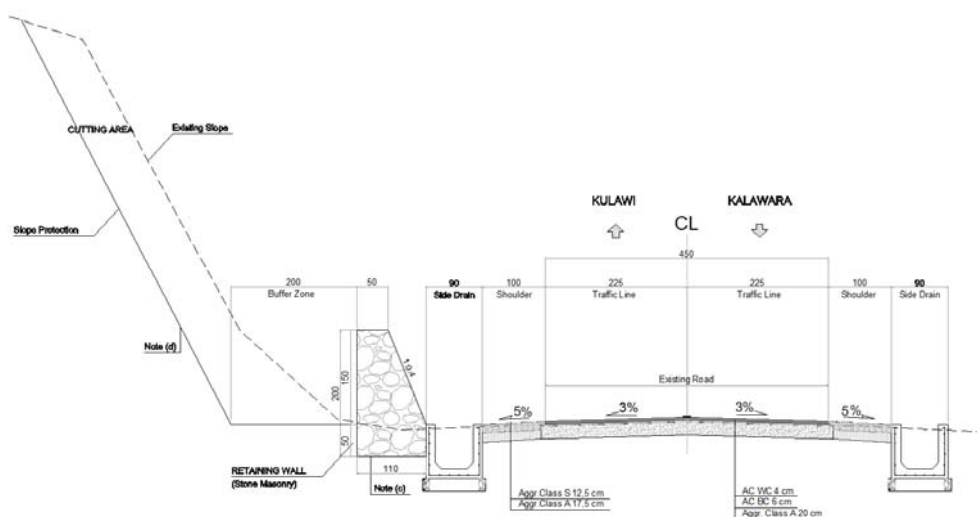


Figure 7-36 Typical Type of Retaining Wall



### **Embankment on valley side and retaining wall**

On the valley side slope of this road, there is a part where the current road is greatly eroded due to scouring due to river flooding and the surface collapse of a loose cliff, so a stable slope cannot be secured. The design policy is to plan “embankment + retaining wall” at such locations.

In the case of a widening of embankment, 1: 1.5 gradient slope is usual, but 1: 0.5 gradient retaining wall jointly by masonry or gabion will be applied considering that the project terrain has a height difference to the bottom of the valley.



Figure 7-37 Existing Conditions (Valley side slope failure)

The other design details for Reconstruction Kalawara-Kulawi Road is referred to “Appendix II-3-1 Outline of Infrastructure projects and Appendix II-3-4 Submission of the Draft Design Documents”.

## **(2) Access Road and Main Road for permanent housing TONDO (Project Code A4)**

### **1) Scope of Project**

The purpose of this project is to provide the access roads of the Tondo permanent housing area for tsunami and earthquake victims. This project is high priority project due to the access road of permanent housing area for the victims.

Basically, the horizontal arraignment of access road is followed by basic design which is provided by Bina Marga. The plan, design and construction of the permanent housing area are supervised by Cipta Karya. The design and construction of the access road is supervised by Bina Marga.



Figure 7-38 Road Plan

**【Outline of Road】**

1) Road Length : 7.3km (in total)

2) Traffic Lane : 2 lanes (E-W route) \*1, 4 lanes (N-S route) \*2

\*1: Traffic lane is decided by the width of existing road.

\*2: Two traffic lanes will be paved in this project, because the development planning in this area is in progress.

**2) Standard and Provision**

Standard to be used in road design:

- Persyaratan teknis jalan dan kriteria perencanaan teknis jalan: Peraturan Menteri Pekerjaan Umum (Nomor: 19/PRT/M/2011)
- SNI T-14-2004 Geometri Jalan Perkotaan: Badan Standardisasi Nasional (BSN)
- Geometric Design of Highways and Streets (2018 7th Edition): AASHTO
- MANUAL DESIGN PERKERASAN JALAN, 2017, Bina Marga

### 3) Road Geometric Design

Road alignment is followed the existing road in case of sub-project for the road improvement.

In case of sub-project for access road to Tondo permanent housing, the new road will be constructed in the hill and mountain area. As the result of discussion with Bina Marga, 40 km/hour is decided as the design speed to minimize the volume of soil cutting and embankment. The geometric design criteria of the access road to Tondo permanent housing is shown in Table 7-15.

Table 7-15 Geometric Design Criteria

Item	Unit	Criteria	
		East-West Route	North-South Route
Design speed	km/hour	40	40
Cross Section		(Minimum)	(Minimum)
Traffic Lane	m	3.50	3.50
Outer Shoulder	m	1.50	1.50
Inner Shoulder	m	-	0.50
Median	m	-	0.50
Sidewalk	m	1.00	1.00
Horizontal Alignment			
Minimum Radius of Curve	m	60	
Minimum Length of Curve	m	70	
Minimum Length of Transition Curve	m	35	
Minimum Radius not Requiring Transition Section	m	250	
Vertical alignment			
Maximum Gradient – Standard Value	%	7	
Gradient – Limited Length	-	8 % – 400 m, 9 % – 300 m, 10 % – 200 m	
Minimum Radius of Curve	m	At crest 450, At sag 450	
Minimum Length of Curve	m	35	
Maximum Superelevation	%	8	

Source: JICA Study Team

### 4) Horizontal and Vertical Alignment Plans

To minimize a land acquisition, road alignment is followed by the existing road in case of sub-project for the road improvement.

In case of sub-project for the access road to Tondo permanent housing, basically, the horizontal arraignment of access road is followed by basic design which is provided by Bina Marga considering the geometric design criteria. The vertical alignment in existing road section follows the existing road alignment considering the drainage of road surface water. And the vertical alignment in the hill and mountain area is decided to minimize the volume of soil cutting and embankment considering the connection with crossing roads.

The elevated road is aligned to minimize the land acquisition as much as possible.

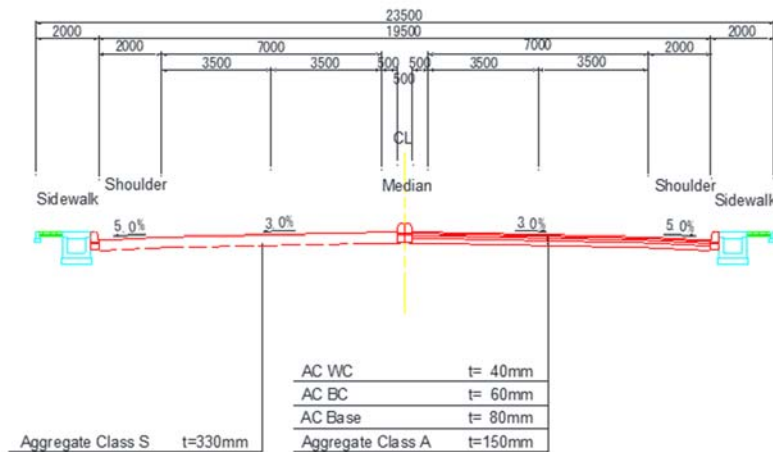
### 5) Cross Section Structure

The cross section structure of road is adapted the existing design or current cross section structure in the road improvement sub-project. To prevent land acquisition, the cross section structure is adjusted within the existing width of space.

In case of sub-project for access road to Tondo permanent housing, the development planning in

this area is in progress. As the result of discussion with Bina Marga, four traffic lanes of road will be designed, but only two traffic lanes will be paved in this project. The remaining two traffic lanes will be conducted temporary pavement and paved in the future.

The cross section structure of the access road to Tondo permanent housing is shown in Figure 7-39.



Source: JICA Study Team

Figure 7-39 Cross section Structure of Access Road to Tondo Permanent Housing

## 6) Pavement Structure

The pavement structure is applied the current pavement structure in the road improvement sub-project. Since asphalt pavement is applied to existing roads and is economically constructed and can be done the maintenance easily compared with concrete pavement, asphalt pavement will be applied in this project.

The pavement structure is determined by Table 7-16. Design traffic load is supposed the medium class in suburb area (from 2 to 7 [106 ESAS]). CBR value is supposed more than 10 from existing result of N value ( $N \geq 50$ , sand gravel) conducted by JICA study team.

### 【Pavement Structure】

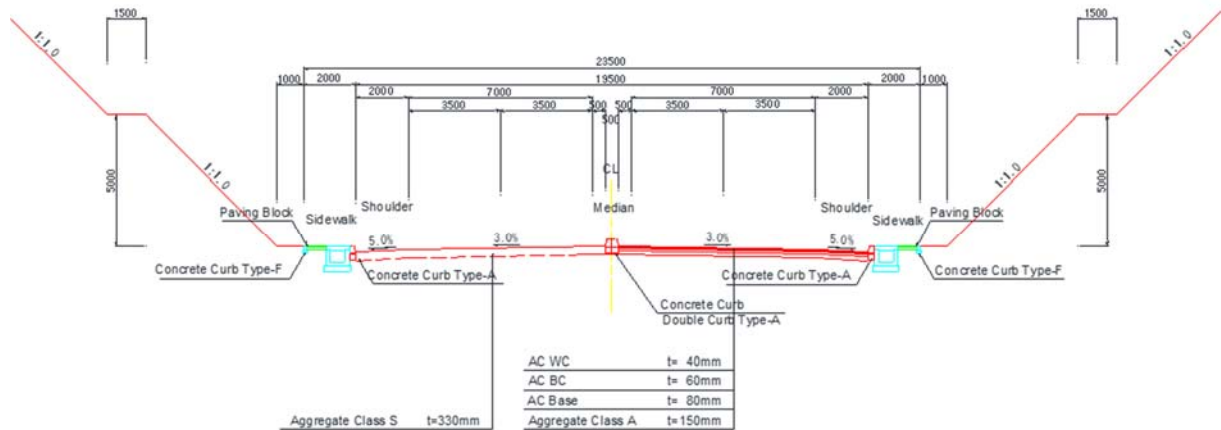
- AC WC (t=40mm)
- AC BC (t=60mm)
- AC Base (t=80mm)
- Aggregate A (t=150mm)
- Total (t=330mm)

Pavement structure for no pavement in North-South route is Aggregate S (t=330mm).



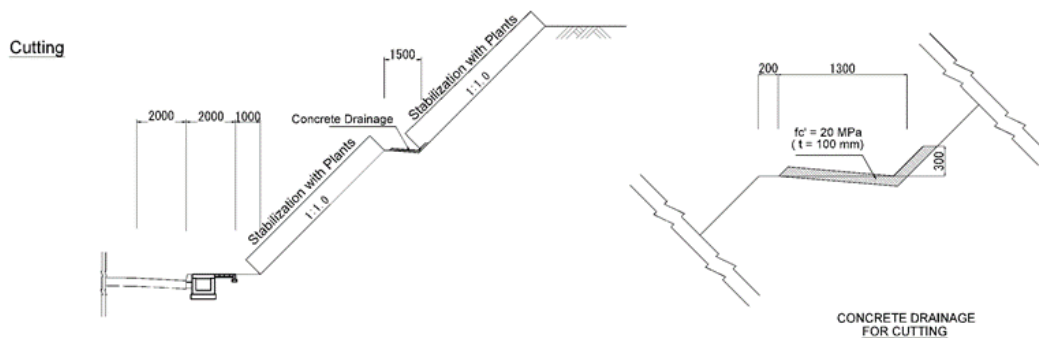
## 7) Slope Protection Structure

The stable cut slope gradient (1:1.0) and the surface protection measure are adopted in consideration of the stability and the erosion of slope surface as shown in Figure 7-40 and Figure 7-41.



Source: JICA Study Team

Figure 7-40 Stable Cut Slope of Access Road to Tondo Permanent Housing



Source: JICA Study Team

Figure 7-41 Surface Protection Measure of Access Road to Tondo Permanent Housing

The other design details for Access Road and Main Road for permanent housing TONDO is referred to “Appendix II-3-1 Outline of Infrastructure projects and Appendix II-3-4 Submission of the Draft Design Documents”.

### (3) Rehabilitation, Replacement and development of bridge (Lonpio, Lonpio2, Tarise1, Buluri ) (Project Code A10)

#### 1) Standard and Provision

Standard to be used in Bridge and Box Culvert Design is described below.

- Bridge Design Code Volume 1 & 2 - Bridge Management System 1992 (BMS-1992), Direktorat Jenderal Bina Marga Departemen Pekerjaan Umum.

- Bridge Design Manual Volume 1 dan 2 - Bridge Management System 1992 (BMS-1992), Direktorat Jenderal Bina Marga Departemen Pekerjaan Umum.
- Standard Specification for Highway Bridge 17th Edition 2002 (AASHTO).
- Bridge Loading Standard, SNI-1725-2016
- Steel Structure Design for Bridge, RSNI T-03-2005
- Concrete Structure Design for Bridge, RSNI T-12-2004
- Design of Bridge against Earthquake Loading, Ministry of Public Works, 2016 (SNI-2833-2016)
- AASHTO LRFD Bridge Design Specifications Third Edition, 2004 AASHTO LRFD Bridge Design Specification, 5th Edition, 2012.
- Standard for Geotechnical Design, SNI 8460 – 2017
- Indonesia Seismic Hazard Map, National Center of Earthquake Research (PUSGEN), 2017

## 2) Rehabilitation and reconstruction of bridge

Based on the field inspection, confirm the damage status of the existing bridge and the surrounding conditions, and decide the policy of rehabilitation or reconstruction. When reconstructing an existing bridge, select from a box culvert structure or a bridge structure considering the crossing conditions. The structure type is selected by the following chart.

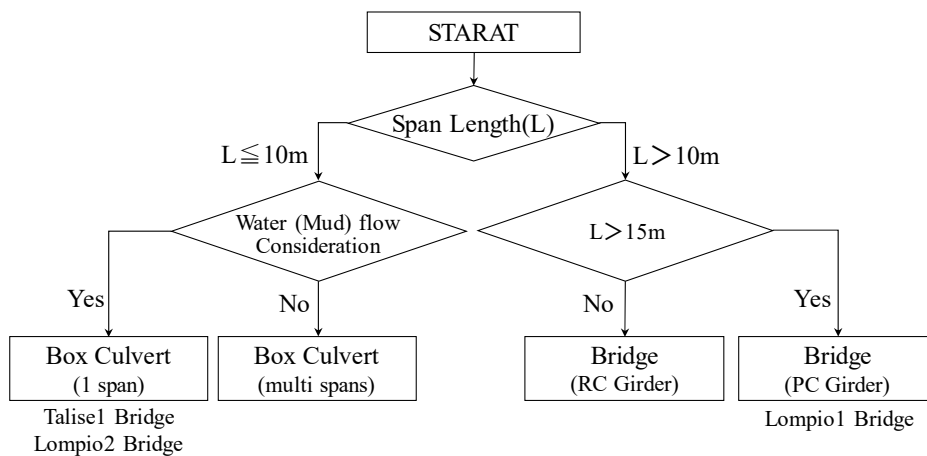


Figure 7-42 Selection Flow of Reconstruction Structure Type

Since all structures are planned in the crossing river area, the span of the structure is set in consideration of the river flow.

### 3) Material Specification

General material specification to be used is as follow:

#### « Structural Concrete »

Type	:	K-350
Application	:	Floor Plates, Barrier, Pierhead, Pier, Bored Pile, Pilecap Pier
Concrete compressive strength (Cylinder)	:	30 MPa
Modulus Elasticity (E)	:	25310 MPa
Unit Weight (G)	:	25 kN/m <sup>3</sup>
Type	:	K-250
Application	:	Abutment, Pilecap Abutment
Concrete compressive strength (Cylinder)	:	20 MPa
Modulus Elasticity (E)	:	25310 MPa
Unit Weight (G)	:	25 kN/m <sup>3</sup>

#### « Steel Reinforcement »

Type	:	BJTD40
Application	:	Slab reinforcement, Barrier, Pierhead, Pier, Bored Pile, Abutment, Pilecap
Yield Strength (fy)	:	390 MPa
Ultimate Strength (fu)	:	500 MPa
Modulus Elasticity (E)	:	200,000 MPa
Unit Weight (G)	:	78.5 kN/m <sup>3</sup>

#### « Steel Structure »

Type	:	JIS SM490
Application	:	Composite girder, Steel truss bridge
Yield Strength (fy)	:	325 MPa
Ultimate Strength (fu)	:	490 MPa
Modulus Elasticity (E)	:	200,000 MPa
Unit Weight (G)	:	78.5 kN/m <sup>3</sup>

#### « Bolt »

Type	:	A 325
Application	:	Composite girder, steel bridge
Yield Strength (fy)	:	660 MPa
Ultimate Strength (fu)	:	825 MPa
Proof Stress	:	585 Mpa

### 4) Loadings

In designing the structure, consider the following loads appropriately.

#### ➤ Self weight

Bridge self weight is the weight of the material and the part of the bridge which is a structural

element coupled with non-structural elements calculated using specific gravity based on the following table.

Table 7-16 Unit Weight of Material

Material	Unit weight
Concrete	24 kN/m <sup>3</sup>
Steel	78.5 kN/m <sup>3</sup>

Source: JICA Study Team

➤ Superimposed Dead Load

The superimposed dead load is the weight of all non-structural materials which give an additional load to the bridge, and the magnitude may change over the life of the bridge. Bridge girder is planned to be able to carry additional pavement dead loads for overlay purposes.

- Vehicle Live Load
- Centrifugal Load
- Brake Load
- Wind Load
- Earthquake Load

The earthquake load is taken as a horizontal force which is determined based on the multiplication of the elastic response coefficient (C<sub>SM</sub>) with the weight of the equivalent structure which is then modified by the modification factor response (R) with the following formulations:

$$E_Q = \frac{C_{SM}}{R} \times W_t$$

where,

E<sub>Q</sub> = Static Horizontal Earthquake Load (kN)

C<sub>SM</sub> = Elastic Response Coefficient

R = Response Modification Factor

W<sub>t</sub> = Total Structure Weight consist of Live Load and Dead Load of Structure (kN)

Site classification is determined based on the type of soil at the bridge location as a reference can be used below table:

Table 7-17 Site Classification

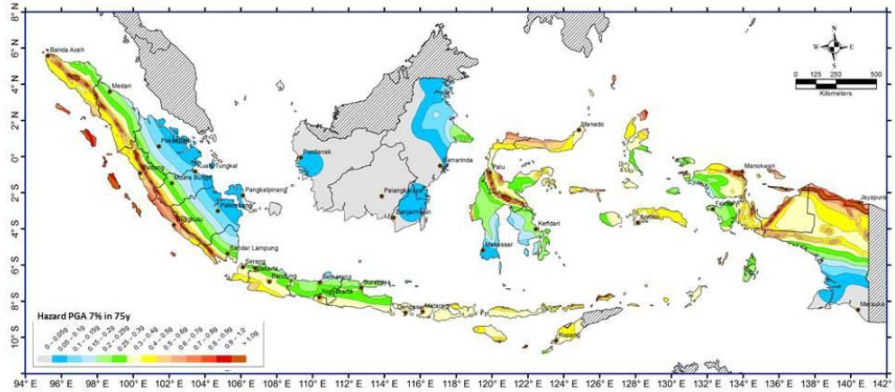
Site Class	$\bar{v}_s$ (m/sec)	$\bar{N}$	$\bar{s}_u$ (kPa)
A. Hard Rock	$\bar{v}_s \geq 1500$	N/A	N/A
B. Rock	$750 < \bar{v}_s \leq 1500$	N/A	N/A
C. Dense Soil	$350 < \bar{v}_s \leq 750$	$\bar{N} > 50$	$\bar{s}_u \geq 100$
D. Medium Soil	$175 < \bar{v}_s \leq 350$	$15 \leq \bar{N} \leq 50$	$50 \leq \bar{s}_u \leq 100$
E. Soft Soil	$\bar{v}_s < 175$	$\bar{N} \leq 15$	$\bar{s}_u < 50$
	Or each soil profile with a thickness of more than 3 m with the following characteristics: 1. Plastic Index, PI > 20 2. Water content (w) ≥ 40% 3. Undrained shear strength $\bar{s}_u < 25$ kPa		
F. Locations that require	Each soil profile has one or more characteristics such as:		



Site Class	$\bar{v}_s$ (m/sec)	$\bar{N}$	$\bar{s}_u$ (kPa)
geotechnical investigation and analysis of specific dynamic responses	– Susceptible and potentially failing to earthquake loads such as liquefaction, clay soils are very sensitive, but weakened		
	– High organic and / or peat clay (with thickness > 3 m)		
	– High plasticity (H thickness > 7.5 m with PI > 75).		
	– Soft clay / stiff medium layer with thickness H > 35 m		

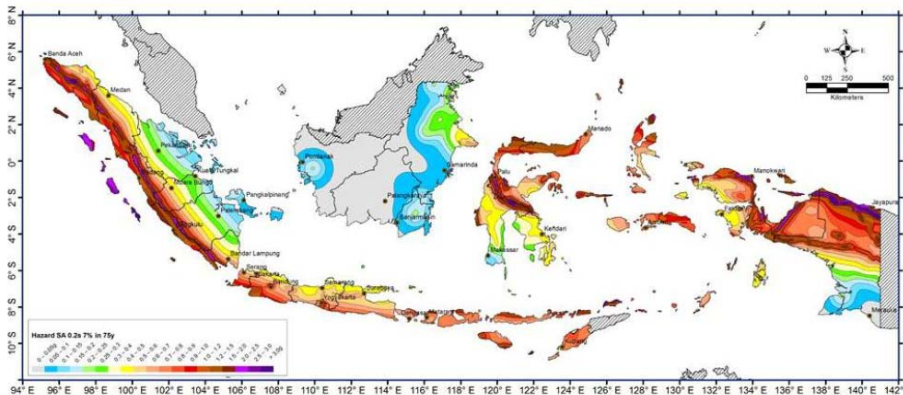
Source: Bridge Design Code Volume 1 & 2 - Bridge Management System 1992 (BMS-1992)

The Earthquake parameter obtained from the Indonesia Seismic Hazard Map is shown below.



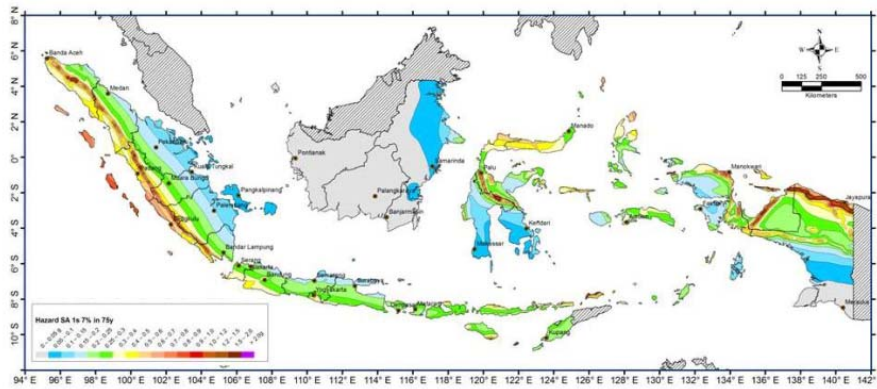
Source: SNI- INDONESIA EARTHQUAKE SOURCES AND EARTHQUAKE 2017 MAP

Figure 7-43 The Peak Acceleration Map in Basic Rock (PGA) for Probability Exceeded 7% in 75 years



Source: SNI- INDONESIA EARTHQUAKE SOURCES AND EARTHQUAKE 2017 MAP

Figure 7-44 Response Spectra Map 0.2 Seconds Acceleration in Bedrock for 7% Probability of Exceeding in 75 years



Source: SNI- INDONESIA EARTHQUAKE SOURCES AND EARTHQUAKE 2017 MAP

Figure 7-45 Map of Response Spectra 1-second Acceleration in Bedrock for Probability Exceeded 7% in 75 years

### 5) Performance Criteria and Design Lifetime of Bridge

Bridges are designed with an earthquake return period of 1000 years or the possibility of exceeding 7% in 75 years in accordance with SNI 2833-2016. Based on the design lifetime, the expected level of performance can be determined along with the planned return period for earthquake loading cases from the functional structure and performance as shown in the following table.

Table 7-18 Earthquake Loading System for Each Structural Performance

Earthquake Reduction	Return Period	Applicable for Structural Element	Remark
R = 1.5	1000 (7% probabilities)	Foundation, Bearing, and Expansion Joint	The foundation is designed to remain elastic in resisting earthquakes designed so that no serious damage occurs and endanger the structure
R = 3.0	1000 (7% probabilities)	Superstructure (girder), Mid Pier and End Pier / Bridge Abutment	The upper structure and Pier are designed to behave plastic and dissipate energy during the design earthquake. Damage can occur on the pier which needs repairs, but the bridge does not collapse or endanger the user.




Source: JICA Study Team

### 6) Assumption of Foundation Design

The target site of bridges, it is generally assumed that a bearing layer can be found around 13 m depth from the existing soil surface elevation (design foundation length of approx. 10 m). This assumption should be confirmed by the contractor by conducting actual soil investigation at minimum 1 location for each abutment (or 2 locations for 1 bridge structure). Based on the obtained soil investigation data, foundation design review should be carried out to ensure that the proposed design has enough bearing and structural capacity to resist vertical, horizontal and moment force acting on the foundation. Design adjustment and modification of foundation are subject to implement when it is found inadequate to satisfy the required criteria and factor of safety.

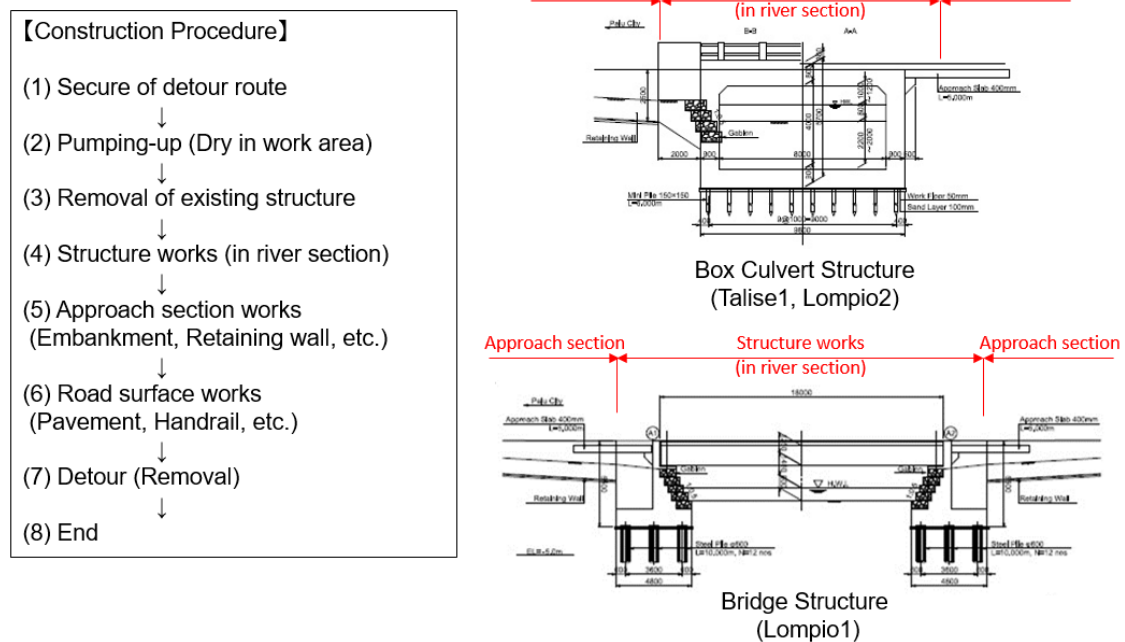
## 7) Construction method for Bridge

Considering site situation: limitation of land use around the construction site, river width (size), workability, construction method for bridge shall be closely examined. Figure 7-46 shows the comparison of various construction method and Figure 7-47 and Figure 7-48 shows construction procedure applied in the Project.

	Alternative-1: River Diversion	Alternative-2: Coffering	Alternative-3: Pumping-Up
Construction Image			
Method Outline	Making a river diversion before bridge works. Land acquisition is required.	Closing river partially with coffering structure.	Arranging pump facility on upstream side of river for making construction area to dry condition
Limitation of Land Use around Site	· No	· Yes	· Yes
River width (size)	· Narrow (Small)	· Wide (Large)	· Medium (Medium)
Workability	· Good	· Fair	· Good
Evaluation	Fair	Good	<b>Excellent</b>

Source: JICA Study Team

Figure 7-46 Comparison of Construction Methods in the River

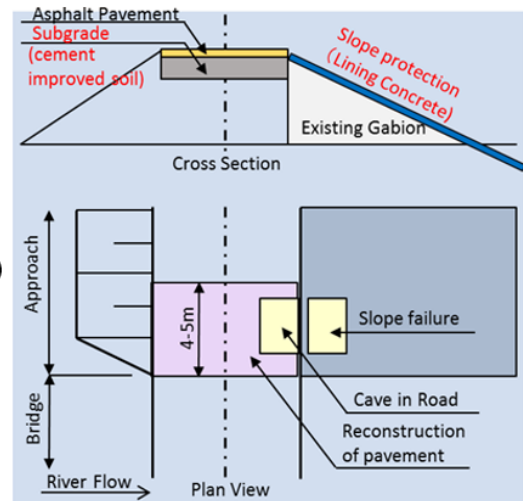


Source: JICA Study Team

Figure 7-47 Procedure of Construction (Talise1, Lompio1, Lompio2)

## 【Rehabilitation Procedure】

- (1) Detour / Closing of construction area
- ↓
- (2)-1. Subgrade works (Cement improvement soil )
- ↓
- (2)-2. Pavement works (Base course and Asphalt layers )
- ↓
- (2)-3. Slope Protection works (Lining concrete)
- ↓
- (3) Opening of construction area
- ↓
- (4) End



Source: JICA Study Team

Figure 7-48 Procedure of Construction (Bululi bridge)

For construction sites such as narrow areas and backfilling of structures where large compactors cannot approach, is applied small compactors such as vibration roller (small size, 1 ton) or tamping rammer. Figure 7-49 shows an image of small compactors.



【1 ton Vibration Roller】  
Size: 600 × 1200



【Tamping Rammer】

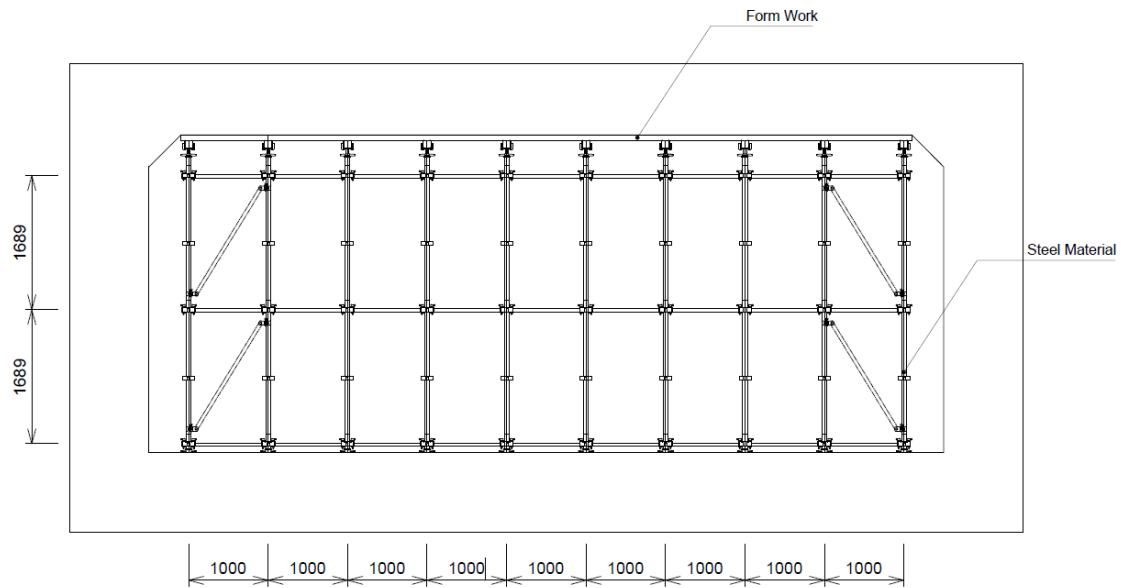
Source: JICA Study Team

Figure 7-49 Image of Small Compactors

## 8) Safety measure for Construction

Safety measures for construction have to be considered not only during construction but in the design stage of bridge in advance. For example, structure construction in the target site, they usually use timber material such as coconut tree for support work, and it is causing frequent accidents. To prevent accident during construction, it is necessary to plan to apply steel support pipe in the design stage.





Source: JICA Study Team

Figure 7-50 Application of Steel Support Pipe to Box Culvert

The other design details for Rehabilitation, Replacement and development of bridge (Lonpio, Lonpio2, Tarise1, Buluri) is referred to “Appendix II-3-1 Outline of Infrastructure projects and Appendix II-3-4 Submission of the Draft Design Documents”.

#### (4) River Improvement and Sediment control in POI River (Project Code B3)

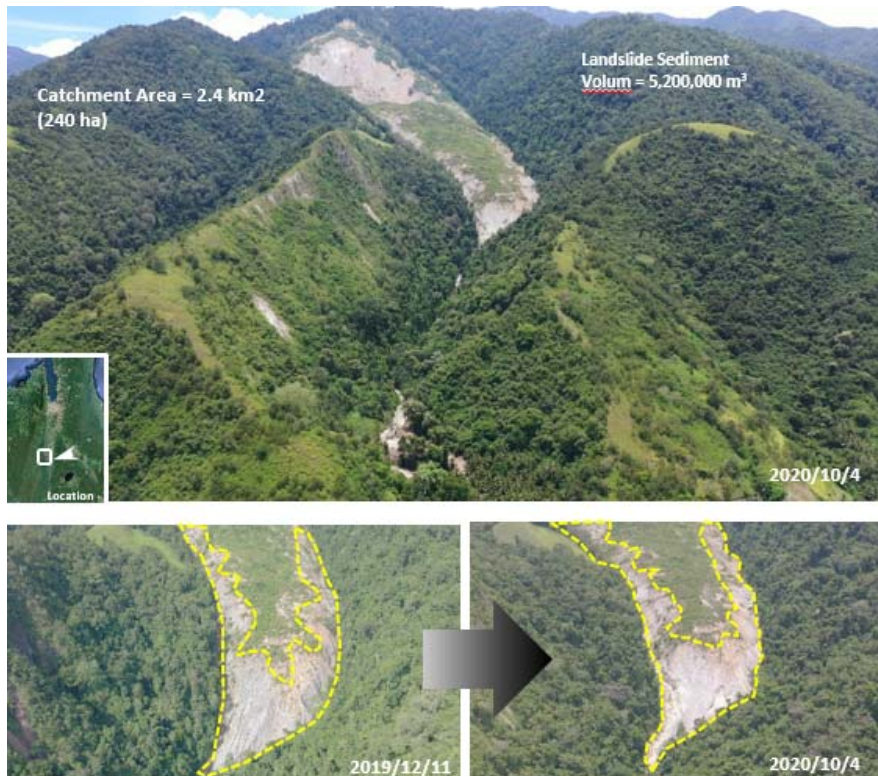
##### 1) Disaster features

The amount of landslide amount due to large scale collapse is estimated to be 5,200,000 m<sup>3</sup>. The characteristics of the sediment are mainly sand and gravel of  $\phi$ 10 mm to 100 mm, and rock mass of  $\phi$ 500 mm to 2000 mm is included. In addition, the vegetated trees with a diameter of about 800 mm to 1500 mm are also present in a mixed state. Immediately after the outbreak, from October 2018 until February 2019, there was no movement or deformation of the collapsed soil and it was now temporarily stable.

However, since March 2020, frequent localized torrential rains have changed the situation to one where the collapsed soil itself is stable, but the surface layer collapses and erodes, resulting in repeated runoff of unstable sediment.

The distance to the houses and main roads directly below the point of collapse is about 800 meters, which makes it highly likely that the area will be directly hit by a debris flow. It is urgently necessary to build sediment control facilities to avoid direct hits from debris flows.

The ends and ends of the collapsed soil have been repeatedly eroded and collapsed due to the effects of heavy rainfall. Since March 2020, the unstable sediment produced by the erosion and collapse has been transported downstream several times as Debris flow. The reach of the Debris flow exceeded the main road. As the subsequent debris flow, sand flows reached the main river of the Palu River.



Source: JICA Study Team

Figure 7-51 Disaster features on Poi River

## 2) Countermeasure Policy

- Suppression of secondary movement of collapsed soil
- Sediment capture as much as possible
- Prevents direct impact on maintenance targets, or dampens collision force
- Safe flow of sediment flow
- Monitoring and construction of evacuation system

## 3) Contents of Sub Project

Install sabo dams to catch collapsed sediment runoff from deep landslides to the extent possible. However, it is difficult to estimate the sheer volume of collapsed soil and the production of unstable sediment due to erosion and collapse. Therefore, consolidation dams will be placed to ensure that the uncaptured sediment does not directly affect the object. In addition, the current channel will be fixed to provide a safe channel for the safe discharge of sediment runoff downstream at all times.



Items		Quantity		Spec
1	SABO Dam Works	1	Set	PO-SD1 : H=14.5m L=130m
2	Channel Works	780	m	Concrete B=10.0m H=3.0 ~ 5.0m L=780.0m
3	Consolidation Dam	5	Set	OP-CD1, CD2, CD3, CD4, CD5
4	Road Works	527	m	Inspection & Maintenance Road B=4m

Source: JICA Study Team

Figure 7-52 Countermeasure for Poi River

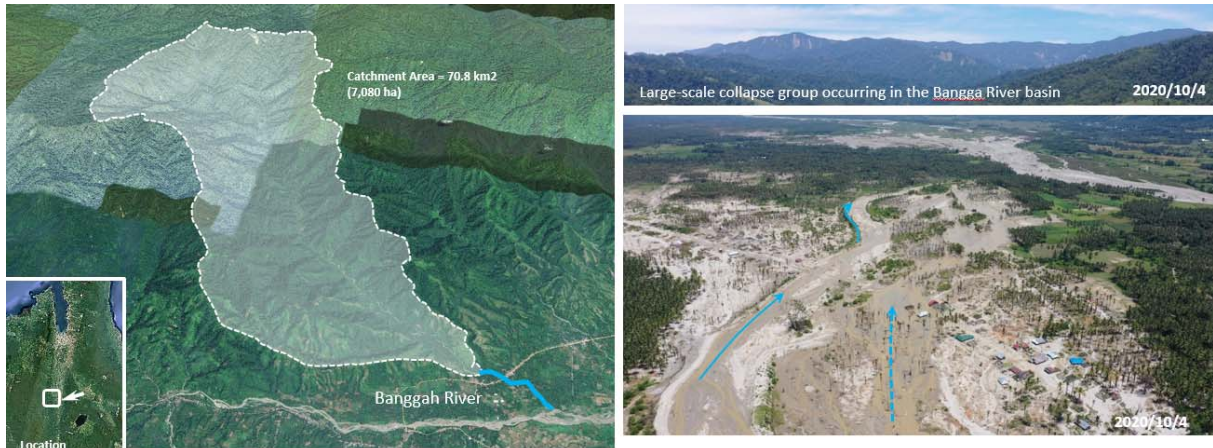
#### (5) River Improvement and Sediment control in BANGGA River (Project Code B4)

##### 1) Disaster features

The Bangga River is the left branch of the Palu River, about 40 km south of Pal City, Central Sulawesi. The basin area of the Bangga River is about 70.8km<sup>2</sup>, and the Palu River basin is estimated to be a medium basin area. The main river channel is about 20km and joins the Palu River from the mountainous area through the fan area. In the downstream, major local roads cross the river, and villages are dotted along the road. According to local residents' information, no major floods or sediment flows have occurred over the past 10 years.

After the September 2018 earthquake, many slope failures and large-scale collapses have occurred in the mountainous areas in the Bangga basin. Due to torrential rain from February 2019, the collapsed sediment flowed downstream as a sediment flow. The largest sediment flow occurred from April 28 to 30, 2019. Detailed rainfall is unclear because there is no observatory. It is reported by BNPD Kab SIgi that the sediment flow began at 15:00 on April 28th. This flooding caused damage to 551 houses in Bangga village.





Source: JICA Study Team

Figure 7-53 Features of Banggah River

## 2) Countermeasure Policy

- Countermeasures against sediment sources to the collapse area will be a future issue.
- Capable of capturing sediment that flows down
- Flood and sediment protection to surrounding villages
- Suppression of newly generated soil in fan (washing suppression)
- Control of sediment secondary movement of river channel
- Safe flood, sediment flow passage of village, road crossing river part
- Continuous stone removal management

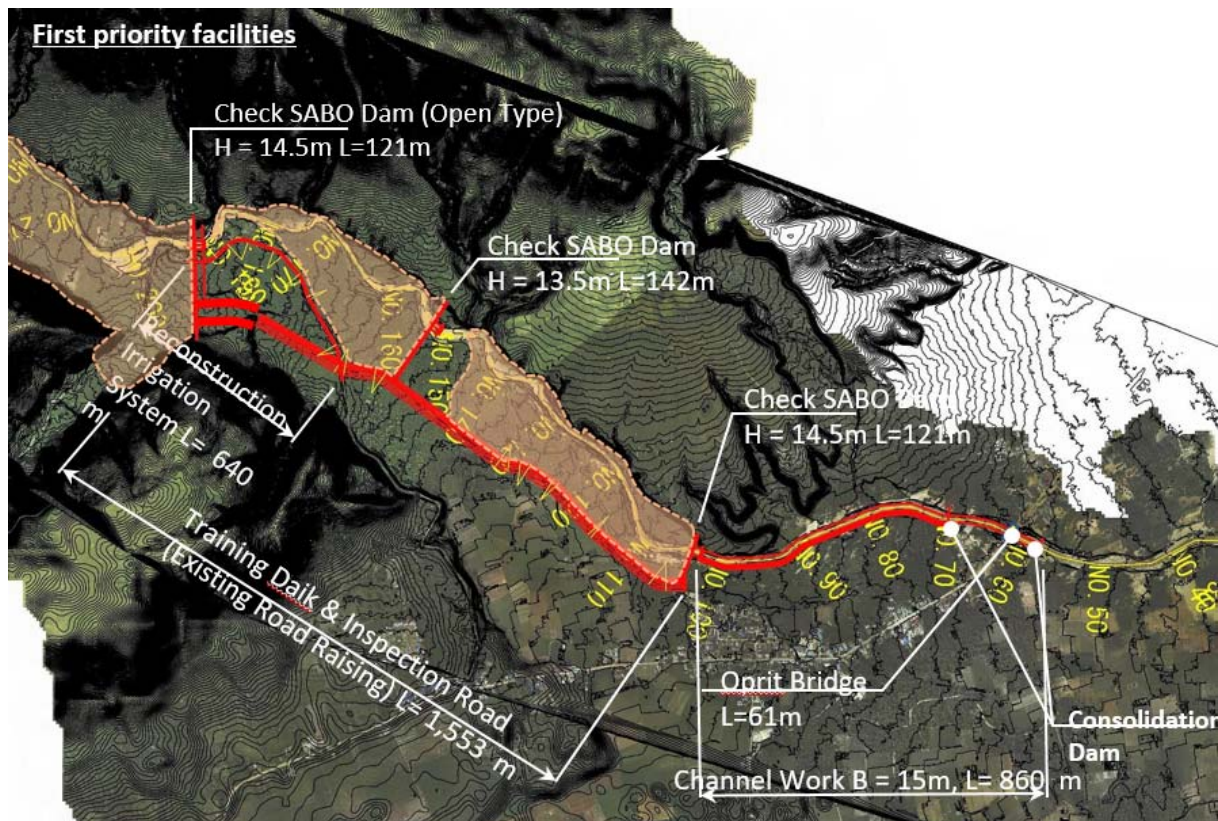
## 3) Contents of Sub Project

The reach of the debris flow is up to the location of the SABO Dam, which is located at the upstream end of the river. From this point, the flow downstream will be a sediment flow without huge stones. Sand pockets are the only way to capture the sediment flow at the sediment control facility, and it is impossible to capture the flow at the Sabo Dam.

Therefore, the Sabo Dam, located upstream of the Sabo Dam, will stop the sediment flow and place sand pockets downstream to prevent sediment flooding.

In addition, as of October 2020, the downstream stream channel is buried due to sediment accumulation. Therefore, channel work will be placed to fix the stream channel. A road bridge that functions as a bed-solidifier will also be placed to prevent disruption of the Bridge.





Items		Quantity		Spec
1	SABO Dam Works	3	Set	BA-SD1 : H=14.5m L=121.0m, BA-SD2 :H=13.5mL=142.0m BA-SD3 : H=14.0m L=128.5m
2	Channel Works	860	m	Type 1 : Concrete Channel B=15.0m H=5.0m L=200,0m Type 2 : Masonry Channel B=15.0m H=5.0m L=660.0m
3	Road Works	1,553	m	Inspection & Maintenance Road B=4m
4	Irrigation Works	640	m	B=2.0m H=1.0m
5	Bridge Works	1	Set	Oprit Type H= 7.7 m, L=61.0m, 3.0m x 3.0m x 4

Source: JICA Study Team

Figure 7-54 Countermeasure for Banggah River

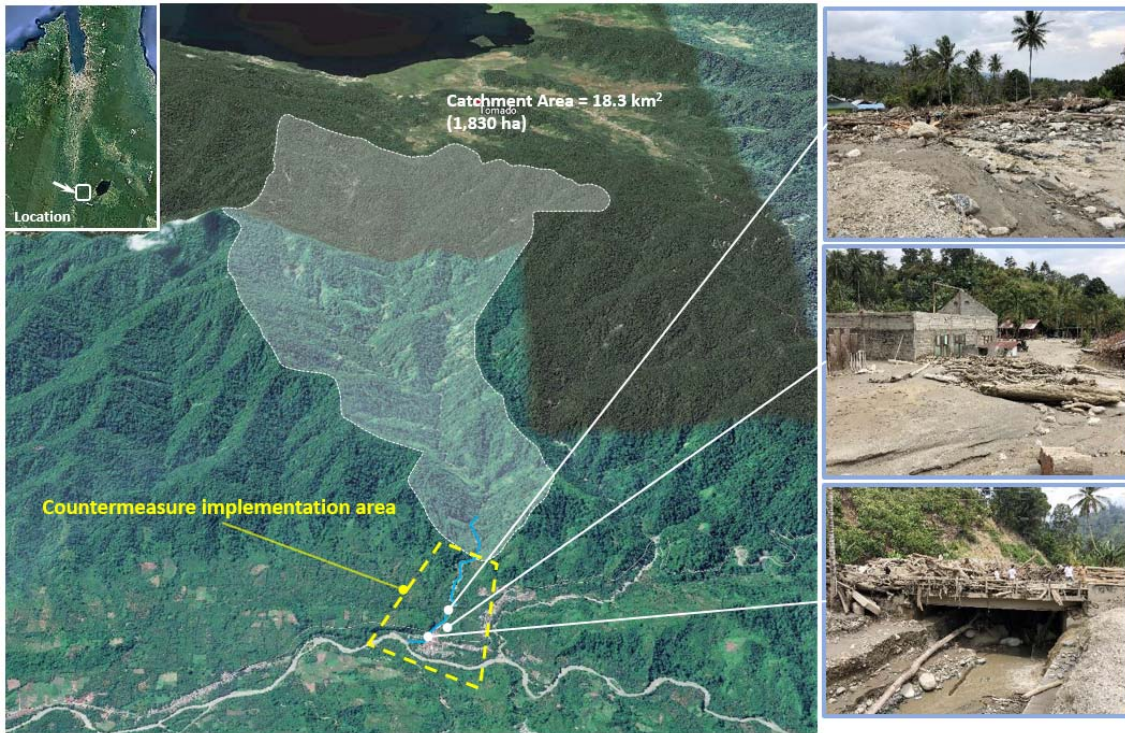
## (6) River Improvement and Sediment control in SALUA River (Project Code B5)

### 1) Disaster features

The Salua River is the right branch of the Miu River, about 50 km south of Pal City. The basin area of the Salua River is about 18.3km<sup>2</sup>, and the Palu River basin is estimated to be a small basin area. The main river channel is about 7km and joins the Miu River from the mountainous area through the fan area. In the downstream, major local roads cross the river, and villages are dotted along the road. According to local residents' information, no major floods or sediment flows have occurred over the past 10 years.

The feature of the sediment disaster in the Salua River is that the area where the damage occurred

is in the downstream area of the basin, the debris flow material mainly composed of buried the existing river, and the continuous debris flow caused the flooding It is. On the other hand, the amount of driftwood is enormous, and when driftwood overlap, sedimentation and collapse of the sand and gravel are repeated, and when colliding with a house, collapse is caused by a large impact force. In addition, these sediments and driftwood deposits reduce the ability of river channels to communicate and promote inundation.



Source: JICA Study Team

Figure 7-55 Disaster features on Salua River

## 2) Countermeasure Policy

- Countermeasures against sediment sources to the collapse area will be a future issue.
- Capture in the possible range of flowing soil and driftwood
- Countermeasures against driftwood damage
- Control of sediment secondary movement of river channel
- Safe flood, sediment flow passage of village, road crossing river part
- Continuous stone removal management

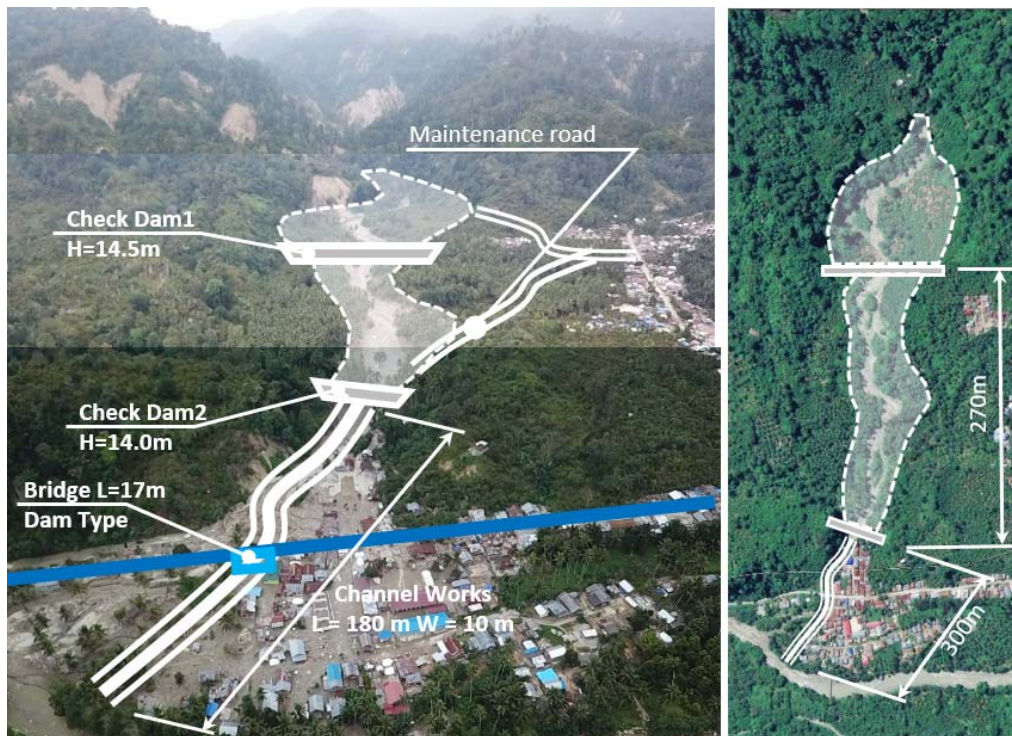
## 3) Contents of Sub Project

Large-scale slope failures have occurred in the mountainous areas that form deep valleys, and it is not currently possible to place Sabo facilities in these valleys. Therefore, Sabo facilities will be placed in the former depositional area from the valley outlet to the settlement.

The slope of the river bed is more than 1/30 (3%) until it joins the main Miu River, which is a debris flow section. Therefore, two Sabo dams will be placed in this section to prevent debris flow.



The March 2019 landslide also resulted in a lot of driftwood runoff. Considering that the driftwood blocked the river channel and contributed to sediment inundation, a permeable Sabo Dam will be used upstream, which will also capture the driftwood. The downstream Sabo Dam is located very close to the village and is an Closed Sabo Dam to avoid direct damage from the debris flow. In addition, in order to allow sediment flow to pass through the village safely, channel work will be installed.



Items		Quantity		Spec
1	SABO Dam Works	2	Set	SA-SD1 : H=14.0m L=211.5m SA-SD2 : H=14.5m L=130.5m
2	Channel Works	180	m	Masonry Channel B=10.0m H=5.0m L=180m
3	Road Works	765	m	Inspection & Maintenance Road B=4m
4	Bridge Works	1	Set	

Source: JICA Study Team

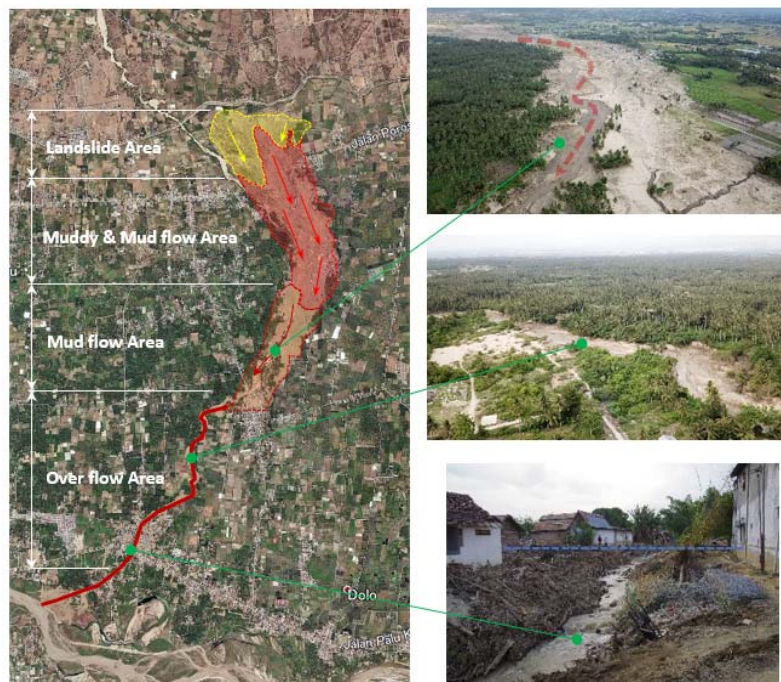
Figure 7-56 Countermeasure for Banggah River

(7) River Improvement and Sediment control in PANEKI River (Down Stream)  
(Project Code B13)

1) Disaster features

Liquefied landslide generated in the Jono Oge area caused a large amount of liquefied soil to flow out as flash flood. The amount of sediment moved by the liquefaction is estimated to be about 1,320,000 m<sup>3</sup>, and it is estimated that 50% of the sediment has flowed to the Palu river as a sediment flow. It is presumed that this fluidization of soil is due to large pressure coverage of groundwater and generation of a large amount of spring water.

The characteristics of sediment are mainly sand and gravel with  $\phi$ 1 mm to 10 mm. The Paneki River is a river flowing south of this liquefaction landslide area, and part of it was liquefaction and the river disappeared and was divided. Also, in the downstream section from the liquefaction landslide area, the flash flood flowed down the ridge, passed through the settlement while involving many trees and flowed into the Palu river main river.



Source: JICA Study Team

Figure 7-57 Disaster features on Paneki River

2) Countermeasure Policy

- Restoration of the lost river
- Suppression and capture of secondary movement of remaining unstable soil
- Improvement of river flow capacity and sediment flow
- We aim at groundwater reduction effect by river repair (liquefaction control)
- Repair of bridge
- Monitoring and construction of evacuation system

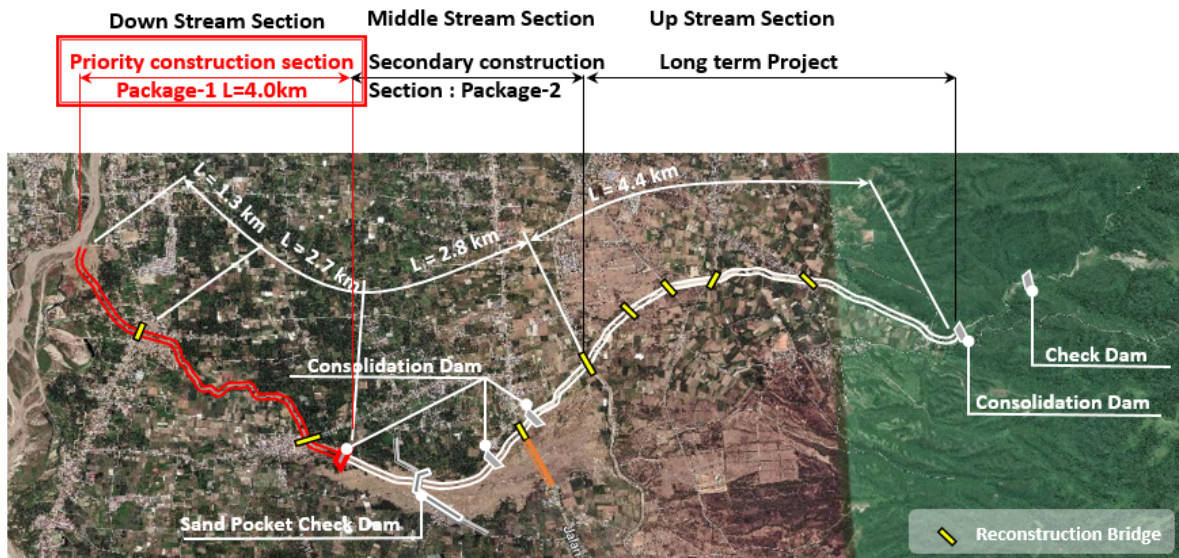


### 3) Contents of Sub Project

Renovate rivers, control sediment runoff, and improve river flow capacity. In addition, two bridges that cross the current river is also planned to repair. The river improvement work is expected to have the effect of lowering the water level at all times and has the purpose of taking measures to reduce the height of groundwater, which was the cause of the liquefaction landslide.

Paneki River needs to be rebuilt on the whole line. Among them, we set the river improvement section with priority given to [Down Stream Section] L = 4.0 km.

- [Down Stream Section] is a section that has been damaged to settlement and road by the sediment flow.
- [Middle Stream Section] is necessary to construct the section which will be the liquefaction landslide area along with the liquefaction landslide measures and irrigation channel rehabilitation work.
- [Up Stream Section] is less likely to be flooded and sediment-laden than the other sections.



Source: JICA Study Team

Figure 7-58 Countermeasure for Paneki River

### 7-3 Technical Assistance

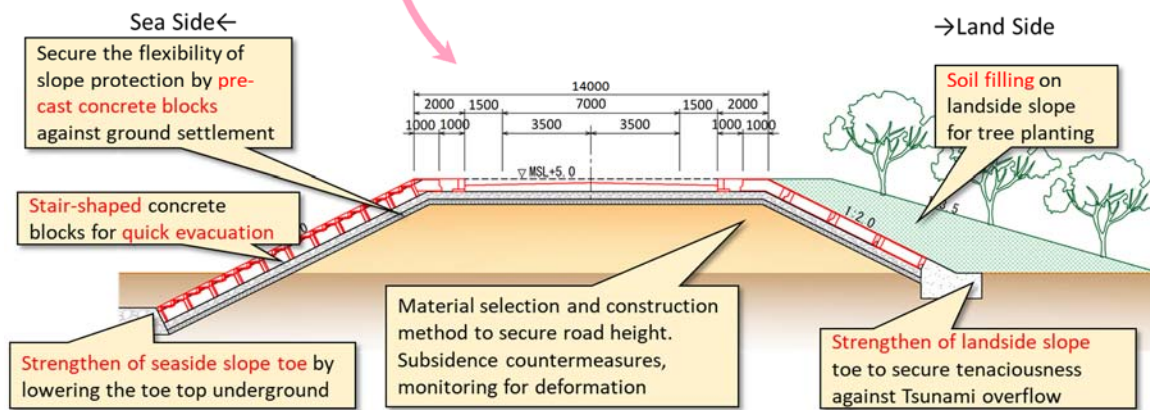
The BBB concept provides advice on reconstruction for a more disaster-resilient infrastructure. In addition, in order to implement the BBB concept in all sectors, the JICA Study Team incorporated this concept into irrigation facilities and coastal revetment projects, which were supported by the other donors.

Design policy of sub-projects in the road and bridge sector is mainly for improving the earthquake resistance, pavement durability and drainage system. In the rivers sector, the design policy is to contribute to the improvement of the overall disaster risk reduction. These designs were shared with other donors and related organizations in Indonesia. On the other hand, in the public facility sector, The JICA Study Team advised on the reconstruction of the general hospital with a seismic isolation structure. The main points of the TA in each sector are described below.

#### (1) TA in the Road and Bridge Sector

The main projects in the road and bridge sector are elevated road, mountain road, city ring road, access road to relocation area, and bridge repair and reinforcement.

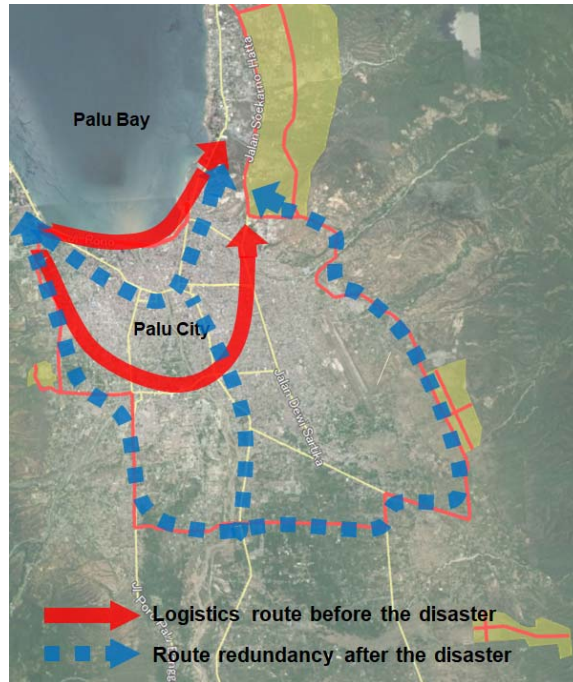
The elevated road project is one of the tsunami mitigation measures for the coastal area in the centre of Palu City. If the tsunami prevention is completely relies on the elevated road, the height and width will be extremely large. Considering efficiency in the economy and Palu City's landscape as a tourist destination, it has many disadvantages such as the need for large-scale land acquisition and difficulty in the project promotion. Therefore, as shown in Figure 7-59, it is preferable to reduce the height of the elevated road and allow water to overflow. In addition, taking advantage of the experience of the Great East Japan Earthquake, the reference manual (draft) described the setting of inundation depth in which evacuation is possible, building structures that can easily resist the tsunami pressure, the building structure and the road structure that can withstand the strike-slip of floods and faults. In addition, as discussed in the expert panel, the JICA Study Team supported the promotion of tsunami countermeasure project, by coordinating vegetation such as mangroves with other donor projects (Palu coastal protection project by ADB).



Source: JICA Experts and JICA Study Team

Figure 7-59 Measures to Mitigate Tsunami Damage  
(Top: Concept of measure, Bottom: Structure of the elevated road)

For road and bridge repair and reinforcement projects, to prevent complete blockage of people and logistics, it is important to build a strong road networks by improving the ring roads and coastal arterial roads and seismic reinforcement of the bridges. As shown in Figure 7-60, in addition to the recovery of existing arterial roads in the coastal areas and the centre of Palu City, The JICA Study Team advised to strengthen the second and third ring road networks to ensure a redundancy during a disaster. In addition, as shown in Figure 7-61, to prevent traffic flow disruption such as collapse of superstructure (girder) and catastrophic collapse that affect human life due to an earthquake, the JICA Study Team also advised on bridge repair and reinforcement projects, by effectively utilizing existing infrastructure such as bridge collapse prevention measures and installation of girder movement restriction devices.



Source: JICA Study Team

Figure 7-60 Image of Strengthening the Road Networks

Seismic Measures	Target Bridge	Installation Image
Axial failure prevention device	A bridge consisting of multiple spans, and a bridge that is likely to cause a bridge collapse	
Lateral movement limited device of girder	Arch bridge, truss bridge (from the damage situation)	

Source: JICA Study Team

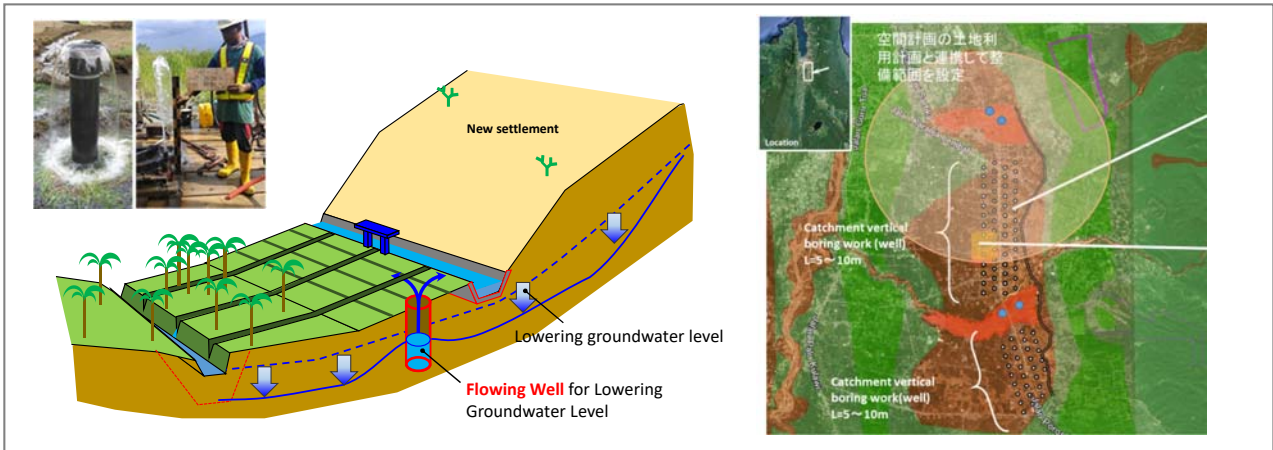
Figure 7-61 Image to Mitigate the Bridge's Damage

## (2) TA in the Water Resources Sector

The main projects in the water resources sector are Nalodo countermeasures, flood and sediment disaster countermeasures, etc.

Nalodo is unprecedented and its occurrence mechanism has not been fully elucidated, but groundwater level is predicted as the main causes. As shown in Figure 7-62, it is possible to combine multiple countermeasures such as sealing the irrigation canals which can be a source of groundwater to prevent water leakage, and dissipating excess pore water pressure during an earthquake by providing a flowing well. In addition, The JICA Study Team advised the necessity of non-structural measures such as groundwater management and monitoring, flood and sediment disaster early warning system, etc.





Source: Prepared by JICA Experts

Figure 7-62 Image to Mitigate Nalodo Damage

For flood and landslide disaster countermeasure, taking into account the damage situation that occurred repeatedly during the project period, as shown in Figure 7-63, while reviewing the countermeasures step by step, the JICA Study Team advised the need for comprehensive flood control measures such as sediment control dams, river channel excavation, consolidation work, etc.

Paneki River needs to be rebuilt on the whole line. Among them, we set the river improvement section with priority given to [Down Stream Section] L = 4.0 km.

- ◆ [Down Stream Section] is a section that has been damaged to settlement and road by the sediment flow.
- ◆ [Middle Stream Section] is necessary to construct the section which will be the liquefaction landslide area along with the liquefaction landslide measures and irrigation channel rehabilitation work.
- ◆ [Up Stream Section] is less likely to be flooded and sediment-laden than the other sections.

**【Contents of Sub Project】**  
 Renovate rivers, control sediment runoff, and improve river flow capacity. In addition, we will repair the two bridges that cross the current river. The river improvement work is expected to have the effect of lowering the water level at all times, and has the purpose of taking measures to reduce the height of groundwater, which was the cause of the liquefaction landslide.

Source: JICA Study Team

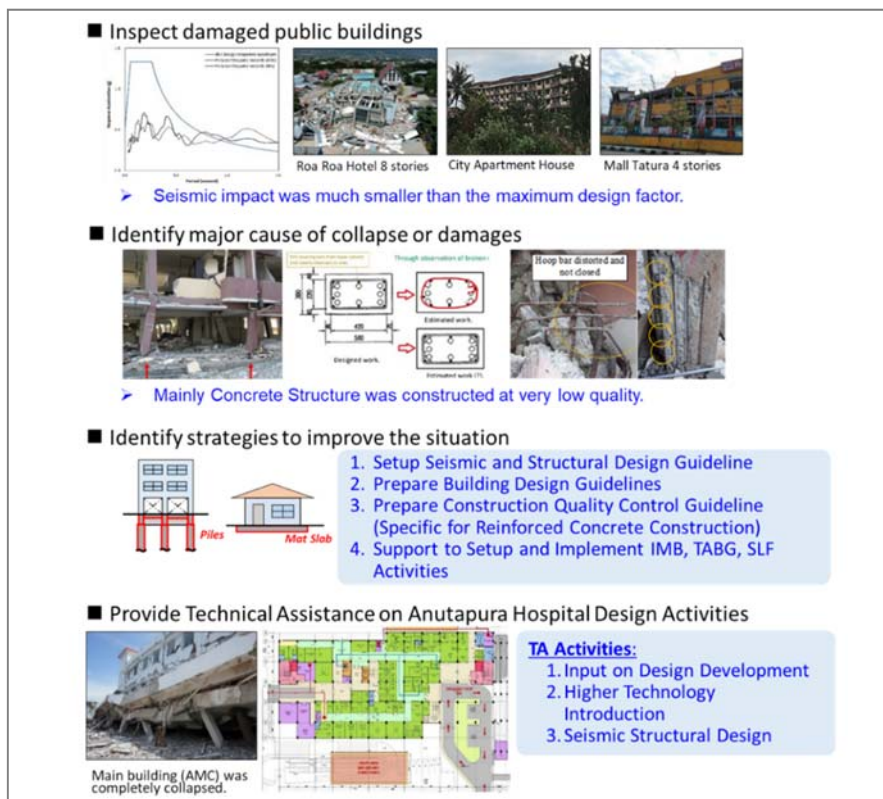
Figure 7-63 Image to Mitigate Sediment-related Disaster

### (3) TA in the Public Facility Sector

The JICA Study Team surveyed the damage situation of public facility in general, and based on factor analysis to comply with earthquake resistance standards, the JICA Study Team advised on formulation of structural design reference manual (draft), concrete quality control manual, and building construction inspection system.

As a result of analysing the damage factors of public facility, The JICA Study Team found that the reinforcements were not constructed according to the design and structural construction standards, and the foundation structures were not adopted according to the scale and type of disaster. Therefore, the JICA Study Team created a reference manual (draft) for basic structure plan according to the scale and type of disaster, reinforcement method plan to improve the earthquake resistance, etc. In addition to improve concrete quality, strength testing methods, formwork, reinforcing bars, and precaution on placing concrete, etc., a quality control method was added to the reference manual (draft) (refer to Figure 7-64).

In addition to the reference manual (draft), the JICA Study Team also conducted opinion exchange on the building inspection system through workshops. Reconstruction project of Anutapura General Hospital required advanced detail design technology for the structural calculation and seismic isolation design. The JICA Study Team recommended a transfer technology utilizing construction work in JICA's loan cooperation project, but PUPR decided to adopt only integrated design and construction tender method. The JICA Study Team conducted technical cooperation only to assist the basic plan.



Source: JICA Experts and JICA Study Team

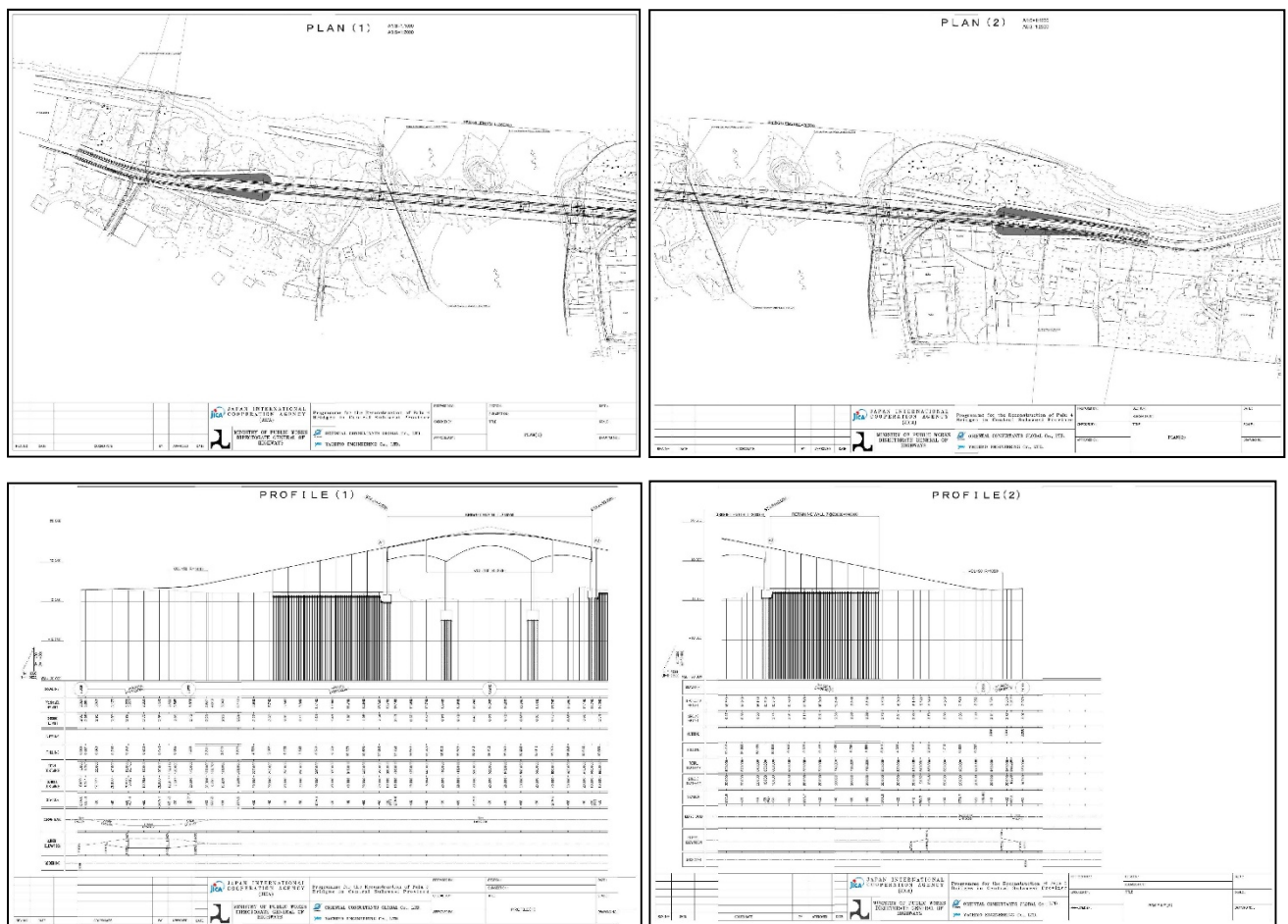
Figure 7-64 Outline of TA on the Public Facilities (Hospital)

## 7-4 Outline Design of Grant Aid Project (Palu IV Bridge)

### 7-4-1 Outline

In response to a request from the Government of Indonesia for grant aid for the reconstruction of the Palu IV Bridge, the technical cooperation implemented an outline plan. The reconstruction of the Palu IV Bridge was expected to improve logistics in the gulf area, expanding traffic capacity in the east-west direction, and strengthening the road networks.

In the Project, the Palu IV bridge reconstruction will be one of symbol for reconstruction in the disaster-affected area. The design policy was decided through discussion with the concept of early completion for the construction, landscape consideration, minimization of land acquisition, and ensuring sufficient seismic performance. In addition, based on the design policy decided in the Project, a preparatory survey named "The Preparatory Survey on the Programme for the Reconstruction of Palu 4 Bridges in Central Sulawesi Province" was conducted.



Source: JICA Study Team (Drawing details referred to Appendix II-3-7)

Figure 7-65 Palu IV Bridge General Plan Map

## 7-4-2 Outline Design for Palu IV Bridge

### (1) Introduction

For the reconstruction in Central Sulawesi, Japanese grant project for the Reconstruction of Palu IV Bridge has been decided to be conducted based on the cabinet council decision in February, 2019. The grant project can progress faster than the loan project, thus, the objective project shall be adopted considering urgent necessity and the symbol of reconstruction.

In the Progress Report, it is briefly reported because the appendix which is described in detail regarding the Japanese Grant Project is attached. Thus as for the details, see the Appendix II-3-7.

Since the detailed design has been separately conducted based on the design policy in this progress report, the latest information on Palu IV Bridge is described in the detailed design report.

### (2) Selection of Japanese Grant Project

Based on the result of discussion between Bina Marge and JICA Study Team, a bridge across the Palu River is decided to be constructed in order to restore regional economic activities around these areas.

The comparison of the project location and the bridge type are shown in figures from Figure 7-66 to Figure 7-69.



**Alternative 1: The construction of the multipurpose pedestrian bridge considering aesthetic (Palu IV)**



- Completion : Palu IV: Jul. 2022 Others: N/A
- Road Alignment : Not smooth
- Land Acquisition : Approx. 150 houses
- Cost : Total 490 bil. IDR
  - Palu IV (Pedestrian) : 321 bil. IDR (2.50 bil. JPY) [Grant]
  - Palu IV A (Road) : 100 bil. IDR [Indonesia]
  - Road : 69 bil. IDR [Indonesia]
- Bridge Maintenance: Coastal area and many members (tower, diagonal member, girder)
- Remarks (on Palu IV)
  - Special design such as main tower, diagonal member (cable), dynamic analysis for anti-seismic, wind resistant, etc., are required.

\* Expected Commencement of Construction: Aug. 2020  
 \* Cost of tsunami dike is not included in construction cost above.

Source: JICA Study Team

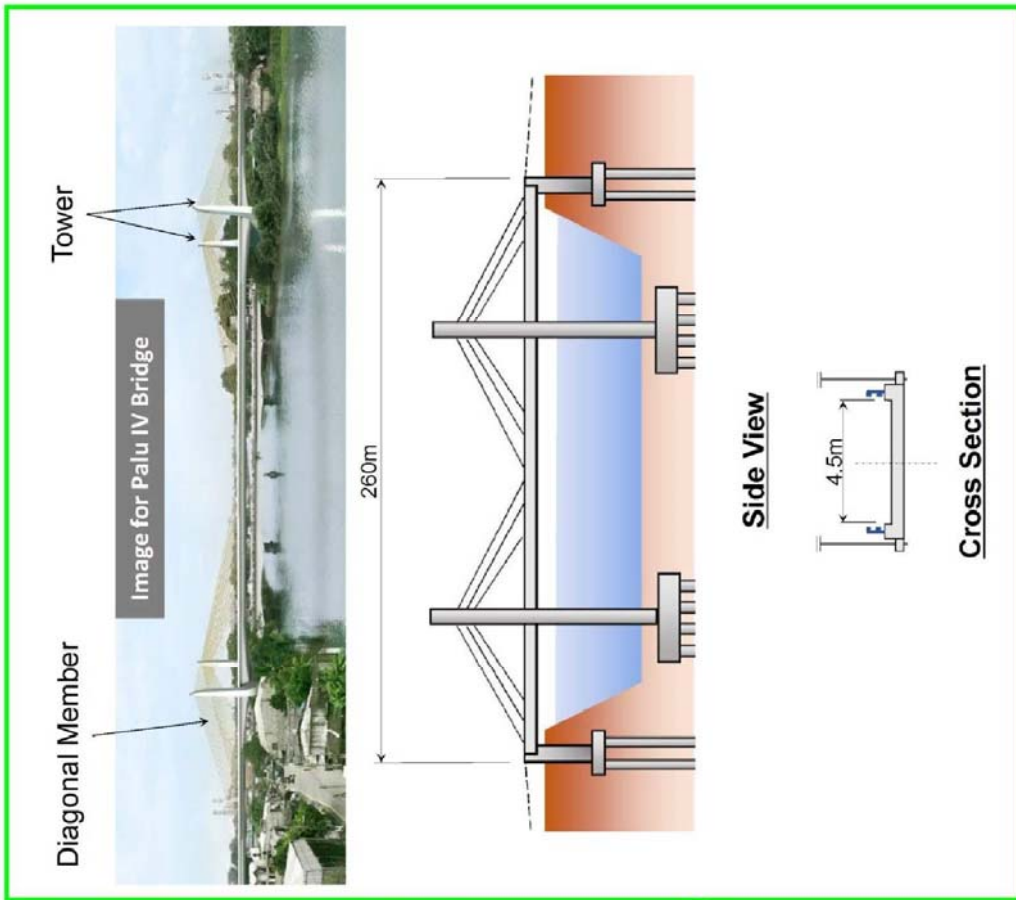


Figure 7-66 Alternative 1

**Alternative2: The construction of the roadway bridge with sidewalk considering aesthetic (Palu IV)**



- **Completion** : 2020
- **Road Alignment** : Smooth
- **Land Acquisition** : 0 houses
- **Cost** : Total: 359 bil. IDR (2.76 bil. JPY)
- **Road and Pedestrian Bridge** : 325 bil. IDR (2.50 bil. JPY) [Grant]
- **Road on Dike** : 34 bil. IDR (0.26 bil. JPY) [Grant or Loan]
- **Bridge Maintenance** : Concrete Structure
- **Remarks (on Palu IV)**
  - Special design and analysis are not required.
  - Symbolic landscape plan will be implemented.
  - Consider rapid construction measures for superstructure construction.

Source: JICA Study Team

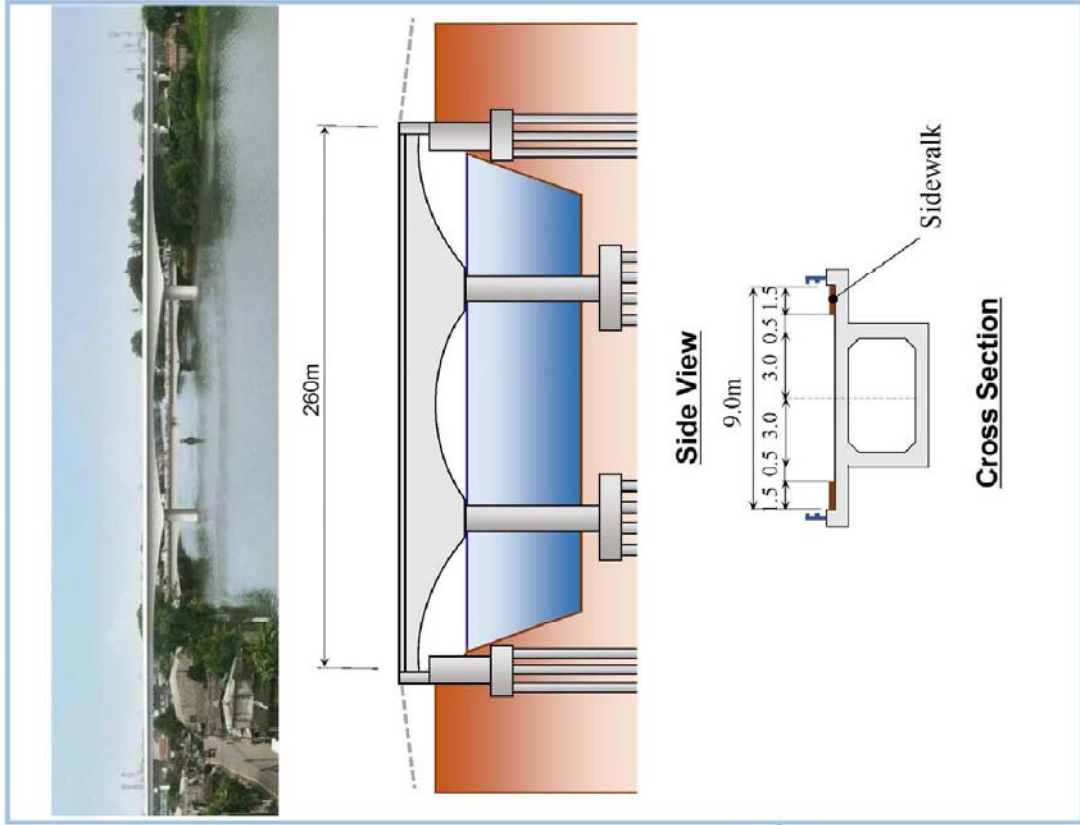
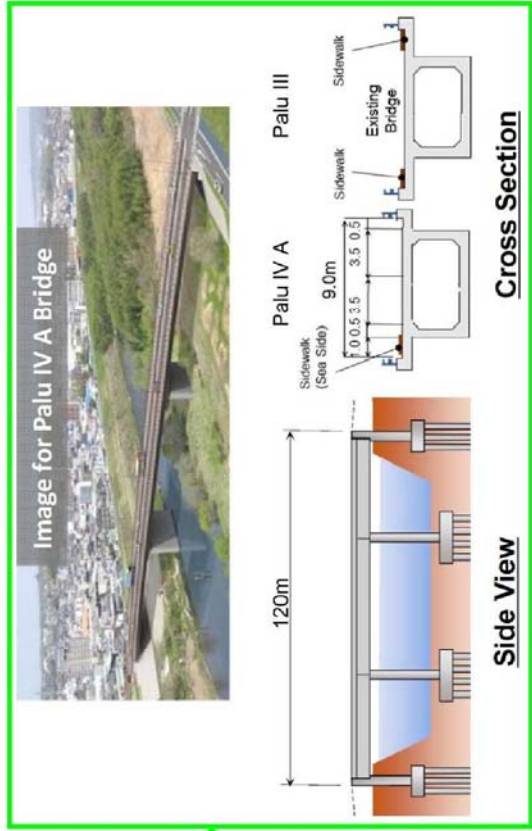
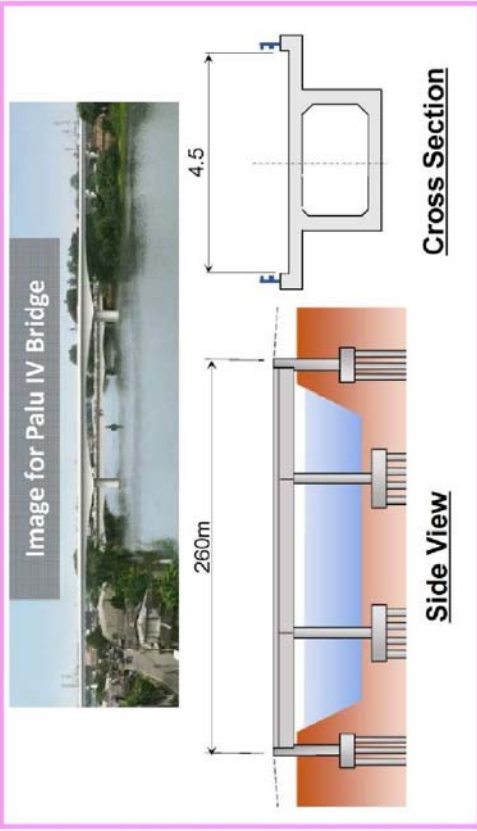


Figure 7-67 Alternative 2



**Alternative3: The construction of the multipurpose pedestrian bridge (Palu IV)  
The construction of the bridge for the improvement of the traffic network (Palu IV A)**



- Completion : Palu IV: May 2022  
Palu IV A: Oct. 2022  
(When it starts at the same time of Palu IV)
  - Road Alignment : Smooth
  - Land Acquisition : Palu IV: -, Palu IV A: Approx. 5 houses
  - Cost : Total 372 ~ 384 bil. IDR
  - Palu IV (Pedestrian) : 172 bil. IDR (1.34 bil. JPY) [Grant]
  - Palu IV A (Road and Pedestrian): 142 bil. IDR (1.11 bil. JPY) [Grant]
  - Improvement of the existing Palu III Bridge: 39 ~ 51 bil. IDR (It's necessary to carry out the detailed inspections) [Indonesia]
  - Road: 19 bil. IDR [Indonesia]
  - Bridge Maintenance : Concrete structure
  - Remarks (on Palu IV & IV A)
    - Dynamic analysis are required.
    - **Bridge type shall be determined based on discussion with GOI.**
- \* When the bridge should be constructed by Dec. 2022, one-bridge can be constructed because the construction cost will be increased due to rapid construction.
- \* Expected Commencement of Construction: Aug. 2020
- \* Cost of tsunami dike is not included in construction cost above.

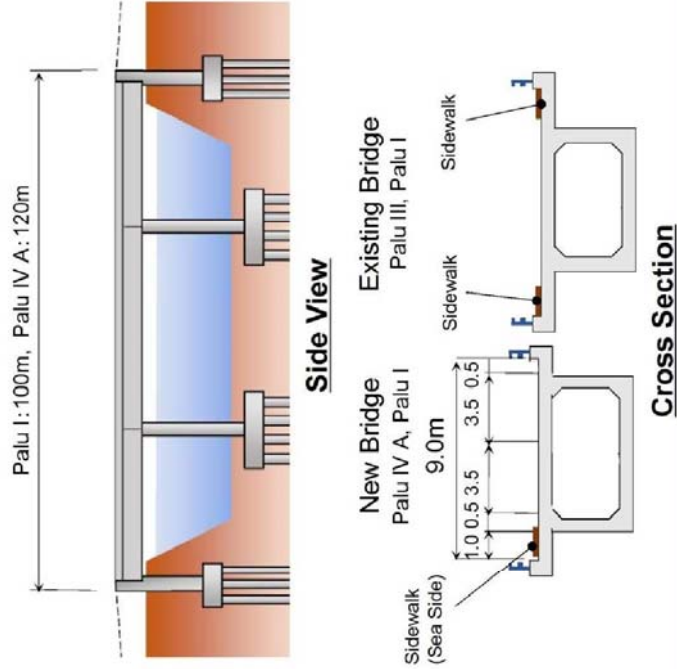
Source: JICA Study Team

Figure 7-68 Alternative 3

**Alternative 4: The construction of the bridge for the improvement of the traffic network (Palu IV A) (Palu I)  
The improvement of the Palu I and Palu III bridges**



\* The multipurpose pedestrian bridge will be constructed by sector loan.



- Completion : Palu IV A: Oct. 2022  
Palu I: Oct. 2022  
(When it starts at the same time of Palu IV A)
- Road Alignment : Smooth
- Land Acquisition : Palu IV Approx. 5 houses, Palu I: Approx. 5 houses
- Cost : Total 321 ~ 340 bil. IDR
  - Palu IV A (Road and Pedestrian): 142 bil. IDR (1.11 bil. JPY) [Grant]
  - Palu I (Road and Pedestrian) : 112 bil. IDR (0.87 bil. JPY) [Grant]
  - Improvement of the Palu III and Palu I Bridge: 45 ~ 64 bil. IDR (It's necessary to carry out the detailed inspections) (0.35 ~ 0.50 bil. JPY) [Grant]
- Road: 22 bil. IDR [Indonesia]
- Bridge Maintenance: Concrete structure
- Remarks (on Palu IV A & I)
  - Dynamic analysis are required.
  - Bridge type shall be determined based on discussion with GOI.

\* When the bridge should be constructed by Dec. 2022, one-bridge can be constructed because the construction cost will be increased due to rapid construction.

\* Expected Commencement of Construction: Aug. 2020

Source: JICA Study Team

Figure 7-69 Alternative 4

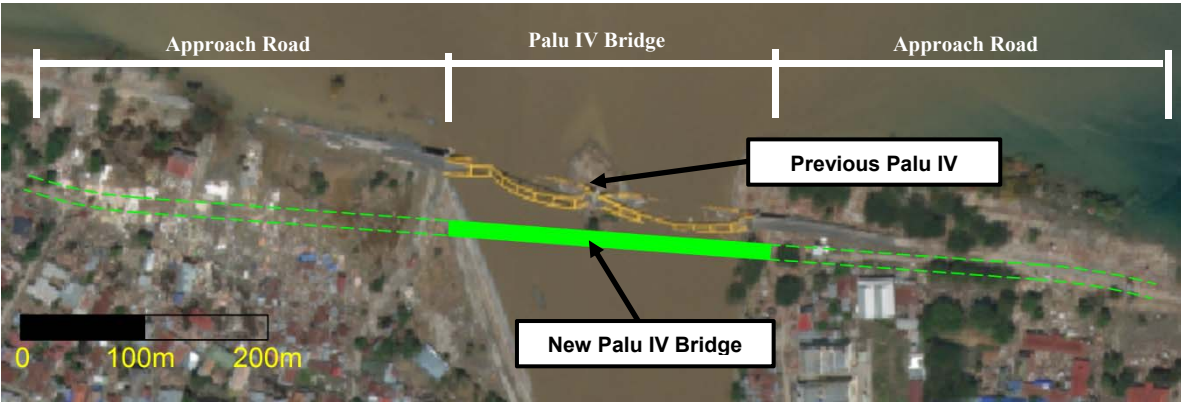


The result of discussion on 18<sup>th</sup> February, 2019 in Palu, the Government of Indonesia (hereinafter referred to as GoI) has adopted the Alternative 2 in order to restore regional economic activities instead of original Palu IV Bridge. Therefore, a roadway bridge with sidewalk will be constructed at the mouth of the Palu River, besides, the type of the bridge must be considered aesthetic as requested by GoI.

(3) Scheme of Japanese Grant Project

1) Location of the Palu IV Bridge

The location of the Palu IV Bridge will shift toward upstream side of the previous location as shown in Figure 7-70. The location has been determined based on the discussion with Bina Marga. Besides, although the maximum grade is set at 5% according to the standards<sup>1</sup> of Indonesia, it has been decided to be 4% as requested by Bina Marga. As for the comparison of the route.



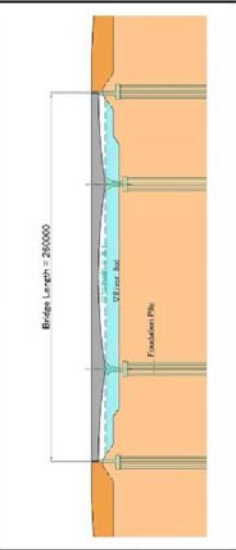
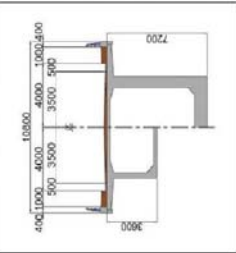

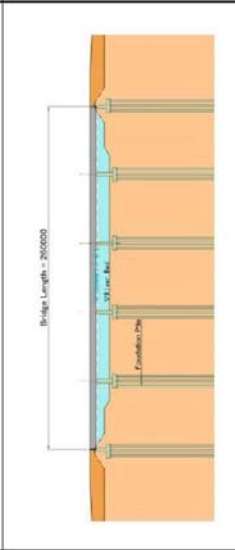
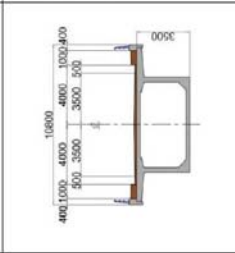

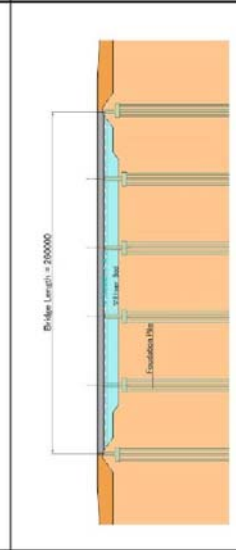
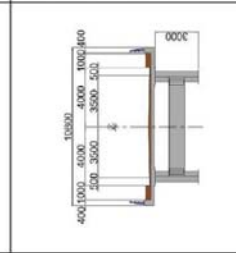

Source: JICA Study Team

Figure 7-70 New Location of the Palu IV Bridge, end of June, 2019

2) Bridge Type

The comparison of bridge type for Palu IV Bridge is shown in Figure 7-71. The comparison has been carried out considering the number of piers in the river, aesthetic, and so on under budget.

<sup>1</sup> Persyaratan teknis jalan dan kriteria perencanaan teknis jalan: Peraturan Menteri Pekerjaan Umum (Nomor: 19/PRT/M/2011)

	Side View	Cross Section	Image	Cost	Recommendation
<p>Alternative-1 PC-Box Girder (Balanced Cantilever Method)</p>				<p>1) Total - 321 bil. Rp - 2.5 bil. JPY 2) Superstructure - 154 Rp 3) Substructure - 62 Rp 4) Others - 65 Rp 5) Consultant(DD,CS) - 40Rp</p>	<p>The number of piers in the Palu River is the fewest among alternatives. From the viewpoints of river inhibition, Alt-1 is the most advantageous among alternatives. <b>Recommendation</b></p>
<p>Alternative-2 PC-Box Girder (Launching Girder Method)</p>				<p>1) Total - 290 bil. Rp - 2.3 bil. JPY 2) Superstructure - 110 Rp 3) Substructure - 80 Rp 4) Others - 64 Rp 5) Consultant(DD,CS) - 36Rp</p>	<p>From the viewpoints of river inhibition, it is inferior to Alt-1 because 4 piers will be constructed in the river.</p>
<p>Alternative-3 Steel-I Girder (Launching Girder Method)</p>				<p>1) Total - 311 bil. Rp - 2.4 bil. JPY 2) Superstructure - 130 Rp 3) Substructure - 78 Rp 4) Others - 65 Rp 5) Consultant(DD,CS) - 39Rp</p>	<p>Ditto</p>

Source: JICA Study Team

Figure 7-71 Comparison of Bridge Type

From the viewpoint of the following reasons, the PC Box-Girder with variable depth (Balanced

Cantilever Method) has been selected based on the discussion with Bina Marga.

- The number of piers in the river must be reduced in order to avoid the inhibition of river flow.
- The bridge design must be aesthetic to characterize the bridge as the symbol of reconstruction for Central Sulawesi.
- The budget must include the cost for construction, consultant (for detailed design and supervision), and physical contingency.

### 3) Conformity with Spatial Plan of Disaster Resilient Areas

Based on the Direction of Spatial Plan in the Regional Regulation of Palu Number 16 of 2011 regarding the Spatial Planning and Layout (RTRW) of Palu City in 2010 – 2030, Palu IV Bridge located in Others Designation Area. This activity is allowed based on the Government of Central Sulawesi Decree No: 650/374/DBMPR-G.ST/2019 dated on September 27th 2019 regarding the Determination of the Area of Silae, Lere, West Besusu, and Talise in Palu as the Disaster Resilient Areas. Recommendation of Spatial Plan Conformity is not required to be issued for implementation of construction plan of Disaster Resilient Area and or SILEBETA (Silae, Lere, Besusu Barat and Talise) Area.

### 4) Drawings

Drawings including plan, profile, and typical cross section, which are prepared in "The Preparatory Survey on the Programme for the Reconstruction of Palu 4 Bridges in Central Sulawesi Province", are shown as followings.





PLAN (2)

A1:9=1:1000  
A3:9=1:2000

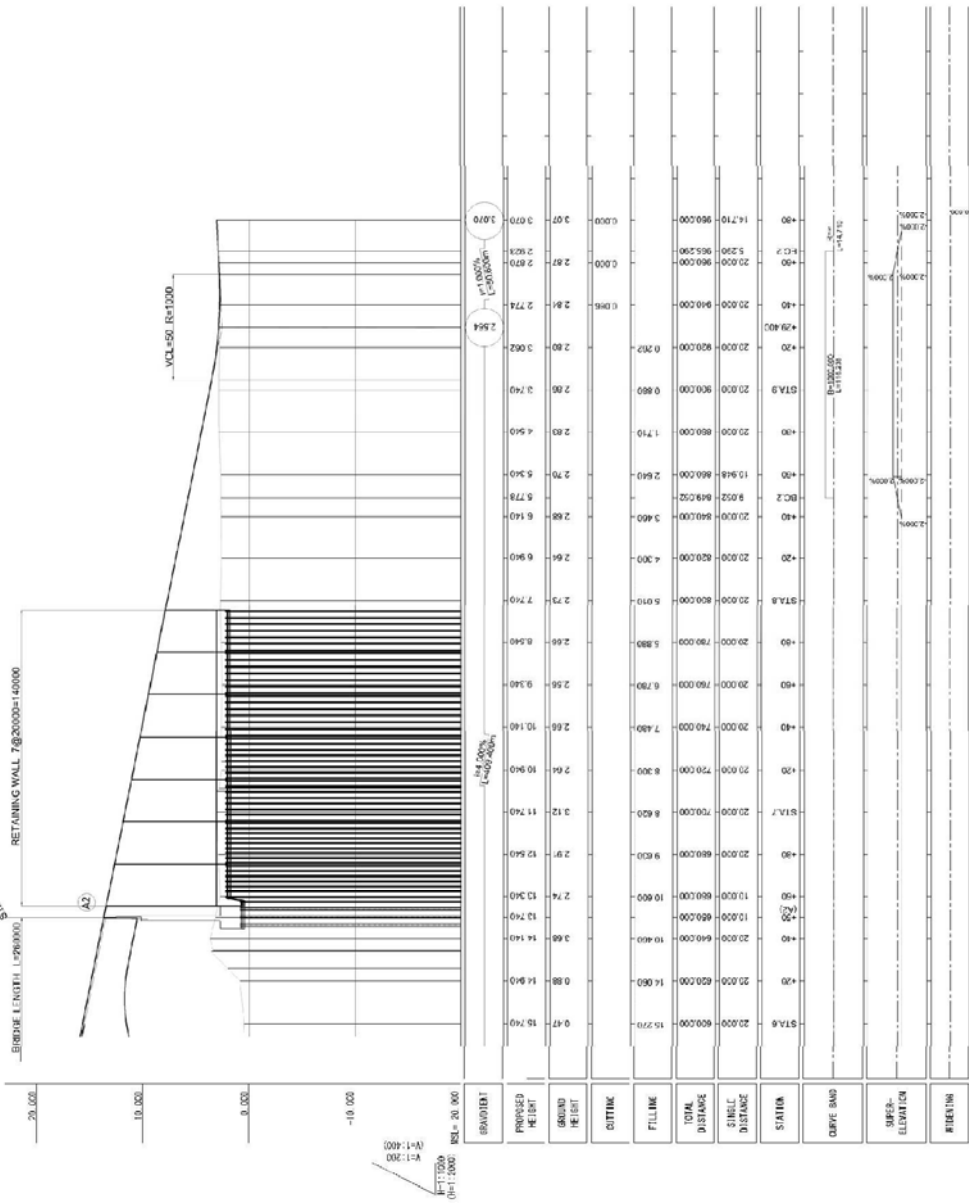


Figure 7-73 Palu IV Plan (2/2), end of June, 2019

Source: JICA Study Team



# PROFILE (2)

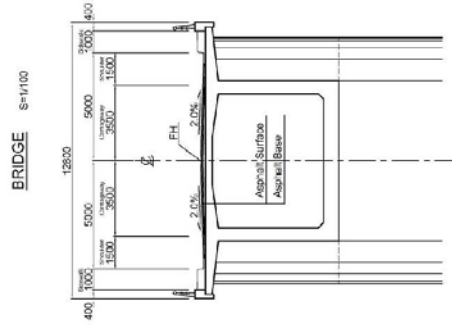
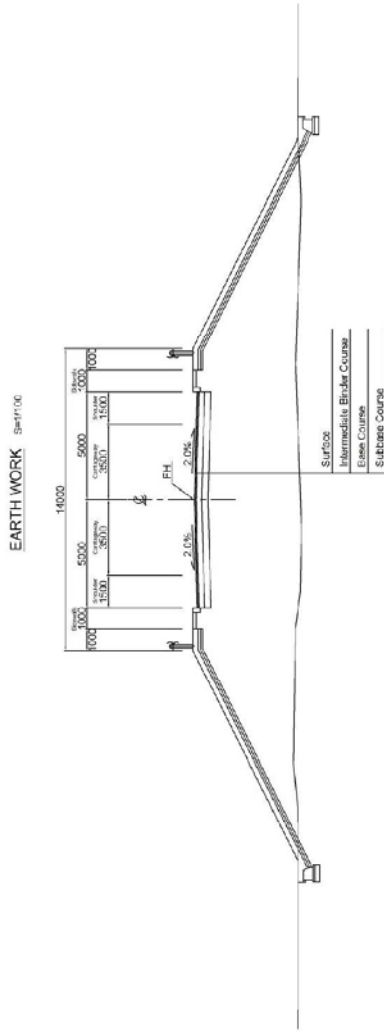


REV. NO.	DATE	APPROVED	DATE	COORDINATE	DATE	APPROVED	DATE
				PROGRAMME FOR THE RECONSTRUCTION OF PALU 4 BRIDGES IN CENTRAL SULAWESI PROVINCE ORIENTAL CONSULTANTS GLOBAL CO., LTD. YACHYO ENGINEERING CO., LTD.			
				PROFILE (2)			
				SCALE:			
				SITE:			

Source: JICA Study Team

Figure 7-75 Palu IV Profile (2/2), end of June 2019

# TYPICAL CROSS SECTION (1)



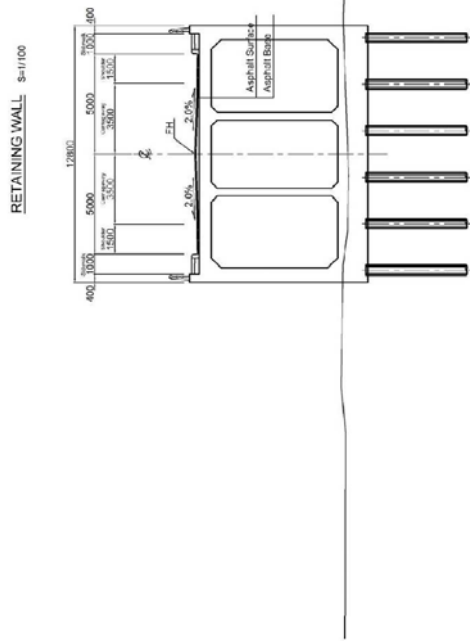
REV. NO.	DATE	BY	APPROVED	DATE	COORDINATE	PREPARED BY:	SECTION:	DATE
							SUBSECTION:	
							TITLE:	SCALE:
								DRAWING NO.:
<p><b>JICA INTERNATIONAL COOPERATION AGENCY (JICA)</b></p> <p><b>MINISTRY OF PUBLIC WORKS DIRECTORATE GENERAL OF HIGHWAYS</b></p>						<p>Programme for the Reconstruction of Palm 4 Bridges in Central Sulawesi Province</p>		
						<p>ORIENTAL CONSULTANTS GLOBAL Co., LTD. YEO YACHYO ENGINEERING Co., LTD.</p>		

Source: JICA Study Team

Figure 7-76 Palu IV Typical Cross Section (1/2), end of June 2019



# TYPICAL CROSS SECTION (2)



REV. NO.	DATE	BY	APPROVED	DATE	JICA	MINISTRY OF PUBLIC WORKS DIRECTORATE GENERAL OF HIGHWAYS	ORIENTAL CONSULTANTS GLOBAL Co., LTD. YAS YACHYO ENGINEERING Co., LTD.	PROGRAMME for the Reconstruction of Palu 4 Bridges in Central Sulawesi Province	PROJECT	SECTION SUBSECTION TITLE	DATE
									CHECKED BY		SCALE:
									APPROVED BY		DRAWING NO.

Source: JICA Study Team

Figure 7-77 Palu IV Typical Cross Section (2/2), end of June 2019

## Chapter 8 Assisting the Local Governments, PUPR and MOT on the Construction of the Infrastructure and Public Facilities

There were delays in reviewing the packages of sub-projects and preparing the tender documents for construction works because of the repeated occurrences of sediment disasters in April and May 2020. Therefore, based on a request of related Indonesian organizations, the sub-projects shown in Table 8-1 were targeted to contribute to promote infrastructure and public facility construction. For high priority project in Package 1, TA was implemented to review the draft detailed design and construction supervision. TA was also implemented for Package 1.5 projects which required a review of the project plan based on the sediment disaster situation. However, since April 2020, the COVID-19 pandemic has affected the assistance activities of the Study Team in many ways including restrictions to stay in the study areas for the Japanese and local staff. Accordingly, the JICA Study Team did remote monitoring and technical assistance through web meetings and social networking service (SNS).

As a result of the TA on the infrastructure and public facility construction, the draft detailed design was reviewed and the local governments and PUPR understanding on technology required for construction supervision was improved. The following were the results of this TA activity:

- For sub-projects in the road and bridge sector, and the water resources sector, the JICA Study Team shared to PUPR the points for design modification based on the disaster that occurred after the draft detailed design was completed. As shown in Table 8-1, PUPR understanding on necessary items for promoting construction in each sub-project was improved.
- For sub-projects in the road and bridge sector, the JICA Study Team shared to PUPR the points to improve earthquake resistance using the first aid method on the collapsed road embankment slope and review of the river crossing structure. PUPR understanding on necessary items for the design modification was improved.
- For sub-projects in the water resources sector, the JICA Study Team shared to PUPR the points for design modification based on the disaster that occurred after the draft detailed design was completed. PUPR understanding on the changes in the subproject and necessary items for the design modification was improved.
- The understanding of PUPR on the contents of modified designs for the road and bridge and water resources sectors was improved. PUPR carried out the procurement procedures for consultants and contractors that reflected the modifications.

TA on the infrastructure construction has been continued until the end of June 2021. Based on the results of this construction assistance, it is expected that each infrastructure construction project will be revised and promoted based on the local conditions, and contribute to the promotion of the entire reconstruction project.

Table 8-1 Outline of TA Activities in the Infrastructure Reconstruction

Sector	No.	Name of Sub-project	Package	Completed/ongoing support by JICA TA ○Completed ΔOngoing XNot applicable			Additional JICA TA against PUPR's request
				Basic/Outline Design (BD)	Draft Detailed Design (DDD)	Supervision	
Road & Bridge Sector	A3	Reconstruction Kalawara-Kulawi Road and Elevated Road in Sirenja	1	○	○	X	Technical advice on DDD revision and supervision
	A4	Access Road and Main Road for permanent housing TONDO (Bridge & Drainage System)	1	○	○	X	Ditto
	A10	Rehabilitation, Replacement and development of bridge (Lonpio, Lonpio2, Tarise1, Buluri)	1	○	○	Δ	Technical advice on supervision
Water resources Sector	B3	Sediment control in POI River	1	○	○	X	Technical advice on DDD revision and supervision
	B4	Sediment control in BANGGA River	1	○	○	X	Ditto
	B5	Sediment control in SALUA River	1	○	○	X	Ditto
	B6	Sediment control in MIU River	1.5	○	X	X	Technical advice on DDD
	B7	Sediment control in NAMO River	1.5	○	X	X	Ditto
	B8	Sediment control in KALAWI River Area	1.5	○	X	X	Ditto
	B9	Sediment control in Omu River	1.5	○	X	X	Ditto
	B10	Sediment control in Tuva River Area	1.5	○	X	X	Ditto
	B11	Polder System Pilot Project in Lende Sirenja Village	1.5	○	X	X	Ditto
	B13	River Improvement and Sediment control in PANEKI River (Down Stream)	1	○	○	X	Technical advice on DDD revision and supervision

Source: JICA Study Team

## 8-1 TA on Infrastructure Reconstruction Supervision in the Road and Water Resource Sectors

The target TA is technical advice on construction supervision after commencement of the construction for the sub-projects which are categorized as priority projects (Package 1). The target sub-projects are “Mountain road maintenance project to strengthen the people and logistics road networks: 1 project”, “Access road maintenance project for the relocation areas: 1 project”, “Earthquake-resistant project to strengthen bridges on the arterial roads: 1 project”, and “Flood and sediment disaster countermeasure project by improving the rivers, sediment control dams, etc.: 4 projects”.

The packaging of the sub-projects was revised in consideration of the influence of the repeated occurrence of sediment disasters in April and May 2020. In addition, the delay in the tendering of the construction works of the sub-projects by the Government of Indonesia has prevented the construction management from being implemented.

## 8-2 TA on Infrastructure Design in the Road Sector

The target TA was technical advice on the design changes after the topographic and geological survey results for the sub-projects categorized as priority projects (Package 1). The target sub-projects are “Access road maintenance project to promote resettlement: 1 project”, “Mountain roads maintenance project to strengthen the people and logistics road networks: 1 project”, and “Earthquake-resistant project to strengthen bridges on the arterial roads: 1 project”.

The packaging of the sub-projects was revised in consideration to the influence of the repeated occurrence of sediment disasters in April and May 2020. The main contents of the design TA for the road sector’s sub-projects are described below.

### (1) TA on access road maintenance project to promote the relocation areas (Tondo-Talise)

#### ➤ Background

This sub-project is a priority project (Package 1), and the TA for preparing the draft detailed design is completed. When the sub-project was in the design stage, the relocation plan to Tondo and Talise areas and the construction plan of relocation facilities in these areas were not finalized yet and the planning of sediment control and improvement in the river crossing the access road required a longer time to be finalized. Thus, the sub-project was originally planned to be completed ahead of the relocation and sediment control as well as river improvement sub-projects on the premise of tentative commencement of service. The determination of the tentative commencement of service was subject to the design conditions that: only two lanes out of eventual four lanes would be constructed according to full-scale specifications; the tentative access road would have temporary drainage facilities provided that full-scale drainage facilities would be constructed concurrently with the adjacent construction of relocation facilities; and the river crossing section would be constructed as a tentative road section to which a ford would be applied until the confirmation of the necessity to construct an eventual river crossing facility such as a bridge in the sediment control and river improvement plan. Then, after discussion between the Public Works Department of Palu City and PUPR, the two public agencies made a proposal that Palu



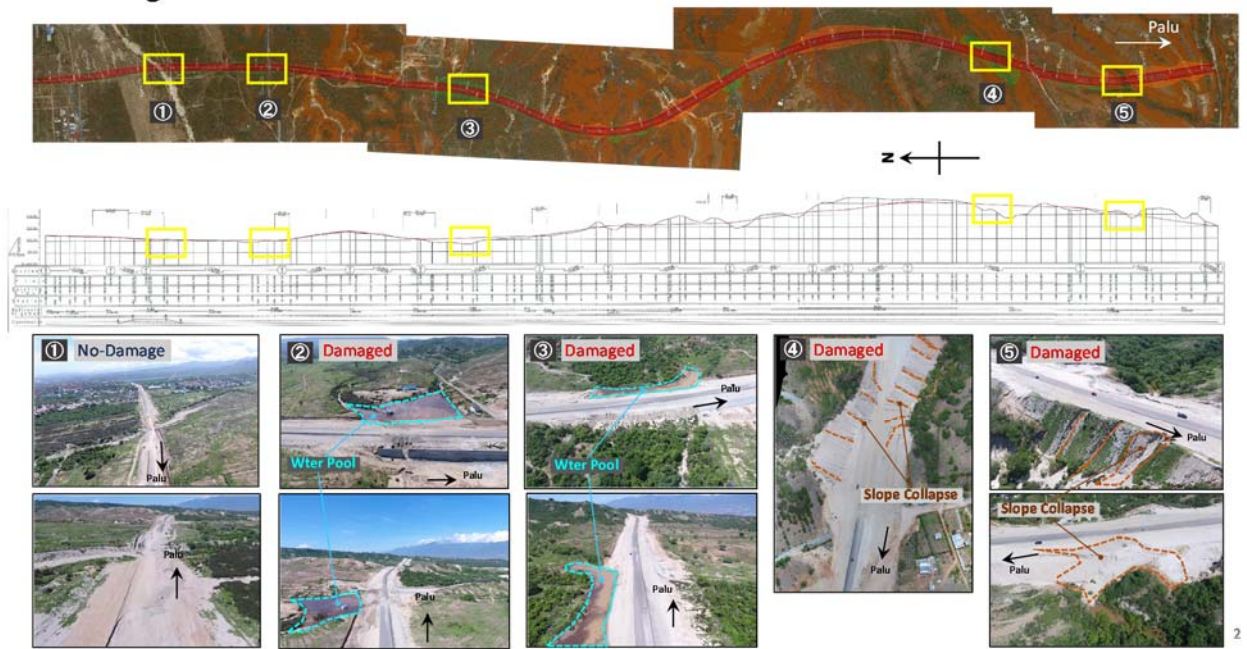
City would be in charge of the construction of the tentative access road and the scope of works of PUPR would be limited to the construction of major structures such as bridge and box culvert.

➤ Actual activities

The JICA Study Team extended the TA for the planning and design of such major facilities as bridge and transverse box culvert. In the course of the TA, the JICA Study Team provided advice as to what to do on the basis of the concept of BBB including that: the layout planning of the river crossing facility should be conducted so as not to interfere a river flow crossing the access road; a geological survey should be conducted to confirm whether or not the foundation ground had sufficient bearing capacity; and the river crossing facility should have an appropriate structural type which could ensure high technical and financial feasibility as well as sufficient earthquake resistance.

Meanwhile, in May 2020 while the TA on the bridge reconstruction plan was in progress, heavy rain caused a slope collapse at a road embankment temporarily constructed by Palu City. Being in charge of the construction of the temporary access road, Palu City has been responsible for the management of constructed road facilities. Although the access road was not an immediate subject of the TA on the bridge reconstruction plan, considering the close relation of the access road with the bridge and transverse structures to be designed by PUPR in the future, PUPR requested the JICA Study Team to give them advice on the type of emergency countermeasure and the method for taking such a countermeasure. Then, the JICA Study Team gave them advice as reference. Specifically, the JICA Study Team introduced an emergency countermeasure using waterproof sheets and sandbags to cope with the relatively severe slope collapse and possible secondary damage due to other heavy rains. An excerpt of the materials used for introducing the emergency countermeasure is shown in Figure 8-1 and Figure 8-2.

● **Damage situation of Tondo road**

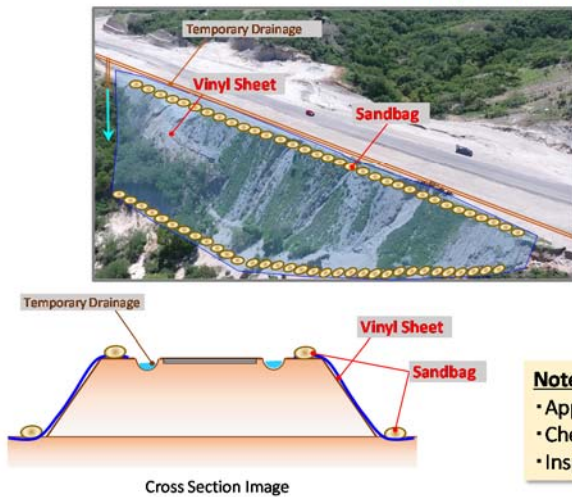


Source: JICA Study Team

Figure 8-1 Example of Explanation Material Used for TA in the Infrastructure Reconstruction in the Road Sector (Slope Collapse at Road Embankment)

● **Proposal of damage countermeasures**

(2) Slope collapse countermeasure ④ ⑤  
 → Slope protection with sheets and sandbags and temporary drainage



**Notes:**  
 • Approximately Quantity refers to page-6  
 • Check the countermeasure range on site.  
 • Inspection is required after the rain until the start of the JICA loan.

Source: JICA Study Team

Figure 8-2 Example of Explanation Material Used for TA in the Infrastructure Reconstruction in the Road Sector (Emergency Countermeasure against Slope Collapse at Road Embankment)

➤ Recommendation

For the promotion of reconstruction project, it is preferable that the planning and design of the main structures such as the bridge and box culvert will be conducted on the basis of TA extended to local counterparts as part of the activities of the project this time through consulting services to be procured under a loan scheme. It is also preferable to have clear division of the scope of works in terms of construction and management between the access road and the bridge and road crossing facilities by obtaining as-built documents of the temporary access road from Palu City.

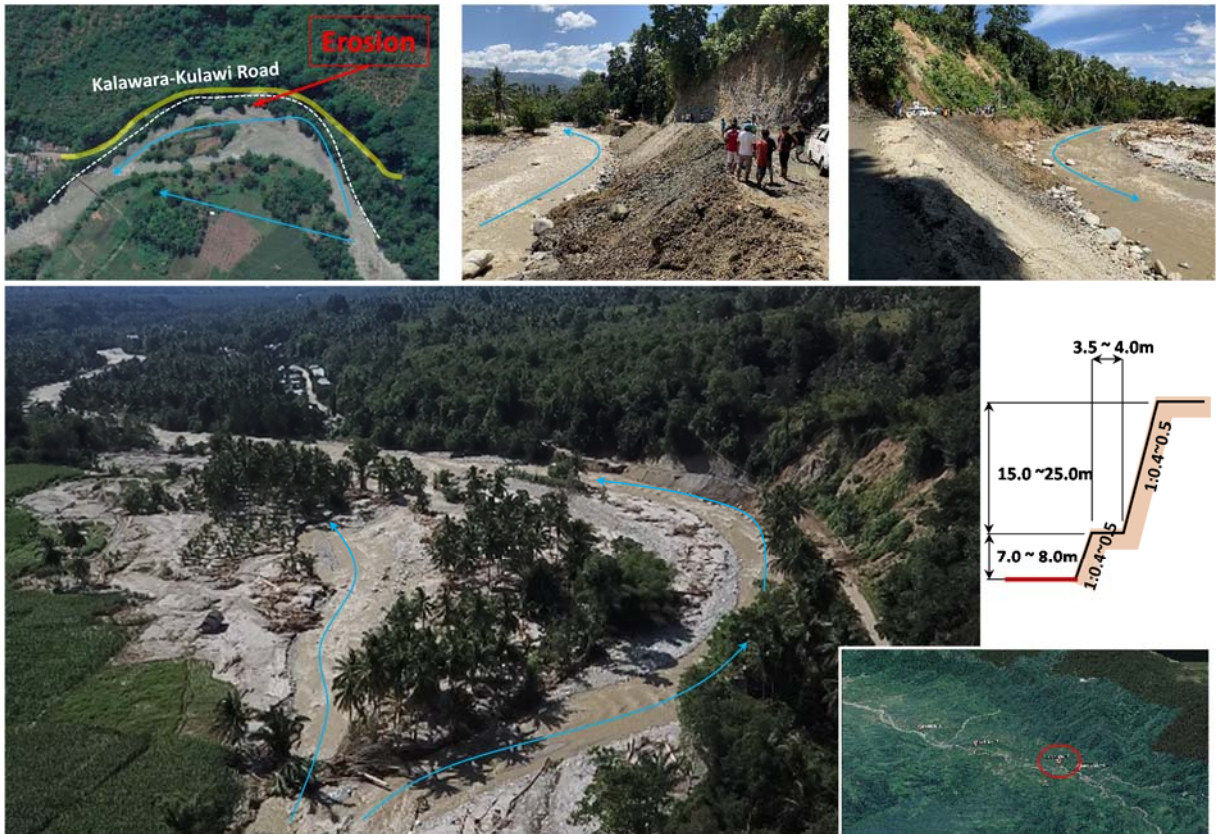
(2) TA on mountain road maintenance project (Kalawara-Kulawi) to strengthen the people and logistics road network

➤ Background

This sub-project has been categorized as one of the priority sub-projects (Package 1) for which the technical assistance in preparing the draft detailed design documents was already completed. The draft detailed design for this sub-project originally included the stabilization of cut earth slope with stable gradients and surface failure countermeasure with gravity type retaining walls separated from slopes. However, local design conditions had been largely altered as the target area had been subject to repeated occurrences of road slope collapses, erosion and mudslides in adjacent Miu River due to aftershocks and heavy rains. In order to cope with these disasters, emergency countermeasure works have been implemented by Central Sulawesi Province and Sigi Regency. Therefore, the urgent issue in the sub-project was to understand the local conditions.

➤ Actual activities

The JICA Study Team conducted a field survey and identified the damage due to local surface failures and gully erosion on slopes, as well as risk of road shoulder failures at locations corresponding to river water colliding fronts where scouring of river banks have destabilized the road shoulders. Thus, the JICA Study Team gave advice on the cut earth and embankment structures highly resistant to disasters on the basis of the concept of BBB including the methods for stabilizing slopes to be constructed by cutting soft ground and for preventing road shoulders on river banks from scouring. An excerpt of the materials used when giving the above advice is shown Figure 8-3.



Source: JICA Study Team

Figure 8-3 Example of Explanation Material Used for TA in the Infrastructure Reconstruction in the Road Sector (Field Survey Material for Scouring at Road Shoulder on River Bank)

➤ Recommendation

As the slope collapses has occurred intermittently since the field survey of the JICA Study Team, an additional geological survey is required to understand the properties of the natural ground. Also, for the promotion of reconstruction project it is preferable that the planning and design of permanent measures to stabilize cut earth and embankment will be conducted on the basis of TA extended to local counterparts as part of the activities of the project this time through consulting services to be procured under a loan scheme.



### (3) TA on earthquake resistance enhancement project for arterial road and bridge

#### ➤ Background

These sub-projects are to repair and reinforce four bridges; i.e., two bridge repair sub-projects in Sirenja District (Lompio 1 and 2), one bridge repair sub-project in Palu City (Talise); and one bridge reinforcement sub-project in Donggala Regency (Buluri). These sub-projects have been categorized as one of the priority sub-projects (Package 1) for which the technical assistance in preparing the draft detailed design documents has already been completed. Then, the detailed design and cost estimation for these sub-projects were implemented by PUPR and their construction works were already put out to tender in April 2020.

#### ➤ Actual activities

As part of the TA on the design for the repair and reinforcement of four small-scale bridges, the JICA Study Team participated in the construction coordination meeting and shared the original design policy including the concept of BBB with the other participants including the explanation of the idea to install anchors on bridge abutments to improve earthquake resistance.

#### ➤ Recommendation

The construction of sub-projects has already been started and completed under the management of PUPR. PUPR is recommended to utilize and update the knowledge accumulated by TA activities more and more through applications to other road and bridge projects in Central Sulawesi.

### 8-3 TA on Infrastructure Design in the Water Resource Sector

The target TA is technical advice on the design changes after the topographic and geological survey results for the river improvement for the sub-projects categorized as priority projects (Package 1). The target sub-projects are “Flood and sediment disaster countermeasure project by improving the rivers, sediment control dams, etc.: 4 projects”. The TA also targeted the sub-projects that required review based on the current situation of the sediment disasters, which are categorized as priority projects (Package 1.5). The target sub-projects are “Flood and sediment disaster countermeasure project: 6 projects”.

The packaging of the sub-projects was revised in consideration of the influence of the repeated occurrence of sediment disasters in April and May 2020. The main items requiring technical assistance for the sub-projects in the water resource sector are explained as follows.

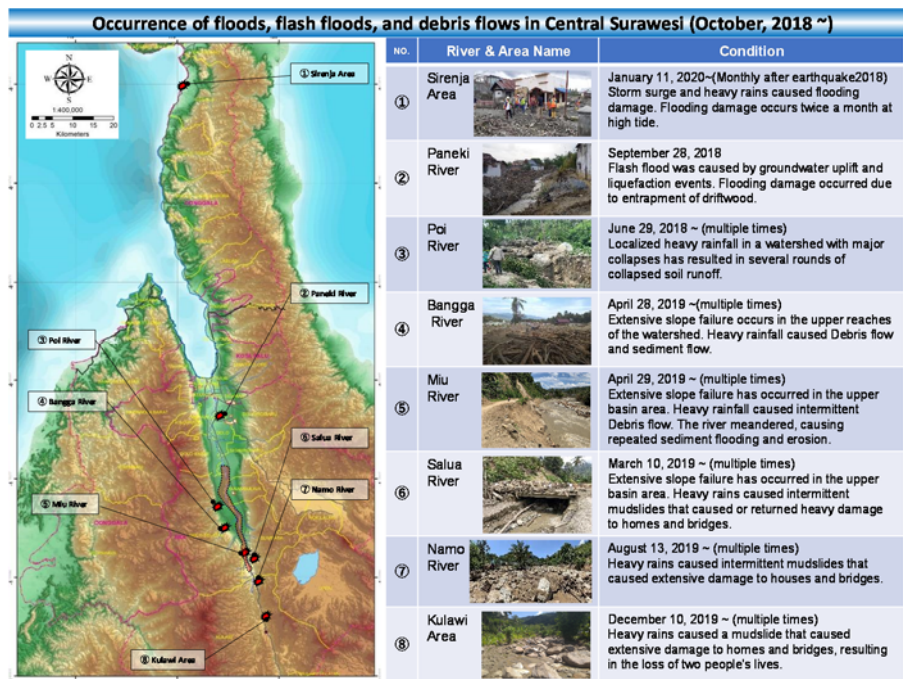
#### ➤ Background

These sub-projects have been categorized among the priority sub-projects (Package 1) for which the technical assistance in preparing the draft detailed design documents has already been completed. Then, the detailed design and cost estimation for these sub-projects were implemented by PUPR, and contractors were already selected through tenders. The target rivers of these sub-projects are Banggar, Salua, Poi and Paneki Rivers. These rivers have been subject to continued sediment runoff due to aftershocks and heavy rains since December 2019 with occurrences of additional mudslides and sediment flows. These natural events had caused significant changes in the situations of respective rivers, thereby creating a need for design changes. These natural events also caused sediment and flood damage to rivers other than the four rivers to be improved as the priority sub-projects.

➤ Actual activities

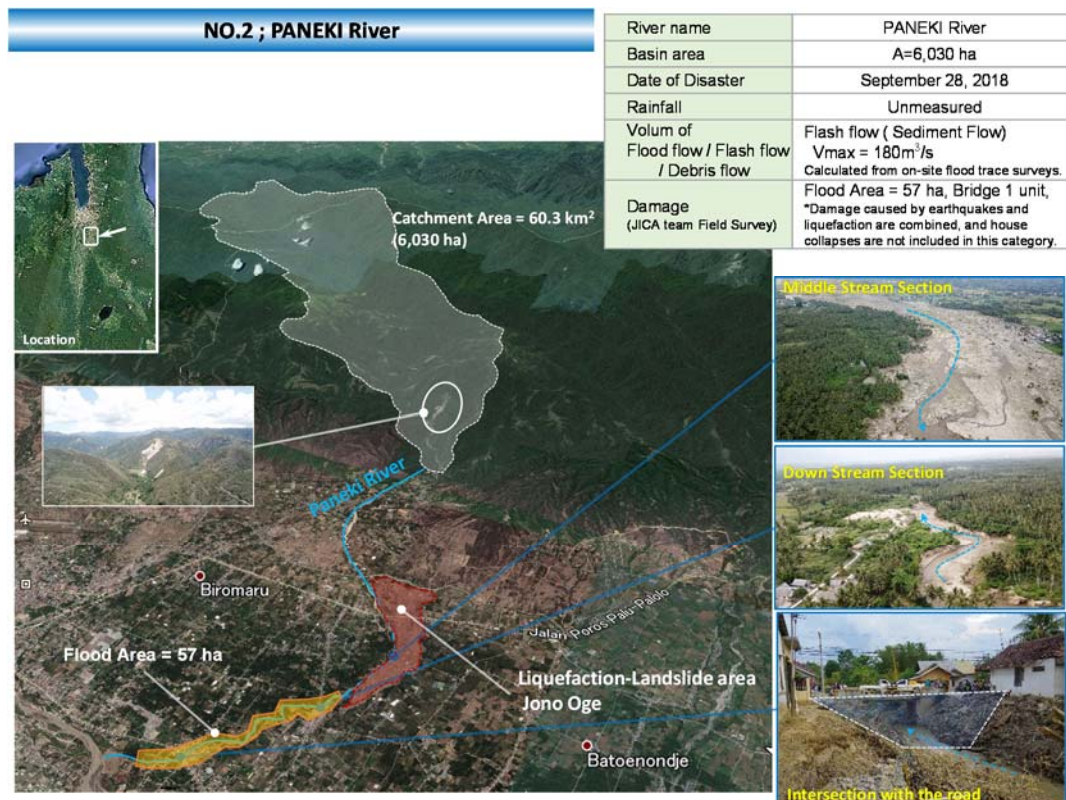
As part of the TA in the design for the improvement of sediment control dams and rivers, the JICA Study Team collected information on disaster damage to these rivers, conducted a field survey at some locations, and submitted explanation materials updating the river situations. The explanation materials were prepared so as to enable clear understanding of the areas and scales of damage and existing situations through distant aerial images taken by drone. The JICA Study Team also submitted materials, on the scales of sediment runoff and a list of related infrastructure damaged by these natural events, which were necessary for revising the packages of the sub-projects. In addition, JICA Study Team advised on quality and implementation control of construction through regular construction meetings and participated in technical meetings with other donors as well for sharing knowledge that we obtained from the Project.

An excerpt of the submitted materials is shown in Figure 8-4 and Figure 8-5. As a result of analysing the occurrence range and factor of sediment disasters, some of the four flood and sediment-related disaster countermeasure projects that were categorized as Package 1 were further subdivided and classified as Package 1.5. The JICA Study Team advised to make partial revisions on the draft tender documents and draft specifications formulated in the previous draft detailed design.



Source: JICA Study Team

Figure 8-4 Example of Explanation Material Used for TA in the Infrastructure Reconstruction in the Water Resource Sector (Overall Situation of Disaster)



Source: JICA Study Team

Figure 8-5 Example of Explanation Material Used for TA in the Infrastructure Reconstruction in the Water Resource Sector (Outline of Disaster Damage to Paneki River)

➤ Recommendation

Floods and sediment runoff have occurred intermittently since the field survey of the JICA Study Team. Thus, for the promotion of reconstruction project it is preferable that the revisions of the planning and design, on the basis of the existing disaster situation, shared with local counterparts as part TA in the design for the improvement of sediment control dams and rivers will be implemented through consulting services to be procured under a loan scheme.

#### 8-4 TA on Infrastructure Design in the Public Facilities Sector

Basically, the support activities in the public facilities sector were finalized in the third JCC meeting held in December 2019 and there has been no request for additional assistance. However, when the technical meeting at Anutapura Hospital was held in Palu City in March 2020, the JICA Study Team participated in the meeting on the web.

In the meeting, the JICA Study Team confirmed the following: a wide range of issues including the design technique applicable to the buildings to be constructed in ZRB 3 area and the involvement of the implementing organization; and the necessity of reconstructing the hospital on the basis of the concept of BBB. The JICA Study Team also gave technical advice on base-isolation structures.

## Chapter 9 Finalization of the Reference Manual

### 9-1 Outline of Final Reference Manual

As a result of reviewing existing manuals in each target sector, i.e., road and bridge, river, and public facilities sectors, the JICA Study Team summarized the design policies, conditions, etc. that are lacking in the current manuals as a reference manual (draft) as mentioned in Chapter 5. It aims to implement the mission, “Recovery of infrastructure and public facilities for a resilient society”, as shown in the reconstruction M/P.

In the Project, the reference manual (draft) formulated by the JICA Study Team was used by PUPR for basic design and construction and has been finalized based on the knowledge PUPR gained from the TA activities (Final reference manual is referred to Appendix II-3-2).

The lessons learned from the finalization work of the reference manual are described below.

- Through discussions on repair and reinforcement of existing bridges, it was confirmed that there was very limited experience in design of bridge collapse prevention devices and girder movement restriction devices to prevent collapse of bridges. In this connection, it was decided that the criteria for determining the degree of damage, the determination method, and the selection method for reinforcement and repairing methods should be included in the reference manual.

For tsunami countermeasures on the south coast of Palu Bay, The importance of design conditions and construction conditions to maintain the function as a tsunami mitigation measure was discussed in the Japanese Advisory Committee and the tsunami expert panel. In the meeting, it was decided that not only the raising road plan, but also the points to be noted in the construction stage and the maintenance stage, and the importance of drainage measures in the coastal area should be included in the reference manual.

- In the road and bridge sector and river sector sub-projects, it has been found that the scale of the collapse was occasionally expanded without proper countermeasures for the small-scale collapse that occurred immediately after the heavy rain. Therefore, it was decided that the countermeasure method for heavy rain disasters should be included in the reference manual.
- Through discussions with PUPR and other donors, not only the results of the boring survey and groundwater monitoring, but also the evaluation method and future water level management plans for irrigation canals have been shared/discussed. In the consideration of request from PUPR, it was decided that the water level management planning for irrigation canals and method on building a management system should be included in the reference manual.

Based on the above lessons, the reference manual was finalized and shared with the local government and PUPR. Furthermore, finalization of the reference manual is planned to reflect the TA activities on the construction by the end of March 2021. It is expected that this reference manual will be given to PUPR to be utilized for future reconstruction design of each infrastructure and public facility.



## 9-2 Contents of Final Reference Manual

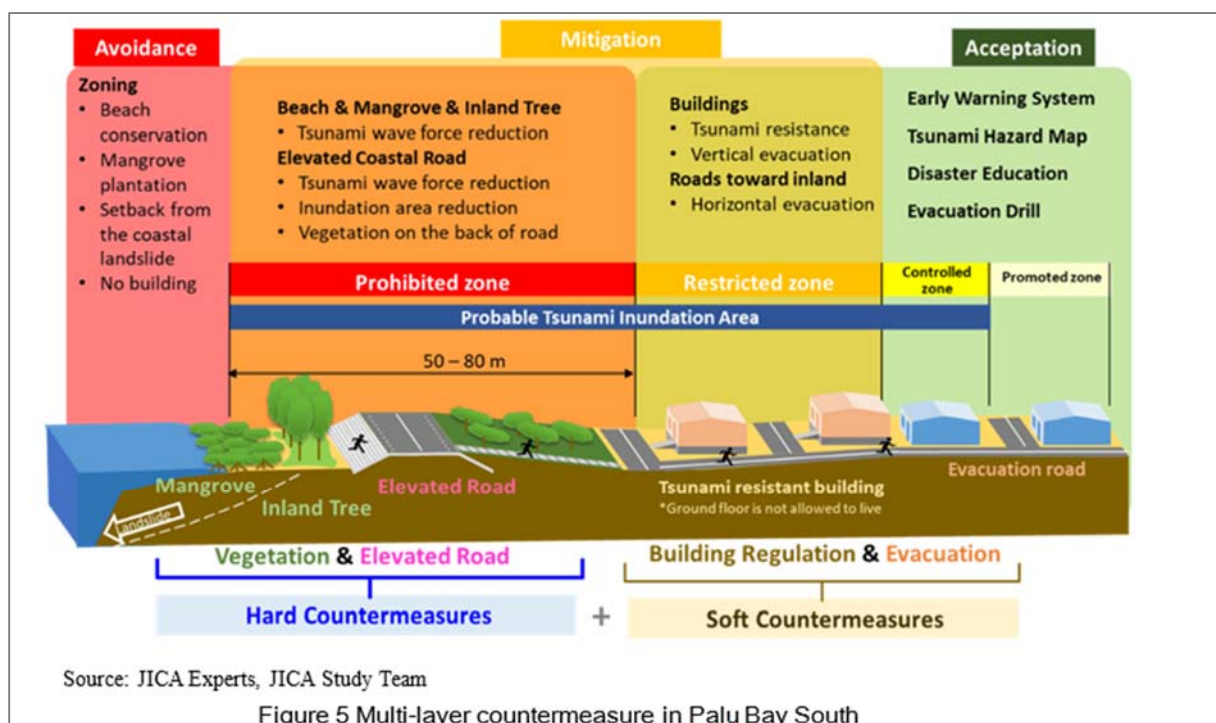
The contents for each final reference manual is shown in Table 9-1 to Table 9-4. Further details are referred to Appendix II-3-2.

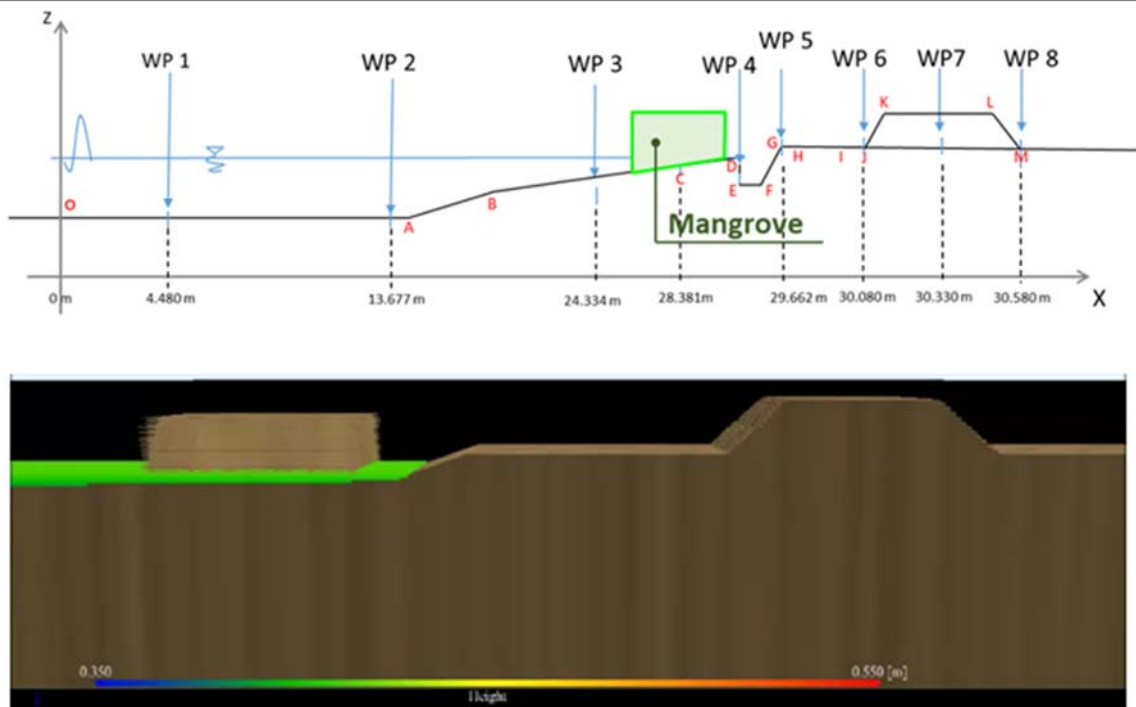
Table 9-1 Content of the Countermeasure for Tsunami

Title	Table of Contents	Contents
Countermeasure for Tsunami	1-1.Basic concept of tsunami countermeasure	<ul style="list-style-type: none"> <li>➤ Target tsunami</li> <li>➤ Tsunami mitigation strategy</li> <li>➤ Basic policy for tsunami countermeasure</li> <li>➤ Multi-layer countermeasure in Palu Bay South</li> </ul>
	1-2.Basic plan of elevated road	<ul style="list-style-type: none"> <li>➤ Field survey</li> <li>➤ Numerical calculation</li> <li>➤ Calculation of required height</li> <li>➤ Setting of the elevated road</li> </ul>
	1-3.Elevated road structure against the earthquake	
	1-4.Verification of the tsunami energy reduction effect by the vegetation	<ul style="list-style-type: none"> <li>➤ Method I: Physical Model Test</li> <li>➤ Method II: Simulation Analysis</li> </ul>
	1-5.Draft tsunami countermeasure plan for southern Palu Bay	
	1-6.Tsunami Evacuation Plan	<ul style="list-style-type: none"> <li>➤ Basic Policy of Evacuation Plan</li> <li>➤ Basic Evacuation Plan [Draft]</li> </ul>
	1-7.Considerations for future detailed design and construction stage	

Source: JICA Study Team

Excerpts of additional content from the final reference manual are shown below.





Source: Prof. Arikawa's laboratory

Figure 15 Situation of the simulation analysis

Table 4 Basic evacuation plan

Area of Pal Bay	Palu Bay South	Palu Bay West, East
Side View		
<b>Basic Action</b> Just after earthquake [Supposed Tsunami] Fault Rupture Evacuation Time - Long	<b>Horizontal Evacuation: Move to evacuation target point</b> 	
<b>Optional Action</b> If the tsunami arrival is confirmed [Supposed Tsunami] Coastal Landslides (Sep. 2018) Evacuation Time - Short	<b>Vertical Evacuation: Move to upper floor or evacuation facility</b> 	

Source: JICA Study Team

Table 9-2 Content of Countermeasure for Seismic Wave for Building Structures

Title	Table of Contents	Contents
Countermeasure for Seismic Wave for Building Structures	2-1. Earthquake hazard	<ul style="list-style-type: none"> <li>➤ Seismic sources (subduction zones and active faults, magnitude and frequency, seismic source map for Central Sulawesi)</li> <li>➤ Attenuation of Earthquake</li> <li>➤ Site soil conditions and soil amplification effect</li> <li>➤ Soil liquefaction and building foundation</li> </ul>
	2-2. Design Earthquake	<ul style="list-style-type: none"> <li>➤ 2017 probabilistic seismic hazard map of Indonesia</li> <li>➤ Soil amplification factor</li> <li>➤ Maximum considered earthquake and design response spectrum</li> </ul>
	2-3. Basic Concept of Seismic Design	<ul style="list-style-type: none"> <li>➤ Importance factor</li> <li>➤ Strength and ductility</li> <li>➤ Structural characteristics and analysis procedure</li> <li>➤ Indonesian national standard (SNI) for structural design</li> </ul>
	2-4. Best Practices for Seismic Design of Building Structures	<ul style="list-style-type: none"> <li>➤ Practices for avoiding irregularity</li> <li>➤ Practices for avoiding discontinuity</li> <li>➤ Practices for avoiding concentration of seismic forces</li> </ul>
	2-5. Building Design Guideline	<ul style="list-style-type: none"> <li>➤ The guideline is set for small scale building and medium/large scale building as well as key disaster types of earthquake, tsunami and liquefaction landslide (Nalodo) to maximize building's disaster resilient performance even before the structural calculation incorporating Indonesian Micro Zonation factors.</li> <li>➤ Design guideline items                             <ul style="list-style-type: none"> <li>- Foundation</li> <li>- Above Ground Structure</li> <li>- Building Form</li> <li>- Mechanical, Electrical and Plumbing</li> <li>- Finishes</li> </ul> </li> </ul>
	2-6. Quality Control Manual for Reinforced Concrete Work	<ul style="list-style-type: none"> <li>➤ Basic knowledge                             <ul style="list-style-type: none"> <li>- Characteristics of Cement</li> <li>- Typical Characteristics of Concrete</li> <li>- General Definition of Reinforced Concrete</li> <li>- Trial Mixing of Concrete</li> </ul> </li> <li>➤ Execution                             <ul style="list-style-type: none"> <li>- Concrete Work</li> <li>- Formwork</li> <li>- Steel Bar Work</li> <li>- Material Stock and Storage</li> </ul> </li> </ul>

Source: JICA Study Team

Table 9-3 Content of Road Reconstruction Manual

Title	Table of Contents	Contents
Road Reconstruction	3-1. Pavement	<ul style="list-style-type: none"> <li>➤ Survey of Pavement                             <ul style="list-style-type: none"> <li>- Survey workflow</li> <li>- Road surface surveys</li> <li>- Structural surveys</li> </ul> </li> <li>➤ Evaluation for Existing Pavement                             <ul style="list-style-type: none"> <li>- Cracking, Rutting, Potholes, Bleeding, Reduction of surface roughness, Faulting, etc.</li> </ul> </li> <li>➤ Maintenance and Repair Methods for Pavement</li> <li>➤ Application in the Project</li> </ul>
	3-2. Road Reconstruction in Liquefaction Area	<ul style="list-style-type: none"> <li>➤ Drainage Treatment                             <ul style="list-style-type: none"> <li>- Groundwater Level Lowering</li> <li>- DEPP Method (Dissipation Excess Pore Water Pressure Method)</li> </ul> </li> <li>➤ Soft Ground Treatment</li> </ul>

		<ul style="list-style-type: none"> <li>- Compaction Method</li> <li>- Consolidation method</li> <li>➤ Application in the Project</li> </ul>
	3-3. Cut Slope	<ul style="list-style-type: none"> <li>➤ Evaluation for Existing Cut Slope along Road</li> <li>➤ Stable Gradient of Cut Slope</li> <li>➤ Cut Slope Protection Method</li> <li>- Surface Protection (Sodding Work, Shotcrete, Concrete Crib)</li> <li>- Slope Stabilization (Retaining Wall, Soil Nailing, Ground Anchor)</li> <li>➤ Application in the Project</li> </ul>
	3-4. Introduction of Method in Japan	<ul style="list-style-type: none"> <li>➤ Method 1: Ground Improvement with Interlayer Mixing Method</li> <li>➤ Method 2: Porous Concrete</li> <li>➤ Method 3: Chemical Grouting using Sodium Silicate</li> <li>➤ Method 4: Press-in Method</li> <li>➤ Method 5 :Stabilization of Embankment Construction Utilizing Reinforcement with Gravel</li> <li>➤ Method 6: Terra-mesh Reinforced Earth Wall</li> <li>➤ Emergency Measures against Flood Disaster</li> </ul>

Source: JICA Study Team

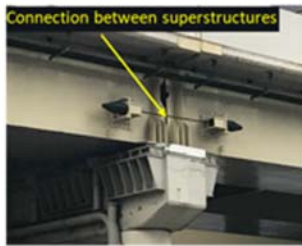
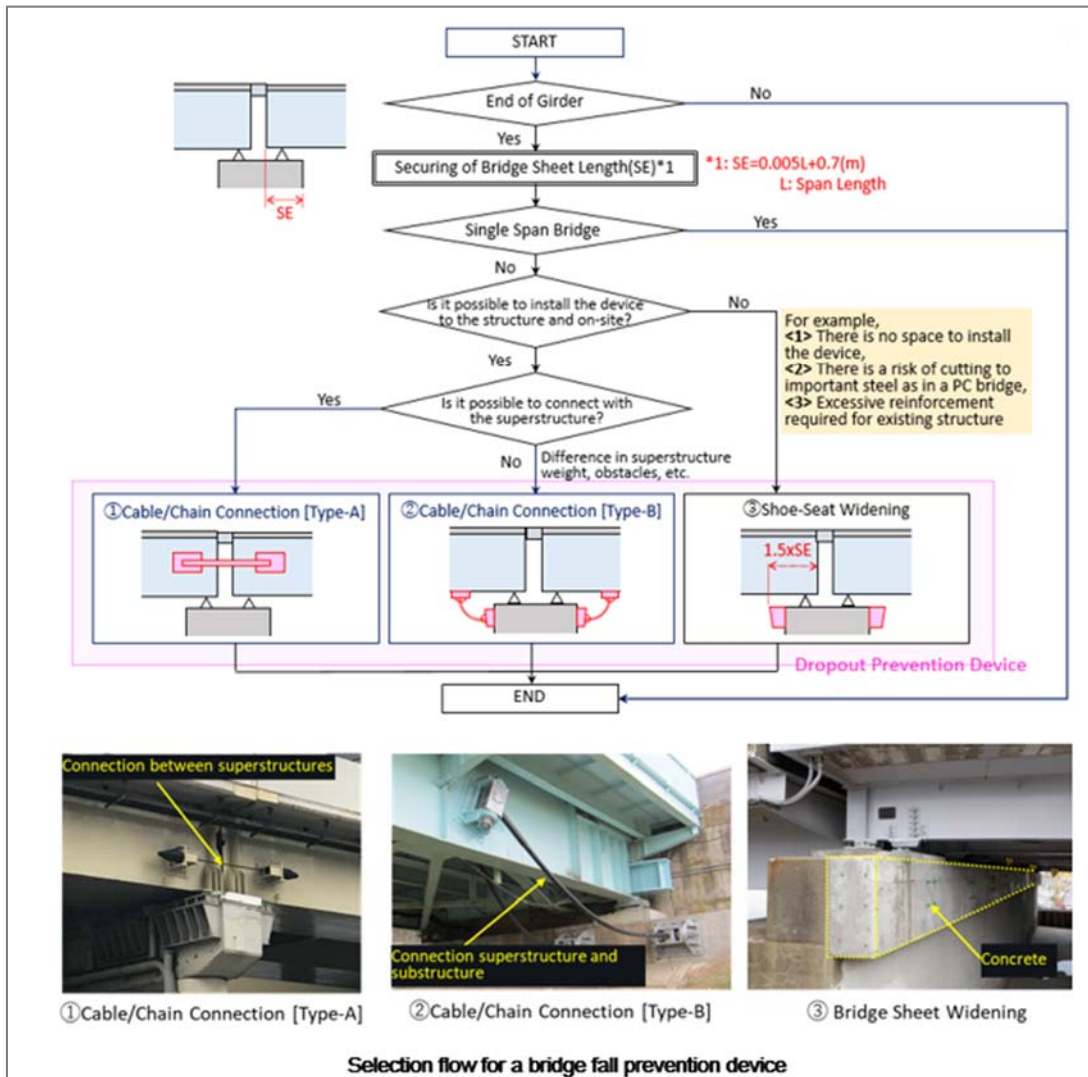
Table 9-4 Content of Bridge Repair and Reinforcement Manual

Title	Table of Contents	Contents
Bridge Repair and Reinforcement	4-1. General Provisions	<ul style="list-style-type: none"> <li>➤ Purpose</li> <li>➤ Scope of application</li> </ul>
	4-2. Investigation	<ul style="list-style-type: none"> <li>➤ Types of Damage State Inspection</li> <li>➤ Estimation of Damage</li> <li>➤ Sample of Field Inspection Sheet of Bridge</li> </ul>
	4-3. Example of Damage and Deterioration	<ul style="list-style-type: none"> <li>➤ Concrete Members</li> <li>➤ Metal Component</li> <li>➤ Bearing</li> <li>➤ Expansion Joints</li> <li>➤ Substructure</li> </ul>
	4-4. Repair and Reinforcement: Execution Principle	<ul style="list-style-type: none"> <li>➤ Flow of Necessity Determination</li> <li>➤ Selection of Method</li> <li>➤ Examination of Replacement</li> </ul>
	4-5. Repair and Reinforcement Method	<ul style="list-style-type: none"> <li>➤ Concrete Members <ul style="list-style-type: none"> <li>- Crack Repair Method</li> <li>- Patching Repair Method</li> <li>- Replacing Method for Deck Slab</li> </ul> </li> <li>➤ Steel Members <ul style="list-style-type: none"> <li>- Re-painting</li> <li>- Stop Hole</li> <li>- Patch Plate Work</li> </ul> </li> <li>➤ Reinstallation sequence of Bearing</li> <li>➤ Reinstallation sequence of Expansion Joints</li> <li>➤ Substructure <ul style="list-style-type: none"> <li>- Foundation Protection Method</li> <li>- Bridge Pier Reinforcing Method</li> </ul> </li> <li>➤ Bridge Fall Prevention Device <ul style="list-style-type: none"> <li>- Draft selection flow for a bridge fall prevention device</li> </ul> </li> <li>➤ Examples of damaged bridges in central Palu</li> </ul>
	4-6. References	<ul style="list-style-type: none"> <li>➤ List of referred document</li> </ul>

Source: JICA Study Team



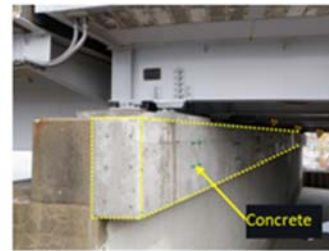
Excerpts of additional content from the final reference manual are shown below.



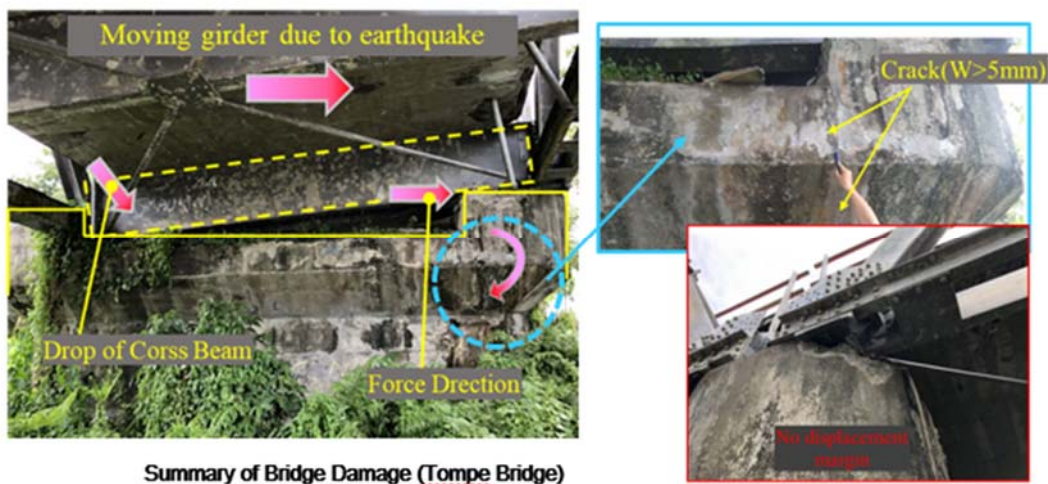
① Cable/Chain Connection [Type-A]



② Cable/Chain Connection [Type-B]



③ Bridge Sheet Widening



Source: JICA Study Team

## Chapter 10 Assisting the related Ministries and Agencies on Improvement of the Current Manuals

In the formulation of the reference manual (draft), finalization of the reference manual, basic design for each infrastructure, and discussion with the local government and PUPR in charge of construction, there was no request for improvement of the existing manuals. However, a request for technical support related to the improvement of tender documents required for procurement of consultants and contractors was confirmed. Therefore, the JICA Study Team shared the finalized reference manual, tender for consultants and contractors, technical specifications, and requirements for resilient infrastructure for disaster risk reduction to PUPR. The following were the results of this activity:

- In term of technical specification (Particular Specification), additional topographical and geological surveys were conducted due to daily changes of the site condition such as retreating the landslides. The JICA Study Team shared the survey results to PUPR and PUPR formulated the bidding documents by reflecting the survey results (see the sample in Figure 10-1, and the details are referred to Appendix II-3-4).
- To shorten the bidding period and the time required for contract negotiations, alternative bidding (Alternative Bid) was not provided. The JICA Study Team shared the simple bidding documents to PUPR and PUPR formulated the bidding documents by reflecting the JICA Study Team's documents (see the Clause 13. Alternative Bids of Instruction to Bidders, Appendix II-3-4).
- The JICA Study Team proposed the Bill of Quantities (BoQ) item to save time and effort required to change the contract due to new unit price. This proposal was shared to PUPR and PUPR formulated the bidding documents by reflecting the BoQ proposal (see the sample in Figure 10-2, and the details are referred to Appendix II-3-4).

*Particular Specification*

**PARTICULAR SPECIFICATION**

**PS-1 Particular Requirements for Road and Bridge**

(1) Topographical Survey

The Contractor shall carry out the topographical survey of the existing sites and prepare topographical survey map in a scale of 1:1,000 in A3 size showing the existing roads with right-of-way, curb lines, medians, traffic islands, structures, drainages, manholes, catch basins, traffic barriers, trees, street lights, traffic signs, and all other facilities located on the roads. Existing buildings, houses and boundary walls along the roads shall also be shown on the topographical survey map. Survey reference points and bench marks used for the survey shall be secured and indicated on the topographical survey map.

Cross-section survey shall be conducted and cross sections showing the right-of-way, curbs, footpaths, median, traffic islands, structures, drainages, boundary walls along the roads shall be prepared at every 20m unless otherwise accepted by the Engineer. Supplemental cross sections shall be prepared as required where the feature changes in short stretch. Dimensions and levels shall be shown in the cross sections.

Three (3) copies of the topographical survey map and cross-sections with an electronic copy shall be submitted to the Engineer for approval.

(2) Existing Utility Survey

The Contractor shall survey the existing utilities both above ground and underground of the roads and prepare existing utility plans showing the existing utilities. The Contractor shall endeavor to collect the information from the relevant authorities and agencies of the utilities. Test pits may be excavated to check the underground utilities where necessary subject to the prior approval of the authority and the Engineer. The Contractor shall inform the Engineer before such test pits will be carried out explaining the purpose, location, and evidence of approval from the authority.

Three (3) copies of the existing utility plans with an electronic copy shall be submitted to the Engineer for approval.

(3) Existing Condition Survey

The Contractor shall conduct the existing condition survey of the pavement, footpath, drainage, and existing ancillary road facilities and prepare a report of existing condition survey. The report shall contain the survey results such as location, dimensions, conditions and proposed measures and method to reconstruct, repair, or no improvement with proposed program and estimated quantities. Color photos shall also be attached in the report showing the existing conditions.

In principle, pavement and facilities in good condition shall be kept as it is without disturbing.

The Report, in principle, shall be in A4 size. A3 size may be used partially if required for drawings or else to be attached or inserted. Three (3) copies of the Report shall be submitted to the Engineer with an electronic copy.

After reviewing the Report, the Engineer will carry out joint inspection with the Contractor of the existing condition to determine the measures to be taken.

PS - 1/3

*Particular Specification*

(4) Plans, Profile and Cross Sections

Based on the topographical survey, existing utility survey and the existing condition survey, the Contractor shall review the Contract Drawings and prepare the plans, profiles and cross sections of new roads to be constructed including roads, footpaths, curbs, median, traffic islands, drainages, manholes, catch basins, traffic signs and all other ancillary facilities.

Typical cross falls shall be as per the Contract Drawings unless otherwise approved by the Engineer. Gradients may be adjusted to match with the survey results to have smooth vertical alignment.

Three (3) copies of plans, profiles and cross sections of new roads with an electronic copy shall be submitted to the Engineer for approval.

(5) Working Drawings and Shop Drawings

The Contractor shall prepare detailed working drawings for the construction of road including pavements, curbstones, drainage structures, road markings, traffic signs, etc. with arrangement plans, detailed dimensions, materials to be used and construction requirement.

Shop drawings such as bar bending schedules for reinforced concrete structures, fabrication drawings of steel structures as require shall also be prepared indicating all detail dimensions and materials to be used.

Three (3) copies of the working drawings and shop drawings shall be submitted to the Engineer for approval prior to the commencement of the work.

(6) Confirmation of the existing subgrade

The Contractor shall conduct CBR tests on the existing subgrade before commencing the pavement works. Leveling and compaction shall be carried out to form the gradient and cross-fall necessary for the new pavement.

In case that the CBR of the existing subgrade is less than that shown in the drawings, improvement of the subgrade shall be carried out in a manner approved by the Engineer.

(7) Cost

The cost of the above shall be considered to be included in the unit rate of any other relevant items in the Bill of Quantity and shall not be paid separately.

**PS-2 Soil Investigation**

(1) Soil Investigation

The Contractor shall carry out the soil investigation to get the geological information for slope cutting sections of the Kalawara Kulawi road.

Boring including Standard Penetration Test (SPT) and reports for the soil investigation shall be conducted as described in Section 1.29 of General Specification.

Three copies of the soil investigation report with an electronic copy shall be submitted to the Engineer for approval.

PS - 2/3

Source: JICA Study Team

Figure 10-1 Particular Specification (extract from the 1st Package Bidding Document)

Section IV. Bidding Forms **BF-9**

**Bill No.1**

**Reconstruction of Kalawara Kulawi Road**

Project Name : Reconstruction of Kalawara Kulawi Road [Package -1]

BILL OF QUANTITIES

PROJECT FOR DEVELOPMENT OF REGIONAL DEAR TOURISM RESILIENCE PLAN IN CENTRAL SULAWESI IN THE REPUBLIC OF INDONESIA

REKONSTRUKSI JALAN KALAWARA KULAWI ROAD

BS No.	Work Item	Unit	Qty	Local Price		Foreign Price		Local Currency (Rp)	Local Currency (Rp)
				Foreign Currency (M)	Local Currency (Rp)	Foreign Currency (M)	Local Currency (Rp)		
a	b	c	d	e	f	g	h	i	j
<b>DIVISION 1 - GENERAL WORKS</b>									
1.1	Measurement, Mobilization, Demobilization, Project Management	LS	1.00						
1.2	Measurement, Site Traffic Safety	LS	1.00						
1.3	Measurement, Site Traffic Safety	LS	1.00						
1.4	Measurement, Site Traffic Safety	LS	1.00						
1.5	Measurement, Site Traffic Safety	LS	1.00						
1.6	Measurement, Site Traffic Safety	LS	1.00						
1.7	Measurement, Site Traffic Safety	LS	1.00						
1.8	Measurement, Site Traffic Safety	LS	1.00						
1.9	Measurement, Site Traffic Safety	LS	1.00						
1.10	Measurement, Site Traffic Safety	LS	1.00						
1.11	Measurement, Site Traffic Safety	LS	1.00						
1.12	Measurement, Site Traffic Safety	LS	1.00						
1.13	Measurement, Site Traffic Safety	LS	1.00						
1.14	Measurement, Site Traffic Safety	LS	1.00						
1.15	Measurement, Site Traffic Safety	LS	1.00						
1.16	Measurement, Site Traffic Safety	LS	1.00						
1.17	Measurement, Site Traffic Safety	LS	1.00						
1.18	Measurement, Site Traffic Safety	LS	1.00						
1.19	Measurement, Site Traffic Safety	LS	1.00						
1.20	Measurement, Site Traffic Safety	LS	1.00						
1.21	Measurement, Site Traffic Safety	LS	1.00						
1.22	Measurement, Site Traffic Safety	LS	1.00						
1.23	Measurement, Site Traffic Safety	LS	1.00						
1.24	Measurement, Site Traffic Safety	LS	1.00						
1.25	Measurement, Site Traffic Safety	LS	1.00						
1.26	Measurement, Site Traffic Safety	LS	1.00						
1.27	Measurement, Site Traffic Safety	LS	1.00						
1.28	Measurement, Site Traffic Safety	LS	1.00						
1.29	Measurement, Site Traffic Safety	LS	1.00						
1.30	Measurement, Site Traffic Safety	LS	1.00						
1.31	Measurement, Site Traffic Safety	LS	1.00						
1.32	Measurement, Site Traffic Safety	LS	1.00						
1.33	Measurement, Site Traffic Safety	LS	1.00						
1.34	Measurement, Site Traffic Safety	LS	1.00						
1.35	Measurement, Site Traffic Safety	LS	1.00						
1.36	Measurement, Site Traffic Safety	LS	1.00						
1.37	Measurement, Site Traffic Safety	LS	1.00						
1.38	Measurement, Site Traffic Safety	LS	1.00						
1.39	Measurement, Site Traffic Safety	LS	1.00						
1.40	Measurement, Site Traffic Safety	LS	1.00						
1.41	Measurement, Site Traffic Safety	LS	1.00						
1.42	Measurement, Site Traffic Safety	LS	1.00						
1.43	Measurement, Site Traffic Safety	LS	1.00						
1.44	Measurement, Site Traffic Safety	LS	1.00						
1.45	Measurement, Site Traffic Safety	LS	1.00						
1.46	Measurement, Site Traffic Safety	LS	1.00						
1.47	Measurement, Site Traffic Safety	LS	1.00						
1.48	Measurement, Site Traffic Safety	LS	1.00						
1.49	Measurement, Site Traffic Safety	LS	1.00						
1.50	Measurement, Site Traffic Safety	LS	1.00						
1.51	Measurement, Site Traffic Safety	LS	1.00						
1.52	Measurement, Site Traffic Safety	LS	1.00						
1.53	Measurement, Site Traffic Safety	LS	1.00						
1.54	Measurement, Site Traffic Safety	LS	1.00						
1.55	Measurement, Site Traffic Safety	LS	1.00						
1.56	Measurement, Site Traffic Safety	LS	1.00						
1.57	Measurement, Site Traffic Safety	LS	1.00						
1.58	Measurement, Site Traffic Safety	LS	1.00						
1.59	Measurement, Site Traffic Safety	LS	1.00						
1.60	Measurement, Site Traffic Safety	LS	1.00						
1.61	Measurement, Site Traffic Safety	LS	1.00						
1.62	Measurement, Site Traffic Safety	LS	1.00						
1.63	Measurement, Site Traffic Safety	LS	1.00						
1.64	Measurement, Site Traffic Safety	LS	1.00						
1.65	Measurement, Site Traffic Safety	LS	1.00						
1.66	Measurement, Site Traffic Safety	LS	1.00						
1.67	Measurement, Site Traffic Safety	LS	1.00						
1.68	Measurement, Site Traffic Safety	LS	1.00						
1.69	Measurement, Site Traffic Safety	LS	1.00						
1.70	Measurement, Site Traffic Safety	LS	1.00						
1.71	Measurement, Site Traffic Safety	LS	1.00						
1.72	Measurement, Site Traffic Safety	LS	1.00						
1.73	Measurement, Site Traffic Safety	LS	1.00						
1.74	Measurement, Site Traffic Safety	LS	1.00						
1.75	Measurement, Site Traffic Safety	LS	1.00						
1.76	Measurement, Site Traffic Safety	LS	1.00						
1.77	Measurement, Site Traffic Safety	LS	1.00						
1.78	Measurement, Site Traffic Safety	LS	1.00						
1.79	Measurement, Site Traffic Safety	LS	1.00						
1.80	Measurement, Site Traffic Safety	LS	1.00						
1.81	Measurement, Site Traffic Safety	LS	1.00						
1.82	Measurement, Site Traffic Safety	LS	1.00						
1.83	Measurement, Site Traffic Safety	LS	1.00						
1.84	Measurement, Site Traffic Safety	LS	1.00						
1.85	Measurement, Site Traffic Safety	LS	1.00						
1.86	Measurement, Site Traffic Safety	LS	1.00						
1.87	Measurement, Site Traffic Safety	LS	1.00						
1.88	Measurement, Site Traffic Safety	LS	1.00						
1.89	Measurement, Site Traffic Safety	LS	1.00						
1.90	Measurement, Site Traffic Safety	LS	1.00						
1.91	Measurement, Site Traffic Safety	LS	1.00						
1.92	Measurement, Site Traffic Safety	LS	1.00						
1.93	Measurement, Site Traffic Safety	LS	1.00						
1.94	Measurement, Site Traffic Safety	LS	1.00						
1.95	Measurement, Site Traffic Safety	LS	1.00						
1.96	Measurement, Site Traffic Safety	LS	1.00						
1.97	Measurement, Site Traffic Safety	LS	1.00						
1.98	Measurement, Site Traffic Safety	LS	1.00						
1.99	Measurement, Site Traffic Safety	LS	1.00						
2.00	Measurement, Site Traffic Safety	LS	1.00						
2.01	Measurement, Site Traffic Safety	LS	1.00						
2.02	Measurement, Site Traffic Safety	LS	1.00						
2.03	Measurement, Site Traffic Safety	LS	1.00						
2.04	Measurement, Site Traffic Safety	LS	1.00						
2.05	Measurement, Site Traffic Safety	LS	1.00						
2.06	Measurement, Site Traffic Safety	LS	1.00						
2.07	Measurement, Site Traffic Safety	LS	1.00						
2.08	Measurement, Site Traffic Safety	LS	1.00						
2.09	Measurement, Site Traffic Safety	LS	1.00						
2.10	Measurement, Site Traffic Safety	LS	1.00						
2.11	Measurement, Site Traffic Safety	LS	1.00						
2.12	Measurement, Site Traffic Safety	LS	1.00						
2.13	Measurement, Site Traffic Safety	LS	1.00						
2.14	Measurement, Site Traffic Safety	LS	1.00						
2.15	Measurement, Site Traffic Safety	LS	1.00						
2.16	Measurement, Site Traffic Safety	LS	1.00						
2.17	Measurement, Site Traffic Safety	LS	1.00						
2.18	Measurement, Site Traffic Safety	LS	1.00						
2.19	Measurement, Site Traffic Safety	LS	1.00						
2.20	Measurement, Site Traffic Safety	LS	1.00						
2.21	Measurement, Site Traffic Safety	LS	1.00						
2.22	Measurement, Site Traffic Safety	LS	1.00						
2.23	Measurement, Site Traffic Safety	LS	1.00						
2.24	Measurement, Site Traffic Safety	LS	1.00						
2.25	Measurement, Site Traffic Safety	LS	1.00						
2.26	Measurement, Site Traffic Safety	LS	1.00						
2.27	Measurement, Site Traffic Safety	LS	1.00						
2.28	Measurement, Site Traffic Safety	LS	1.00						
2.29	Measurement, Site Traffic Safety	LS	1.00						
2.30	Measurement, Site Traffic Safety	LS	1.00						
2.31	Measurement, Site Traffic Safety	LS	1.00						
2.32	Measurement, Site Traffic Safety	LS	1.00						
2.33	Measurement, Site Traffic Safety	LS	1.00						
2.34	Measurement, Site Traffic Safety	LS	1.00						
2.35	Measurement, Site Traffic Safety	LS	1.00						
2.36	Measurement, Site Traffic Safety	LS	1.00						
2.37	Measurement, Site Traffic Safety	LS	1.00						
2.38	Measurement, Site Traffic Safety	LS	1.00						
2.39	Measurement, Site Traffic Safety	LS	1.00						
2.40	Measurement, Site Traffic Safety	LS	1.00						

## Chapter 11 Assisting Facilitation of the National Expert Panel

During the process of considering the hazard analysis and countermeasures for tsunami and Nalodo, expert meetings such as with the Japanese Advisory Committee consisting of Japanese experts, tsunami model experiments, and the Indonesian Expert Panel consisting of Indonesian professors and experts were held to facilitate consensus building between the government and other related agencies. The JICA experts led the assistance with support from the JICA Study Team. Table 11-1 and Table 11-2 summarized the main activities that have been collaborated on. Details of the activities such as of the Japanese Advisory Committee (tsunami and Nalodo), and the tsunami model experiments are summarized in Appendix II-3-8. The following were the results of the expert panel assistance:

### [Tsunami and liquefaction landslide (coastal area)]

- For tsunami, the JICA experts and Japanese academicians on tsunami shared the lessons learned from the Great East Japan Earthquake, and the BBB concept described in the construction M/P were shared to tsunami researchers in Indonesia. An agreement was reached on the basic policy of tsunami risk mitigation measures by combining elevated road, vegetation plantation, land use regulation, and building regulation based on the hazard assessments.
- Among the hard measures for tsunami risk mitigation, in addition to elevated road and vegetation plantation such as mangroves, hydraulic model experiments led by PUPR Research Institute were conducted to verify tsunami mitigation effects. The understanding of PUPR on experimental planning, handling of measuring instruments, and experimental data collection and analysis techniques was improved.
- In addition, as a non-structural measure (soft measure) for tsunami risk mitigation, there was consent regarding the importance of having an evacuation plan due to the characteristic of a tsunami of having a short time from its occurrence to arrival at the coast. It was confirmed that the Indonesian side will proceed with the formulation of this evacuation plan in the future.

Table 11-1 Outline of Japanese Advisory Committee Activities on Tsunami and Liquefaction Landslide (Coastal Area)

Event	Implementation Date	Work and Discussion
Field survey*	2018/10/4-5	Tsunami damage situation survey, and estimation of the tsunami's occurrence cause
Japanese Advisory Committee (1 <sup>st</sup> )	2018/12/20	Status of reconstruction M/P, tsunami damage simulation, and coastal risk assessment
Japanese Advisory Committee (2 <sup>nd</sup> )	2019/1/29	Target level of tsunami embankment, linear concept of tsunami embankment, how to set height of tsunami embankment, and points to note for model experiments
Japanese Advisory Committee (3 <sup>rd</sup> )	2019/3/20	Mechanism and outbreak period of the tsunami, how to proceed with infrastructure planning, and handling of hazard maps
Japanese Advisory Committee (4 <sup>th</sup> )	2019/6/22	Handling of tsunami trace survey for embankment height setting, and handling of mangroves as a tsunami countermeasure
Tsunami Expert Panel (1 <sup>st</sup> )	2019/6/26	Tsunami countermeasure basic policy, target tsunami, tsunami mitigation measures, etc.
Tsunami Expert Panel (2 <sup>nd</sup> )	2019/8/8	Elevated road height, and tsunami model experiment
Visit to the Coastal Research Institute (Balai Pantai)	2019/8/10	Confirmation of experimental facility and experimental plan



Event	Implementation Date	Work and Discussion
Visit to the Coastal Research Institute (Balai Pantai)	2019/11/15-11/16	Checking the operation of measuring instruments and inspecting the experimental status
Japanese Advisory Committee (5 <sup>th</sup> )	2020/9/14	Confirmation of final policy for Palu Bay tsunami countermeasures
Tsunami Expert Panel (3 <sup>rd</sup> )	2020/2/9	Discussion on model experiments, simulation analysis, and recommendations from the JICA Study Team

Activities marked with \* are activities in another project, but they are listed in this table because they are closely related to the project.

Source: JICA Study Team

### [Nalodo (liquefaction landslide)]

- Nalodo is a rare disaster in the world, the JICA Study Team conducted on-site and geological surveys in collaboration with Indonesian academics and researchers immediately after the disaster, which made the disaster mechanism unique and will continue in the future. The JICA Study Team shared the peculiarities of the disaster mechanism, and the needs for continuous monitoring and academic research in the future. In Indonesia, the Nalodo Research Center has been established and future research activities are planned.
- The Gumbasa Irrigation Canal Recovery Project is one of the causes of Nalodo. It is shared to Indonesian academicians, PUPR, local governments, and ADB (support on the irrigation canal M/P and F/S). The understanding on the importance to plan appropriate groundwater management and operation management based on the land use plan of the irrigation area to implement the BBB concept was improved.

Table 11-2 Outline of Japanese Advisory Committee Activities on Liquefaction Landslide (Inland Areas)

Event	Implementation Date	Work and Discussion
JICA First Survey Team*	2018/10/17-18	Nalodo field survey in the inland areas and coastal areas
JICA Second Survey Team*	2018/11/2-4	Same as above
Japanese Advisory Committee (1 <sup>st</sup> )	2018/12/19	First boring survey implementation stage
Field Survey and Survey Report with Indonesian Side	2019/1/5~2019/1/10	First boring survey completed, and soil test
Japanese Advisory Committee (2 <sup>nd</sup> )	2019/1/29	First boring survey, laboratory test, and added trench survey
Japanese Advisory Committee (3 <sup>rd</sup> )	2019/3/19	Report the results of the liquefaction survey (FL method and energy method)
Opinion Exchange Meeting in Japan	2019/4/27	Explanation of policy for countermeasure
Japanese Advisory Committee (4 <sup>th</sup> )	2019/6/3	Explanation of policy for countermeasure, and second boring survey plan
Japanese Advisory Committee (5 <sup>th</sup> )	2019/8/8	Explanation of the second boring survey results
Japanese Advisory Committee (6 <sup>th</sup> )	2019/9/30	Completed the second boring survey, liquefaction study, and explanation of two-dimensional osmotic flow analysis
National Panel	2019/10/5~2019/10/10	Field survey Presentation to the National Panel
Technical Meeting (Before the Final Committee)	2020/11/11	Coordinating policy as a committee on long-distance flow
Japanese Advisory Committee (7 <sup>th</sup> )	2020/12/11	Confirmation of draft JICA report

Activities marked with \* are activities in another project, but they are listed in this table because they are closely related to the project. Source: JICA Study Team

## Chapter 12 Support for Implementation of Strategic Environmental Assessment (SEA)/ Environmental Impact Assessment (EIA)

### 12-1 Assistance for Preparation of Environmental and Social Considerations and Resettlement/Land Acquisition Framework

In the context of emergency disaster support which are characteristics of this project, preparation of following 2 documents were assisted on January 2020. (See Attachment III-3-5)

- Draft Environmental Assessment and Review Framework
- Draft Resettlement and Customary Communities Development Framework

These two frameworks were finalized through discussion between Government of Japan and Government of Indonesia. Regarding environmental and social considerations procedure of sector loan projects in this project, two countries committed in advance that project is implemented in accordance with environmental and social considerations stated in these frameworks and with due considerations to local people.

### 12-2 SEA concept for the Project (Output 3)

In Indonesia, regulation on SEA procedure was established in 2016 and the regulation prescribes that SEA is not necessary to be conducted for the plan such as disaster emergency response and safety measures. However, reconstruction plan and spatial plan for this project is required to conduct SEA because these plans are identified as being prepared for earthquake disaster reconstruction phase which are after disaster emergency response. Regarding SEA for Output 2, it was expected that responsible organization of Indonesia takes initiative and proceeds with SEA procedure for spatial plan because SEA is required to conduct in accordance with regulation of Indonesia.

However, some of SEA procedure of Output 2 and Output 3 is overlapped each other such as SHM for affected people and heavy burden on Government of Indonesia and local people and confusion for them were concerned caused by SEA in both Outputs. Concerning this situation, instead of SEA, proceeding EIA procedure in accordance with regulation of Indonesia was assisted for subprojects of sector loan in Output 3.

### 12-3 Environmental Laws and Regulations

Law No. 32 of 2009 on Protection and Management of Environment is the fundamental law on environmental management in Indonesia. The law states to conduct AMDAL (EIA), UKL-UPL (Environmental Management Efforts Form and Environmental Monitoring Efforts) or SPPL (Statement of Environmental Management and Monitoring) according to significance of possible impact; The law also stipulates necessity of environmental permission. Table 3-1 shows the relevant regulations of AMDAL in Indonesia.

Table 12-1 Regulations related to AMDAL

Name of Regulation	Outline
Government Regulation No.27 of 2012 concerning Environmental Permits	Regarding Environmental Permits issued by Minister, Governor or Regent that require for business or activity that requires AMDAL or UKL-UPL.
Minister of Environment and Forestry (MOEF) Regulation No P38 of 2019 regarding Type of Business plans and/or activities requiring AMDAL	Amendment of the Minister of Environment (MOE) Regulation No. 05/2012, defining the type and scale of the activities/projects that requires AMDAL procedure.
MOE Regulation No 08 of 2013 regarding Procedures for AMDAL assessment and examination and Environmental Permit Issuance	Defining implementation scheme and contents to be included in ANDAL, UKL-UPL and SPPL. It also stipulates about the duties of KPA (AMDAL Assessment Commission).
MOE Regulation No 16 of 2012 regarding Preparation of AMDAL with non-OSS system	Regarding preparation procedure of AMDAL for government's projects
MOEF Regulation No P26 of 2018 regarding Preparation of AMDAL with OSS system	Regarding preparation procedure of AMDAL for projects initiated by private company and state-owned company
MOE Regulation No 17 of 2012 regarding Guidelines for community involvement in the EIA and Environmental Permit process	Regarding community involvement in the EIA process
MOE Regulation No.27 of 2009 on Guidelines for Implementation of Strategic Environmental Assessment	Defining the environmental assessment at levels of policy, plan and program (basic idea)

Source: JICA Survey Team

The flow of EIA approval procedures can be visualized largely at three levels. The following shows the major steps in the AMDAL approval process in Indonesia.

Table 12-2 EIA Procedure and associated Public Participation Activities in Indonesia

Step	Contents	Public Participation
Screening	<p>a) The project proponent shall notify the Project Authority concerned of the proposed implementation of the project. Upon receipt of the project plan, AMDAL Committee or the Project Authority concerned shall start the screening process in accordance with MOEF Regulation No P38 of 2019. In the event that the proposed project falls under none of those listed on the AMDAL project implementation list, Regional Governor or the State Minister of Environment shall consider whether or not the AMDAL process is necessary.</p> <p>b) As regards the project having been judged to require AMDAL, the project proponent shall publicly announce the project plan according to the schedule authorized by the Project Authority concerned. As regards the project whose environmental impacts have been judged to be light, the project operator shall prepare UPL/UKL under the guidance of the Project Authority concerned.</p> <p>c) During a period of 30 business days starting from the date of the public announcement, residents' comments, proposals and opinions shall be received.</p>	<p>Announcement of the project</p> <ul style="list-style-type: none"> <li>The project proponent shall make a public notification on its project including the following contents; the name and address of the project proponent, the site, the contents and map of the project, the kind of the project and activities, the kind of products, the kind, quantity and management system of waste to be generated, the impacts on the natural environment to be foreseen, the deadline date of acceptance of residents' comments, proposals and opinions, the address to which residents' comments, proposals and opinions must be sent (name and address of the organization in charge), etc.</li> <li>The residents can submit to the AMDAL Committee their documented opinions within 30 business days from the date of such public notification, with their copy sent to the project proponent.</li> </ul>
Scoping	<p>a) The project proponent shall prepare the KA-ANDAL, having regard to residents' comments, proposals and opinions.</p> <p>b) The project proponent shall submit the KA-ANDAL to the AMDAL Committee. The AMDAL Committee shall issue its note of receipt to the project operator.</p> <p>c) If needed, residents may submit to the AMDAL Committee their documented opinions on KA-</p>	<p>Information of outline of the project, environmental factors to be affected during KA-ANDAL preparation</p> <ul style="list-style-type: none"> <li>The project proponent must hold consultation with interested residents</li> <li>The project proponent must publicly notify the meeting place, form and method (citizens' assembly, workshop, seminar, etc.) of such consultation to be held.</li> </ul>

	<p>ANDAL, with their copy being simultaneously sent to the project proponent.</p> <p>d) The AMDAL Committee shall review KA-ANDAL and residents' documented opinions. The project proponent shall revise the KA-ANDAL in accordance with the comments of the AMDAL Committee and the documented opinions of residents.</p> <p>e) The AMDAL Committee shall submit the outcome of assessment on KA-ANDAL to the Authority Responsible for the Environment for approval by the Approval Authority.</p>	<ul style="list-style-type: none"> <li>Information concerning the outlines of the project (its kind, size and site), significant environmental factors to be impacted and problems of environmental impacts likely to be generated should be provided. Review of KA-ANDAL</li> <li>Those representing residents likely to be directly or indirectly affected can become Members of the AMDAL Committees.</li> <li>Local residents to be directly or indirectly affected can submit their documented opinions to the AMDAL Committee and (or) the project proponent.</li> </ul>
AMDAL Examination	<p>a) The project proponent shall prepare the AMDAL documents and submit them to the AMDAL Committee. The AMDAL Committee shall issue its note of receipt to the project proponent.</p> <p>b) The project proponent shall publicly disclose the AMDAL documents. If needed, the residents may submit to the AMDAL Committee and the project operator their documented opinions.</p> <p>c) The AMDAL Committee shall review the contents of the AMDAL documents and Residents' documented opinions and shall make AMDAL assessment. If necessary, the AMDAL Committee may make comments to the project proponent.</p> <p>d) The project proponent shall revise the AMDAL documents in accordance with the comments of the AMDAL Committee and residents' documented opinions and shall submit the revised AMDAL documents to the AMDAL Committee.</p> <p>e) Based on the outcome of assessment of the AMDAL Committee, the Approval Authority of the Authority Responsible for the Environment (Mayor of City, Governor of Prefecture, Governor of Province and State Minister of Environment) will issue the final decision document (approval document). Such final decision document may contain collateral conditions (conditional approval).</p>	<p>Review of AMDAL</p> <ul style="list-style-type: none"> <li>Residents to be affected can, through their representatives designated, have their opinions reflected in the discussions of the AMDAL Committee.</li> <li>Those interested in the project can submit in writing their comments, proposals and opinions to the AMDAL Committee and (or) the project operator within a period of less than 45 business days after the meeting schedule of the AMDAL Committee has been officially and publicly notified.</li> </ul> <p>Disclosure of the final AMDAL document</p> <ul style="list-style-type: none"> <li>The final version of the AMDAL documents shall be publicly disclosed together with the final decision document issued by the Approval Authority.</li> </ul>

Source: JICA Survey Team

## 12-4 Assistance for Implementation of Environmental Impact Assessment (EIA) for Grant Aid Project

For Palu IV bridge reconstruction of Grant Aid Project, environment and social considerations study such as baseline survey and scoping was conducted and proceeding EIA procedure was assisted in accordance with regulation in Indonesia. The project is required to proceed UKL-UPL procedure in accordance with regulation on EIA in Indonesia and Environment Permit was obtained on July 2020 supported by subcontractor. The project is Grant Aid Project, hence implementation of stakeholder meeting for local people in project area and related organizations was assisted in accordance with JICA Guideline.

### 12-4-1 Project Outline

The outline of the grant project is summarized in following Table and Figure. It is a reconstruction of original Palu IV Bridge just upstream side. The length of the bridge is about 260m. The bridge will be connected to existing road Jalan Rajamoili on the right bank and Jalan Cumi Cumi on the left bank. The

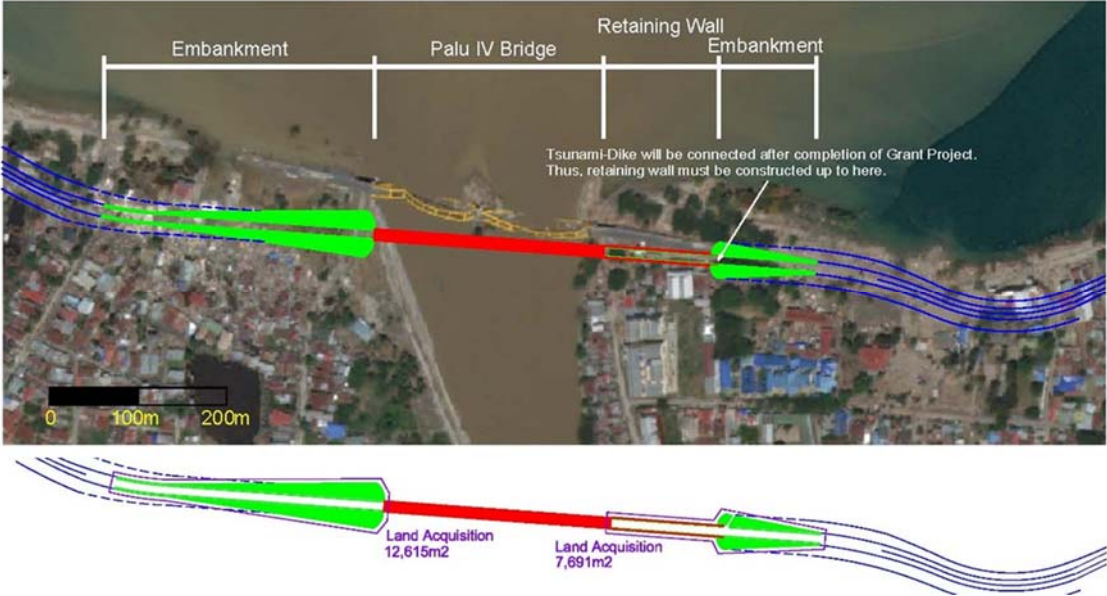


left bank may apply retaining wall to reduce land acquisition. The following project summary is the data as of Feasibility study phase in 2019, and the environmental impact assessment was conducted based on this information.

Table 12-3 Summary of the Project

* Road	(1 car lane + side walk), both side
* Bridge	Length about 260 m, Width about 14 m
* Embankment + Retaining wall	Length about 250 m, Right bank to be connected to Jalan Rajamoili Left bank to be connected to Jalan Cumi Cumi
* Necessary land area	Right bank: about 7,700 m <sup>2</sup> (including about 3,000 m <sup>2</sup> of existing road) Left bank: about 12,620 m <sup>2</sup> , Total: about 20,320 m <sup>2</sup>
* Location	Right bank: Besusu Barat village Left bank: Lere village
* Executing Agency (EA)	Ministry of Public Works and Housing

Source: JICA Study Team



Source: JICA Study Team

Figure 12-1 Outline of the Project as of end of June, 2019

12-4-2 Project Category

The grant loan project is the reconstruction of Palu IV Bridge of about 260 m in length. According to Indonesian environmental review system, a bridge construction of over 500 m in length requires an AMDAL or full EIA. Projects of a bridge shorter than 500 m are, therefore, subject to UKL-UPL, or the review of environmental mitigation and monitoring plan. Since the road is a City Road, Palu City will be the reviewing agency.

According to “JICA Guidelines for Environmental and Social Considerations 2010” (JICA Guidelines 2010), projects are categorized mainly depending upon the significance of negative impacts. The ESMF (Environmental and Social Management Framework) for the project states that no sub-project under the project shall be categorized as A. Considering that the Project will cause no relocation of residents, and the project is basically the reconstruction of the original Palu IV Bridge, the project can be categorized

as B.

### 12-4-3 Scoping of Impacts

Based on the project components and existing environmental and social conditions, scoping of potential impacts are studied and summarized in following table.

Table 12-4 Scoping

No	Item	Evaluation		Reason for evaluation
		BC/DC	AC	
<b>Pollution control measures</b>				
1	Air quality	B-	D	<b>DC:</b> Temporary air pollution by equipment operation is expected. <b>AC:</b> Passing traffic on the bridge will generate exhaust gas, but the air quality will not be significantly different from the condition with the original bridge. The structure to be built by the Project is a reconstruction of the original bridge damaged by the earthquake at the upstream-side of the original bridge.
2	Water quality	B-	D	<b>DC:</b> Temporary water pollution by works in the river area is expected. <b>AC:</b> No additional water pollution is expected.
3	Waste	B-	D	<b>DC:</b> Wastes will be generated such as debris of removed existing structures and bags and containers of materials and paints used for the works. <b>AC:</b> No additional waste generation is expected.
4	Soil contamination	B-	D	<b>DC:</b> In case fuel, oil, grease, and paints used for the works are spilled on the ground, soil contamination may occur at the work area. <b>AC:</b> No additional waste generation is expected.
5	Noise and vibrations	B-	D	<b>DC:</b> Temporary noise pollution and vibrations by equipment operation is expected. <b>AC:</b> Passing traffic on the bridge will generate noise and vibration, but the condition will not be significantly different from the condition with the original bridge. The structure to be built by the Project is a reconstruction of the original bridge damaged by the earthquake at the upstream-side of the original bridge.
6	Ground subsidence	D	D	No significant negative impact is expected during and after the construction.
7	Offensive odor	D	D	No significant negative impact is expected during and after the construction.
8	Bottom Sediment	D	D	No significant negative impact is expected during and after the construction.
<b>Natural Environment</b>				
9	Protected area	D	D	The Project is not located in or near any protected areas. The structure to be built by the Project is a reconstruction of the original bridge damaged by the earthquake at the upstream-side of the original bridge.
10	Ecosystem	C	D	During construction, there is a risk of temporary water pollution due to turbid water by construction works.. Ecosystem survey in the downstream area will be conducted.
11	Hydrology	D	D	No significant negative impact is expected during and after the construction.
12	Topography and geology	D	D	No significant negative impact is expected during and after the construction.
<b>Social Environment</b>				
13	Involuntary resettlement	B-/C	D	<b>DC:</b> About 2 ha of land will be used for the Project. As of end of June 2019, no residential structures are located in the Project area and no resettlement will be caused by the Project. The approach road on the right bank is planned to pass between the roadside buildings and the original approach road. The roadside buildings that will not be affected by the Project, look partially destructed and

No	Item	Evaluation		Reason for evaluation
		BC/DC	AC	
				unused as of end of June 2019. Further, repeated site survey is necessary to clarify whether there are residents in those buildings. AC: No additional negative impact is expected.
14	Poverty	C	B+	<b>DC:</b> The land owners or the owners of the structures located on the Project area are affected by the tsunami and relocated. Further study is necessary to understand their recent socio-economic condition to understand the impact of the Project on poverty. <b>AC:</b> With the recovery of transportation axis along the coast, local economy in the coastal area is expected to recover to the pre-earthquake condition, that will give positive impacts to the livelihood of the poor group.
15	Ethnic minority and indigenous people	D	D	The Project is not located in or near any protected areas. The structure to be built by the Project is a reconstruction of the original bridge damaged by the earthquake at the upstream-side of the original bridge.
16	Local economy (Employment and livelihood)	B±	B+	<b>DC:</b> Jobs will be generated for construction workers, service for such workers, and local procurement of construction materials and equipment. <b>AC:</b> With the recovery of transportation axis along the coast, local economy in the coastal area is expected to recover to the pre-earthquake condition
17	Land use and utilization of local resources	D	D	The structure to be built by the Project is a reconstruction of the original bridge damaged by the earthquake at the upstream-side of the original bridge. No significant negative impact on use of local resource is expected.
18	Water usage	D	D	The structure to be built by the Project is a reconstruction of the original bridge damaged by the earthquake at the upstream-side of the original bridge. No significant negative impact on local water use is expected.
19	Existing social infrastructure and service	B-	B+	<b>DC:</b> The approach road on the right bank is planned to pass between the roadside buildings and the original approach road. There is an unused futsal court among the buildings. Access to the facility may become difficult during the construction works. The new approach road will use existing road space. With the construction works on the road space, current traffic that run on the road and make left turn along the river need to use other route. Other utilities, such as electricity and water, that may be affected will be studied and the contacts for coordination will be found during the Detailed Design Phase. <b>AC:</b> The through traffic along the coast will be recovered. The other major roads in Palu will be relieved from heavy transportation vehicles, such as dump trucks and container trailers, and road safety condition along such roads, especially near schools and hospitals, will be improved.
20	Social institutions such as social infrastructure and local decision-making institutions	D	D	The structure to be built by the Project is a reconstruction of the original bridge damaged by the earthquake at the upstream-side of the original bridge. No significant negative impact is expected.
21	Misdistribution of damage and benefit	D	D	The structure to be built by the Project is a reconstruction of the original bridge damaged by the earthquake at the upstream-side of the original bridge. No significant negative impact is expected.
22	Local conflict of interest	D	D	The structure to be built by the Project is a reconstruction of the original bridge damaged by the earthquake at the upstream-side of the original bridge. No significant negative impact is expected.
23	Cultural heritage	D	D	The structure to be built by the Project is a reconstruction of the original bridge damaged by the earthquake at the upstream-side of the original bridge. No significant negative impact is expected.
24	Landscape	D	D	The structure to be built by the Project is a reconstruction of the original bridge damaged by the earthquake at the upstream-side of the original bridge. No significant negative impact is expected.

No	Item	Evaluation		Reason for evaluation
		BC/DC	AC	
25	Gender	D	D	The structure to be built by the Project is a reconstruction of the original bridge damaged by the earthquake at the upstream-side of the original bridge. No significant negative impact is expected.
26	Children's rights	D	D	The structure to be built by the Project is a reconstruction of the original bridge damaged by the earthquake at the upstream-side of the original bridge. No significant negative impact is expected.
27	Infectious disease and HIV/AIDS	B-	D	<b>DC:</b> In case migrant workers are high risk group of HIV infection in Indonesia, and are used for the construction works, regional risk may become higher during the construction works. If stagnant water is left at the work areas or at the yard, and mosquitoes are bred there, the risk of infectious disease may become higher. <b>AC:</b> No additional risk for infectious disease is expected.
28	Occupational Health (including work safety)	B-	D	<b>DC:</b> Work accidents may occur during the construction. <b>AC:</b> No additional work accident is expected.
<b>Other</b>				
29	Accident	B-	D	<b>DC:</b> General public may be involved in accidents at or near the work areas or with transportation vehicle. <b>AC:</b> The Project is not located in or near any protected areas. The structure to be built by the Project is a reconstruction of the original bridge damaged by the earthquake at the upstream-side of the original bridge..
30	Cross-border impact, climate change	D	D	The structure to be built by the Project is a reconstruction of the original bridge damaged by the earthquake at the upstream-side of the original bridge. No significant negative impact is expected.

Evaluation:

A-: Significant Negative Impact    A+: Significant Positive Impact

B-: Some Negative Impact        B+: Some Positive Impact

C: Impacts are not clear; need more investigation

D: No Impact or Impacts are negligible; no further study required

Source: JICA Study Team

#### 12-4-4 Schedule of UKL-UPL

Environmental Permit of UKL-UPL for the Palu IV Bridge Project has been obtained on July 2020.

#### 12-4-5 Stakeholder Consultation

This project is requested for the UKL-UPL procedure. Under Indonesia's laws and regulations, stakeholder consultations do not require to the project. Therefore, it is assumed that the stakeholder consultation in the JICA guidelines will be conducted as follows.

##### (1) Stakeholder Meeting with Related Organizations

The table below shows a list of stakeholder meeting that have been conducted on the grant aid projects so far. The target persons who have discussed are administrative staff such as countries, states and cities.



Table 12-5 Stakeholder meetings for JICA on Grant Aid project

Year	Month	Day	JICA	Mission Team	National	State	City	Topics	
2019	1	9	X	X	SATGAS (Mr. Arie) Bina Marga			* Alternatives of Palu IV bridge	
		18		X	SATGAS Bina Marga			* Alternatives of Palu IV bridge	
		21	X	X				* Alternatives of Palu IV bridge	
		27	X	X				* Alternatives of Palu IV bridge	
		25		X	ATR			* Spatial Plan	
		30	X	X				* Project Schedule	
	2	1	X	X	Bina Marga			* Alternatives of Palu IV bridge	
			4		X	Ministry of Environment			* AMDAL, UKL UPL * Spatial Plan and SEA
		7	X	X	X			* JCC No.1	
		7		X	Bina Marga		Balai	* Alternatives of Palu IV bridge	
		11	X	X	X	X	X	* Seminar on Accelerating Recovery and Reconstruction in Central Sulawesi ~ Experience Sharing between Indonesia and Japan ~	
		18	X	X	X	X	X	* Alternatives of Palu IV bridge	
		22	X	X	Bina Marga			* Alternatives of Palu IV bridge	
	3	4	X	X				* Project schedule	
			11	X	X	Bina Marga T/N			* About the starting timing of Outline Design
			13	X				Balai	* Land acquisition implementation
			15	X	X	Bina Marga			* Project schedule
			18			Bina Marga T/N			* Contents of Technical Note
			24		X	SATGAS			* Alternatives of Palu IV bridge
			26		X	SATGAS		Balai	* Site inspection * Selection of recommended alternative
	4	2		X	X (Palu TF)		Mayor, Balai	* Land acquisition	

Source: JICA Study Team

## (2) Stakeholder Meeting with Public

On 27 June 2019, stakeholder meeting (SHM) for Palu IV Bridge was held in Palu Barat District office (Jalan WR. Supratman No 2) and people in and around project site and representative of related government participated. Purpose of the SHM is explanation of plan for construction activities for Palu IV Bridge. Information of SHM was announced to Palu city to head of sub-district in 24 June 2019 (3 days before) and invitation letter was distributed from Palu city to invited government and invited people via head of sub-district in 25 June 2019 (2 days before). List of invitation distribution and constitution of participants are shown in table below. To easily receive opinion from female participants in the SHM, gender balance of participants of citizens are well considered as consideration for vulnerable people.

Table 12-6 List of invitation distribution and constitution of participants

Organization/Location	Number of participants	Male or Female		Invitation
		M	F	
<b>Village</b>				
Head of West Besusu Subdistrict	1	1	-	Yes
Head of Lere Subdistrict	1	1	-	Yes
Staff of Lere Subdistrict	-	-	-	No
Staff of West Besusu Subdistrict	-	-	-	No
<b>District</b>				
Head of East Palu District	1	1	-	Yes
Head of West Palu District	1	1	-	Yes
Staff of East Palu District	1	1	-	No
Staff of West Palu District	2	2	-	No
<b>Representative land owners including in and around the project site</b>				
left-bank (Lere sub-district)	18	10	8	Yes
right bank (West Besusu sub-district)	55	23	32	Yes
<b>Police</b>				
East Palu District	-	-	-	Yes
West Palu District	1	1	-	Yes
<b>Military</b>				
East Palu District	3	3	-	Yes
West Palu District	2	2	-	Yes
<b>Local government</b>				
Bappeda Kota Palu (Regional Development Planning Agency of Palu City)	1	1	-	Yes
Dinas Pekerjaan Umum Kota Palu (Public Works Department of Palu City)	2	2	-	Yes
Dinas Perumahan dan Kawasan Permukiman Kota Palu (Department of Housing and Settlement Area of Palu City)	1	1	-	Yes
Dinas Lingkungan Hidup Kota Palu (Environmental Agency of Palu City)	1	1	-	Yes
Balai Pelaksanaan Jalan Nasional (BPJN) XIV Kota Palu (Department of National Roadways Implementation XIV of Palu City)	5	4	1	Yes
Perencanaan dan Pengawasan Jalan Nasional (P2JN) Kota Palu (National Roadways of Planning and Supervision of Palu City)	4	4	-	Yes
Satgas K5 (Task Force K5)	2	2	-	Yes
Badan Pertanahan Nasional (BPN) Kota Palu (National Land Agency of Palu City)	1	1	-	Yes
Babinsa (Village Advisory Board)	4	4	-	Yes
<b>Others</b>				
Journalist	6	6	-	No
<b>AMOUNT</b>	<b>113</b>	<b>72</b>	<b>41</b>	

Source: JICA Study Team

Contents of project, project location and area, necessity of land acquisition and relocation, and procedure of environment permit were explained and opinion was exchanged. At the end of SHM, questionnaire was distributed and collected. During opinion exchange, negative opinion for project implementation was not expressed but opinion for compensation for land acquisition and relocation was given. Palu city responded that Palu city will set up meeting for affected people to explain details after affected people is identified. After SHM, minutes of meeting was made with signature of representatives of participants of SHM. Agenda of SHM, contents of opinion exchange and contents of minutes of meeting with signature was shown in table below. Pictures of SHM was shown in figure below.

Table 12-7 Agenda of SHM

No	Agenda	Content	Speaker
1	Introduction	Purpose of the meeting and agenda of the meeting	PT PRIMA Consultant
2	Explanation of the Project back ground		BALAI Representative
3	Explanation of the Project Design	location, height, length, type of bridge, methodology of construction. etc.	BALAI Representative
4	Explanation of relocation		Dinas Pekerjaan Umum Kota Palu (Department of Public Work Palu City) and Bappeda
5	Explanation of UKL-UPL process	Stage activity, impact, and management impact	PT PRIMA Consultant
6	Q &A session		BALAI Representative

Source: JICA Study Team

Table 12-8 Opinion from participants and response from Palu city

<b>Opinion from local people</b>	
1	<ul style="list-style-type: none"> <li>· Agree with Palu IV Bridge Project Plan, as long as relocation or land compensation is clearly socialized.</li> <li>· Agree with land compensation, but area of compensation land is far from beach, for people who work as fishermen.</li> <li>· The house structure is still strong enough although already hit by earthquake, so if the land compensation from government is only Rp. 150.000 / m2, will stay and refused to hand over the land to government</li> </ul>
2	<ul style="list-style-type: none"> <li>· Agree with Palu IV Bridge Project Plan, as long as peoples land that affected by project area has to be planned for fair land compensation.</li> <li>· Socio economic aspect has to be more considered, particularly for the people who work at planned project area, as their livelihood will be affected.</li> </ul>
3	<ul style="list-style-type: none"> <li>· Shop building structure was not damaged during earthquake, but it damaged because of criminal post-earthquake</li> <li>· Government has to consider more fair land compensation, land compensation has considered fairness and equality for compensation neither to land owner or business owner</li> </ul>
4	· Government has to consider land compensation that avoid financial loss to people affected
5	<ul style="list-style-type: none"> <li>· During earthquake: his house is not damaged, but his 3 shops damaged</li> <li>· Government has to conduct land compensation in systematic way; collect data of land that is affected by the project, land compensation is not only done with land to land compensation (Huntap, 36m2 house), but has to be negotiated before agreement of land compensation</li> <li>· Need fairness during land replacement, and do not accept if the land is paid only Rp 150.000 / m2 by government</li> </ul>
6	· Boat mooring for fishermen should be built at the existing area, not moved to another village as it will be a problem for fishermen. At West Besusu Village there were 2 groups of fishermen having mooring at West Besusu, heard that the mooring will be moved all to Lere Village. Please bring back the mooring location to existing place.
<b>Response from Palu city</b>	
7	Thanked to the people which is agreed with the bridge project plan
8	Land Compensation has to follow regulation, particularly for area affected by bridge project
9	People live in dangerous zone will be relocated using Huntap scheme, 36 m2 house, certified land
10	People live in crack zone will be relocated using Huntap scheme, 36 m2 house, certified land
11	Huntap scheme (Hunian tetap / Permanent residential): <ul style="list-style-type: none"> <li>· Area: 10 x 15 m2</li> <li>· Building: 36 m2</li> <li>· Certified land, owned by people who is relocated</li> <li>· Water supply</li> <li>· Electricity supply</li> </ul>
12	Will invite National Land Agency (BPN / Badan Pertanahan Nasional) to collect data on land which is affected by project plan, and collect data about the land owner
13	The land owner whose land is affected by project area will be invited to further detail meeting regarding to land compensation.

Source: JICA Study Team

Table 12-9 Contents of minutes of meeting with signature

Contents of Minutes of Meeting	
1	Affected community agree with Planning of Palu IV Bridge Construction
2	Community ask for the principle of equality and justice in land acquisition activities
3	Need to be concerned for social-economic aspect for land owner that affected by the project, specifically whose livelihood located around the bridge.
4	Regarding land acquisition activities, there will be land data collection, total area, and the identity of affected land owner.
5	Another meeting will be conducted related land acquisition plan.
List of Signer	
1	Mr. Slamet from Department of National Roadways Implementation XIV of Palu City
2	Mr. David as Head of National Roadways of Planning and Supervision
3	Mr. Iskandar Arsyad as Head of Public Work Agency
4	Mr. Ahmad Rijal Arma from Regional Development Planning Agency of Palu City
5	Mr Yeleskiel from National land Agency
6	Mr. Iskandar from Enviromental agency
7	Mr. Kapau Bawuo as Head of West Palu District
8	Mr. Rusdin as Head of East Palu District
9	Mr. Marsuki as Head of Lere Sub-district
10	Mr. Abdul Halim as Head of West Besusu Sub-district
11	Mr. Safir as Head of West Palu Military Headquarter
12	Mr. Achman as member of East Palu Military Headquarter
13	Mr. Abdul Halik as Head of West Palu Police Department
14	Herman Mangosa as Member of West Palu Police Department
15	Mr. Arya Wicaksana from Prima Consultant

Source: JICA Study Team



Source: JICA Study Team

Figure 12-2 State of SHM

### (3) Stakeholder Meeting with Relevant Organization

Stakeholder meeting with relevant organizations was conducted. Purposes of this stakeholder meeting are 1) to provide fundamental knowledge to decide principle in the sight of geologically low risk and spatially appropriate location of infrastructure and 2) to receive their opinion and confirm their development policy. Received opinion and confirmed development policy was used for consideration for the preparation of RTRW of the spatial plan. Bappeda and Dinas PU in charge of the construction of infrastructure in Palu city, Sigi district and Donggala regency was invited. This stakeholder meetings consists of 2 parts, explanation and collecting opinion, and these were conducted separately. At first, the stakeholder meeting was conducted for purpose 1) and then another stakeholder meeting was conducted for purpose 2).



## 12-5 Environmental Impact Assessment (EIA) for Sector Loan Project

### 12-5-1 Sorting of the Target Sector Loan Projects

#### Sector Loan Project to be Proposed in 2019

As of 2019, reconstruction and rehabilitation of infrastructure and building which were damaged by the earthquake occurred, in Central Sulawesi Province were planning in the project. The project consisted of sub-projects and JICA provided supporting activities for Design & Supervision, Construction and Technical Assistance (TA). For the speeding-up of starting construction activities, implementation priority was identified as Package I (1st priority) in consideration of the following criteria points;

- Largely damaged and thus the urgency for reconstruction is high
- High demand and needs because of trunk road and/or large traffic volume.
- Implementation is easier due to little necessity for land acquisition or additional project survey is not required
- Size of construction volume is relatively small and able to be completed by the year 2020

As of end of November 2019, List of JICA Sector Loan Project to be proposed is shown in below table.

Table 12-10 List of JICA Sector Loan Project (As of end of November 2019)

No.	Name of sub project	Volume	Supporting Activity by JICA			Remark
			Design (BD/DD)	Construction Package I or II	TA	
<b>Road Sector</b>						
1	Reconstruction and major rehabilitation Tompe - Palu inner - Surumana Road	49.5 km	-	-	○	TA only
2	Integrated Road and Tsunami Mitigation Measure	4.0 km	BD	II	-	
3	Reconstruction Kalawara-Kulawi Road	12 km	BD+DD	I	-	
4	Rehabilitation and reconstruction Palupi Simoro road, Kalukubula-Kalawara, Birobilu Palolo road, access to permanent housing	29.4 km	-	-	○	TA only
5	Access Road and Main Road for Permanent Housing (Duyu, Tondo, Petobo, and Pombewe)	30 km	BD+DD	I	-	
6	Access Road to Lake Lindu	17 km	BD	II	-	
7	Reconstruction Palu inner ring road 1	25 km	BD	II	-	
8	Reconstruction Palu inner ring road 2	17 km	BD	II	-	
9	Slope counter measure and Raising on Tambu-Tompe road	7.5 km	BD	II	-	
<b>Bridge</b>						
10	Rehabilitation of the Dolago Bridge	111 m	BD	II	-	
11	Rehabilitation of the Tompe Bridge	123 m	BD	II	-	
12	Reconstruction of the Lompio Bridge	7 m	BD+DD	I	-	
13	Reconstruction of the Talise Bridge	10 m	BD+DD	I	-	
14	Rehabilitation of the Buluri Bridge	131 m	BD+DD	I	-	
15	Rehabilitation of the Palu II Bridge	120 m	BD	II	-	
16	Reconstruction of the Lompio II bridge	10 m	BD+DD	I	-	

No.	Name of sub project	Volume	Supporting Activity by JICA			Remark
			Design (BD/DD)	Construction Package I or II	TA	
<b>Irrigation</b>						
17	Rehabilitation of Irrigation Networks Gumbasa 5,500 Ha Post Earthquake: Main Canal L=23.0km(NGKn 7 toBGKn 48a), 12 Secondary canals L=26.0km, diversion gates and other necessary facilities	5,500 ha	-	-	○	TA only
18	Improvement of Gumbasa Main Channel (Lining t = 100)	9.0 km	BD+DD	II	○	
19	Improvement of agricultural systems in liquefaction-landslide area (Improvement of JonoOge secondary canal, tertiary canals, and paddy field recovery)	150 Ha	BD+DD	II	○	
<b>Tsunami Prevention</b>						
20	River Improvement (Down stream of Palu River considering tsunami countermeasures)	5.0 km	BD	II	-	
<b>Flood and Sediment Disaster Prevention</b>						
21	River Improvement and Sediment control (Middle stream of Palu River)	15.0 km	BD+DD	I	-	Only Paneki River is implemented in Package I
22	River Improvement and Sediment control (Up stream of Palu River)	120,000 ha	DD	I	-	
23	Flood and sediment disaster countermeasures against relocation areas	-	BD	II	-	
24	Polder System Pilot Project in Lende Sirenja Village	1 set	BD	II	-	
<b>Liquefaction Prevention</b>						
25	Countermeasure for Liquefaction-Landslide area	380 ha	BD	II	-	
26	Capacity Development of the Surface and Groundwater Monitoring (including telemetry system)	1 set	BD	II	-	
27	Comprehensive Watershed management Plan in Palu River Basin	1 set	BD+DD	II		
<b>Public Facilities</b>						
28	Rehabilitation of Anutapura Hospital	-	BD	I	○	TA only *Design and build work will be implemented by local contractor

Source: JICA Study Team

Table 12-11 Type of Project Subject to AMDAL

Sector / Type of activity	
<b>A. Multisector Field</b>	
1.	Reclamation of Coastal Areas and Pulau- Small island, with a. Area of reclamation $\geq 25$ ha , b. Urge material volume, or $\geq 500,000$ m <sup>3</sup> c. Reclamation length $\geq 50$ m (upright straight towards the sea from the line beach)
2.	Cutting hills and land collection with Volume $\geq 500,000$ m <sup>3</sup>

Sector / Type of activity	
3.	Taking clean water from lakes, rivers, eyes water, or other surface water sources - withdrawal debit > 250 l / sec, this is equivalent to water requirements clean 250,000 people
4.	Groundwater extraction (ground wells) shallow, ground wells in m ) $\geq$ 50 liters / second (from one or several wells in the area of <10 ha)
5.	Building construction - Land area > 5 ha, or - Buildings > 10,000 m <sup>2</sup>
<b>C. Agriculture</b>	
1.	Food crop cultivation with or without its processing unit, with an area of $\geq$ 2,000 ha
2.	Horticulture cultivation with or without its processing unit, with an area of $\geq$ 5,000 ha
3.	Plantation cultivation a. Season with or without the processing unit: 1) In non-forestry cultivation area, area $\geq$ 2,000 Ha 2) In convertible production forest area (HPK), area $\geq$ 2,000 ha b. Tahunan with or without processing unit: 1) In non-forestry cultivation area > 3,000 ha, wide 2) In convertible production forest area (HPK), area > 3,000 ha
<b>F Transportation sector</b>	
1.	Railroad Development (Train, with or without the station) a. On the surface, land (at-grade), length $\geq$ 25 km b. In underground, all lengths c. In elevated, length $\geq$ 5 km
2.	Terminal construction for passenger and terminal for transportation of goods: Area $\geq$ 5 ha
3.	a. Dredging waters with <i>capital dredging</i> - Volume > 500,000 m <sup>3</sup> b. Dredging the waters of the river and / or sea with <i>capital dredging</i> which cut batu, which is not included coral material. $\geq$ 250,000 m <sup>3</sup> or all quantities that use explosives c. dredge placement on the sea - Volume, or > 500,000 m <sup>3</sup> - Area of placement of dredge > 5 ha
4.	Construction of a port with one of the following facilities: a. Dock with the construction form <i>sheet pile</i> or <i>open pile</i> - Length, or > 200 m - Area > 6,000 m <sup>2</sup> b. Dock with massive construction All quantities c. Anchoring wave (embankments) and / or breakwater ( <i>breakwater</i> ) - Length > 200 m d. <i>Fasilitas Terapung (Floating Facility)</i> $\geq$ 10,000 DWT
5.	Development of Airport for <i>fixed wing</i> along with the facilities -Runway, length > 1,200 m -Terminal passengers or terminal Cargo Size > 10,000 m <sup>2</sup>
<b>I. Field of Public Works</b>	
1.	Development of Dams / reservoirs or other water ampungan Type T 1) high; or $\geq$ 15 m 2) reservoir capacity, or $\geq$ 500,000 m <sup>3</sup> 3) inundation area, or $\geq$ 200 ha
2.	Irrigation area a. new development with an area of $\geq$ 3,000 ha b. Increase with an additional area of $\geq$ 1,000 ha c. Development of rice fields, area (in groups) $\geq$ 500 ha
3.	Swamp Development: Swamp reclamation for irrigation purposes $\geq$ 1,000 ha
4.	Development of Beach and river mouth improvement and conservation: - Distance is calculated perpendicular to the beach $\geq$ 500 m
5.	Normalization River (included sodetan) and the Making of Flood Channels a. Big city / metropolitics - Length, or > 5 km

	<b>Sector / Type of activity</b>
	<ul style="list-style-type: none"> <li>- Dredging volume &gt; 500,000 m<sup>3</sup></li> <li>b. Medium city <ul style="list-style-type: none"> <li>- Length, or &gt; 10 km</li> <li>- Dredging volume &gt; 500,000 m<sup>3</sup></li> </ul> </li> <li>c. Rural <ul style="list-style-type: none"> <li>- Length, or &gt; 15 km</li> <li>- Dredging volume &gt; 500,000 m<sup>3</sup></li> </ul> </li> </ul>
6.	<p>Development and / or road improvement <b>Toll Road</b> that require procurement luhan outside rumija (the room belongs Street) with scale / km length (km) and scale / area scale Land acquisition (ha):</p> <ul style="list-style-type: none"> <li>a. in metropolitan city / large <ul style="list-style-type: none"> <li>- length of road with land acquisition area; or <math>\geq 5</math> km with land acquisition &gt; 10 ha</li> <li>- Land acquisition area <math>\geq 30</math> ha</li> </ul> </li> <li>b. in medium city <ul style="list-style-type: none"> <li>- the length of the road with the area of land acquisition; or <math>\geq 5</math> km by land acquisition &gt; 20 ha</li> <li>- Land acquisition area <math>\geq 30</math> ha</li> </ul> </li> <li>c. in rural <ul style="list-style-type: none"> <li>- the length of the road with the area of land acquisition; or <math>\geq 5</math> km by procuring land &gt; 30 ha</li> <li>- land acquisition area <math>\geq 40</math> ha</li> </ul> </li> </ul>
7.	<p>Development and / or widening of Road with widening which requires land acquisition (outside the road):</p> <ul style="list-style-type: none"> <li>a. in metropolitan city / large <ul style="list-style-type: none"> <li>- the length of the road with the area of land acquisition; or <math>\geq 5</math> km by procuring land <math>\geq 20</math> Ha</li> <li>- land acquisition area <math>\geq 30</math> ha</li> </ul> </li> <li>b. in medium city <ul style="list-style-type: none"> <li>- the length of the road with the area of land acquisition; or <math>\geq 5</math> km by procuring land &gt; 30 Ha</li> <li>- land acquisition area <math>\geq 40</math> ha</li> </ul> </li> <li>c. Rural <ul style="list-style-type: none"> <li>- the length of the road with the area of land acquisition; or <math>\geq 5</math> km by procuring land &gt; 40 Ha</li> <li>- wide land acquisition <math>\geq 50</math> ha</li> </ul> </li> </ul>
8.	<ul style="list-style-type: none"> <li>a. Development <i>Underpass, tunnel, flyover</i>, with a length of <math>\geq 2</math> km</li> <li>b. Bridge construction, with a length of <math>\geq 500</math> m</li> </ul>
9.	<p>Waste</p> <ul style="list-style-type: none"> <li>a. Construction of TPA domestic waste disposal system <i>controlled landfill /sanitary landfill</i> including the supporting installation <ul style="list-style-type: none"> <li>- area of TPA, or <math>\geq 10</math> ha</li> <li>- total capacity of <math>\geq 100,000</math> tons</li> </ul> </li> <li>b. TPA at tsuru tidal area, <ul style="list-style-type: none"> <li>- spacious <i>landfill</i>, or</li> <li>- All capacity / capacity total capacity</li> </ul> </li> <li>c. Development <i>transfer station</i> <ul style="list-style-type: none"> <li>- capacity of <math>\geq 500</math> tons / day</li> </ul> </li> <li>d. Waste Processing plant construction Terpadu <ul style="list-style-type: none"> <li>- Capacity of <math>\geq 500</math> tons / day</li> </ul> </li> <li>e. Processing with incinerator <ul style="list-style-type: none"> <li>- capacity All capacity</li> </ul> </li> <li>f. <i>Composting Plant</i> <ul style="list-style-type: none"> <li>- capacity of <math>\geq 500</math> tons / day</li> </ul> </li> </ul>
10.	<p>Water Domestic waste</p> <ul style="list-style-type: none"> <li>a. Development Instalasi Processing Lumpur Tinja (IPLT), including supporting facilities <ul style="list-style-type: none"> <li>- Area, or <math>\geq 2</math> ha</li> <li>- Capacity <math>11 \text{ m}^3</math> / day</li> </ul> </li> <li>b. Construction Installed of Waste Water Treatment (IPAL) waste domestic including supporting facilities <ul style="list-style-type: none"> <li>- Area, or <math>\geq 3</math> ha</li> <li>- Organic load <math>\geq 2.4</math> tons / day</li> </ul> </li> <li>c. System development water piping waste, extensive service <ul style="list-style-type: none"> <li>- Service area, or <math>\geq 500</math> ha</li> </ul> </li> </ul>



Sector / Type of activity	
	- Debit water waste $\geq 16,000 \text{ m}^3 / \text{day}$
11.	Development of drainage channel (primary and / or secondary) in settlements a. big city/ metropolitan, length $\geq 5 \text{ km}$ b. medium city, length $\geq 10 \text{ km}$
12.	Water network clean in a big / metropolitan city a. development of distribution networks - service area $\geq 500 \text{ ha}$ b. construction of a transmission network - length $\geq 10 \text{ km}$
<b>J. Field Housing and Settlement Areas</b>	
1.	Housing Construction and Settlement area with certain managers : a. Metropolitan City, area $\geq 25 \text{ ha}$ b. Large city, area $\geq 50 \text{ ha}$ c. Medium and small city, area $\geq 100 \text{ ha}$ d. For the purposes of <i>settlement</i> transmigration $\geq 2000 \text{ ha}$

Source: Law No. 32 of 2009 on Protection and Management of Environment

Table 12-12 Classification of Business and/or Activity which Required to Compile UKL-UPL Document in Sigi Regency

No.	Business/and or Activity	Unit	Scale of the business and/or activity
<b>Public Working</b>			
1.	Road and Bridge		
	a. Construction of new road with land acquisition		
	- Length	km	$\geq 1$ until $< 5$
	- Area	ha	$\geq 2$ until $< 5$
	b. Road improvement with land acquisition		
	- Length	km	$\geq 1$ until $< 5$
	- Area	ha	$\geq 2$ until $< 5$
	c. Road improvement and widening		
	- Length	km	$\geq 1$ until $< 5$
	- Area	ha	$\geq 2$ until $< 5$
	d. Construction of subway, underpass, tunnel, flyover and bridge		
	-Length	km	$\geq 0.5$ until $< 2$
	e. Bridge construction over the river		
	-Length	m	$\geq 100$ until $< 500$

Source: Regulation of Sigi Regent Number 27 of 2015

### 12-5-2 Result of EIA approval

Necessity of EIA procedure was determined for 9 subprojects of sector loan project including priority subprojects and other subprojects such as rehabilitation of bridge. As of December 2020, all required Environmental Permits have been already obtained for 6 subprojects supported by subcontractor. EIA report and Environment Permit are shown in Attachment.

In 4 subprojects of water resource sector, land is not acquired but voluntarily donated, hence agreement and signature from local people is needed in accordance with JICA Guideline. However, holding a meeting was restricted in the proposed project area due to COVID-19 and discussion only with representative of local people was organized, thus, continuous support from contractor is necessary. In river improvement and sediment control (Middle of Palu River: Paneki River) project, Traffic Agency in Sigi Regency requests to conduct traffic AMDAL and prompt action by Balai is recommended.

Table 12-13 Status of Environmental and Social Considerations Procedure for Grant Aid Project and Sector Loan Projects (As of January 2021)

S/No	Name of Sub-project	Required Procedure			Status
		EIA Permit	ANDAL ALIN	Land Acquisition/	
	Rehabilitation of the Palu IV Bridge	Approved	Not requested	Action required on the Indonesian side	Environmental Permit has been obtained on July 2020. Traffic Agency of Palu City requested to conduct ANDALALIN and complete it by construction, however, this Sub-project is rehabilitation of existing bridge and traffic volume is supposed to be not changed, thus Balai negotiated with Traffic Agency of Palu City and the request was cancelled.
Bridge and Road					
1	Reconstruction Kalaware-Kukawi Road	Approved	—	—	Environmental Permit has been obtained on February 2020.
4	Access Road and Main Road for Permanent Housing (Tondo)	—	—	—	Initially, advise such as integration of related project was given to CHIPTA KARYA, project implementation organization, for technical assistance. However, construction has been started in 2019 by Indonesia, thus any assistance is not required.
6	Rehabilitation of the Dolago Bridge	—	—	—	Environmental Permit Letter for rehabilitation plan which were prepared in the past was confirmed and this letter is accepted for activity of this sub-project. Therefore EIA procedure is not necessary again for this sub-project.
11	Rehabilitation of the Palu II Bridge	Approved	Not requested	—	Environmental Permit has been obtained on February 2020. Traffic Agency of Palu City requested to conduct traffic AMDAL and complete it by construction, however, this Sub-project is rehabilitation of existing bridge and traffic volume is supposed to be not changed, thus Balai negotiated with Traffic Agency of Palu City and the request was cancelled.
River Improvement and Sediment Control					
12	River improvement and sediment control (Middle of Palu River: Paneki River)	Approved	Action required on the Indonesian side	Action required on the Indonesian side	Environmental Permit has been obtained on December 2020. SDA / Balai and local governments will need to handle Land Donation procedures in the future. To conduct ANDALALIN procedure is requested in conditions of Environmental Permit. SDA/Balai is requested to conduct and complete it before construction starts. Cost is covered by Indonesia.
13	River improvement and sediment control (Upstream of Palu River: Poi River)	Approved	—	Action required on the Indonesian side	Environmental Permit has been obtained on March 2020. SDA / Balai and local governments will need to handle Land Donation procedures in the future.
14	River improvement and sediment control (Upstream of Palu River: Banggar River)	Approved	—	Action required on the Indonesian side	Environmental Permit has been obtained on February 2020. SDA / Balai and local governments will need to handle Land Donation procedures in the future.

S/No	Name of Sub-project	Required Procedure			Status
		EIA Permit	ANDAL ALIN	Land Acquisition/	
15	River improvement and sediment control (Salua/Saluki River)	Approved	—	Action required on the Indonesian side	Environmental Permit has been obtained on February 2020. SDA / Balai and local governments will need to handle Land Donation procedures in the future.
Public Facilities					
16	Rehabilitation of Anutapura Hospital	—	—	—	For technical assistance, UKL-UPL report which were prepared in the past for construction of the hospital was received from Environment Agency of Macassar and shared with project proponent. According to Environment Agency of South Sulawesi Province, EIA procedure is not newly necessary so far, however necessity of EIA depends on size of hospital to be reconstructed.

Source: JICA Study Team

Environment check lists for grant aid project and sector loan project were prepared and shown in the attachment.

### 12-5-3 Lessons and Recommendation

#### (1) Certain Implementation of EMP and EMoP

Environmental Permit was obtained for grant aid project and 6 sector loan projects through UKL-UPL procedure. EMP and EMoP were prepared in the procedure of UKL-UPL, thus contractor is requested to construct in compliance with EMP and EMoP.

#### (2) EIA procedure and other procedure related to environment in Indonesia

In this project, EIA was requested for each sector loan project based on regulation in Indonesia. The necessary EIA approval process is already done by 2020. However, though the influence of COVID-19 cannot be ignored, the approval process for some of the projects took time because landslide occurred again in the project site for river improvement, and the project plan was reconsidered, and a revised plan was reflected the EIA report. A local government that is examination authority was supportive of the proceeding procedure and requested an unreasonable procedure such as traffic AMDAL. Prompt action is important for a disaster restoration project; therefore, Balai is recommended to take the initiative and discuss and form a consensus with the related organization in advance to simplify the EIA procedure for the disaster restoration project. In addition, regarding River improvement and sediment control (Middle of Palu River: Paneki River), Balai is required to promptly implement necessary environment-related procedures such as ANDALALIN in addition to EIA.

#### (3) Land acquisition (Land Donation)

Land Donation that land is voluntarily provided by landowner without compensation is included in this project. In land donation procedure, it is necessary to explain to each landowner respectively in advance and decide area and location of land to be donated based on confirmation by landowner and

Government through site survey. However, site survey could not be conducted in this study due to COVID-19, hence contractor is responsible for conducting the site survey. Land Donation should not be conducted forcibly without prior agreement, thus plan and transaction should be duly considered to minimize landowner's disadvantage and careful communication with landowner is recommended.



## Chapter 13 Assistance for Implementation of Resettlement and Land Acquisition Plan (LARAP)

### 13-1 Land Acquisition Laws and Regulations

Indonesia enacted a new land acquisition law; Presidential Regulation No. 2 of 2012 for Land Acquisition for the Development for the Public Interest and its implementing regulations as shown in below Table. These regulations provide clear, time-bound procedures for land acquisition for the construction for the public interest carried out by the government in Indonesia.

Table 13-1 National Regulations related to Land Acquisition for the Development for the Public Interest

Name of Regulation	Outline
Presidential Regulation No.2 of 2012 for Land Acquisition for the Development for the Public Interest	Clear procedure and timeframe for land acquisition for the public interest carried out by the government, involving all stakeholders
President of the Republic of Indonesia Regulation No. 71 of 2012	Implementation regulations of Presidential Regulation No.2 of 2012 Amended by No.40 of 2014, No.99 of 2014, No.30 of 2015 and No.48 of 2015
Head of BPN Regulation No.5 of 2012	Technical Guidelines for Land Acquisition
Ministry of Home Affairs Regulation No. 72 of 2012	Operating Costs and Supporting Cost of Implementation of Land Acquisition for the Development of the Public Interest that Source from the Local Government Budget
Ministry of Finance Regulation No. 13/PKM.02 of 2013	Operating and Supporting Cost of Implementation of Land Acquisition for the Development of the Public Interest that source from the State Budget

Source: JICA Survey Team

These regulations stipulate the implementation procedure of land acquisition for the development for the public interest through the four stages, i.e. planning, preparation, implementation and delivery of result, as shown in below Table.

Table 13-2 Implementation Procedure of Land Acquisition for the Development for the Public Interest

Stage	Procedure
Planning	<ol style="list-style-type: none"> <li>1) The Agency which requires the land shall prepare the Plan of Land Procurement for Public Interest prepared based on feasibility study The Plan of Land Procurement for Public Interest should include at least the following contents; <ul style="list-style-type: none"> <li>• Principles and objectives of development plan</li> <li>• The compatibility with regional spatial layout plan and regional development plan</li> <li>• Location of the land</li> <li>• Size of land required</li> <li>• General description of the land status</li> <li>• Approximate time of land procurement implementation</li> <li>• Approximate period of construction</li> <li>• Approximate value of the land</li> <li>• Budgeting plan</li> </ul> </li> <li>2) The Plan of Land Procurement for Public Interest is submitted to provincial government.</li> </ol>
Preparation	<ol style="list-style-type: none"> <li>1) The Executing Agency together with provincial government shall notify the development plan that should be presented to the public on development location plan for Public Interest, either direct or indirectly.</li> <li>2) The Executing Agency together with provincial government shall conduct initial data collection, comprises initial data collection activity of Entitled Party and Land Procurement Object, at the latest 30 (thirty) days since the date of development plan notification.</li> <li>3) The Executing Agency together with provincial government shall conduct the Public Consultation of development plan not later than 60 (sixty) working days period in order to achieve an agreement regarding location of the development plan from the Entitled Party. <i>*If there are parties who object to the construction location plan in 60 working days after the first consultation, Public Consultation with the objection party shall be repeated within 30 (thirty) working days at the latest.</i></li> <li>4) Based on the agreement with the Entitled Party, the Executing Agency shall submit an application of location determination to governor.</li> </ol>

	<p>5) Governor shall determine the location at the latest of 14 (fourteen) working days since the application of location determination received from the Executing Agency. (Location determination of the construction for Public Interest is granted within 2 (two) years and may be extended in maximum 1 (one) year)</p> <p>6) Governor with the Executing Agency shall announce the location determination of construction for Public Interest to notify the respective society that the construction for Public Interest will be conducted on such location.  <i>* If there is still objection exists, the Entitled Party of the determined location may submit a claim to a respective State Administrative Court at the latest 30 (thirty) working days period since the issuance of determined location.</i></p>
Implementation	<p>1) The Executing Agency shall submit the application of Land Procurement implementation, which includes the following contents, to the Land Agency</p> <ul style="list-style-type: none"> <li>• Inventory and identification of control, ownership, use, and utilization of land</li> <li>• Appraisal of Compensation</li> <li>• Deliberation on the Compensation determination</li> <li>• Distribution of Compensation</li> <li>• Relinquishment of Agency's land</li> </ul> <p><i>* Inventory and identification of control, ownership, use, and utilization of land is conducted in the latest period of 30 (thirty) working days</i>  <i>The result of inventory and identification of control, ownership, use, and utilization of land must be announced in the village administration office, sub-district office, and in the location where the Land Procurement is exercised, at the latest of 14 (fourteen) working days.</i>  <i>The Entitled Party may submit objection to the Land Agency at the latest of 14 (fourteen) working days since the announcement of inventory result if they don't accept the inventory result.</i></p> <p>2) The Land Agency determines the Appraiser, then the determined Appraiser assesses the compensation value per land, including land, space above and under the ground, building, plants, objects related to land, and/or other losses that can be assessed.</p> <p>3) The amount of Compensation value based on the result of Appraiser's assessment shall be delivered to the Land Agency along with the minutes.</p> <p>4) The Land Agency conducts deliberation with the Entitled Party at the latest period of 30 (thirty) working days since the assessment result from the Appraiser delivered to the Land Agency.  <i>* The Entitled Party may submit objection to the relevant district court at the latest period of 14 (fourteen) working days after the deliberation on determination of Compensation, if they don't agree on it.</i></p>
Delivery of Result	<p>1) The Land Agency deliver the Land Procurement result to the Executing Agency.</p> <p>2) The Executing Agency may start conducting the construction activities after the delivery of Land Procurement result.</p>

Source: Arranged by the JICA Study Team based on Presidential Regulation No.2 of 2012

Other key features of Indonesia's land acquisition law and regulations are as follows:

- i) The agencies or institutions that are eligible to acquire land through Law No. 2 include any state, institution, ministry and non-ministry government institution, provincial government, district or city government, and state-owned legal entity/state-owned entity that is assigned by the Government. The government can also acquire land through cooperation with state-owned enterprises, regional government-owned enterprises, and public-private partnerships (PPPs).
- ii) Law No. 2 of 2012 strengthened protection of the rights of property owners through requirements on stakeholder consultations and involvement as well as through feasible and equitable compensation or indemnification. The law provides several forms of compensation including resettlement of displaced property owners. The law ensures replacement value for the compensation so that entitled parties losing their land and nonland assets are able to live better. While the law covers compensation for non-titled property holders in cases in which land acquisition is required, it does not apply to cases where there is no acquisition (e.g., when the land is publicly owned), in which case the land is cleared according to Basic Agrarian Law No 5 of 1960.

## 13-2 Necessity of Land Acquisition for the Project

In coastal area including Palu IV bridge, resettlement and land acquisition are implemented by Government of Indonesia for the purpose of procedure for spatial plan for the disaster, thus land acquisition is not implemented for the purpose of this project individually. Because the project area is tsunami-devasted area, currently nobody lives there. JICA Study Team assisted for discussion between landowners in the project area and Government of Indonesia in the EIA procedure.

In the project area for sector loan project, project plans were considered to avoid resettlement and land acquisition at the planning phase for each project. However, land donation is necessary to implement for 4 subprojects of water resource sector in the future.

## 13-3 Land Donation

Private land is included in the project area for sediment control facilities in 4 projects of water resource sector, Banggar, Salua, Poi, and Paneki, and the private land is planned to be donated (Land Donation).

Voluntary land donation is defined as the ceding of a property by an owner who is: (a) appropriately informed; and (b) can exercise free will, that is, can refuse to donate. There are situations in which people are willing to donate a portion of their land for project purposes for no compensation or reduced compensation. Voluntary land donations involve some monetary or non-monetary benefits or incentives provided to the land donor by the project or by community members benefiting from a project. Both can be broadly classified as a “voluntary land donation,” because the transfer of assets takes place without payment of compensation at replacement value.

According to JICA safeguard section, voluntary land donations are required to be satisfied with following six conditions;

- The potential donor or donors have been appropriately informed and consulted about the project and the choices available to them.
- Potential donors are aware that refusal is an option, and have confirmed in writing their willingness to proceed with the donation
- The amount of land being donated is minor and will not reduce the donor’s remaining land area below that required to maintain the donor’s livelihood at current levels
- No household relocation is involved
- The donor is expected to benefit directly from the project
- For community or collective land, donation can only occur with the consent of individuals using or occupying the land. The borrower will maintain a transparent record of all consultations and agreements reached.

Almost all land to be donated is hilly land along with river and land being used for any purpose is most probably not included. According to representative of local people, all landowners are villagers and they are beneficiary of sediment control project. In SHM of each project area, provision of land without compensation as Land Donation is promoted to participated local people and there is no

negative opinion and positive opinions are received. However, landowners have not been completely identified yet, thus it is not clear yet whether all landowners participated SHM.

As of February 2020, considering these situation and period until construction, SHM was planned to be organized again to invite villagers who are identified as landowner and explain Land Donation and get tentative agreement with them once it's possible to conduct site survey. A series of these site survey was planned to be assisted by subcontractor hired by JICA Study Team, however, it was difficult to conduct the survey because of COVID-19. Prior explanation regarding Land Donation from Sigi Regency to landowners was recommended to Government of Indonesia.

It was also recommended that detailed area of land is confirmed through site survey by contractor with landowner and an agreement is prepared again before construction. The sample of the land donation document is shown in the next box.



**CERTIFICATE OF LAND/ASSET TRANSFER for VOLUNTARY DONATION**  
 Surat Pernyataan Penyerahan Hak Milik untuk Sumbangan Sukarela

I, the undersigned here

Saya, yang bertanda tangan di bawah ini

Name :  
 Name  
 Age :  
 Umur

Nationality :  
 Kebangsaan

Occupation :  
 Kepemilikan

Residence Located in :  
 Bertempat tinggal di

Village :  
 Desa

Sub District :  
 Kecamatan

District :  
 Kabupaten

Province :  
 Propinsi

1. I confirm that I have been previously informed regarding description and objectives of River Improvement and Sediment Control activity in Bangga River which beneficial as early treatment for potential of floods and sediment run off in Bangga River, Bangga Village, South Dolo District, Sigi Regency. Saya menyatakan bahwa saya telah mengetahui tentang deskripsi dan tujuan kegiatan normalisasi dan kontrol sedimen Sungai Bangga yang bermanfaat sebagai penanganan dini terhadap potensi banjir dan limpasan sedimen yang terjadi di Sungai Bangga, Desa Bangga, Kecamatan Dolo Selatan, Kabupaten Sigi.

2. Certify that I have been previously informed by local authority of my right to entitle compensation for any loss of property (house, land and trees) that might be caused by the construction of sediment capture building and its supporting facilities for river improvement and sediment control activity of Bangga River.

In Village : Bangga, District : South Dolo, Regency : Sigi

Menyatakan bahwa saya telah mengetahui tentang kompensasi terhadap penyerahan hak milik saya atas kepemilikan Rumah, Tanah dan Pohon yang mungkin diperlukan untuk pembangunan bangunan penangkap sedimen dan bangunan pelengkap untuk kegiatan Normalisasi dan Kontrol Sedimen Sungai Bangga.

Di Desa : Bangga, Kecamatan : Dolo Selatan, Kabupaten : Sigi

3. I confirm that I agree/disagree to voluntarily donate the land of .....square meters located in Village: Bangga, District: South Dolo, Regency : Sigi  
 Saya menyatakan setuju/tidak setuju untuk suka rela menerima kehilangan atas tanah seluas.....m2 yang terletak di desa : Bangga, Kecamatan: Dolo Selatan, Kabupaten Sigi.

Figure 13-1 Sample of Land Donation Letter(1)

I also confirm that do not request any compensation and would request to consider this as my contribution and participation to the project.

Saya juga menyatakan bahwa Saya tidak meminta kompensasi dan meminta untuk dipertimbangkan sebagai sumbangan dan partisipasi saya terhadap proyek.

**1. Type and loss value of the donated asset is as follows**

Jenis dan Nilai kerugian atas aset yang disumbangkan adalah sebagai berikut:

<u>Type of Loss</u> Jenis Kerugian	<u>Quantity</u> Banyaknya	<u>Unit</u> Satuan	<u>Unit Rate</u> Nilai Satuan	<u>Total</u> Total Nilai	<u>Comment</u> Catatan
Land/ Lahan		M <sup>2</sup>			
Tress/Pohon		Batang			
<b>Total</b>					

2. I confirm that the amount of land being donated is minor and will not reduce the remaining land area below that required to maintain my livelihood at current level.

Saya menyatakan bahwa jumlah lahan yang saya donasikan hanya sebagian kecil dari jumlah lahan yang saya miliki dan tidak akan mengurangi luas lahan yang saya butuhkan untuk mempertahankan kehidupan saya pada saat ini.

I also confirm that there is no liveable buiding in the land being donated, thus the relocation is not required.

Saya juga menyatakan bahwa tidak ada bangunan yang ditinggali pada lahan yang saya donasikan. Sehingga tidak diperlukan adanya relokasi.

Therefore, I prepare and sign this certificate for the proof of my decision.

Demikian, saya membuat dan menandatangani pernyataan sebagai bukti atas keputusan saya

....., ..... 20.....

The owner of the land

Pemilik Tanah

( \_\_\_\_\_ )

Witnesses:

Saksi-Saksi:

1. \_\_\_\_\_ :

2. \_\_\_\_\_ :

3. \_\_\_\_\_ :

4. \_\_\_\_\_ :

Certified by:

The Chief of the Village \_\_\_\_\_

Kepala Desa: \_\_\_\_\_

The Chief of Sub District \_\_\_\_\_

Kepala Kantor Kecamatan \_\_\_\_\_

Figure 13-2 Sample of Land Donation Letter(2)

## 13-4 Assisting the Land Acquisition in the Coastal Areas

### ➤ Organizing Issues related to the land acquisition

In Indonesia, regulation for land acquisition for public interests is stipulated under "Law of the Republic of Indonesia Number 2 of 2012 on Land Acquisition for Development for the Public Interest" and other related laws and regulations. Providing a permanent housing with a unify land size/building size as provided by the Ministry of Public Works called HUNTAP, is not possible due to inability to prepare a huge budget for the land acquisition in a statutory manner. On the other hand, the compensation will be provided for a livelihood recovery (fisherman's pier, stalls, cafes, etc.)

The Indonesian government had an opinion that the area has under-value because most of the movable/immovable properties in the coastal area had been flowed out by the disaster and the land is frequently flooded. However, based on the land registry map before the disaster, there are large differences area of each parcel, and the value of each property owned by each landowner was estimated to be different. Therefore, providing a unify land size/building size HUNTAP plots and livelihood recovery as a compensation may not be sufficient to the affected residents, especially for those whose originally owned large property.

Table 13-3 below shows comparisons between current condition and JICA's Environmental and Social Considerations Guidelines (April 2010). Although the relocation project is not JICA ODA project, it is shown in the table for reference because it is closely related to the Palu IV Bridge Project which is a JICA ODA project.

Table 13-3 Gap comparison with JICA Guideline

No.	JICA Guideline	Current policy of Indonesian government	Gap comparison with JICA Guideline
1	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.	<p>① <b>The Reconstruction of Palu IV Bridges in Central Sulawesi Province</b> The Palu IV bridge was designed to avoid impact to the remaining houses on the right bank side. On the left bank side, all the houses were swept away by the tsunami and the whole area was expected to be designated as ZRB4 (area with high future tsunami hazard and mass relocation) and no special design considerations have been made.</p> <p>② <b>Relocation project</b> For the safety reason, the ZRB4 area of ATR's 2018 ZRB map is 200m or 100m wide from the coastline, with no consideration for remaining houses or loss of livelihoods. The range of the ZRB4 area is being adjusted on the Indonesian side as of March 2021.</p>	<p>The Palu IV Bridge reconstruction project area is the entire ZRB4 range and it is already unoccupied by residents due to the tsunami.</p> <p>No consideration was given to involuntary resettlement in designating ZRB4 as the target area for resettlement, and there is a gap with JICA GL.</p>
2	When, after such an examination, avoidance is proved unfeasible, effective measures to minimize impact and to compensate for losses must be agreed upon with the people who will be affected.	<p>① <b>The Reconstruction of Palu IV Bridges in Central Sulawesi Province</b> According to Palu City, in negotiation with the affected residents, the above compensations have been generally agreed verbally, but obtaining a written agreement is not yet completed.</p> <p>② <b>Relocation project</b> All residents in the ZRB4 area are planned to be relocated to HUNTAP, regardless of their</p>	<p>There is no gap with JICA GL if the residents of the land covered by the project agree on the compensation method.</p>

No.	JICA Guideline	Current policy of Indonesian government	Gap comparison with JICA Guideline
		<p>circumstances, and their original land ownership will be lost after the relocation to HUNTAP. The relocated households will be compensated with land and house in HUNTAP, and monetary compensation for the land subject to ZRB4 will be provided. In addition, as a means of recovering the livelihoods, measures such as giving them spaces to set up shops, cafes and markets in the relocation site or in the coastal area, and granting the fishermen the right to use public boat dock and fish market are being considered.</p>	<p>Regarding the relocation projects in the ZRB4 area, the local government has held several briefings to the residents and made door-to-door visits, but the agreement from residents has not been obtained. A response to the loss of livelihoods has been considered. As an individual response for each household, effort to minimize the impact such as giving monetary compensation is being considered. Gaps are unlikely to occur with JICA GL.</p>
3	<p>People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by project proponents etc. in a timely manner.</p>	<p>The only property eligible for compensation is the land, because the buildings and other assets were lost in the disaster. Residents in the ZRB4 area will be given a unify ownership of one parcel in HUNTAP per household, and will be able to use the space within the HUNTAP to develop business and commercial facilities as a means of livelihood recovery. In the future, the right to use public commercial facilities that are planned to be developed in ZRB4 will be provided free of charge.</p>	<p>The value and size of the original land varies for each affected resident, and the one who had larger original property might get inadequate compensation. Gaps are likely to occur with JICA GL.</p>
4	<p>Prior compensation, at full replacement cost, must be provided as much as possible.</p>	<p>At the moment, only land is eligible for compensation, as buildings and other assets were lost in the tsunami disaster. One household will be given ownership of one parcel land and building of HUNTAP as a mass relocation project, regardless of the value of the original property. However, there is a policy not to sale or lease the HUNTAP land and buildings.</p>	<p>The value and size of the original land varies from one unit to another, and compensation for affected residents with larger original property might be insufficient. Monetary compensation is being considered to minimize the gaps with JICA GL.</p>
5	<p>Host countries must make efforts to enable people affected by projects and to improve their standard of living, income opportunities, and production levels, or at least to restore these to pre-project levels. Measures to achieve this may include: providing land and monetary compensation for losses (to cover land and property losses), supporting means for an alternative sustainable livelihood, and providing the expenses necessary for the relocation and re-establishment of communities at resettlement sites.</p>	<p>Compensation and other support for the disaster and relocation project in the ZRB4 area is a uniform relocation for each household to one HUNTAP parcel, with granted rights before relocation. After the relocation, residents will be given additional rights to use public facilities as a means of livelihood recovery.</p>	<p>This is a disaster recovery project and the target residents no longer live in the project area. Therefore, there is no gap with JICA GL if "before relocation" is defined as before moving to HUNTAP.</p>
6	<p>For projects that will result in large-scale involuntary resettlement, resettlement action</p>	<p>The Land Acquisition and Resettlement Action Plan (LARAP) for the relocation projects driven by Palu City and PU which targeted for ZRB4 areas is being prepared by BPBN and BPBD with</p>	<p>At the moment, as LARAP by the World Bank is not published, there is a gap with JICA GL which was</p>



No.	JICA Guideline	Current policy of Indonesian government	Gap comparison with JICA Guideline
	plans must be prepared and made available to the public.	the support of the World Bank, and currently is not published.	published earlier, and the gap with the content of the LARAP is not clear. LARAP needs to be obtained and contents should be confirmed.
7	In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance.	At the moment, LARAP implementation method has not been finalized.	Same as above.
8	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. It is desirable that the resettlement action plan include elements laid out in the World Bank Safeguard Policy, OP 4.12, Appendix A.	At the moment, LARAP implementation method has not been finalized. However, consultations with affected residents have been conducted by the local agency in charge of the Palu IV Bridge Project, and the method of explanation and consultation has been adapted to the local situation.	Same as above.
9	Appropriate participation by affected people and their communities must be promoted in the planning, implementation, and monitoring of resettlement action plans and measures to prevent the loss of their means of livelihood.	For relocation of residents in the designated ZRB4 area, one parcel land in HUNTAP will be provided. When they moved to HUNTARA, a livelihood recovery support compensation called "Basic Necessity Assistance" will be given for two months. In consultation with the residents who cannot live far away from the original land such as coastal fisherman and farmers, satellite HUNTARA area located in other than ZRD area is designated. To secure the livelihood in HUNTARA, support on the housing reconstruction is considered.	Pilot activities in the Palu IV Bridge Project are reflecting the needs of the residents, such as providing fishery facility development plan. It is necessary to continue the monitoring. In some cases, measures were taken such as relocating the drink stand vendors along the coastal area to City Forest Park, which is the target for disaster relocation area. But no measures have been taken other than payment benefits for the residents of ZRB area who agreed to relocate.
10	In addition, appropriate and accessible grievance mechanisms must be established for the affected people and their communities.	At the moment, there is no grievance mechanism for relocation has been set up, and complaints on consultation and compensation for affected land and buildings are mainly brought to the BPN of Palu City, where staff members are available for hearings and advice as appropriate.	There is a gap with JICA GL as no grievance mechanism has been set up for the relocation project.

Source: JICA Study Team based on the JICA guidelines for Environmental and Social Considerations April 2010, Updated by JICA Study Team in March 2021

### 13-5 Points to be considered for Resettlement and Compensation under the Disaster Recovery Project

In general, the resettlement compensation in disaster damaged areas under this recovery project is handled and responsible by the Indonesian government through relocation process to HUNTAP sites. However, this compensation program has not been finalized and set as a general mechanism by the end of February, 2021, therefore the following two compensation options shall be considered for resettlement process with particular consideration to be taken into account.

1. Original HUNTAP resettlement to be proceeded as planned.
2. Based on each living condition, environment, income level and others before the disaster occurrence, appropriate compensation amount calculated in accordance with the government regulation to be paid as official compensation (Government shall not be responsible for land, building, business, employment, etc. after the completion of compensation payment.).

It is important to promote and implement the resettlement program to secure people's safety after the disaster occurrence under the recovery project. Through the disaster damage recovery program, it is necessary to implement the resettlement based on new government order, policy, regulation and plan, by incorporating new disaster-prone area designation, improving infrastructure for disaster prevention, new land use control, etc. Thus, the points listed hereafter should be carefully and properly evaluated as well as applied as basic condition to be followed in accordance with the environmental and social consideration points of view. Preparation of compensation policy and action plan shall be made by publicly open method instead of individual consultation, and all information shall be recorded as public document and open to public.

- Compensation of necessary house and its living environment that should have the same level of quality and functionality existed before the disaster occurrence (additional function or quality with levels other than originally existed level shall be borne by affected people themselves (individual, family, household, etc.) as their responsibility).
- Compensation to secure the income base level without formulating any new forced change or control over their working or employment condition.
- Compensation to secure access to regional functions and places, such as access to markets, ports, farm lands, river, sea, etc., related to affected people's business, work, employment, etc., as well as to secure these general level of access qualities.
- Compensation to secure access to social services and functions, such as government services, schools, medical services, etc., that affected people (individuals and/or families) originally had before the disaster occurrence by each household (individual).
- Compensation including resettlement to secure connections, networks and attachment of affected people's (individuals and/or families) with or to communities, values of culture, customs and religions, etc.

Based on the above described condition, following recommendations are suggested for the Indonesian governments' action toward HUNTAP resettlement and compensation.

#### 1. In case of HUNTAP Resettlement

- ✓ Size and function of house to be included in HUNTAP should be designed and constructed in several variations to match with multiple living condition and size of affected people before disaster occurrence (current HUNTAP house development by the government provides one house type for resettlement, and this condition cannot provide various options to each affected people's household concerned of the original living condition before the disaster occurrence).
- ✓ The living condition evaluation survey for land before the disaster occurrence and land in resettlement site shall be implemented by both government officials and actual affected people (individual, family, etc.), regional or community leader(s) and any necessary person as third party

if required. The evaluation might be implemented utilizing satellite photo/images, land registration record, family record, and affected people owned photos, etc. in order to make evaluation as objective as possible with the data, and prepare a report.

- ✓ Living condition and family structure of each affected family before the disaster occurrence should be objectively evaluated and reported together with individual interview to each person.
- ✓ Each HUNTAP area development should be implemented with effective transportation service network to the existing markets and/or industrial activity sites located in the original living area as much as possible (Many families or individuals may keep working in the same business sectors or jobs that they originally have been working for, and these businesses or jobs may be strongly connected or related to the industries or markets linked with original living area/district. Therefore, such relationship or connectivity should be secured as much as possible). As examples, coastal areas (for fishery oriented workers), farmlands (agriculture oriented workers), markets (retail and service workers), manufacturing centers, and others are considered with wide business and job needs and opportunities.
- ✓ Each HUNTAP area shall be developed with basic social services and facilities (schools, medical, government, etc.) to provide appropriate services based on planned population and number of households.
- ✓ Industrial related facilities and functions (these may include markets and functions that were spontaneously formed in the past) existed before the disaster occurrence should be integrally developed in disaster affected and damaged areas that correspond to each HUNTAP area to support affected peoples' livelihood recovery activities (number of affected people, who need working conditions that they had before the disaster occurrence, is assumedly large. For instance, fishery and agricultural industry workers. Therefore necessary facilities, functions and places existed in the affected areas should be provided, promoted or consulted for establishment).
- ✓ Resettlement site should be selected based on the demand or preference of each affected family or household as much as possible. A government compensation responsibility toward work/job opportunity and condition might be flexible, if a different resettlement location was chosen by an affected family or household other than the originally planned site.
- ✓ Preparation of compensation policy and action plan shall be made by publicly open method instead of individual consultation. The compensation plan and policy should be carefully explained to each the person subject to compensation with implementation schedule, definition of compensation recipient, evaluation method of living condition and environment before disaster occurrence, etc. These public explanation and hearings should be conducted under a fair condition to all participants without discrimination by region and gender in order to avoid any influence by small groups or individuals over straight forward decision making.
- ✓ A final compensation plan should also be publicly explained by the same method, and further explanation of how all comments and/or concerns have been dealt with should be given. A contact point of executing agency should be established to receive consultations, complaints and grievances.

## 2. In case of Compensation by Payment

Each compensation amount shall be properly calculated based on the government law/regulation to set an appropriate compensation. The following criteria should be well taken into account to set a compensation amount.

- ✓ Properly evaluate size and service equipment of each house, which were a living basis before disaster occurrence.
- ✓ Properly evaluate total income amount of each household based on the government law and regulation with evaluation of working environment that made to bring income and location and evaluation of distances and other conditions between working location and their house (this could properly evaluate opportunity cost effectiveness that could be lost).
- ✓ Based on the above calculated household income, properly set the amount of compensation by number of months in accordance with the concerned law and regulation.
- ✓ Properly calculate and include the additionally necessary cost for construction to fulfill required facilities, which are considered necessary to set the equal living condition at the new location.
- ✓ Properly add any additional cost necessary based on the location oriented particular condition other than above (positively existing conditions at a new site should not be subtracted).
- ✓ Above evaluation and calculation method, unit prices, law/regulation based conditions, etc. for the compensation cost calculation should be thoroughly and clearly explained to let all recipients understand, and these should be fully published.
- ✓ By signing the agreement with each affected recipient family (individual), a compensation will be implemented and the process should be completed.
- ✓ Preparation of compensation policy and action plan shall be made by publicly open method instead of individual consultation, and all information shall be recorded as public document and open to all.

Both cases described above are considered for implementation, each disaster affected recipient (household, family or individual) has a right to choose either method of compensation at their will. In case of HUNTAP resettlement compensation method with large living condition gap between compensation and their previous living condition, it is highly recommended that this condition should be well treated with additional payment to fulfil the gap.

### 13-6 Recommendation

- For Land Donation on four projects in the water resources sector, regarding the exact area of Land Donation, the JICA Study Team suggested the contractors to reconfirm the exact Land Donation area before starting the construction and re-acquire the agreement.
- For land acquisition in the coastal areas, the JICA Study Team suggested that the compensation shall be equivalent to the value of the assets of each landowner and the implementation shall be based on the Land Acquisition Law of Indonesia.

If either relocation to HUNTAP or payment for compensation are provided, the JICA Study team suggested the person subject to compensation to choose one of the option on their own will. If only HUNTAP is provided, when there is a big gap in their life before the disaster, it is recommended to take flexible measures such as giving compensation by payment.



## Chapter 14 Lessons and Recommendations

### (1) Realization of the “Build Back Better (BBB)” Concept at the implementation stage of infrastructure projects

The Build Back Better (BBB) concept was incorporated into the recovery M/P developed by Bappenas in December 2018. In order to promote the BBB concept, more specific survey methods, design policies, quality control methods, and draft specifications were described in the reference manual and draft bidding documents, and shared with the PUPR staff in the project. In particular, it seemed necessary to further improve the management skills of PUPR personnel through field experience in the areas of seismic reinforcement methods for bridges, ensuring safety through emergency measures in the event of a disaster, and concrete quality control for public facilities.

The reconstruction will move to the implementation stage of infrastructure projects after the completion of the project. It is expected that the concept and design of BBB supported by the project will be shared among the PUPR staff, utilized in the design and construction coordination meetings, and seamlessly transferred to the project implementation stage, and resilient infrastructure development will be realized.

### (2) Review of infrastructure packages in light of landform modification and damage caused by frequent river disasters

Since the earthquake in September 2018, the region has been experiencing frequent river flooding and sediment runoff due to heavy rains. In light of the landform modification and damage, the contents of infrastructure planning for the subprojects covered by JICA's grant aid projects have been reviewed.

After the completion of the project, the reconstruction will move to the implementation stage of the infrastructure projects, but in the event of a similar disaster in the future, the PUPR staff will review the infrastructure plan as needed. It is expected that PUPR's system for implementation will be established, and budget will be secured to realize the emergency measures to minimize secondary damage and the infrastructure projects that contribute to DRR based on the factors of the disaster.

### (3) Simplification of procedures for environmental and social considerations based on the characteristics of disaster recovery projects

The infrastructure reconstruction project will require EIA procedures referring to the laws and regulations of Indonesia. As landslides occurred again in the area of the river improvement project, a review of the plan was reflected in the EIA report, which took a lot of time to be approved by the EIA procedure. In addition, there were a number of cases where procedures not appropriate for disaster recovery projects were required, such as request to conduct a traffic EIA for a project that did not affect the existing road traffic conditions.

PUPR, as the implementing agency of the infrastructure projects, is expected to take the lead in coordinating with the relevant agencies to simplify the EIA procedures as speed is very important for disaster recovery projects.

#### (4) Promotion of infrastructure restoration projects in coastal areas that will become symbols of earthquake recovery and reconstruction

The coastal area of Palu's downtown is an area where many infrastructure were damaged by the tsunami and earthquake, including the Palu IV Bridge, a symbol of the area. Risk mitigation measures planned for this area include the establishment of safe areas (to reduce exposure) through land use regulations and building restrictions, the deterrence and mitigation of tsunami flooding through the use of elevated roads, and the development of infrastructure that is resilient to earthquake disasters (restoration of the Palu IV Bridge).

As of January 2021, Palu City is in the process of acquiring land for the Palu IV Bridge, and it is expected that Palu City will provide compensation equivalent to the value of each landowner's property for the acquisition of land for the infrastructure projects, including the Palu IV Bridge, in accordance with the Land Acquisition Law of Indonesia. It is also expected that ATR will approve RDTR for evacuation plans of coastal areas, parks, and ship mooring facilities, and that PUPR will facilitate the ordering procedures for the infrastructure rehabilitation projects such as elevated roads with the addition of maintenance plans for the required height of elevated roads and management systems. The formulation of this evacuation plan should be the initiative of the local government and local residents. In order to realize a more resilient society, local governments are expected to make various coordination so that women, the elderly, and various household members can participate from the early stages of the formulation process and be proactively involved in decision-making.

National Development Planning Agency (BAPPENAS)

**Project for Development of Regional  
Disaster Risk Resilience Plan in Central  
Sulawesi in the Republic of Indonesia**

**FINAL REPORT  
(Volume V)**

**November 2021**

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)**

**JICA Expert, Comprehensive Disaster Risk Reduction, BNPB  
JICA Expert, Integrated Water Resources Management, PUPR**

**Yachiyo Engineering Co., Ltd.  
Oriental Consultants Global Co., Ltd.  
Nippon Koei Co., Ltd.  
Pacific Consultants Co., Ltd.  
PASCO CORPORATION**

IM
JR
21-053

## Preface

In response to a request from the Government of Indonesia, the Japan International Cooperation Agency (hereinafter referred to as “JICA”) assisted on understanding the disaster situation and formulated a Reconstruction Master Plan. The assistance started by dispatching the first survey team to collect information on the disaster situation and emergency assistance in October 2018. In addition, discussions on future seamless recovery and reconstruction assistance measures were held with related Indonesian organizations, such as Bappenas. As a result, the Indonesian government requested JICA to implement a technical cooperation project for the recovery from the disaster, and it has been decided to implement this project (implementation period: December 2018 to November 2021): “Project for Development of Regional Disaster Risk Resilience Plan in Central Sulawesi in the Republic of Indonesia” (hereinafter referred to as “the Project”). JICA entrusted the Project to Yachiyo Engineering Co., Ltd., Oriental Consultants Global Co., Ltd., Nippon Koei Co., Ltd., Pacific Consultants Co., Ltd., and PASCO CORPORATION.

Regarding the assistance for formulating the Reconstruction Master Plan, after the first survey team was dispatched immediately after the disaster in October 2018. Naoto TADA, JICA Expert of Comprehensive Disaster Risk Reduction, BNPB, and Jun HAYAKAWA, JICA Expert of Integrated Water Resources Management, PUPR (hereinafter referred to as "JICA Experts"), led the formulation of the Reconstruction Master Plan. To continue the seamless and reliable knowledge transfer from this Reconstruction Master Plan formulation assistance, JICA experts also provided guidance to the study team of the Project. The Project cited some charts created by the JICA experts during the Reconstruction Master Plan formulation.

This final report summarizes the results of JICA experts and the study team’s activities in the Project, and the findings from Japanese experts who participated in Japanese Support Committee.

In addition, using a part of the Project results as basic data, in June 2019, during the implementation period of the Project, a Grant Agreement (G/A) was signed for “The Programme for the Reconstruction of Palu 4 Bridges in Central Sulawesi Province”, which is the core infrastructure in the disaster area. Furthermore, in January 2020 an ODA Loan Agreement (L/A) was signed for the “Infrastructure Reconstruction Sector Loan in Central Sulawesi”, to promote infrastructures reconstruction such as roads, bridges, irrigation facility, rivers, and reconstruction of public facility (hospital).

## Final Report Structure

The final report consists of a summary, main report and appendix. The detail results of the project are described in the main report. The main report consists of Volume I to Volume V.

### Summary (English)

\* Essential part from summary (Outline and Recommendation) is translated to Bahasa Indonesia and included in the report.

### Main Report (English)

Volume I	Outline of the Project
Volume II	Disaster Hazard Assessment and Hazard Map
Volume III	Formulation of Spatial Plan Based on Disaster Hazard and Risk Assessment
Volume IV	Resilient Infrastructure and Public Facilities
Volume V	Livelihood Recovery and Community Restoration

### Appendix

US Dollar \$ 1.00 = Indonesia Rupiah IDR 14,021.59 = Japanese yen ¥ 103.90 (February 2021)
---

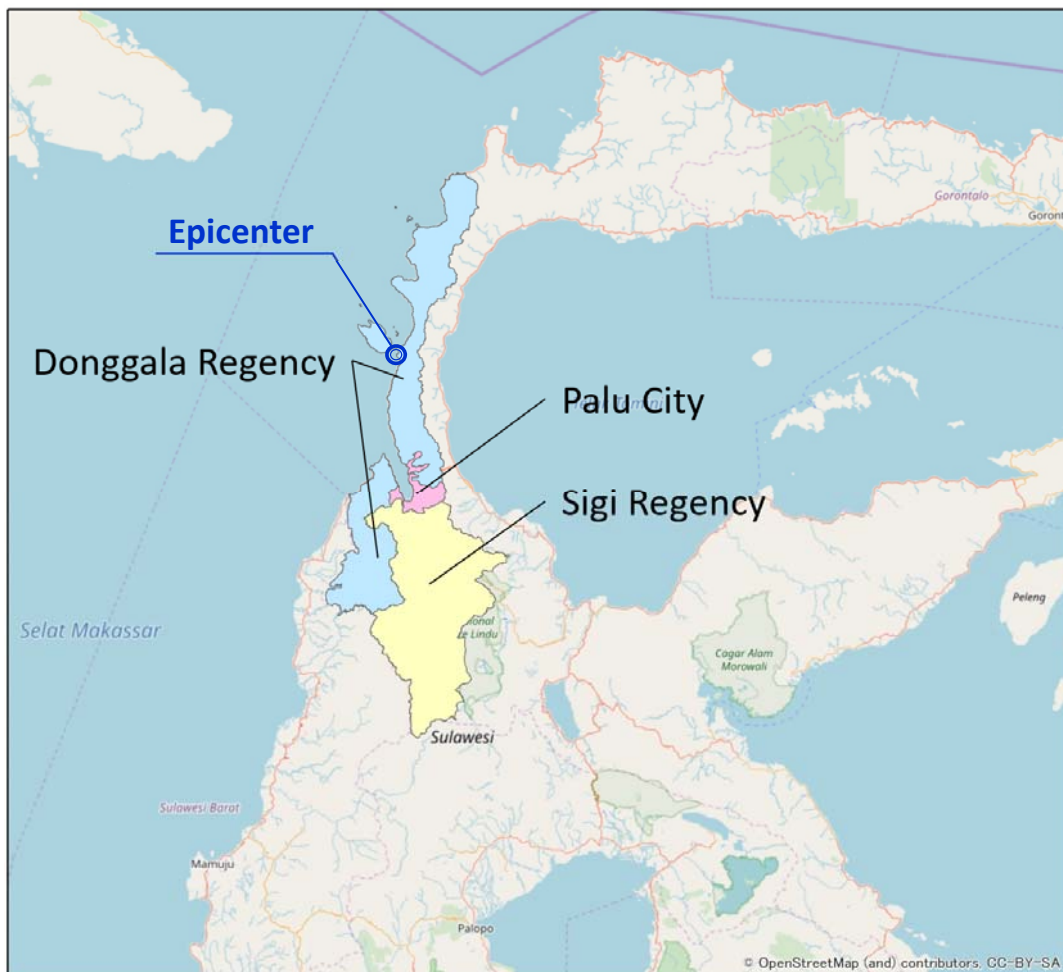


## Location Map of the Project Area

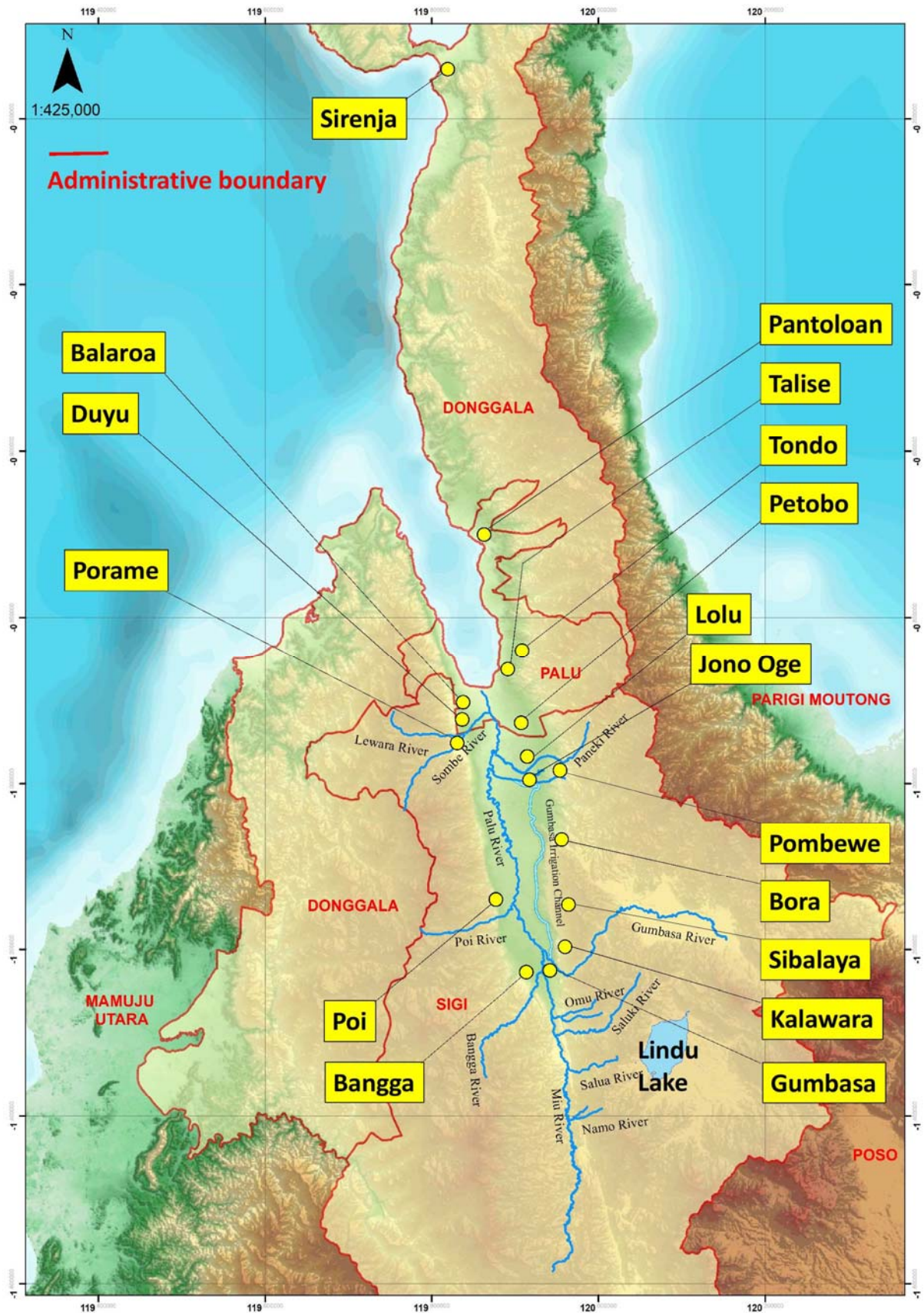
### Location of Central Sulawesi Province



### Location of Disaster Affected Area and Epicenter (Palu City, Sigi Regency and Donggala Regency)



### Location of Target Area in the Project



Source: Prepared by JICA Study Team based on Data from the Geospatial Information Authority of Indonesia (BIG)



## Lead-off Photos (1/7)

### Damage Conditions



Condition of the Coastal Area of Palu Bay After the Disaster (Right Shore Side, Drone Shooting)



Condition of the Coastal Area of Palu Bay After the Disaster (Left Shore Side, Drone Shooting)



## Lead-off Photos (2/7)

### Damage Conditions



The Palu IV Bridge located at the Palu River Estuary was Collapsed by the Earthquake.



Collapsed Coastal Road along the Palu Bay



Damaged Buildings by Tsunami Inundation (100m to 450m from the Coast) (On the Right Shore of Palu Bay)



Damaged Port Facilities in the Palu Bay  
(The Photo is SAMAS Container Jetty on the Left Shore of Palu Bay)



Damaged Road by Nalodo (Palu City)



Damaged in Sibalaya Area by Nalodo (Sigi Regency, Drone Shooting)



## Lead-off Photos (3/7)

### Damage Conditions



Damaged Caused by Floods and Landslides (Bangga River, Sigi Regency)



Sediment Disaster Caused by Debris Flow (Salua River, Sigi Regency)



Collapsed buildings by the Earthquake (Pal City)



Damaged Irrigation Facilities by Ground Deformation (Watergate of Gumbasa Irrigation, Sigi Regency)



Damaged in Sirenja Area by Inundation (Donggala Regency)



Evacuation Shelter Built in Balaroa District of Palu City After the Disaster



## Lead-off Photos (4/7)

### Stakeholder Discussions and Field Surveys



The First Joint Coordinating Committee (February 17, 2019)



Discussions with the Ministry of Land and Spatial Planning (ATR) and the National Land Agency (BPN) (March 21, 2019)



Discussions on Infrastructure Reconstruction Plans with the Ministry of Public Works and National Housing (PUPR) (February 18, 2019)



The Second Joint Coordinating Committee (August 6, 2019)



The Third Joint Coordinating Committee (December 11, 2019)



Discussion on the Japanese Support Committee (Nalodo) (March 25, 2019)

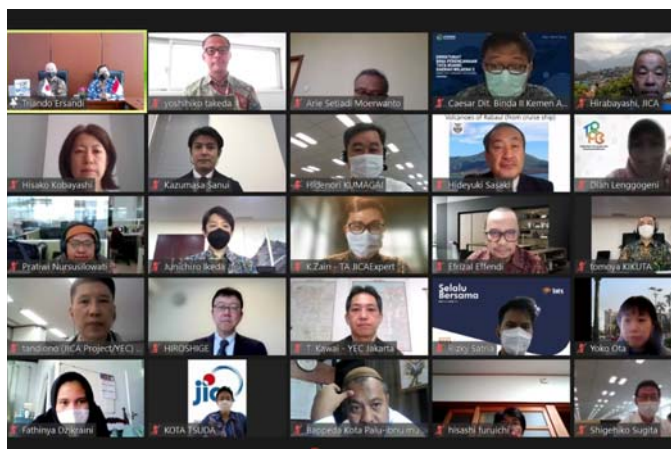


## Lead-off Photos (5/7)

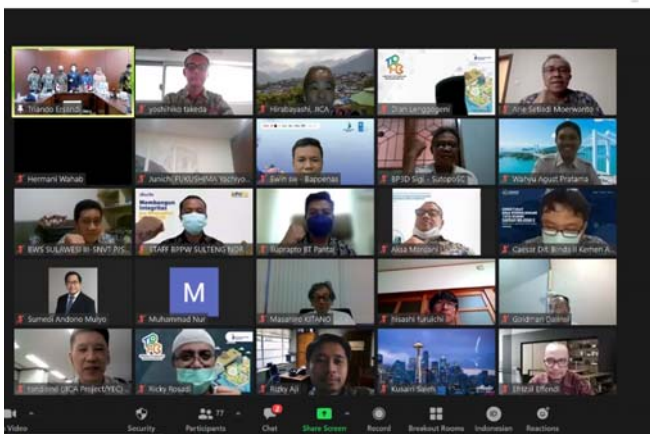
### Stakeholder Discussions and Field Surveys



The Final Joint Coordinating Committee (October 6, 2021)  
In Bappenas Meeting Room (Onsite participation)



The Final Joint Coordinating Committee (October 6, 2021)  
By web communication tool (Online participation-1)



The Final Joint Coordinating Committee (October 6, 2021)  
By web communication tool (Online participation-2)



The Final Joint Coordinating Committee (October 6, 2021)  
By web communication tool (Online participation-3)



Closing Ceremony – Handover report (October 6, 2021)

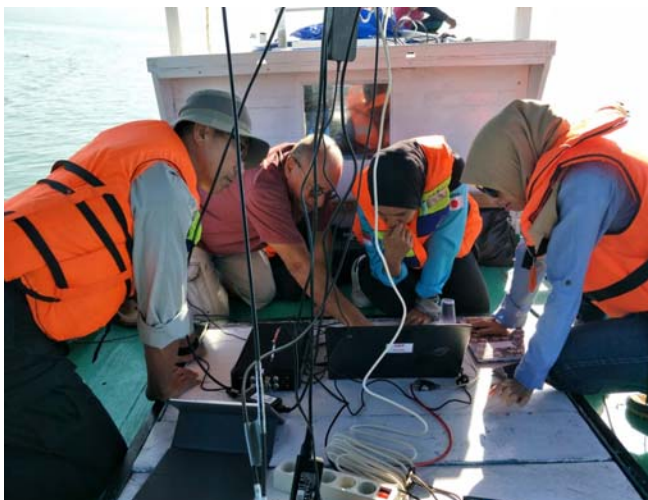


Closing Ceremony – Group picture (October 6, 2021)  
(left-right); Mr. Ikeda; Mr. Kikuta; Mr. Fukushima; Mr. Tsuda, Mr. Sumedi,  
Ms. Lenggo



## Lead-off Photos (6/7)

### Stakeholder Discussions and Field Surveys



Reflection seismic survey of Palu Bay (Output 1 Activity)

A survey conducted to understand the geological composition and structure of the seabed at the southern of the Palu Bay, including the area around the Palu River Estuary (total 29.6 km).



Discussion with the Ministry of Land and Spatial Planning (ATR)

(Output 1 and Output 2 Activities, April 11, 2019)



Discussion with Local Government (Central Sulawesi)

(Output 2 Activity, March 18, 2019)



Discussion on Anutapura Hospital Design Review

(Output 3 Activity- Public Facilities Sector, April 9, 2019)



Palu IV Bridge Field Survey (Output 3-Road and Bridge Sector)

Survey for reconstruction of the collapsed Palu IV Bridge (January-May 2019).



Pilot Project Activities in Balaroa Shelter (Output 4 Activity)

Training was conducted twice to introduce Silar leaves weaving as an activity to obtain income in a short term.



## Lead-off Photos (7/7)

### Stakeholder Discussions and Field Surveys



Pilot Project Activities in Balaroa Shelter (Output 4)

Small culinary business activities were carried out by the groups of victims of the Balaroa evacuation shelter



Pilot Project Activities in M'panau Village (Output 4)

Training was conducted to improve the construction skills for the victims in the community in collaboration with vocational schools in the Province



Pilot Project Activities in M'panau Village (Output 4)

A MSMEs Centre was built to support the improvement of livelihood through micro business entities



Pilot Project Activities in Lero Tatari Village (Output 4)

20 fishing boats were provided to support the recovery of livelihood activities of a group of 40 fishermen.



Pilot Project Activities in Lero Tatari Village (Output 4)

Training on new processing technology of *Ikan Teri* (White bite) was conducted in cooperation with the department of SMEs in Central Sulawesi Province.



Pilot Project Activities in Lero Tatari Village (Output 4)

DRR education seminar was conducted for the pilot project beneficiaries by BPBD together with inviting BMKG and BASARNAS as lecturers

## List of Abbreviation

Abbreviation	Indonesian Language	English
<b>Organization / Institution</b>		
AASHTO	—	American Association of State Highway and Transportation Officials
ACT	Aksi Cepat Tanggap	Quick Response Action
ADB	Bank Pembangunan Asia	Asian Development Bank
ADRA	—	Adventist Development and Relief Agency
AMC	—	Anutapura Hospital Medical Center
ASB	—	Arbiter Samariter Bund
ATR	Kementerian Agraria dan Tata Ruang	Ministry of Land and Spatial Planning
AusAID	—	Australian Agency for International Development
BAPPEDA	Badan Perencanaan Pembangunan Daerah	Regional Development Planning Agency
BAPPENAS	Badan Perencanaan Pembangunan Nasional	National Development Planning Agency
BG	Badan Geologi	Geological Agency
BIG	Badan Informasi Geospasial	Agency for Geospatial Information
BM	Bina Marga	Directorate General of Highways
BMKG	Badan Meteorologi, Klimatologi dan Geofisika	Agency for Meteorology, Climatology and Geophysics
BNPB	Badan Nasional Penanggulangan Bencana	National Disaster Management Authority
BPBD	Badan Penanggulangan Bencana Daerah	Regional Disaster Management Authority
BPN	Badan Pertanahan Nasional	Provincial land agency
BPPW	Balai Prasarana Permukiman Wilayah	Regional Settlement Infrastructure Center
BSN	Badan Standardisasi Nasional	National Standardization Agency
BWS	Balai Wilayah Sungai	River Basin Development Agency
Cipta Karya	—	Directorate General of Human settlements
CRS	—	Catholic Relief Services
CWS	—	Inanta Church World Service
DGST	Direktorat Jenderal Perhubungan Laut (DirJen Hubla)	Directorate General of Sea Transportation
Dinas	—	Agency
DKP	Dinas Kelautan dan Perikanan	Agency of Marine Affairs and Fisheries (at regional level) <sup>1</sup>
DLH	Dinas Lingkungan Hidup	Environmental Agency (at regional level)
DPMPSTP	Dinas Penanaman Modal dan Perijinan Terpadu Satu Pintu	One-stop office of integrated Investment and Permit Services
DPRP	Dinas Penataan Ruang dan Pertanahan	Local Spatial Planning and Land Service Agency
EA	—	Executing Agency
ESDM	Energi dan Sumber Daya Mineral	Ministry of Energy and Mineral Resources
FAO	Organisasi Pangan dan Pertanian Dunia	Food and Agriculture Organization
GOI	Pemerintah Negara Republik Indonesia	Government of Indonesia
HAKI	Himpunan Ahli Konstruksi Indonesia	Association of Indonesia construction expert
HATTI	Himpunan Ahli Teknik Tanah Indonesia	Indonesian Society For Geotechnical Engineering <sup>2</sup>

<sup>1</sup> Note: DKP at regional level (D = Dinas); KKP at national level (K=Kementerian/Ministry).

<sup>2</sup> Source: <https://www.hatti.or.id/>



Abbreviation	Indonesian Language	English
IFRC	—	International Federation of Red Cross and Red Crescent
ILO	Organisasi Pekerja Internasional	International Labour Organization
INGO	Lembaga Swadaya Masyarakat Internasional	International Non-Governmental Organization
INKINDO	Ikatan Nasional Konsultan Indonesia	National association of Indonesian Consultant
JCC	Komite Koordinasi	Joint Coordinating Committee
JFPR	—	Japan Fund for Poverty Reduction
JICA	—	Japan International Cooperation Agency
JST	Tim Studi JICA	JICA Study Team
KfW	Lembaga Pendanaan untuk Rekonstruksi - Jerman (Kreditanstalt für Wiederaufbau)	A German State-owned Development Bank
KKP	Kementerian Kelautan dan Perikanan	Ministry of Maritime Affairs and Fisheries
KPKPST	Kelompok Perjuangan Kesetaraan Perempuan Sulawesi Tengah	Central Sulawesi Women's Equality Group
LNGO	Lembaga Swadaya Masyarakat Lokal	Local Non-Governmental Organization
LTF	Satuan Tugas Lokal	Local Task Force
MCI	—	Mercy Corps Indonesia
MDMC	Pusat Manajemen Bencana Muhammadiyah	Muhammadiyah Disaster Management Center
Ministry of Cooperatives and SMEs	Kementerian Koperasi dan Usaha Kecil dan Menengah, Republik Indonesia	Ministry of Cooperatives and Small and Medium Enterprises
MOT	Kementerian Perhubungan	Ministry of Transport
NGO	Lembaga Swadaya Masyarakat (LSM)	Non-Governmental Organization
OGD	Departemen Kebidanan dan Kandungan <sup>3</sup>	Obstetrics and Gynecology Department
PARCIC	—	PARC Interpeoples' Cooperation
PMI	Palang Merah Indonesia	Indonesian Red Cross Societies
PUPR	Kementerian Pekerjaan Umum dan Perumahan Rakyat	Ministry of Public Works and Public Housing
PuSGen	Pusat Studi Gempa Nasional	National Center for Earthquake Studies
PUSKIM	Pusat Kebudayaan Indonesia	Indonesian Cultural Center
SATGAS	Satuan Tugas	Task Force
SDA	Direktorat Jenderal Sumber Daya Air	Directorate General of Water Resources
SKP-HAM	Solidaritas Korban Pelanggaran Hak Asasi Manusia	Solidarity of Victims of Human Rights Violations
TABG	Tim Ahli Bangunan Gedung	Building Construction Expert Team
TKPRD	Tim Koordinasi Penataan Ruang Daerah	Regional Spatial Planning Coordination Team
UN	Persatuan Bangsa-Bangsa (PBB)	United Nations
UNDP	—	United Nations Development Programme
UNFPA	—	United Nations Fund for Population Activities
UNHCR	—	United Nations High Commissioner for Refugees
UNICEF	—	United Nations International Children's Emergency Fund
WB	Bank Dunia	World Bank
WFP	Program Pangan Dunia	United Nations World Food Programme
WHO	—	World Health Organization
WVI	Wahana Visi Indonesia	World Vision Indonesia
YEU	Unit Gawat Darurat Yakkum	Yakkum Emergency Unit

<sup>3</sup> In private hospitals as well as universities, commonly they use the term *Obstetri dan Ginekologi*

Abbreviation	Indonesian Language	English
YPAL	Yayasan Panorama Alam Lestari Kabupaten Poso	<i>Panorama Alam Lestari</i> Foundation, Poso Regency
YPI	Yayasan Pusaka Indonesia	Indonesian Heritage Foundation
YSTC	Yayasan Sayangi Tunas Cilik	Save The Children Foundation
Regulation / Plan		
EPMA	Undang-Undang Tentang Perlindungan dan Pengelolaan Lingkungan Hidup	Environmental Protection and Management Law
IMB	Izin Mendirikan Bangunan	Building Permit
KDB	Koefisien Dasar Bangunan	Building Coverage Ratio
KLB	Koefisien Lantai Bangunan	Floor Area Ratio
PERDA	Peraturan Daerah	Local regulation
PP	Peraturan Pemerintah	Government Regulation
PRR	Laporan Kemajuan	Progress Report
RAB	Rancangan Anggaran Biaya	Budget Plan
RDTR	Rencana Detail Tata Ruang	Detailed Spatial Plan
RSNI	Rancangan Standar Nasional Indonesia	Draft Indonesian National Standard
RTRW	Rencana Tata Ruang Wilayah	General Spatial Plan
RTRWN	Rencana Tata Ruang Wilayah Nasional	National spatial plan
RW	Rukun Warga	Neighbourhood unit <sup>4</sup>
SEA	Kajian Lingkungan Hidup Strategis (KLHS)	Strategic Environmental Assessment
SNI	Standar Nasional Indonesia	National Standard of Indonesia
UKL-UPL	Upaya Pengelolaan Lingkungan Hidup dan Upaya Pemantauan Lingkungan Hidup	Environmental Management Efforts and Environmental Monitoring Efforts
ZRB	Zona Rawan Bencana	Disaster Prone Zone
Others		
AP	Rencana Aksi	Action Plan
APBN	Anggaran Pendapatan dan Belanja Negara	State budget
ASTER	—	Advanced Space-borne Thermal Emission and Reflection
Banpem	Bantuan Pemerintah	Government Assistance
BARRATAG A	Bangunan Rumah Rakyat Tahan Gempa	Earthquake Resistant Housing
BBB	Membangun Kembali dengan Lebih Baik	Build Back Better
BCP	Rencana Kelanjutan Bisnis	Business Continuity Plan
BLM	Bantuan Langsung Masyarakat	Community Direct Assistance
BMS	Sistem Manajemen Jembatan	Bridge Management System
BoQ	—	Bill of Quantity
BTP	—	Brownian Passage Time
BUMDes	Badan Usaha Milik Desa	Village-Owned Company
BWP	Bagian Wilayah Perencanaan	Part of the Planning Area
C/P	—	Counter Part
CBD	Kawasan Niaga Terpadu	Central Business District
CCT	Pembayaran Tunai Bersyarat	Conditional Cash Payment
CRED	—	Centre for Research on the Epidemiology of Disasters
CSO	Organisasi Masyarakat Sipil (ORMAS)	Civil Society Organization
CSR	Tanggungjawab Sosial Korporat	Corporate Social Responsibility

<sup>4</sup> In urban area (especially Java Island), RW is a neighbourhood unit below Village Level. Smaller unit is RT (Rukun Tetangga). 1 RT consist of 10-50 Households and 1 RW consist up to 10 RT.

Abbreviation	Indonesian Language	English
DED	—	Detail Engineering Design
DEM	—	Digital Elevation Model
DFR	Draf Laporan Akhir	Draft Final Report
DG	Direktur Jenderal (Dirjen)	Director General
DRR	Pengurangan Risiko Bencana (PRB)	Disaster Risk Reduction
DTM	—	Digital Terrain Model
EIA	Analisis Mengenai Dampak Lingkungan (AMDAL)	Environmental Impact Assessment
EMP	Rencana Pengelolaan Lingkungan	Environmental Management Plan
EMoP	Rencana Pemantauan Lingkungan	Environmental Monitoring Plan
ER	Tanggap Darurat (TD)	Emergency Response
ESMF	—	Environmental and Social Management Framework
EWS	Sistem Peringatan Dini	Early Warning System
EXPO	—	Exposition
FGD	—	Focus Group Discussion
FLSH		
FR	Laporan Akhir	Final Report
F/S	Studi Kelayakan	Feasibility Study
G/A	Perjanjian Hibah	Grant Agreement
GBV	—	Gender-Based Violence
GC	Kondisi Umum	General Conditions
GERTASKIN	Program Gerakan Pengentasan Kemiskinan	Poverty Alleviation Program
GIS	Sistem Informasi Geografis (SIG)	Geographic Information System
GL	Panduan	Guide Line
GRP	Produk Regional Bruto	Gross Regional Product
HIV	—	Human Immunodeficiency Virus
Huntap	Hunian Tetap	Permanent Relocation Site
Huntara	Hunian Sementara	Temporary Housing Site
ICR	Laporan Awal	Inception Report
IDR	Rupiah	Indonesian Rupiah
ITR	Laporan Sementara	Interim Report
IKM	Industri Kecil Menengah	Small and Medium Industries
IMB	Ijin Mendirikan Bangunan	Procedures of building permit
IPAL	Instalasi Pengolahan Air Limbah	Wastewater Treatment Plant
IPLT	Intalasi Pengelolaan Limbah Tinja	Faecal sludge treatment plant
ITB	—	Instructions to Bidders
IUMK	Izin Usaha Mikro Kecil	Micro Small Business Permit
JET	—	Japan Exchange and Teaching
KRK	Keterangan Rencana Kota	City Plan Description
L/A	Perjanjian Pinjaman	Loan Agreement
LGBTQ+	—	Lesbian, Gay, Bisexual, Transgender, Questioning, etc.
LLC	—	Level Luffing Crane
Linsek	Lintas Sektor	Inter Sector
LPG gas	—	Liquefied Petroleum gas
MD	Risalah Diskusi	Minutes of Discussion
MEP	Mekanikal, Elektrikal dan Perpipaan	Mechanical, Electrical and Plumbing
M/M	Risalah Rapat	Minutes of Meeting
MKK	Mengawasi Kondisi Konstruksi	Construction supervising works

Abbreviation	Indonesian Language	English
MOU	Nota Kesepahaman	Memorandum of Understanding
M/P	Rencana Induk	Master Plan
MSMEs	UMKM	Micro Small and Medium Enterprises
MTU	Unit Pelatihan <i>Mobile</i>	Mobile Training Unit
ODA	—	Official Development Assistance
OP	Keluaran	Output
PASIGALA	Kota Palu, Kabupaten Sigi dan Kabupaten Donggala	Palu city, Sigi Regency and Donggala Regency
PGA	—	Peak Ground Acceleration
PTHA	—	Probabilistic Tsunami Hazard Assessment
PC	Konsultasi Publik	Public Consultation
Persub	Persetujuan Substansi	Substantial Approval (on the Spatial Plan)
POKJA	Kelompok Kerja	Working Team
POKMAS	Kelompok Masyarakat	
PPP	Kebijakan, Rencana dan Program	Policies, Plans and Program
PPs	Proyek Percontohan	Pilot Projects
PQ	Prakualifikasi	Pre-qualification
PRR	Laporan Perkembangan	Progress Report
PSHA	—	Probabilistic Seismic Hazard Assessment
PV	—	Photo Voltaic System
QGC	—	Quay Gantry Crane
RB	Rusak Berat	Severely damaged
RD	Risalah Diskusi	Record of Discussion
R/D	Riset dan Pembangunan	Research and Development
RKPD	Rencana Kerja Perangkat Daerah	Regional Government Work Plans
LARAP	Rencana Aksi Pembebasan Lahan dan Pindahan Pemukiman	Land Acquisition and Resettlement Action Plan
RRI	—	Rainfall Runoff Inundation
RS	Rusak Sedang	Moderately damaged
RT	Rukun Tetangga	Neighbor Association
SD	Sekolah Dasar	Primary school
SHMs	—	Stakeholder meetings
SLF	Sertifikat Laik Fungsi	Certificate of Building Performance and Function
SMEs	Usaha Kecil dan Menengah (UKM)	Small and medium-sized enterprises
SMP	Sekolah Menengah Pertama	Middle School
SNS	Layanan Jejaring Sosial	Social Networking Service
SOP	Standar Prosedur Operasi	Standard Operational Procedure
SPPL	Pernyataan Kesanggupan Pengelolaan dan Pemantauan Lingkungan Hidup	Statement of Environmental Management and Monitoring Undertaking
TA	Bantuan Teknis (Bantek)	Technical Assistance
ToR	Kerangka Acuan Kerja (KAK)	Terms of Reference
TPA	Tempat pembuangan akhir	Landfill
WASH	Air, Sanitasi, Kebersihan	Water, Sanitation, Hygiene

---

---

## *Table of Contents*

---

---

Chapter 1	Outline of the Activities .....	V-1
Chapter 2	Review of Local Government's Reconstruction Action Plan(s) for Livelihood and Community Restoration .....	V-3
2-1	Analyze Disaster Damages .....	V-3
2-1-1	Economic Activities.....	V-3
2-1-2	Social and Community Structures .....	V-9
2-2	Response Activities.....	V-10
2-2-1	Structure of Emergency Response Taken by the Government and Assigned Donors.....	V-10
2-2-2	Response and Support Action Taken in the Sector by Line Ministries and Departments of Local Governments .....	V-11
2-2-3	Donors and NGOs.....	V-17
2-3	Review of Action Plans on Livelihood and Community Restoration Drafted by Local Governments .....	V-22
Chapter 3	Selection of Pilot Projects .....	V-28
3-1	Outline of Pilot Projects.....	V-28
3-2	Pilot projects in Municipalities .....	V-28
3-2-1	Priority Areas for the Selection of Pilot Projects .....	V-28
3-2-2	Principle for Selection of Pilot Projects for Livelihood Recovery and Community Restoration .....	V-30
3-2-3	Examination of Pilot Projects .....	V-31
3-2-4	Formulation of Pilot Project .....	V-41
3-3	Ensuring Inclusiveness When Formulating Pilot Projects .....	V-43
Chapter 4	Implement of Pilot Project .....	V-46
4-1	Implementation of Pilot Projects on Municipalities.....	V-46
4-1-1	Pilot Project on Livelihood Recovery of Women in Balaroa Evacuation Shelter through Work Trainings and Community Activities .....	V-46
4-1-2	Pilot Project on the Installation and Operation of Community MSMEs Center and Providing Training for Livelihood Recovery at Temporary Houses Site .....	V-63
4-1-3	Pilot Project on Livelihood Restoration of the Affected Fishermen (Fishing <i>Ikan Teri</i> ) by Building of Boats and Provision of Fishing Equipment, and Livelihood Recovery of Women Traditionally Processing <i>Ikan Teri</i> Products.....	V-84
4-2	Pilot Project on Applying the Reference Manual in Indonesian Government Projects.....	V-104
4-2-1	Applying for a support program called Banpem (Bantuan Pemerintah: Government Assistance) of the Ministry of Cooperatives and SMEs.....	V-104
4-2-2	Ministry of Villages, Development of Disadvantaged Regions, and Transmigration....	V-111



4-3	Evaluation and Lessons Learned from the Pilot Project .....	V-112
4-3-1	Characteristics of each pilot project implemented in 2019.....	V-112
Chapter 5	Formulate the Reference Manual for Implementation of Livelihood and Community Restoration from Disaster.....	V-116
5-1	Outline of the Reference Manual .....	V-116
5-2	Preparation of Reference Manual Based on Pilot Project Implementation in 2019 .....	V-117
5-3	Working Group Activities for the Revision of Reference Manual .....	V-118
5-3-1	Launch of Working Group in Central Sulawesi.....	V-118
5-3-2	Outline of collaborated workshop of Working Group .....	V-118
5-4	Contents of the Reference Manual.....	V-119
5-4-1	Items reflected in the reference manual based on pilot project experiences.....	V-120
5-4-2	Key Approaches in Livelihood Recovery and Community Restoration.....	V-122
5-4-3	Key Points in Mainstreaming Livelihood Recovery and Supporting Community Restoration .....	V-122
5-4-4	Main Roles of Local Governments and Related Organizations.....	V-124
5-4-5	Applying the reference manual to a National Program.....	V-126
5-5	Implementation of Recovery and Reconstruction Case Studies.....	V-126
5-5-1	Objectives of Compiling Recovery and Reconstruction Experiences in a Case Study..	V-127
5-5-2	Methodology and Procedure for the Survey of Recovery and Reconstruction Projects	V-127
5-5-3	Major Revisions.....	V-144
Chapter 6	Recommendation.....	V-147

---

---

## *List of Tables*

---

---

Table 2-1	Estimated Amount of Damage and Loss in Economic Sector in Target Regions.....	V-3
Table 2-2	Estimated Amount of Damage and Loss in Economic Sector in Palu City.....	V-4
Table 2-3	Estimated Amount of Damage and Loss in Economic Sector in Sigi Regency .....	V-4
Table 2-4	Estimated Amount of Damage and Loss in Economic Sector in Donggala Regency .....	V-5
Table 2-5	Estimated Amount of Damage and Loss in Target Municipalities .....	V-5
Table 2-6	Estimated Amount of Damage and Loss in Palu City .....	V-5
Table 2-7	Estimated Amount of Damage and Loss in Sigi Regency.....	V-6
Table 2-8	Estimated Amount of Damage and Loss in Donggala Regency.....	V-6
Table 2-9	No. of Fishing Households, Boats and Marine Fish Production in Central Sulawesi (2017) .....	V-7
Table 2-10	Fish Hatcheries and Location in Sigi Regency.....	V-7
Table 2-11	Affected Fishermen in Palu City and Donggala Regency .....	V-7
Table 2-12	Number of Lost or Damaged Boats and Engines in Donggala Regency.....	V-8
Table 2-13	Number of Lost or Damaged Boats and Engines in Palu City .....	V-8
Table 2-14	Damage on Health Facilities (as of 8 January 2019).....	V-9
Table 2-15	Damage on Education Facilities (as of 8 January 2019) .....	V-10
Table 2-16	National Cluster and International Cluster in Indonesia.....	V-11
Table 2-17	Fishing Boats Provided in Donggala Regency (as of Feb. 2019).....	V-14
Table 2-18	Fishing Boats Provided in Palu City (as of Feb. 2019) .....	V-14
Table 2-19	Roles and Actions of the Ministry of Villages, Disadvantaged Region and Transmigration .....	V-15
Table 2-20	Roles and Actions of the Department of Community Empowerment and Village Development (Province).....	V-16
Table 2-21	Roles and Actions of the Department of Community Empowerment and Village Development (Regency).....	V-16
Table 2-22	List of NGOs Working for Psychological Intervention (Trauma Healing).....	V-17
Table 2-23	List of NGOs Working for Vulnerable Groups and PwDs .....	V-18
Table 2-24	List of NGOs Working for Provision of Temporary Housing (Huntara).....	V-19
Table 2-25	List of NGOs Working for Provision of Permanent Shelter (Huntap).....	V-20
Table 2-26	List of Donors/NGOs Working for Provision of Livelihood / Cash Intervention .....	V-20
Table 2-27	Strategies of the Action Plans of Palu City with Direct Relation to Livelihood Recovery and Community Restoration .....	V-23
Table 2-28	Strategies of the Action Plans of Sigi Regency with Direct Relation to Livelihood Recovery and Community Restoration.....	V-24
Table 2-29	Strategies of the Action Plans of Donggala Regency with Direct Relation to Livelihood	

	Recovery and Community Restoration .....	V-26
Table 3-1	Considered Situation of each Local Government Before the Disaster .....	V-28
Table 3-2	Summary of Damage for each Local Government .....	V-29
Table 3-3	Principles for the Selection of Pilot Projects .....	V-31
Table 3-4	Candidate Pilot Projects and Their Preliminary Evaluation .....	V-32
Table 3-5	Preliminary Evaluation of Pilot Projects .....	V-34
Table 3-6	Pilot Projects with Municipalities .....	V-42
Table 3-7	Examples of Challenges in Each Vulnerable Group .....	V-44
Table 4-1	Summary of the Pilot Project on Livelihood Recovery of Women in the Balaroa Evacuation Shelter in Palu City through Vocational Trainings and Community Activities .....	V-46
Table 4-2	Palu City – Balaroa Shelter: Summary of <i>Silar</i> Weaving Activities .....	V-50
Table 4-3	Amount of Sales of <i>Silar</i> Handcraft Products (Cumulative Total by Oct. 2019) .....	V-51
Table 4-4	Answers to the Question on the Reduction of Post-Disaster Stress .....	V-51
Table 4-5	Evaluation of <i>Silar</i> Weaving Activities .....	V-53
Table 4-6	Target Groups Selected by Batch .....	V-55
Table 4-7	List of Materials Provided for Beneficiary Groups .....	V-55
Table 4-8	Palu City – Balaroa Shelter: Summary of Livelihood Recovery Activities through the Sale of Foods and Processed Foods .....	V-56
Table 4-9	Monthly Sales of Each Group (May 2019 to November 2019: Unit IDR/Month).....	V-57
Table 4-10	Activities for Livelihood Recovery: Total Monthly Income of Each Group Member	V-57
Table 4-11	Evaluation of Livelihood Recovery Activities in the Balaroa Shelter.....	V-59
Table 4-12	Livelihood Recovery Groups Continuing Their Activities (as of October 2020).....	V-60
Table 4-13	Livelihood Recovery Groups No Longer Implementing Their Activities (as of October 2020).....	V-60
Table 4-14	Summary of the Pilot Project on the Installation and Operation of Community MSMEs Center and Providing Training on Livelihood Recovery at Temporary Housing Sites .....	V-63
Table 4-15	Curriculum for Competence-based Training .....	V-66
Table 4-16	Equipment Items Provided for One Group.....	V-67
Table 4-17	Sigi Regency: Summary of Construction Skills Training.....	V-67
Table 4-18	Transition of Employment Situation of Construction Skills Participants.....	V-68
Table 4-19	Considerations for the Construction Skills Training .....	V-71
Table 4-20	Evaluation of Sigi Regency: Construction Skills Training.....	V-72
Table 4-21	Candidate Locations for the MSMEs Center in Sigi Regency .....	V-73
Table 4-22	Results of the Discussion on the Types of Business in the MSMEs Centre .....	V-74
Table 4-23	Preliminary Assessment of the Types of Business in MSMEs Center.....	V-74
Table 4-24	Selected Four Types of Services to be Provided in the MSMEs Center in M’panau ...	V-75
Table 4-25	Number of Proposals Submitted for the MSMEs Center in M’panau.....	V-76
Table 4-26	Sigi Regency: Summary of Activities of Business Group in MSMEs Center.....	V-76

Table 4-27	List of Materials Provided for Business Groups in MSMEs Center .....	V-77
Table 4-28	Sigi Regency: Summary of Activities for the MSMEs Center.....	V-77
Table 4-29	Situation of the Activities of the Confectionery Selling Group (From October 2019 to November 2020 / Unit: IDR).....	V-78
Table 4-30	Situation of Activities of the Laundry Services Group (From October 2019 to August 2020 / Unit: IDR) .....	V-79
Table 4-31	Situation of Activities of Cafeteria Services Group (From October 2019 to December 2019/ Unit: IDR) .....	V-79
Table 4-32	Transition of Monthly Income of Groups in MSMEs Center.....	V-80
Table 4-33	Evaluation Indicators for the Activities of MSMEs Center.....	V-81
Table 4-34	Project Idea for Community Restoration in Sigi .....	V-84
Table 4-35	Summary of the Pilot Project on Livelihood Restoration of Affected Fisherman and Women Processing <i>Ikan Teri</i> Products .....	V-85
Table 4-36	Provided Fishing Boats and Equipment .....	V-87
Table 4-37	Lero Tatari Village in Donggala Regency: Summary of Support Activities for Fishermen's Groups.....	V-87
Table 4-38	Situation of Activities of Tatari Bahari Group (From February to July 2020) .....	V-88
Table 4-39	Situation of Activities of Usaha Rono Group (From February to July 2020) .....	V-88
Table 4-40	Evaluation of Livelihood Recovery Activities of Fishermen's Group in Lero Tatari Village .....	V-90
Table 4-41	Equipment Items for Different Types of <i>Ikan Teri</i> Processed Products.....	V-93
Table 4-42	Donggala Regency <i>Ikan Teri</i> Fishing in Lero Tatari Village: Summary of Support for the Activities of the Processing Group.....	V-94
Table 4-43	<i>Ikan Teri</i> Products.....	V-95
Table 4-44	<i>Ikan Teri</i> Fishing in Lero Tatari Village: Evaluation Indicator for the Processing Group .....	V-99
Table 4-45	Summary of Damage Situation in Lero Tatari Village and Challenges of DRR .....	V-100
Table 4-46	Related Agencies of Disaster Risk Reduction Education and Their Roles in DRR	V-102
Table 4-47	Donggala Regency: Summary of DRR Education Activities .....	V-103
Table 4-48	Summary of Consultations with the Regional Departments.....	V-105
Table 4-49	Inputs to the SOP Based on the Reference Manual .....	V-106
Table 4-50	Supporting Activities by the Regional Departments .....	V-107
Table 4-51	Concepts Not Included in the SOP but Described in the Reference Manual.....	V-110
Table 4-52	SOP Items Described in the SOP but Were Not Implemented .....	V-110
Table 4-53	Supporting Programs for MSMEs .....	V-111
Table 4-54	Outline of the Training Program of the Ministry of Villages .....	V-112
Table 4-55	Characteristics of Communities Targeted in Each Pilot Project and Lessons Learned .....	V-113
Table 4-56	Characteristics of Livelihood Recovery Activities in Each Pilot Project .....	V-114
Table 5-1	Information About the Dissemination Seminars .....	V-116



Table 5-2	Working Group Members.....	V-118
Table 5-3	Implementation Schedule for the Revision of Reference Manual.....	V-119
Table 5-4	Project Implementation Steps.....	V-123
Table 5-5	Summary of the Required Activities in Each Step Based on the Key Approaches .....	V-123
Table 5-6	Division of Roles Among Local Governments and Related Organizations .....	V-124
Table 5-7	Content of the Questionnaire.....	V-128
Table 5-8	Questionnaire Distribution Among Government Agencies .....	V-129
Table 5-9	Questionnaire Distribution Among Development Partners .....	V-129
Table 5-10	Activities Adapted to the Four Key Approaches Based on Results of Case Study ....	V-131
Table 5-11	Contents of Activities in Each Sector by Governments.....	V-135
Table 5-12	Content of Support in Each Sector by NGOs and Donor Agencies.....	V-137
Table 5-13	Main Revisions in the Reference Manual Done During Working Group Activities..	V-145
Table 5-14	Regional Clusters in Central Sulawesi Province .....	V-146

---

---

## *List of Figures*

---

---

Figure 1-1	Summary of Livelihood Recovery and Community Restoration Activities .....	V-2
Figure 2-1	Share of Regional GDP by Sector in Palu City, Sigi Regency and Donggala Regency	V-3
Figure 3-1	Estimated Damage Amount and Required Budget for Recovery mentioned in the Action Plans .....	V-29
Figure 3-2	Affected areas by Nalodo and tsunami .....	V-30
Figure 4-1	Implementation Structure of Pilot Project (1: Balaroa in Palu) .....	V-47
Figure 4-2	<i>Silar</i> Sheet .....	V-48
Figure 4-3	Average Monthly Income of <i>Silar</i> Weaving Beneficiaries (Endline Survey) .....	V-52
Figure 4-4	Answers of Beneficiaries on the Effectiveness of the Pilot Project on <i>Silar</i> Weaving (Endline Survey).....	V-52
Figure 4-5	Implementation Structure of the Pilot Project (2).....	V-58
Figure 4-6	Answers of Beneficiaries in the Culinary Group Regarding the Effectiveness of the Pilot Project (Endline Survey) .....	V-58
Figure 4-7	Implementation Structure of the Pilot Project (2: M'Panau in Sigi) .....	V-64
Figure 4-8	Employment Situation of Construction Skills Training Participants.....	V-69
Figure 4-9	Transition of the Income of Participants .....	V-69
Figure 4-10	Answers of the Construction Training Participants on the Effectiveness of the Pilot Project (Endline Survey) .....	V-70
Figure 4-11	Transition of Participants' Income.....	V-80
Figure 4-12	Answers of the Business Group Members on the Effectiveness of the Pilot Project in MSMEs Center (Endline Survey).....	V-81
Figure 4-13	Implementation Structure of the Pilot Project (3: Lero Tatari in Donggala) .....	V-85
Figure 4-14	Monthly Income After the Disaster and Under the Current Condition.....	V-89
Figure 4-15	Answers of Fishermen on the Effectiveness of the Pilot Project (Endline Survey) ..	V-89
Figure 4-16	Preferred Products in the Group .....	V-95
Figure 4-17	Monthly Income After the Disaster and Under the Current Situation .....	V-96
Figure 4-18	Purchase of <i>Ikan Teri</i> from Outside the Village.....	V-97
Figure 4-19	Status of the Applied Group Savings .....	V-97
Figure 4-20	Purchase of <i>Ikan Teri</i> from Outside the Village.....	V-98
Figure 4-21	Signboard Designs for Disaster Prevention Awareness in Lero Tatari Village .....	V-103
Figure 4-22	Number of Beneficiaries by Age and Sex .....	V-108
Figure 4-23	Beneficiaries per sales amount (%).....	V-109
Figure 5-1	Timeline for the preparation of the reference manual .....	V-116
Figure 5-2	Designs of the Reference Manual and Its Pocket Book Version .....	V-117
Figure 5-3	Key Points from Lessons Learned and Findings During Pilot Project Implementation	

	.....	V-121
Figure 5-4	Key Approaches in Livelihood Recovery and Community Restoration.....	V-122
Figure 5-5	Responses from NGOs (Extracted) .....	V-130
Figure 5-6	Sample Coordination Framework at Municipality Level.....	V-146

---

---

## Volume V Livelihood Recovery and Community Restoration

---

---

### Chapter 1 Outline of the Activities

The Output 4 activities in the study were carried out aiming to recover victims' livelihoods and revitalize affected communities after the earthquake, Nalodo (liquefaction-landside) and tsunami that occurred on September 28, 2018 at Central Sulawesi.

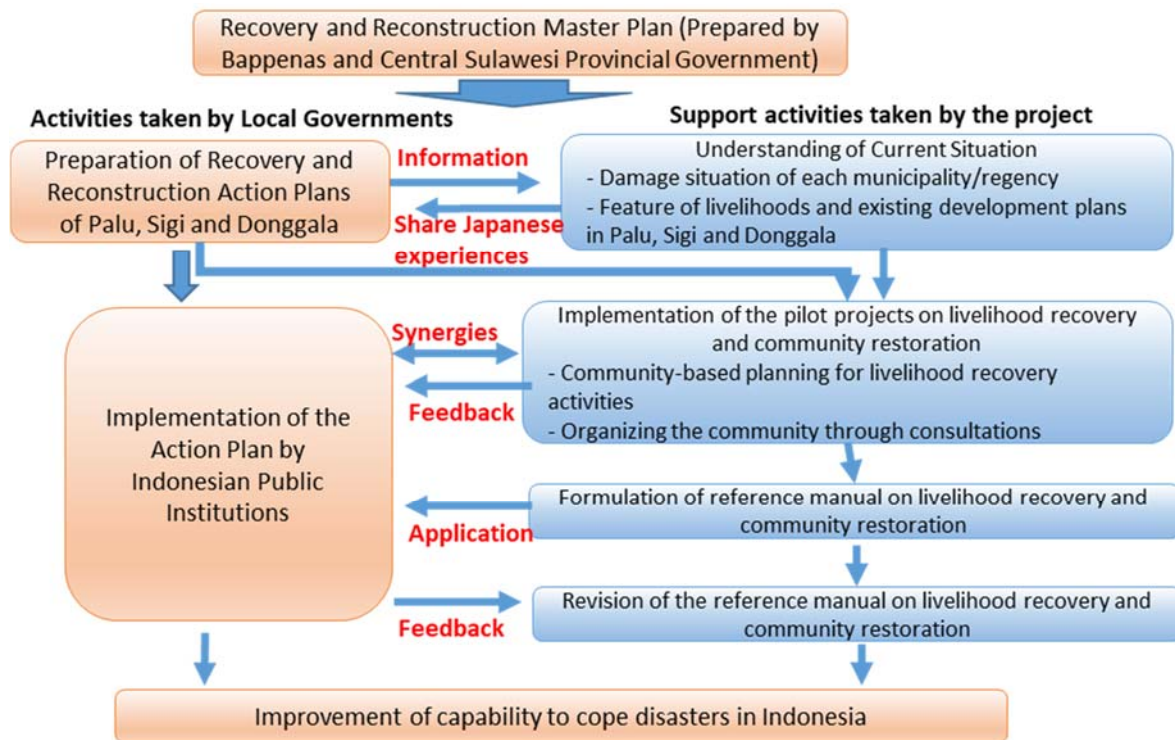
In Indonesia, the master plan (2019~2023) for reconstruction of Central Sulawesi was prepared in December 2018 by Bappenas and Central Sulawesi Provincial Government. Consequently, each local government prepared a reconstruction action plan based on the master plan. Since January 2019, in the study as "Output 4: The Activities Related to Livelihood Recovery and Community Restoration", the local disaster situation was grasped since January 2019 and the pilot projects were implemented based on the selection criteria prepared through discussion with the disaster-affected communities. The pilot projects conducted activities having an immediate effect accelerating socio-economic recovery, which was highly demanded by the affected people, while keeping consistence with the reconstruction action plan, by utilizing Japanese expertise. In December 2019, the experience and lessons obtained from the implementation of the pilot projects were summarized into "Reference Manual for Promoting Post-Disaster Livelihood Recovery and Community Restoration<sup>1</sup>" hereinafter referred to as "Reference Manual". Then a seminar to explain the reference manual was implemented in cooperation with Bappenas. In the seminar, it was explained that the contents of the manual and its plan to be revised based on the subsequent activities.

In 2020, a new pilot project was implemented, by applying the reference manual prepared in 2019 on a Micro and Small Enterprises Support Program (Bantuan Pemerintah : Banpem) implemented by the Ministry of Cooperatives and SMEs. In addition, the case study done through interviewing organizations supporting recovery and reconstruction from the disaster was implemented, and the cases of reconstruction activities in Central Sulawesi were summarized. Based on the results, series of workshops were implemented with related local governments and central governments. The discussions were reflected in the reference manual, revision of which was finalized in January 2021.

---

<sup>1</sup> Reference Manual for Promoting Post-Disaster Livelihood Recovery and Community Restoration: Lessons Learned from the Post-Disaster Livelihood Recovery and Community Restoration Activities





Source: JICA Study Team

Figure 1-1 Summary of Livelihood Recovery and Community Restoration Activities

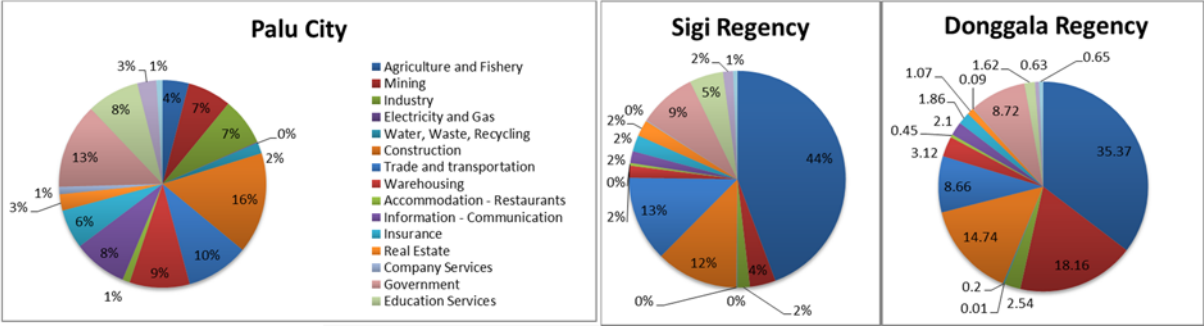
# Chapter 2 Review of Local Government’s Reconstruction Action Plan(s) for Livelihood and Community Restoration

## 2-1 Analyze Disaster Damages

### 2-1-1 Economic Activities

#### (1) General view of economic activities in target areas

Before the disaster, agriculture sector was the top economic activity in Central Sulawesi in terms of Gross Regional Product (GRP) followed by construction, food processing, mining and commerce sector. In Palu City, various economic activities were carried out, as shown in Figure 2-1, and construction, trade and warehouse services were the major ones. Compared with Palu City, the major economic activities in Sigi Regency and Donggala Regency were primary such as agriculture and fisheries. Figure 2-1 indicates break down of GRP of Palu City, Donggala Regency and Sigi Regency.



Source: Regional Action plan for Rehabilitation and Reconstruction of each local Government

Figure 2-1 Share of Regional GDP by Sector in Palu City, Sigi Regency and Donggala Regency

#### (2) Damage and loss in economic sectors

“Regional Action Plan for Rehabilitation and Reconstruction” of each municipality figures out the amount of damage and loss in economic sectors. Main damage in economic sectors in each municipality was determined with regards to infrastructures such as buildings, irrigation channels, port, etc. The total amount of damage and loss from the disaster was over IDR 5 billion, or approximately JPY 37 billion (Table 2-1).

Table 2-1 Estimated Amount of Damage and Loss in Economic Sector in Target Regions

Region	Total Amount of Damage & Loss (IDR)
Palu	2,444,650,366,689
Sigi	2,410,468,322,601
Donggala	170,508,450,000
Total	5,025,627,139,290

Source: Compiled by JICA Study Team based on 2020 data in “Rencana Aksi Daerah Rehabilitasi dan Rekonstruksi” of Palu (as of 7 Feb.), Sigi (as of 4 Mar.) and Donggala (as of 5 Apr.)

As shown in Table 2-2, the value of damage and loss in Palu City and Sigi Regency was over IDR 2 billion each (approx. JPY 14.8 billion). In comparison, the damage and losses in Donggala Regency was only IDR 170 million (approx. JPY 1.3 billion). The reasons for such high damage amount in Palu City is caused by the damage of commercial hotels, and the reason in Sigi Regency's is by damage in the Gumbasa irrigation system and various roads disrupted by Nalodo. The details of damage and loss in economic sector in each region are shown in Table 2-2, Table 2-3 and Table 2-4.

Table 2-2 Estimated Amount of Damage and Loss in Economic Sector in Palu City

Sector/Sub-sector	Value of Damage (IDR)	Value of Loss (IDR)	Total Value of Damage and Loss (IDR)
Plantation farmland	8,433,886,500	28,254,655,000	36,688,541,500
Livestock	2,933,458,000	32,003,930,689	34,937,388,689
Fisheries and Marine Affairs	13,918,000,000	-	13,918,000,000
<b>Agriculture, fisheries and marine Sub-sector total</b>	<b>25,285,344,500</b>	<b>60,258,585,689</b>	<b>85,543,930,189</b>
Market	93,822,000,000	292,640,892,000	386,462,892,000
Shops / Kiosks / MSMEs	16,496,370,000	8,327,372,000	24,823,742,000
BUMN (state-owned company)	5,831,100,000	-	5,831,100,000
Warehouse	606,936,000,000	47,313,440,000	654,249,440,000
<b>Trade Sub-sector total</b>	<b>723,085,470,000</b>	<b>348,281,704,000</b>	<b>1,071,367,174,000</b>
Tourism	1,206,422,812,500	81,316,450,000	1,287,739,262,500
<b>Tourism Sub-sector total</b>	<b>1,206,422,812,500</b>	<b>81,316,450,000</b>	<b>1,287,739,262,500</b>
<b>Grand Total</b>	<b>1,954,793,627,000</b>	<b>489,856,739,689</b>	<b>2,444,650,366,689</b>

Source: Compiled by JICA Study Team based on data in "Rencana Aksi Daerah Rehabilitasi dan Rekonstruksi" of Palu as of 7 Feb. 2020

Table 2-3 Estimated Amount of Damage and Loss in Economic Sector in Sigi Regency

Sector/Sub-sector	Value of Damage (IDR)	Value of Loss (IDR)	Total Value of Damage and Loss (IDR)
Agriculture, Plantation, Animal Husbandry	2,080,917,603,500	147,651,775,314	2,228,569,378,814
Fishery	14,116,480,000	3,185,000,000	17,301,480,000
Trading	122,094,250,000	705,600,000	122,799,850,000
Domestic industry	33,807,563,566	7,245,400,222	41,052,963,788
Tourism	622,250,000	122,400,000	744,650,000
<b>Total</b>	<b>2,251,558,147,066</b>	<b>158,910,175,536</b>	<b>2,410,468,322,602</b>

Source: Compiled by JICA Study Team based on data in "Rencana Aksi Daerah Rehabilitasi dan Rekonstruksi" of Sigi as of 4 Mar. 2020

Table 2-4 Estimated Amount of Damage and Loss in Economic Sector in Donggala Regency

Sector/Sub-sector	Value of Damage (IDR)	Value of Loss (IDR)	Total Value of Damage and Loss (IDR)
Agriculture	36,330,000,000	10,899,000,000	47,229,000,000
Livestock	3,150,000,000	535,000,000	3,685,000,000
Fishery	64,234,000,000	19,270,200,000	83,504,200,000
Cooperatives and MSMEs	7,701,250,000	1,397,500,000	9,098,750,000
Industry	3,150,000,000	535,000,000	3,685,000,000
Trading	12,000,000,000	47,500,000	12,047,500,000
Tourism	10,967,500,000	291,500,000	11,259,000,000
<b>Total</b>	<b>137,532,750,000</b>	<b>32,975,700,000</b>	<b>170,508,450,000</b>

Source: Compiled by JICA Study Team based on data in “Rencana Aksi Daerah Rehabilitasi dan Rekonstruksi” of Palu as of Feb. 7, Sigi as of Mar. 4, and Donggala as of April 5, 2020

### (3) Industries, SMEs (Small and Medium Enterprises) and Cooperatives

“Regional Action Plan for Rehabilitation and Reconstruction” of each region figures out the amount of damage and loss in sectors, specifically industries, SMEs and cooperatives as shown in Table 2-5 below:

Table 2-5 Estimated Amount of Damage and Loss in Target Municipalities

Region	Total Amount of Damage & Loss (IDR)
Palu	1,071,367,174,000
Sigi	163,852,813,738
Donggala	24,831,250,000

Source: Compiled by JICA Study Team based on data in “Rencana Aksi Daerah Rehabilitasi dan Rekonstruksi” of Palu as of Feb. 7, Sigi as of Mar. 4, and Donggala as of Feb. 14, 2020

The above-referenced amounts indicate an aggregated presumption value of damage and loss in several sub-sectors. This is outlined by region as follows:

**Palu City:** The data for Palu City describe an affected number and estimated damage and loss amount in public market, kiosk, micro small and medium enterprises (MSMEs), state-owned enterprise warehouse, and private sector warehouse (Refer to Table 2-6). As many as 424 enterprises out of 508 are categorized as “heavily damaged” in terms of affected buildings and equipment.

Table 2-6 Estimated Amount of Damage and Loss in Palu City

Sub-sector	No. of Affected Units	Total Amount of Damage & Loss (IDR)
Public market	11	386,462,892,000
Kiosk	156	18,543,870,000
MSMEs	508	6,279,872,000
State-owned enterprise warehouse	3	5,831,100,000
Warehouse	33	654,249,440,000

Source: Compiled by JICA Study Team based on data in “Rencana Aksi Daerah Rehabilitasi dan Rekonstruksi” of Palu as of Feb. 7, 2020

**Sigi Regency:** Sigi Regency compiled the concerned data divided into four sub-sectors: public market, small-medium industry (SMI), enterprise and cooperative as shown in Table 2-7. Enterprise sub-sector includes home industries, restaurants (*warung*), kiosks, motorbike repairing shops, school canteens, etc. Heavy damaged SMIs account for about 30% of the total 152 SMIs.

Table 2-7 Estimated Amount of Damage and Loss in Sigi Regency

Sub-sector	No. of Affected Units	Total Amount of Damage & Loss (IDR)
Public market	20	122,799,850,000
SMI	152	2,683,372,500
Enterprise	950	12,975,355,222
Cooperative	34	25,394,236,066

Source: Compiled by JICA Study Team based on data in “Rencana Aksi Daerah Rehabilitasi dan Rekonstruksi” of Sigi as of Mar. 4, 2020

**Donggala Regency:** A brief overview of damage and loss in public market, cooperative, SME and SMI sub-sectors in Donggala Regency is shown in Table 2-8. Regarding SME sub-sector, the data on damage and loss were compiled from 11 sub-districts (Kecamatan). Affected enterprises in the districts of Banawa (94 SMEs), Tanantovea (89 SMEs) and Sirenja (80 SMEs) had the highest numbers among the 11 sub-districts. As for the SMI sub-sector, all 210 industries were reported as confectionery producers.

Table 2-8 Estimated Amount of Damage and Loss in Donggala Regency

Sub-sector	No. of Affected Units	Total Amount of Damage & Loss (IDR)
Public market	16	12,047,500,000
Cooperative	54	3,361,250,000
SME	449	5,737,500,000
SMI	210	3,685,000,000

Source: Compiled by JICA Study Team based on data in “Rencana Aksi Daerah Rehabilitasi dan Rekonstruksi” of Donggala as of Feb. 14, 2020

#### (4) Fisheries

Marine and coastal fishing is carried out in Donggala Regency and Palu City, whereas Sigi Regency, being a land-locked district, has inland fishery. According to 2017 data, Donggala Regency and Palu City together contributed about 15 percent (25,151 tons) in all fishery production in Central Sulawesi. Donggala Regency had a significant share of fishery households (27%), fishing boats (30%) and marine fish production (14%) in the project area, suggesting that the regency plays a major role in the fishery sector.



Table 2-9 No. of Fishing Households, Boats and Marine Fish Production in Central Sulawesi (2017)

Municipalities	Fishing Households	Share	Boats	Share	Production (tons)	Share
Donggala	9,201	27%	10,776	29.6%	24,521	14%
Palu	972	3%	939	2.6%	1,630	1%
Sigi	-	-	254*	0.7%	-	-
Other Municipalities	24,200	70%	24,409	67.1%	147,899	85%
Central Sulawesi	34,373	100%	36,378	100%	174,050	100%

Remarks: (\*) Boats used in inland capture fishery (Lake Lindau) in Sigi.

Source: Compiled from Dalam Angka 2018 Sulawesi Tengah.

Sigi Regency is engaged in freshwater aquaculture and inland capture fishery (Lindau Lake). Five fish hatcheries (refer to Table 2-10) have been established by the public to produce and supply fingerlings to fish farmers.

Table 2-10 Fish Hatcheries and Location in Sigi Regency

Name of BBI*	Location	Year Established
BBI Mpanau	Desa Mpanau, Kec Biromaru	2004
BBI Rindau	Kota Rindau, Kec Dolo	2004
BBI Lindu	Kec Lindu	2010
BBI Baluase	Kec Dolo Selatan	2016
BBI Banasu	Kec Pipikoro	2016

Note: \*BBI : Public hatchery

Source: Department of Agriculture and Food Security, Sigi Regency

Fingerlings commonly produced (common carp, Nile tilapia and catfish) by public hatcheries are provided for free to selected fish farming groups (about 185 groups in Sigi Regency). Lindau Lake (18,600 acres) is stocked four times per year (about 200,000 juvenile fish each time) for fishermen living around the lake.

#### 1) Affected fishermen

The number of affected fishermen was around 1,122 in Palu City and 870 in Donggala Regency (refer to Table 2-11); meanwhile, updating of data is still on-going in Palu City. In addition, about 175 salt farmers were affected in Palu City.

Table 2-11 Affected Fishermen in Palu City and Donggala Regency

Palu City		Donggala Regency	
Sub-districts	Affected Fishermen	Sub-districts	Affected Fishermen
Palu Barat	175	Banawa	211
Palu Utara	217	Tanantovea	43
Mantikulore	218	Labuan	14
Tawaeli	252	Sindue*	86*
Ulujadi	244	Sirenja	293
Palu Timur	16	Balaesang**	223**
<b>Total</b>	<b>1,122</b>	<b>Total</b>	<b>870</b>

Notes: \* Total of Kec Sindue (76) and Sindue Tombusabora (10).

\*\*Total of affected fishers in Kec Balaesang (135) and Kec Balaesang Tanjung (88)

Source: Compiled by JICA Study Team from data/information provided by Palu City Fisheries Dept. and Donggala Fisheries Dept.

## 2) Damages on fishing boats and equipment

Fishing boats being used by fishermen in these areas are traditional canoes with hull and outrigger system, and with length that ranges from 5 to 9 meters with outboard engines ranging from 5 to 9 hp depending on boat size. Fishermen are known to own two or more boats for different fishing gear and area. The disaster damaged or caused the lost of boats, but it is not possible to verify the situation as no system in practice requires the fishermen to register ownership of fishing assets.

Summarized data on lost or damaged fishing boats and engines in Donggala Regency are shown below, where 611 fishing boats and 530 engines owned by among 870 affected fishermen were lost or damaged.

Table 2-12 Number of Lost or Damaged Boats and Engines in Donggala Regency

Sub-districts	Affected Fishermen	Lost or Damaged		Other Damages & Losses
		Boats	Engines	
Banawa	211	54	108	
Tanantovea	43	68	35	
Labuan	14	8	11	
Sindue	76	71	70	
Sindue Tombusabora	10	10	4	
Sirenja	293	293	153	
Balaesang	135	71	70	Balaesang lost many bagan-fishing platforms with equipment, nets, etc. Only 5 are in operation now.
Balaesang Tanjung	88	36	79	
<b>Total</b>	<b>870</b>	<b>611</b>	<b>530</b>	

Source: Compiled from data provided by Donggala Fisheries Dept.

In the case of Palu City, it is not possible to provide at this time a breakdown of lost or damaged boats and engines. The reason for this is that the Fisheries Department of Palu City assumes that all the affected fishermen have lost or damaged their fishing assets. The department is still processing data and information.

Table 2-13 Number of Lost or Damaged Boats and Engines in Palu City

Sub-districts	Affected Fishermen	Lost or Damaged		Other Damages & Losses
		Boats	Engines	
Palu Barat	175	Breakdown of data was not possible; provided data were incomplete. However, it showed lost or damaged boats & engines correspond to the affected number of fishermen.		<ul style="list-style-type: none"> <li>- There were 7 bagan fishing platforms before the disaster; 6 platforms were lost. Only one is undamaged and in operation.</li> <li>- There were 175 salt farmers in Mantikulore before the disaster; 15 have left salt farming. Among 160 farmers, about 40 are in salt farming now.</li> </ul>
Palu Utara	217			
Mantikulore	218			
Tawaeli	252			
Ulujadi	244			
Palu Timur	16			
<b>Total</b>	<b>1,122</b>			

Source: Compiled from data from Palu City Fisheries Dept.

### 3) Damages of hatcheries in Sigi Regency

In Sigi Regency, the five public hatcheries were damaged along with buildings, indoor/outdoor ponds and water intake facilities; thus, the hatcheries were not in operation. Meanwhile according to the head of Sigi's Inland Fisheries Department, three hatcheries located in Mpanau, Kotarindu and Lindu have been salvaged partially to operate as irrigation water flow was not affected seriously in Mpanau and Lindu. The office has also allocated budget (IDR 25 million) for a deep well for Kotarindu hatchery.

### (5) Agriculture

Before the disaster, there were 15,000 ha of paddy fields in Sigi Regency and the production of rice was around 120,000 tons per year. Out of these area, 5,700 ha have been affected by the earthquake, mainly due to the damage to Gumbasa irrigation system. Also, the community agricultural land cannot be cultivated as food source because of the damage to the irrigation canal in Gumbasa. As a result, livelihood has been shifting from agriculture to services since the disaster occurrence. Another problem caused by the loss of main livelihoods is the inability of the community to repay loans or difficulties in financing children's education, because many farmers got loan before the crop season.

## 2-1-2 Social and Community Structures

### (1) Outline of damages or impact of the disaster on social sector (Health and Education)

The disaster impacted heavily on the social sector, with predicted damage and loss exceeding three trillion IDR in total<sup>2</sup>. As for the health sector, more than half of the health facilities in the affected municipalities have been damaged, as shown in Table 2-14. Accordingly, a significant number of them was unable to operate, and this resulted in the increased vulnerability of residents to post-disaster diseases, such as respiratory disease and intestine inflammation, that are especially serious in evacuation shelters. The major challenge was found also in the aspect of human resources – affected areas experienced the lack of doctors, nurses and midwives and they had to rely on the support of NGOs and UN agencies.

Table 2-14 Damage on Health Facilities (as of 8 January 2019)

Regency (Kabupaten)/ City (Kota)	Condition of Health Facilities				Total No. of Damaged Facilities	No. of Existing Facilities
	Lightly Damaged	Moderately Damaged	Heavily Damaged	Missing*		
1. Palu	18	20	3	2	43	57
2. Sigi	15	6	14	0	35	68
3. Donggala	54	22	15	0	91	94
4. Parigi Moutong	15	1	0	0	16	106
Total	102	49	32	2	185	325

Note: Health facilities refer to hospitals, public health facilities and supporting public health facilities

\* Missing: Disappearance caused by Nalodo (liquefaction landslide)

Source: Decree of Governor of Central Sulawesi No.360/006/BPBD-G.ST/2019

<sup>2</sup> Reconstruction Master Plan, BAPPENAS, January 2019

Meanwhile, a severe impact can be felt in the education sector because the total number of damaged facilities exceeded one thousand (Table 2-15). According to BAPPENAS, the decline in access to education is considerable particularly in Sigi Regency, where almost all students are affected by the destruction of schools. In addition, educational facilities and personnel (i.e., teachers) are so insufficient that donor support from NGOs seems to be essential.

Table 2-15 Damage on Education Facilities (as of 8 January 2019)

Regency (Kabupaten)/ City (Kota)	Condition of Educational Facilities			Total No. of Damaged Facilities
	Lightly Damaged	Moderately Damaged	Heavily Damaged	
1. Palu	165	114	107	386
2. Sigi	35	109	123	267
3. Donggala	249	173	118	540
4. Parigi Moutong	39	41	26	106
<b>Total</b>	<b>488</b>	<b>437</b>	<b>374</b>	<b>1,299</b>

Note: Education facilities refer to general schools including all levels.

Source: Decree of Governor of Central Sulawesi No.360/006/BPBD-G.ST/2019

## (2) Women and child protection

Both the Ministry of Women Empowerment and Child Protection (MoWECP), and the Women Empowerment and Child Protection Department pointed out that women, specifically those with small children, who lost their husband, the breadwinner of the family, due to the disaster is the most vulnerable group among disaster victims. These women do not have sufficient working experience and cannot work flexibly because they need to take care of their children.

Furthermore, according to the interview with the Department of Women Empowerment and with evacuees in the temporary evacuation sites, several cases of gender-based violence (GBV) and sexual harassment in the evacuation sites were reported. Women in evacuation sites in Donggala Regency pointed out that space for shower and bathroom for women in the site were insufficient.

## 2-2 Response Activities

### 2-2-1 Structure of Emergency Response Taken by the Government and Assigned Donors

During the emergency response phase, the Government of Indonesia (GoI) activated the cluster framework based on Inter-Agency Contingency Plan.

The GoI has the National Cluster led by government agencies and the International Cluster led by Humanitarian Country Team organizations as shown in Table 2-16. For example, National Cluster for Displacement and Protection brings together partners active in various sub-clusters, including Shelter, Camp Coordination and Camp Management, Protection (and its various sub-clusters on GBV, Child Protection, Elderly People, vulnerable groups including those living with HIV/AIDS, and psychosocial support). Cluster-level coordination framework also functioned at provincial level in Central Sulawesi Province from the early stage of emergency response. Regional-level cluster, initiated on 1 November

2018<sup>3</sup>, had been functioning in the recovery and reconstruction stage as of March 2019, led by secretary of governor in Central Sulawesi Province.

Table 2-16 National Cluster and International Cluster in Indonesia

Sector	National Cluster		International Support
	Lead	Co-Lead	
Education	Ministry of Education and Culture	Ministry of Religious Affairs	UNICEF
Health	Ministry of Health	Ministry of Medical and Health, POLRI	WHO and UNICEF (WASH & Nutrition)
Logistics and Equipment	BNPB	Ministry of Social Affairs and TNI	WFP
Early Recovery	Ministry of Home Affairs	BNBP	UNDP
Displacement and Protection	Ministry of Social Affairs	POLRI	IFRC, UNICEF and UNFPA
Infrastructure and Facilities	Ministry of Public Works and Public Housing	-	UNICEF and WFP
Economy	Ministry of Agriculture	Ministry of Cooperatives and SMEs	FAO and WFP
Search and Rescue	BASARNAS	TNI	OCHA

Source: Prepared by the JICA Study Team based on data from official Save the Children Indonesia

## 2-2-2 Response and Support Action Taken in the Sector by Line Ministries and Departments of Local Governments

### (1) Disaster management (BPBD/BMKG)

Each of the three affected regencies/cities formulated a Regional Disaster Management Plan based on the Head of BNPB Regulation No.4 2008. The plan includes general information of the region, disaster risk, basic strategy and policy, action plans with related stakeholders and target year of implementation. Emergency response and recovery activities are implemented based on the institutional arrangement of the plan.

BPBD has been implementing awareness-raising activities and village-level disaster management activities based on the Head of BNPB Regulation No.1 2012. Each regency and city has selected several villages for the conduct of disaster-resilient village activities and awareness-raising activities based on their regional disaster management plan. At the early stage of recovery, BPBD had suspended disaster management activities because it prioritized emergency response and early recovery, including relief distribution, temporary shelter coordination, damage assessment and coordination for compiling the regency/city action plans. The BPBD Palu City had planned to conduct school-based DRR activities during fiscal year 2019, while the BPBD Sigi Regency had planned to install signboard in disaster-prone areas.

<sup>3</sup> Displacement and Protection Cluster Central Sulawesi 1-11-2018, received from Department of Social Affairs in Central Sulawesi Province.



As for disaster awareness activities, BMKG Palu Office was in charge of educating the public on the mechanism of earthquake, liquefaction and tsunami by visiting schools or through local media such as radio and TV station. The BMKG headquarter (Earthquake and Tsunami Mitigation Division) instructed its Palu Office on the content of awareness activities.

## (2) Industries

As part of effort to support damaged industries, the Ministry of Industry in collaboration with the Regional Departments of Industry had constructed production houses where owners of home-based industries who lost their assets/homes can restart their businesses: rattan furniture producers, women's group engaged in craft production using local plants in Palu City, chocolate confectionery producers, tailors and those in handy craftworks in Sigi Regency.

As for the Regional Departments, there was no additional budget allocated for the purpose of recovery and restoration. Moreover, a part of secured budget for FY 2018/ 2019 was reallocated to cover emergency aid cost. Consequently, the departments contrived to allocate their limited budget for supporting local industries.

**Palu City:** The Department of Industry of Palu City secured FY 2019 budget before the earthquake, which was to be used for various programs, such as SMI development, improvement of production knowledge and technique, and enhancement of efficiency in trading. Part of that budget had been applied for recovery of damaged industries.

**Sigi Regency:** The response of the Department of Industry of Sigi Regency was relatively quick. Starting January 2019, the Department assessed the damage incurred by businesses and provided assistance, including repair of buildings and recovery of equipment, and assisting affected home-based industries, such as food processing or furniture and craft making, whose shops and houses had been severely damaged.

**Donggala Regency:** Assistance programs for affected businesses had not been compiled or planned as of the end of January 2019, due to the lack of budget available for FY 2019. The only support activity identified was assistance for SMI to participate in Industry EXPO in Jakarta.

## (3) Cooperatives and SMEs

The Ministry of Cooperatives and SMEs had provided 5 million IDR each for SMEs in Palu City, Sigi Regency and Donggala Regency. Each Regional Department had selected a total of 50 SMEs and 150 enterprises that received the fund with no obligation to repay. As beneficiaries of this support scheme, heavily-damaged SMEs were given high priority. The Ministry had also conducted workshop for those beneficiaries, in which session to rekindle their motivation and to formulate business plan were provided. The Regional Departments monitored those recipients to check their use of funds and business operation.

**Palu City:** In Palu City, MSMEs and cooperatives mainly in the food processing sector were affected. According to the Department of Cooperatives and MSMEs and Labor, 1,200 enterprises had reported to the Department on their damage and loss (as of January, 2019). As urgent assistance, the Department

had provided cash-for-work program for those who live in shelters. As many as 80 evacuees (Micro-enterprises) had participated in this program and received a wage of 65,000 IDR per hour. Provision of equipment and material, as well as consultation/ technical assistance for improving production process, was planned in FY 2019. In addition, the Department assisted local enterprises/ cooperatives through support programs funded by other agencies such as the National Disaster Management Agency (*BNPB*).

***Sigi Regency:*** Nalodo - liquefaction landslide happened during the disaster that resulted in the complete destruction of many enterprises in Sigi Regency, such as kiosks and motorbike repair shops. Accordingly, high priority was given to these businesses during response activities. The Department of Cooperatives and MSMEs planned to assist affected SMEs through two main programs: one would be the establishment of MSME centers at temporary housing sites, and the other would be provision of equipment replacing things that were lost or damaged along with skills training. For the former, they identified four temporary housing locations, namely: Lolu in Biromaru, Binangga in Marawola, Sibalaya Selatan in Tanambulava and Baluase in Dolo Selatan. For the latter assistance, the businesses designated to receive assistance were motorcycle repairing, sewing, hairdressers, food businesses, etc. For the cooperatives, it was planned that 15 cooperatives would receive rehabilitation assistance for their damaged offices and equipment, and three would receive a temporary office building and some training. The total budget of the Department for FY 2020 was estimated at 4.5 billion<sup>4</sup> IDR.

***Donggala Regency:*** In Donggala Regency, one of the most affected sectors was fishery. Consequently, SMEs and cooperatives for fishery and marine product processing were severely affected. The Department compiled a list of affected cooperatives and their needs, but the budget for the assistance was not secured. In order to assist one of the fish processing women's groups in Lero Tatari village in Sindue sub-district, whose members lost equipment and processing venues (their houses), the Department had proposed an assistance program to the Provincial Offices.

#### (4) Fisheries and marine affairs

The government led immediate rehabilitation to help the worst affected fishing families. International organizations, including FAO, joined the effort to support fishermen with fishing equipment to help restore their livelihoods.

- FAO undertook a survey to assess the affected fishers, validated losses and damages in fishing assets in Donggala Regency and Palu City, and not to rely on available data/information for planning. Based on the survey results, FAO had decided to provide fishing inputs (fishing nets, hooks and lines, insulated and thermos boxes); but it did not intend to provide boats and engines.
- Other organizations who were at the planning stage at that time to assist the fisheries sector were World Vision, OXFAM and Solidaritas Swiss.
- Donors in Indonesia – such as PMI (Indonesian Red Cross Societies), PLN (Pusat Electric Negara), Pertamina, local NGOs, etc. – initiated to provide boats, etc. through the Department of

---

<sup>4</sup> Information from the presentation at the Musrenbang of Sigi Regency in March 14, 2019.

Fishery and Marine Affairs (DKP) of Donggala, which was tasked to receive and distribute donated fishing boats and equipment (refer to the table below).

- Names of donors providing fishing boats, etc. through Palu City Fisheries were not made available, except some figures (refer to table below).
- There had been informal distribution of boats in both Palu City and Donggala Regency, without the knowledge of the respective fisheries offices; therefore, actual number of boats distributed and recipient beneficiaries or villages were not documented.
- BAPPEDA Donggala Regency and BAPPEDA Palu City had budgeted in their Action Plans, the provision of 516 and 240 fishing boats, and 240 boats with fishing gears, respectively.

Table 2-17 Fishing Boats Provided in Donggala Regency (as of Feb. 2019)

Donor	No. of Boats	Remarks
Red Cross Surabaya (PMI)	20	Provided boats through Donggala DKP which were distributed to fishermen groups in Banawa, Tanantovea
Surabaya City	14	
Pusat Electric Negara	54	
<b>Sub-total</b>	<b>88</b>	
Podo Sidaka NGO*	6	Provided boats in Sirenja but not through Donggala DKP
Other Donors**	200	Distribution in target villages was unknown (informal).
<b>Subtotal</b>	<b>206</b>	
<b>Total</b>	<b>294</b>	

Sources: \*Personal communication with fishery staff of KUPT in Sirenja.

\*\*Personal communication with Head of Donggala DKP.

Table 2-18 Fishing Boats Provided in Palu City (as of Feb. 2019)

Donor	No. of Boats	Remarks
Donors names were not released	84	Boats were provided through Palu City KPP, and these were distributed to fishermen in Tawaeli, Mantikulore and Palu Barat
	56	Boats already with Palu City KPP but awaiting distribution
<b>Subtotal</b>	<b>140</b>	
Adi Kariya NGO	10	Provided boats to fishermen in Lere, but not through Palu City KPP
<b>Total</b>	<b>150</b>	

Note: In most cases, above-cited boats were provided without outboard engines.

Source: Personal communication with Data Processing staff

## (5) Agriculture

In response to the earthquake, the government adopted a policy to shift from paddy production to horticulture in Sigi Regency in order to mitigate the liquefaction damage. The target crops are chili, sweet corn, eggplant and onions. Chili and sweet corn already have certain market such as Kalimantan, etc. Sweet corn, particularly, has high demand and considered to have potential for market expansion.

In Sigi, local government provided 200 units of hand tractors and four wheel tractors. Moreover, 53 units of water pumps, which are capable of irrigating 3 ha of land, have been provided also. However, there is no concrete plan to promote the transition of cropping among farmers. The demand for the prospective crops, such as chili, sweet corn, eggplant and onions, is still higher than production. In terms of market saturation, it is needed to gradually develop cultivation plans for crop diversification and disseminate them among farmers to avoid concentration on a certain crop.

In a similar way to fishery sector, FAO is carrying out support activities in agriculture sector. FAO with WFP conducted market assessment and impact assessment whose result was released in December 2018. FAO is focused on horticulture crops, such as tomato, chili and vegetables, due to the required short-time cropping period.

**(6) Women empowerment**

Women Empowerment and Child Protection Department of affected areas is the member of Displacement and Protection Cluster and its related sub-clusters, including Child Protection in Central Sulawesi Province. During the early recovery stage, the Regional Departments in collaboration with UNFPA conducted women-friendly space field assessment, TOT workshop for prevention of sexual exploitation and abuse, and discussion on gaps and challenges on women and child protection. The Department in each affected regency and city has collected gender-aggregated evacuees’ data for further utilization on reconstruction activities.

In addition to these activities, the Department is a focal point of the emergency response, early recovery activities including construction of women-friendly shelter and psychosocial support for the victims.

**(7) Village development and community empowerment**

**1) National level (the Ministry of Village, Disadvantaged Region and Transmigration)**

The Ministry of Village, Disadvantaged Region and Transmigration is the national-level governmental agency working for village development and community empowerment. The Ministry has a section specialized in disaster risk management, and after the occurrence of disaster, it disbursed emergency budget for village reconstruction.

**Table 2-19 Roles and Actions of the Ministry of Villages, Disadvantaged Region and Transmigration**

Roles and Responsibility	Actions Taken Related to Disaster
<ul style="list-style-type: none"> <li>• Allocation of budget for employment, training and dispatch of village facilitators</li> <li>• Monitoring and setting guidelines for village development fund</li> <li>• The Department for Development of Specific Areas in the Ministry is engaged in disaster risk management and designation of Disaster-Prone Areas</li> </ul>	<ul style="list-style-type: none"> <li>• For the past 5 years, the Ministry has been coordinating with the Government of New Zealand to support preparation of hazard map and capacity building in Palu and Donggala.</li> <li>• Allocation of village development fund to affected areas (planned amount: one billion IDR/year for each village) for village reconstruction purpose</li> </ul>

Source: Information were mainly from interview with Dept. of Community Empowerment and Village Development of the Province of Central Sulawesi in January 2019.

## 2) Provincial level (Dept. of Community Empowerment and Village Development)

The provincial agency responsible for village development and community empowerment is the Department of Community Empowerment and Village Development. In ordinary times, the Department recruits and dispatches staff who works at village level to facilitate and empower communities. It has been engaging in the strengthening of village-owned companies and in the provision of clean water and sanitation goods as a disaster response.

Table 2-20 Roles and Actions of the Department of Community Empowerment and Village Development (Province)

Roles and Responsibility	Actions Taken Related to Disaster
<ul style="list-style-type: none"> <li>• Formulation of Province's strategic plan on village development</li> <li>• Guidance and training on village offices through implementation of development programs (in partnership with other departments such as the Dept. of Health and PUPR)</li> <li>• Monitoring of plans, administration and activities of villages</li> <li>• Recruitment, training and dispatch of three types of staffs: local village facilitator, village facilitator and village experts.</li> </ul>	<ul style="list-style-type: none"> <li>• Strengthening of Village-Owned Company (BUMDes) through training courses on business development, accounting, etc. by the initiative of the Division of Community Empowerment</li> <li>• Provision of clean water and sanitation goods</li> <li>• Convening of meetings on water and sanitation inviting all affected cities/regencies</li> <li>• The Department does not intervene directly in the reconstruction of village infrastructure.</li> </ul>

Source: Information were mainly from interview with Dept. of Community Empowerment and Village Development of the Province of Central Sulawesi in January 2019.

## 3) Local level (Dept. of Community Empowerment and Village Development)

The Department of Community Empowerment and Village Development is the responsible agency at regency level. The Department does not exist in the city (kota), which has different administrative system from regencies. For Palu City, the agency concerning community development and empowerment is placed under the Department of Social Affairs. Their roles, responsibility and the actions taken regarding disaster are summarized in Table 2-21.

Table 2-21 Roles and Actions of the Department of Community Empowerment and Village Development (Regency)

Roles and Responsibility	Actions Taken Related to Disaster (in the case of Sigi Regency)
<ul style="list-style-type: none"> <li>• There are 3 divisions (village administration, organizational development and economic development).</li> <li>• Empowerment and monitoring/evaluation of village or community as well as their activities</li> </ul>	<ul style="list-style-type: none"> <li>• Distribution of drinking water to affected people at lower price during emergency response period</li> <li>• Making a request to the Ministry of Villages for budget to rebuild/repair village buildings</li> <li>• Cash-for-Work: Villagers were hired with allowance of 80,000 IDR/day to clean debris.</li> <li>• Repair/Installation of village infrastructure (water pipe, etc.)</li> </ul>

Source: Information were mainly from interview with Dept. of Community Empowerment and Village Development of Sigi Regency in January 2019.



## 2-2-3 Donors and NGOs

### (1) Structure of coordination

In the beginning of emergency response period, the GoI formulated the Cluster System at national level and province/municipality level based on the guideline for emergency response developed by BNPB, the Ministry of Social Affairs and other related agencies. As for Central Sulawesi Province, the Regional Cluster is composed of 6 clusters and one working group, namely: relocation and protection cluster, health cluster, education cluster, logistic cluster, food security and livelihood cluster, cash transfer (Working Group) and early recovery cluster. Each of these clusters consists of sub-clusters.

Each cluster consists of government agencies, international organizations, and international and local NGOs which hold weekly or bi-weekly meetings to share their activity progress and coordinate with each other. As a regional coordination body, all clusters and donors gather weekly at the Governor's Office of Central Sulawesi Province under the lead of the province secretary to report progress of each cluster.

### (2) Activities taken by major donors and NGOs

#### 1) Psychological intervention

Activities of donors/NGOs regarding psychological intervention are summarized in the following table.

Table 2-22 List of NGOs Working for Psychological Intervention (Trauma Healing)

	Name of Organization	Operating Areas		Activities	Target (ppl)	Partners
		City/Regency	Sub-district			
1	World Vision Indonesia (WVI)	Palu	Palu Barat, Tawaeli, etc.	Psychological support for children through supportive non-formal education	3,000	Min. of Social Affairs, Dept. of Social Affairs
		Sigi	Marawola Biromaru			
2	Yayasan Plan International Indonesia (YPII)	Palu	Palu Utara	Trauma healing through playing, painting, singing, story telling, earthquake debriefing	330	Min. of Social Affairs, Dept. of Social Affairs
		Sigi	Dolo Barat, Gumbasa, etc.			
3	NU Peduli - Childfund	Palu	Tatanga, etc.	Giving additional nutrition (under 5-year olds), praying together and opening of private vocational school	-	Min. of Social Affairs, Dept. of Social Affairs
		Sigi	Dolo Selatan, etc.			
		Donggala	Sirenja			
4	MDMC	Palu	Ulujadi, etc.	Psychological counselling for groups, opening of fun school, formation of teenager community, socialization and FDG, etc.	9,000	Min. of Social Affairs, Dept. of Social Affairs
		Sigi	Kulawi, etc.			
		Donggala	Sirenja, etc.			
5	BANUAMEN TOR	Palu	Palu Timur, Mantikulore, etc.	Community guidance for adults, recreational activity for students, provision of additional learning	700	Min. of Social Affairs, Dept. of Social Affairs

Source: Coordination meeting of Food Security and Livelihood Sub-cluster, 4W Central Sulawesi (dated 4 January 2019)

## 2) Vulnerable groups and persons with disabilities

Activities of donors/NGOs regarding vulnerable groups and persons with disabilities (PwDs) are summarized in the following table.

Table 2-23 List of NGOs Working for Vulnerable Groups and PwDs

	Name of Organization	Operating Areas		Activities	Target (ppl)	Partners (lead organizations)
		City/Regency	Sub-district			
1	PP IFI Jakarta	Palu	Palu Timur	Training and workshop for socially vulnerable people	-	Humanity& Inclusion (US-based NGO)
2	DY/TAGANA Sulteng	Palu	Palu Barat	Assessment of vulnerable people and peer-to-peer support	800	Humanity& Inclusion (US-based NGO)
		Sigi	Sigi Biromaru, etc.			
		Donggala	Banawa			
3	Pottja Pasigala	Palu	Taweli	Hygiene Kits Distribution & Hygiene Promotion Session for general, with specific attention to PwDs and the elderly	1,750	Arbeiter-Samariter- Bund (ASB)
		Sigi	Dolo Barat, etc.			
		Donggala	Balaesang			
4	UNICEF	Across affected areas		<ul style="list-style-type: none"> <li>Nutritional guidance and support to mothers on breastfeeding and child-feeding</li> <li>Health training for midwives, nutritionists, health facilitators</li> <li>Protection from diseases through supporting vaccination efforts and provision of bed nets against malaria</li> <li>Education: establishment of temporary learning spaces</li> </ul>	Over 50,000	Min. of Health, Dept. of Health
6	UNFPA	Palu	Palu Timur, etc.	<ul style="list-style-type: none"> <li>Establishment of Women-Friendly tent, Youth-Friendly tent</li> <li>Delivery of basic SRH (sexual and reproductive health) services through deployment of health personnel</li> <li>Provision of individual kits to pregnant women, new-born babies, maternity kits</li> <li>Training and workshop for gender-based violence</li> </ul>	300	Min. of Health, Dept. of Health, KPKP-ST (local NGO), PKBI
		Sigi	Sigi Biromaru			

Source: 4W Central Sulawesi (dated 4 January 2019)

Note: ppl = people

## 3) Shelter / Temporary housing (Huntara)

Donors and NGOs supported the GOI to construct temporary housing and permanent houses, too. Their activities regarding construction of temporary housing and permanent houses are summarized in the following Table 2-24.

Table 2-24 List of NGOs Working for Provision of Temporary Housing (Huntara)

	Name of Organization	Planned	On-Going	Complete		Name of Organization	Planned	On-Going	Complete
1	ACT Fitriyani	1292		1292	36	LAZ AL-AZHAR	36		36
2	ADRA	15		15	37	LAZ As Sallam Jayapura	2		2
3	Al Khair Indonesia	275		275	38	MAPIM - Malaysia	57		57
4	BAA Peduli	50		50	39	MDMC	1503	203	821
5	Bakrie Untuk Negeri	96		96	40	MDS Perkantas	1354		1354
6	Bank Indonesia	13		33	41	Mercy Malaysia	205		205
7	Bank Mandiri	250		250	42	NU Peduli	218		214
8	BAZNAS Deden	603		569	43	OJK Peduli	312		312
9	BNI	550		550	44	Pemprov Jawa Tengah	100		100
10	BRI	100		100	45	PKPU-HI	937	329	543
11	Caritas PSE Manado	236		232	46	PMI	40		40
12	CBM Peduli Indonesia	18		18	47	PT. Vale Tbk	24		24
13	CWS - DANGAU Harun Tamning	220		220	48	Radar Malang	40		40
14	CWS - INANTA Harun Taming	208		208	49	Rotary	136		136
15	Darussalam Peduli	14		14	50	Rumah Zakat	600	49	551
16	DKMG Faiz Firmansyah	1377		1377	51	SINODE GEREJA TORAJA	38		38
17	Dompot Dhuafa	417		417	52	SQL Berjamaah	50		50
18	Dompot Peduli Dhuafa	45		45	53	SSG Indonesia	112		112
19	DT Peduli	400		400	54	Surabaya Peduli	135		135
20	ERCB	264		258	55	Telkom Peduli	62		62
21	Global Peace Mission - Malaysia	14		14	56	TRAMP	357		357
22	GPI	120		120	57	WIZ	155	17	65
23	Habitat for Humanity	1120		1039	58	WVI	12	9	3
24	Haluan Prihatin Malaysia	97		97	59	WVI - DD	100		100
25	HOPE worldwide INDONESIA	45		45	60	WVI - HFI	50		50
26	IDEF Foundation dan YPAL Poso	100		100	61	WVI - HFI	350		350
27	ILUNI	384		360	62	Yayasan Arkom Indonesia	150	16	40
28	Indonesia Power	10		10	63	Yayasan STDI	51		51
29	Islamic Relief-Konsepsi	209	74	135	64	YGNI	140		140
30	IZI	148		148	65	YKMI	183		183
31	Kalla Group	96		96	66	YSTC	657		657
32	KAPPALA INDONESIA	5		5	67	YWMI	50		50
33	Karinakas	102		102	68	ZIS Indosat	3		3
34	Kompas	160		160	69				
35	KUN Humanity	64		64	36				

Source: Shelter Sub-Cluster Team, July 1, 2020

Table 2-25 List of NGOs Working for Provision of Permanent Shelter (Huntap)

	Name of Organization	Planned	On-Going	Complete
1	ADRA	22	10	5
2	AHA CENTRE	100		75
3	Al Khair Indonesia	400		
4	BAZNAS	20		20
5	Dompot Dhuafa	150		5
6	Rumah Zakat	100	100	
7	YBT	469	81	103
8	YEU	47		46
9	Habitat for Humanity	150	27	7
10	Budha Tsu Chi	2500	841	1159
11	Yayasan Arkom Indonesia	150	12	4
12	WIZ	11	4	7
13	PEMDA	123	123	0

Source: Shelter Sub-Cluster Team, July 1, 2020

#### 4) Livelihood / cash intervention

Activities of donors/NGOs regarding livelihood and cash intervention are summarized in the following table.

Table 2-26 List of Donors/NGOs Working for Provision of Livelihood / Cash Intervention

	Name of Organization	Operating Areas		Activities	Target	Partners
		City/Regency	Sub-district			
1	World Vision Indonesia (WVI)	Sigi	Sigi Biromaru	Cash for Work	500 hh	
				Restoration of food production (Input Provision - cash voucher, business training, water well making)	200 hh	Agriculture Dept. input provider
				Financial Literacy Training	200 hh	Bank
				Alternative livelihood program (strengthening of SME or business groups, financial inclusion)		-
		Marawola	Alternative livelihood program (strengthening of SME or business groups, financial inclusion)	100 hh	Cooperatives and MSMEs Dept., local vendor, bank	
				Input provision (Cash Voucher) in poultry		100 hh
		Kinovaro	Alternative livelihood program (strengthening of SME or business groups, financial inclusion)	50 hh	-	

	Name of Organization	Operating Areas		Activities	Target	Partners
		City/Regency	Sub-district			
		Donggala	Sindue Tanantovea	Restoration of livelihood source in fishery, livestock, agriculture and SME sector	200 hh	Marine and Fishery Dept., Cooperatives & MSMEs Dept.
			Banawa Selatan	Restoration of livelihood source in fishery sector	Planning stage	
		Palu	Ulujadi	Restoration of livelihood source in fishery, agriculture and SME sector	200 hh	Agriculture Dept. of Palu City, bank, Cooperatives & MSMEs Dept.
			Tawaeli	Restoration of livelihood source in agriculture and SME sector	100 hh	
2	Yayasan Sayangi Tunas Cilik (YSTC)	Palu	Tawaeli, Ulujadi	Community cash grant	300–400 hh in each sub-district	-
		Donggala	Sindue, Banawa, etc.	Community cash grant		-
3	Yayasan Fondasi Hidup	Sigi	Kulawei	To be decided	50 hh in each village	-
			Sigi Biromaru	Cash transfer for livelihood (agriculture & small business)		Village office
4	Islamic Relief	Sigi	Sigi Biromaru (Lolu, Mpanau)	Home industry	1,000 hh	Women Empowerment and Child Protection Dept. KONSEPSI (local NGO)
				Mushroom cultivation	1,000 hh	
				Hydroponic cultivation	1,000 hh	
				Microfinance	1,000 hh	
		Palu	-	Home industry	500 hh	
				Mushroom cultivation	500 hh	
				Hydroponic cultivation	500 hh	
				Microfinance	500 hh	
5	SHEEP Indonesia	Donggala	Sindue,	In-depth assessment and livelihood profiling of fishermen groups and farmer groups	1,700 ppl	Agriculture Dept. Marine and Fishery Dept., village office, civil society organization for regional level
			Balesang,		468 ppl	
			Sirenja,		180 ppl	
			Benawa,		2,791 ppl	
			Dolo Selatan		1,258 ppl	
		Palu	Palu Utara	Livelihood recovery for fishermen groups and farmer groups	2,953 ppl	
6	FAO	Sigi	Dolo, Gumbasa, etc.	Livelihood recovery in agriculture sector and fishery sector through provision of input	8,000 farmers, 2,300 fishermen	Agriculture Dept., Marine and Fishery Dept., Community organizations
		Palu	Tawaeli, etc.			
		Donggala	Labuan, Sindue, etc.			

Source: Coordination meeting of Food Security and Livelihood Sub-cluster  
Notes: hh = households; ppl = people



## 2-3 Review of Action Plans on Livelihood and Community Restoration Drafted by Local Governments

Based on the results of Post-Disaster Needs Assessment (*Jitu Pasna*, abbreviated as PDNA) implemented by local governments, Palu City, Sigi Regency and Donggala Regency have formulated their respective Reconstruction Action Plans indicating the recovery needs of the disaster-affected areas, as well as the policies and strategies to address these needs and to accomplish the concept of build-back-better (BBB).

The Action Plan prepared by each local government consists of a common structure with six (6) chapters as follows:

1. Background: Explains the context in which the Action Plan was prepared
2. General Description: Explains the general status of the area, including its natural and socio-economic conditions
3. Assessment of Recovery Needs: Mainly a discussion of disaster impact and recovery needs in the sectors of (1) Settlement, (2) Infrastructure, (3) Social and Cultural, (4) Economic, and (5) Cross Sector
4. Principles, Policies and Strategies: Indicates the direction toward which the City/Regency aims to approach rehabilitation and reconstruction, as well as indicative measures to implement the strategies.
5. Management: Discussion of the expected schedule and sources of funding as well as the implementation structure of the activities indicated in the above.
6. Conclusion: Mainly an explanation of the legal background of the Action Plan

Chapter 4 indicates the actual strategies for rehabilitation and recovery of the disaster-affected areas, where each local government has developed a unique set of strategies based on the local context and situation of damages and losses. The strategies are described corresponding to the categories indicated in Chapter 3.

Though most strategies are related to livelihood recovery and community restoration, the following table summarizes those considered directly pertaining or addressing these items.

Table 2-27 Strategies of the Action Plans of Palu City with Direct Relation to Livelihood Recovery and Community Restoration

Palu City	
Sector	Strategies
1. Housing and Settlement	<p>(1) Providing choices for residents to settle:</p> <ul style="list-style-type: none"> <li>a. Facilitating the community and preparing new settlement locations to accommodate ex-situ residents to Talise-Tondo Village, Duyu Village, Petobo Village, and Balarooa Village relocation sites.</li> <li>b. Accommodate the wishes of the people who want to continue to build their land on condition that they are not in-situ areas.</li> <li>c. Developing village and/or development plans that are sub-district based (village planning) as the main instrument for reconstruction of post-disaster urban areas.</li> </ul>
2. Infrastructure	n.a.
3. Economic	<p>(1) Restoring community service facilities that support economic activities</p> <p>(2) Restoring the income of disaster victims</p> <ul style="list-style-type: none"> <li>a. Provide employment related to reconstruction rehabilitation and according to the location of new settlements that are more resilient to disasters.</li> <li>b. Provide various job trainings to people who have lost their jobs, through vocational training, entrepreneurship, and mobile training units.</li> </ul> <p>(3) Providing assistance to disaster-affected communities</p> <ul style="list-style-type: none"> <li>a. Provide direct assistance through a community-based approach</li> <li>b. Provide direct grants or facilities for banking credit</li> </ul> <p>(4) Increasing support for disaster victims</p> <ul style="list-style-type: none"> <li>a. Strengthening cooperatives, MSMEs, and IKM through training, mentoring, and business capital assistance.</li> <li>b. Relocation of new selling points for coastal MSMEs to the Kaombona city forest, Salena tourism area, and Uventumbu tourism zone.</li> <li>c. Providing assistance for community development</li> </ul>
4. Social and Cultural	<p>(1) Improve services to disaster victims</p> <ul style="list-style-type: none"> <li>a. Conduct psychological assistance to disaster victims and their families.</li> <li>b. Provide assistance and guarantees for vulnerable communities.</li> </ul> <p>(2) Preserve cultural heritage together with customs, traditions and art activities</p> <ul style="list-style-type: none"> <li>a. Rebuild evidence of community history through the debris of post-disaster buildings (disaster warning monuments).</li> <li>b. Optimizing community functions in maintaining local customs, traditions and art activities.</li> </ul>
5. Cross-Cutting	<p>(1) Improve women empowerment and child protection</p> <ul style="list-style-type: none"> <li>a. Conduct prevention and handling of gender-based violence.</li> <li>b. Provide counseling or psychosocial support services.</li> <li>c. Carry out women empowerment activities.</li> </ul> <p>(2) Provide special recovery assistance that considers the needs of vulnerable groups to increase resilience in the face of future disasters</p>

Source: Action Plan of Palu City

Table 2-28 Strategies of the Action Plans of Sigi Regency with Direct Relation to Livelihood Recovery and Community Restoration

Sigi Regency	
Sector	Strategies
1. Housing and Settlement	<p>(1) Form a team for the management and implementers of Relocation of Post-Disaster, Nalodo (Liquefaction landslide) and Flash Flood Refugees in Sigi Regency which involves the participation of women and other vulnerable groups. The intended team will be determined by the Regent's Sigi Decree.</p> <p>a. Provide socialization and direction to disaster-affected communities at the disaster site.</p> <p>b. Prepare operational plans and work programs for relocation handling activities.</p> <p>c. Verify refugee data.</p> <p>d. Assign refugees to be relocated.</p> <p>e. Place refugees in designated relocation sites.</p> <p>f. Report the results of the team's activities to the Bupati through the Sigi Regency Regional Secretariat.</p> <p>(2) Prepare a Sigi Regency Decree regarding affected victims who will be placed in permanent housing (aid houses in the form of special houses or landed houses) with a pattern of community empowerment.</p> <p>(3) Provide choices for residents to settle based on data on Siguna.</p> <p>a. Facilitate the community to immediately start a new life in a safe starting location or a safer new area (relocation).</p> <p>b. Prepare a new settlement location to accommodate residents who want to move.</p> <p>c. Develop village planning as the main instrument for post-disaster village reconstruction.</p> <p>(4) Assist and implement housing rehabilitation and reconstruction</p> <p>a. Establish the type of home assistance with a typical model to minimize the occurrence of social conflict.</p> <p>b. Help victims who want to return to their original place of residence in equal cash or in-kind form.</p> <p>c. Help provide housing, infrastructure and basic supporting facilities for disaster victims who wish to move to new places (resettlement);</p> <p>d. Construction of housing assistance that follows technical standards in accordance with the provisions of legislation.</p> <p>e. Construction of houses that follows technical standards in accordance with the provisions of laws and regulations, and takes into account input from relevant agencies / institutions as well as the aspirations of disaster victims.</p> <p>f. Preparation of Detailed Engineering Design (DED) technical planning documents for the construction of housing assistance carried out by the Ministry of PUPR.</p> <p>g. Provide stimulant assistance for the implementation of settlement sector recovery based on the results of verification of recipients of housing assistance, ownership status of land and buildings based on data in the disaster management information system (Siguna) stipulated in the Sigi Regent's decree regarding determination of affected houses with stimulant rates determined based on the appropriate damage provisions of legislation accompanied by assistance, monitoring and evaluation.</p> <p>h. Complete assistance and provision of housing for disaster victims in a period of less than 2 years.</p> <p>i. Assistance is provided through a pattern of community empowerment by paying attention to local wisdom, character, and culture of the local community according to established mechanisms.</p>
2. Infrastructure	<p>(1) Post-disaster rehabilitation and reconstruction of the infrastructure sector is carried out in order to support the implementation of community economic recovery</p>
3. Economic	<p>(1) Recovery of community service facilities that support economic activities by carrying out post-disaster rehabilitation and reconstruction of physical and non-physical infrastructure in the economic field by considering the economy of Sigi Regency which is still dominated by the agriculture, trade, construction and government sectors. The sector with the fastest growth in 3 years in Kab. Sigi is Financial Services,</p>

Sigi Regency	
Sector	Strategies
	<p>Health and Social Services, and Electricity and gas Procurement</p> <p>(2) Recovery of the income of disaster victims</p> <ol style="list-style-type: none"> <li>a. Provision of employment related to rehabilitation and reconstruction that is suitable for the location of new settlements, such as labor intensive programs in post-disaster recovery activities, by ensuring women's involvement and participation in the program;</li> <li>b. Provide training in various work skills to people who have lost their jobs through vocational training, entrepreneurship, and mobile training units (MTU) or work training programs carried out in the neighborhood where residents live.</li> <li>c. Provide assistance to disaster victims by giving priority and considering special needs of the most vulnerable groups, such as female heads of household, teenagers, male heads of households who have toddlers, children and people with disabilities, in the form of medium and long-term assistance that include: <ol style="list-style-type: none"> <li>a) Direct assistance through a community-based approach</li> <li>b) Direct grants</li> <li>c) Ease of bank credit</li> <li>d) Land assistance for business or housing</li> <li>e) Stimulant assistance for the economic recovery of the community</li> </ol> </li> </ol> <p>(3) Increasing support for disaster victims</p> <ol style="list-style-type: none"> <li>a. Optimize the use of village funds for cash-intensive work;</li> <li>b. Strengthen cooperatives, MSMEs, and SMEs through counseling, technical guidance, assistance and business capital stimulant assistance.</li> <li>c. Provide assistance to the community.</li> </ol> <p>(4) Establishment of legal entity to small and medium enterprises in relocation locations to fulfill economic sector aid distribution.</p>
4. Social and Cultural	<p>(1) Restoring security and community protection facilities through victim data collection so that the number of basic needs is known, providing temporary shelter assistance and basic facilities and providing assistance and guarantees to vulnerable communities.</p> <ol style="list-style-type: none"> <li>a. Women, including female heads of household, pregnant women</li> <li>b. Children</li> <li>c. Youth</li> <li>d. Elderly</li> <li>e. Persons with disabilities</li> </ol> <p>(2) Increase the protection of victims of gender-based violence</p> <ol style="list-style-type: none"> <li>a. Prevention, which is carried out by increasing awareness of the entire community through intensive socialization of the importance of gender justice</li> <li>b. Handling of gender-based violence in residential areas, carried out with rapid response through the provision of complaint service units, health services, enforcement and legal assistance services and social rehabilitation and reintegration services (including counseling, spiritual guidance, safe homes, economic empowerment, and or alternative care for child victims).</li> </ol> <p>(3) Activities to empower women by ensuring the involvement of women and vulnerable groups in the policy-making process at all levels starting from planning, implementation and monitoring and evaluation to the development of rehabilitation and reconstruction</p> <p>(4) Restoration of social institution services by rehabilitating nursing facilities and infrastructure</p> <p>(5) Preservation of cultural heritage that includes rebuilding the historical evidence of the community through debris after the disaster, optimizing community functions in maintaining local customs, traditions and art activities</p>
5. Cross-cutting	n.a.

Source: Action Plan of Sigi Regency

Table 2-29 Strategies of the Action Plans of Donggala Regency with Direct Relation to Livelihood Recovery and Community Restoration

Donggala Regency	
Sector	Strategies
1. Housing and Settlement	<p>(1) The community-based housing development strategy is designed with a community organizing strategy (community groups abbreviated as POKMAS) and relies on community initiatives and initiatives by not abandoning local wisdom;</p> <p>(2) The rehabilitation and reconstruction of the housing sector in areas affected by the earthquake and tsunami are carried out using the Community Empowerment Approach Program scheme, in which the community becomes the main actor in rehabilitation and reconstruction.</p> <p>(3) Establish mechanisms and procedures for distributing Community Direct Assistance (BLM) and accelerate the distribution of aid for rebuilding and repairing community housing.</p> <p>(4) Optimize the use of local resources, both in terms of labor, skills, optimizing the use of used building materials from damaged houses and developing construction workshops that include planning and construction techniques and building materials workshops, including the procurement of materials and components of community-managed development.</p> <p>(5) Opening employment opportunities through a cash-for-work of IDR 100,000.00 per household for cleaning house debris, home environment and collecting remaining building materials that are still being used. Cash-for-work recipients are disaster-affected communities, both homeowners and tenants, and residents of official homes, but there should not be multiple recipients.</p>
2. Infrastructure	<p>(1) Implement in the framework of supporting the implementation of community economic recovery, especially for marketing agricultural, fishery and livestock products.</p>
3. Economic	<p>(1) Provide assistance for replacing assets / repairing business assets, in the form of assistance with damaged equipment and machinery;</p> <p>(2) Mentoring of UKM and IKM</p> <p>(3) Rehabilitation and reconstruction of damaged market infrastructure.</p> <p>(4) Recovery of the agriculture, fisheries and industrial sub-sectors which have the largest employment opportunities.</p> <p>(5) Restoring marketing access for small and medium enterprises and agricultural products.</p> <p>(6) Facilitation of MSMEs and the agricultural processing industry in obtaining special banking credit treatment</p> <p>(7) Support and provide business capital assistance / business credit schemes for MSMEs and agricultural products processing industries.</p> <p>(8) Coordinate with relevant ministries / institutions in preparing policies / schemes for recovery and development of MSMEs, industry, including the utilization of APBN funds or other sources.</p> <p>(9) Coordination with the private sector in supporting the use of corporate social responsibility.</p>
4. Social and Cultural	<p>(1) Recovery of social services by prioritizing vulnerable groups, giving Jadup when building houses after a disaster.</p> <p>(2) Integrate with the Donggala Regency poverty alleviation program in 2019 (according to the RKPD), namely through the GERTASKIN poverty alleviation movement program. The GERTASKIN program is a poverty alleviation program based on three successes or tri successes, namely, successful basic needs, income success and business success.</p>
5. Cross Cutting	n.a.

Source: Action Plan of Donggala Regency



The Action plan created by each local government indicated the strategies for accelerating rehabilitation and recovery of the economy and society as below.

- Arrangement and re-establishment of facilities supporting social, economic and cultural activities in the disaster-affected areas regarded as safe.
- Improvement of quality of mental and physical health in the societies of the disaster-affected areas.
- Recovery of social and economic activities of community, governments, and public service organizations, and satisfaction to the unique needs of groups being on disadvantageous situation such as women in the disaster-affected areas.
- Enlarge and strengthen resilience in various social, economic, and cultural sectors of community groups and the disaster-affected areas.
- Participation of various communities, and utilization of related organizations in social, economic and cultural sectors in the community in regions influenced by the disaster.

## Chapter 3 Selection of Pilot Projects

### 3-1 Outline of Pilot Projects

The above action plans established by each local government indicate the direction of recovery and reconstruction of Central Sulawesi. However, their preparation were carried out at the same time as the examination of the pilot project at the beginning of this study. Therefore, it was not able to take an approach to select the pilot project as the most effective activity from the action plans. Therefore, the pilot project is examined through considering the preparing action plans, and they should be activities keeping consistent with the reconstruction action plans of the local government, utilizing the knowledge of Japan, and the activities with immediate effect. Moreover, considering the disaster situation in the target area, the active economic field before the disaster, etc., the selection criteria for the pilot project were organized.

### 3-2 Pilot projects in Municipalities

#### 3-2-1 Priority Areas for the Selection of Pilot Projects

The priority areas to carry out pilot projects were determined based on (1) analysis of disaster damages in each affected municipality, (2) understanding their reconstruction and recovery action plan, and (3) discussion with concerned officials of each local government.

Table 3-1 Considered Situation of each Local Government Before the Disaster

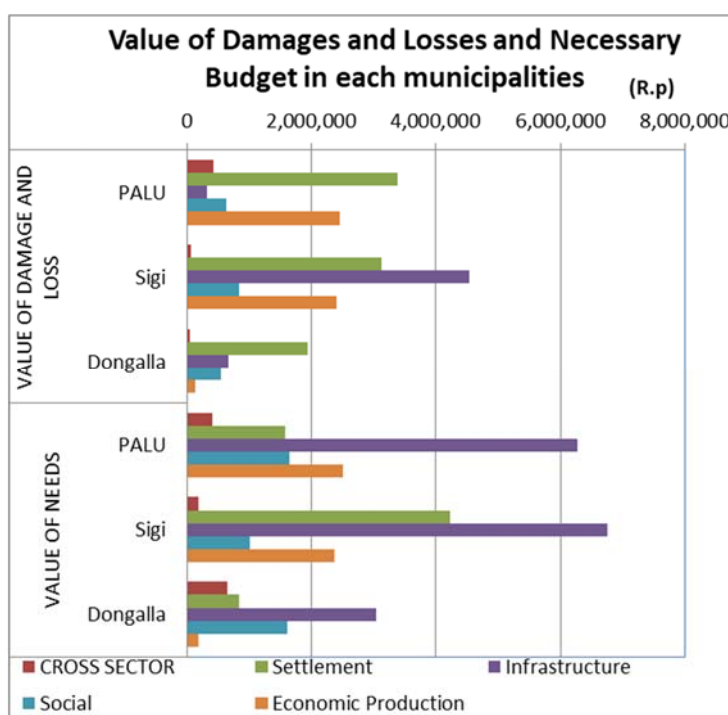
City/ Regency	Major Economic Sectors	Share of Major Economic Sector in RGDP ('18)
Palu	Share of the second and third industries (such as trade, construction, warehouse, light industry) is high.	Construction (16%), Public Service (13%), Trade and repair the vehicles (10%)
Sigi	Landlocked territory. Share of primary industry is high.	Agriculture, Forestry and Fishery (44%), Vehicle Sales (13%), Construction (12%)
Donggala	Share of primary industry is high. Due to its long seashore, one-third of them are working in the fishery sector. In addition, earth and sand quarrying industry is active due to production of good mountain sand	Agriculture, Forestry and Fishery (35%), Mining industry (18%), Construction (15%)

Source: Statistic Book in 2018 (Palu City, Sigi Regency and Donggala Regency in Figure 2018)

Table 3-2 Summary of Damage for each Local Government

Name	Characteristic of Damages	Situation of Damages
Palu City	Subsidence in coastal area, human and building damage caused by tsunami. Destructive damage caused by liquefaction landslide in Balaroa area and Petobo area, which are residential areas. Many damages in high-rise buildings.	Among the three municipalities, the number of deaths was the highest in Palu City, and the total number was 2,642 including unknowns and deaths. In the breakdown of the estimated amount of damage and losses (IDR.2.44 trillion equivalent to JPY 18.1 billion), damages in the housing and buildings, and industrial fields were high.
Sigi Regency	Many areas were damaged, like collapse of houses by liquefaction, such as in Jono Oge area and Sibaraya area where many residents lived. Damage to farmland due to slope failure in mountainous areas and ground deforming is widespread, and irrigation channels are also heavily damaged.	Among the three local governments, Sigi Regency had the largest number of evacuees, and 93,187 people evacuated from their own houses. Large numbers of serious housing damage (there were 13,144). The estimated amount of economic damage and loss as well as in Palu City was IDR 2.41 trillion, which is equivalent to JPY 17.1 billion. The breakdown shows 90% of the damage is marked to the agriculture sector, including livestock and forestry.
Donggala Regency	Subsidence in coastal area, human and building damage caused by tsunami.	The number of deaths were lower compared to other municipalities. However, number of serious damage to houses and buildings were 7,290, and number of evacuees were 36,346. The estimated amount of economic damage and loss were IDR 170.5 billion (approx. JPY 1.26 billion) and fishery sector occupied 50% of the amount.

Source: Report on January 7 by the Provincial Government of Central Sulawesi, Reconstruction and Recovery Action Plans of the three municipalities

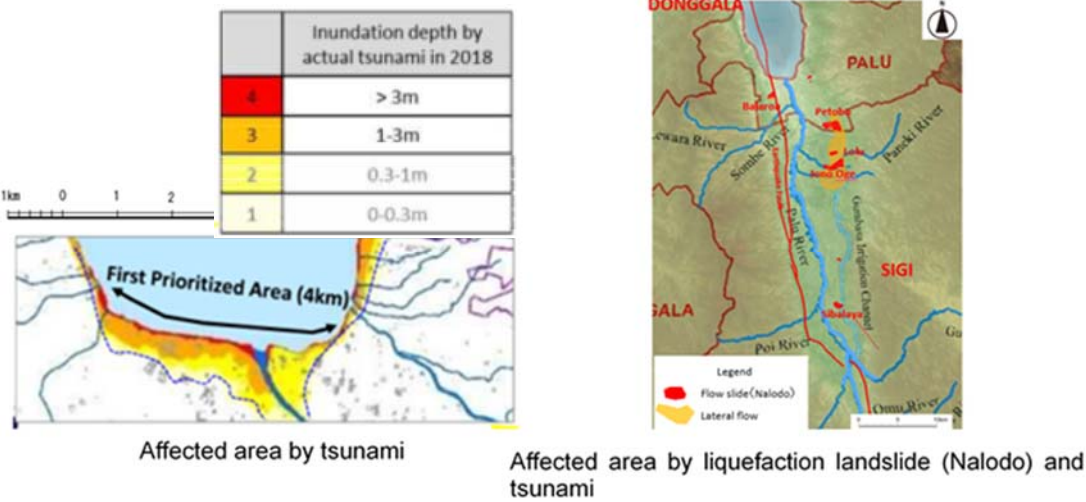


Source: Recovery and Reconstruction Action Plan of Palu, Sigi and Donggala (As of April, 2019)

Figure 3-1 Estimated Damage Amount and Required Budget for Recovery mentioned in the Action Plans

Considering the above situation of damages, the significant and priority challenges of each municipality in the areas of livelihood recovery are shown in below. Here, it was assumed that reconstruction and restoration for hotels in the tourism field, warehouses in the commercial field, and factories of private businesses, which were the private facilities that were severely damaged in Palu City, would be supported through preparation of special loan or other financial arrangement for reconstruction. Since it does not match this JICA’s technical assistance scheme, they were excluded from target of pilot project in OP4. The affected area by Nalodo and tsunami is shown in Figure 3-2.

- Palu: Recovery and reconstruction of micro, small and medium enterprises (MSMEs) in the areas which received severe damage by Nalodo or tsunami
- Sigi: Recovery of the livelihoods of the evacuees who lost their houses and livelihood in the areas which were severely damaged by Nalodo, and the restoration of their community
- Donggala: Recovery of the livelihoods of the evacuees which were damaged by the tsunami, and the restoration of their community



Source: JICA Study Team

Figure 3-2 Affected areas by Nalodo and tsunami

**3-2-2 Principle for Selection of Pilot Projects for Livelihood Recovery and Community Restoration**

Taking the current situations into consideration, principles for the selection of pilot projects were set through discussion with counterpart agencies, such as BAPPEDA of Palu, Sigi and Donggala.

Since the pilot projects should be part of the implementation of the action plan prepared by each municipality under the Disaster Recovery and Reconstruction Master Plan, the principles related to the plans are considered. Moreover, these activities are pilot projects under JICA’s technical cooperation, therefore, sharing the experience of recovery and reconstruction in Japan and other countries become important. Due to the same reasons, contribution to capacity development of governmental institutions of Indonesia and the affected communities is considerable point as well. These principles are described below.

Table 3-3 Principles for the Selection of Pilot Projects

<ol style="list-style-type: none"> <li>1. Project that will accelerate the implementation of Recovery and Reconstruction Master Plan (Policies, Strategies and Activities) <ol style="list-style-type: none"> <li>① To accelerate socio-economic recovery in the disaster-affected communities</li> <li>② To strengthen the resilience of social and economic activities in the affected communities</li> <li>③ To foster the bond of community people, including the socially vulnerable groups</li> </ol> </li> <li>2. Listed as high priority project in the action plan of each local government <ol style="list-style-type: none"> <li>① Targeting the area or the sector which has a large number of victims (especially those who do not have income now)</li> <li>② Targeting victims who lost their means of livelihood</li> <li>③ Innovative activities to increase added value after the disaster</li> <li>④ General versatility (The GoI has a track record of activities; high possibility of dissemination.)</li> <li>⑤ Sustainability (Expectation for allocation of human resources and budget by the local government)</li> <li>⑥ The project's budgeting may be delayed or may not be enough, or the project may become more effective through putting added value, although it is expected to be implemented by the Indonesian government.</li> </ol> </li> <li>3. Project that should be able to start quickly and show effect within a short time</li> <li>4. Project that contributes to community restoration (promote bonds of community people)</li> <li>5. Project in which the socially vulnerable people (women, PwDs, etc.) can be key actors in livelihood recovery activities, in some cases.</li> <li>6. Project that can be disseminated over the study area</li> <li>7. Project in which synergy effect with other stakeholders' activities (such as those by volunteers, NGOs and donors) is expected</li> <li>8. Project in which experience of recovery and reconstruction in Japan and other countries can be effectively utilized</li> <li>9. Project that contributes to capacity development of governmental institutions of Indonesia and the affected communities</li> <li>10. Project that is possible to be implemented within the budget and period of this project</li> </ol>
--

Source: JICA Study Team

### 3-2-3 Examination of Pilot Projects

The action plan of each local government was first drafted in January 2019 and updated afterwards. Although the list of recovery activities is also included in the action plan, as for economic activities, its detailed information vary and some only the number of targets with symbolic title such as “recovery of MSMEs”. Then, in fact, the activities will be implemented individually according to the target’s condition.

Therefore, the ideas of pilot projects are collected through discussion with counterpart agencies in the local governments, namely, Central Sulawesi Province, Palu City, Sigi Regency and Donggala Regency. The given project ideas were reviewed based on the principles for the selection of pilot project described earlier (Table 3-3) and evaluated their possibility to be applied to the pilot projects. Each principle of project idea was generally reviewed in three categories, such as “Yes”, “Moderate” and “No”. Then the total score of each project was calculated, like 2 points for “yes”, 1 point for “moderate” and 0 point for “No”. However, in the selection principles, the following are critical: (2) the high priority in the action plan, and (10) Projects possible to be implemented within budget and period. Thus, if the two items were reviewed, the outcome becomes “No”, and the project idea was not applied.



The summary results of the preliminary evaluation of each idea are shown in Table 3-4 and the detailed review is shown in Table 3-5.

Table 3-4 Candidate Pilot Projects and Their Preliminary Evaluation

Municipality	Pilot Project Title	C/P Organization	Evaluation	Note
Palu	Recovery of MSMEs activities	Dept. of Cooperatives and MSMEs	Considerable	Provision of equipment to group
	Reconstruction of cooperative's office	Dept. of Cooperatives and MSMEs	-	It is only reconstruction of an office.
	Quick income recovery	Dept. of Trade and Industry	Considerable	There is quick earning of income.
	Waste recycling	Dept. of Trade and Industry	Considerable	It might be good if all members in the shelter site can benefit even how small it is.
	Recovery of MSMEs activities	Dept. of Trade and Industry	Considerable	Provision of equipment to group
	Selling products in Silae market	Dept. of Trade and Industry	-	Capacity of the market may be full.
	Provision of boats and fishing gear	Dept. of Agriculture and Food Security	Considerable	More than 80 boats are provided, but only uncertain information can be provided by CP.
	Reconstruction of salt farms in Talise	Dept. of Agriculture and Food Security	-	World Vision to provide tools to clear the debris. Need to clarify location and land use category.
	Support for shop owners and street vendors	Mayor	Considerable	Provision of equipment to group
	Support for Hotel/Hostels	Mayor	-	Need to clarify the demand
Sigi	Recovery of MSME activities	Dept. of Cooperatives and MSMEs	Considerable	Provision of equipment to group
	Reconstruction of cooperative's office	Dept. of Cooperatives and MSMEs	-	Purpose of use is for an office. It cannot be accepted
	Construction of MSME Center	Dept. of Cooperatives and MSMEs	Considerable	Provision of equipment to group
	Provision of equipment for carpenters and masons	Dept. of Cooperatives and MSMEs	Considerable	Provision of equipment to group
	Freshwater fishery cooperative	Dept. of Cooperatives and MSMEs	Considerable	Need to clarify the location and required budget
	Rehabilitation of traditional markets	Dept. of Trade and Industry	-	Over the budget
	Reconstruction of virgin coconut oil production	Dept. of Trade and Industry	-	Over the budget
	Development of production and sales for new entrepreneurs	Dept. of Trade and Industry	Considerable	Provision of equipment to group
	Development of potential products	Dept. of Trade and Industry	Considerable	Provision of equipment to group
	Rehabilitation of damaged hatcheries	Dept. of Fishery and Marine Affairs	-	Some of them can be rehabilitated by own budget, and others are over the budget.
	Shift from paddy production to horticulture	Dept. of Agriculture	Considerable	FAO support to provide vegetable seeds; other NGOs' support is available

Municipality	Pilot Project Title	C/P Organization	Evaluation	Note
	Recovery of livestock farming	Dept. of Livestock	Considerable	Need to market demands
	Rehabilitation of damaged health facilities	Dept. of Health	-	The formal request was sent to UN organizations. Also, JICA infrastructure team will be committed to rebuilding of a hospital.
	Support to recover the activities of women's group	Dept. of Women Empowerment and Child protection	Considerable	
	Start of cacao processing business	Dept. of Village Development and Community Empowerment	-	The activity is related to NGO's activities.
Donggala	Reconstruction of Bagan fishing platform	Dept. of Fishery and Marine Affairs	-	Location is too far; less information are available.
	Support for Donggala weaving	Dept. of Trade and Industry	-	The persons are working independently.
	Recovery of Ikan Teri processing in Lero tatari	Dept. of Cooperatives and MSMEs	Considerable	-
	Support for children to be able to go back to school	Dept. of Women Empowerment and Child protection	-	Not to meet the objective on recovery of livelihood
	<i>Reconstruction of Donggala Fabric Center</i>	<i>Study team proposal</i>	-	The damaged building was not used so much. (Dept. of Industry)
Province	Organizing modern cooperative in Lero area	Dept. of Fishery and Marine Affairs	-	The target is far from current situation, It shows future direction
	Reconstruction of Donggala Fishery Port	Dept. of Fishery and Marine Affairs	-	Cannot be covered by the budget
	Recovery of local chocolate production	Dept. of Trade and Industry	Considerable	Need to clarify acceptance of provision of equipment to group
	Training for Village Corporation (BUMDes)	Dept. of Village Development and Community Empowerment	Considerable	The Province had no idea on target village and target activities of BUMDes

Source: JICA Study Team

Table 3-5 Preliminary Evaluation of Pilot Projects

## (1) Palu City

Pilot Project Title	Recovery of MSME activities	Reconstruction of cooperative's office	Quick income recovery	Waste recycling	Recovery of MSME activities
C/P Organization	Dept. of Cooperatives and MSMEs	Dept. of Cooperatives and MSMEs	Dept. of Trade and Industry	Dept. of Trade and Industry	Dept. of Trade and Industry
1. Project that will accelerate the implementation of Recovery and Reconstruction Master Plan (Policies, Strategies and Activities)	yes	yes	moderate	no	yes
① To accelerate socio-economic recovery in the disaster-affected communities	yes	yes	yes	moderate	yes
② To strengthen the resilience of social and economic activities in the affected communities	no	yes	no	no	no
③ To foster the bonds of community people, including the socially vulnerable groups	no	no	no	yes	no
2. Listed as high-priority project in the action plan of the local government	yes	no	yes	moderate	yes
① Targeting the area or the sector which has a large number of victims (especially those who do not have income now)	yes	yes	yes	yes	yes
② Targeting victims who lost their means of livelihood	yes	no	yes	yes	yes
③ Innovative activities to increase added value after the disaster	no	no	yes	yes	no
④ General versatility (The GOI has a track record of activities; high possibility of dissemination)	yes	yes	no	moderate	yes
⑤ Sustainability (Expectation for allocation of human resources and budget by the local government)	yes	moderate	moderate	yes	yes
⑥ The project's budgeting may be delayed or may not be enough; or the project may become more effective through putting added value, although it is expected to be implemented by the Indonesian government.	yes	yes	moderate	moderate	yes
3. Project that should be able to start quickly and show effect within a short time	yes	moderate	yes	yes	yes
4. Project that contributes to community restoration (promote bond of community people)	moderate	yes	moderate	yes	moderate
5. Project in which the socially vulnerable people (women, PwDs, etc.) can be key actors in livelihood recovery activities in some cases.	yes	no	yes	no	yes
6. Project that can be disseminated over the study area	yes	yes	no	moderate	yes
7. Project in which synergy effect with other stakeholders' activities (such as those by volunteers, NGOs and donors) is expected	No	No	yes	yes	No
8. Project in which experience of recovery and reconstruction in Japan and other countries can be effectively utilized	yes	yes	yes	no	yes
9. Project that contributes to capacity development of governmental institutions of Indonesia and the affected communities	yes	No	Yes	yes	yes
10. Project that is possible to be implemented within the budget and period of this project	yes	yes	Yes	yes	yes
Number of Answers					
- Yes	14	10	11	10	14
- Moderate	1	2	4	5	1
- No	4	7	4	4	4
Total Score	29	22	26	25	29
Other Reason/ Condition	Target should be group, not individual person	Cannot Support under JICA scheme		Activities can be applied for whole community	Target should be group, not individual person

## Palu City - Continuation

Pilot Project Title	Selling products in Silae Market	Provision of boats and fishing gear	Reconstruction of salt farms in Talise	Support for shop owners and street vendors	Support for hotels/hostels
C/P Organization	Dept. of Trade and Industry	Dept. of Agriculture and Food Security	Dept. of Agriculture and Food Security	Mayor	Mayor
1. Project that will accelerate the implementation of Recovery and Reconstruction Master Plan (Policies, Strategies and Activities)	yes	yes	yes	yes	yes
① To accelerate socio-economic recovery in the disaster-affected communities	yes	yes	yes	yes	yes
② To strengthen the resilience of social and economic activities in the affected communities	no	no	no	no	no
③ To foster the bond of community people, including the socially vulnerable groups	no	no	yes	no	no
2. Listed as high-priority project in the action plan of the local government	yes	yes	no	yes	yes
① Targeting the area or the sector which has a large number of victims (especially those who do not have income now)	yes	yes	no	yes	yes
② Targeting victims who lost their means of livelihood	yes	yes	yes	yes	no
③ Innovative activities to increase added value after the disaster	no	no	no	no	no
General versatility (The GOI has a track record of activities; high possibility of dissemination)	no	yes	no	yes	no
⑤ Sustainability (Expectation for allocation of human resources and budget by the local government)	yes	yes	yes	yes	yes
⑥ The project's budget may be delayed or may not be enough, or the project may become more effective through putting added value, although it is expected to be implemented by the Indonesian government.	no	yes	no	yes	no
3. Project that should be able to start quickly and show effect within a short time	yes	yes	moderate	yes	moderate
4. Project that contributes to community restoration (promote bond of community people)	no	moderate	yes	moderate	no
5. Project in which the socially vulnerable people (women, PwDs, etc.) can be key actors in livelihood recovery activities in some cases.	moderate	no	no	yes	moderate
6. Project that can be disseminated over the study area	no	moderate	no	yes	moderate
7. Project in which synergy effect with other stakeholders' activities (such as those by volunteers, NGOs and donors) is expected	no	moderate	moderate	yes	
8. Project in which experience of recovery and reconstruction in Japan and other countries can be effectively utilized	yes	yes	moderate	yes	moderate
9. Project that contribute to capacity development of governmental institutions of Indonesia and the affected communities	yes	yes	yes	yes	yes
10. Project that is possible to be implemented within the budget and period of this project	yes	yes	no	yes	yes
Number of Answers					
Yes	10	12	7	15	7
moderate	1	3	3	1	4
No	8	4	9	3	7
Total Score	21	27	17	31	18
Other Reason/ Condition	Capacity of the market may be full	More than 80 boats are provided, but only uncertain information are available	World Vision to provide tools to clear the debris. Need to clarify location and land use category.	Target should be group, not individual person	

## (2) Sigi Regency

Pilot Project Title	Recovery of MSME activities	Reconstruction of cooperative's office	Construction of MSME Center	Provision of equipment for carpenters and masons	Freshwater fishery cooperative
C/P Organization	Dept. of Cooperatives and MSMEs	Dept. of Cooperatives and MSMEs	Dept. of Cooperatives and MSMEs	Dept. of Cooperatives and MSMEs	Dept. of Cooperatives and MSMEs
1. Project that will accelerate the implementation of Recovery and Reconstruction Master Plan (Policies, Strategies and Activities)	yes	yes	yes	yes	yes
① To accelerate socio-economic recovery in the disaster-affected communities	yes	yes	yes	yes	yes
② To strengthen the resilience of social and economic activities in the affected communities	no	yes	yes	no	no
③ To foster the bond of community people, including the socially vulnerable groups	no	no	no	no	moderate
2. Listed as high priority projects listed in the action plan of the local government	yes	yes	yes	yes	yes
① Targeting the area or the sector which has a large number of victims (especially those who do not have income now)	yes	yes	yes	yes	yes
② Targeting victims who lost their means of livelihood	yes	moderate	yes	yes	yes
③ Innovative activities to increase added value after the disaster	no	no	no	yes	no
General versatility (The GOI has a track record of activities of the Government of Indonesia, high possibility of dissemination)	yes	no	moderate	moderate	yes
⑤ Sustainability (Expectation for allocation of human resources and budget by the local government)	yes	yes	yes	yes	yes
⑥ The project's budget may be delayed or not enough. Or the project may become more effective through putting added value, although it is expected to be implemented by the Indonesian government.	yes	yes	yes	yes	yes
3. Project that should be able to start quickly and show effect within a short time	yes	moderate	yes	yes	moderate
4. Project that contribute to community restoration (promote bond of community people)	moderate	yes	moderate	moderate	yes
5. Project in which the socially vulnerable people (women, people with disabilities, etc.) can be key actors in livelihoods recovery activities in some cases.	yes	no	yes	no	no
6. Project that can be disseminated over the study area	yes	yes	yes	yes	yes
7. Project in which synergy effect with other stakeholders' activities (such as those by volunteers, NGOs and donors) is expected	no	no	no	yes	yes
8. Project in which experience of recovery and reconstruction in Japan and other countries can be effectively utilized	yes	yes	yes	yes	yes
9. Project that contribute to capacity development of governmental institutions of Indonesia and the affected communities	yes	No	yes	yes	yes
10. Project that is possible to be implemented within budget and period of this project	yes	yes	yes	yes	yes
Number of Answers					
Yes	14	11	14	14	14
moderate	1	2	2	2	2
No	4	6	3	3	3
Total Score	29	24	30	30	30
Other Reason/ Condition	Target should be group, not individual person		Target should be group, not individual person	The equipment should be provided for a group, not individual person	



## Sigi Regency-Continuation

Pilot Project Title	Rehabilitation of traditional markets	Reconstruction of virgin coconut oil production	Development of production and sales for new entrepreneurs	Development of potential products	Rehabilitation of damaged hatcheries
C/P Organization	Dept. of Trade and Industry	Dept. of Trade and Industry	Dept. of Trade and Industry	Dept. of Trade and Industry	Dept. of Fishery and Marine Affairs
1. Project that will accelerate the implementation of Recovery and Reconstruction Master Plan (Policies, Strategies and Activities)	yes	yes	yes	yes	yes
① To accelerate socio-economic recovery in the disaster-affected communities	yes	yes	yes	moderate	yes
② To strengthen the resilience of social and economic activities in the affected communities	moderate	moderate	yes	moderate	moderate
③ To foster the bond of community people, including socially vulnerable groups	moderate	no	no	moderate	moderate
2. Listed as high-priority project in the action plan of the local government	yes	no	yes	yes	yes
① Targeting the area or the sector which has a large number of victims who not have income now)	yes	moderate	yes	moderate	yes
② Targeting victims who lost their means of livelihood	moderate	yes	yes	yes	yes
③ Innovative activities to increase added value after the disaster	no	no	no	yes	moderate
④ General versatility (There is a track record of activities of the Government of Indonesia, high possibility of dissemination)	yes	no	moderate	moderate	yes
⑤ Sustainability (Expectation for allocation of human resources and budget by the local government)	yes	yes	yes	yes	moderate
⑥ The project's budget may be delayed or not enough. Or the project may become more effective through putting added value, although it is expected to be implemented by the Indonesian government.	yes	yes	yes	moderate	moderate
3. Project that should be able to start quickly and show effect within a short time	no	no	yes	no	no
4. Project that contributes to community restoration (promote bond of community people)	yes	yes	yes	yes	moderate
5. Projects in which the socially vulnerable people (women, people with disabilities, etc.) can be key actors in livelihoods recovery activities in some cases.	no	no	yes	moderate	no
6. Projects that will be disseminated over the study area	yes	no	yes	moderate	no
7. Project in which synergy effect with other stakeholders' activities (such as those by volunteers, NGOs and donors) is expected.	yes	yes	yes	yes	no
8. Project in which experience of recovery and reconstruction in Japan and other countries can be effectively utilized	yes	no	yes	no	no
9. Project that contributes to capacity development of governmental institutions of Indonesia and the affected communities	yes	yes	yes	yes	yes
10. Project that is possible to be implemented within budget and period of this project	no	no	yes	moderate	moderate
Number of Answers					
Yes	12	8	16	8	7
Moderate	3	2	1	9	7
No	4	9	2	2	5
Total Score	27	18	33	25	21
Other Reason/ Condition	Over the budget	Over the budget			

## Sigi Regency-Continuation

Pilot Project Title	Shift from paddy production to horticulture	Recovery of livestock farming	Rehabilitation of damaged health facilities	Support to recover the activities of women's group	Start of cacao processing business
C/P Organization	Dept. of Agriculture	Dept. of Livestock	Dept. of Health	Dept. of Women Empowerment and Child Protection	Dept. of Village Development and Community Empowerment
1. Project that will accelerate the implementation of Recovery and Reconstruction Master Plan (Policies, Strategies and Activities)	yes	yes	yes	yes	yes
① To accelerate socio-economic recovery in the disaster-affected communities	yes	yes	yes	yes	yes
② To strengthen the resilience of social and economic activities in the affected communities	yes	moderate	moderate	no	moderate
③ To foster the bond of community people, including socially vulnerable groups	moderate	moderate	moderate	no	yes
2. Listed as high-priority project in the action plan of the local government	yes	yes	yes	yes	yes
① Targeting the area or the sector which has a large number of victims who not have income now)	yes	yes	no	yes	yes
② Targeting victims who lost their means of livelihood	yes	yes	no	yes	no
③ Innovative activities to increase added value after the disaster	yes	moderate	no	no	yes
④ General versatility (There is a track record of activities of the Government of Indonesia, high possibility of dissemination)	moderate	yes	yes	yes	moderate
⑤ Sustainability (Expectation for allocation of human resources and budget by the local government)	moderate	yes	yes	yes	yes
⑥ The project it's budgeting may be delayed or not enough. Or the project may become more effective through putting added value, although it is expected to be implemented by the Indonesian government.	yes	yes	yes	yes	moderate
3. Project that should be able to start quickly and show effect within a short time	yes	yes	no	yes	no
4. Project that contributes to community restoration (promote bond of community people)	yes	yes	yes	no	yes
5. Projects in which socially vulnerable people (women, people with disabilities, etc.) can be key actors in livelihoods recovery activities, in some case.	no	yes	yes	yes	no
6. Project to be disseminated over the study area	yes	yes	yes	yes	no
7. Project in which synergy effect with other stakeholders' activities (such as those by volunteers, NGOs and donors) is expected	no	yes	no	no	yes
8. Project in which experience of recovery and reconstruction in Japan and other countries can be effectively utilized	yes	yes	yes	yes	no
9. Project that contributes to capacity development of governmental institutions of Indonesia and the affected communities	yes	yes	no	yes	no
10. Project possible to be implemented within budget and period of this project	yes	yes	no	yes	no
Number of Answers					
Yes	14	16	10	14	9
Moderate	3	3	2	0	3
No	2	0	7	5	7
Total Score	31	35	22	28	21
Other Reason/ Condition	To make a well, we need land that belongs to the public				

### (3) Donggala Regency

Pilot Project Title	Reconstruction of Bagan fishing platform	Support for Donggala weaving	Recovery of Ikan Teri processing in Lero tatari	Support for children to be able to go back to school	Reconstruction of Donggala Fabric Center
C/P Organization	Dept. of Fishery and Marine Affairs	Dept. of Trade and Industry	Dept. of Cooperatives and MSMEs	Dept. of Women Empowerment and Child protection	Study team proposal
1. Project that will accelerate the implementation of Recovery and Reconstruction Master Plan (Policies, Strategies and Activities)	yes	yes	yes	yes	yes
① To accelerate socio-economic recovery in the disaster-affected communities	yes	yes	yes	yes	yes
② To strengthen the resilience of social and economic activities in the affected communities	no	no	moderate	no	no
③ To foster the bond of community people, including socially vulnerable groups	no	no	yes	yes	moderate
2. Listed as high-priority project in the action plan of the local government	yes	no	yes	no	no
① Targeting the area or the sector which has a large number of victims who not able to have income now)	moderate	yes	yes	yes	yes
② Targeting victims who lost their means of livelihood	yes	moderate	yes	no	moderate
③ Innovative activities to increase added value after the disaster	no	no	yes	no	no
④ General versatility (There is a track record of activities of the Government of Indonesia, high possibility of dissemination)	moderate	moderate	yes	no	yes
⑤ Sustainability (Expectation for allocation of human resources and budget by the local government)	yes	yes	yes	no	moderate
⑥ The projects budget may be delayed or not enough. Or the project may become more effective through putting added value, although it is expected to be implemented by the Indonesian government.	moderate	moderate	yes	no	moderate
3. Project that should be able to start quickly and show effect within a short time	moderate	moderate	yes	no	no
4. Project that contributes to community restoration (promote bond of community people)	no	no	yes	yes	no
5. Project in which the socially vulnerable people (women, people with disabilities, etc.) can be key actors in livelihoods recovery activities in some cases.	no	yes	yes	yes	yes
6. Project to be disseminated over the study area	no	moderate	yes	yes	no
7. Project in which synergy effect with other stakeholders' activities (such as those by volunteers, NGOs and donors) is expected	yes	yes	yes	yes	yes
8. Project in which experience of recovery and reconstruction in Japan and other countries can be effectively utilized	no	yes	yes	no	no
9. Project that contributes to capacity development of governmental institutions of Indonesia and the affected communities	yes	yes	yes	no	no
10. Project that is possible to be implemented within budget and period of this project	no	yes	yes	yes	no
Number of Answers					
Yes	7	9	18	9	6
Moderate	4	5	1	0	4
No	8	5	0	10	9
Total Score	18	23	37	18	16
Other Reason/ Condition				Not to meet the objective with regards to recovery of livelihood	

### Donggala Regency - Continuation

Pilot Project Title	Organizing modern cooperative in Lero area	Reconstruction of Donggala Fishery Port	Recovery of local chocolate production	Training for Village Corporation (BUMDes)
C/P Organization	Dept. of Fishery and Marine Affairs	Dept. of Fishery and Marine Affairs	Dept. of Trade and Industry	Dept. of Village Development and Community Empowerment
1. Project to accelerate the implementation of Recovery and Reconstruction Master Plan (Policies, Strategies and Activities)	yes	yes	yes	yes
① To accelerate socio-economic recovery in the disaster-affected communities	moderate	yes	yes	yes
② To strengthen the resilience of social and economic activities in the affected communities	yes	yes	yes	no
③ To foster the bond of community people, including socially vulnerable groups	yes	no	no	yes
2. Listed as high-priority project in the action plan of the local government	moderate	yes	yes	no
① Targeting the area or the sector which has a large number of victims who are not able to have income now)	yes	yes	moderate	moderate
② Targeting victims who lost their means of livelihood	yes	no	yes	moderate
③ Innovative activities to increase added value after the disaster	yes	no	no	yes
④ General versatility (There is a track record of activities of the Government of Indonesia, high possibility of dissemination)	no	no	moderate	moderate
⑤ Sustainability (Expectation for allocation of human resources and budget by the local government)	moderate	yes	yes	yes
⑥ The projects budget may be delayed or not enough. Or the project may become more effective through putting added value, although it is expected to be implemented by the Indonesian government.	no	no	moderate	moderate
3. Project that should be able to start quickly and show effect within a short time	moderate	no	yes	no
4. Project that contributes to community restoration (promote bond of community people)	yes	no	moderate	yes
5. Project in which socially vulnerable people (women, people with disabilities, etc.) can be key actors in livelihood recovery activities in some cases.	yes	no	yes	moderate
6. Project that can be disseminated over the study area	moderate	no	yes	yes
7. Project in which synergy effect with other stakeholders' activities (such as those by volunteers, NGOs and donors) is expected	yes	yes	yes	yes
8. Project in which experience of recovery and reconstruction in Japan and other countries can be effectively utilized	yes	yes	yes	yes
9. Project that can contribute to capacity development of governmental institutions of Indonesia and the affected communities	yes	no	yes	yes
10. Project that is possible to be implemented within budget and period of this project	no	no	yes	yes
Number of Answers				
Yes	11	8	13	11
Moderate	5	0	4	5
No	3	11	2	3
Total Score	27	16	30	27
Other Reason/ Condition	The target is far from current situation but showing future direction		The chocolate maker is working individually.	The Province had no idea on the target village and target activities of BUMDes

The draft ideas of pilot projects were examined, taking into account the budget and the principle for pilot project selection explained in Table 3-3.

In the project's target municipalities, there are many small-scale livelihood activities by individuals, (called micro-enterprises), especially in Palu City and its surroundings, and the damages on these micro-enterprises were serious. Then, it was considered that pilot projects should be formed consisting of multiple activities, rather than implementation of sporadic activities with the micro or small-scale individuals. In addition, they became the pilot projects enabling the affected people to get income recovery immediately while the activities led to livelihood recovery in the medium to long term.

In order to create a kind of solidarity among participants in the activities for long-term community restoration, it was planned that the pilot projects should include discussion, consultation and collaboration activities in the community. Furthermore, since the common feedback was that the activities in groups or through cooperatives did not work well in the area, the projects included cleaning activities in the entire community in order to promote cooperation, and some kinds of organization activities (such as grouping) to promote moderate cooperation among people, or activities that strengthen the internal collaboration of existing groups.

#### 3-2-4 Formulation of Pilot Project

Based on the key considerations mentioned above, in Palu City, a pilot project named "Pilot project on livelihood recovery of women in Balaroa evacuation shelter through work trainings and community activities" was designed targeting implementation in the evacuation shelter in Balaroa, the area which was affected severely by Nalodo. The pilot project aimed to realize the quick recovery of income through the implementation of *Silar* weaving and waste recycling, which the Department of Trade and Industry of Palu City has been promoting since pre-disaster time. It aimed also to recover livelihoods of micro or small group/entities.

In Sigi Regency, a pilot project named "Pilot project on installation and operation of community MSME Center and providing training for livelihood recovery at temporary housing site" was formulated. In the Regency, the Department of Cooperatives and MSMEs originally had a plan to construct MSME Center in four temporary housing areas using its own budget. This MSME Center is a place for the community where several different small businesses are operating in one location, and this pilot project is to support the installation of such facility in two temporary housing areas. At the same time, based on the apparent needs of support for construction operators proposed by the same department, construction skills training were carried out for victims who have lost their land due to liquefaction. In addition, since the construction skills training is targeted at men, livelihood recovery activities for women will also be conducted within this pilot project.

In Donggala Regency, "Pilot project on livelihood restoration of affected fishermen (fishing whitebait called *Ikan Teri*) by building of boats and provision of fishing equipment, and livelihood recovery of women traditionally processing *Ikan Teri* products" was formulated. This pilot project is comprised of a combination of two ideas: the first one is the support for the affected fishermen, which was included in the action plan of Donggala Regency, and the second one is the support for women's group in Lero Tataru village that is proposed by the Department of Cooperatives and MSMEs. It is also expected to



become a foothold for forming a modern fishery cooperative in Lero region, which was proposed by the Department of Fishery and Marine Affairs of Central Sulawesi Province.

The idea of pilot projects was discussed first with the counterpart organization in each municipality and also it BAPPEDA. In Palu City, BAPPEDA organized a meeting with related departments. In the Central Sulawesi Province, the pre-local task force meeting was organized in February 2019 by BAPPEDA and related departments such as Department of Industry and Trade, Cooperatives and MSMEs, Fishery and Marine Affairs, Crop and Horticulture, Plantation and Livestock, Social Affairs, Community and Village Empowerment and Women Empowerment and Child Protection. And finally, the result was reported in the 1<sup>st</sup> JCC held on February 7, 2019.

Provision of equipment for individual or private entities was an issue for consideration in the examination of the pilot project proposals. Currently, even in the responsible departments in each local government, the equipment provided for livelihood restoration activities are often given in the form of rental. Therefore, the equipment necessary for the activities will be rented from the responsible department in each local government by target persons or groups.

The outline of the three pilot projects (first phase) described above is as follows:

Table 3-6 Pilot Projects with Municipalities

Local Government/ Responsible Department	Project Title and Purpose	Major Activities
Palu City / Dept. of Trade and Industry	<p>Pilot Project on Livelihood Recovery of Women in Balaroa Evacuation Shelter Through Work Trainings and Community Activities</p> <p>Objective: To empower economic activities of women in Balaroa Shelter, and to create and strengthen the unity of women as well as whole community of evacuees at the shelter site through community activities</p>	<p>In evacuation shelters where about 700 families (about 2,000 people) from the liquefaction landslide area in Balaroa lived, <i>Silar</i> (dried plant leaves) weaving and waste recycling that can provide some income in the short term, and canteen operation / selling cooked products for long-term livelihood recovery, etc. will be carried out. The necessary equipment will be provided to the target group by the Department of Trade and Industry in Palu City.</p>
Sigi Regency/ Dept. of Cooperatives and MSMEs	<p>Pilot Project on Installation and Operation of Community MSME Center and Providing Training for Livelihood Recovery at Temporary Housing Site</p> <p>Objective: To recover the livelihood of SMEs and also to improve the community’s access to daily essentials through operation of community MSME centers installed in temporary housing sites; to increase revenue opportunities for both women and men through the provision of trainings related to livelihood recovery</p>	<p>Establish a community MSME center with several small-scale stores in temporary housing site. It aims to improve the economic activity of micro and small-scale entities affected by the disaster, and also improve access to daily goods of residents in temporary housing site. The services were assumed to be provided by kiosks, cafes, motorcycle repair services, etc. and these will be determined by people in temporary housing site through consultation. Meantime, skills training for construction and necessary equipment to work will be provided for long-term livelihood restoration for those who have lost their means of livelihood and now living in the temporary housing area. Training will be conducted by the Provincial Vocational Training Center.</p>

Local Government/ Responsible Department	Project Title and Purpose	Major Activities
		Similar kinds of trainings for females are also supposed to be carried out. Chicken farming is expected but details will be decided through consultation with the target group.
Donggala Regency/ Dept. of Fishery and Marine Affairs and Dept. of Cooperatives and MSMSs	<p>Pilot Project on Livelihood Restoration of Affected Fishermen (fishing Ikan Teri) by Building of Boats &amp; Provision of Fishing equipment, and Livelihood Recovery of Women Traditionally Processing Ikan Teri Products</p> <p>Objective: To restart the economic activities through providing training and equipment for the community in Lero Tatari and to aim sustainable restoration of economy through improving the quality of the processed products.</p>	<p>In the village where the fishermen and women's group lost fishing boats, gears and processing equipment because of the tsunami, equipment will be provided in order to prepare the environment to restart livelihood such as fishery, marine processing and selling of product.</p> <p>The Department of Fishery supports the fishermen's group by providing the members with boats. The boats are built in the village. The f group members will also take turns in participating as OJT for improvement of maintenance and management capacity.</p> <p>The Department of Cooperatives and MSMEs will provide the training for improving the processing skills of women's group members. The department also supports the group members to strengthen their organization and marketing, aiming to produce qualified production and expansion of its market.</p> <p>In addition, as part of raising awareness for ensuring sustainability, both groups will carry out saving activities to accumulate a certain amount from landing of fish and sales of processed products within the group. It will devote to additional purchases of shortfall and maintenance and management of equipment.</p> <p>Moreover, the pilot project site is located in the coastal area; disaster management training will be carried out to increase the disaster prevention awareness of the community.</p>

Source: JICA Study Team

### 3-3 Ensuring Inclusiveness When Formulating Pilot Projects

At the time of formulating and implementing the Pilot Project at the Regency and Municipality level, JICA Study Team interviewed relevant ministries and departments as well as development partners. The interviews aimed to ensure that the Pilot Project formulation and implementation do not adversely affect the vulnerable population in the disaster affected areas.

Table 3-7 illustrates the challenges in post-disaster period faced by women, the elderly, and PwDs, which were obtained from the interviews with relevant stakeholders.

Table 3-7 Examples of Challenges in Each Vulnerable Group

Persons with Disabilities	Elderly People	Women
<ul style="list-style-type: none"> <li>It is difficult to collect data and information to understand the current situation<sup>5</sup> because the definition of people with disabilities is not properly understood at the village office level</li> <li>Due to the limited number of barrier-free temporary housing, people with disabilities are restricted in their activities due to the deterioration of their living environment</li> </ul>	<ul style="list-style-type: none"> <li>Elderly people are susceptible to change of living environment such as tents and temporary housing</li> <li>It is less likely to be selected as beneficiaries of subsidized projects by the incumbents<sup>6</sup></li> <li>Difficulty in finding new employment compared to younger generations if they lose their pre-earthquake means of livelihood</li> </ul>	<ul style="list-style-type: none"> <li>High risk of sexual harassment in environments where privacy is difficult to secure, such as temporary housing and tents</li> <li>The living environment of temporary housing increases the burden of caring for the elderly and PwDs, depriving them of employment opportunities</li> <li>High risk of GBV by spouse and/or relatives due to stress caused by poverty, unemployment, and deteriorating living conditions</li> </ul>

Source : JICA Study Team

The number of aid agencies that provide livelihood restoration assistance to PwDs and the elderly is limited compared to the agencies that provide assistance to women, which limits the opportunities to contribute to the assistance from outside sources. As for women, MoWECP and the donor agencies indicated that the most vulnerable groups that need support are women who do not have working experience and are widowed and have infants to take care of.

Since the main counterparts in the Project were the departments that have jurisdiction over the business enterprises, such as the Department of Fisheries and the Department of Cooperatives and MSMEs, the conditions for the beneficiaries were set to have business registration and work experience as indicated in Banpem's selection criteria for the beneficiaries. Due to the nature of the incumbent government agencies, priority will have to be given to the selection of beneficiaries whose funding and loans are likely to lead to the restoration of their livelihoods, and it is expected that local departments may not have the authority to decide on the numerical targets for the inclusion of vulnerable groups in the case of programs funded by the central government.

As for gender mainstreaming, the Department of Women in Palu City explained that the main role of the department was to embed some activities regarding women empowerment in implementing activities of other departments, or confirm the embedment of thoughts of gender equality. Therefore, the project plan of operation which the department initiatively conducted was not shown. Also, regarding the livelihood recovery of women, the Department of Women in Palu and Sigi implemented activities collaborating with NGOs. On the other hand the Department of Women in Donggala had an original

<sup>5</sup> According to the interviews with Humanity and Inclusion staff, it was difficult to collect information at the preliminary stage of project formulation because it was not possible to identify PwDs based on the unified criteria at the village office level, such as the decline in physical functions due to old age, mental disabilities, internal disabilities, and other disabilities that are difficult to identify from external appearances, and cases in which diseases worsened after the earthquake and became disabilities.

<sup>6</sup> In the case of Banpem, which was supported by this project, there was a case where the upper age limit was set as the criteria for selecting beneficiaries because it was not possible to provide funds to all applicants with limited resources.

plan for the implementation of activities such as training sessions for stopping domestic violence against women in the evacuation shelters in the affected area, and arrangement of life environment.

Ensuring barrier free temporary housing can contribute to solving issues such as providing opportunities for the elderly and PwDs to participate in economic activities by easing their mobility restrictions, and reducing the burden<sup>7</sup> on women who are responsible for care and assistance in the community. In addition, as a way to reduce the burden on women who are responsible for childcare, JICA Study Team considered a program to support children's learning by using student volunteers in temporary housing, but this was not implemented due to the limited input of the Study Team.

In this reconstruction activity in Central Sulawesi, the construction of temporary housing was to be carried out by NGOs and the government, with the local government confirming the required number of houses to be built. The construction of public temporary housing was under the jurisdiction of the Central Sulawesi Branch of the Housing Department, which is the PUPR Housing Department's outpost in Central Sulawesi. The Women's Department worked together with aid agencies to create an environment for temporary housing suitable for women, the elderly, and the PwDs. However, in the end, the project was not implemented in consideration of project limitations, such as not being able to install structures on private land where most of the temporary housings were built, as well as the possibility of receiving complaints that it would not be fair to maintain only certain temporary housings.

The Pilot Projects were implemented under the above-mentioned conditions. As economic activities in the project target area, there are lots of businesses of micro, small and medium-sized enterprises and many of the micro enterprises were food processing and sales in markets carried out by women. For reconstruction from the disaster aiming at the recovery of livelihoods, direct supporting measures from the government to small- and medium-sized enterprises promote the self-reliant effort of the private sector with such support as the extension of the repayment term of a loan, suspension of interest rate calculation or the special provision of a low interest rate. On the other hand, under those situations where the enterprises could not find any hope for restoration of society, they did not tend to like to borrow funds. So as support for micro enterprises, this project in Central Sulawesi implemented a measure directly supporting the restart of livelihood activities with the provision of materials and equipment which were damaged by the disaster.

Pilot projects in this project targeted many micro entrepreneurs, many of which were women. Also, a support program for livelihood recovery implemented in 2020 by the Ministry of Cooperatives and SMEs targeted women entrepreneurs at 74% of the entire target.

## **Chapter 4 Implement of Pilot Project**

### **4-1 Implementation of Pilot Projects on Municipalities**

In 2019, three pilot projects mentioned above in Table 3-6 were implemented, and the reference manual was created based on the lessons learned and experiences obtained through the implementation

---

<sup>7</sup> According to interviews in communities in Sigi Regency, women commented that their elderly relatives needed assistance to use the communal bathing areas and toilets at temporary housing so frequently, which severely limited their opportunities to work.

of pilot projects. Also, in 2020, the manual prepared in 2019 was applied to the national program called Banpem (Bantuan Pemerintah: Government Assistance), and activities were implemented to verify the effectiveness of the manual. The implementation of each pilot project is explained below.

**4-1-1 Pilot Project on Livelihood Recovery of Women in Balaroa Evacuation Shelter through Work Trainings and Community Activities**

This project is mainly targeting women, but is also expected to serve all evacuees in Balaroa shelter in Balaroa Kelurahan and in Palu Barat Kecamatan in Palu City, the area severely damaged by Nalodo. The objective of the pilot projects is to empower the economic activities of women in the Balaroa shelter, and to create and strengthen the unity of whole evacuees in the shelter through community activities. The summary of the pilot project is as follows.

The project activities in Balaroa started in February 2019. In October 2019, the project’s activities were evaluated by conducting an endline survey. In 2020, the situation of each group’s activities were monitored by the Department of Industry and Trade, which is a counterpart organization in this pilot project.

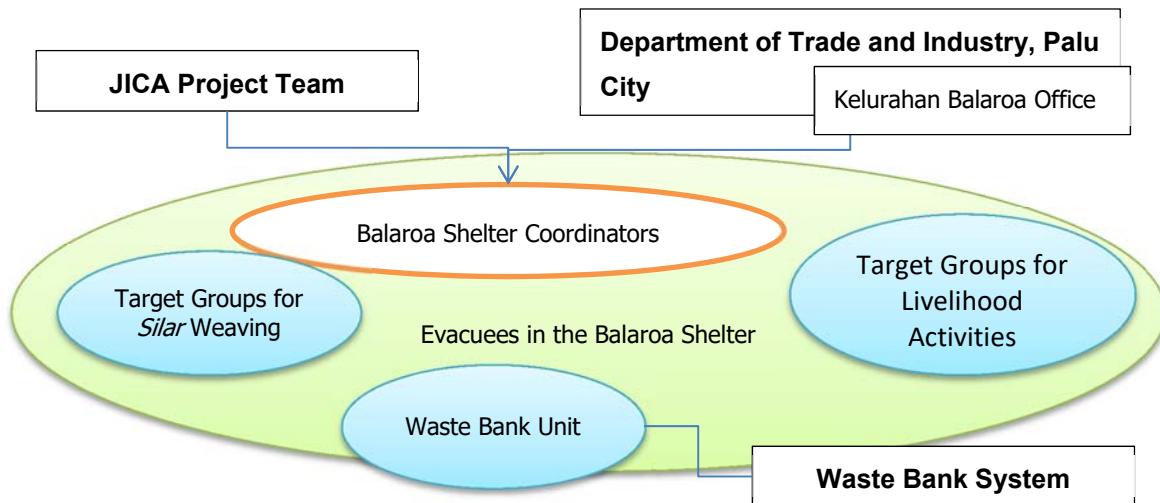
**Table 4-1 Summary of the Pilot Project on Livelihood Recovery of Women in the Balaroa Evacuation Shelter in Palu City through Vocational Trainings and Community Activities**

Location	Palu City, Palu Barat Kecamatan, Balaroa Kelurahan, Balaroa Shelter	
Target Group	Women and others in the Balaroa shelter	
Object	To empower the economic activities of women in the Balaroa shelter and to create and strengthen the unity of the women’s community as well as all evacuees in the shelter through community activities	
Expect Outputs	<ul style="list-style-type: none"> <li>To obtain cash income for women through the economic activities</li> <li>To formulate model activities for livelihood recovery and community restoration in the evacuation shelter by creating or strengthening the ties among women communities and within the whole shelter area by carrying out livelihood recovery activities</li> </ul>	
Activities	<ol style="list-style-type: none"> <li>To introduce <i>silar</i> weaving activity as a small income-generating activity for the short term. Training programs for <i>silar</i> weaving were carried out twice.</li> <li>Supported light meal production and selling as activities for livelihood recovery in women’s communities.</li> </ol>	
Period	February to December 2019	
Counterpart	Department of Trade and Industry of Palu City, Balaroa Kelurahan Office	

Source: JICA Study Team

The implementation structure of the pilot project is summarized as shown in Figure 4-1. The main counterpart organization is the Department of Trade and Industry of Palu City (hereinafter referred to as the Dept. of Industry Palu). The Balaroa Kelurahan Office is also another counterpart as the pilot project area’s local administrative unit in charge of supervising the shelter.





Source: JICA Study Team

Figure 4-1 Implementation Structure of Pilot Project (1: Balaroa in Palu)

The pilot project was expected to carry out three main activities:

1. Short-term income generation: Introduction of *silar* weaving activity as a small income-generating activity. The training for *silar* weaving are carried out to those who urgently need income, are engaged in household activities, and are willing to participate in short-term activities to secure temporary income and also to bring about positive effects in the minds of the evacuees.
2. Activities covering all the community: Initiation of waste recycling activity in the whole shelter area for improving the environment of the evacuation shelter site and for generating small incomes.
3. Long-term activities: Support for economic activities of women, such as light meal production and selling, snack production, etc., in order to help them recover their means of livelihood.

Major issues facing the affected people in Balaroa are described as the following:

Livelihood	<ul style="list-style-type: none"> <li>• Loss of working place: companies, hotels and shopping malls were damaged</li> <li>• Loss and damage of production tools/equipment, workshops, selling space and funds for operation</li> <li>• Loss of husband as the main breadwinner</li> </ul>
Living environment	<ul style="list-style-type: none"> <li>• Lack of food/daily commodities: decrease of relief supplies</li> <li>• Getting bored/tired of living in the shelter, no activity to fill in the time</li> <li>• Conflict among evacuees in shelter: noises, rubbish, use of common space/ kitchen, distribution of relief supplies/earning opportunities, etc.</li> </ul>

## (1) Support the livelihood recovery of women through *silar* weaving activities

In the last two years from 2017 to 2018, the Palu City government initiated the effort to develop a local specialty product under the name of “one kelurahan one product” through the Innovation Village Program (PROKIUM). Among such products is a handicraft product made from woven *silar* leaves. Currently, the promotion period for woven *silar* products is still ongoing, and it is necessary to produce primary products such as woven *silar* sheet (refer to Figure 4-2), the foundation for the final product. However, *silar* weaving has not been commonly done in Palu recently, and the Dept. of Industry Palu was searching for groups to produce the *silar* sheets.



Source: Photo taken by the JICA Study Team

Figure 4-2 *Silar* Sheet

Therefore, as part of the assistance for the disaster in September 2018, it was agreed that *silar* weaving activities will be introduced in the Balaroa shelter for the generation of quick income for the evacuees.

### 1) Design of the activities

In general, the purpose of the activity is not to assist the affected people in resuming their previous work, but rather aims to support the people by helping them to earn quick income to cover their immediate needs until they have resumed their work or found a stable job.

Handicrafts like *silar* weaving is not a typical type of occupation for the residents in Balaroa area. It is also assumed that because *silar* weaving is a job that requires patience, it may not be possible that all trainees will continue to work on it for the long term. Nevertheless, the work is expected to help them gain income and also mitigate some stress in the shelter.

The women in the target shelter were set as candidate beneficiaries for this activity. First of all, a short-term training for *silar* weaving is carried out for the selected participants. The produced *silar* sheets were purchased by the Dept. of Industry Palu, although the quality of the sheets was not sufficient to support the evacuees.

### 2) Selection of target beneficiaries

The selection criteria for the target women was drafted through discussion with the Dept. of Industry Palu, and agreed by the head of Kelurahan Balaroa.

There were more than 600 households in the shelter at the time of the selection process, and the households were divided into 21 blocks. The shelter site was managed by the shelter coordinator, and each block also has a block coordinator. In order to share the purpose of the activity with the concerned parties, the project team and the counterpart held a meeting which was attended by the head of Kelurahan Balaroa as well as the head of the sub-district, shelter coordinator, block coordinators, and representatives from women’s support organizations in the Balaroa shelter. In this meeting, the selection criteria were presented and cooperation among concerned parties was requested.

Based on the selection criteria below, one person from each block was selected. For this process, the shelter and block coordinators checked the basic information on each household and nominated the suitable person from each block. The Kelurahan office, the Dept. of Industry Palu and the project team confirmed the results and determined the target women beneficiaries.

Selection Criteria for *Silar* Weaving Activity in Balaroa:

1. Interested in the activities;
2. Does not have own income yet;
3. Husband does not have a permanent job;
4. Does not have husband;
5. Recommended by the head of each shelter block;
6. Does not bring her children to the training site unless she is accompanied by someone else (to keep an eye on the children for safety reasons).

### 3) Activities

Trainings related to the technique of producing *silar* woven sheet by utilizing *silar* leaves as material for handicrafts and secondary products were conducted for a total of 21 women evacuees in the Balaroa evacuation shelter. The *silar* weaving sheets were positioned for activities such as Cash for Work, a system in which the Dept. of Industry Palu purchases the sheets, in which the purchase leads to the securement of short-term income. (Refer to Table 4-2.)

After the first training, a training on *silar* weaving, the second training course, a training on creating secondary products (coasters) was carried out.

After the trainings sessions, four training participants could complete the creation and sale of *silar* sheets measuring 100cm x 50 cm. In addition, one man continued this weaving activity by learning from his wife who was one of the training participants. Although *silar* sheet weaving activity is a promised income source – as the Dept. of Industry Palu is ready to purchase their products – not all training participants continued this activity after the training. Some of the participants have succeeded in resuming work/obtaining other means of livelihood such as selling of food and beverage, which generates a higher profit than *silar* weaving. Besides, this weaving work calls for a lot of patience, which might be big hurdle for some of the participants in completing/continuing their weaving activity.

Meanwhile, one member has continued to weave smaller-sized sheets, which are subsequently used for making coasters. Her products are of quite good quality. The Dept. of Industry Palu intended to assist her in conducting sales activities and provided her with an opportunity to participate in a sales exhibition held in August 2019. The project also supported the activities through bookkeeping trainings, marketing and creation of product branding design. Moreover, other counterparts such as the Ministry of Cooperatives and SMEs and the Department of Cooperatives and MSMEs in Central Sulawesi supported the activities by displaying the products on exhibitions and providing trainings on HaKI to help the group activities



progress further. The Ministry of Cooperatives and SMEs supported the sales promotion of the group’s products by featuring them on websites supporting the products of local small enterprises.

Table 4-2 Palu City – Balaroa Shelter: Summary of *Silar* Weaving Activities

Class	Activities
Project Activities	<ul style="list-style-type: none"> <li>▪ First Training (Feb. 26 - Mar. 2: 21 female participants on <i>silar</i> weaving, cutting the leaves, etc.)</li> <li>▪ Second Training (Apr. 2: coaster production, bookkeeping training, product branding design)</li> <li>▪ Provide support in marketing the products at the exhibition (Aug. 14-17: Palu Dept. Ind. and Trade)</li> <li>▪ Monitoring</li> </ul>
Support from outside the counterpart organization	<ul style="list-style-type: none"> <li>▪ Products displayed at SMESCO (Jakarta) (Min. Coop. and SMEs)</li> <li>▪ HaKI (Intellectual Property Rights) Training (Aug 26-30: Dept. of Coop. and MSMEs in the province)</li> <li>▪ Dissemination of training in temporary houses to find potential weavers (Dept. of Industry Palu)</li> <li>▪ Start of production of new handicraft items such as pouches for women by utilizing the funds from Micro and Small Enterprises Support Program of the Min. of Coop. and SMEs for the purchase of sewing machines and materials.</li> <li>▪ Support for selling this group’s handicrafts through a website (<a href="https://www.yakumart.com/">https://www.yakumart.com/</a>) for the sales promotion of local small-scale enterprises (Dept. of Cooperatives and MSMEs)</li> </ul>

Source: JICA Study Team

4) Project achievements and evaluation

For the evaluation of the project, an endline survey was implemented in October 2019. In the endline survey, researchers conducted an interview survey by utilizing the same questionnaire used in the baseline survey and by the researchers.

(a) Production of *silar* handicrafts

In the beginning, the Dept. of Industry Palu purchased the produced *silar* sheets from women’s groups. However, an individual woman began to sell secondary products such as coasters and placemats. In addition, the group has made a direct contract with the Palu Golden Hotel in Palu City, which was introduced by the Dept. of Industry Palu, and a large amount of *silar* woven sheets were fabricated as decoration materials (for lamp shades and interiors of the hotel). Through the initiative of the participant, the information on *silar* weaving activities were spread out to women in other temporary housing sites aside from the one in Balaroa area. Six women in a temporary housing site joined the weaving activities and one of them said, “After the disaster, I was spending time every day with nothing to do, and I could only kill time with a card game at night. But now, I’m happy to be able to do weaving.”

Since March to October 2019, the total sales of *silar* handicraft products such as *silar* sheets, coasters, placemats and bowls amounted to IDR 962,000. On the other hand, the amount of total sales of decoration materials was IDR 2,340,000. In total, the women obtained IDR 3,381,000 (JPY 25,040) (Table 4-3). Due to the production of decoration materials for the hotel, the group could maintain the incentive to continue manufacturing *silar* products.

Table 4-3 Amount of Sales of *Silar* Handcraft Products (Cumulative Total by Oct. 2019)

Products (Unit Price x Pcs)	Sales (IDR)
<i>Silar</i> sheets (IDR 13,000 x 12pcs)	156,000
Coasters (IDR 10,000 x 45 pc)	450,000
Placemats ( IDR 100,000 x 4 pcs)	400,000
Bowl trays (IDR 35,000 x 1 pcs)	35,000
Mats for the interior of Palu Golden Hotel	2,340,000
Total	3,381,000

Source : JICA Study Team

(b) Mitigation of post-disaster stress

As regards the contribution of the pilot project in mitigating stress (the second indicator), training participants have expressed their appreciation not only because they had acquired a new knowledge and skill, but also for having the occasion to gather and work together. Through the interaction of participants which happened during training sessions, participants said that their grief for the loss of their families/ friends were healed even only for a moment.

Therefore, in the baseline survey and endline survey, participants were asked the question, “I feel that this activity contributed to stress reduction after the earthquake.” The answers from 21 respondents were obtained as shown in Table 4-4.

In both surveys, 95% of participants said that participating in the group activity reduced their stress. One participant commented, “I participated in the weaving training, and for a short time, I could forget the sadness of losing my family in the earthquake by concentrating on the work.”

Table 4-4 Answers to the Question on the Reduction of Post-Disaster Stress

	Baseline survey	Endline survey
Very helpful	17	16
Helpful	3	4
It depends/I don't know	-	-
Not useful	-	1
No answer	1	-

Source: JICA Study Team

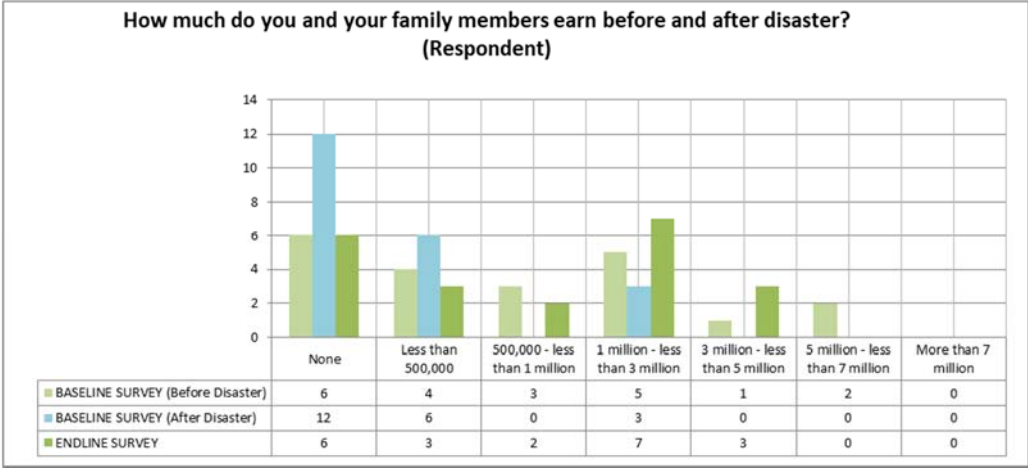
(c) Effects of the pilot project

The income of the beneficiaries was compared between the baseline survey and endline survey. When this pilot project was started, 12 beneficiaries had no income, and six (6) beneficiaries earned less than IDR 500,000 per month. In the endline survey, the number of beneficiaries who had no income has decreased to six (6), and three (3) beneficiaries were earning less than IDR 500,000 per month, the same as the number before the disaster. However, data on income recovery was not obtained in the pilot project activities. (Refer to Figure 4-3 )

For the other question, participants were asked about the effectiveness of the pilot project. A total of 20 out of 21 respondents answered that the pilot project was helpful in reducing their stress after disaster and also in fostering the community or a sense of belongingness. However, about half of the respondents

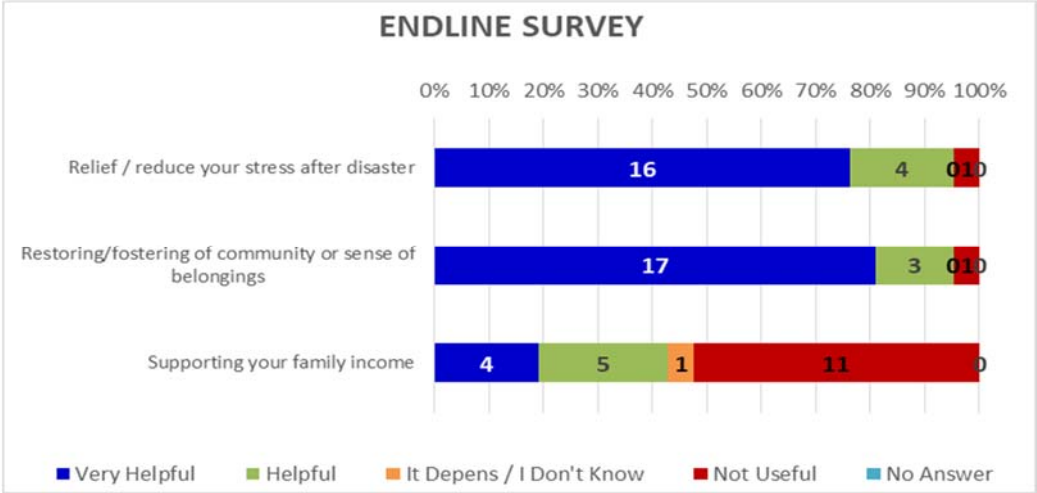


answered that it was not helpful in supporting the family income as shown in Figure 4-4 . This means that even if *silar* waving activities aimed to recover the income of beneficiaries in the early stage of post-disaster situation, the activity did not have much effect because most of the beneficiaries could not finalize the production of *silar* weaving and hence, did not receive payment.



Source : JICA Study Team

Figure 4-3 Average Monthly Income of *Silar* Weaving Beneficiaries (Endline Survey)



Source : JICA Study Team

Figure 4-4 Answers of Beneficiaries on the Effectiveness of the Pilot Project on *Silar* Weaving (Endline Survey)

5) Evaluation indicators and results

The evaluation indicators set at the beginning of the pilot project were shown in Table 4-5 based on the activity results. The indicator for “the number of women gaining income through the implementation of *silar* weaving activities after the trainings” was set up at one-third of the total amount. The reason for this is that *silar* weaving was not principally common as a livelihood activity in the target area, and it was assumed that the affected people would resume their usual livelihood activities gradually at a high rate as the reconstruction activities progressed.

Table 4-5 Evaluation of *Silar* Weaving Activities

Indicators		Target (February 2019)	Results (October 2019)
1	Number of women engaged in <i>silar</i> weaving activities to earn money after the training	7 (1/3 of the total trainees)	7*
2	Percentage of women who participated in the pilot project while considering that the pilot project contributed to mitigating their stress levels	70%	95% (20 persons)

\*Among the seven members, only two members received the first training. The remaining five are participating from other temporary houses.

Source : JICA Study Team

## 6) Lesson learned from the pilot project activities

- Collective activities in the initial phase of post-disaster situation contributed greatly to the mitigation of mental stress levels of the affected women.
- The purchasing of products by the Dept. of Industry Palu was an effective measure for women to be treated equally, particularly with the Cash for Work scheme. However, due to low purchasing price, this measure did not contribute to the livelihood restoration of a large number of women and did not promote the continuous implementation of *silar* weaving group activity for women.
- However, some women with experience in sales and production of handicrafts continued the activity spontaneously and formed a group with the involvement of other district residences in order to continue the *silar* weaving activities. It was found that the spontaneous actions of the participants was one of the most important factors to consider, even though support by the local governments was deemed crucial.
- Also, new income improvement activities regarding the provision of a specific amount of *silar* leaves materials took place regularly due to the formation of a women's group that processes *silar* leaves.

## (2) Livelihood recovery support activities through the sale of foods and processed foods

The “food and beverage” business is a popular means of livelihood for Balaroa residents, especially for women in this area. Based on discussion with evacuees in the Balaroa shelter and also with the Dept. of Industry Palu, a series of support activities for small-scale food business was determined as a pilot activity for Palu City.

### 1) Design of the activities

This project is designed for those who are willing to start a small-scale food business, but have lost their own equipment due to the disaster. Many Balaroa residents have experience in small-scale food business before the disaster. Some were running small restaurants; many women have experience in preparing homemade dish and confectionery; some were selling on a daily basis; and others were selling in front of their houses on special occasions such as during Ramadan (Islamic fasting period before the

New Year). Food business was a popular means of livelihood for residents in Balaroa area. However, their equipment for production and sales, along with their houses and other assets, were swallowed up by a large-scale Nalodo in Balaroa.

The target beneficiaries could be both individuals and groups with experience in the same business activity. In accordance with the key approaches applied in the implementation of pilot projects, “group working” was adopted as a principle in the case of the Balaroa shelter in order to mitigate stress through social interaction among the group members. It should be noted that since the main target beneficiaries are the evacuees living in shelter, it was assumed that most of them would move out sooner or later. Consequently, the continuity of group activity as a business unit is not the priority target in this case. Thus, this type of pilot project was aimed for temporary income generation in medium term.

## 2) Selection of the target group

Through meetings with the head of Kelurahan and counterpart organization, the criteria for the target group was determined as follows:

The target group should have:

- 1) at least one member currently living in the Balaroa shelter or a resident of Balaroa Kelurahan;
- 2) a leader who does not have a full-time job yet;
- 3) a leader who is not receiving any assistance for food business after the disaster;
- 4) at least one member has some experience in food and beverage business;
- 5) the commitment to participating in the bookkeeping training; and
- 6) the willingness to commit to work together in the Balaroa Culinary Center.

A stakeholder’s meeting which explained the plan of pilot project supporting small-scale food business group and also requested for cooperation for implementation was organized in collaboration with Balaroa Kelurahan Office. This meeting was held involving the key persons/parties such as block heads in shelter, heads of neighborhood unit of Balaroa Kelurahan, Kecamatan officers, etc.

For the selection, application forms were distributed both to the residents in the shelter through the block heads, and to the residents of Kelurahan who live outside the shelter through the head of Kelurahan. After that, a group interview and tasting check were conducted with those who applied. Finally, five groups with a total number of 22 members (19 women and 3 men) were selected for the first batch.

The second batch comprised of three groups (8 women) was additionally selected in September 2019 based on request by the other evacuees in the shelter to increase the number of target groups for the activities.

In total, eight (8) target groups were selected as shown in Table 4-6.

Table 4-6 Target Groups Selected by Batch

First Batch		Second Batch	
Group	Number of members	Group	Number of members
a. <i>Jalangkote</i> (traditional local snack)	4 (all females)	f. Noodle	3 (all females)
b. <i>Uvempoi</i> (traditional beef soup)	5 (all females)	g. <i>Nasi kuning</i> (yellow rice)	2 (all females)
c. <i>Utadada</i> (traditional chicken soup)	4 (all females)	h. <i>Warung makan</i> (delicatessen)	3 (all females)
d. Sale of coconut oil	4 (all females)	-	-
e. Coffee shop	4 (2 females, 2 males)	-	-

Source: JICA Study Team

### 3) Activities

#### (a) Provision of equipment

Based on the results of interviews and in consultation with each group, cooking tools and related equipment necessary for the implementation of activities were purchased and handed over to each group. The materials provided and the total amount for each group are listed in Table 4-7.

Table 4-7 List of Materials Provided for Beneficiary Groups

Group	Amount (IDR)	Materials
a. <i>Jalangkote</i> (traditional local snack)	4,339,000	Frying pan, blender, noodle mill, display shelf, etc.
b. <i>Uvempoi</i> (traditional beef soup)	6,761,500	Pan, plate, glass, gas stove, etc.
c. <i>Utadada</i> (traditional chicken soup)	5,142,000	Pan, plate, glass, gas stove, etc.
d. Sale of coconut oil	7,222,700	Gas stove, buckets, milling machine, etc.
e. Coffee shop	7,944,042	Coffee dripper, color box, kettle, pan, mixer, etc.
f. Noodle	9,490,800	Chest freezer, noodle mill, display shelf, gas stove, etc.
g. <i>Nasi kuning</i> (yellow rice)	2,681,500	Display shelf, gas stove, rice stocker, etc.
h. <i>Warung makan</i> (delicatessen)	5,990,200	Gas stove, dish, spoon, food container, etc.

Source: JICA Study Team

#### (b) Bookkeeping training

In collaboration with a local NGO as a trainer, a two-day bookkeeping training was carried out. The group members acquired some basic skills and knowledge in bookkeeping, such as how to calculate the material costs/labor costs; how to calculate the appropriate selling price; how to manage the recording of sales; etc.

During the two-day training period, participants were highly motivated to learn both individually and for group works. There was no group who had an exact understanding of their actual production costs, sales and profits. Some of the participants, especially the elder members, were not used to calculation.

#### (c) Balaroa Culinary Center

The head of Balaroa Kelurahan Office proposed that an existing open space in front of Kelurahan Office be utilized as a sales stand for the project, since the office has intended to utilize the space as a

place for people to gather. The open space is envisioned to be the place where the Balaroa Kelurahan residents could gather while eating and drinking. This open space, which includes four stands with roof, was originally developed five years ago for the above-mentioned purpose, though it has not been utilized until the sales stand had been proposed.

Providing a selling space and facility for the target groups could be an effective measure to support the economic recovery of the evacuees. In addition, this could contribute to the promotion of community restoration. On the other hand, there was a concern about its location and the potential of production sales. Originally, it was perceived as a good location being in front of a public office, but it has become difficult to access from the outside after the disaster due to road disruption caused by Nalodo in Balaroa area. Therefore, in 2019, it was agreed that the space, named “Balaroa Culinary Center,” would be initially opened as a special market for selling food only during Ramadan period.

For the preparation of “Balaroa Culinary Center”, related parties shared roles for the necessary tasks. Particularly, Kelurahan Office cleaned the location and bore the cost for water and electricity. Six booths as eating spaces were provided by the Department for free. The JICA Study Team provided some facilities such as tables, chairs and promotion banners.



The types of support provided to the target groups are shown in Table 4-8 below:

Table 4-8 Palu City – Balaroa Shelter: Summary of Livelihood Recovery Activities through the Sale of Foods and Processed Foods

Class	Activities
Project activities	<ul style="list-style-type: none"> <li>• Lending of equipment to five (5) target groups in April, similar to three target groups in September (Total number of participants: 27 women and 3 men).</li> <li>• Bookkeeping training, support for participation in exhibitions (Aug 14-17: Palu City Trade and Industry Dept.)</li> <li>• Preparing the food court in front of Balaroa Kelurahan Office</li> <li>• Constant monitoring</li> </ul>
Support from outside the counterpart organization	<ul style="list-style-type: none"> <li>• Provision of funds by NGOs</li> </ul>

Source: JICA Study Team



#### 4) Project achievements and evaluation

##### (a) Sales of each group in 2019

Table 4-9 summarizes the monthly sales of each group in 2019, and Table 4-10 summarizes the total income of the members. The data includes the income of each member obtained from other sources aside from the culinary activities carried out in the project. As a result, the total income of all eight (8) groups from May to November was higher compared to the same period before the disaster event.

Table 4-9 Monthly Sales of Each Group (May 2019 to November 2019: Unit IDR/Month)

	a. <i>Jalangkote</i> (traditional local snack)	b. <i>Uvempoi</i> (traditional beef soup)	c. <i>Utadada</i> (traditional chicken soup)	d. Coconut oil	e. Coffee shop	f. Noodle	g. <i>Nasi kuning</i> (yellow rice)	h. <i>Warung makan</i> (delicatessen)
May	4,750,000	4,230,000	1,200,000	160,000				
June	2,044,000	1,065,000	1,600,000	180,000	318,000			
July	2,052,000	3,175,000	710,000	2,150,000	167,000			
August	2,308,000	1,358,000	1,440,000	0	330,000	1,595,000		
September	5,580,000	1,101,000	0	425,000	0	1,290,000	2,770,000	4,505,000
October	5,735,000	1,177,500	325,000	0	150,000	3,390,000	8,440,000	17,350,000
November	9,452,500	1,080,000	0	0	0	4,760,000	8,060,000	11,940,000
Total	31,921,500	13,186,500	5,275,000	2,915,000	965,000	11,035,000	19,270,000	33,795,000

Source: JICA Study Team

Table 4-10 Activities for Livelihood Recovery: Total Monthly Income of Each Group Member

	Group	Income After the Disaster and Before the Pilot Project	Income After the Pilot Project as of October 2019	Rate of Increase
a	<i>Jalangkote</i> (traditional local snack)	2,200,000	4,400,000	2.00
b	<i>Uvempoi</i> (traditional beef soup)	3,000,000	4,350,000	1.45
c	<i>Utadada</i> (traditional chicken soup)	3,200,000	5,700,000	1.78
d	Sale of coconut oil	650,000	1,020,000	1.57
e	Coffee shop	0	1,800,000	-
f	Noodles	0	130,000	-
g	<i>Nasi kuning</i> (yellow rice)	850,000	1,450,000	1.71
h	<i>Warung makan</i> (delicatessen)	3,000,000	5,000,000	1.67
	Total	12,900,000	23,850,000	1.85

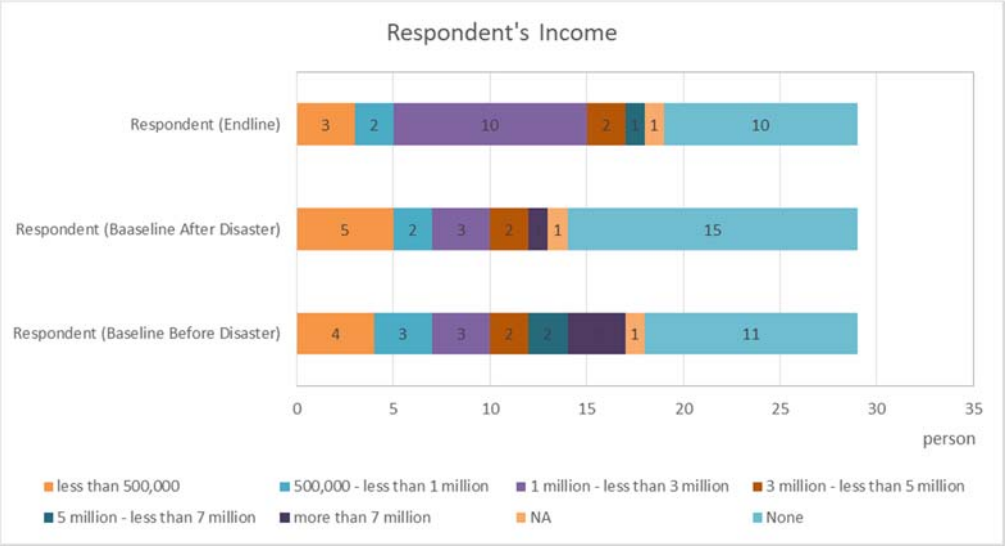
Note) The data reflects the total monthly income of group members, including income obtained from other sources aside from the project activities based on self-reported information in the baseline and endline surveys.

Source: JICA Study Team

##### (b) Effects of the pilot project

The change in the income of beneficiaries was determined through comparison of baseline data and endline data as shown in Figure 4-5. When the project started, 15 beneficiaries did not have a source of income; in the endline survey, 10 beneficiaries still had no income. Among the 10 beneficiaries with no income, three (3) persons were in Coffee shop group and also in Sale of coconut oil group; two (2)

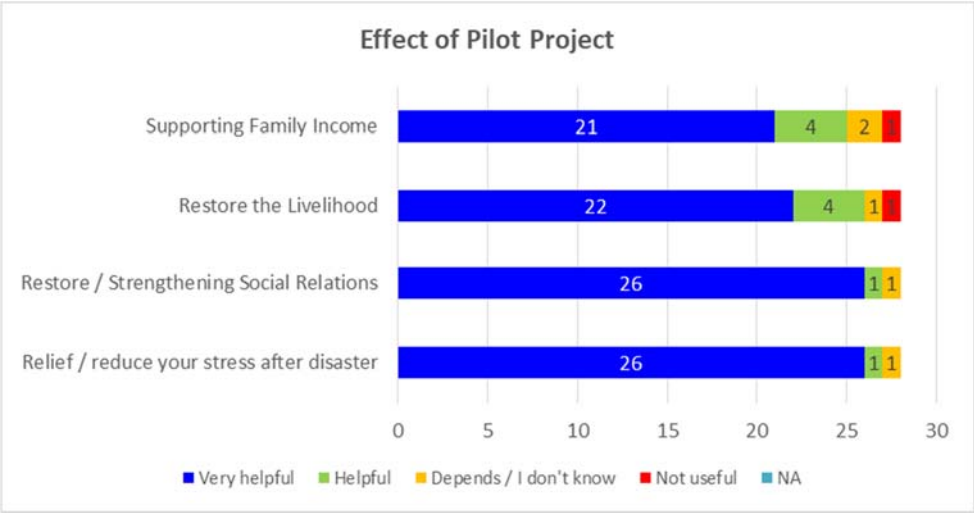
persons were in *Utadada* group, and one (1) person was in *Jalangkote* group and Noodles group, respectively. Because the Coffee shop group, Sale of coconut oil group and *Utadada* group had stopped their activities before the endline survey, the amount of their respective incomes was not obtained.



Source: JICA Study Team

Figure 4-5 Implementation Structure of the Pilot Project (2)

For the other question, participants were asked about the effectiveness of the pilot project. Among the 28 respondents, majority of them answered that the pilot project was helpful in restoring their livelihood and also in reducing the stress after disaster as shown in Figure 4-6.



Source : JICA Study Team

Figure 4-6 Answers of Beneficiaries in the Culinary Group Regarding the Effectiveness of the Pilot Project (Endline Survey)

## 5) Evaluation indicators and results

The results of the activities confirmed in the endline survey conducted in October 2019 were checked with the evaluation indicators set at the beginning of the pilot project. Regarding the continuation of group activities, the pilot project has set the objective that all groups would continue to work. However, in reality, there were only six (6) groups that continually implemented the activities. The reasons for the suspension of activities for the two groups – which were the Sale of coconut oil group and the Coffee shop group – are as follows: for the Sale of coconut oil group, the reason was that it was difficult for only the members to continue to produce coconut oil because of the absence of the woman leader who became occupied with helping her husband in his job. For the Coffee shop group, one reason was that the project could not increase the number of customers, and the young members who mainly worked on the activities took new jobs.

Table 4-11 Evaluation of Livelihood Recovery Activities in the Balaroa Shelter

Indicators		Target (set in February 2019)	Results (as of October 2019)
1	Number of groups that continued their livelihood recovery activities	8 groups (All the target groups)	6 groups
2	Total income of members who participated in the livelihood recovery activities was compared with their income after the disaster event (before the launch of the project activity)	Total income of members increased compared with the income after the disaster event (before the launch of the project activity)	All groups
3	Percentage of group members who participated in the pilot project while considering that the pilot project contributed to mitigating their stress	70%	97 % (28 of 29 )

Source: JICA Study Team

## 6) Results of the monitoring in 2020

### (a) Group status

After the implementation of the pilot project in 2019, the activity of each group has been continually monitored. In 2020, the relocation of evacuees from the Balaroa evacuation shelter to permanent residential areas has progressed, and this meant that some groups had suspended their activities. Furthermore, from March 2021, due to the surge of COVID-19 infection, the amount of sales fell significantly, and some groups moved to other places to continue the activities. In conclusion, only four (4) groups, which is half of the number of groups at the beginning of the activities, continued their activities until October 2020 as shown in Table 4-12.

Table 4-12 Livelihood Recovery Groups Continuing Their Activities (as of October 2020)

	Group	Situation
a	<i>Jalangkote</i> (Traditional local snack)	The group relocated the food selling kiosk from the Balaroa Culinary Center in front of the Balaroa Kelurahan Office to the Balaroa evacuation shelter, and continued their activities. Afterwards, the group relocated to a permanent residential area and continued their activities in front of the house.
f	Noodles	This group conducted selling activities by managing the temporary store in the Balaroa evacuation shelter. In August, the leader moved to a residential area in Tondo and continued the activities.
g	<i>Nasi kuning</i> (yellow rice)	At the Balaroa Culinary Center, this group continued selling the products every morning. However, due to restrictions brought about by COVID-19 pandemic, the space was closed, and so the group has been selling the products at the footway of the Kelurahan Office. Sales decreased due to COVID-19 pandemic.
h	<i>Warung makan</i> (delicatessen)	This group conducted selling activities in the Balaroa evacuation shelter by setting up a store right in front of their tents. However, group members moved from the evacuation shelter site to rented rooms before finally moving to a permanent housing area. Because of the movement, the group has stopped its operation. The members resumed their activities in mid-August in the permanent residential area in Tondo.

Source: JICA Study Team

The table below summarizes the situations of the four (4) groups that were no longer implementing their activities.

Table 4-13 Livelihood Recovery Groups No Longer Implementing Their Activities (as of October 2020)

	Group	Situation
b	<i>Uvempoi</i> (Traditional beef soup)	The members sold fried bananas and soup at the Balaroa Culinary Center. However, due to the small number of customers, the group discontinued their activity. The group was planning to sell foods in front of the house – which is facing a busy road – of a member’s relative. However, due to restrictions brought about by the COVID-19 pandemic, their activity has not resumed yet.
c	<i>Utadada</i> (Traditional chicken Soup)	The group members moved from the Balaroa evacuation shelter to the Pengau temporary houses. Thereafter, they set up a temporary housing site for selling and continued their activity. Due to COVID-19 pandemic, the group suspended its activity. Once again, the members relocated to another place without giving any further details.
d	Sale of coconut oil	The group leader moved to another area, and the rest of the group was not able to continue their activities. Some equipment items were stolen. The equipment for oil refinement is still operational.
e	Coffee shop	The key young members took on other jobs and the activity was stopped.

Source: JICA Study Team

#### (b) Balaroa Culinary Center

After Ramadan in 2019, participants and the village office have discussed and agreed to set up a permanent food court in the Balaroa Culinary Center. By doing so, the Culinary Center was able to function as a place of gathering for women in the vicinity and the children returning from school. However, as the initial concerns, daily traffic was limited and the number of customers did not increase. As a countermeasure, the Team took measures such as installing signboards and displaying the location on the Google map, but the number of customers did not increase.

As a result, the number of groups active in the Culinary Center has decreased and, in addition, the number of customers has decreased. As a countermeasure, the groups discussed about conducting a trial by selling all products – including products sold by groups operating in the Balaroa evacuation shelter – only on Saturdays and Sundays at the Center. However, the activity was not carried out due to the timing of the relocation period from the Balaroa evacuation shelter to the temporary housing, etc. Subsequently, all group stopped their activities in the Center.

*Nasi kuning* (yellow rice) is sold only in the morning, and since the group leader's home is on the side of the Center, the group continued to sell it at the Center. However, as a measure against COVID-19, the space was closed by the Balaroa Kelurahan Office, and the group has moved its *nasi kuning* selling location on the side of the road.

Analyzing the reasons why the Balaroa Culinary Center was no longer being used, the groups were asked about the reasons why they do not sell the products in the Center anymore. It was found that the Balaroa Culinary Center is a little far from the Balaroa evacuation shelter. If women should take care of their children, the location is inconvenient for them to bring their children along. On the other hand, there are always people in the evacuation shelter area, and the group members can still work while looking after their families.

## 7) Lessons learned from the pilot project activities

- The groups formed in the evacuation shelter area varied in their forms of activities based on the changes in their situations because the environmental conditions surrounding the projects were unstable. Hence, it is important for participants to have the intention to continue the implementation of projects, particularly in order to sustain the government support for a long time. For this, it is easier to provide assistance to stabilize projects that have been existing prior, or projects implemented after the disaster, rather than creating brand new projects.
- For the people who encountered each other by chance after the disaster, it was not easy to form new groups and manage the business together because livelihood recovery activities involved the distribution of income and cash. Friction among members often led to stagnation of activities. If the relation of member in a group is clear like family or leader who has experience in management and other members as employees, the relation makes the activities function well. Particularly, activities for microenterprises depend on individual qualities such as experience and positivity. Therefore, in cases where recovery of business and livelihood as a group activity is implemented, the pilot project should select a leader and implement a training on nurturing leaderships with detailed assistance. Otherwise, the activity would not function effectively.
- Even for businesses that have continued their activities after moving to a permanent residential area, the group has been dissolved due to relocation, and there are many cases where only the leaders with business experience continue their activities. Originally, the leader with business experience implemented the activities and the women in the surrounding area participated in the activity. In regards to the working system, the leader managed the entire business. This is the reason why the business could work continually.
- The Balaroa Culinary Center, situated in front of Balaroa Kelurahan Office based on their



proposal, was initially set up as a special marketplace during Ramadan period. Subsequently, based on the agreement of participants, the Center was set up as permanent food court. The permanent establishment functioned well as an opportunity to enable the women around the vicinity and the children coming back from school to gather together. In the initial phase, the space played a role in fostering human communication. However, due to the cutting off of road access as a result of Nalodo, the number of customers was not increased because of the limited daily traffic and it was difficult to work in such kind of place to maintain sustainable livelihood. For the women taking care their children, the place was inconvenient given its long distance from the shelter, and so the number of stores in the Culinary Center had decreased. In the end, the Culinary Center was closed down as a preventive measure against COVID-19. To avoid confusion among the participants, it would be more beneficial to set up the Center for limited time activities as a flexible means of support based on the recovery and reconstruction phase.

### (3) Waste Recycling Activity

The plastic waste recycling program was on the early stage of implementation under the partnership of UNICEF-WVI and the initiative of the Dept. of Industry Palu, through coordination with related stakeholders such as the Department of Environment, Department of Health, Department of Education, and NGOs. In February 2019, a kickoff meeting among the stakeholders was organized to discuss the division of role divisions and the steps for implementation. However, the actual coordination and implementation system has not been officially formed.

A local recycling company, which plays a key role in recycling plastic waste where people can convert their collected plastic waste to cash, has started its recycling plant operation in March. The company has agreed to cooperate by introducing and implementing plastic waste recycling activities in the Balaroa shelter. However, the company has not responded to a request to organize an orientation meeting for the Balaroa shelter evacuees.

Meanwhile, the number of evacuees in the Balaroa shelter has decreased to around two hundred households as of July 2019. According to the residents in the shelter, some individuals had registered their names at the shelter in order to get relief supplies/various aids, but these people do not actually live in the shelter. Thus, one of the expected outcomes of this activity is that improving the sanitary environment of the evacuation site is not a critical issue for the evacuees.

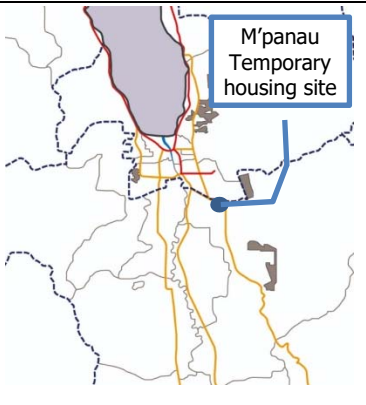
After considering the abovementioned observation and situational changes, the implementation of waste recycling activity was cancelled.

#### 4-1-2 Pilot Project on the Installation and Operation of Community MSMEs Center and Providing Training for Livelihood Recovery at Temporary Houses Site

This pilot project targets the evacuees in temporary housing sites and affected communities in the surrounding areas in M'panau Village, Kecamatan Sigi Biromaru in Sigi Regency. The objective is to help recover the livelihood of people who work for MSMEs and also to improve the community's access to daily essentials through the operation of community MSMEs centers installed in temporary housing sites. In addition, the pilot project aims to increase opportunities for both women and men to earn income through the provision of training related to livelihood recovery.

In May 2019, the project provided construction skills training for 25 male residents and monitored the activities thereafter. A temporary building for small-scale stores was constructed as a MSMEs center in front of the Biromaru market adjacent to the temporary housing area. Three groups were selected in accordance with the selection criteria and started their operations from October 2019. However, the project became stagnant in 2020 because of the suspension of the activities in MSMEs center from around March 2020 due to the impact of COVID-19 pandemic, and the flow of customers changed following the road restoration work in front of the MSMEs center.

Table 4-14 Summary of the Pilot Project on the Installation and Operation of Community MSMEs Center and Providing Training on Livelihood Recovery at Temporary Housing Sites

Location	Two temporary housing sites in Sigi Regency (It was originally planned be carried out at the temporary housing sites in M'panau Village in Biromaru Kecamatan which was damaged severely by liquefaction.)	
Target Group	Micro and small enterprises, located in the temporary housing sites, that have lost their assets	
Objectives	To recover the livelihood of MSMEs; to improve the community's access to daily essentials through the operation of community SMEs centers installed in the temporary housing sites; and to increase revenue opportunities for both women and men through the provision of training related to livelihood recovery	
Expect Outputs	<ul style="list-style-type: none"> <li>To start activities carried out in the community MSMEs center installed in the temporary housing sites, and improve access to commodities and services in the temporary houses</li> <li>To recover livelihoods of trained females and males for the long term through their businesses.</li> <li>To gather lessons to support micro and small enterprises in the Department of Cooperatives and MSMEs in Sigi Regency</li> </ul>	
Activities	<ol style="list-style-type: none"> <li>To conduct community consultation to determine the types of activities to be carried out in the community MSMEs Center and MSMEs;</li> <li>To identify the target members for each activity and organize them as groups;</li> <li>To establish the community MSMEs center and MSMEs selected by the Department of Cooperatives and MSMEs and conduct community operation;</li> <li>To carry out training on construction technical skills for men in the area aiming to recover their livelihood – training to be facilitated by the Department of Cooperatives and MSMEs in cooperation with relevant institutions; and</li> <li>To organize economic recovery activities for women's groups.</li> </ol>	
Period	April 2019 to December 2020	
Counterpart	Department of Cooperatives and MSMEs, Sigi Regency	

Source: JICA Study Team

The implementation structure of this project is summarized as shown in Figure 4-7. The Department of Cooperatives and MSMEs of Sigi Regency are the main counterpart organizations of this project. The pilot project also targeted the M’panau Village, and the village head of village functioned as the counterpart for the implementation of activities.

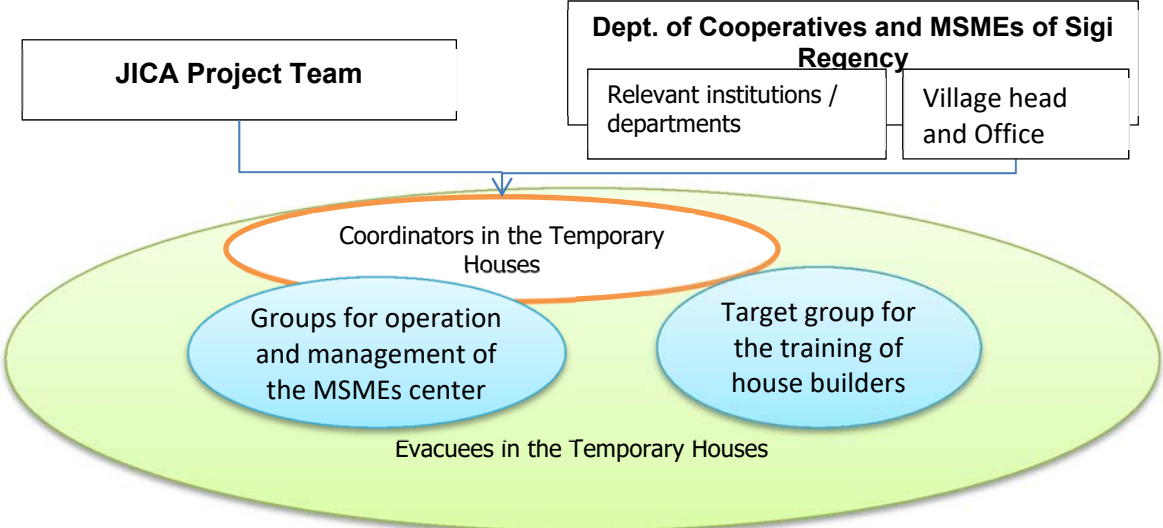


Figure 4-7 Implementation Structure of the Pilot Project (2: M’Panau in Sigi)

The pilot project consists of three main activities, namely:

1. Recovery of income generation and benefit to the community: Restarting of MSMEs in the community MSMEs center – installed in the temporary housing sites– which aimed at improving access to commodities and services for the evacuees in temporary houses.
2. Long-term activities: Construction skills training who have lost their means of livelihood (such as farming) in order provide them with an alternative source of income through construction works.
3. Long-term activities: Occupational skills training for women who have lost their means of livelihood (such as farming) in order to provide them with an alternative source of income through chicken farming (tentative).

Major issues facing the affected people in M’panau temporary housing site and the village people are described as follows:

Livelihood	<ul style="list-style-type: none"> <li>• Loss and damages of tools/equipment for production, and lack of funds for operation</li> <li>• Limited opportunities to find temporary works</li> </ul>
Living environment	<ul style="list-style-type: none"> <li>• Most of the group members moved to temporary houses in an area that is a bit mountainous. Some of them are staying in their original houses near the beach.</li> </ul>

## (1) Support for livelihood reconstruction through construction skills training

The idea on construction skills training was initiated by the Department of Cooperatives and MSMEs of Sigi Regency. The necessity of the training was confirmed in the M'panau Village. Representatives from the Department of Public Works in Sigi were also in the meeting organized by the head of M'panau Village.

### 1) Design of the activities

This project is designed for those who are willing to learn construction skills. When the project started, most of the construction of temporary housing sites were not completed. Therefore, all the trainees from M'panau Village were gathered. Majority of them were living in their own houses, even if they were damaged, or in the neighboring original shelter house.

The objective of this activity was to increase job opportunities for the disaster victims who had lost their jobs, especially former farmers affected by the damaged Gumbasa irrigation system. In order to achieve this objective, a vocational training for construction was provided.

There are several institutions providing construction training, including the provincial vocation training center (BLK), the Department of Public Works, private vocational schools, etc. Among them, BLK was selected as the training institution for this pilot project because of the assumption that if BLK can continue to provide similar training in the area, the Central Sulawesi government can easily replicate the activity.

### 2) Selection of the target group

As shown below, the selection criteria was decided based on meetings with the village head, heads of *dusun* (block) , chiefs of RT (neighborhood association) and other community leaders including several women leaders.

- 1) A person whose house was severely or moderately damaged (RB or RS) by the earthquake or liquefaction, and who is currently living in the M'panau shelter or temporary house;
- 2) A person who has lost his/her job due to earthquake or liquefaction, and is currently working as a daily laborer or a temporary staff worker (no permanent job);
- 3) A person who is not receiving any financial assistance from the government (such as pension);
- 4) A person who desires to get a job in the construction sector using the skills obtained from the training when the training is over (regardless of previous job);
- 5) A person who can commit to participate in the entire training course;
- 6) A person who has some relevant experience in construction-related activities;
- 7) No more than one participant is allowed per family.
- 8) A person who was recommended by RT; and
- 9) A person who is literate.

Following the selection criteria, a total of 25 trainees were selected for the training by the village head.

### 3) Activities

#### (a) Construction skills training

Since beginners or less experienced people who have just started working in the field of construction were the expected targets of the training course, training contents were designed to be similar to the standard vocational program provided by BLK in their center.

At the same time, the training should contribute to the strengthening of resilience in performing recovery and reconstruction activities. Therefore, in addition to the basic contents, points related to the strengthening of building against earthquake were explained carefully. Given these considerations, a curriculum for competence-based training was determined as shown in Table 4-15 below:

Table 4-15 Curriculum for Competence-based Training

No.	Competence Unit	Training Hours					
		Knowledge		Skills		Total	
1	BASIC COMPETENCE						
1.1	Labor safety and health	2	Hours	2	Hours	4	Hours
	TOTAL 1	2	Hours	2	Hours	4	Hours
2	CORE COMPETENCE						
2.1	Determine Building Materials	3	Hours	7	Hours	10	Hours
2.2	Determine Building Tools	3	Hours	7	Hours	10	Hours
2.3	Measurement and Installation of Building Boards	5	Hours	15	Hours	20	Hours
2.4	Techniques for Installing Rubble Stone Foundation	5	Hours	20	Hours	25	Hours
2.5	Techniques for Installing Bricks	5	Hours	13	Hours	18	Hours
2.6	Techniques for Plastering and Smoothing Walls	5	Hours	13	Hours	18	Hours
2.7	Techniques for Tie Beam and Ring Beam Casting	5	Hours	10	Hours	15	Hours
2.8	Techniques for Concrete Column	5	Hours	10	Hours	15	Hours
2.9	Techniques for Installing Tiles/Floor Coverings	5	Hours	10	Hours	15	Hours
2.10	Budget Plan (RAB )	10	Hours	0	Hours	10	Hours
	TOTAL 2	51	Hours	105	Hours	156	Hours
	TOTAL 1 + 2	53	Hours	107	Hours	160	Hours

Source: JICA Study Team

From April 22 till May 11, 2019, a 20-day vocational training course was conducted for 25 male residents of M'panau Village, who were selected based on the set criteria. A total of 24 trainees completed the course.

#### (b) Provision of equipment

After receiving the training, the trainees were organized into five groups, and the equipment items needed to start construction works were provided for each group. The equipment items and their specifications were listed by the Department of Cooperatives and MSMEs of Sigi Regency and reviewed by a BLK lecturer. Based on to the list, the equipment items were handed over to the Department by the JICA Study Team. (refer to Table 4-16) The Department and each group agreed on an MOU about equipment usage and maintenance.



Table 4-16 Equipment Items Provided for One Group

NO	Equipment	Specifications	Unit		UNIT PRICE	TOTAL PRICE
1	Aluminum Water Level	Made with ALUMINIUM, PANJANG 60 CM	1	unit	IDR 35,000	IDR 35,000
2	Drilling Machine	220-230 V	2	unit	IDR 475,000	IDR 950,000
3	Square Scoop	26 X 35 CM	2	unit	IDR 85,000	IDR 170,000
4	Large Cement Spoon	20 CM	2	unit	IDR 20,000	IDR 40,000
5	Hoe	STANDARD Size	2	unit	IDR 85,000	IDR 170,000
6	Grinder	850 Watt	2	unit	IDR 365,000	IDR 730,000
7	Tile Cutter	Capacity MAX 22 MM	2	unit	IDR 360,000	IDR 720,000
8	Circular Saw	220V - 5,9 A. 50-60 HZ	2	unit	IDR 1,600,000	IDR 3,200,000
9	Chisel (Set)	5 MM - 40 MM	2	set	IDR 30,000	IDR 60,000
10	Iron Elbow	30cm long, stainless steel	2	unit	IDR 30,000	IDR 60,000
11	Iron Hammer	5 KG	2	unit	IDR 100,000	IDR 300,000
12	Rubber Hammer	0.5 KG in weight	2	unit	IDR 20,000	IDR 40,000
13	Meter (5m)	5 meter long, aluminum	2	unit	IDR 25,000	IDR 50,000
14	Stroller	MAX 15 KG	2	unit	IDR 525,000	IDR 1,050,000
15	Crowbar	Multifunction, 150 cm long	2	unit	IDR 60,000	IDR 120,000
16	Electric Planner	220 V - 2,1 A. 450 WATT	2	unit	IDR 480,000	IDR 60,000
17	Water Pump	9m suction, 30 m discharge, 200 watts	1	unit	IDR 1,020,000	IDR 020,000
18	Helmet	blue helmet	5	unit	IDR 40,000	IDR 200,000
19	Screwdriver	SMALL	2	unit	IDR 440,000	IDR 880,000
20	Hand Saw		2	unit	IDR 87,500	IDR 175,000
21	Plastic Box	-	1	unit	IDR 167,000	IDR 167,000
22	Rubber Boots	Size M and L	5	pair	IDR 58,000	IDR 690,000

Source: JICA Study Team

The support provided to the target groups are as shown follow Table 4-17:

Table 4-17 Sigi Regency: Summary of Construction Skills Training

Class	Activities
Project Activities	<ul style="list-style-type: none"> <li>Construction skills training for 25 target persons (all male participants, 1 person did not participate) (4/22-5/11)</li> <li>24 trainees who completed the course formed five groups and were lent equipment (May)</li> <li>Periodic monitoring</li> </ul>
Support from outside the counterpart organization	<ul style="list-style-type: none"> <li>Recommend the 24 trainees who have completed the course as technical training graduates. Introduce them when there is a demand for construction (prefecture public works bureau).</li> </ul>

Source: JICA Study Team

#### 4) Project achievements and evaluation

##### (a) Employment situation of the participants

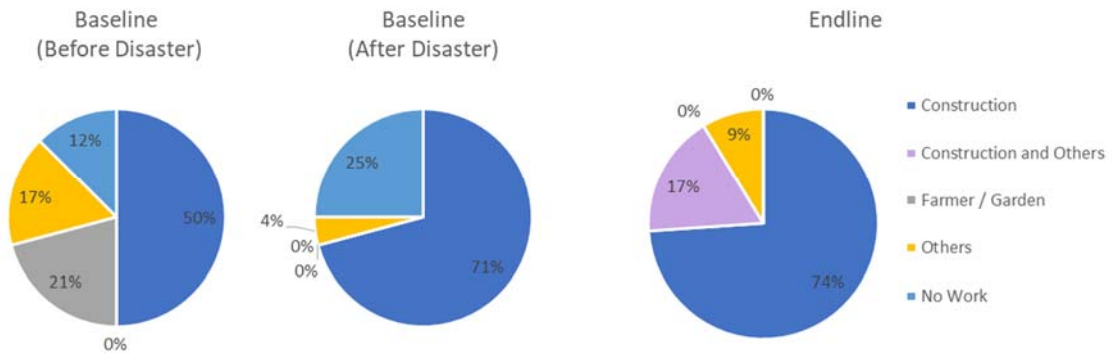
The monitoring on the participants of the training was carried out in collaboration with the Department of Cooperatives and MSMEs of Sigi Regency. The summary of the monitoring result is described in Table 4-18. As shown in the table, 21 of the 24 participants had been engaged in construction works. However, among these 21 participants, there was a big difference in the number of

working days and the type of their activities (refer to Figure 4-8). It was perceived that this gap was due to the difference in the experience of the participants before taking the course.

Table 4-18 Transition of Employment Situation of Construction Skills Participants

Before the Disaster	After the Disaster & Before the Training	After the Training
12 participants were construction workers.	<p>⇒ <b>11 construction workers continued to work in the construction.</b></p> <p>⇒ <b>1 construction worker did not work.</b></p> <p>-</p> <p>⇒ <b>3 famers started to work in the construction.</b></p> <p>⇒ <b>3 private sector employees (gas company, furniture and trader) started to work in the construction.</b></p> <p>-</p> <p>➔ <b>A total of 17 participants were engaged in construction work before the training.</b></p>	<p><u>17 participants who worked in the construction before the training.</u></p> <p>⇒ <b>15 continued to work in the construction.</b></p> <p>⇒ <b>1 started to do trading business.</b></p> <p>⇒ <b>1 moved to another island.</b></p> <p>-</p> <p>⇒ <b>1 private sector employee (gas station) started to work in the construction.</b></p> <p>⇒ <b>5 unemployed participants started to work in the construction.</b></p> <p>-</p> <p>➔ <b>A total of 21 participants became engaged in construction work.</b></p>
5 participants were farmers.	<p>⇒ <b>3 farmers started to work in the construction.</b></p> <p>⇒ <b>2 farmers did not work.</b></p>	<p><i>*1 engaged in farming besides construction work.</i></p>
4 participants were private sector employees. <ul style="list-style-type: none"> <li>▫ Gas company</li> <li>▫ Furniture</li> <li>▫ Trader</li> <li>▫ Photo studio</li> </ul>	<p>⇒ <b>3 participants started to work in the construction.</b></p> <p>⇒ <b>1 participant did not work (photo studio).</b></p> <p>-</p> <p>⇒ <b>1 participant who used to be unemployed started to work at a gas station.</b></p> <p>-</p> <p>➔ <b>1 participant was a private sector employee before the training.</b></p>	<p><u>1 participant worked in the private sector before the training.</u></p> <p>⇒ <b>1 participant started to work in the construction.</b></p> <p>-</p> <p>⇒ <b>1 unemployed person started to work for his family business (furniture).</b></p> <p>⇒ <b>1 construction worker started to engage in trading business.</b></p> <p>-</p> <p>➔ <b>A total of 2 participants became private sector employees.</b></p> <p><i>*3 engages in private sector business besides construction work.</i></p>
3 participants were unemployed, including 1 unskilled day labor ( <i>serabutan</i> ).	<p>⇒ <b>1 participant started to work at a gas station.</b></p> <p>⇒ <b>1 participant was still unemployed.</b></p> <p>⇒ <b>1 participant continued to work as unskilled day laborer.</b></p> <p>-</p> <p>⇒ <b>4 participants (1 photo studio, 1 construction worker, 2 farmers) became unemployed.</b></p> <p>-</p> <p>➔ <b>A total of 6 participants were unemployed.</b></p>	<p><u>6 unemployed participants before the training.</u></p> <p>⇒ <b>5 participants started to work in the construction.</b></p> <p>⇒ <b>1 participant started to work for family business (furniture).</b></p> <p>-</p> <p>➔ <b>No participant was unemployed.</b></p>
		➔ <b>1 participant moved to another island.</b>

Source: JICA Study Team



Source: JICA Study Team

Figure 4-8 Employment Situation of Construction Skills Training Participants

(b) Maintenance of provided materials

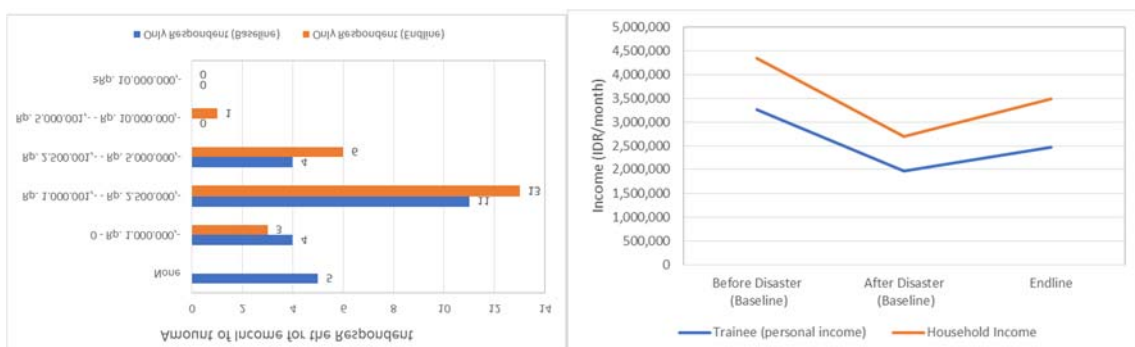
After the training, participants formed five groups, and the Department of Cooperatives and MSMEs lent each group a set of equipment necessary for construction work.

During monitoring, it was confirmed that participants felt inconvenient to use and maintain the equipment because there was only one set of provided equipment for the work. The group members worked individually, so their need to use a particular equipment unit was sometimes duplicated.

Moreover, it was confirmed that a member in Group 3 sold the rented equipment items, which were the tile cutter and grinder. The person left M'panau Village and transmigrated to another area. The counterpart organization, the Department of Cooperatives and MSMEs in Sigi, could make an MOU with the person to repay the cost for the sold equipment after they caught him. Such promise has not yet been carried out.

(c) Effects of the pilot project

With regard to the income of training participants, this has changed as shown in Figure 4-9. The average income has increased after the disaster from IDR 1,963,182 to IDR 2,473,159. However, the income at IDR 3,266,250 prior to the disaster has not been recovered.

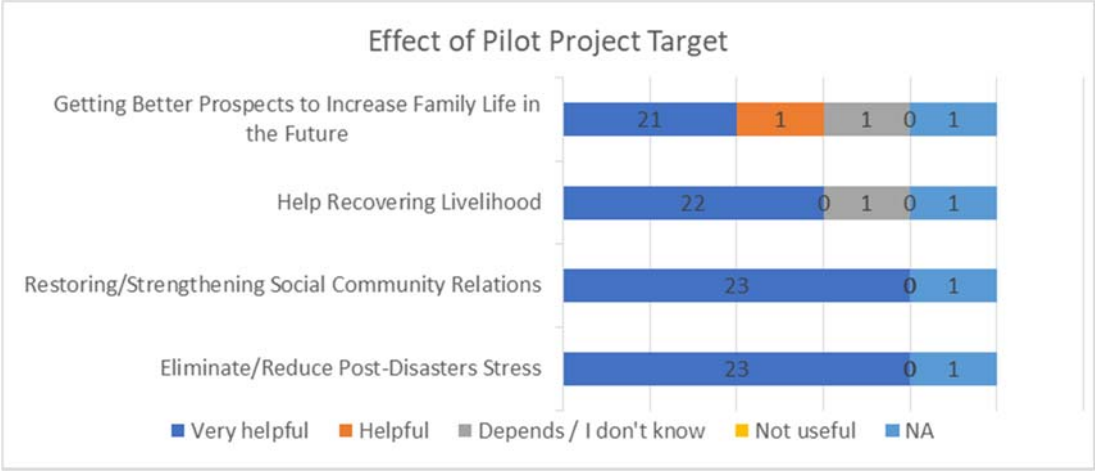


Source: JICA Study Team

Figure 4-9 Transition of the Income of Participants

For the other question, participants were asked about the effectiveness of the pilot project. Among the 24 training participants, one person had moved to another island and could not provide an answer to the

question. Among the remaining 23 respondents, most of them answered that the training was effective in supporting their livelihood recovery. The results are shown in Figure 4-10.



Source : JICA Study Team

Figure 4-10 Answers of the Construction Training Participants on the Effectiveness of the Pilot Project (Endline Survey)

(d) Evaluation workshop with participants

In February 2020, a workshop was conducted to evaluate the training by participants based on the results of monitoring on their activities after the training. In the monitoring workshop, the following three themes were set, and participants exchanged their opinions.

- Was the content of the training appropriate?
- Were there any problems about the specification and maintenance of the equipment?
- What solutions could be offered to participants who were not able to secure a job and to those whose working time was short?

Participants pointed out the skills that should be added to the training and the content of the lecture that needed improvement. Regarding the specifications and maintenance of the equipment, participants requested that they legally appeal to those who resold the equipment and left the group. Participants also exchanged opinions on equipment management in the group. It has been pointed out that there were some participants who could not find a job even after taking the course, and that aptitude and experience are important criteria for the selection of trainees regarding the increase in work volume. However, even in an environment where the demand for construction engineers is increasing due to reconstruction, it was discussed that it is difficult for inexperienced people to work in the construction field.

Based on the main opinions discussed in the workshop, the points to be noted when conducting construction skill training in the future are summarized in Table 4-19.

Table 4-19 Considerations for the Construction Skills Training

<p>1. About the selection criteria for participants in the construction skills training</p> <ul style="list-style-type: none"> <li>• When construction skills training is implemented to spread strong construction skills against disasters and recover livelihood, it is effective to select constructing technical workers at the level of enabling them to reconstruct houses by themselves as participants, to restart their activities earlier by replenishing their equipment lost.</li> <li>• Although related to Central Sulawesi culture, it was clearly found to be difficult for workers with not enough experience if they participated in construction work, they could work as construction workers because of a high demand for construction. Contractors tend to use workers from other regions rather than local workers because workers from other regions are more focused on their work and the contractor is likely to manage their time, on the other hand, local workers could not focus on the work due to various reasons. Therefore, if the training is positioned as to support new employment, it is necessary to design the training with assuring employment opportunity after the training such that the training should provide inexperienced workers the promise to be employed by contractors and construction technical workers. Moreover, it is necessary to have a device such as evaluating their aptitude through interviewing, rather than deciding to train participants.</li> </ul>
<p>2. Contents of the training</p> <p>If it is assumed that expected trainees are construction technical workers enabled to receive orders by themselves, the contents below are necessary:</p> <ul style="list-style-type: none"> <li>• Not only cement flooring technique such as concrete foundation and block masonry, but also ceramic tile installation technique and ceiling installation technique should be incorporated in the training.</li> <li>• Training on light steel frame construction applied in most temporary and permanent housing is preferred. Acquiring those skills will increase job opportunities/employment for the trainees.</li> <li>• Because of the high demand for the restoration of damaged furniture and demand new furniture, it is necessary to provide training for those demands, except for basic construction skills according to the demand situation.</li> <li>• Budget Planning and Estimation are valuable assets for construction workers, which most of them have difficulty in. Therefore the trainer/instructor should teach them adequately.</li> </ul>
<p>3. About the specification and maintenance of equipment</p> <p>(1) Specification of equipment</p> <ul style="list-style-type: none"> <li>• Equipment with specifications determined before procurement cannot always be procured due to local post-disaster situations. Under those cases the equipment with specification agreed upon by the project which are not possible to be procured, a representative of the group should accompany project members to shops as the project procures equipment in order to provide recommendations.</li> </ul> <p>(2) Maintenance of equipment</p> <ul style="list-style-type: none"> <li>• Each member undertakes assignments individually, because the system that the group takes on work together does not function even though the group was formed with participants. Therefore, sharing the equipment with the group members is evaluated as inconvenient as such usage overlaps the use of necessary tools.</li> <li>• In one group, the leader is in charge of the safekeeping of the equipment and regular checking. If equipment cannot be found, the last user is accountable and requested to return the equipment.</li> <li>• Groups set group internal rules about usage of equipment because as equipment is broken, the user should take responsibility. But it is revealed that the broken equipment remains were not repaired or replenished.</li> <li>• There were some members who resold equipment and left the groups. The equipment has not yet been replenished by them. To prevent this problem, selection process checks the aptitude of trainees and clearly indicates the rule of punishment for reselling</li> <li>• As points for improving activities, a system for provision of equipment is necessary with considering the points below.             <ol style="list-style-type: none"> <li>① Select trainees on the premise of receiving work in the group.</li> <li>② Set a time in the training to clearly agree on rule of equipment management within the group, and set clear penalties</li> <li>③ Provision of equipment to each member</li> </ol> </li> </ul>

Source: JICA Study Team



5) Evaluation indicators and results

Table 4-20 indicates that the results of the activities confirmed in the endline survey were checked with the evaluation indicators set at the beginning of the pilot project. For the first indicator – which is to increase the number of working days for the trainees – the results showed that the average number of working days per month for both trainees and non-trainee participants were almost the same, or the working days of non-trainee participants were slightly higher than the trainees.

The main reasons were presumed to be due to the following. The pilot project selected non-trainees who are capable of implementing construction work individually by themselves to some extent and not as beginners. Moreover, the working arrangement in the field was based on individual service agreement, so there was no significant difference under the post-disaster situation in which there were plenty of demands for construction works right after the disaster, and no significant difference was found.

Table 4-20 Evaluation of Sigi Regency: Construction Skills Training

Indicators	Target	Results
Job opportunity is increased for the person who received the construction skills training	Number of working days of the trainees is higher than those who did not participate in the training	No obvious difference - Trainees: 10.1 days/ month Non-trainees: 10.9 days/ month
Certain percentage of the trainees answered that they have better prospects of reconstructing their livelihoods	70 % of the trainees	96% (22 of 23 trainees) *One trainee who moved to Kalimantan is excluded from the target respondents.

Source: JICA Study Team

(2) Support for starting businesses in MSMEs Center

1) Location to install the MSMEs Center

The concept of MSMEs center was provided by the Department of Cooperatives and MSMEs of Sigi Regency. The Department had planned to install MSMEs centers in four locations. Originally, the center was designed to have four shops which included a restaurant, a coffee shop, a motorcycle repair workshop and a kiosk. However, the original design of the center was not constructed. After which, one person who was doing a good business in the temporary houses site was asked to manage the MSME center constructed by the Department, since MSMEs are usually run by individuals.

In the pilot project, it was expected that the community MSMEs center would be installed in two locations. The suitable locations to be selected are: 1) the location which was severely damaged by the disaster; 2) temporary house sites where evacuees are moving in from the same village or at least from Kecamatan; and 3) the temporary housing site with a specific number of household (over 100 households). With these criteria, the Department of Cooperatives and MSMEs of Sigi Regency selected four candidate locations as shown in Table 4-21.

Table 4-21 Candidate Locations for the MSMEs Center in Sigi Regency

Village	Kecamatan	Number of Households
M'panau	Biromaru	170
Beka	Marawola	121
Walatana	Dolo Selatan	160
Boladangko	Kulawi	169

Source: Department of Cooperatives and MSMEs Sigi (as of February 2019)

After the site survey and upon discussion with the Department, the first location was decided to be M'panau Village because of its location being close to the liquefaction-affected area, the number of temporary houses, and where easy to display the project effect. Moreover, since the MSMEs center cannot be constructed in a private land, having a public land in the temporary houses site was also an essential condition to be selected as the target location.

Efforts were made in identifying a second location, but because of various barriers such as the selected area being at a far distance from Palu, or the lack of necessity for a MSMEs center in the candidate site, etc., the second suitable location was not determined. As a result, the MSMEs center could only be installed in M'panau Village.

## 2) Design of the activities

This project is designed for those who are willing to start a small-scale business in the MSMEs center. Many evacuees and inhabitants of M'panau Village have experience in small-scale business before the disaster. However, their equipment for production and sales, along with their houses and other assets, were damaged or lost in the disaster. The MSMEs center constructed in front of the Biromaru Market is a temporary building until the temporary housing sites are demolished and the people are asked to vacate. Therefore, the activities support the recovery of livelihood of disaster victims by providing the materials and location to re-start their own business. However, people may change their business once they start moving from the temporary houses to a new environment.

## 3) Selection of target groups

In the pilot project, the main targets are the evacuees living in the temporary houses constructed in M'panau Village, and residences in the M'panau Village are also recognized as targets due to being in the same community. After which, the target groups for the activities were selected among the people or groups who have similar business experiences before the disaster occurred. In the project, the procedure for the target group selection was part of the series of activities. The details of the selection process is described below.

## 4) Activities

### (a) Expected services provided through discussions in M'panau Village

By the end of April, 2019, two workshops were held to determine the services to be provided in MSMEs center in M'panau. The first workshop held on March 28 was attended by evacuees who already moved into the west part of the M'panau temporary houses site, and their needs and willingness to

provide service were discussed. The results of the workshop is summarized in Table 4-22. In addition, based on the results of the workshop, the possibility and suitability of the activities in the MSMEs center are examined internally as summarized in Table 4-23.

Table 4-22 Results of the Discussion on the Types of Business in the MSMEs Centre

Types of Business Proposed	
Opinions by female participants	Opinions by male participants
<ul style="list-style-type: none"> <li>• Kiosk (nine basic needs)</li> <li>• Motorbike repair workshop</li> <li>• Food stall and cafe</li> <li>• Selling cooked side dishes (vegetables, fish, chicken, etc.), cookies, yellow rice</li> <li>• Sewing</li> <li>• Laundry</li> </ul>	<ul style="list-style-type: none"> <li>• Furniture business and its tools</li> <li>• Handicraft</li> <li>• Selling clothes and school uniform (needs)</li> <li>• Gas base</li> </ul>

Source: JICA Study Team

Table 4-23 Preliminary Assessment of the Types of Business in MSMEs Center

Activities	Community Demand	Feasibility of the Activities	Suitability with JICA's Scheme	Results
Kiosk (nine basic needs)	○	○	△	
Motorbike repair workshop	△	○	○	
Food stall and cafe, selling side dishes (vegetables, fish, chicken, etc.), cookies, yellow rice	△	○	○	
Handicraft	X	○	○	
Selling clothes	X	△	△	
Gas base	○	△	△	
Sewing	X	△	△	X(duplicate)
Laundry	△	X	○	X(water)
Furniture business and tools	X	X	△	X(space)

Note: Legend ○: High, △: Medium, ×: Low

Source: JICA Study Team

On April 10, 2019, the second workshop attended by community members from M'panau Village was held in the village office. In this workshop, participants were informed about the result of the first workshop and participants had further discussions on the suitability and necessity of each service for the MSMEs center. As a result, four (4) types of activities among a total of ten (10) activities proposed in the previous workshop were chosen by the community to be included in the MSMEs center at M'panau Village.

Table 4-24 Selected Four Types of Services to be Provided in the MSMEs Center in M'panau

Activities Chosen	Discussion Points
LPG gas base	<p>LPG gas base is highly needed</p> <ul style="list-style-type: none"> <li>▪ There should be a license to have an LPG gas base.</li> <li>▪ Before the disaster, an LPG gas base could be found in each <i>dusun</i> (block), but still did not meet the needs of the people in M'panau Village.</li> <li>▪ Because of the disasters, two gas bases had disappeared due to liquefaction.</li> <li>▪ In Ramadan (fasting month), the price of 3kg of LPG gas can reach IDR 50,000 at the kiosk, while the normal price of an LPG gas is 16,000 IDR. This means the supply does not meet the demand.</li> </ul>
Food stall and cooked side dish	<ul style="list-style-type: none"> <li>▪ Food stall and cooked side dishes are combined in one lot.</li> <li>▪ Even though there are many food stalls around, it is still good to include it in the MSMEs center, as the place is next to the main road which is used by people traveling from Palu to Palolo and vice versa.</li> </ul>
Kiosk	<ul style="list-style-type: none"> <li>▪ Nine basic needs items should be sold.</li> </ul>
Cafe	<ul style="list-style-type: none"> <li>▪ Having a cafe induces people to come and buy other products from other lots.</li> </ul>

Source: JICA Study Team

(b) Selection criteria for the target groups

The selection criteria for the target groups were determined as shown below:

1. Place of domicile: At least one member in the business group is a resident of M'panau shelter or a resident of M'panau Village and currently lives outside the shelters.
2. Conditions of the houses of group members after the disaster: Priority is given to the group with members whose houses were severely damaged.
3. Current job status/fixed income: Priority is given to the group in which the majority of its members have no jobs or no fixed income.
4. The chairman and/or group members have well-managed business experience.
5. Group members may consist of neighbors or family members, but must have different shelters/tents/house units.
6. No restriction on gender and age, although school children cannot participate (out-of-school children may participate).
7. Group is willing to take part in entrepreneurship training scheduled after the commencement of the MSMEs center, and is ready to receive monitoring including the monthly reporting of sales data.
8. Group is willing to accept the sale of goods that are related to the business being carried out (example: a coffee shop receiving a cake/snack from the affected M'panau residents).
9. Group is willing to comply with the rules of the MSMEs center and to respect group activities, including maintaining and caring of MSMEs center facilities (buildings, equipment, shared kitchen areas, etc.).
10. Group needs to have the necessary capital.

(c) Selection procedure

For the selection of target groups to operate in the MSMEs center, the following procedures are taken:

1. Organization of an explanatory meeting with the village head, *dusun* (block) heads, heads of RT (neighborhood association) and temporary house coordinators about public announcement on the request for proposals for MSMEs center operators
2. Organization of meetings with each temporary house coordinators in the west and north temporary housing sites (*huntara*)
3. Acceptance of proposals at M'panau Village office and interview with groups which submitted the proposal
4. Summary of information and profile of groups according to the selection criteria (to be described hereinafter)
5. Evaluation and selection of the target group by the counterpart agency and the village head

In the selection, eight proposals were submitted as shown in Table 4-25. Among the selected four types of activities, there was no proposal for kiosk. The reason for this is presumably that, since financial provision for the selling of commodities is not allowed under the regulation, the necessary initial capital to open a kiosk needs to be secured by the group members themselves.

Table 4-25 Number of Proposals Submitted for the MSMEs Center in M'panau

	LPG Gas Base	Food stall and cooked side dish	Kiosk	Cafe	Laundry
Number of proposals	1	4	0	2	1

Source: JICA Study team

With regard to LPG gas base, it was found that a license to operate a 3 kg of subsidized gas tank, which the local people commonly use, could not be obtained. This means that the shop would manage the business with only 5 kg of non-subsidized tank. Therefore, the business may not meet the demand of the local people, and it was decided that this activity would not be prioritized in the selection process.

After the interview with candidates, three business groups – the laundry services, sale of confectionery, and cafeteria – were selected, and they started their operations in October 2019.

Table 4-26 Sigi Regency: Summary of Activities of Business Group in MSMEs Center

Group	Members	Activities
1. Confectionery Selling Group	Four (4) females	Making cookies and traditional confectionery at home and selling them at MSMEs center
2. Laundry Group	Four (4) females	Bringing laundry items at home and providing laundry services MSMEs is utilized as the area for the reception of items for laundry and for return after washing
3. Cafeteria Group	Three (3) females and one (1) male	Management of cafeteria providing cuisine service at MSMEs center

Source: JICA Study Team



(d) Provision of equipment

Based on the results of interviews and consultation with each group, the materials necessary for the implementation of business were purchased and handed over to each group. The materials provided and the total amount for each group is listed in Table 4-27.

Table 4-27 List of Materials Provided for Business Groups in MSMEs Center

Group	Amount (IDR)	Materials
1. Confectionery Selling Group	7,562,700	Gas stove, steamer, display cabinet, oven, mixer, etc.
2. Laundry Group	11,209,000	Washing machine, cabinet, ironing machine, etc.
3. Cafeteria Group	9,453,800	Table, shelf, gas regulator, refrigerator, etc.

Source: JICA Study Team

(e) Bookkeeping training

In collaboration with a local NGO as a trainer, a two-day bookkeeping training was carried out. The group members acquired some basic knowledge and skills in bookkeeping, such as how to calculate the material costs/labor costs; how to calculate the appropriate selling price; how to manage the recording of sales; etc. However, the cafeteria group members did not show up to the training even though they did not have any bookkeeping experience. This has caused the poor management of their business later on.

(f) Marketing through SNS

In February 2020, when the impact of COVID-19 was still very limited in Central Sulawesi but was anticipated to become widespread, a marketing training using SNS such as Facebook and WhatsApp was conducted. The laundry services and confectionery selling group members participated in the training where the members could learn about how to inform the public about their services and receive orders through SNS.

The support activities provided to the target groups are as follows:

Table 4-28 Sigi Regency: Summary of Activities for the MSMEs Center

Class	Activities
Project Activities	<ul style="list-style-type: none"><li>• Construction of MSME Center (completed in June 2019)</li><li>• Selection of three activities groups in MSMEs center and lending of the equipment (October 2019)</li><li>• Trainings on bookkeeping (October 2019) and marketing through SNS (February 2020)</li><li>• Implementation of monitoring activities</li></ul>
Support from outside the counterpart organization	<ul style="list-style-type: none"><li>• Provision of MSME Center construction site (Dept. of Industry and Trade in Sigi)</li></ul>

Source: JICA Study Team

5) Project achievements and evaluation

At MSMEs center, the three business groups began their operations in October 2019. The results on the income and expenditure of the activity of each group are shown below. The profit from group activities is calculated by subtracting the expenditure from the income. Since March 2020, or six months

after the start of activities, the management of the business groups was seriously affected by COVID-19.

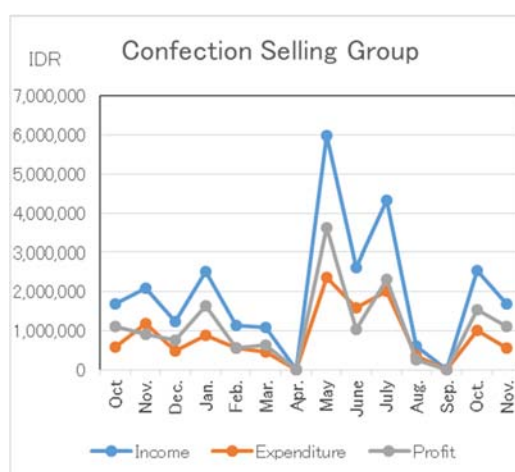
(a) Confectionery selling group

After the commencement of the activity, due to the impact of COVID-19, the confectionery selling group stopped their activities in April and September 2020. From May 2020, the group started selling the products from the members' homes by receiving orders through SNS. In May, the group was able to get more orders than usual because of Ramadan period. In September 2020, the number of COVID-19 cases has increased again in Central Sulawesi, and the business group members stopped their activities.

Table 4-29 Situation of the Activities of the Confectionery Selling Group  
(From October 2019 to November 2020 / Unit: IDR)

	Income	Expenditure	Profit
Oct	1,697,000	590,000	1,107,000
Nov.	2,105,000	1,195,000	910,000
Dec.	1,240,000	488,000	752,000
Jan.	2,530,000	892,000	1,638,000
Feb.	1,145,000	570,000	575,000
Mar.	1,090,000	450,000	640,000
Apr.	0	0	0
May	5,980,000	2,360,000	3,620,000
Jun.	2,630,000	1,595,000	1,035,000
Jul.	4,340,000	2,020,000	2,320,000
Aug.	620,000	360,000	260,000
Sep.	0	0	0
Oct.	2,550,000	1,005,000	1,545,000
Nov.	1,700,000	575,000	1,125,000
Total	27,627,000	12,100,000	15,527,000

Source: JICA Study Team



(b) Laundry services group

The laundry services group was in great demand at the beginning of its business in October 2019, and the group with four (4) members handled the business. However, toward the end of 2020, the scale of business had decreased because only two people were managing the business. In response to the surging COVID-19 pandemic from around March 2020, the group has not officially received orders since April 2020 for fear of spreading the infection through laundry. For this reason, there has been periods in which the group has no official book record. During the period covered, laundry activities continued upon the request of some neighboring residents, and the group's monthly profits in the sales records were maintained were not much different from what the group was earning before COVID-19 (See Table 4-30).

Table 4-30 Situation of Activities of the Laundry Services Group  
(From October 2019 to August 2020 / Unit: IDR)

	Income	Expenditure	Profit
Oct 2019	1,638,300	234,500	1,403,800
Nov.	1,322,200	155,000	1,167,200
Dec.	602,000	120,000	482,000
Jan.2020	706,500	92,000	614,500
Feb.	633,000	77,000	556,000
Mar.	606,500	141,000	465,500
Apr.-Jun.	?	?	Not clear
Jul.	912,000	225,000	687,000
Aug.	834,000	225,000	609,000
Total	7,254,500	1,269,500	5,985,000

Source: JICA Study Team



(c) Cafeteria group

The cafeteria group started its business in October 2019. However, its number of customers had decreased, and the group could not improve the balance between their income and expenditures due to unstable management, in which the cafeteria was closed irregularly and was not open at fixed hours. In January 2020, there was a problem regarding water source, and the group's activities were suspended. The group resumed their activities in February 2020, but because the amount of sales was low, it has been gradually reducing its activities.

Recently, road restoration work in front of MSMEs center has started. Because of the accumulation of sand dust due to the construction works and the dramatic decrease of traffic volume due to road restoration work in front of MSMEs center, the flow of customers to the Biromaru Market – which was open twice a week – was coming in from a different direction and no longer from the side of MSMEs center. As a result, the number of customers had declined. The situation of not having enough customers since last year was further worsened due to COVID-19 pandemic. Furthermore, the impact of COVID-19 occurred when the situation had already taken a downturn, so the group decided to suspend most of its activities in 2020 (See Table 4-31).

During the suspension of activities, a damage caused by theft occurred. As of January 2021, the pilot project is in discussion with the Department of Cooperatives and MSMEs in Sigi which is a counterpart organization, and is preparing to relocate the place of activity.

Table 4-31 Situation of Activities of Cafeteria Services Group  
(From October 2019 to December 2019/ Unit: IDR)

	Income	Expenditure	Profit
Oct 2019	3,117,500	942,000	2,175,500
Nov.	580,000	742,000	-162,000
Dec.	1,558,000	1,219,000	339,000
Total	5,255,500	2,903,000	2,352,500

Source: JICA Study Team



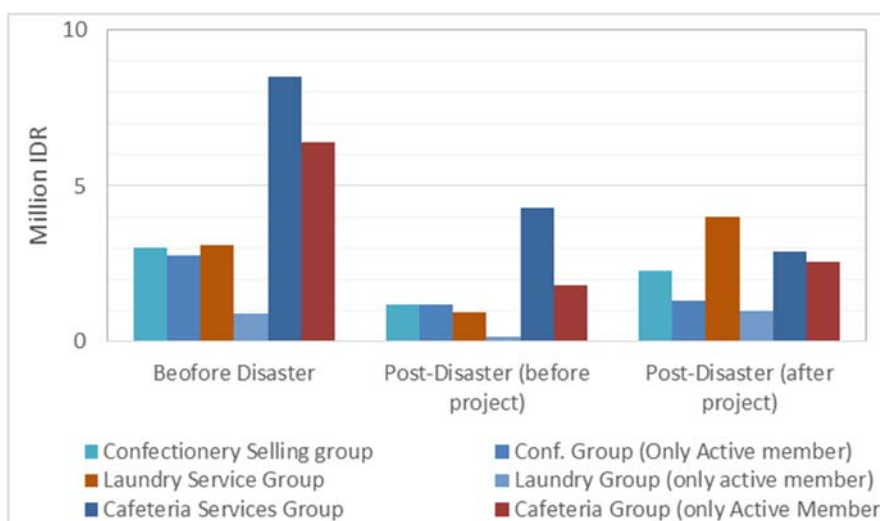
(d) Effects of the pilot project

The average income of each group was compared with the total amount for each group – which were gathered in the baseline survey – before the disaster, and the total amount in the endline survey as shown in Table 4-32. For the laundry group, their income has recovered and was in the same level as what they were earned before the disaster despite the impact of COVID-19. However, for both the confectionery selling group and the cafeteria group, their post-disaster incomes (after the project) were still lower. In particular, focusing only on the active members, it has been confirmed in the endline survey that the incomes of these two groups have not increased much and has remained the same before the start of the project.

Table 4-32 Transition of Monthly Income of Groups in MSMEs Center

Group		Before the Disaster	Post-Disaster (Before the Project)	Post-Disaster (After the Project)	Recovery Rate
		Million IDR			(%)
Confectionery Selling Group	Subtotal	3.03	1.20	2.30	76%
	Subtotal (only active persons)	2.80	1.20	1.30	46%
Laundry Service Group	Subtotal	3.11	0.95	4.00	129%
	Subtotal (only active persons)	0.91	0.15	1.00	110%
Cafeteria Services Group	Subtotal	8.50	4.30	2.90	34%
	Subtotal (only active persons)	6.40	1.80	2.60	41%

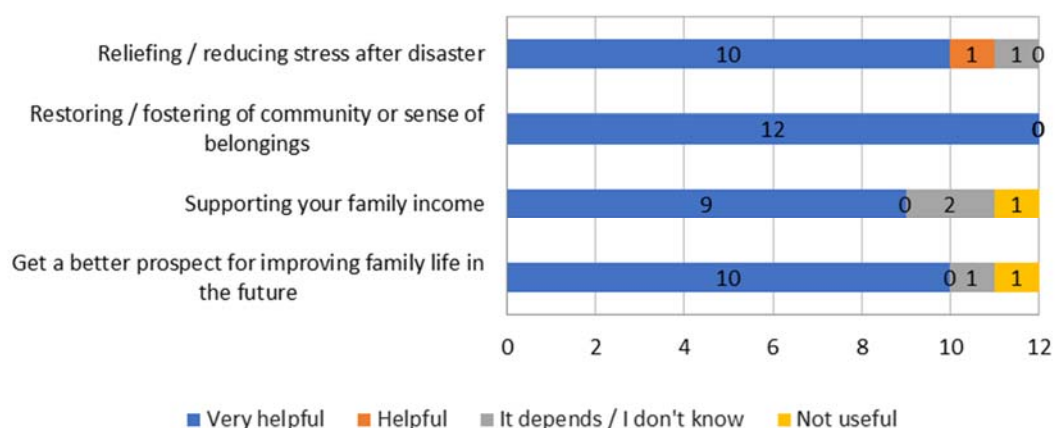
Source: JICA Study Team



Source: JICA Study Team

Figure 4-11 Transition of Participants' Income

For the other question, participants were asked about the effectiveness of the pilot project. Among the 12 beneficiaries, one (1) member from the cafeteria service group said that the project was not effective in recovering the income. She is not involved in the activities even in the group, and the cafeteria group's activities were stopped. The results of the survey are shown in Figure 4-12.



Source : JICA Study Team

Figure 4-12 Answers of the Business Group Members on the Effectiveness of the Pilot Project in MSMEs Center (Endline Survey)

## 6) Evaluation indicators and results

A baseline survey for participants of MSMEs Center activity was conducted in October 2019, and the endline survey was conducted in October 2020. Both survey was carried out by enumerators. The survey results and evaluation indicators are compared as shown in Table 4-33.

Table 4-33 Evaluation Indicators for the Activities of MSMEs Center

Indicators	Target	Results
Income recovery of small and micro enterprises and groups in MSMEs Center	60% of income before the disaster	Laundry service group recovered its income at 110% Confectionery selling group recovered at only 46% Cafeteria group did not have income from project activities during the endline survey
Rate of feeling of the affected people in temporary shelters regarding the improvement of access to products and services through the MSME Center	70% of households in the shelters in M'panau feel improvement (only in west and south areas)	Laundry services met the needs, but the impact of other activities was limited.

Note: The calculation does not include the income of former members who left the group during the endline survey.

Source: JICA Study Team

Initially, all three business groups started their activities in groups of multiple people. However, nearly half of the members left the group during the endline survey and earned income by means of other livelihood sources. Therefore, the evaluation for each group on income recovery was conducted by excluding the income of those who are no longer engaged in group activities, and including only the income of the people remaining in the group and continuing the activities.

The total income of the laundry service group increased compared to before the disaster, but the confectionery group could not raise their profits and had difficulty in recovering their total income due to the impact of COVID-19. However, the situation is improving compared to the initial situation in which the group had no profit at all.



The cafeteria group did not earn any income at the end of the pilot project activities. It is presumed that the group could not manage its activities due to the members having only a little experience in cafeteria management before the disaster. In addition, although the JICA Study Team presented a proposal for the improvement of their activities, the improvement from the groups was not seen and there had been many situations in which management awareness was shallow, such as not participating in bookkeeping trainings.

Regarding the improvement of service access through MSMEs center, interviews with the local residents could not be implemented because the activities at MSMEs center were not carried out at the time of the endline survey.

As for the activity evaluation, the laundry service group could provide services that meet the needs of the neighborhood at the beginning of the business and reduced the burden of housekeeping for women given the situation of unstable water supply. However, the scale was reduced because of the decrease in the number of members in the group, and self-restraint of activities due to COVID-19. On the other hand, the confectionery sales and the cafeteria group had little impact on the local residents. Overall, it is perceived that the group had limited impact in terms of providing the services necessary for the lives of the local residents. In the beginning, it was envisioned to provide food services to the local residents, such as through the opening of kiosks. Based on prior interviews, there were some people who wished to implement the project. However, this did not materialize in the end, presumably because the project did not provide resources for the purchasing of products.

## 7) Lessons learned from the pilot project activities

- Candidates for the livelihood recovery support project in the temporary shelters area were confirmed through discussions with the residents. During that time, the laundry service group that was initially not considered was listed as a project candidate. It was confirmed that the demand for laundry was high in the shelters area due to problems with water supply and there were applicants for the project, so it was effective to grasp the needs for starting up a business through consultations with the residents.
- Business needs for retailers such as kiosks was high at the temporary shelters. However, the project support did not include the purchasing of beginning inventory, and also because the funds for the purchasing of sales materials were borne by the affected people. These factors became obstacles for the retailers, and they did not submit their business proposals. The funds that the people can prepare on their own are limited, and in the case of setting up large-sized stores, it was found that support would be necessary in combination with subsidies and loans for purchasing resources.
- The original plan was to set up a temporary store in the area of temporary shelter, but it was necessary to set up a temporary store on a public land, and it took time to secure the land. In addition, there were restrictions on the location, and it remained a question whether the place selected for the activities was the best place. If the self-initiative and speed of each group are weighed on, the project should consider further simple measure to support the self-initiative

of the group, such as providing materials to set up a small store in each house in the temporary shelter and providing mobile sales stores.

- This time, the project selected the project members based on business experience before the disaster, even though there was no way to confirm whether the activities were actually carried out based on the business background. The cafeteria group members who highlighted their experience did not have much experience in the business, and it was difficult to raise awareness on entrepreneurship in order to continue the business. In the case of supporting new businesses, it is necessary to conduct entrepreneurship trainings to raise awareness as well as to provide knowledge and skills for business continuity in order to increase sustainability.

### (3) Other activities considered

#### 1) Local chicken breeding

At the beginning of this pilot project, it was expected that small-scale chicken farming project would be carried out by a women's group in M'panau Village. There is a popular dish called "Biomaru Chicken" made from a specific chicken variety called "Ayam Kampong Super." Therefore, the supply of this chick variety depends on the import from outside of the Central Sulawesi, and poultry feed and medicines are also required. This means that without a certain breeding scale, chicken breeding especially of "Ayam Kampong Super" variety may be difficult to maintain from the viewpoint of economic sustainability.

Therefore, the chicken breeding was not considered for this project.

#### 2) Youth and education support for all ages

With regard to the strengthening of community restoration efforts, various activity ideas were discussed with the women's group and the youth in M'panau community. Currently, there are several students in the temporary housing site. They go to school in the morning, but come back home in the early afternoon. Thereafter, only a few students were actively engaged in club activities, social activities, and learning on a daily basis. The women, particularly the mothers, were concerned about the situation and wanted to have some community activities involving the students.

As a background information, it has been identified that the use of drugs (called glue) by minors, including middle and high school students, was increasing and is becoming a problem in the region. The number of drug dealers has increased in the region after the earthquake, and it is said that minors dealing with stress and trauma are more likely to get involved in illegal substance.

As shown in Table 4-34, the project idea was formulated based on discussions with the Department of Social Affairs, Department of Education, Department of Women Empowerment and Child Protection, three (3) universities in Central Sulawesi, and active NGOs. Unfortunately, the idea was not applied because it was difficult to get approval from the Department of Education.

Table 4-34 Project Idea for Community Restoration in Sigi


Project Title	Program on learning support for junior and senior high school students by youth mentors in temporary housing in Sigi
Target Groups	Junior and senior high school students in the temporary housing sites
Location	Utilize public house called “PMPN Center”
Objective	<ul style="list-style-type: none"> <li>Provide learning sessions and mentoring by university students inside and outside the target temporary housing sites. This brings about positive changes (stimulating curiosity, expanding future prospects) for junior and senior high school students in temporary housing, and forms a sense of community by promoting mutual communication.</li> <li>Contribute to the reduction of post-earthquake stress and trauma of junior and senior high school students by actively engaging them in learning and exchange activities and building new relationships (trauma healing).</li> </ul>
Implementation Structure(draft)	<ul style="list-style-type: none"> <li>Counterpart : Department of Social in Sigi</li> <li>Youth mentors : Students from Alkhairaat University (to create an MOU with the university) and students living in M’panau Village</li> <li>Junior and senior high school students in M’panau Village : Major beneficiaries to receive mentoring</li> </ul> <p>The diagram illustrates the implementation structure. At the top is the Village office. Below it is the JICA Team, which has a bidirectional coordination relationship with the Sigi Dept. of Social. The NGO provides necessary goods (desks, etc.) to the JICA Team. The JICA Team has a coordination relationship with the Sigi Dept. of Social and a request for cooperation and handover of certificate from the Sigi Dept. of Social. The JICA Team is also involved in an MOU with Alkhairaat Uni. The JICA Team and Sigi Dept. of Social provide mentoring (Teaching &amp; Coaching &amp; Counseling) to School Children in Huntara (South &amp; East). The JICA Team and Sigi Dept. of Social also have a flow of money/equipment relationship with the School Children in Huntara (South &amp; East). A legend indicates that blue arrows represent agreement, red arrows represent coordination, and black arrows represent flow of money/equipment.</p>

Source: JICA Study Team

#### 4-1-3 Pilot Project on Livelihood Restoration of the Affected Fishermen (Fishing *Ikan Teri*) by Building of Boats and Provision of Fishing Equipment, and Livelihood Recovery of Women Traditionally Processing *Ikan Teri* Products

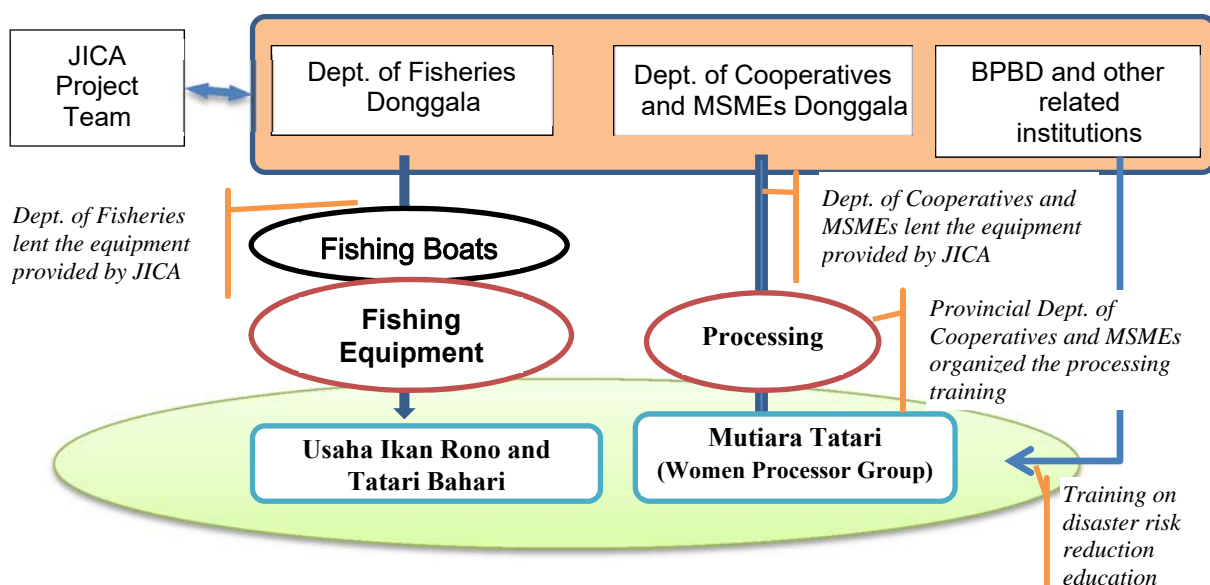
This project is targeting both fishermen groups and fish processing group in Lero Tatari Village in Donggala Regency. The main objective of the pilot project is to help restart the economic activities of the target groups, such as catching *ikan teri* (whitebait) and its processing, by providing equipment to the target groups as theirs had been lost or damaged by the disaster. The summary of the pilot project is as follows.

Table 4-35 Summary of the Pilot Project on Livelihood Restoration of Affected Fisherman and Women Processing *Ikan Teri* Products

Location	Lero Tatari Village, Sindue Kecamatan, Donggala Regency	
Target Group	Fisheries in Lero Tatari Village	
Objectives	<ul style="list-style-type: none"> <li>To restart economic activities of fishery sector through providing training and equipment for the community in Lero Tatari</li> <li>To support sustainable restoration of economy through improving the quality of processed fishery products</li> </ul>	
Expect Outputs	<ul style="list-style-type: none"> <li>To recover livelihood through resumption of <i>ikan teri</i> fishing in Lero Tatari Village and bring home cash income</li> <li>To improve the quality of processed <i>ikan teri</i> produced in Lero Tatari Village and thereby improve women's earnings</li> <li>To raise awareness on disaster prevention of the community affected by tsunami</li> </ul>	
Activities	<ol style="list-style-type: none"> <li>To support the resumption of <i>ikan teri</i> fishing by utilizing the boats built and providing fishing assets</li> <li>To support women's group for the recovery and improvement of <i>ikan teri</i> processing</li> <li>To introduce internal saving activities to strengthen group activities and improve sustainability</li> <li>To conduct disaster risk reduction education training</li> </ol>	
Period	February 2019 to October 2020	
Counterpart	Dept. of Fishery and Marine Affairs and Dept. of Cooperatives and MSMEs, Donggala Regency	

Source: JICA Study Team

The Implementation Structure of the Pilot Project was structured as shown in Figure 4-13. The major counterparts for this project were the Department of Fisheries in Donggala for the fishermen's group, and the Department of Cooperatives and MSMEs Donggala for the processing group. Moreover, with regard to disaster risk reduction education, the BPBD of Donggala Regency was the main counterpart organization.



Source: JICA Study Team

Figure 4-13 Implementation Structure of the Pilot Project (3: Lero Tatari in Donggala)

The pilot project consists of three main activities, namely:

- 1) Long-term activities: Resumption of *ikan teri* fishing by providing fishing boats and fishing gears to fishermen groups in order to recover livelihood.
- 2) Long-term activities: Recovery and improvement of the quality of processed *ikan teri* and improve women's earnings.
- 3) Resilience improvement: Increase disaster prevention awareness of the community affected by the tsunami.

At the time of the field survey (January onwards), the selected beneficiary groups (fishermen and women processors) had not received any training. After the team has confirmed and verified the status of the fishermen with the village head, the team organized a two-day boat building training (April 30 and May 1) conducted by Donggala Department of Fisheries. Incidentally, the women processor group (Mutiarata Tatari) had their training for 5 days (April 29 - May 3) organized and conducted by Donggala Coop & SME. The contents of the training were to improve the quality of the products as well as to introduce new processed products.

Major issues facing the affected people in Lero Tatari are described as follows:

Livelihood	<ul style="list-style-type: none"> <li>• Loss of equipment: Boats and fishing gears were lost or damaged.</li> <li>• Loss and damages of production tools/equipment, and funds for operation.</li> <li>• Decreased income: Currently, fishermen are renting boats and equipment, and the rental cost has decreased their profit and income.</li> </ul>
Living environment	<ul style="list-style-type: none"> <li>• Most of the group members moved to temporary houses in a mountainous area. Some of them are staying in their original houses near the beach</li> </ul>

## (1) Livelihood recovery by providing support for fishermen's groups

### 1) Design of the activities

Though most of the target group members lived in temporary houses in a mountainous area, they came to the beach and worked as fishermen, the same as what they did before the disaster. Therefore, this activity was designed for the purpose of assisting the affected people to restart their previous jobs by using the tools provided to them.

The activities in the pilot project for the target fishermen were framed in consultation with the target fishermen and concerned governmental agencies. The overall aim of the activities is to provide emergency recovery of the livelihood of affected fishermen in Lero Tatari Village.

The selected beneficiary groups (fishermen) received a two-day boat building training (April 30 and May 1) which was conducted by Donggala Department of Fisheries. A total of 20 boats were built in Lero Tatari Village by local carpenters. The fishermen received business training to calculate the benefits of the fishing. Meanwhile, a general focus group discussion (FGD) was conducted to strengthen the membership base of the group.



## 2) Selection of the target groups

The target groups, namely Usha Ikan Rono and Tatari Bahari, collectively have 40 full-time fishermen. The groups were formed by the village head and recognized by the Department of Fishery and Marine Affairs of Donggala Regency. The JICA Study Team, with the cooperation of the village head and the Department, has checked and validated the fishermen's residence, current status of ownership of fishing assets before and after the disaster, etc. Those who lost their boats or have damaged boats and have not received fishing assets were selected as targets for assistance. Furthermore, the results of the baseline survey also validated the damages to fishing assets.

## 3) Activities

### (a) Providing fishing boats and equipment

Because *ikan teri* fishing is carried out by two fishermen, 20 fishing boats were provided to the group with 40 members. The list of fishing boats and equipment items is shown in the table below.

Table 4-36 Provided Fishing Boats and Equipment

Description	Groups Request	Remarks
Fishing boats (wooden)	20	8m long, 45cm wide and 60cm in height
Outboard engine	20	9 PK (Honda/Japan or Thailand)
Generator	20	1000 Watt (Honda Japan)
Other fishing gears	20	Lamp set (24w x 16), fishing nets (7m nets), thermos box (25 liters), anchor and rope, styrofoam box

Source: JICA Study Team

### (b) Training on boat construction and maintenance

A two-day training on boat building in Lero Tatari was conducted on April 30 and May 01 for the selected target fishermen groups. The training was conducted by the Department of Fishery and Marine Affairs of Donggala Regency and the JICA Study Team. The purpose of the training was to impart the fishermen and master carpenters with some knowledge on wooden boat building construction before the commencement of boat building. A training was conducted at a boat building yard in Wani-wani, where the master carpenters acquired some knowledge on the basics of boat building, type of wood, repair and maintenance, etc. The summary of activities is shown in Table 4-37.

Table 4-37 Lero Tatari Village in Donggala Regency: Summary of Support Activities for Fishermen's Groups

Class	Activities
Project Activities	<ul style="list-style-type: none"> <li>• Training of target fishermen (April 30 – May 01, 2019) on the construction of fishing boats and maintenance</li> <li>• Regular support and implementation of focus group discussion (FGD)</li> <li>• Construction of fishing boats in Lero Tatari Village and the adjacent Lero Induk Village</li> <li>• Provision of fishing boats (20 boats) from the counterpart organization (November 2019 ~ February 2020)</li> <li>• Business training</li> </ul>

Support from outside the counterpart organization	• None
---	--------

Source: JICA Study Team

#### 4) Project achievements and evaluation

##### (a) Usage of boats

From February to July 2020, monitoring activities were conducted on the use of the equipment provided and the recovery situation of the livelihood of fishermen's group. The situations of Tatari Bahari group and Usaha Rono group are shown in Table 4-38 and Table 4-39, respectively. All the boats provided were used effectively by both groups. In general, a boat is used by a pair of fishermen, but the pairing of fishermen are not always similar. Some fishermen have not used the boats provided by the project, and instead go fishing with fishermen who are not members of the group.

Table 4-38 Situation of Activities of Tatari Bahari Group (From February to July 2020)

Items		Feb.	March	April	May	June	July
Number of fishing boats used (boats)		8	9	7	10	10	10
Number of fishermen (people)		15	15	13	16	17	16
Number of people not using the project boats		4	5	6	4	3	5
Average number of fishing days (days)	Avg. per user* <sup>1</sup>	10.6	17.1	23.3	18.6	21.5	16.4
	Avg.	8.0	12.8	15.9	14.9	18.3	13.2
Days of use of JICA boats	Avg. per user* <sup>1</sup>	7.9	17.1	23.3	18.3	21.5	16.4
	Avg.	5.9	12.8	15.9	14.4	18.3	13.2
Monthly average sales (IDR)		1,325,777	2,642,356	2,000,795	1,653,978	1,743,902	1,546,927
Monthly average expenses (IDR)	Total	409,466	723,000	707,077	558,067	646,235	534,375
	- Fuel	385,333	627,333	660,769	554,667	630,000	534,375
	-Meals and others	24,133	95,667	46,308	3,400	16,235	—
Monthly average income (IDR)		916,311	1,919,356	1,293,718	1,095,911	1,097,667	1,012,552

Note: Average per user refers to the average amount of users of the fishing boats

Source: JICA Study Team

Table 4-39 Situation of Activities of Usaha Rono Group (From February to July 2020)

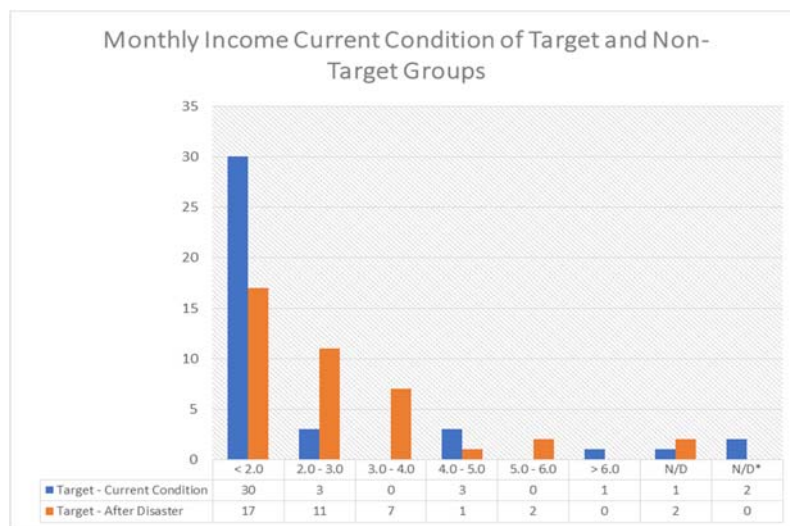
Items		Feb.	March	April	May	June	July
Number of fishing boats used (boats)			10	10	10	10	10
Number of fishermen (people)			19	19	20	20	20
Number of people not using the project boats			5	5	6	6	5
Average number of fishing days (days)	Avg. per user* <sup>1</sup>	10.6	24.47	26.35	20.75	27.35	19.55
	Simple avg.	8	23.25	26.35	20.75	27.35	19.55
Days of use of JICA boats	Avg. per user* <sup>1</sup>	7.9	19.20	24.73	20.50	27.36	18.07
	Simple avg.	5.9	14.40	18.55	14.35	19.15	13.55
Monthly average sales (IDR)		1,370,228	2,245,204	2,040,175	1,587,895	1,448,947	1,323,421
Monthly average expenses (IDR)	Total	651,158	925,500	923,052	758,158	823,158	639,473
	- Fuel	610,526	787,778	787,368	679,474	813,158	630,526
	-Meals and others	40,632	137,722	135,684	78,684	10,000	8,947
Monthly average income (IDR)		719,070	1,319,704	1,117,123	829,737	625,789	683,948

Source: JICA Study Team

(b) Recovery of Income

Based on the interview, before the start of the pilot project, the average monthly income of fishermen before the disaster was IDR 3,000,000, and the average monthly income before the pilot project after the disaster was IDR 2,200,000. On the other hand, the average monthly income per fisherman's group during the monitoring period (February till July 2020) was the highest in March, with Usaha Rono group's income at IDR 3,194,194 and Tatari Bahari group's income at IDR 2,337,944. In other months, Tatari Bahari group's income was slightly lower by over IDR 1,000,000, and it was lower for Usaha Rono group. Normally, around February is considered as off season because of rough seas; after April comes the season for full-scale *ikan teri* fishing. However, in April 2020, there was a low volume of landings which was a problem for the fishermen and processing group that procure raw materials.

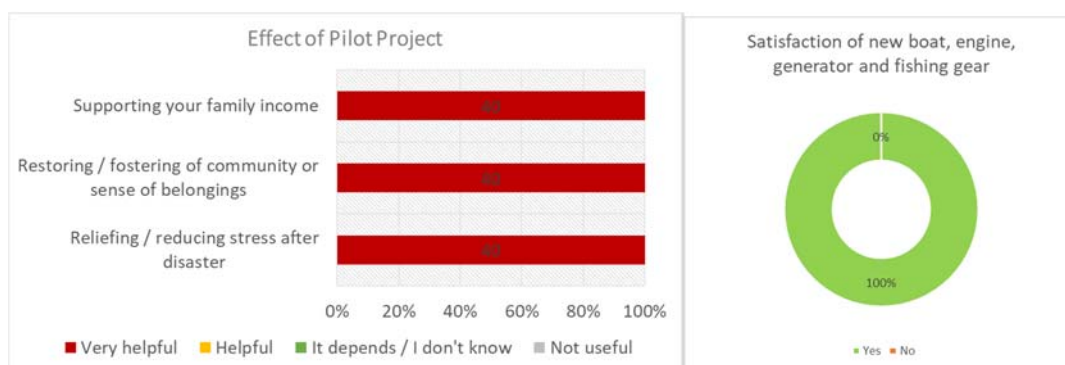
In Figure 4-14, the monthly income after the disaster and under the current condition is shown below. The number of fishermen earning less than IDR 2 million has increased under the current condition.



Source: JICA Study Team

Figure 4-14 Monthly Income After the Disaster and Under the Current Condition

For the other question, participants were asked about the effectiveness of the pilot project. The 40 beneficiaries of this pilot project answered that it is very helpful and they are also satisfied with the new boat, engine, generators and fishing gears. Their answers as summarized in Figure 4-15.



Source : JICA Study Team

Figure 4-15 Answers of Fishermen on the Effectiveness of the Pilot Project (Endline Survey)

## 5) Evaluation indicators and results

The activities were evaluated with the indicators agreed in advance based on the above monitoring data from February to July 2020, and the results of the endline survey were implemented in October 2020 (refer to Table 4-40). As a result, the boats provided were utilized without problems. However, due to the sea condition this year, poor catch has continued, and catch landing and income recovery could not be achieved.

Table 4-40 Evaluation of Livelihood Recovery Activities of Fishermen's Group  
in Lero Tatar Village

Indicator	Target	Before the Disaster	After the Disaster/ Before the Project	After the Project
Recover to monthly regular fishing and landing compared with the time before the disaster event	40 buckets/month	Landing quantity at more than 40 buckets/month	Landing quantity currently at 20 buckets/month	Average of 10 buckets/month. Month with the highest landing quantity is March 2020, when the average for both groups was 17 buckets/month. In other months, average landing quantity was from an average of 8 buckets/month to 11 buckets/month.
Recover and attain stable profit before the disaster event (on season)	IDR 3,000,000/month	IDR 3,000,000/month Sales IDR 400,000/bucket (lean season); IDR 200,000/bucket (normal season)	IDR 2,200,000 Income is irregular and not in the scale before the disaster event	Under analysis

Note: The weight of one (1) bucket estimated to be around 10kg – 12kg (as landing, sea water is included)

Source: JICA Project Team

## 6) Lessons learned from the pilot project activities

- Fishing boats are used according to the fishing methods of fishermen in each region, so the specifications that reflect the demand of fishermen are required. The pilot project produced the boats with local carpenters by confirming the requests from the users all throughout the production. The process has led to the provision of boats that satisfied the requirements of the local fishermen and contributed to the effective utilization of the boats. Meanwhile, fishing boats provided by a private donor (TV Company) have been abandoned in Lero Tatar Village. When the Department of Fishery in Donggala Regency distributed the boats provided by the donor, they confirmed the needs of the local fishermen but did not check the detailed specifications of the boat. The Department distributed a common type of boats that local fishermen do not use for their fishing. Hence, when providing a special equipment such as fishing boats, it is necessary to properly understand the needs and usage of the people.
- Construction of fishing boats by local ship carpenters was significantly delayed following the schedule, and the provision of fishing boats was also delayed. The causes are attributed to low awareness of ship carpenters' contracts and lack of ability to manage the construction processes. Before the project implementation, in response to the construction of fishing boats, the project

expected that the pressure coming from the fishermen to the carpenters to work quickly would work inside the community, but the sufficient coordination function could not be enacted. For the construction work management, an NGO with experience in fisheries-related activities was selected in Central Sulawesi, and a staff member of the NGO was stationed locally. However, due to the remote location, the NGO staff had encountered problems such as frequent loss of communication. A replacement staff could not be assigned, and it became one of the factors that delayed the process. Eventually, the project team could allocate work to the boat carpenters in the neighboring Lero Village and manage the process. When carrying out similar work in the future, the progress of the work should be carefully checked by bringing in outside viewpoints in order to avoid the delay of work.

- Due to the delay in providing fishing boats, unstable landing, and some people not going fishing, there were not enough activities being carried out to provide sufficient support for strengthening group activities. Group discussions were being held since the beginning of the fishing boat construction stage, and some group activities had already been confirmed such as voluntarily holding meetings to change the group members. However, discussions on activities could not be carried out, and this was likely caused by low fish landings. The Donggala Fisheries Department did not provide any activities to strengthen the fishermen's group, and it would have been desirable if more collaborative activities could be carried out with the Department of Cooperatives and MSMEs, which is a joint counterpart organization.
- The fishermen's group is encouraged to save on boat maintenance cost by working in pairs at the time of delivery. More than half (23 fishermen) answered that they are able to save the fund, but the amount is not sufficient. Only five fishermen are saving more than IDR 100,000 (about JPY 740).
- The Department of Fishery is checking the data on fish landings, but its office building was damaged by the tsunami and the entire volume of historical data was lost. The pilot project conducted the activity for keeping a record of fish landings with groups of fishermen, but this has not yet become a daily routine for them, so it is necessary for the Department of Fishery to continue the activities.

## (2) Lending of equipment to the processing group and support activities

### 1) Design of the activities

Similar to fishermen, most of the target group members live in temporary houses located in a mountainous area. It was expected that the group would continue the processing work at the beach side. However, at present, the group members come to the beach and bring back the harvested fish to the temporary housing site and work there. This activity was designed for the purpose of assisting the affected people to restart their previous job by using the tools provided to them.

The activities for the pilot project in Lero Tatari for the women processing group are framed (designed) in consultation with the target beneficiaries and stakeholders. The overall aim of the activities



is to provide emergency recovery of the livelihood of affected MSMEs for fish processing in Lero Tatari Village.

## 2) Selection of the target group

The selected group, namely Mutiara Tatari, has 38 women processors; the group was organized by the village head and recognized by the Department of Cooperatives and MSMEs of Donggala Regency. The Study Team, with the cooperation of the village head and the Department, has checked and validated the target group's membership, place of residence, etc. as the pilot project's aim is to provide and replace the damaged processing equipment for an early recovery and income generation to sustain their livelihood. Furthermore, the results of the baseline survey also validated the damages to fishing assets.

All the target women processors, except for one, are living in temporary housing facilities (*huntara*) which is not very far from the beach side where they had lived before the disaster. These women are self-employed and skilled in processing; there is no doubt that they would wish to be moved away from Lero Tatari. Hence, it is expected the concerned authority would accord due consideration to the permanent housing facilities close to the existing *huntara* during the selection process.

## 3) Activity

According to the baseline survey, there are no known formal group activities among women processors. Fish processing is not a group activity, but a normal individual activity with the help of family members. Likewise, with fishermen's groups and women's group were formed in order that the aid coming from public agencies (government) could be channeled. Hence, the group is not organized with the joint goals of collaborating or working to improve themselves; rather, each member is fending for oneself when doing the activity.

### (a) Providing fish processing training

The group received a five-day training (from April 29 to of May03) on *ikan teri* processing organized by the Department of Cooperatives and MSMEs of Donggala Regency and funded by the Department of Cooperatives and MSMEs of Central Sulawesi Province. Both in theory and in practice, the training covered courses on sanitation, hygiene, quality improvement, etc. *Rono dange* (smoke-grilled whitebait wrapped with banana leaf) is the usual product that the women have been traditionally producing in Lero Tatari and in other areas in Donggala. However, in this training course, women participants were provided training on the processing of new products, such as *rono dange* crispy, *rono* crispy, *rempeyek rono*, and others. Accordingly, three (3) sub-groups were formed among the participants to process three (3) new *ikan teri* products. Each group will process one of the new products besides the usual traditional *rono dange*. Moreover, the group obtained additional equipment for the processing of new products.

### (b) Equipment for Different Types of *Ikan Teri* processed products

There are four types of products, and different equipment items are needed for different products. The equipment items for the processing of *ikan teri* products listed in Table 4-41 were provided to the group on July 2019.

Table 4-41 Equipment Items for Different Types of *Ikan Teri* Processed Products

Description of Items	Rono Dange*	Rono Dange Crispy**	Rono Crispy***	Rempeyek Rono****	Remarks
Iron Plate for Grill Smoking	38				
Loyang (Small size -12kg)	38				
Large Plastic Pan (Large size - 30kg)	38				
Large Plastic Pan				2	
Medium - Stainless Pan				2	
Basket (24 kg capacity)	38				
Plastic Thermos (30 kg capacity)	38				
Bucket No. 3	76				2 pcs/person
Plastic Colander (Small)	38				
Sun-Drying nets (1 Roll)	38				1.2mx 100m/roll
Scissors	38				
Long Tongs (for Food) Normal Size	38				
Long Tongs (for Food) Slightly Longer				2	
Large Basket (for Banana Leaf)	38				
Small Measuring Cup	38				
Noodle Milling Machine		1			
Frying Pan (Big Size)		2	2	2	
Spatula		2	2	2	
Gas Stove		1	1	1	
Gas Tank		1	1	1	
Food Strainer (Small Size)			1		
Food Strainer (Medium Size)			1		
Food Strainer (Big Size)				2	
Blender			1		
Mixer				1	
Tray for Rice (Sosiru)			3		
Wheat Flour Sieve			2		
Plastic Cookie Spatula			2		
Food Scales			1		
Plastic Jar (Big Size)			1		
Ladle				2	
Vacuum Sealer	1	2			Trial operation
Total Cost (IDR)	2,960,500	2,121,500	2,558,500	1,237,000	

Remarks (\*) Rono Dange: Smoke grilled *ikan teri*; (\*\*) Rono Dange Crispy: Smoke-grilled *ikan teri* is mixed with ingredients such as wheat flour, onion powder, etc. and fried in oil; (\*\*\*) Rono Crispy: Fresh *ikan teri* mixed with other ingredients (wheat flour, onion powder, etc.) and fried in oil; (\*\*\*\*) Rempeyek Rono: Deep fried *ikan teri* brittle.  
Note: Vacuum sealer: Provided one (1) unit to the women processor group for trial operation to study its use and performance.

Source: JICA Study Team

### (c) FDGs and continuous support by NGOs

Weekly FDGs (focus group discussions) to exchange opinions and follow up on the use of the processing equipment provided were carried out. The Team adequately suggested solutions to any issues raised, such as providing the proper equipment materials for the new processed products based on the justification of the group's request. The Team is encouraging the group members to have the mindset of being self-reliant and independent and not to depend on outside support to solve their problems.

It was suggested that the group create a savings fund for any emergency needs, such as the purchase of consumables (plastic bags, ingredients, etc.). The group has no experience in group savings and therefore has no group savings account. The group expressed its desire to create a group savings account and receive training on business development.

Members are realizing the importance of group discussions as they can collaborate to resolve problems among themselves. After a series of discussions on production cost analysis, members were surprised when it was pointed out that they were not making profit or even a small profit margin. They have no idea on bookkeeping, profit and loss, etc. The Team plans to implement training on leadership, accounting, bookkeeping, etc.

Moreover, several exhibitions were organized and the project beneficiaries were invited to join the exhibitions. However, the group members were unable to collect the feedbacks from customers trying their products, which could help the members improve their new products. The importance of customers' comments was discussed in the FGD, and the members have improved their method of gathering customers' feedbacks when they join other exhibitions.

It is expected that the group activities will contribute to relieving the mental stress or trauma to some extent, aside from other group activities on disaster prevention education, etc., organized by BPBD.

**(d) Bookkeeping training**

In collaboration with a local NGO as a trainer, a two-day bookkeeping training was carried out in October 2019. Due to the large number of group members, the group was divided into two and the training was carried out two times. The members acquired some basic knowledge and skills in bookkeeping, such as how to calculate the material costs/labor costs; how to calculate the appropriate selling price; how to manage the recording of sales; etc.

**(e) Quality improvement of *Rono Dange***

The *rono dange* goes stale easily within a day and is no longer suitable for selling. Therefore, improving its best-before period is important for the processing group. The use of vacuum sealer was attempted in order to prolong the product's shelf life, but this was not successful. The *rono dange* was stored at freezing point in the refrigerator, but its taste had changed after freezing, so this method was not applied as well.

The summary of activities is shown on Table 4-42.

Table 4-42 Donggala Regency *Ikan Teri* Fishing in Lero Tatari Village: Summary of Support for the Activities of the Processing Group

Class	Activities
Project Activities	<ul style="list-style-type: none"> <li>• Training on the processing of <i>ikan teri</i> (by the Dept. of MSME in Central Sulawesi)</li> <li>• Lending of equipment</li> <li>• Bookkeeping training and support for obtaining sanitation inspection qualifications</li> <li>• Regular FGD meetings</li> </ul>

Support from outside the counterpart organization	<ul style="list-style-type: none"> <li>• Display the products in SMESCO (Jakarta) (Min. Cooperatives and SMEs)</li> <li>• HaKI (Intellectual Property Rights) Training (Dep. Coop. and SMEs Central Sulawesi)</li> <li>• Socialization of Intellectual Property Rights and PIRT and Exhibition (Dep. Cooperatives and MSMEs Central Sulawesi)</li> </ul>
---	--

Source: JICA Study Team

#### 4) Project achievements and evaluation

##### (a) Increased variety of products

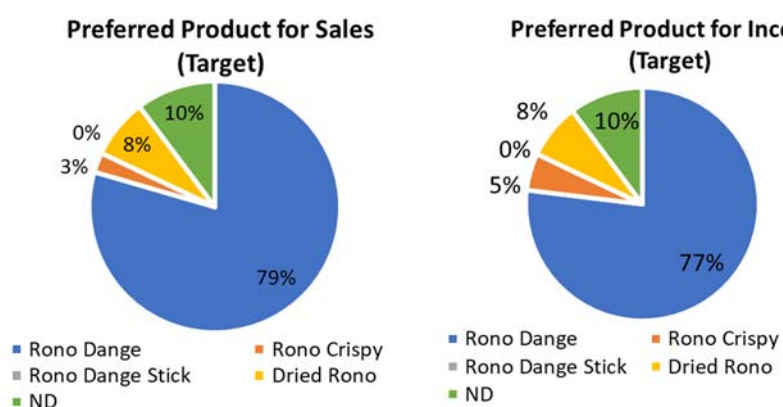
In July 2019, the project lent the equipment for the production of *rono dange*. The groups have been registered in the village office as a group of same business that produce *rono dange*. Then, each member was originally micro entrepreneur to produce *rono dange*. Therefore, each member worked in pairs to process the traditional *rono dange* and sell the product respect. Meanwhile, as for the new products that the groups learned to process as a result of the training provided in the project (See Table 4-43), the processing group was divided into three sub-groups, and each sub-group produces the product.

Table 4-43 *Ikan Teri* Products

Traditional Product	New Products		
Grilled <i>Ikan Teri</i> (Rono Dange)	Fried <i>Ikan Teri</i> (Rono Crispy)	Grilled <i>Ikan Teri</i> Stick (Rono Dange Crispy)	<i>Ikan Teri</i> Fritter (Rempeyek Rono)

Source: JICA Study Team

During the endline survey, project beneficiaries were asked about their preferred products. Around 80% of the respondents answered *rono dange*, 3% picked *rono crispy*, and 8% chose dried *rono* as indicated in Figure 4-16. From the viewpoint of income, the preferred product has not changed so much –77% answered *rono dange*, 5% picked *rono crispy*, and 8% chose dried *rono*.

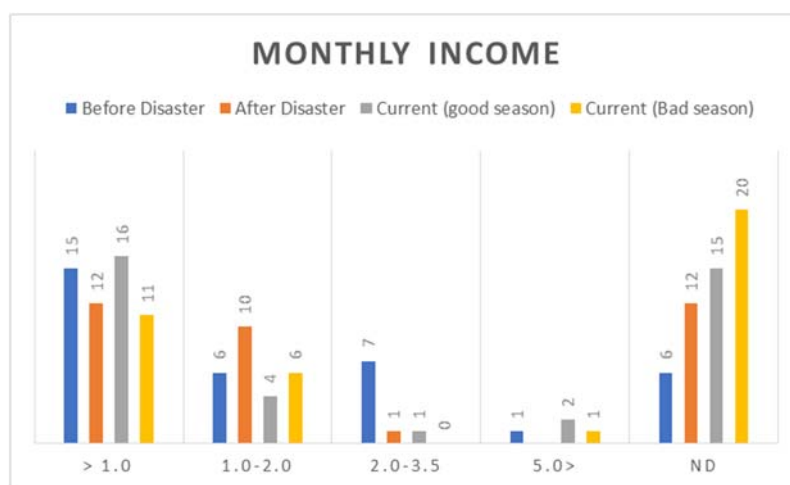


Source: JICA Study Team

Figure 4-16 Preferred Products in the Group

### (b) Recovery of income

Among the beneficiaries, their monthly incomes are compared between, before the disaster, after disaster and under the current situation, during both good season and bad season, as shown in Figure 4-17. Before the disaster, seven (7) members earned IDR 2 to 3.5 million per month, and six (6) members earned more than IDR 1 million. However, the number of members who earned over 2 million was reduced to only one (1) person after the disaster. The monthly income of many members earned more than IDR 2 million became IDR 1 to 2 million. Moreover, the number of members earning less than IDR 1 million has also decreased and was changed to ND, which means no income, or smaller and poses uncertainty. Under the current situation, three (3) members earned more than 2 million during a good season, but the number of members earning less than 2 million rose to 20. This indicates that the situation has not improved significantly since after the disaster.



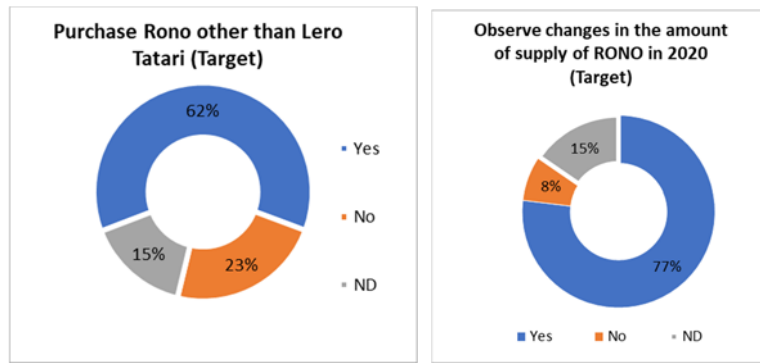
Source: JICA Study Team

Figure 4-17 Monthly Income After the Disaster and Under the Current Situation

From 2019 to 2020 – as the activities of fishermen’s groups were explained earlier – due to this year’s poor catch of *ikan teri* by village fishermen in Lero Tatari, members of the processing group had no option but to purchase their supply outside their village. As shown in Figure 4-18, many members purchased *ikan teri* outside of Lero Tatari, or stopped their processing work due to lack of supply. A total of 77% of the respondents agreed that the reason for this was due to the change in *rono* landing in 2020. Therefore, the processing cost was affected due to the high purchase price of *ikan teri*. Moreover, the quantity of the purchased *ikan teri* supply became limited because it was necessary to pay the fishermen on time for the purchase of the fishes. As a result, the group’s profitability has deteriorated.

From April 2020, during the restriction period for preventing the infection spread of COVID-19, the markets in Pal City continued to operate under limited and shorter opening hours. Despite this, the production group continued selling the processed products while adhering to the necessary rules. As for the processing group, regarding the deterioration of the group’s profitability, the above-mentioned poor landing of *ikan teri* had a greater impact than the effect of COVID-19 pandemic.





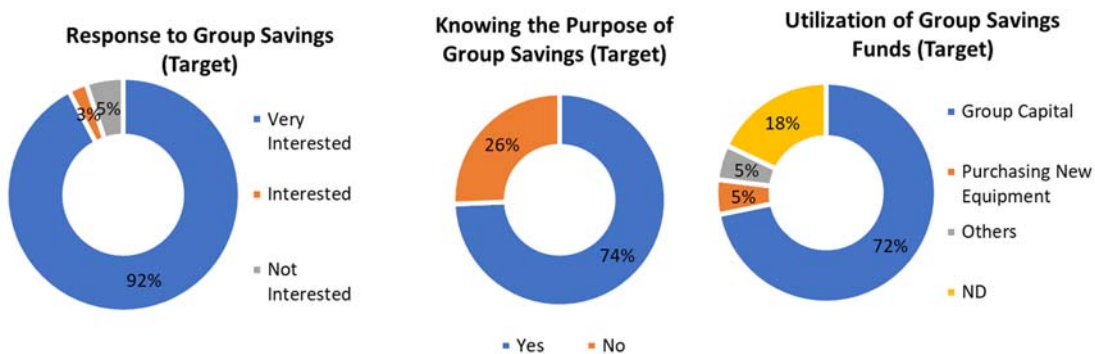
Source: JICA Study Team

Figure 4-18 Purchase of *Ikan Teri* from Outside the Village

(c) Introduction of group savings

A group savings scheme was applied for the processing group in order to strengthen their activities. Among the 39 respondents, only two (2) members did not show interest, and the rest expressed their interest. However, when asked about the purpose of group savings, 26% of the respondents said that they did not understand it.

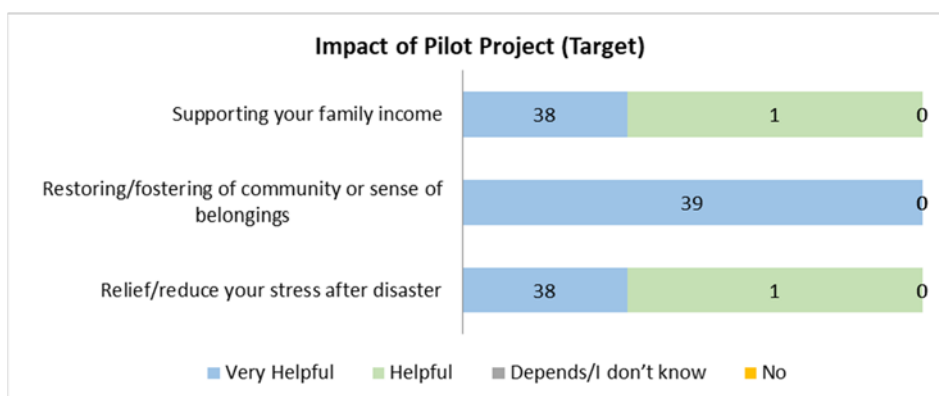
With regard to the utilization of group savings, only four (4) persons could borrow the fund for personal utilization. The remaining savings fund was used to purchase raw materials for the sub-groups to produce new products.



Source: JICA Study Team

Figure 4-19 Status of the Applied Group Savings

For the other question in the endline survey, participants were asked about the effectiveness of the pilot project. The 38 beneficiaries of this pilot project answered that it is very helpful as shown in Figure 4-15 earlier.



Source: JICA Study Team

Figure 4-20 Purchase of *Ikan Teri* from Outside the Village

### 5) Evaluation indicators and results

Table 4-44 summarizes the data of evaluation indicators set up at the beginning of the project based on the result of the endline survey. The income generated from *ikan teri* processing has slightly improved compared to before the implementation of project, but did not reach the same level as before the disaster due to the low landing of *ikan teri* in 2020. Among the group, it was confirmed that some people who could afford to purchase the material had continued to process and sell products and had increased their profits significantly.

The processing group also developed three new products as a result of technical training in Central Sulawesi. These new products could be produced and sold if *ikan teri* could be purchased at an appropriate price, but as of the end of 2020, group members had been limited to specific activities such as selling at exhibitions and events where people gather.

Regarding the improvement of the quality of processed products, the project attempted the vacuum packing of traditional grilled *ikan teri*, but the storage period could not be extended and the product could not be sold. For qualitative improvement, the new products are processed foods with a longer shelf life. Therefore, if the landing of *ikan teri* recovers and production increases, these new products could contribute to reducing food loss.

All members participated in the group savings activities. Group savings are generally used to fund group activities. Specifically, members use the savings to purchase materials for producing new products. In the endline survey, out of 38 people in the group with the exception of two people (5%), the rest showed their continued interest in savings activities.

In addition, as an activity in 2020, it was envisioned that gender awareness training would be implemented with the Department of Women Empowerment and Child Protection in Donggala as a counterpart. The content of the training was planned on gender issues in temporary housing. However, it could not be conducted due to the influence of COVID-19.

Table 4-44 *Ikan Teri* Fishing in Lero Tatari Village: Evaluation Indicator for the Processing Group

Indicators	Target	Before the Disaster*1	After the Disaster / Before the Project	End of the PP
Achieve recovery of regular income of processing group members by <i>ikan teri</i> processing compared with the time before the disaster event	At minimum, achieve regular income the same as before the disaster occurred	IDR 0.5 to 5.0 million/month (an average of IDR 1.4 million)	IDR 0.2 to 2.5 million/month (an average of IDR 0.9 million)	IDR 0.25 to 9.0 million/month (an average of IDR 1.2 million)
Diversify to other new products besides sun-dried and hot plate grilled <i>ikan teri</i> ; value addition	More than two kinds of new products are produced	Only dried and grilled <i>ikan teri</i>	Same as in the left column	Three new products were added
Attain the improvement of the quality of products produced by the processing group (shelf life of the processed products will become longer)	With training, the shelf life of products will be improved. In particular, the introduction of vacuum sealer will significantly improve the shelf life of hot plate grilled <i>teri ikan</i>	Sun dried <i>ikan teri</i> has a better shelf life than grilled <i>ikan teri</i> which has a short shelf life; hence, the women have to get them sold without delay.	Same as in the left column	No improvement yet on grilled <i>ikan teri</i> 's shelf life, but obtained food hygiene certificate on new products
Savings activities continue in both groups	More than 70% of the members continue their savings activities	-	-	100%

Source: JICA Study Team

## 6) Lessons learned from the pilot project activities

- Although the group was registered as a processing group, group activities were rarely carried out, and traditional grilled *ikan teri* production was carried out individually. Presently, the training for creating new products and their production are being carried out as a group, and the merits of the group are beginning to be understood.
- A system that allows for the continuation of group activities has been established, such as understanding the purpose of group savings activities and using the fund when producing new processed products. However, since self-initiated group activities have not yet been attained, it is necessary to continue working with counterparts to establish cooperatives in the future.
- Group activities were effective in reducing stress after the disaster. The project provides opportunities for continuous discussions as part of group activities, as well as disaster risk reduction training workshop with fishermen's group members. One group member commented that the activities contribute to fostering a sense of belonging in the community.

- Generally, women process the grilled *ikan teri* at nighttime and go to the market to sell the product in the early morning after taking a nap. Using the provided processing iron plate for *ikan teri* processing had an effect in shortening their working time. This extra time helped women to improve their daily lives, such as being able to take a longer rest at night.
- The project sub-contracted a local NGO to supervise the pilot project. The NGO rented a house in Lero Tatari Village and conducted the activities by closely communicating with both fishermen's group and the processing group. Regular meetings chaired by the NGO facilitated the discussions among the processing group members. Meanwhile, even though the NGO regularly supervised the fishing boat production in the village, the supervision of boat production was challenging for the NGO. The production of the boat got delayed, and the Study Team members needed to directly supervise to recover the delay, which ended up as extra input in the project.

### (3) Disaster Risk Reduction (DRR) education

#### 1) Design of the activities

Disaster Management Act in Indonesia prescribes that it is the local government's responsibility to conduct disaster risk reduction (DRR) activities and to protect the community from disaster. At the local level, BPBD is responsible for conducting DRR activities in collaboration with disaster management-related agencies including the Meteorology, Climatology, and Geophysical Agency (BMKG), Social Department, and so on.

For this project, disaster risk reduction education is specially designed for a community that recently experienced devastating disasters such as destructive earthquakes and tsunamis. In order to design the activities, the JICA Study Team conducted interviews with DRR-related agencies and with the target village of Lero Tatari. The damage of earthquake and tsunami and the challenges of DRR in Lero Tatari Village are summarized in the table below.

Table 4-45 Summary of Damage Situation in Lero Tatari Village and Challenges of DRR

Damage and conditions after the earthquake	Issues of DRR in Lero Tatari Village
<ul style="list-style-type: none"> <li>• 15 villagers (including 3 children and 3 elderly persons) perished during the earthquake and tsunami</li> <li>• 150 HHs were severely damaged, 30 HHs were moderately damaged and 80HHs were lightly damaged.</li> <li>• After the occurrence of the earthquake, villagers received an SMS from BMKG about the occurrence of M5 level earthquake.</li> <li>• Because of lack of evacuation orders, villagers did not anticipate the occurrence of the tsunami.</li> <li>• Residents who were physically strong enough to evacuate to hilly areas survived, and those who could not run fast or were not physically strong became the victims of tsunami.</li> </ul>	<ul style="list-style-type: none"> <li>• Villagers misunderstood that BMKG issues the evacuation order. A proper understanding of information from BMKG is insufficient.</li> <li>• How to assist the evacuation of persons with mobility limitation, including elderly persons and persons with disabilities</li> <li>• Practical first aid skills before the arrival of assistance and rescue personnel</li> <li>• Practical skills and knowledge on rescuing from water-related disaster</li> </ul>

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• When the rescue team from the health department came to Lero Tatari, 9 days had already passed since the earthquake and tsunami occurred. Until that time, villagers needed to depend on primitive measures or give inappropriate first aid treatment.</li> </ul> |  |
|--|--|

Source: JICA Study Team

During interviews with DRR-related organizations, they commented that there is no specialized post-disaster program in Indonesia and that the shock of the disaster should be taken into consideration, as many residents in the affected areas are likely to panic even from small aftershocks.

Based on the above-mentioned interviews, the JICA Study Team designed a DRR education program suitable for the post-disaster period considering the situation of the people in the affected areas. The following points were taken into consideration in developing the program.

In addition, the BMKG of Palu City commented that the previous disaster history was not recognized by the communities, and the BPBD of Donggala Regency requested the JICA Study Team to help in managing past disaster records to educate the communities and especially for future generations.

- The target population demographics are fishermen and those who make a living by selling processed products in the market as day-to-day laborers. During the period when the income base is not stable following the earthquake, the items to be included in the program should be narrowed down compared to the normal program.
- At the time the program was considered, the location of the temporary housing where the residents would be relocated and the timing of the relocation were unknown, so activities that were included in Indonesia's national disaster resilience community program, such as community mapping, were not implemented. (Considering the income opportunities during the period when the income base is not stable as mentioned above, it was concluded that it was not a priority to conduct activities at this time, since they will not be used in a few months.)
- In consideration of the traumatized people, the program omitted activities with high safety risks, such as evacuation drills, that may remind people of the disasters and cause panic. Instead, the program included trauma healing activities to reduce the psychological burden on the participants and practical skills that can be both enjoyed and learned.

## 2) Target groups and related agencies

The target groups for the activities are the fishery communities in Lero Tatari Village, similar to the “Pilot Project on Livelihood Restoration of Affected Fisherman and Women Processing *Ikan Teri* Products.”

The main coordinating agency for disaster risk reduction education is the BPBD of Donggala Regency. The related agencies are selected in consultation with the BPBD Donggala and according to the request of the villagers in Lero Tatari Village.



Table 4-46 Related Agencies of Disaster Risk Reduction Education and Their Roles in DRR

Name of Agency	Roles in Disaster Risk Reduction Education
BPBD	• DRR awareness-raising on prevention and preparedness
BMKG	• Education about metrological hazard, tsunami, earthquake and early warning information
Social Department	• Trauma healing
BASARNAS	• Search and rescue
PMU	• First aid training for villagers

Source: JICA Study Team

### 3) Implementation of the DRR education workshop

In the DRR education workshop, the JICA Study Team introduced the case of the Indian Ocean earthquake and tsunami and the Sunda Strait Tsunami, both of which had stories about survivors because the records of past disasters, which were handed down to the community, urged the people to evacuate.

In order to prepare for future disasters by recording past disasters and disaster-prone areas in the community, participants discussed and agreed on the locations of the tsunami signboards and the information to be conveyed. The tsunami signboards were installed in four locations in the village in October 2020. Before the installation, the JICA Study Team conducted a briefing session for non-workshop participants, including the head of Lero Tatari Village, community representatives such as representatives of women's groups in the village, and neighboring areas around the signboard locations, to agree on the details and locations.

Based on the program of the DRR education workshop, the BPBD of Donggala Regency also supported the activity of organizing a one-day DRR education workshop in Wani Village in Donggala Regency as part of the DRR education activities in Donggala Regency.

During the two-day DRR workshop in Lero Tatari Village, participants deepened their understanding of disaster prevention and shared their knowledge on the actual disaster situation and past disasters in Lero Tatari Village. The following comments were obtained from participants:

- It is necessary to set up boards that recorded the earthquake and tsunami in schools and village halls to show the records of disasters, so that children who do not know about the disasters can learn about them in the future.
- It is necessary to pass on the knowledge and skills learned in DRR education to people in other areas of the village and to organize village disaster management committees. In order to organize the disaster management committees, it is necessary to request support from the BPBD of Donggala Regency, since BPBD conducts trainings and provides support to several villages every year within their budget.
- The village development fund of the Ministry of Village Development can be used to support disaster prevention activities in the villages, so the village should consider using the fund.

Table 4-47 Donggala Regency: Summary of DRR Education Activities

Class	Activities
Project Activities	<ul style="list-style-type: none"> <li>• DRR education seminar in Lero Tatari Village (Jul 31-Aug 1, 2019) Disaster information (BMKG), trauma healing (Social Dept.), evacuation support, SAR and first aid training (BASARNAS and PMI)</li> <li>• Support for DRR education seminars jointly held by Wani I and Wani II (Sep 26, 2019)</li> <li>• Record and install signboards (October 2020)</li> </ul>

Source: JICA Study Team

#### 4) Project achievements and evaluation

During the two-day DRR education workshop in Lero Tatari Village, participants deepened their knowledge about disaster prevention and shared knowledge about the actual disaster situation and past disasters in Lero Tatari Village. In addition, after discussions regarding the installation of signboards, the activities were related to the entire community, and community representatives such as village leaders, female group representatives of the village, and experts were able to participate. The designs of the signboard installed in Lero Tatari Village are shown below (See Figure 4-21).



Source: JICA Study Team

Figure 4-21 Signboard Designs for Disaster Prevention Awareness in Lero Tatari Village

## 5) Lessons learned from the pilot project activities

- One year after the disaster, disaster victims often experience memory flashbacks of the disaster and become emotionally unstable. The DRR education provided a workshop on trauma healing conducted by a social worker dispatched by the Department of Social. This was deemed effective to reduce such kind of stress.
- After conducting a DRR workshop for the pilot project targets, in order to obtain permission to install signboards for disaster prevention awareness, a workshop was organized with the community leaders such as the village head, female group representatives of the village, school teaches and others. Through this activity, DRR activities targeting only pilot groups could be expanded to the community.
- At the seminar held at Wani, it was difficult to attend the seminar during the daytime, so there were few male participants, although a large number of women could participate in the training (Female 25; male 10 comprised mostly of elderly persons). Hence, it is necessary to consider the method of conducting the workshop by taking into consideration the convenience of the various group of population including both gender, youth, elderly people, and PwDs.

### 4-2 Pilot Project on Applying the Reference Manual in Indonesian Government Projects

For the purpose of verifying the usefulness of the reference manual as well as updating the reference manual based on the identified points for improvement through actual utilization, Indonesian stakeholders and the JICA Study Team agreed to implement a pilot project in 2020 which apply the reference manual to livelihood recovery and community restoration activity of Indonesia's nationwide program.

#### 4-2-1 Applying for a support program called Banpem (Bantuan Pemerintah: Government Assistance) of the Ministry of Cooperatives and SMEs

##### (1) Outline of the program

The Ministry of Cooperatives and SMEs is implementing a support program called Banpem (Bantuan Pemerintah: Government Assistance) for the affected micro-small enterprises (hereinafter referred to as "MSEs") in the disaster area. The Banpem program was adopted as a response to the earthquake disasters in West Nusa Tenggara Province and Central Sulawesi Province that occurred in 2018, based upon a request for assistance issued by the National Disaster Management Agency (BNPB) to relevant ministries.

The Banpem program is a subsidy program for disaster-affected enterprises. In 2019, a total of 150 enterprises in Palu City, Sigi Regency, and Donggala Regency were provided with IDR 5 million (Approx. JPY 37,000) per person. In 2020, a total of 150 disaster-affected enterprises (Female 111; male 39) from the said three municipalities became the target beneficiaries. The subsidy amount was IDR 3.5 million (Approx. JPY 25,900) per person.

(2) Consultation for the utilization of the reference manual

1) Consultation with the Ministry of Cooperatives and SMEs

In December 2019 and January 2020, the JICA Study Team had meetings with the Business Protection Department of the Ministry of Cooperatives and SMEs, which is the responsible section for the Banpem program, to discuss the possibility and purpose of the utilization of the reference manual in the Banpem program. The main discussion points are described below.

- In the Banpem program, some problems were identified during its implementation in 2019, such as confusion in the administrative process of selecting the beneficiaries; inappropriate selection of beneficiaries; and inappropriate use of the subsidy. The Ministry expects that an application of the reference manual would contribute toward improving the Banpem program implementation.
- The Ministry issues an implementation instruction for the Banpem program (*Petunjuk Pelaksanaan*, hereinafter referred to as “implementation guideline”) to the concerned regional departments of cooperatives and micro, small, and medium enterprises (hereinafter referred to as “regional department of cooperatives and MSMEs”). The implementation guideline is already in the stage of approval by the Minister; therefore, the content of the implementation guideline cannot be revised by reflecting the reference manual.
- Each regional department of cooperatives and MSMEs is a substantial implementing body in the field, and each department determines its implementation steps and method such as the selection of beneficiaries. It is possible to implement the Banpem program using the reference manual upon consultation with each department. The Ministry welcomes the utilization of the reference manual and would like to encourage departments to collaborate with the JICA Study Team and apply the reference manual for the implementation of the Banpem program.

2) Consultations with the regional departments

At the end of January 2020, the JICA Study Team subsequently exchanged opinions with each regional department of cooperatives and MSMEs. Regarding the issues identified last year, which were mentioned in preceding meetings with the Ministry described above, the same recognition was confirmed at regional level consultations described below. In addition, it was confirmed that there is a need to prepare a document that describes the working procedures of the Banpem program.

Table 4-48 Summary of Consultations with the Regional Departments

Issues identified last year	<ul style="list-style-type: none"> <li>• Under a state of confusion after the disaster, the working procedures in the department, especially the steps in the selection of beneficiaries, were not unified. Consequently, this has caused disruption in project implementation.</li> <li>• Since the procedure period for the selection of beneficiaries was short, verification of the candidates was not sufficiently implemented. Consequently, some selected beneficiaries did not match the selection criteria, there was improper use of the subsidy fund, and the department had lost contact with several beneficiaries and failed in monitoring.</li> </ul>
-----------------------------	--

Possibility of the utilization of reference manual	<ul style="list-style-type: none"> <li>• Since there were some confusions regarding the administrative procedure last year, the reference manual will be helpful.</li> <li>• Reference materials for staff showing the work procedures should be prepared.</li> </ul>
--	---

Source: JICA Study Team

### (3) Formulation of SOP

Based on discussions with the Ministry of Cooperatives and SMEs and the regional departments of cooperatives and MSMEs, the JICA Study Team has decided to propose the formulation of a Standard Operating Procedure (hereinafter referred to as “SOP”) for the Banpem program that incorporates the essence of the reference manual for smooth execution of the livelihood recovery and community restoration activity during the recovery and reconstruction period.

In collaboration with the JICA Study Team, each regional department has formulated the SOP in late February to early March 2020. In formulating the SOP, work items and procedures were organized by incorporating the essence of the reference manual while taking into account the implementation guideline of the Ministry of Cooperatives and SMEs, lessons learned from last year, and implementation plans for this year. The following is a summary of the main inputs from the reference manual (Table 4-49).

Table 4-49 Inputs to the SOP Based on the Reference Manual

Key points in the Reference Manual	Inputs to the SOP
Setting the selection criteria for beneficiaries based on detailed and measurable data/information	<ul style="list-style-type: none"> <li>• Added measurable criteria in addition to the criteria indicated in the implementation guideline <i>Examples:</i> age, period of business experience in years after the disaster has occurred until the present</li> </ul>
Disclosure of official information regarding the selection of beneficiaries	<ul style="list-style-type: none"> <li>• Described policy and work procedures of selecting the beneficiaries (ensuring transparency by stating the information in SOP)</li> <li>• As one of the procedures, determined the notification plan for notifying the village heads on the selection of beneficiaries</li> </ul>
Prior explanation to beneficiaries on their responsibility and penalties for inappropriate use of funds	<ul style="list-style-type: none"> <li>• Determined and described penalties when inappropriate use of subsidy is found (ensuring mutual recognition of staff)</li> </ul>
Formulation of monitoring and evaluation framework	<ul style="list-style-type: none"> <li>• Added monitoring and evaluation plan (schedule and items to be monitored/evaluated), in addition to the plan determined in the implementation guideline</li> <li>• Collect comments and recommendations from the beneficiaries at the time of final monitoring, in addition to the monitoring items requested by the Ministry</li> </ul>
Conduct evaluation at the end of the program and share the results	<ul style="list-style-type: none"> <li>• Added a plan of evaluation workshop to share the evaluation results of the program among the beneficiaries and related departments, in addition to reporting to the Ministry as determined in the implementation guidelines.</li> </ul>

Source: JICA Study Team

To formulate the SOP is a process of “documentation of policy and procedures” of each regional department, such as the method and selection criteria for beneficiaries. Therefore, the formulation of SOP itself was expected to “ensure accountability and transparency,” which are among the key approaches stipulated in the reference manual.

(4) Implementation of the Banpem Program

1) Selection of the beneficiaries and preparation of application documents

In accordance with the formulated SOP, each regional department conducted a series of necessary supporting activities: selecting the beneficiaries, support in the preparation of application documents, and sending the documents to the Ministry. The JICA Study Team supported the activities of each department while confirming the difference between the SOP description and the actual implementation.

Table 4-50 Supporting Activities by the Regional Departments

Selection of beneficiaries	<ul style="list-style-type: none"> <li>The regional departments visited beneficiary candidates in order to interview them and observe their current situation. The following conditions were confirmed: disaster damages, condition of business operation, and whether they fulfill the criteria.</li> </ul>
Preparation of application documents	<ul style="list-style-type: none"> <li>Compiled the application documents of candidates and submitted the documents to the Ministry. In the process, the following support activities were conducted: provide guidance to the candidates, support the candidates in obtaining the necessary documents, assistance in filling up the documents, verification of the contents of the documents, preparation of data to be submitted to the Ministry, etc.</li> <li>For the Banpem program of 2020, acquisition of “micro-small business permission (IUMK: Izin Usaha Mikro Kecil)” had been determined as one of the criteria. However, almost all of the 150 candidates had not obtained the permission at that time. Since online procedures were required, access had been difficult for the candidates, and the procedure was quite complicated. Therefore, the regional departments supported the procedural process (substantially, the departments dealt with the procedure on behalf of the candidates).</li> </ul>

Source: JICA Study Team

The JICA Study Team provided the necessary advice and support to the regional departments, such as giving advice on the detailed working procedure in accordance with the SOP, preparation of data entry form, and assisting the regional departments in their actual works (accompanying them during site visits, documentation of interviews, data entry, verification of documents, etc.). The regional departments had little experience in acquiring IUMK through an online system, so it was necessary to start by confirming the procedure with the assistance of the JICA Study Team.

The following items were confirmed as issues that hinder the smooth execution of activities: shortage of human resources in both quantitative as well as qualitative aspects; deficiency in operational budget (e. g., transportation and personnel expenses for field inspections, cost for the printing of necessary documents); and lack of IT infrastructure.

On March 10 and 11, 2020, the Ministry of Cooperatives and SMEs held an orientation meeting for the beneficiary candidates. In addition to the explaining the guidance of the Banpem program including the rules on utilizing the subsidy, motivation training and accounting training were also conducted.

2) Disbursement of subsidies

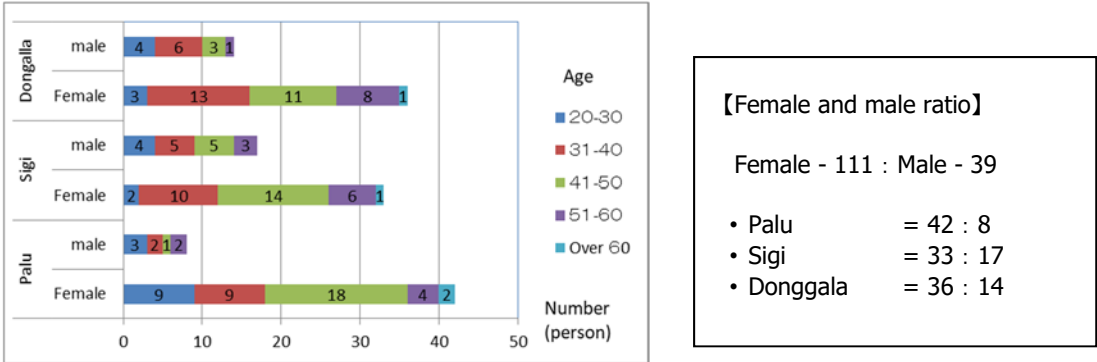
The disbursement process of the Banpem program subsidy was initially planned to be conducted in April 2020. However, due to the spread of COVID-19 infection, the verification of submitted documents in the Ministry was delayed since its staff shifted to work from home. Moreover, the execution of the Banpem program was suspended due to government budget review in order to consider measures against



COVID-19 pandemic. The disbursement was finally executed on June 30 by transferring the funds to the beneficiaries' respective bank accounts. The amount of subsidy was IDR 3,500,000 (JPY 25,900) for each enterprise. The breakdown of the beneficiaries of Banpem program by gender and age is shown in Figure 4-22.

Before coming up with a final decision on the disbursement, the Ministry instructed the regional departments to reconfirm the current status of the beneficiaries. As a result, many of the beneficiaries were found to be affected by COVID-19 pandemic, which has caused the suspension of their business activities and decline in their sales. Some beneficiaries had no option but to change their business type to remain in operation. The shift in business type was allowed by reporting this to the regional department.

In the beginning of July, each regional department once again explained to the beneficiaries about the utilization of subsidy and requested cooperation for monitoring during the next two years.



Source: JICA Study Team based on data from the Ministry of Cooperatives and SMEs

Figure 4-22 Number of Beneficiaries by Age and Sex

3) Field Monitoring

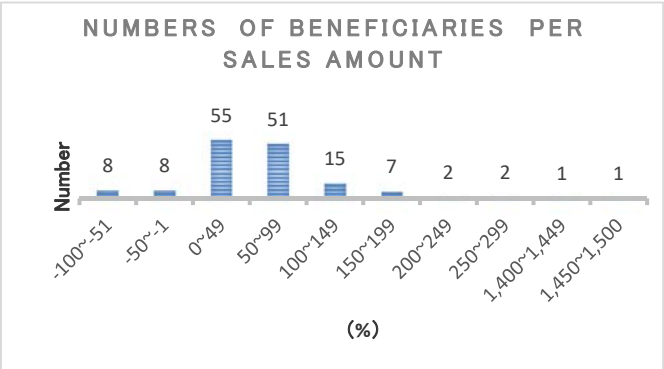
The guidelines set by the Ministry of Cooperatives and SMEs stipulates that beneficiary monitoring should be carried out once every six months. At a short time after the payment of subsidy at the end of June 2020, the Ministry of Cooperatives and SMEs issued an instruction to carry out monitoring in August 2020. Following this, Department of Cooperatives and MSMEs of Donggala Regency and Palu City conducted the first monitoring in August, and the one in Sigi Regency conducted the first monitoring in October. Figure 4-23 illustrates the number of beneficiaries per sales amount (% in increase and decrease of sales).

The monitoring items stipulated in the implementation guideline of the Ministry of Cooperatives and SMEs were confirmed: “amount of assets”, “amount of sales”, and “number of employees”. In general, sales increased for many beneficiaries as 134, but in Sigi Regency, 16 businesses were confirmed whose sales declined due to the spread of COVID-19 infection. Of the total of 150 beneficiaries of the three local governments, 28 MSMEs increased their sales more than 100% compared to the sales amount before receiving the subsidy; 51 MSMEs increased their sales from 50 to 99%; and 55 MSMEs increased from 5% to 49%. Meanwhile 16 businesses had reported a decrease in their sales, sales for some

businesses had dropped to nearly 90%. There was no significant difference between female and male participants and regions regarding the increase in sales.

It was confirmed that the “asset amount” increased by IDR 3,500,000 in the benefit amount. Even though sales were sluggish due to the impact of COVID-19, no beneficiaries had decreased their own assets from when the project started. Throughout the project period, there was no change in the “number of employees.”

Based on above information, it can be evaluated that the funding subsidy for supporting individual MSMEs contributed to maintaining livelihoods even under the influence of COVID-19, and that the subsidy project was generally effective.



	Decrease of sales	No change	Increase of sales
Palu	0	0	50
Sigi	16	0	34
Donggala	0	0	50

Source: JICA Study Team created based on data from the Ministry of Cooperatives and SMEs.

Figure 4-23 Beneficiaries per sales amount (%)

At the time of SOP formulation, all Departments of Cooperatives and MSMEs in three municipalities planned to carry out monitoring every three months. However, as of the end of 2020, no monitoring activities were carried out other than the above-mentioned primary monitoring. In response to the spread of COVID-19 infection, a subsidy project was implemented for micro and small businesses all over Indonesia, and each department became extremely busy with work related to this project. Therefore, the carrying out of the first monitoring was delayed, and the reporting of the results were also delayed. There was no room to carry out additional monitoring every three months as planned by the SOP.

In addition, although all the Departments of Cooperatives and MSMEs in three municipalities contributed to the SOP to confirm the beneficiary's “project operation issues” at the time of monitoring, if the JICA Study Team members did not accompany the project members responsible, the records done by officials of each department or contracted staff were not thorough. For each department, it is considered that preparing an input form for the monitoring of the activity of each staff, giving clear instructions in advance about the work content, or stipulating it as a monitoring item by the Ministry of Cooperatives and SMEs, are some measures for a reliable implementation.

## (5) Feedback to the reference manual

In this pilot project, the Banpem project was implemented using the SOP created, which was embodied using a reference manual according to the guideline set by the Ministry of Cooperatives and SMEs. Based on the contents that the concept of the reference manual could not be applied at the stage of creating the SOP and the activities that were set as implementation procedures in the SOP but were not actually implemented, the materials for updating the manual were examined.

The points in the reference manual that were not included in the SOPs were those related to ensuring “inclusion” and “accountability and transparency” as shown in Table 4-51. For example, the SOP indicates that the percentage of women and socially vulnerable groups should be set as a criterion for selecting the beneficiaries, but in reality, it was difficult to set such target due to lack of data on the percentage of women and men in existing businesses, which could be used as a guide for setting gender-specific targets. Furthermore, as shown in Table 4-52, the items that were included in the SOPs but not implemented and the reasons for not implementing them were related to “accountability and transparency” and “monitoring.” These were organized as items to be considered when updating the reference manual.

Table 4-51 Concepts Not Included in the SOP but Described in the Reference Manual

Description in the Reference Manual	Reasons Why They Were Not Included
<u>3.1 Inclusive</u> Beneficiary selection criteria: XXX % of beneficiaries are women/vulnerable people	<ul style="list-style-type: none"> <li>It is difficult to make adjustments to achieve the goal while considering the actual field surveys and the influence of politics.</li> </ul>
<u>2.2 Accountability and Transparency</u> Selection of beneficiaries are based on public open selection and recommendation of village governments, commerce and industry society and departments in charge.	<ul style="list-style-type: none"> <li>Public selection often brings about conflict</li> <li>It is difficult to exclude the influence of politics.</li> <li>Frequent recommendation by personnel with some connection to village leaders or commercial and industrial society</li> </ul>
<u>2.2 Accountability and Transparency</u> Public announcement of the selection results to <i>kelurahan</i> /village community (e.g., putting up an announcement in a public space)	<ul style="list-style-type: none"> <li>Public announcement may cause confusion regarding the selection results</li> </ul>

Source: JICA Study Team

Table 4-52 SOP Items Described in the SOP but Were Not Implemented

Description in SOP	Actual implementation	Reason why it was not implemented
Accountability and transparency Recipient selection procedure (Palu City) 1. Selection of a <i>kelurahan</i> which was heavily damaged by the disaster 2. Check the existing data of MSMEs residing in the selected <i>kelurahan</i> and select candidates	<ul style="list-style-type: none"> <li>The selection was not based on the analysis of damage status data for each <i>kelurahan</i>, but the evacuation shelters, temporary housing, areas with large damage, etc. were selected based on the information within the range that the union bureau can assess.</li> <li>Confirm the current situation and conduct interview surveys in the selected area and select appropriate candidates (most beneficiaries are businesses that were not recognized by the union bureau before the disaster)</li> </ul>	<ul style="list-style-type: none"> <li>Since there is no appropriate data that can assess the damage situation for each <i>kelurahan</i> and the department has not been able to organize all the business data, the selection was made based on the information on the degree of damage and the support situation within the range that the department can assess.</li> </ul>

Description in SOP	Actual implementation	Reason why it was not implemented
Accountability and transparency Recipient selection procedure (Sigi Regency) 1. List of candidates provided by the village office 2. Collecting and organizing candidate data provided by the village office 3. Confirmation of the current situation of candidates and conducting an interview survey	<ul style="list-style-type: none"> <li>Department has selected the county of interest based on the information provided</li> <li>List of candidates for each selected county based on the information provided</li> <li>Confirm the current status and conduct interviews</li> </ul>	<ul style="list-style-type: none"> <li>Conducted by the department to avoid shortage of human resources at the village office and selection of candidates due to personal connections with the village office staff</li> </ul>
Monitoring and facilitation The department visits the beneficiaries every three months for monitoring.	<ul style="list-style-type: none"> <li>Not implemented</li> </ul>	<ul style="list-style-type: none"> <li>Busy schedule due to other work, lack of human resources</li> </ul>

Source: JICA Study Team

As shown in the table below, other supporting activities for MSMEs due to the COVID-19 pandemic are being provided by the Ministry and the regional departments.

Table 4-53 Supporting Programs for MSMEs

Supporting organizations	Supporting programs
Ministry of Cooperatives and SMEs	<ul style="list-style-type: none"> <li>Debt relief measures (interest rates cut, moratorium of payment)</li> <li>Cash grant assistance of IDR 2.4 million per person for 12 million MSEs in Indonesia. Disbursement starts gradually from the middle of August. Criteria for the selection of beneficiaries are the following: 1) having no financial loans from bank, and 2) deposit amount is less than IDR 2 million. The SMEs departments of Palu, Sigi, and Donggala are in the stage of compiling the necessary documents for application. The quota for each region is unknown.</li> <li>Provision of training on online marketing skill (webinar)</li> </ul>
Regional departments (supported by NGO)	<ul style="list-style-type: none"> <li>Launching of online shopping site</li> <li>Training on online marketing skill</li> </ul>

Source: JICA Study Team

#### 4-2-2 Ministry of Villages, Development of Disadvantaged Regions, and Transmigration

Indonesian stakeholders and the JICA Study Team had also agreed to apply the reference manual to a program of the Ministry of Villages, namely the Vocational Training of Disaster Affected Enterprises in 2020. This program was implemented in Sigi in 2019 and is planned to be implemented in 2020 in Sigi and Donggala. The program outline for 2020 is shown in the Table 4-54.

Table 4-54 Outline of the Training Program of the Ministry of Villages

	Sigi Regency	Donggala Regency
Training course	<ul style="list-style-type: none"> <li>• Confectionery</li> <li>• Sewing</li> </ul>	<ul style="list-style-type: none"> <li>• Fish dumpling</li> <li>• Fish nuggets</li> </ul>
Target	<ul style="list-style-type: none"> <li>• 50 participants for each course (100 in total)</li> <li>• Participants have been selected</li> <li>• 5 people for one group, 10 groups for each course</li> </ul>	<ul style="list-style-type: none"> <li>• 50 participants for each course (100 in total)</li> <li>• Participants have been selected</li> <li>• Women from fishery households in 10 villages, Banawa district</li> <li>• 10 people for one group, 5 groups for each course</li> </ul>

Source: JICA Study Team

On March 11 and 12, 2020, the Ministry of Villages had visited Sigi and Donggala to have a coordination meeting among related departments and the JICA Study Team. Subsequently, the Ministry of Villages and the JICA Study Team planned to have a meeting in mid-March for a separate discussion. However, this was cancelled due to the spread of COVID-19 virus. Thereafter, the Ministry of Villages has been busy dealing with the pandemic, and the training program has been suspended due to budget revision. The Ministry said that it would use the reference manual when implementing the program.

### 4-3 Evaluation and Lessons Learned from the Pilot Project

This section summarizes the result of the pilot projects implemented in collaboration with regencies/municipality in 2019 and the pilot project implemented with the Ministry of Cooperatives and SMEs.

#### 4-3-1 Characteristics of each pilot project implemented in 2019

Based on the results and lessons learned from the pilot projects implemented in 2019 as well as the findings obtained through the implementation, the items to be included in the reference manual are organized. For this purpose, the characteristics of each pilot project were rearranged, and lessons learned are summarized below.

##### (1) Characteristics of the pilot project from the perspective of the target communities

The project in Balaroa, Palu City targets evacuation shelter (temporary evacuation area) residents after the disaster, and the project in M'panau, Sigi Regency targets those residing in temporary shelters area, both of which are originally the same local residents before the disaster. It can be said that a temporary community, consisting of unrelated residents, which was formed after the disaster is targeted in the project. On the other hand, the pilot project of Lero Tatari in Donggala Regency originally targeted the district (*dusun*) in the village, and even though their living conditions – such as moving to different temporary residential areas or living in the original residential area – had changed after the disaster, it can be regarded as a community which was connected by livelihood activities and has continued from before the disaster occurred.

The characteristics of targeted communities differ significantly in terms of mutual trust and mobility among project participants, and the lessons to be reflected in the guideline should consider these points. Table 4-55 illustrates the characteristics of each pilot project community.

Table 4-55 Characteristics of Communities Targeted in Each Pilot Project and Lessons Learned

Pilot Project	Target Community	Characteristics	Lesson Learned
Livelihood Recovery of Women in Balaroa Evacuation Shelter in Palu City	Evacuation Shelter	Originally, the community consisted of various ethnic groups with different cultural backgrounds who were mixed and lived in the Balaroa Kelurahan, and the relationships between the residents are sparse. After the disaster, they were further mixed up. With the development of temporary housing areas, residents gradually exited from the shelters.	It is difficult to foster mutual trust because of the high mobility of the people and the limited period of their stay in the evacuation shelter that is planned to be removed. Hence, it is important to set an appropriate target and implement the necessary activities immediately after the disaster.
Installation and Operation of Community MSMEs Center and Providing Training on Livelihood Recovery in Sigi Regency	Temporary Housing Sites and Household in M'panau Village	The community was formed with residents moving from the surrounding areas to temporary housing sites constructed after a brief interval during their evacuation. Many inhabitants maintain their affinity with their original place of residence and rebuild their homes for their eventual return. For this reason, the community exists for a certain period of time, but it is recognized that the community will eventually be dismantled.	It is necessary to carry out the activities in consideration of the high mobility of people. Even within the same village, it takes time to build mutual trust if the original social clusters of the people were different.
Livelihood Restoration of Affected Fishermen and Women Processing <i>Ikan Teri</i> Products in Lero Tatari in Donggala Regency	Regional Community in the Village	The original community that is maintained mainly by livelihood even if the people had relocated to several temporary housing sites.	Need for sustainable activities that take into account the current situation while considering the relationships of the original communities

Source: JICA Study Team

## (2) Characteristics of the pilot project from the perspective of livelihood recovery

The livelihood recovery activities carried out in the pilot projects can be categorized based on the immediate effectivity and sustainability. Since the pilot project in Balaroa of Palu City targeted the evacuation shelters with high mobility, it focused on the immediate effectivity of livelihood recovery. On the other hand, the construction skills training in Sigi Regency, the recovery of *ikan teri* fishing and the processing in communities in Donggala Regency were carried out in view of long-term activities and their sustainability considering the relatively low motility of their living conditions. Table 4-56 illustrates the characteristics of livelihood recovery activities in each pilot project site.



Table 4-56 Characteristics of Livelihood Recovery Activities in Each Pilot Project

Pilot Project	Livelihood Recovery Activity	Characteristics	Lesson Learned
Livelihood Recovery of Women in Balaroa Evacuation Shelter in Palu City	<i>Silar</i> Weaving	The design of activities is that the group processes the materials provided by the Industry Department of Palu City and the department purchases the products. This means that the people can obtain a quick income recovery similar to Cash for Work.	The unit price was set low and it is needed to produce a large size of product to earn income. Therefore, the incentive to produce was weak and the activities are not directly connected to increased income. Since the training on produce and sell products were conducted, activities were developed and continued through the voluntary activities initiated by an experienced person.
	Livelihood Recovery Activities (Culinary Sales)	Sale of food products at food stalls generate a small profit, but can provide daily income. A quick recovery in livelihood can be expected from this activity.	Location condition that can attract many customers is required. Financial support on purchasing materials for activities other than providing equipment is required.
Installation and Operation of Community MSMEs Center and Providing Training for Livelihood Recovery in Sigi Regency	Construction Skills Training	A livelihood recovery can be expected in response to the demand in the construction field, which is increasing due to reconstruction from the disaster.	Most of the experienced and less-experienced persons were able to secure jobs. However, less-experienced persons had lesser number of working days.
	MSME Center	A quick recovery in livelihood can be expected through commercial activities such as sale of foods.	Financial support on purchasing materials for activities other than provision of equipment is required.
Livelihood Restoration of Affected Fishermen and Women Processing <i>Ikan Teri</i> Products in Lero Tatari in Donggala Regency	Fishery and Processing	Recover their livelihood and develop it as long-term sustainable activities. Provide assistance throughout the value chain of <i>ikan teri</i> – from fishing the <i>ikan teri</i> (production) down to its processing and sales.	Due to the delay in the provision of fishing boats, the production was not recovered and only a limited number of women is processing the products.

Source: JICA Study team

### (3) Evaluation of the project by the Ministry of Cooperatives and SMEs on the application of the reference manual

The main activity of this pilot project is the disaster recovery assistance project that the Ministry of Cooperatives and SMEs is implementing not only in Central Sulawesi, but also in other areas. This project is providing business funding to 150 microenterprises.

As a pilot project, the project aimed to verify the content of the reference manual through the actual application of the reference manual developed in 2019 to the Indonesian government's assistance program. As a result, it was highlighted that, among the contents described in the manual, it is essential to share awareness with the local government regarding transparency and other issues, and that it is important to raise awareness among the village government and community leaders.

In addition, in order to properly evaluate the activities, the central government emphasizes the importance of identifying the beneficiaries and monitoring based on the appropriate indicators. However, it is difficult for the local governments to cope given the limited human and financial resources especially after the disaster, and this needs to be taken into consideration during implementation.

# Chapter 5 Formulate the Reference Manual for Implementation of Livelihood and Community Restoration from Disaster

## 5-1 Outline of the Reference Manual

In the project, the experience of restoration and reconstruction in Central Sulawesi as the Pilot Projects was summarized in a manual that disaster-affected local governments in the future can refer to when planning, formulating and implementing reconstruction work. The 2019 version of the reference manual for promoting livelihood recovery and community restoration has been prepared based on the experiences in the implementation of pilot initiatives in 2019.

In December 2019, dissemination seminars for the manual were organized by Bappenas and Central Sulawesi Provincial Bappeda. Bappenas prepared the printed the manual and its pocket book version using its own budget and provided copies to the participants. Two JICA advisory committee members were also invited to the seminars to share their own experiences on reconstruction and restoration after the Great East Japan Earthquake. Information about the two seminars are shown below.

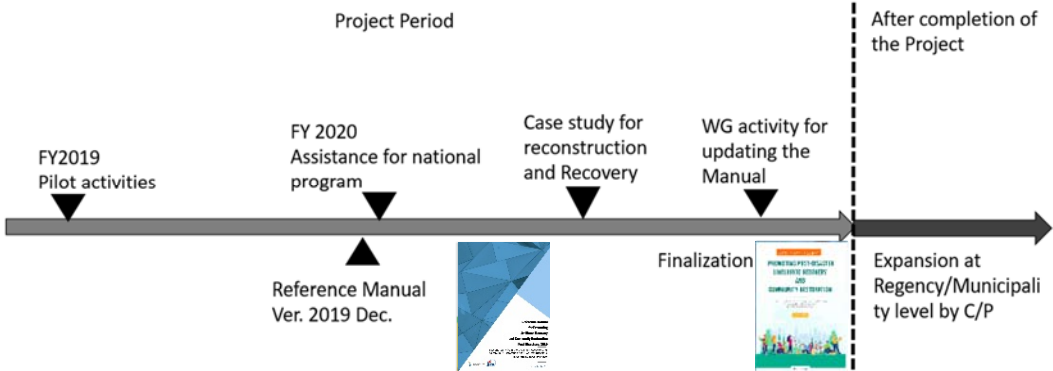
Table 5-1 Information About the Dissemination Seminars

Location	Jakarta, Bappenas meeting room	Palu, Provincial Bappeda meeting room
Number of Participants	56 persons (from 13 institutions)	51 persons (from 24 institutions)
Major Participants	Related ministries and Bappenas	Related provincial departments and three local governments

Source: JICA Study Team

In 2020, the reference manual was finalized and revised throughout implementation of pilot projects, support of national programs, case study of recovery and reconstruction, and working group and counterpart’s activities. The Project held a webinar to disseminate the contents of the reference manual to the stakeholders in January 2021.

After the completion of the Project, C/Ps in Palu City, Sigi Regency, and Donggala Regency are planning to implement the dissemination workshop with the support from Bappeda in Central Sulawesi Province and Bappenas. (See Figure 5-1)



Source: JICA Study Team

Figure 5-1 Timeline for the preparation of the reference manual

5-2 Preparation of Reference Manual Based on Pilot Project Implementation in 2019

The Project compiled the experiences and lessons on the implementation of pilot initiatives in 2019 and came up with “The Reference Manual for Promoting Post-Disaster Livelihood Recovery and Community Restoration”.

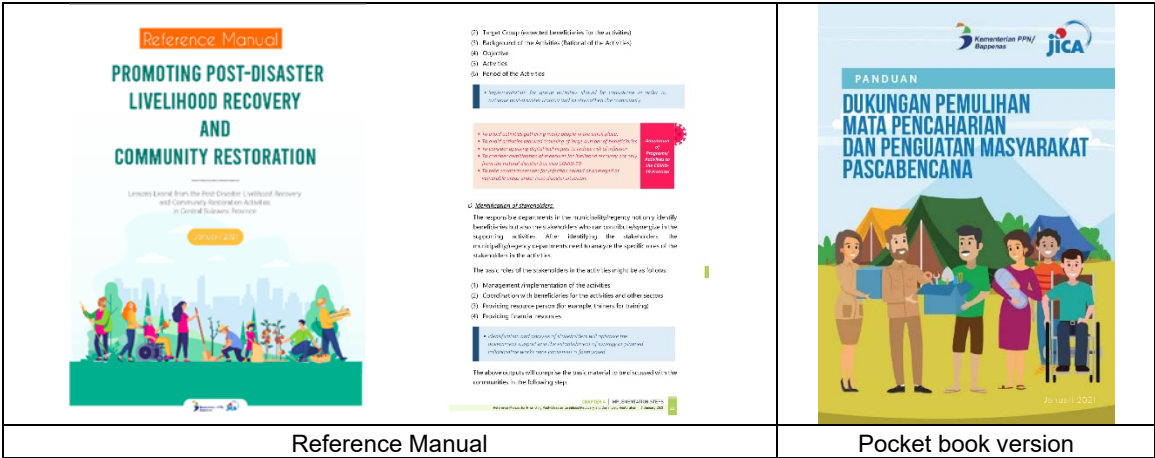
In 2020, the Project updated and finalized the manual that describes the implementation of the pilot activities, assistance for the national program, reconstruction case study survey, and working group activities for updating the reference manual with Indonesian C/Ps.

The manual contains the required activities, procedures, and necessary considerations to restore the livelihoods of disaster-affected people and to promote the formation of communities in response to the situation after the disaster event. The main users and expected usage of the manual are as follows:

- Main users of this manual:
  - Officials in local government, ministries and agencies, donors, NGOs, etc. engaged in activities related to livelihood recovery and community restoration
- Expected usage:
  - This manual is used to accelerate reconstruction assistance in Central Sulawesi.
  - It can be used as reference for post-disaster recovery / reconstruction support in other locations in the future.

The 2019 version of the reference manual for promoting livelihood recovery and community restoration has been prepared based on the experiences in pilot project implementation in 2019. The draft manual was discussed in the Local Task Force meeting, and its structure and layout were created in cooperation with Bappenas, the Ministry of Cooperatives and SMEs. In December 2019, dissemination seminars for the manual were organized at Jakarta and Palu City of Central Sulawesi. The compiled manual printed with financial support from Bappenas was disseminated in the seminar.

In addition, since the manual contains a lot of written descriptions, a pocket book version was prepared to organize its elements in an easy-to-understand manner so that local government officials can easily grasp it (Figure 5-2).



Source: JICA Study Team

Figure 5-2 Designs of the Reference Manual and Its Pocket Book Version

### 5-3 Working Group Activities for the Revision of Reference Manual

The reference manual once drafted in December 2019 was updated to reflect the results of the pilot projects in 2020. To kick off the updating process at the beginning of 2020, it was planned that Central Sulawesi Bappeda would organize a working group to conduct discussion for the activity; and in the government, Bappenas would play the main role in forming an editing team for the updating process with some committee members from post-disaster areas. However, the situation caused by COVID-19 pandemic hindered the implementation of local activities so that central governments and municipalities formed the working group and conducted online workshops to facilitate the revision of the manual.

#### 5-3-1 Launch of Working Group in Central Sulawesi

In June 2020, the governor of Central Sulawesi issued an official letter to organize a working group for updating the reference manual. The working group composed of 18 members was formed as shown in Table 5-2:

Table 5-2 Working Group Members

Organization	Department	Role
Central Sulawesi	Bappeda	Director of Economic Planning I
	Bappeda	Director of Economic Planning II
	Bappeda	Director of Economic Planning III
	Department of Laws	Vice Director of Formulation of Governor's Order by Governor
	Department of Women Empowerment and Child Protection	Director General
	Department of Cooperatives and MSMEs	Director General
Palu City	Bappeda	Director General
	Bappeda	Director of Information
	Department of Industry and Trade	Director General
	Department of Cooperatives and MSMEs	Director General
Sigi Regency	Bappeda	Director General
	Bappeda	Vice Director General
	Department of Cooperatives and MSMEs	Section Chief of Micro, Small-scale Enterprises
Donggala Regency	Bappeda	Director General
	Bappeda	Director of Economy
	Department of Fishery	Director General
	Department of Cooperatives and MSMEs	Director General
	Department of Women Empowerment and Child Protection	Director General

Source: Governor's Decree in Central Sulawesi No.481.3/289/BAPPEDA-G.ST/2020

#### 5-3-2 Outline of collaborated workshop of Working Group

Considering the current and assumed future situation of COVID-19 pandemic, updating method of the reference manual was discussed with related organizations such as Bappenas and the Ministry of Cooperatives and SMEs. The following items were concluded/discussed:

- ① Collaborated workshops with the working group in Central Sulawesi and related organizations of Bappenas, Ministry of Cooperatives and SMEs, Ministry of Industry, and Ministry of Trade in Jakarta will be held through web systems in order to discuss the updating of the reference manual.
- ② In the collaborated workshops, the participants discussed the application of the 2019 reference manual to the Banpem Project of the Ministry of Cooperatives and SMEs, feedback from actual use in Central Sulawesi Province, and revisions based on the results of the reconstruction case study.

Table 5-3 Implementation Schedule for the Revision of Reference Manual

Period	Activity	Content
September to October 2020	Collection of implementation guidelines from related ministries; Comparison of reference manuals from various agencies	<ul style="list-style-type: none"> <li>• Compare the implementation guidelines and reference manual, and note major points for revising the reference manual.</li> <li>• Discuss the comparison with users of the implementation guidelines in Central Sulawesi.</li> </ul>
Nov.25 2020	Holding of the first collaborated workshop	<ul style="list-style-type: none"> <li>• Discuss revised parts and revision policy of the reference manual</li> </ul>
Dec.17 2020	Holding of the second collaborated workshop	<ul style="list-style-type: none"> <li>• Draft of the revised reference manual under consideration.</li> </ul>
Jan.20 2021	Introduction of the revised reference manual	

Source: JICA Study Team

#### 5-4 Contents of the Reference Manual

The reference manual was prepared and updated throughout the Output 4 activities, and its structure is as follows:



**CHAPTER 1 Introduction**

Background • Main Purposes of the Manual • Target Users of the Manual • Basic Principles for Post-Disaster Livelihood Recovery and Community Restoration

**CHAPTER 2 Key Approaches for Post-Disaster Livelihood Recovery and Community Restoration**

Strengthen Mutual Assistance • Ensure the Accountability and Transparency • Facilitate the Community for Continuous Recovery activities • Consider Differences in Stages of Recovery and Reconstruction Based on Conditions/Situations of Affected Communities

**CHAPTER 3 Strategies in Mainstreaming Livelihood Recovery and Community Restoration Support Affected by the Disasters**

Inclusiveness • Sustainability • Self-Reliance

**CHAPTER 4 Implementation Steps of the Activities**

Planning Activities • Selection of Beneficiaries • Implementation of Activities • Monitoring and Evaluation

**CHAPTER 5 Roles of Stakeholders and Coordination Framework**

Coordination framework in the context of recovery and reconstruction • Proposed Coordination framework at Regency / Municipality Level • Roles and responsibility of each stakeholder • Stakeholder Mapping for Coordination of the Activities

**Appendixes**

- (1) Project Profile of Pilot Projects in Municipalities
- (2) Program for DRR Education
- (3) Check Sheets for Implementation of the Activities
- (4) Sample of SOP – Standard Operating Procedure
- (5) Sample of Implemented Program – Case Study
- (6) Implemented Program in Central Sulawesi
- (7) Sample Questionnaire for Baseline Survey

The project compiled outcomes and lessons learned when finalizing the reference manual. Overview of the activities conducted is as follows:

**5-4-1 Items reflected in the reference manual based on pilot project experiences**

The key approaches explained in the manual are presented in Figure 5-3 based on the examination of lessons learned from the pilot project described above, findings that described the implementation of the pilot project, and experiences derived from community consultations, etc. conducted during the implementation of pilot projects.

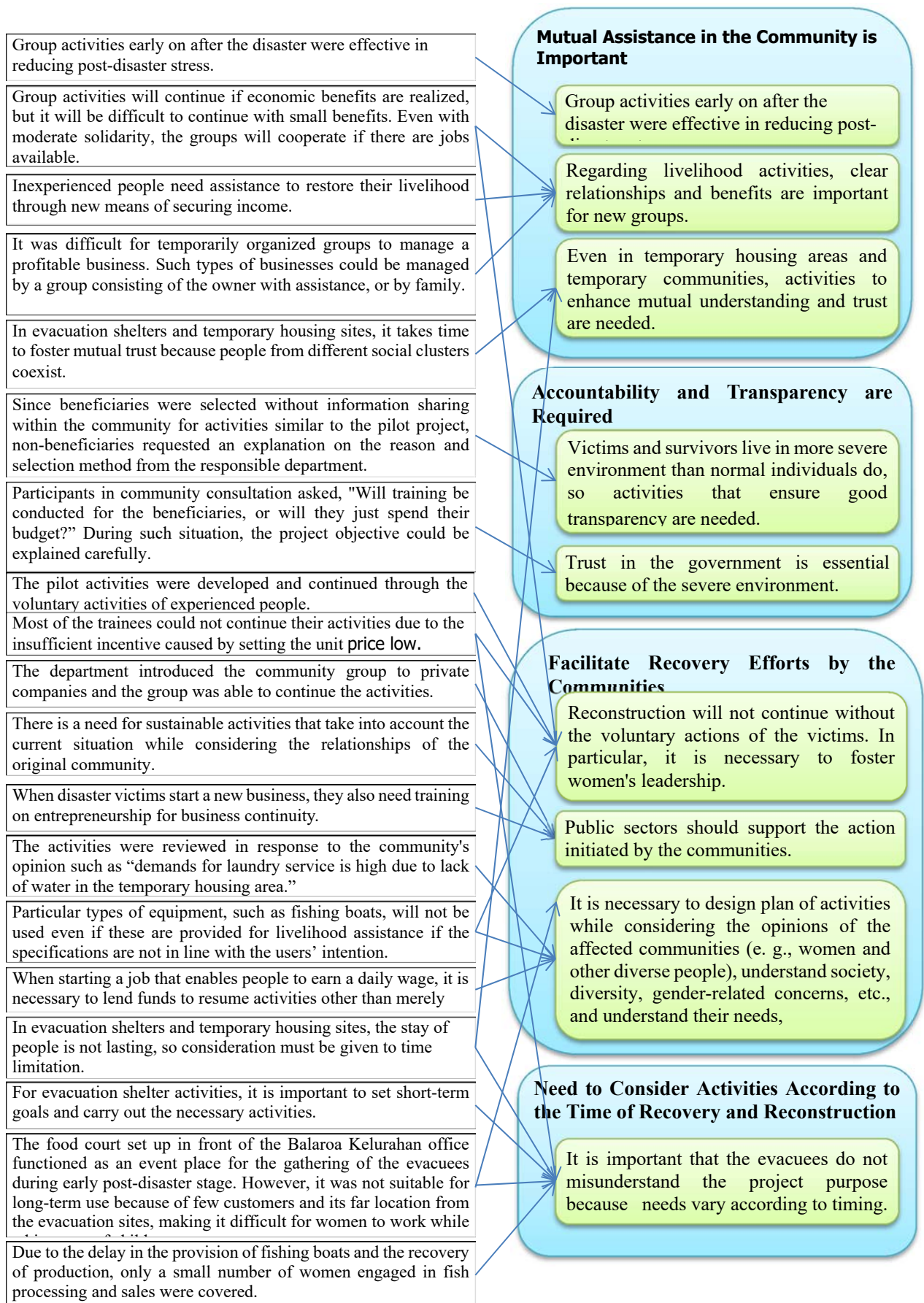
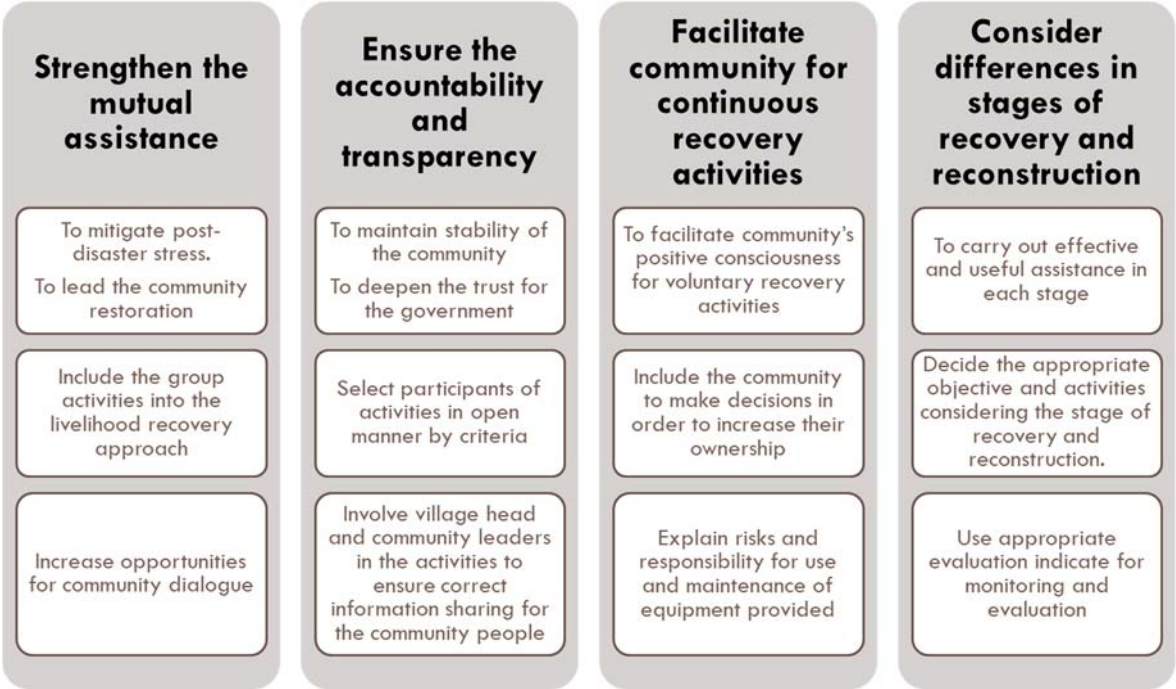


Figure 5-3 Key Points from Lessons Learned and Findings During Pilot Project Implementation

### 5-4-2 Key Approaches in Livelihood Recovery and Community Restoration

Based on the experience in pilot project implementation in 2019, the four items shown in Figure 5-4 are recognized as important key approaches.



Source: JICA Study Team

Figure 5-4 Key Approaches in Livelihood Recovery and Community Restoration

### 5-4-3 Key Points in Mainstreaming Livelihood Recovery and Supporting Community Restoration

When carrying out livelihood recovery and community restoration activities, it is necessary to mainstream the following three items in the activities.

- **Inclusiveness** : In the activities, it is necessary to consider not only gender equality, but also the promotion for the participation in the decision-making process of the youth, the elderly, PWD, people living with HIV, LGBTQ+ , and other socially vulnerable people.
- **Sustainability** : Restoration and reconstruction activities should strengthen the community to be more resilient and sustainable in case of occurrence of future disaster, rather than returning to its pre-disaster situation.
- **Self-Reliance** : It is necessary to support and promote the community so that it can work independently.

## (1) Steps of project implementation

For the implementation of project, there are several steps taken by responsible department in the municipality / regency together with community leaders, beneficiaries and other stakeholders as shown in Table 5-4.

Table 5-4 Project Implementation Steps

Category	Steps
Preparation of Project Design	Pre-examination of project design and its stakeholders Consultation with the community and formulation of project design
Selection of Participants/ Beneficiaries	Setting up of participant selection criteria Selection of project participants/ beneficiaries
Implementation of Project Activities	Orientation meeting Procurement Training Support Other capacity development activities
Monitoring and Evaluation	Monitoring and facilitation Evaluation

Source: JICA Study Team

In each step, some activities and considerations should be mainstreamed according to the key approaches explained above. The approaches and required activities are summarized in Table 5-5 .

Table 5-5 Summary of the Required Activities in Each Step Based on the Key Approaches

		Strengthen mutual assistance	Ensure transparency	Facilitate community participation for continuous recovery activities	Consider differences in stages of recovery and reconstruction
(1) Preparation of Project Design	1) Pre-examination of project design and its stakeholders	Include group activities	Determine the person who will share the information to the community		Make clear decision to determine project purpose
	2) Consultation with community and formulation of the project design	Increase opportunities for dialogue with the community	Create an activity plan in the community involving the village and district heads.	Increase opportunities for dialogue with the community	
(2) Selection of Participant s/ beneficiaries	1) Setting up of Participant Selection Criteria	Consciously incorporate group activities into the selection criteria, such as prioritizing group activities	The selection criteria are set by involving the community, including the village and district heads.	The selection criteria are set by involving the community.	
	2) Selection of project participants/ beneficiaries	-	The selection is carried out with the village and district heads.	The selection is carried out with participation of the community.	-

		Strengthen mutual assistance	Ensure transparency	Facilitate community participation for continuous recovery activities	Consider differences in stages of recovery and reconstruction
(3) Implementation of Project Activities	1) Orientation Meeting	Disseminate the purpose of group activities.	Share information about risks accurately with participants of project activities	Accurately convey the content of support, activities to be performed by the groups themselves, and the risks involved.	-
	2) Procurement	-	-	Identify the equipment that can be provided to the target groups and for the groups to organize the purchase of the equipment themselves.	-
	3) Training Support	Include training to promote group cooperation in activities	-	-	Carry out training according to its purpose
	4) Other Capacity Development Activities	Include training to promote group cooperation in activities		Facilitate the community initiative	
(4) Monitoring and Evaluation	1) Monitoring and Evaluation		Involve village and district heads so that the results of activities will be accurately communicated.	Share monitoring results with groups to raise awareness.	Set indicators according to project purpose.

Source: JICA Study Team

#### 5-4-4 Main Roles of Local Governments and Related Organizations

The local governments and related organizations are the main actors in the recovery of livelihood and community regeneration. The divisions of their roles by activities are summarized in Table 5-6.

Table 5-6 Division of Roles Among Local Governments and Related Organizations

	Central Government	Municipality/Regency (BAPPE DA)	Responsible Departments in the Municipality/Regency	Village Head	Dusun Head/ RT Head / Coordinator(s)	NGOs, Private Partners and Others	Community
<b>(1) Preparation of Project Design</b>							
1) Pre-examination of project design and	Provide information regarding the available support from	Prioritize target activities among	Prioritize target activities and identify stakeholders	Provide information as required	Provide information as required	Cooperate to identify the stakeholder	

	Central Government	Municipality/Regency (BAPPE DA)	Responsible Departments in the Municipality/Regency	Village Head	Dusun Head/ RT Head / Coordinator(s)	NGOs, Private Partners and Others	Community
its stakeholders	the central level	action plans				s (if required)	
2) Consultation with the community and formulation of the project design			Manage the consultation meeting and facilitate the activities	Organize the meeting	Participate in the meeting, share information before/ after the meeting		Participate to prepare the plan of activities
<b>(2) Selection of Participants/Beneficiaries</b>							
1) Set up participant selection criteria		Share the result in the municipality/regency	Prepare the draft of selection criteria, finalize the criteria	Attend the meeting to prepare the criteria	Attend the meeting to prepare the criteria		Participate to prepare the criteria
2) Selection of participants			Manage selection of participants	Manage selection of participants, make the announcement	Data collection, support in making the announcement		Organize the group, submit application
<b>(3) Implementation of Project Activities</b>							
1) Orientation meeting			Organize the meeting	Attend the meeting	Attend the meeting		Participate in the meeting
2) Procurement	Provide equipment / facilities if the project is agreed on	Arrange the project budget	Confirm the specification and procure the equipment, sign the MOU for the usage of the equipment	Support in preparing MOU for the usage of equipment			Prepare the list of equipment required, sign the MOU for the usage of the equipment
Training Support	Provide training if the project is agreed on	Arrange the project budget	Organize the training courses	Support in organizing the training	Support in organizing the training	Resource for the Trainer	Participate voluntarily in the training
Other capacity development activities	Provide support if the project is agreed	Arrange project budget	Organize the activities	Support the activities	Support the activities, if necessary	Resource to support the activities	Carry out the activities
<b>(4) Monitoring and Evaluation</b>							
1) Monitoring and Evaluation	Collect the results of monitoring as reference	Coordinate the meeting to share the results	Conduct the monitoring and evaluation process	Conduct the monitoring and evaluation process	Support in the collection of data		Participate in the monitoring and evaluation process

Source: JICA Study Team



#### 5-4-5 Applying the reference manual to a National Program

In 2020, the Project utilized the reference manual to implement the Banpem Program financed by the Government of Indonesia. Throughout the implementation of the program, the Project confirmed the validity and points to be updated and to be considered. The Project updated the manual based on the feedback mentioned in the previous section and organized workshops described in IV-3-4.

#### 5-5 Implementation of Recovery and Reconstruction Case Studies

The main objective of the reference manual is to compile the experiences on recovery and reconstruction from Central Sulawesi earthquake and tsunami disasters, and to be the reference in the future on project design and implementation by regency and municipality level officials in disaster-affected areas.

The pilot projects covered in the Project were designed under limited conditions. For example, the Study did not target the activities in the emergency response phase carried out within three months from the occurrence of disaster, and the activities that gave benefit at the individual level such as Cash for Work. Additionally, the Study compiled the case studies of recovery and reconstruction in Central Sulawesi Province implemented by government agencies and development partners with various types of emergency response and reconstruction projects. The results supplemented the contents of the reference manual so that Indonesian government officials can effectively utilize it.

##### (1) Necessity of compiling recovery and reconstruction case studies

Recovery and reconstruction case study supplements the cases implemented by other agencies that respond to the issues in disaster-affected areas in Central Sulawesi below from aftermath of the earthquake and tsunami to recovery and reconstruction phase. The cases will facilitate government officials to formulate and implement appropriate projects. In addition, the case study will deepen the understanding of the content of the reference manual by introducing cases that actually utilized approaches described in it.

##### (2) Elaboration of the activities aftermath the disaster when conditions are chaotic

Except for volcanic disaster and frequent flooding in some areas, regency and municipalities underwent unprecedented large-scale disaster for the first time and never had experienced recovery and reconstruction activities. Therefore, government officials did not have experience and expertise on livelihood restoration projects. The case study that summarizes the approaches on livelihood restoration and community regeneration is expected to be effective source of information for government officials in plan activities.

##### (3) Collaboration of related agencies for livelihood restoration

During the early phase of the Study (i.e., early phase of recovery and reconstruction), regency and municipality counterpart officials commented that they had no clue as to how would they be able to coordinate with other agencies to implement livelihood restoration activities. Therefore, the materials that exemplify the actual collaboration of multiple agencies are effective for such needs.

### 5-5-1 Objectives of Compiling Recovery and Reconstruction Experiences in a Case Study

The objectives of studying and compiling recovery and reconstruction experiences in a case study are shown below.

#### (1) Compile the cases that endorse the effectiveness of the key approach described in the reference manual

The Study promotes key approaches based on the experience of pilot activities (i. e., strengthen mutual assistance, ensure accountability and transparency, facilitate the community participation for continuous recovery and reconstruction, considering the needs and priority in each phase of post-disaster recovery, and inclusiveness). The case study compiled the livelihood recovery activities that contribute to community restoration and comply with the key approaches to deepen the user's understanding on the contents of the reference manual.

#### (2) Compile the various types of assistance for users of the manual to develop ideas in procuring for their own assistance

The reference manual is based on the experience of pilot projects implemented during the Study, but these were limited to those targeting certain groups of beneficiaries and those whose main implementers were government agencies. However, there were various forms of support that met the needs of affected people for livelihood recovery projects implemented by local governments, NGOs, donors, and other partners in the aftermath of disaster, specifically during the emergency response phase (e.g., farmland development through Cash for Work), as well as projects targeting individuals (e.g., vocational training, microfinance, provision of kiosks) and the case of the private sector supporting the restoration of livelihoods.

This case study summarizes the activities related to livelihood recovery and community restoration, from emergency response to recovery and reconstruction, which have been carried out by relevant organizations and donors. These were compiled so that the intended users can refer to them when they are considering their own activity plans. Furthermore, to promote the use of the reference manual of the Government of Indonesia, the sector of support, method of support, content of support, achievements and factors, scope of activities, and points to consider are described so that the users can easily obtain ideas for their activities.

### 5-5-2 Methodology and Procedure for the Survey of Recovery and Reconstruction Projects

#### (1) Stakeholder analysis

Government agencies and development partners had formulated a cluster framework as inter-agency and inter-donor coordination mechanism immediately after the earthquake and tsunami during the emergency response phase in Central Sulawesi Province. To nominate and analyze the stakeholders before the commencement of the Project, the donor data were extracted from the 4W (Who is doing what, when, and where) Excel format that each cluster filled up to describe the activities mainly implemented during the emergency response phase. In addition, the Project inquired at the Central

Sulawesi Provincial Bappeda (who is the coordinating agency) to nominate the organizations and agencies whose activities satisfy the criteria of the manual’s key approach.

**(2) Preparation of the questionnaire**

The Project developed the questionnaire that describes sector of the assistance, objectives, detailed activities performed, achievement and its contributing factors, lessons learned and issues. Moreover, the Project strived to formulate the questionnaire in order to clarify the compatibility of its four key approaches (①strengthen mutual assistance, ②ensure accountability and transparency, ③facilitate community participation for continuous recovery and ④reconstruction and considering the needs and priority in each phase of reconstruction) and inclusiveness that should be mainstreamed by setting questions related to the approaches. Depending on the contents of the questionnaires, JICA Study Team conducted follow-up interviews.

Considering the number of projects, human resource, and institutional arrangements involved, the project prepared a simple questionnaire for the government agencies, and detailed questionnaire for donor agencies or organizations. Based on the content of questionnaire, the project obtained the information requirement by interviewing the selected agencies and organizations. Table 5-7 illustrates the items in the questionnaire. .

**Table 5-7 Content of the Questionnaire**

Components	Items to be covered in the questionnaire
Sector of assistance	Agriculture, Cooperatives, Women Empowerment, MSMEs (Designed as easy reference for the department-level officials)
Type of assistance	Cash transfer, Provision of equipment, Training, Team building, Provision of gathering place (construction), Cash for Work, etc.
Applicable conditions	Proper timing (Emergency response, Recovery and reconstruction phase) Place for implementation, Individual, Group, Characteristics of target group
Outline of the activity	Objective, Content of the activities, Applicability to key approaches, lessons learned, issues, etc.

Source: JICA Study Team

**(3) Distribution of questionnaires to target agencies**

For the distribution of the questionnaires to the target agencies, the Project consulted with Bappeda. The questionnaires were distributed to stakeholders via WhatsApp groups of the clusters being used for information sharing, and the to the local government agencies that implement the recovery and reconstruction activities. Central Sulawesi Bappeda requested the filling up of the questionnaires on July 15, 2020.

The Project distributed soft copy of the questionnaires to the target agencies for them to directly fill up, and an online version was prepared also utilizing Survey Monkey® to increase the rate of responses.

The Project utilized cluster framework to distribute the questionnaires. Hence, the questionnaires were distributed to the agencies that implement activities that satisfy the criteria of the survey. This method of distribution cannot fully collect the details of each activity, so the Project screened the

projects after collecting the questionnaires. The Project distributed the questionnaires to government agencies and development partners listed below.

## 1) Government agencies (Province/Regency/Municipality level)

The Project distributed the questionnaires to the following agencies in Central Sulawesi Province, Palu City, Sigi Regency, and Donggala Regency. Table 5-8 shows the list of these government agencies.

Table 5-8 Questionnaire Distribution Among Government Agencies

Department Name	Province	Palu	Sigi	Donggala
Crops and Agriculture Dept.	✓	✓	✓	✓
Food Security and Fisheries Dept.	✓	N/A	✓	✓
Livestock and Veterinary Dept.	N/A	N/A	✓	N/A
Cooperatives and MSMEs Dept.	✓	✓	✓	✓
Industry and Trade Dept.	✓	✓	✓	✓
Social Affairs Dept.	✓	✓	✓	✓
Villages and Communities Empowerment Dept.	✓	N/A	✓	✓
Women Empowerment and Child Protection Dept.	✓	✓	✓	✓

Source: JICA Study Team

## 2) Development partners

The Project distributed to 60 development partners through regional cluster WhatsApp group members of Food and Livelihood (FLSH) Shelter, Women Empowerment and Disability. JICA Study Team directly distributed questionnaires to Japanese NGOs.

Table 5-9 Questionnaire Distribution Among Development Partners

(1) International Organizations	
<ul style="list-style-type: none"> <li>• United Nations Population Fund (UNFPA)</li> <li>• Food and Agriculture Organization (FAO)</li> <li>• United Nations Development Programme (UNDP)</li> <li>• International Labour Organization (ILO)</li> <li>• United Nations World Food Programme (WFP)</li> </ul>	<ul style="list-style-type: none"> <li>• United Nations International Children's Fund (UNICEF)</li> <li>• United Nations Entity for Gender Equality and the Empowerment of Women (UN Women)</li> </ul>
INGOs	
<ul style="list-style-type: none"> <li>• International Federation of Red Cross and Red Crescent Societies (IFRC)</li> <li>• CARE Indonesia</li> <li>• Yayasan Plan International Indonesia</li> <li>• Wahana Visi Indonesia (WVI) World Vision</li> <li>• Mercy Corps Indonesia (MCI)</li> <li>• JMK-Oxfam</li> <li>• Save The Children/Yayasan Sayangi Tunas Cilik (YSTC)</li> <li>• Islamic Relief Worldwide</li> <li>• Habitat for Humanity</li> <li>• Muslim Care</li> <li>• SOS Children Village</li> </ul>	<ul style="list-style-type: none"> <li>• Caritas Germany</li> <li>• Caritas Swiss (Solidar Suisse)</li> <li>• Adventist Development and Relief Agency (ADRA)</li> <li>• Inanta Church World Service (CWS)</li> <li>• Catholic Relief Services (CRS)</li> <li>• ZOA Netherlands</li> <li>• Helpage International</li> <li>• Muslim AID</li> <li>• Christian Aid</li> <li>• Shanti Volunteer Association</li> <li>• Peace Wings</li> <li>• PARC Interpeoples' Cooperation (PARCIC)</li> </ul>

LNGOs	
<ul style="list-style-type: none"> <li>• Arbiter Samariter Bund (ASB) Indonesia</li> <li>• MDMC Muhammadiyah</li> <li>• MDS Indonesia</li> <li>• Palang Merah Indonesia (PMI)</li> <li>• Pos Keadilan Peduli Ummat Human Initiative (PKPU)</li> <li>• Aksi Cepat Tanggap (ACT)</li> <li>• Dompot Dhuafa</li> <li>• Harian Kompas</li> <li>• Harian Radar Sulteng</li> <li>• Yakkum Emergency Unit (YEU)</li> <li>• Yayasan Bumi Tangguh</li> <li>• Fondasi Hidup Indonesia</li> <li>• Caritas PSE Manado</li> <li>• IBU Foundation</li> </ul>	<ul style="list-style-type: none"> <li>• Yayasan Sheep Indonesia</li> <li>• ERCB</li> <li>• Yayasan Menara Agung Pengharapan Internasional</li> <li>• Yayasan Pusaka Indonesia (YPI)</li> <li>• Pelkesi Indonesia</li> <li>• Karsa Institute</li> <li>• Libu Perempuan</li> <li>• Sikola Mombine</li> <li>• KPKPST</li> <li>• SKP-HAM</li> <li>• Pena Bulu</li> <li>• Rebana</li> <li>• Yayasan Panorama Alam Lestari Kabupaten Poso (YPAL)</li> <li>• Yayasan Inanta</li> <li>• Sejenakhening.com</li> </ul>

Source: JICA Study Team

#### (4) Status of collecting the questionnaires

By the end of August 2020, a total of 23 government agencies at region and regency/municipality levels, and 30 development partners replied to the above-mentioned survey. Since there were cases when the person in charge had left the project and cannot be tracked, and Indonesian NGOs in partnership with the government or international NGO whose projects were submitted jointly, it was not expected that the Project would receive all the expected responses.

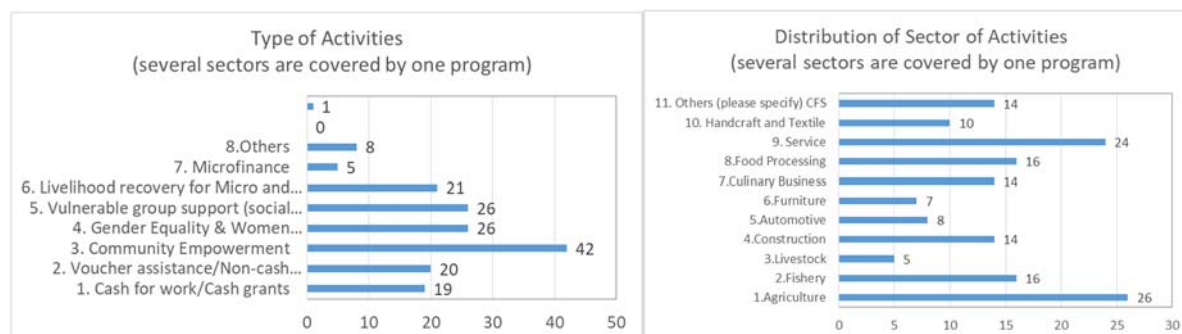


Figure 5-5 Responses from NGOs (Extracted)

#### (5) Analysis of collected information

Based on questionnaire and interview results from target agencies, the Project analyzed and compiled the projects that will be included in the reference manual. When analyzing the results, the Project considered the following points:

- Confirm the checked items on the questionnaire so that the practices complying with the reference manual can be cited as references of the actual practices described in the related part of the reference manual.
- List the projects implemented by government agencies and development partners in the Appendix of the reference manual so that government officials can utilize it as future reference for project formulation.

- Select six projects that especially adapt to the key approaches and conduct comprehensive activities, and compile the summary sheets as Appendix in order to introduce various reconstruction projects.
- During working group meeting, introduce and share the items that are mentioned as challenges and lessons learned in the questionnaire. For the items especially pointed out by several agencies, the Project selected them as discussion topics during working group meetings.

## (6) Result of the case study survey

### 1) Adaptation to key approaches

The study confirmed the agreement between the activities of each organization and the four key approaches (① Strengthen mutual assistance, ② Ensure the Accountability and Transparency, ③ Facilitate Community for continuous recovery and reconstruction, ④ Considering the needs and priorities in each phase of post-disaster recovery) and inclusiveness to be mainstreamed. Table 5-10 indicates the activities of aid agencies that have larger number of matches with the key approach. The direct and causal relationships between the description and results related to the key approaches were not obtained from these survey results.

Table 5-10 Activities Adapted to the Four Key Approaches Based on Results of Case Study

1. Strengthen Mutual Assistance	
1-1	Promoted interaction among beneficiaries/community like conducting group-based activities and increasing opportunity for gathering and promotion of mutual assistance among the beneficiaries and region (Interaction of the business between coastal Area in Donggala Regency and mountainous areas in Sigi Regencies)
1-2	Adopt activity that could contribute to mitigate post-disaster stress/trauma (ex. recreation activities, opportunity to interact with other people, etc.) Psychosocial care service during the emergency response phase.
1-3	Any other practice/policy applied to strengthen mutual assistance among people and between people and government. Joint food and beverage support activities by disaster victims to provide meals and promote communication, as well as spillover activities to benefit the target communities.
2. Ensure Accountability and Transparency	
2-1	Defined selection criteria of beneficiary. Decisions making through open discussions between the village administration and residents.
2-2	Opened to the public about selection criteria of beneficiary, selection method and its result. In addition to disclosing information to the community, feedback was given on the selection process. In many cases, socially vulnerable people are selected as beneficiaries (e.g., female-headed households and LGBTQ+ people).
2-3	Any other practice/policy applied to ensure accountability and transparency. Information on beneficiary households should be shared among aid organizations to maintain fairness in the provision of assistance, so that households that have already received assistance would not receive duplicate assistance from other organizations.
3. Facilitate The Community for Continuous Recovery and Reconstruction	
3-1	Active involvement of community in project formulation (ex. participatory needs assessment, community dialogue for designing project), implementation (ex. selection of beneficiary, selection/procurement of equipment provided), monitoring & evaluation. Foster independence and ownership of activities through the selection of support items, proposal of support content and strategies, and development of sustainable activity plans.



3-2	Set up self-supporting activity/contribution of beneficiary such as labor force, cost sharing, etc. for the purpose of encouraging self-reliance aiming their continuous recovery
3-3	Any other practice/policy applied to facilitate the community for continuous recovery and construction. Scholarships for children and students, support for continuous education through the establishment of educational service facilities, the creation of a local system to respond to disasters with a unique local system and the exercise of initiative, etc.
<b>4. Considering The Needs and Priority in Each Phase of Post-Disasters Recovery</b>	
4-1	Determine the activities and policies that meet the demands and priorities of the post-disaster recovery process through consultation with communities and leaders. The emergency response phase addresses beneficiaries' needs and urgent situations, while the recovery phase supports disaster risk reduction activities and primary industry sectors such as agriculture.
<b>5. Ensuring the inclusiveness</b>	
5-1	Efforts to include socially vulnerable groups (women, elderly, children, PwDs, female-headed households etc.) and residents from diverse backgrounds in the formation of activities (planning, etc.)
5-b	Special measures and support to promote the participation of vulnerable groups (women, elderly, children, PwDs female-headed of households, etc.) and diverse people (diversity taking into account ethnicity, religion, etc.) in the implementation of support activities (including monitoring) promoting the participation of elderly people and PwDs in disaster drills, etc.
5-c	Promotion of gender-responsive strategies and approaches

Source: JICA Study Team

Also, as detailed activities adopting the key approaches, governments, donors and NGOs made sure that activities that support recovery such as the following were implemented.

#### ① Strengthen Mutual Assistance

- Promoting to strengthen mutual assistance through interactive assistance in communities and target areas
- Strengthening mutual assistance through activities that include gathering such as focus group discussions and project implementation by groups, and processes such as building social relationships in the community, agreeing on activities, and selecting local committees.
- The program was implemented by applying to the mechanism that can be applicable to the target community and can involve the people in the community so that many stakeholders can be benefit from the program.
- Mutual assistance was strengthened through sharing business experience and business knowledge between coastal areas of Donggala and mountainous area in Sigi.
- For strong mutual assistance, beneficiaries formed groups as they like, implementing their project, and the leaders take responsibility on the group activities.
- Cooking activities of beneficiaries did not only provide meals but also became communication opportunity to ensure that right information under the situation with many uncertain information spilled over after the disaster.
- As an approach for strengthening mutual assistance, some activities were implemented to recover from psychosocial stress and trauma. During emergency response phase, for example, psychosocial care service had been provided.

- Rehabilitation and reconstruction phase was promoted by setting up Community Disaster Management Group (KMPB) and developed horticulture gardens as an alternative livelihood for the community with support of village leaders.

## ② Ensure Accountability and Transparency

- Establishment of selection criteria and beneficiary selection (including vulnerable people) were conducted through process of discussion with local governments and leaders. These led to selection process being open to the community, carrying out feedback (among beneficiaries, communities and government officials), evaluation and audit, ensuring accountability and transparency.
- Beneficiaries were selected to include women from socio-economic vulnerable households and LGBTQ+. From the perspective of ensuring transparency in the selection, names of selected persons were posted in the village government and the program budget was set in the village to inform both government agencies and beneficiaries.
- As part of the selection process, the criteria for selecting beneficiaries were discussed during the initial meeting and in the building of relationships with stakeholders, and were set under the mechanism of open discussion with the village government and residents.
- Detailed selection criteria were prepared and announced to all participants. Also, socialization was conducted in the supported areas, and information were shared by the local government with all participants.
- Households with nutritional problems due to issue on the fairness of receiving support were targeted, and the information were shared on families who have already received support from other NGOs.
- To ensure transparency through public relations activities, boxes were set up for receiving proposals, suggestions, etc..
- Field survey mapped the targeted people and issues, while feedback on complaints and good practices were provided through direct interaction with project staff and village officials (village leaders, etc.).

## ③ Facilitate Community Participation for Continuous Recovery and Reconstruction

- Since the center of the project is community beneficiaries themselves selected support items, and proposed the content and the strategies and prepared a sustainable activity plan. These activities enhanced initiatives and ownership then drive sustainable reconstruction forward.
- Supported children and students through provision of scholarship grants, and facilities were established to provide minimum level of educational service.
- The program promoted the proactive participation of beneficiaries in the implementation of activities. Beneficiaries are encouraged to apply to the project with their needs, not only for equipment and raw materials, but also for skills they would like to acquire, which will be used to determine the project activities and to conduct monitoring. (For example, agricultural

methods based on local wisdom and customs, selection of crops and agricultural materials and equipment suitable for climatic conditions, etc.)

- Weighing heavily on technical assistance rather than the provision of materials and funds can foster initiative and positive attitude of the beneficiaries, and make project implementation sustainable with good results. Construction-related projects also had involvement of local suppliers and construction-related stakeholders in the community and local governments on such matters as housing design, location, and sanitary facilities, and the beneficiaries also participated during the implementation of project. The project prioritized procurement of resources, raw materials, labor and so on from local suppliers, and Disaster Management Community Post (PMPB) got involved in planning, implementation, and conducting monitoring and evaluation programs. The own system was created to respond to disasters in the community. This led to the demonstration of the initiatives.

#### ④ Considering the Needs and Priorities in Each Phase of Post-Disaster Recovery

- Prioritized support items were determined in consultation with communities and leaders according to the reconstruction situation in the disaster area.
- Emergency Response focused on response to needs and urgent situations, and considered status of vulnerable communities after the disaster. During reconstruction, activities were implemented for disaster preparedness and DRR. Reconstruction period demanded primary sector such as agriculture be prioritized. Therefore, there was no need for many farmers to change their work and could recover their level of economic gradually.
- Culinary business transformed from Public Kitchen to commercial culinary business according to transition of rehabilitation and reconstruction.

#### ⑤ Inclusiveness

- Considered selection and participation so that various beneficiaries and vulnerable affected people (elderly, women, children, persons with disabilities, and female head of households) can receive benefits.
- Activity groups were formed according to consideration for ethnic diversity of vulnerable groups and their religion.
- To maintain inclusive participation, masks and medicines were distributed to the elderly, persons with disabilities, and people in economic poverty to prevent group infection of COVID-19. As the result, safe activities promoted beneficiaries' participation.
- Involvement and activity of vulnerable people were prioritized in terms of planning and implementation, and monitoring. (Some projects had high rate of women's participation, i.e., 60% participation.)
- Activities took care of socially vulnerable people.

- For disaster risk reduction and disaster preparedness: During the socialization process, elderly groups, persons with disabilities and child representatives got involved in the disaster risk reduction and disaster response simulations.
- Project related to food security and culinary business did not only aim for the participation of vulnerable people, but also implemented activities to meet the food and nutrition needs of all affected households.

## 2) Trend and content of support per sector

### ① Tendency and Content of Government Activities in Each Sector (Province, Municipality, and Regency)

Among supporting activities for recovery by government organizations, the most number was 23 in the agriculture sector; fisheries followed with 12 activities; food-processing had 8 activities; and culinary business had 6 activities. Mainstreaming sectors of primary industry and the surrounding related activities in the affected areas were supported. Table 5-11 shows the content of government activities in each sector.

Table 5-11 Contents of Activities in Each Sector by Governments

①-1 Agriculture
<u>Rehabilitation/Reconstruction</u> : Provision of fund, distribution of materials, setting up of agricultural facilities and technical assistance of culture for various types of crops are carried out. In detail, they provided NPK fertilizer to support production, funds as stimulant of business and a drying floor for improving the quality of products and reducing loss of crops. Technical assistance was also provided as training for production management for crops and horticulture (nuts and tubers), post-harvest treatment, processing, marketing and so on.
①-2 Fishery
<u>Rehabilitation/Reconstruction</u> : Fishery sector is the main industry in the affected areas, there are many projects implemented following the ones for agriculture and especially there are many cases of provision of equipment grant and cash gran. The details are the provision of such as catfish seed aid, fish feed and medicines, traditional boats, engines and fishery gears. There were projects related to construction or rehabilitation of fishponds and operation facilities and arrangement of water resource. Projects providing cash grants as stimulant funds for restarting the business after the disaster. Technical assistance activities held training sessions for the production skill of processed marine products and training for developing the human resources capacity for restarting businesses of cooperatives and SMEs after the disaster.
①-3 Livestock
<u>Rehabilitation/Reconstruction</u> : The supports provided aiming for the improvement of the livelihood in remote community residences, such as support cash grants as a stimulant to restart the business and construction of broiler chicken cage and infrastructure facilities. Also supporting activities of cash grants implemented with training sessions for bookkeeping and formulation of business plan.
①-4 Construction
<u>Rehabilitation/Reconstruction</u> : As reconstruction of important facilities to improve economics and social environment, public markets damaged by the disaster were rehabilitated. And as one of activities aiming for poverty reduction and recovery of the economic standard in rural areas, construction of facilities has been implemented.

<b>①-5 Automotive</b>
<u>Rehabilitation/Reconstruction</u> : Main activities are the provision of funds and materials to restore the business of beneficiaries. Also, training sessions for human resources were implemented for the aim of recovery and reconstruction for SMEs in the affected areas.
<b>①-6 Furniture</b>
<u>Rehabilitation/Reconstruction</u> : As well as other sectors, materials were provided for restarting the business of beneficiaries.
<b>①-7 Culinary Business</b>
<u>Rehabilitation/Reconstruction</u> : As well as other sectors under fair management, funds and materials were provided for restarting the business of beneficiaries. Also, the Central Sulawesi government provided training for food processing.
<b>①-8 Food Processing</b>
<u>Rehabilitation/Reconstruction</u> : Technical support training sessions for the improvement of production quantity and quality and provision of funds as stimulants to restart the business of beneficiaries.
<b>①-9 Services</b>
<u>Emergency Response</u> : There were many cross-sectoral activities and activities in the emergency response period. Additionally, dynamics to resolve the social vulnerability provided supports both in terms of mental care after the disaster and in terms of human resource development.
<b>①-10 Handcrafts</b>
<u>Rehabilitation/Reconstruction</u> : Technical training to sew traditional folk costumes were implemented. In addition to the sewing industry, various training such as music instruments, bamboo craft, and natural stone processing were provided. Business support was provided for the purpose of business recovery for SMEs engaged in the textile industry.
<b>①-11 Textiles</b>
<u>Rehabilitation/Reconstruction</u> : Training in sewing techniques for traditional folk costumes. Support for SMEs to recover their business.
<b>①-12 Others</b>
<u>Rehabilitation/Reconstruction</u> : Central Sulawesi has increased the capacity of the community to be more prepared to future disaster and disaster risk and post-disaster vulnerabilities.

Source: JICA Study Team

## ② Trends and content of activities in Each Sector by NGOs and Donor Agencies

During the emergency response, aid agencies (such as NGOs) implemented cross-sectoral technical support based on the preparation of early recovery strategies by the National Disaster Management Authority (BNPB) and provided materials and equipment in order to have quick results. In rehabilitation and reconstruction period, there is the trend to support sustainable recovery by providing technical assistance, cash support, and provision of equipment. Mental care activities are implemented in the long run from emergency response to rehabilitation and reconstruction.

SMEs support project implemented conditional cash grants (CCT) and business skills trainings as multi-cross sectoral activities in rehabilitation and reconstruction. Table 5-12 presents content of support in each sector by NGOs and donor agencies.

Table 5-12 Content of Support in Each Sector by NGOs and Donor Agencies

<b>②-1 Agriculture</b>
<p><u>Emergency Response</u> : Provision of seeds (Paprika, tomato, and sweet corn), mulch and NPK fertilizer, and technical assistance of cultivation were implemented as livelihood recovery activities for horticultural farmers. From Emergency Response to the transition period, support activities for the elderly and persons with disabilities such as food and health support and home care were carried out.</p>
<p><u>Rehabilitation/Reconstruction</u> : While the sector provided agricultural equipment and inputs (fruits seeds, greenhouse facilities, cultivating tools), funds for agriculture and arranged agricultural land, technical assistance were also carried out. These were agricultural training in cross-sectoral programs such as improvement of food security and livelihood recovery support, as well as support and training for specific issues such as maize and cocoa beans cultivation. Also, sustainable agricultural training and food processing training were conducted for women as support for home gardens (organic cultivation). In addition, activities such as cultivation training and sales marketing training were also carried out to improve the income of SMEs.</p>
<b>②-2 Animal husbandry</b>
<p><u>Rehabilitation/Reconstruction</u>: Technical assistance activities carried out training sessions at various levels such as livestock technical training in cross-sectoral programs such as food security improvement and livestock recovery support, training for livestock hygiene workers, livestock breeding (pigs and cattle) management for SMEs, and sales marketing, finance management training. As supply support, piglets and cows were provided free of charge.</p>
<b>②-3 Automotive</b>
<p><u>Rehabilitation/Reconstruction</u> : SME support projects provided conditional cash grant support and business training. Formulation of business planning, conditional funds grant, vocational technical training and counseling support were also implemented.</p>
<b>②-4 Construction</b>
<p><u>Emergency Response</u>: Due to the emergency needs, supplies and equipment related to temporary shelters (emergency shelter supplies, sanitary supplies) were distributed and debris was removed. In addition, the mosque temple was built based on the community needs. For the long run over both Emergency Response and Rehabilitation and Reconstruction, clean water supply activities and construction of sanitary facilities, school construction, vocational technical trainings, capacity building for disaster risk reduction and cash for work (activities to hire the affected people for reconstruction projects and lead to economic recovery in the disaster areas and support for the self-reliance of the affected people) were implemented.</p>
<p><u>Rehabilitation/Reconstruction</u> : Permanent shelters and integrated community shelters were constructed.</p>
<b>②-5 Crafts &amp; Textiles</b>
<p>Conditional cash grants and technical business training sessions in Micro Enterprises Project are cross-sectoral reconstruction support activities. And the activities of Crafts &amp; Textiles were implemented as components of the project.</p>
<p><u>Rehabilitation/Reconstruction</u> : As off-farm income activities of the affected farmers, the support of Crafts &amp; Textiles sector were implemented. In addition, as well as other sectors provision of funds to restart the activities of the beneficiaries and technical trainings for Crafts &amp; Textiles were implemented.</p>
<b>②-6 Culinary Business</b>
<p><u>Emergency Response</u> : Provision of materials and equipment such as cooking equipment and food materials was conducted.</p>
<p><u>Rehabilitation/Reconstruction</u> : Participatory process selected the beneficiaries and formed inclusive group and Family business, small scale business trainings, online marketing trainings were implemented. In addition, the support for recovery of culinary business were implemented such as formulation of business plan and provision of funds, conditional cash grants.</p>
<b>②-7 Fishery</b>
<p>Fishery sector which was affected by considerable large-scale damage is one of the mainstreaming of livelihoods in the areas. Therefore as early as possible to recover the sector, a large amount of equipment and materials were provided</p>



<u>Emergency Response</u> : Fishing equipment (fishing net, rope, buoys, cool box for cold chain and ballast) was provided.
<u>Rehabilitation/Reconstruction</u> : as well as the activities of Emergency Response, the livelihood Fishery program and Micro Enterprises Project provided fishery gear, engines and boats, and supported fishing technique. In addition, the funds were provided to the activities.
<b>②-8 Food processing</b>
<u>Rehabilitation/Reconstruction</u> : In prospect of long run business continuity, during the Rehabilitation/Reconstruction period training for business management, marketing and financial management were implemented. Also, as well as in other sectors, the provision of funds and food processing technical training were implemented to restart the business of beneficiaries, and some sanitary activities to wash hands as a measurement against COVID-19 through food processing technical training are implemented.
<b>②-9 Furniture</b>
<u>Rehabilitation/Reconstruction</u> : Training for bricks making and making furniture (bamboo & rattan) were conducted for the younger generation. Also conditional cash grants and business training (creation of business plan, project evaluation) were implemented
<b>②-10 Livelihood recovery for Micro and Small Businesses</b>
<u>Rehabilitation/Reconstruction</u> : As well as supports for SMEs in other sectors, funds and training were provided according to the business type of each company. The beneficiaries were selected inclusively including the disabled, elders and women.
<b>②-11 Services</b>
There were some activities which were duplicated with other sectors, during the Emergency Response and Rehabilitation/Reconstruction when various activities were implemented.
<u>Emergency Response</u> : Provision of temporary shelter and distribution of emergency shelter kits and hygiene kits were conducted. In addition, provision of proper clean water and sanitation facilities and capacity building for disaster risk reduction were implemented.
<u>Rehabilitation/Reconstruction</u> : Creation of business plan, marketing and promotion, finance training and provision of conditional cash grant were carried out.
<b>②-12 Health</b>
<u>Rehabilitation/Reconstruction</u> : The sector implemented the activities such as the provision of mobile clinic activity, child and maternal health promotion activity and improvement of child nutrition, promotion of organic agriculture and psychosocial mental care activities for children.
<b>②-13 Disaster preparedness</b>
<u>Rehabilitation/Reconstruction</u> : Strengthening the community's disaster preparedness capacity and reinforcement of local capabilities in humanitarian action were implemented.
<b>②-14 Others</b>
<u>Rehabilitation/Reconstruction</u> : For children having trauma, play spaces and free space were set up and an environment or space free from anxiety were provided.

Source : JICA Study Team

### 3) Lessons learned • challenges • notable points for future reconstruction projects

The Project categorized the programs by the level of achievement and unaffected positive effect. The level of achievement in this report is measured whether the program includes description about qualitative achievement and unexpected positive effect. Then the Project observes whether there is a tendency among the programs that have common components depending on the level of achievement. It was concluded that level of achievement did not affect the description of lessons learned, challenges and notable points for future reconstruction. Items such as participation of the beneficiaries and their cultural background were observed in various agencies regardless of their achievements.

The summary of lessons learned, challenges and notable points for future reconstruction projects is as follows:

① Lessons learned from programs with high level of achievement and unexpected positive effect

- Involving vulnerable groups as direct participants (not just as beneficiaries) contributes to provide opportunities for discussion and to expand access to participation for all members of the community.
- Different organizations implementing the same program (e.g., livestock support) results in different outcomes when using different instruments such as mentoring approaches.
- Programs jointly formed by beneficiaries responded to the needs of beneficiaries, and these were more sustainable than those formed solely by program implementers and applied to beneficiaries. The key of the successful implementation is to encourage participation from the planning stage to the evaluation stage.
- While it is inevitable that there is some level of dissatisfaction on the selection process, a transparent and clear resolution process can be implemented with satisfactory results. The close relationship built between the staff and the community is key to problem solving, and community facilitators contribute greatly as mediators. The training content can be generally understood by the beneficiaries, although some lessons included terminologies that were not commonly used and difficult to understand.
- It is important to involve women in future activities. In the program, when dams and irrigation had been damaged, agricultural activities that were generally carried out by men cannot be done. The wives were very helpful in meeting the daily needs of their families when they helped earn income by selling at kiosks, markets, in front of house kiosks, and school canteens.
- The program ensured the involvement of the beneficiaries so that the materials and equipment provided were in line with their needs.

② Challenges of Programs with high level of achievement and unexpected positive effect

- Building materials after the earthquake were insufficient and not fully available
- Inter-agency coordination did not proceed smoothly and this resulted in duplication of activities.
- Even if other stakeholders accepted the presence of people with disabilities and vulnerable groups as objective of participation to the program, their involvement was often limited if they were not actively provided with opportunities to participate.
- Due to the short duration of the program and because of the COVID- 19 pandemic, the mentoring period was shortened.
- Some of the beneficiaries were elderly persons, school drop-outs, and illiterate, and had been operating their businesses for years with little or no profit. Such beneficiaries needed special

assistance in training. The facilitators patiently assisted the beneficiaries until they were able to learn. Although they could not read or write, their worksheets could be written by family members or friends.

- The COVID-19 pandemic led to force majeure situation that affected the global situation including the operation of the project's microenterprises.
- Even though micro-enterprises (such as small stores, kiosks and small snack stalls) were well-operated, the market had been saturated and they were not able to expand on a larger scale. Unless micro-entrepreneurs develop their products that can be sold in public markets, there would not be enough markets in a single village. As for agriculture, when land is damaged and water source is scarce, more alternative livelihoods are needed.
- In the affected villages, flood occurred and local policies, including those for river flood control, affected the project activities.
- Limited human resources (staff) to manage the program had been an issue.
- The time required for community empowerment, sustainability and livelihood restoration programs was very short. Specifically, a total of 221 groups (4,344 people/household) needed to be handled in 20 supported areas for 10 months.

③ Notable attentions for the future project of the Programs with high level of achievement and unexpected positive effect

- It is essential to ensure that vulnerable groups, such as PwDs, are meaningfully involved in the process of designing, implementing, monitoring and evaluating activities/projects/programs.
- The project should be mindful of the distinctive socioeconomic composition of each village and the location where the program was being implemented.
- It is important for program implementers to integrate participatory principles from the planning, implementation, monitoring and evaluation stages.
- More participation of beneficiaries needs to be encouraged so that their participation is meaningful.
- Initial evaluation needs to be conducted carefully to ensure that the assistance received and the assistance provided are relevant at the right timing.
- Initial assessment should be conducted appropriately to ensure that program implementation is effective.
- Communication and close collaboration with the local government give strength to the activities for the residents, as these greatly affect the success of the program and the efficiency of the activities. It was observed that when people were given the opportunity to develop their self-confidence and self-esteem, they developed respect for themselves and for their village, and these will continue to benefit them even after all post-disaster government and NGO projects have been completed.

- It is essential for the project to maintain good relationship with local stakeholders and to make them contribute to be resource persons for policy.
- Understanding the character, traditions, and culture of a particular region is critical.
- Express one's opinion without hurting the feelings of others, especially the beneficiaries.
- It is important to understand the program before implementing it.

④ Lessons learned from Programs with low level of achievement and unexpected positive effect

- It is important to involve local influential people/authorities in the implementation of the program.
- Support from the village government and local community leaders, especially in the early stages of the program, will help implement the program in the target areas.
- Self-reliance at local level can be established with participatory and step-by-step support activities based on the capacity of the beneficiaries.
- Women and children under the age of five are the most vulnerable in times of disaster. It is important to meet their nutritional needs in order for them to grow and develop well and to successfully navigate through the critical period of their development.
- Involving women in all phases of the activities enabled them to articulate their needs and benefit from the activities they participated in.
- In the implementation of the program, widows, widowers, the elderly, and persons with special needs do not only set the priorities for beneficiaries. They also participate directly in community meetings throughout the planning and implementation process. Their best interests were also reflected in the criteria used to select the sequence of temporary housing construction. Vulnerable groups are highly prioritized as beneficiaries of temporary housing. The feedback system shared with the community information on the list of beneficiaries of temporary housing at each stage of development so that community members could be given as much opportunity as possible to raise objections and other views on construction.
- It was noted that children's attendance was low due to schooling, extracurricular activities, and events in the village. Communication with schools, village leaders and parents should be strengthened.
- There is a need to increase government support in organizing activities for government partners.
- All programs implemented should be tailored to the needs of the community. If a program does not meet the needs of the community, it should be flexible because the people who are benefited from the program are beneficiaries.
- Coordination among agencies must be regular to ensure that programs are complementary and not duplicative.

- The role of the government as the lead sector in ensuring coordination and role of all existing non-governmental organizations is important so that aid distributed to communities is evenly distributed and can answer all needs.
- The government should have both primary and secondary data on all the impacts of the disaster as they occur, including economic and infrastructural.

⑤ Challenges of the Programs with low level of achievement and unexpected positive effect

- There is always a need to inform the participants that the community empowerment program will be process driven and not support oriented or form of financial/capital assistance.
- Cost of attending orientation and transportation was an issue for the participants.
- Due to COVID-19, all activities were suspended. It took some time to conduct alternative activities; COVID-19 outbreak is still ongoing. All measures on this need to be taken into consideration.
- Village government support for post-training monitoring has not been implemented.
- Coordination among NGOs is needed to ensure that data duplication does not occur.
- Lack of comprehensive data on community needs for disaster impact and post-disaster recovery was an issue.
- Cases when communities became dependent on assistance exist, and preventing dependence has been a major challenge for agencies working on genuine empowerment of communities.
- Social jealousy at the community level made it difficult to facilitate the activities with the needs of the NGOs with limited resources.

⑥ Notable attention for future projects of Programs with low level of achievement and unexpected positive effect

- The project should pay attention to the local context in implementing the program (local wisdom, local potential, etc.)
- The activities need to allow sufficient time for each stage of program activity implementation.
- It is essential to obtain sufficient evaluation data.
- Having partners with the same vision and values is a key point.
- Ensure adequate coordination among stakeholders is important.
- Financial sector support of the beneficiaries is to be ensured.
- Each region has a different culture, and it is very important to know and pay attention to the culture of each region in order to establish a good working relationship for the program target areas.

- Geography is very important in implementing activities. People living in the highlands, mountainous areas, and those living in the coast have very different needs.
- The organization's human resources, including technicians, need to be properly deployed when implementing the intervention.
- Collaborate with relevant institutions and private companies that have technical expertise in the field. For example, in the case of maize cultivation, collaboration with suppliers of seeds and medicines is the best option.
- The program should pay attention to existing local wisdom (knowledge) so that the community can be involved to the fullest extent.

#### ⑦ Lessons learned for the perspective of women empowerment

- The responsibility of women in infrastructure development will provide a more women-friendly perspective on the development and use of existing facilities.
- Women's leadership in community-based activities is important for benefiting more local people.
- Equal participation of men and women has not yet been achieved, but there is a good understanding of equal participation in activities conducted by men and women together.
- Field activities always provided support to women and involve them in implementing activities in the villages.
- Providing space and opportunities for women in planning, implementation and evaluation suggests that communities can take control and lead the recovery.
- Women beneficiaries have two roles: household management and livelihood. In the target area, these are collaborative obligations and no gender equality issues have arisen. The training uses an approach that helps husbands understand the importance of women doing business.
- The program has a mothers' group that manages the food production, and the close interaction and communication between the mothers and the mothers' group foster mutual support and enable each group to solve problems that arise.
- Women are not generally recognized as breadwinners, despite their role in supporting the household. This severely limits their creativity in running a business, which tends to be unprofessional and unstable in operation. With the knowledge they have through their training, at least they have the opportunity to make their business run more optimally and professionally, and they are confidently running their business. The bookkeeping records can be used as a tool for their budget management. In addition, more professional endeavors can change their views on the role and position of women in the family and community.
- Women who are victims of domestic violence tend to have lower income than those who are not. Special attention should be paid to these women.



- In the target village, most of the men who were engaged in agriculture lost their livelihoods after the earthquake. However, mothers/women/wives are able to meet the needs of their families by running small businesses.
- During disasters, women are the most directly affected group in the sector of meeting food needs for their families. An empowerment approach through women is key to the successful development of home garden activities, as it ensures the sustainability of activities in the management of small-scale agriculture and provides alternative livelihood opportunities at the household scale.
- It is still difficult to find potential women beneficiaries, and there is a problem that many women are not involved in youth organizations.
- Women should not be forced to engage in activities based on their capacities and capabilities.
- The program ensured women's involvement in planning, implementation and monitoring processes through program evaluation.
- The women's group was the most committed group. All the field coordinators were women, and even though all of them were village women/ housewives, they were able to carry out their duties and responsibilities with a presence in the village by getting a place to learn and grow so that they can provide more social benefits in the public places.
- Providing opportunities for both genders to lead the group without discrimination or prohibition is desirable for the sustainability of the group, as all members will work through open communication.

#### 4) Preparation of the summary sheets

JICA Study Team selected six programs that satisfied the key approaches from 30 agencies, and compiled these as the summary sheets by supplementing additional information by interviewing the NGOs.

#### 5) Matters reflected in the reference manual

JICA Study Team compiled the result of the case studies as a recovery and reconstruction project list and case studies in the Appendixes of the reference manual. In addition, topics related to government agency's implementation and operation of the program, including data collection and inter-agency coordination were introduced during working group meetings. The result of the discussion about the topics are reflected in the reference manual.

#### 5-5-3 Major Revisions

The manual created in December 2019 was revised and edited mainly in terms of the following items during working group meetings. As main revisions were added in the main text of the reference manual as the table below, the following sections or parts were moved or added in Appendixes: Implementation Steps of Activities (in Chapter 4), Roles of Stakeholders and coordination framework (in Chapter 5) and SOP of pilot projects and case studies of implemented programs (in Chapter 6).

Table 5-13 Main Revisions in the Reference Manual Done During Working Group Activities

Revised Parts	Addition and/or Revision
General	<ul style="list-style-type: none"> <li>• Added protocol for measures against COVID-19</li> </ul>
Chapter 4. Implementation Steps of the Activities	
4.1 Planning activities	<ul style="list-style-type: none"> <li>• Edited necessity for coordination for planning activities</li> <li>• Recommendation for the creation of SOP and install samples</li> </ul>
4.2 Selection of Beneficiaries	<ul style="list-style-type: none"> <li>• Edited selection criteria for beneficiaries</li> <li>• Corrected statement of such as public announcement for ensuring accountability</li> </ul>
4.3 Implementation of Activities	<ul style="list-style-type: none"> <li>• Corrected text on complaints and feedbacks, and revised the reference manual so that MOU will include penalties to beneficiaries in case they do not to use properly the equipment provided.</li> </ul>
Chapter 5. Roles of Stakeholders and Coordination Framework	<ul style="list-style-type: none"> <li>• Added coordination framework of governments organizations</li> <li>• Added and corrected government organizations and each stakeholder (Stakeholders' matrix)</li> <li>• Introduce stakeholder mapping for coordination of the activities</li> </ul>
Chapter 6. Checklist	<ul style="list-style-type: none"> <li>• Division of checklists and restructuring (moving the text in the Appendixes)</li> </ul>
Appendixes	<ul style="list-style-type: none"> <li>• Add samples of SOP</li> <li>• Add lists of Sample of Implemented Programs – Case Study</li> <li>• Add the summary sheets of Implemented Programs in Central Sulawesi</li> </ul>

Source: JICA Study Team

The revisions in 2020 included some editing and text additions mainly in the coordination framework of stakeholders. As the framework at the central government level for occurrence of disasters is a cluster system established by the central government for emergency response.

As the coordination framework at the provincial government level, Central Sulawesi continues to utilize this framework in the phase of emergency response during transitional phase, and then in the phase of rehabilitation and reconstruction, Bappeda in Central Sulawesi conducts coordination among related organizations.

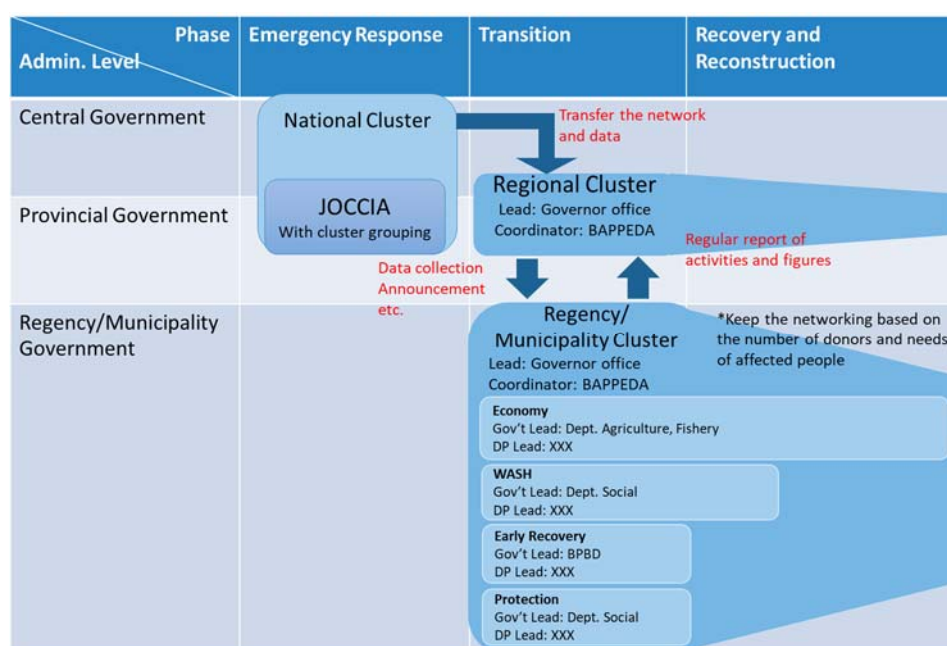
At the municipality level, an official coordination framework does not exist, and the respective governments respond timely on a case-to-case basis. Therefore, the project proposed a coordination framework that will be based on cluster system, of which the main clusters such as shelter, economy and WASH have been enlarged at the municipality level by referring to the regional cluster introduced at the province level, as shown in the following table.

Table 5-14 Regional Clusters in Central Sulawesi Province

Regional Cluster	Sub-cluster and Working Group	
Education	-	
Health	Nutrition, Health, Reproductive Health	
Logistics	-	
Early Recovery	-	
Displacement and Protection	Displacement(sub-cluster) Shelter, Water Sanitation and Hygiene (WASH), Camp Management, Security	Protection(sub-cluster) Child Protection, Women’s Rights Protection, Disabilities, Elderly, Minorities, Psychosocial Support
Economy	Food Security and Livelihood, Cash Transfer Working Group	

Source: JICA Study Team

In order to collect and disseminate the information through administrative line, it is desirable to maintain the same framework at each administrative body. As time has passed, the cluster framework can scale-down responding to the number of aid agencies and needs of the affected people. The figure below (Figure 5-6) illustrates the proposed coordination framework at municipality level.



Source: JICA Study Team

Figure 5-6 Sample Coordination Framework at Municipality Level

## **Chapter 6 Recommendation**

### **(1) Promotion of Usage of Reference Manual**

In the project, “Reference Manual for Promoting Post-Disaster Livelihood Recovery and Community Restoration” was prepared in collaboration with Bappenas, which is the main counterpart organization and the Ministry of Cooperatives and SMEs at the central level, and also with the local government agencies in Central Sulawesi such as the provincial government and the disaster-affected municipalities. Since this manual should be used locally in the actual field, the village heads who are the leaders of local administration and its community should have a common understanding of the contents of the Reference Manual and its key approaches such as "Strengthening of mutual assistance", "Ensuring the accountability and transparency", and “Facilitating the voluntary and continuous recovery activities of the community”.

In order to promote the usage of the Reference Manual, the cascade training method was discussed in the working group which was formed for preparing the Reference Manual. Cascade training means that the local government staff firstly receive the training, then the local government staff give training for the sub-district staff, and finally the sub-district staff give training to the community leaders of the villages. In Central Sulawesi, relocation of disaster-affected residents is progressing and the importance of community restoration activities will be increased soon. Therefore, it is recommended that the Government of Indonesia should disseminate the Reference Manual widely so as to promote its usage.

In addition, although the Reference Manual was prepared mainly based on the experiences in Central Sulawesi, it can also be used in other regions and can also be used as a manual for community-based activities. Therefore, this manual is planned to be published on the Bappenas’s homepage, and hence, it can be used in the event of a disaster in another area. It is expected that this manual will be recognized and accessed by many people. And, it is hoped that the manual will continue to be used widely and updated based on the lessons learned from other regions.

### **(2) Continuing the Reconstruction of Central Sulawesi by Utilizing the Lessons Learned from Reconstruction in Other Regions, and Updating the Reference Manual based on the Collective Experiences in Future**

During the project implementation, the living conditions of the evacuees and survivors were changed from evacuation shelters to temporary housing and then to permanent houses. Regarding the relocation to temporary housing or to permanent houses, the site and the house for each resident was selected with an emphasis on fairness, respecting the policy of donors who support the development of temporary housing and permanent houses. Specifically, when relocating the residence to permanent houses, their location was decided by confirming the wishes of each household, but the exact house was decided by lottery for the sake of fairness.

At the final stage of this project, some troubles were reported among the relocated residents, because they lost the connection with the original community. The main lesson learned was that "when the local government prepares for the relocation of residents, it is necessary to consider their community

formation before the disaster". This lesson was disseminated repeatedly at the seminars conducted in the project to convey the reconstruction experience of Japan. Moreover, there were also similar lessons from the recovery of a large-scale disaster in Indonesia.

Reconstruction from a natural disaster is a long-term effort. It cannot be achieved by government or external support alone. The residents also need to work on their recovery. For that purpose, it is necessary to create a system which can contribute to the sustainable maintenance of local communities through reconstruction assistance. Although the size of the community varies from region to region, it is necessary to create a reconstruction process and to facilitate the community members to have the same awareness of the environment and society, draw their own future vision, seek cooperation with the surrounding communities, and take responsibility for its realization<sup>8</sup>. It is recommended that the support for the reconstruction activities will be continued, and the support will facilitate the community and its members to take the initiative in implementing reconstruction in the region.

Indonesia has faced many natural disasters, and a lot of knowledge and experience are scattered all over the country. However, it is almost the first experience for the local governments of Central Sulawesi to face such a huge natural disaster, and therefore, it is difficult for them to deal with such a disaster. In addition, the local governments in the disaster affected areas have abundant work to deal with in recovery and reconstruction, and human resources are limited. Therefore, in order to utilize the knowledge and experience of disaster recovery in various regions in Indonesia, it is better to form a system to support the local governments after a disaster by dispatching the local government officers from the other disaster-experienced areas. Moreover, it is recommended that the Reference Manual prepared in this project will be updated based on the experiences from other regions.

### (3) Improve Cooperation among Relevant Ministries and Agencies in Recovery and Reconstruction Activities

Livelihoods are a diverse activity, with many sectors involved and therefore a wide range of related ministries and agencies. In order to support its recovery, it is necessary not only to support production and sales, but also to coordinate the related actors in different fields so that the supply flow can be functioned. In addition, community support should also take into account social and cultural aspects which are related comprehensively.

Here, at the start of this project, it was difficult to coordinate the cooperation of relevant ministries and agencies in Indonesia in livelihood-related areas. Moreover, the importance of coordination among the relevant agencies was also recognized in the consultations at working group when preparing the reference manual for recovery and reconstruction support.

As a result of these consultations, based on the concept of clusters for emergency response already stipulated in Indonesia, a mechanism was proposed for local governments to coordinate the activities of relevant ministries and agencies in each sector during recovery and reconstruction, and this has been

---

<sup>8</sup> The emergency recommendation regarding the response to the Great East Japan Earthquake "Necessity to form a platform for post-earthquake town development that utilizes the power of "people" and "community"  
December 5, 2012 Science Council of Japan, Environmental Policy / Environmental Planning Subcommittee

explained in the manual. In the future, it will be necessary to build an effective reconstruction support system by exchanging information on the activities of relevant ministries and agencies at the central and local levels, from coordination immediately after the disaster to activities during the reconstruction period.

#### **(4) Coordination with Donors and NGOs in Livelihood Recovery and Community Restoration**

Immediately after the disaster, many volunteers came and provided various emergency support. Then, at the recovery/reconstruction stage, the donor organizations and NGOs supported livelihood recovery and community restoration through their institutional approaches. In the recovery support, there were several cases that precious human resources were not utilized properly, because of confusion in coordinating the activities of NGOs by the local governments. The local governments also needed to carry out various activities in an environment where information was scarce due to the disaster. Therefore, if the central government level organizations such as ministries, agencies and Bappenas will create a mechanism to dispatch support through coordination with leading domestic NGOs and donors, the burden on the local governments can be reduced, and more efficient livelihood recovery support can be carried out.

#### **(5) Strengthening Community's Resilience through the Implementation of Disaster Risk Reduction (DRR) Education including Disaster Tradition**

As a preparation to conduct DRR education for the project, interviews were conducted with DRR-related organizations in Donggala Regency and residents of Lero Tatari Village, the target village of DRR education, and data and information were collected on information dissemination, evacuation, and post-disaster response. As a result, the issues identified as the main disaster risk factors facing the community include “Weak information transmission infrastructure below the Province/Municipality level, and inability of the county to transmit information to the villages”, “Residents' knowledge of disaster prevention, such as the misconception that the evacuation orders are issued by BMKG”, and “Major delays in public services such as relief activities in areas far from the center of the province such as Lero Tatari village”.

In order to reduce the damage of disaster by early evacuation and appropriate disaster response at the community level, the project designed a DRR education program focusing on enhancing the knowledge of disaster prevention and disaster information, as well as enhancing their response capacity in evacuation and disaster response. Moreover, in Indonesia, the past disaster examples such as the Sumatra earthquake and Sunda Strait tsunami where the community led to early evacuation reduced human casualties. Therefore, in the DRR education program, the above-mentioned examples were discussed, and the case of an elderly person in Lero Tatari Village who heard about the past tsunami damage from his grandparents was shared. The importance of DRR activities are confirmed based on the relationship between past disasters and the disaster at this time. In the future, when DRR education activities are carried out in Indonesia, it is desirable to accumulate the knowledge on disaster prevention and strengthen the resilience of the community by handing down past disaster traditions within the community.