

National Development Planning Agency (BAPPENAS)
Republic of Indonesia

**Project for Development of
Regional Disaster Risk Resilience Plan
in Central Sulawesi in
the Republic of Indonesia**

**INTERIM REPORT
APPENDIX**

May 2019

Japan International Cooperation Agency

**Yachiyo Engineering Co., Ltd.
Oriental Consultants Global Co., Ltd.
Nippon Koei Co., Ltd.
Pacific Consultants Co. Ltd.
PASCO CORPORATION**

Directorate General of Highways
Ministry of Public Works and Housing
Republic of Indonesia

**The Preparatory Survey on the
Programme for the Reconstruction of
Palu 4 Bridges
in Central Sulawesi Province**

OUTLINE DESIGN REPORT

May 2019

Japan International Cooperation Agency

**Oriental Consultants Global Co., Ltd.
Yachiyo Engineering Co., Ltd.**

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Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
ADB	Asia Development Bank
Af	Tropical Rainforest Climate
AIDS	Acquired Immunodeficiency Syndrome
AMDAL	Environmental Impact Assessment
APBN	State Budget
ATR	Ministry of Land and Spatial Planning
BAPPENAS	National Development Planning Agency
BAPPEDA	Agency for Regional Development
BPJN	National Road Implementation Center
BPN	National Land Agency
BWS	River Basin Development Agency
DGH	Directorate General of Highways (Bina Marga)
EA	Executing Agency
EC	Environmental Clearance
EIA	Environmental Impact Assessment
E/N	Exchange of Notes
G/A	Grant Agreement
GDP	Gross Domestic Product
HHWL	Highest High Water Level
HIV	Human Immunodeficiency Virus
IA	Implementing Agency
IEE	Initial Environment Examination
IGES	Institute for Global Environmental Strategies
IMF	International Monetary Fund
JETRO	Japan External Trade Organization
MHWS	Mean High Water Spring
MHWL	Mean High Water Level
MLWL	Mean Low Water Level
MLWS	Mean Low Water Spring
MOD	Minutes of Discussions
MSL	Mean Sea Level
Nirwasita Tantra	Informational Document of Regional Environmental Management Performance
PAPs	Project Affected Persons
PLN	National Electricity Company
PQ	Pre-Qualification
PU	Ministry of Public Works and Housing

SNI/BSN	Standard National of Indonesia
SPPL	Statement of Environmental Management and Monitoring
TOR	Term of Reference
TPA	Final Disposal Sites
TPS3R	Waste Processing Site 3R
TPST	Integrated Waste Management Site
URTI	Upper Respiratory Infection
UKL-UPL	Environmental Management Efforts Form and Environmental Monitoring Efforts

SUMMARY

(1) Overview of the Country

Palu city is located in the central Sulawesi Island which is the study area of central Sulawesi province, the Republic of Indonesia (hereinafter referred to as “Indonesia”). It is adjacent to Gorontalo province, western Sulawesi province and southern Sulawesi province. The northern part of Palu city faces the bay and the mountains such as Mt.Torompupu and other mountains surrounding the city from west, east and south side.

The climate of Palu city is classified as a tropical rainforest which has high rainfall and no clear dry season throughout the year. According to the climate survey by Balai wilayah Sungai Sulawesi (hereinafter referred to as BWS-III) in 2017, the annual average temperature and humidity are 27.5 °C and 79.3%, respectively. And, according to the rainfall observation by BWS-III in 2017, there are many rainfall days such as 237 days in a year, but the annual rainfall is characterized by a low rainfall per unit times of 862 mm.

While the total population of Palu City is 336,352 in 2010 and 379,782 in 2017, of which population growth rate is 1.54%, the rate of Indonesia is 8.0% during the same period.

The population growth in Palu city is not remarkable compared to the whole country, but it is expected to increase as the same tendency with the whole country.

After the Asian financial crisis in July 1997, Indonesia implemented economic structural reform based on an agreement with the IMF in regard to the economic, social stability, financial stability, the expansion of personal consumption, and the economic growth rate from 2005 has been around 5% to 6% except in 2009 affected by the global financial and economic crisis. Nominal GDP per capita exceeded \$ 3,000 in 2010 by achieved a high growth rate.

Indonesia economy has continued to grow steadily for the past 10 years, but the current account has turned into a deficit since around 2012. It is considered that the value of Rupiah has turned to be falling at the same time. Indonesia has an issue to improve balance by promoting exports.

(2) Background, Circumstances and Outlines of Requested Project

An earthquake of magnitude 7.5 occurred on September 28, 2018 and caused tremendous losses. The epicenter of the earthquake is on the Palu-Colo Fault with focal depth of 10 km deep. It paralyzed urban functions in four cities including Palu city along with the tsunami and liquefaction. The National Development Planning Agency (hereinafter referred to as “BAPPENAS”) has started formulating a master plan for the reconstruction of Central Sulawesi to respond to the situation in Palu city. JICA and BAPPENAS made a cooperation agreement to carry out the reconstruction of Central Sulawesi with Japanese advanced technology and disaster management.

The Central Sulawesi Reconstruction Project was formed for the reconstruction planning of damaged buildings and the creation of a resilient city against disasters.

Due to the earthquake, the Palu 4 Bridge, located at the mouth of the Palu River, collapsed, the unique shape of which was used to be an iconic landmark of Palu city. It is used by daily activities and has a role not only as a transport function, but was also commonly known as a popular place among local people. The earthquake physically destroyed Palu 4 Bridge and also emotionally affected local people. It also rise an urgent issue to secure the traffic capacities of both east-west directions as the previous bridge provided. Reconstruction of the Palu 4 Bridge, which has a significant role for affected local people and urban functions, is an urgent task to be addressed.

The Government of Indonesia requested Japan to rebuild the Palu 4 Bridge with the following grant aid in December 2018 with such background and circumstances.

- Requested date: December 2018
- Requested amount cost: 2.5 billion Japanese yen
- Requested object: Reconstruction of the Palu Forth Bridge

(3) Outline of Survey and Substance of the Project

The period of this survey was for 5 months from January to May 2019. The field survey was conducted in the following four periods; 10th January to 24th February; from 5th to 31st March; from 10th to 27th April; and from 14th to 25th May.

The Government of Indonesia has requested the Japan government to reconstruct Palu 4 Bridge for the purpose of improving logistics, expanding traffic volume in east-west direction, strengthening the road network, and symbolizing the reconstruction of the damaged areas with the early completion of the bridge.

The outline of the design determined by the result of the consultation with relevant organizations and the field survey is shown below.

1) Bridge Design

① Design Standards/Specifications

Bridge design shall be studied based on the Road Bridge Design Manual / Japan Road Association. And it will carry out design inspection according to Indonesia Standard / Standard National Indonesia (hereinafter "SNI"). Applied design standards are stated as below.

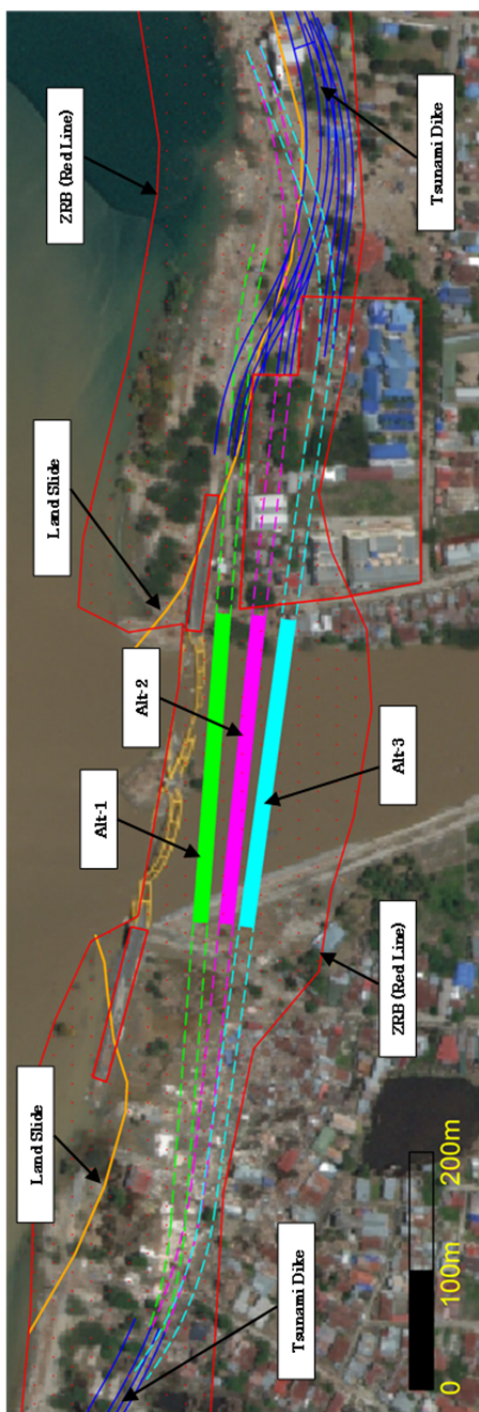
- Road Bridge Design Manual (I~V): Japan Road Association
- Bridge Management System: Directorate General of Highways (DGH)
- SNI 12-2004 Perencanaan struktur beton untuk jembatan: Badan Standardisasi Nasional (BSN)
- SNI 1725-2016 Pembebanan untuk jembatan: Badan Standardisasi Nasional (BSN)

- SNI 2833-2016 Earthquake Map 2017: Badan Standardisasi Nasional (BSN)
- SNI 8460-2017 Persyaratan perancangan geoteknik: Badan Standardisasi Nasional (BSN)

② Location of Bridge

The route comparison is shown in Table 1. The 1st plan was adopted as result of the joint field survey and discussions with relevant organizations. As relevant organizations have concerns about the limitation in RAP, the 1st Alternative plan has been found practical in consideration of EIA, and also considering the budget of Palu city.

Table 1 Route Comparison

Image					
Alternatives	Alternative -1			Alternative -2	Alternative -3
Outline	The route of right bank side avoids the housing area.			The approach road except for access road of right bank side avoids the land slide area.	The route is planned along the ZRB according to the spatial planning.
Bridge Length *					
Approach Road Length *	approx. 260m			approx. 260m	approx. 260m
Access Road Length*	approx. 170m			approx. 170m	approx. 220m
	approx. 140m			approx. 300m	approx. 320m
Impact to housing *	nil (0)			3 housings	3 housings, 1 big facility
Existing bridge	When it is judged to disturb the construction, the existing bridge must be demolished by Indonesian Government before the commencement of the construction. Although the impact to housing is nil, the demolition of the existing bridge on right bank might be necessary.			No influence	No influence
Recommendation				Although there are impacted housings by the project, it is unnecessary to demolish the existing bridge on right bank.	The big facility is impacted by the project.
				Recommended	

Source: JICA Study Team

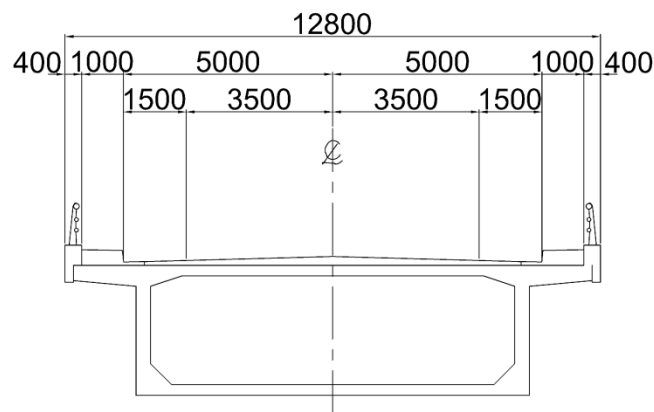
③ Superstructure

As a result of related organizations meeting, JICA project team had reached an agreement to implement PC box girder bridge. Abstract of Superstructure and cross section of the bridge are shown in Table 2 and Figure 1, respectively.

Table 2 Superstructure Type

Contents	Detail
Bridge type	PC box girder (Variable cross section)
Length(m)	260
Number of span	3
Span length (m)	75+110+75
width (m)	12.8

Source: JICA Study Team



Source: JICA Study Team (Technical Note)

Figure 1 Cross Section of the Bridge

④ Substructure

The substructure type is shown in Table 3 based on the superstructure and the tentative result of geotechnical survey. However, the most suitable substructure type in the detailed design shall be determined based on the final result of the geotechnical survey.

Table 3 Substructure Type

Contents	Detail
Basement type	It is considered after geotechnical survey
Abutment type	Reverse T-shaped
Pier type	Pier type, wall type

Source: JICA Study Team

2) Road Design

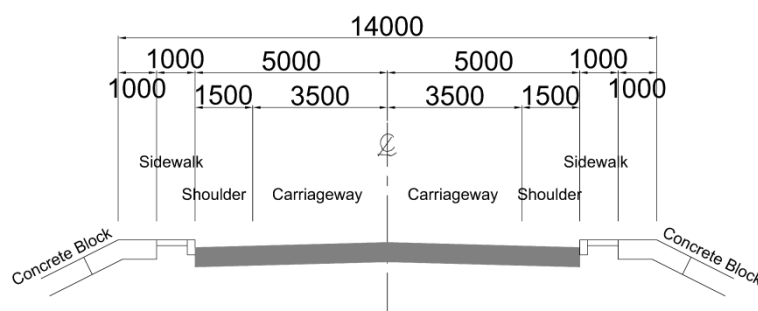
① Design Standards/Specifications

The road design has been studied based on the following design standards.

- 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

② Typical Cross Section

The typical cross section shown in Figure 2 of the road has been determined based on the discussion with related authorities.



Source: JICA Study Team (Technical Note)

Figure 2 Typical Cross Section of the Approached Road

3) Procurement Plan

① Construction materials

The PC cable requires to be imported from Japan or other countries, but other materials such as concrete and asphalt are available to be procured locally in Indonesia. The procurement list of the materials is shown in Table 4.

Table 4 Procurement List of the Materials

Material name	Domestic	Japan	Other	Summary
Steel	○			
PC Steel	○	○		
Steel bar (D13~D32)	○			
Steel bar (D36~D50)	△	○		Special request
H-shape steel	○			
Cement	○			
Asphalt concrete	○			
Ready mix concrete	○			
Sand	○			
Formwork material	○			
Steel Formwork material	○			
Support work material	○			
Hume tube	○			

Source: JICA Study Team

② Construction machines

Although the general construction machines are available in Indonesia, the pile driving machine for the large bore requires to be procured from Japan or other countries. The procurement list for the machines is shown in Table 5.

Table 5 Procurement List of the Machines

Construction machine name	Domestic	Japan	Other	Summary
Dump truck	○			
Backhoe	○			
Bulldozer	○			
Truck crane	○			
Asphalt finisher	○			
Tire roller	○			
Vibratory roller	○			
Large breaker	○			
Engine generator	○			
Crawler crane	○			
Pile driving machine (reverse methodφ1,500mm)		○		
Vibro hammer	○			

Source: JICA Study Team

(4) Project Period and Cost

Indonesia government requested early completion of the construction, thus it is necessary to construct from both shore sides at once in terms of timeframe. The construction period of 20 months is expected, yet it is to be finalized in the detailed design stage.

The total amount of the cost for the project is 2.5 billion yen has been approved by Japanese cabinet. Allocation of expenses between Japan and Indonesia are shown in Table 6 and Table 7 based on charge classification, however this price is not limited to the price of Exchange of Notes (E/N). In addition, based on uncompleted EIA in this phase, the predicted cost and type shown in Table 7 is tentative.

Table 6 Project Cost (Japanese Obligation)

Confidential

Source: JICA Study Team

Table 7 Item and Cost of Recipient Country

Item to be borne	Content	Amount to be borne (million yen)	Amount to be borne (IDR)	Remarks
Bank fees		2.00	300,000,000	
Land acquisition cost		110.00	8,250,000,000	29,400 m ²
Facility relocation cost	Power pole Electric cable	5.00	750,000,000	
Total		117.00	9,300,000,000	

*Above items and costs will be determined after completion of environmental survey, thus, their cost will be tentative.

Source: JICA Study Team

(5) Evaluation of Project

1) Relevance

① Consistency with Higher Development Plan of Indonesia

Indonesia has formulated and implemented a 5-year development plan based on the national long-term development plan which was formulated in 2004. Third planning phase (2015-2019) is ongoing at present. Sulawesi province where the subject area of survey is conducting development for each province by 5 regional road agencies (hereinafter referred to as “BPJT”). For instance, the Greater Sulawesi Corridor Project which connects between the northern capital city Manado and the southern capital city Makassar has been implemented in Sulawesi province. The Manado-Palu section has already been opened, and the development of the Palu-Makassar section is scheduled to be proceeded.

National roads in the east-west direction in Palu city are maintained, but there is only one national road crossing the Palu River through the city. Therefore, expansion of traffic capacity is required to be addressed urgently. Target of the project is expanding traffic capacity in the east-west direction. Strengthening the traffic volume in the east-west direction in Palu city is consistent with the priority plan of Indonesia to enhance the convenience of intercity transportation.

② Consistency with Japanese Aid Policy

Japanese basic aid policy is to implement high-quality infrastructure development in order to support the economic development in Indonesia. This project is to reconstruct the Palu 4 Bridge, by using Japanese design standard, on the site to replace previous Palu 4 Bridge which collapsed by the earthquake in September 2018. The previous Palu 4 Bridge was undertaking extensive part of traffic capacity in the east-west direction in Palu city, however to secure the traffic capacity in the east-west direction is now an issue due to the absence of the bridge. By reconstructing, it shall cover traffic capacity in the east-west direction as it did before the Palu 4 Bridge collapsed.

Moreover, the development and implementation of seismic standards are insufficiently introduced in Indonesia, thus promoting the seismic design based on the Japanese seismic standard shall provide

high-quality infrastructure development covering entire area of Indonesia. Therefore, the project is consistent with Japanese aid policies.

③ Urgency of the Project

The Palu Third Bridge which located about 800 m south from the Palu 4 Bridge is able to provide only a path east to west direction transport after Palu 4 Bridge collapsed. Similarly, Palu First Bridge which located about 1,600 m to the south from the Palu 4 Bridge is able to connect only west to east direction transport. Only the Palu second bridge which located 4,200m south from Palu 4 Bridge could provide both sides transport. Furthermore, the traffic in the coastal area has been forced to detour to the south area. Therefore securing the traffic in the east-west direction is an urgent issue in these circumstances.

Through this project, traffic will be secured in the east-west direction in Palu city. It is expected that reconstructing Palu 4 Bridge undertakes significant role to enhance the inter-city road network, improve logistics and contribute to economic recovery as a part of the implementation of the Greater Sulawesi Corridor Plan.

④ Japanese Technology Introduction

Both countries, Japan and Indonesia, are commonly located in the plate boundary and active volcanoes exist in densely populated areas. As Japanese infrastructure development and buildings are built based on Japanese seismic standards, yet there are many masonry non-engineered buildings in the rural area in Indonesia. Further implementation of anti-seismic method is recommended to be applied in Indonesia to improve vulnerability to earthquakes. In addition, there are limited number of researchers or experts specialized for earthquakes in Indonesia, and the development and implementation of seismic design standards have not been sufficiently implemented.

Japan is the country where often affected not only earthquakes but also a large number of natural disasters such as typhoons, floods, landslides, etc., Especially Japan is the only country where 20% of higher magnitude over 6.0 occur in the world. With regard to bridges in Japan, it has been taken action such as the review of standards and the installation of the anti-fall bridge structure and equipment since Great Hanshin-Awaji Earthquake in 1995.

Certainly, performing seismic design based on Japanese design standard will lead to the transfer of technology to Indonesia and also it will help in the development of their own future seismic standards in Indonesia.

⑤ Business Benefit Target

The beneficial users of this project (the direct beneficiary population) are presumed to be extensive since this road crosses the Palu River and connect the east and west. Focusing at the area of Palu city, number of beneficiary is expected to be approximately 380,000

Table 8 Business Benefit Population

District	Population	
	2016	2017
Palu Barat	61,424	62,293
Tatanga	39,369	39,997
Ulujadi	27,319	27,763
Palu Selatan	69,492	70,571
Palu Timur	70,378	71,452
Mantikulare	62,822	63,804
Palu Utara	22,834	23,196
Tawacli	20,382	20,706
Total	374,020	379,782

Source: JICA Study Team

2) Effectiveness

Expected effect by this project is shown in Table 9.

- It could be solved detour transport to Palu Third Bridge (East-West Direction) and Palu First Bridge (West-East Direction) and possible to both direction transport of itself.
- Detour distance can be shortening 1.2 km in west-east direction and 1.8km in east-west direction.

Table 9 Expected Effect on this Project

Index	Standard Level (value on 2019)	Target(2024) [After finish project in 3years]
Number of lane	-	2
Transport method	-	Both direction
Shorten detour distance *1 (Palu-Donggala-Munif Rahman road)	East-west 6.1km West-east 6.8km	East-west 4.9km (1.2km shorten) West-east 4.9km (1.8km shorten)

*1: Route is expected to pass Palu Third Bridge in east-west direction and Palu First Bridge in west-east direction because Palu 4 Bridge could not pass due to collapse.

Source: JICA Study Team

① Qualitative Effects

- Improvement of Life and Safety of Local People
By strengthening the road network, accessibility of the area and stable procurement will be improved. In addition to the road convenience, in the event of tsunami and/or natural disasters, evacuation places will be secured. Therefore, implementing this project provides quality life and improves safety of local residents.
- Promotion of Regional Economic Activities
By solving current traffic restrictions, traffic movements and logistics will be facilitated and boost local activities. As a symbol of regional recovery from the disaster, the reconstruction of the bridge is expected to develop and promote regional by implementing of this project.

➤ Reduction of Traffic Accidents

By constructing a two-lane road in accordance with the Indonesian standard, it enables to operate both direction transport and secures safe and stable road management which possibly results reduction of traffic accidents.

➤ Reduction of Maintenance Costs

By adopting seismic design by Japanese seismic standards and technology will lead resilience infrastructure development against disasters. It helps to reduce the cost of large-scale repairing works and is expected to enhance cost effectiveness within limited budget.

From above points of view, the project is effective for Indonesia.

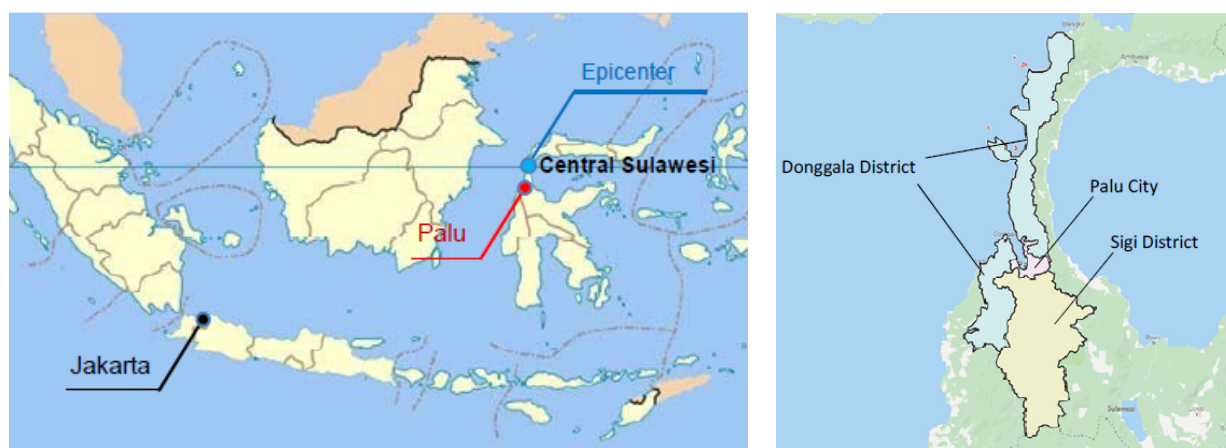
Chapter 1 Background of the Project

1-1 Background and Outline of the Project

1-1-1 Background

On September 28, 2018, an earthquake of magnitude 7.5 occurred with the epicentre at the depth of 10 km along the Palu-Coro fault. Serious damage was caused by this earthquake. The shock of the tremors, as well as the tsunami and following soil liquefaction, paralyzed the urban function of four cities including Palu City. In response to the state of disaster in Palu, National Development Planning Agency (hereinafter referred to as BAPPENAS) formulated for the development of the master plan for the restoration of Central Sulawesi. JICA and BAPPENAS agreed to work in cooperation for the restoration of Central Sulawesi through provision of technology from Japan.

Aiming at the reconstruction of affected infrastructures and the realization of disaster-resilient cities, the Project for Development of Regional Disaster Risk Resilience Plan in Central Sulawesi Central Sulawesi was formulated.



Source: JICA Study Team

Figure 1-1-1 Location of Palu Earthquake (Left) and the Project Area (Right)

The earthquake caused the collapse of the Palu 4 Bridge located at the mouth of the Palu River. The Palu 4 Bridge had been popular among local residents as an iconic landmark with its unique form. In addition to traffic function, it had a role as a place for community activities of citizens. The collapse caused by the earthquake emotionally affected to local residents, also it rises urgent issue to re-establish the east-west traffic, which had been carried by the previous Palu 4 Bridge. The reconstruction of the Palu 4 Bridge, which had been serving essential roles for affected local residents and urban function, is an issue that needs to be addressed urgently. It was, therefore, decided to execute the reconstruction of the Palu 4 Bridge as a grant aid project, considering the need for rapid recovery.

Against this background, the Government of Indonesia requested Japan to provide the following grant aid in December 2018.

- Year and month of request: December 2018
- Amount requested: 2.5 billion yen
- Details of request: Reconstruction of collapsed the Palu 4 Bridge



Source: Kompas.com

Figure 1-1-2 Palu 4 Bridge before Collapse (Left) and after Collapse (Right)

1-1-2 Agreement and Conclusion on the Substance Requested

The project to reconstruct the Palu 4 Bridge, which was destroyed by the earthquake, was agreed upon with the Government of Indonesia to be conducted as the Programme for the Reconstruction of Palu 4 Bridge in Central Sulawesi Province. Based on the description in M/D (Minutes of Discussion), it has been decided to build a new bridge in the former site of the fallen Palu 4 Bridge. The location of the new bridge has been decided to be upstream of the fallen Palu 4 Bridge, avoiding the places where the landslide occurred. By means of the Technical Note, it has been agreed upon with Bina Marga that the bridge design will be developed based on the Japanese standard described in Specifications for Road Bridges, and the resultant design will be verified by Standar Nasional Indonesia (SNI), the design standard of Indonesia.

1-1-3 Necessity of the Project

The Provinces in Sulawesi have been implementing the Greater Sulawesi Corridor Programme, which is planned to connect the northern capital city Manado to the southern capital city Makassar, in the Third National Development Programme. The segment from Manado to Palu in the project area has been opened to traffic by fiscal year 2016. For the future, the programme is planned to proceed with the opening of the segment from Palu to Makassar.

In Palu City, which is the area subject to the project implementation, the Palu 3 Bridge located approximately 800 m south of the fallen Palu 4 Bridge provides only the traffic from east to west. Similarly, the Palu 1 Bridge located approximately 1,600 m to the south supports only from west to east. The only bridge that can carry two-way traffic is Palu 2 Bridge located approximately 4,200 m to the south. Furthermore, the traffic in the coastal area is forced to detour southwards in the current situation.

Thus, the reconstruction of the Palu 4 Bridge is an urgent task to be addressed for re-establishing the traffic in the east-west direction.

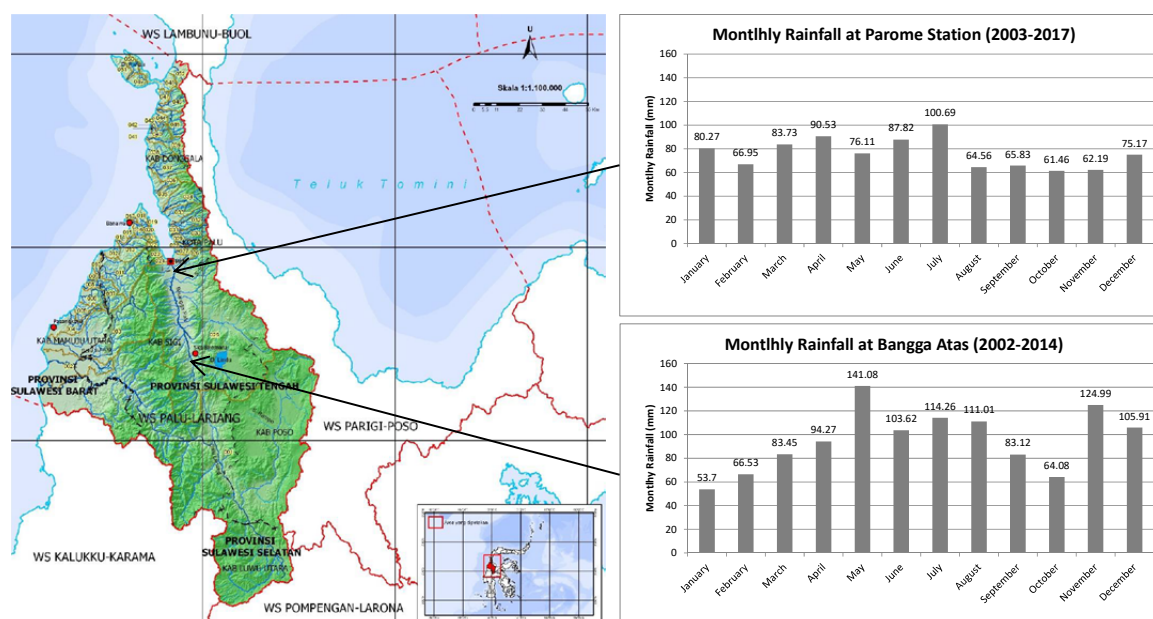
This project is expected to secure the traffic in the east-west direction in Palu City, to undertake an important role in the implementation of the Greater Sulawesi Corridor Programme by enhancing the inter-city road network, and also to contribute to economic recovery and development through improvement of seamless logistics.

1-2 Site Condition

1-2-1 Meteorological Condition

1-2-1-1 Climate

The climate of the area is classified as Tropical Rainforest (Af) by the Köppen-Geiger climate classification, which is characterized by a significant amount of rainfall throughout the year and a limited variation in annual temperature. However, due to its location surrounded by mountains, the rainfall amount in the downstream of the river (rain-shadow¹) is relatively low varying from 60 to 100 mm per month, and the average annual rainfall amount is around 1,000 mm at Parome Station (2003-2017).



Source: Balai Wilayah Sungai –Sulawesi III (BWS-III), Rainfall data from 2002 to 2017

Figure 1-2-1 Monthly Rainfall at the downstream (Parome Station) and upstream (Bangga Atas) of Palu River

Regarding the temperature, the variation throughout the year is little; August is the warmest month with an average of 27.7°C and July is the coldest with temperature averaging 25.7°C.

¹ A rain shadow is a dry area on the leeward side of a mountainous area (away from the wind). The mountains block the passage of rain-producing weather systems and cast a "shadow" of dryness behind them.

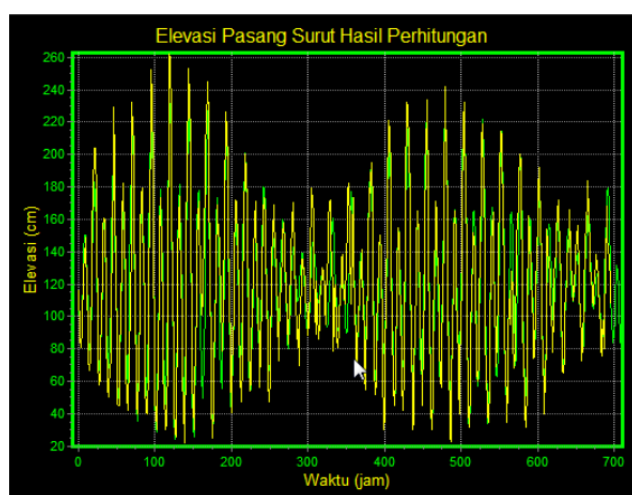
Table 1-2-1 Temperature by Month in Palu City

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Average monthly temperature (°C)	26.6	26.7	26.9	26.9	27.4	26.6	25.7	26.8	26.7	27.7	27.2	27.0
Minimum Temperature (°C)	22.9	23.0	23.1	23.1	23.8	23.1	22.0	22.8	22.5	23.3	23.1	23.2
Maximum Temperature (°C)	30.3	30.5	30.7	30.8	31.1	30.2	29.4	30.8	30.9	32.1	31.3	30.8

Source: climate-data.org (<https://en.climate-data.org/asia/indonesia/central-sulawesi/palu-3638/>)

1-2-1-2 Tide

Regarding tidal observation, the river administration office (BWS: Balai Wilayah Sungai of Sulawesi III) has conducted hourly observation during one month through the “Investigation and Design Survey on the Palu River Boundary in Palu City of 2017”.



		Elevation
HHWL	Highest High Water Level	+2.338m
MHWS	Mean High Water Spring	+2.316m
MHWL	Mean High Water Level	+1.766m
MSL	Mean Sea Level	+1.199m
MLWL	Mean Low Water Level	+0.676m
MLWS	Mean Low Water Spring	+0.279m

Source: BWS (2017), “Investigation and Design Survey on the Palu River Boundary in Palu City of 2017”

Figure 1-2-2 Results of tidal observation conducted in May-June 2017

1-2-2 Hydrological Condition

1-2-2-1 Past studies on Palu River Planning and Design

Due to the steep topographic conditions, high amount of rainfall and change of land use such as the conversion of forests into plantation and agricultural lands in the upstream, river flooding and flash floods occurred in the past along Palu River, especially in the upper and middle stream. On the other hand, due to the transport of sediment from the upstream and tributaries, the riverbed of Palu River is rising and the discharge capacity is decreasing.

To tackle these issues, BWS has conducted the two following studies.

Investigation and Design Survey on the Palu River Management of 2010

This study aimed to: 1) Identify the causes of flooding and sedimentation, 2) formulate the principles and concept for flood and sediment control to manage the river, and 3) design countermeasures against flood

and sedimentation. The main activities of this study were the data collection on actual situation of the river system, analysis of the characteristics of Palu River including the evaluation of existing infrastructure and facilities, considerations on short and long-term countermeasure as well as suggestions to minimize conflicts of interest between stakeholders. This study was reviewed through the “Investigation and Design Survey on the Palu River Boundary in Palu City of 2017”.

Investigation and Design Survey on the Palu River Boundary in Palu City of 2017

This study aimed to determine river boundaries and to review the river planning conditions proposed by the “Investigation and Design Survey on the Palu River Management of 2010”.

The design scale flood of this study is 25-years return period flood (Basin average rainfall of 56.558mm/day) and the calculated flood discharge in the downstream is 756.024 m³/s (Figure 1-2-3 and Table 1-2-2).

River widening in the downstream is not planned, and there is not any description on the design levee height.

1-2-2-2 River Planning Conditions at the Palu River mouth

Actually, the JICA Study Team is considering flood countermeasures consisting of river improvement works and basin countermeasures such as implementation of retention basins in the middle-upper stream of Palu River. The target flood is the 2016 floods which intensity is higher than 25 years return period flood.

Regarding the downstream, since it would be difficult to widen the river because of the number of houses and assets to relocate, the design flood discharge of the river is supposed to be set between 800 to 1,000 m³/s, depending on the scale of the retention basin implemented in the middle-upper stream.

As of April 2019, the river planning conditions at the river mouth are as follows.

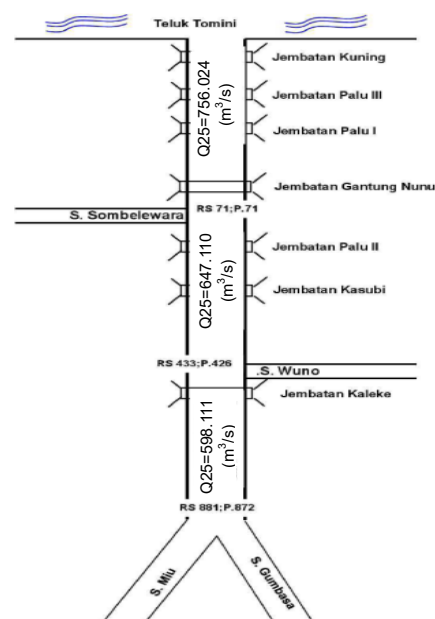


Figure 1-2-3 Design Flood Discharge

Table 1-2-2 Outline of River Planning conditions at the Palu River mouth

	Description
Design Flood Discharge	800 m ³ /s ~ 1,000 m ³ /s
HWL	+2.316m (Mean High Water Spring) *Calculated river water level(W=1/25): +1.23m, velocity=1.21m/s
Design Levee height	N/A
Riverbed	Near the location of Palu 4 Bridge (around 100m from the river mouth) Design riverbed elevation: -1.91m (The mean riverbed elevation was around -0.98m as of 2017) Riverbed Slope: i=1/900
River Width	Actual river boundaries *According to the results of river boundaries delimitation study of 2017, widening of the river in the downstream is not planned.

Note: Factors such as levee height, width will be reviewed and finalized based on the results of the on-going consideration on the tsunami dike and flood countermeasures.

Source: JICA Study Team based on the results of BWS (2017)

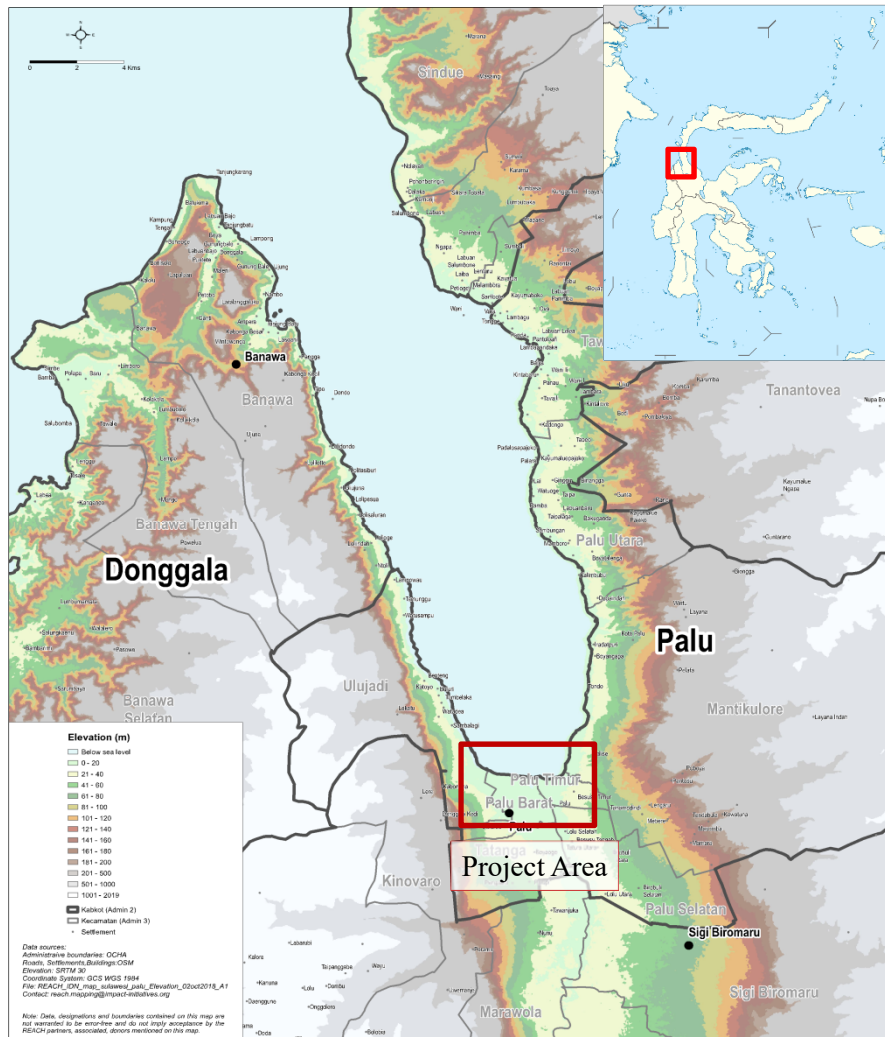
1-2-3 Geological Survey

1-2-3-1 Topographical Condition of Palu City

Sulawesi Island, in eastern Indonesia, is a distinctive K – shape island, dominated by four large peninsulas (south peninsula, Minahassa peninsula in the north, east peninsula, and southeast peninsula) separated by three gulfs i.e., Tomini in the northeast, Tolo in the southeast, and Bone in the south. The terrain is mostly mountainous, with many active volcanoes. Mt. Rantemario (3,440m) in the northern part of South Sulawesi is the highest point on the island. All four peninsulas have mountains standing more than 2,500m above Mean Sea Level (MSL). Due to its topography, the island has limited plains which are mostly scattered along coastlines. These plains are separated by precipitous mountains, gulfs, and the sea. Flat lands account only for about 10% of the total land area.

The project lies within Palu city, the capital of the Central Sulawesi province, situated on a long, narrow bay in the Palu depression and the mouth of Palu River, with an elevation of less than 5m above MSL. Because of its sheltered position between mountain ridges, the climate is unusually dry. Sulawesi has two seasons; i.e., the dry season from May to October and the rainy season from November to April. Heavy downpours occur in January and February. In Central Sulawesi's mountainous region, annual precipitation exceeds 2,500mm. Palu and its other low-lying environs on the other hand, receive less rainfall (less than 1,600mm per annum). Lesser still is the coastal region around Palu city (annual precipitation is only about 600mm) which is one of the driest regions in Sulawesi.

Since the island is located on and near the equator, temperature in the lowlands ranges from 21°C to 35°C, and 15°C to 30°C in the highlands. The average annual temperature in the lowlands is around 27°C.



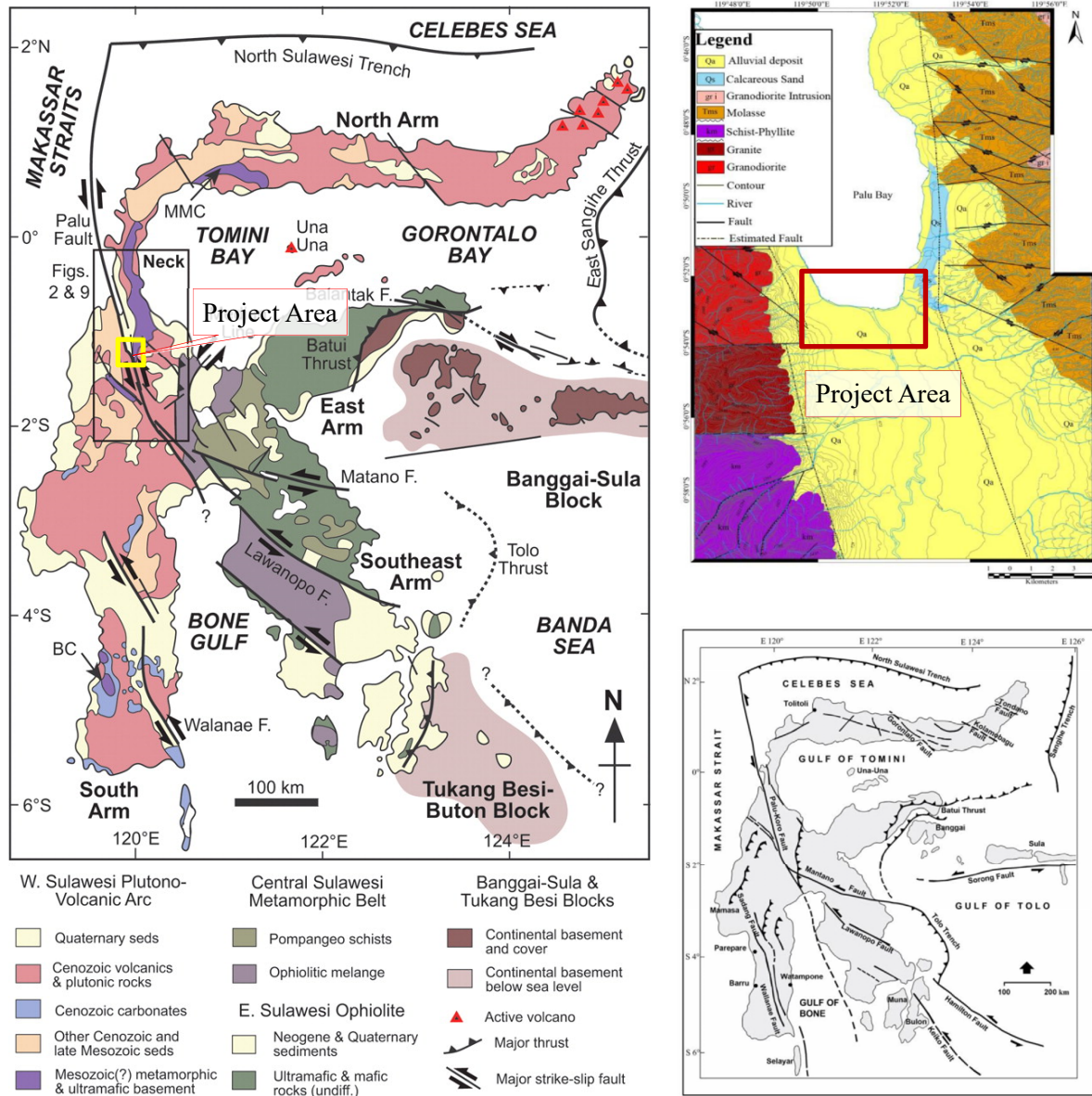
Source: <https://reliefweb.int/>

Figure 1-2-4 Topographic map of Palu in Central Sulawesi

1-2-3-2 Geological Condition of Palu City

Sulawesi, Eastern Indonesia lies at the junction of the Eurasian, Indo-Australian and Pacific plates, in a complex region where subduction and collision have been and still are active. The evolution of Neogene kinematics along the Palu-Koro fault has been confirmed based on microtectonics such as, the sinistral strike-slip due to E-W compression, radial extensions caused by the vertical movement of Neogene granite, and the left lateral with normal component displacement due to the currently active N-S extension/E-W compression.

The Palu depression area is mostly filled by clayey, silty, and sandy alluvial deposits, except on the eastern and western borders which consist of gravelly sands as colluvium wedges. On the western border, the gravel material is granitic fragments mostly of schist, while to the east, the gravel consists of schist, igneous and sedimentary rocks.



Source: <https://sp.lyellcollection.org/content/355/1/157/tab-figures-data>

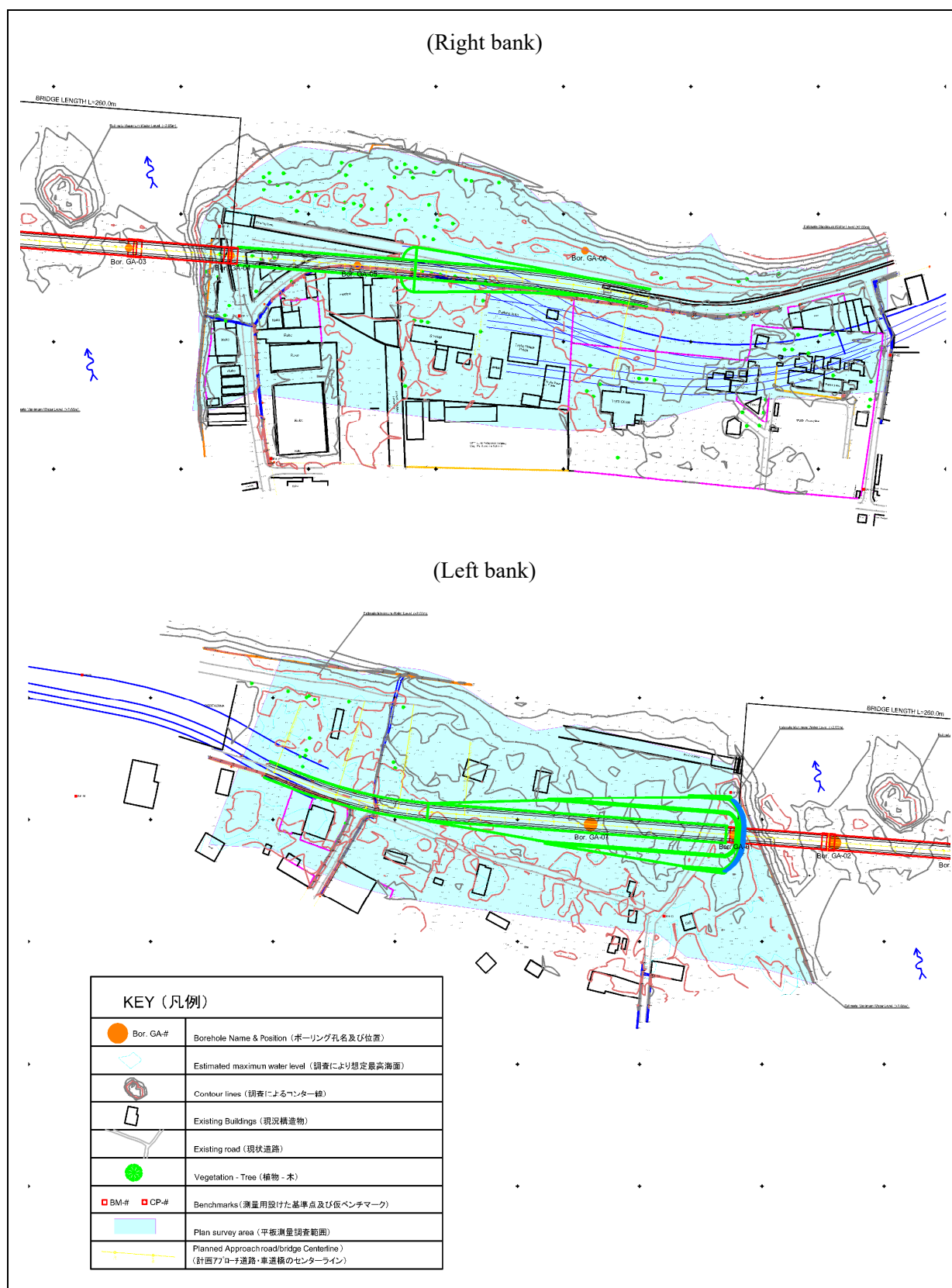
Figure 1-2-5 Geological map of Palu in Sulawesi Island

The western escarpment consists of granite and granodiorite units to the north, while the southern part consists of schistophyllitic units. The eastern escarpment consists of molasses - shallow marine sediments and deposits such as shales, sandstones and conglomerates. The project area lies within the Palu depression as shown in Figure 1-2-5.

1-2-3-3 Survey Results

(1) Topographic Survey

Topographic survey was carried out under supervision of JICA Study Team from March 21st to April 4th in 2019, and the result of survey is shown in Figure 1-2-6.



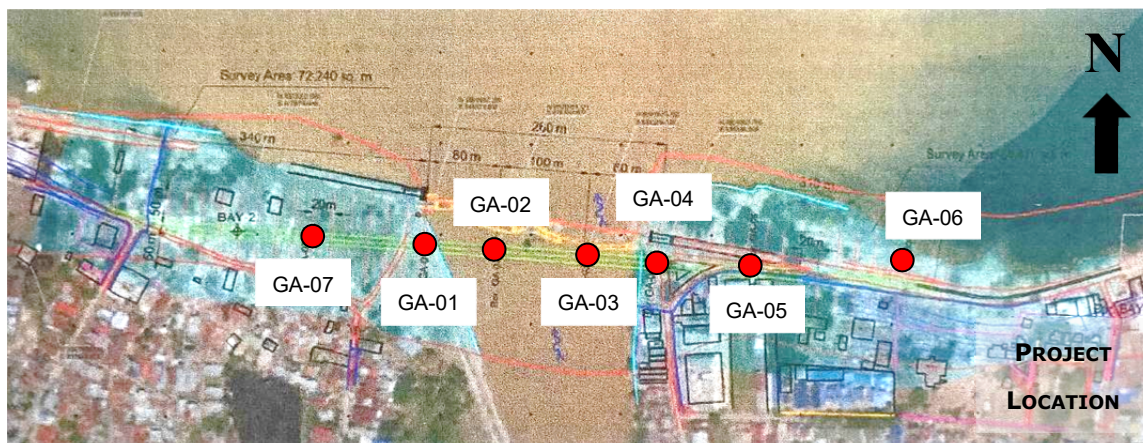
Source: JICA Study Team

Figure 1-2-6 Topographic Survey Results

(2) Geotechnical Survey

1) Survey position and survey method

Boring surveys and SPT tests were conducted under supervision of JICA Study Team to contribute to the foundation ground design of bridges and approach roads. The location of the survey is shown in Figure 1-2-7, and the survey quantity is shown in Table 1-2-3.



Source: JICA Study Team

Figure 1-2-7 Boring survey position

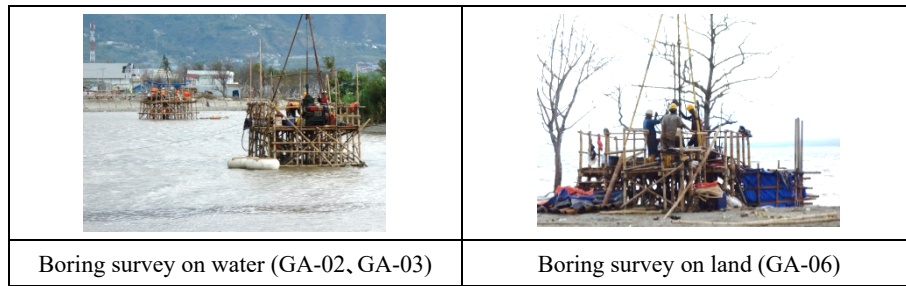
Table 1-2-3 Outline of Boring survey

No.	Bore Hole	Total Depth	SPT	Co-ordinate in UTM 50 South		EGM-08	Remark
	ID#	(m)	(unit)	Easting	Northing	Elevation	
				E (m)	N (m)	Z (m)	
1	GA-01	66.00	65	818,079.45	9,901,987.76	2.42	Left bank
2	GA-02	66.38	58	818,159.73	9,901,981.71	0.97	River-bed
3	GA-03	67.40	59	818,259.57	9,901,974.20	0.57	River-bed
4	GA-04	69.45	69	818,338.72	9,901,968.25	2.72	Right bank
5	GA-05	68.30	59	818,438.36	9,901,960.12	2.52	Right bank side
6	GA-06	65.45	55	818,616.83	9,901,971.53	2.54	Right bank side
7	GA-07	66.40	56	817,959.56	9,901,994.73	2.08	Left bank side

Source: JICA Study Team

Boring investigations were conducted until stable support layer confirmation, and SPT tests were conducted every 1 m except for sampling places with less disturbance.

The survey was conducted 5 on land and 2 on water. The survey status is shown in Figure 1-2-8.



Source: JICA Study Team

Figure 1-2-8 Boring survey

Laboratory soil tests were conducted using boring samples (see Table 1-2-4).

Table 1-2-4 Outline of Laboratory test

Soil Test	purpose
Moisture content	Verification of physical characteristics
Specific Gravity	
Bulk Density	
Sieve	
Atterberg's Limits	
Direct Shear	Confirmation of strength characteristics and liquefaction strength
Unconfined Compression Test	
Triaxial UU	
Triaxial CU	
Consolidation Test	

Source: JICA Study Team

The method of conducting the boring survey and the laboratory soil test is shown in Table 1-2-5.

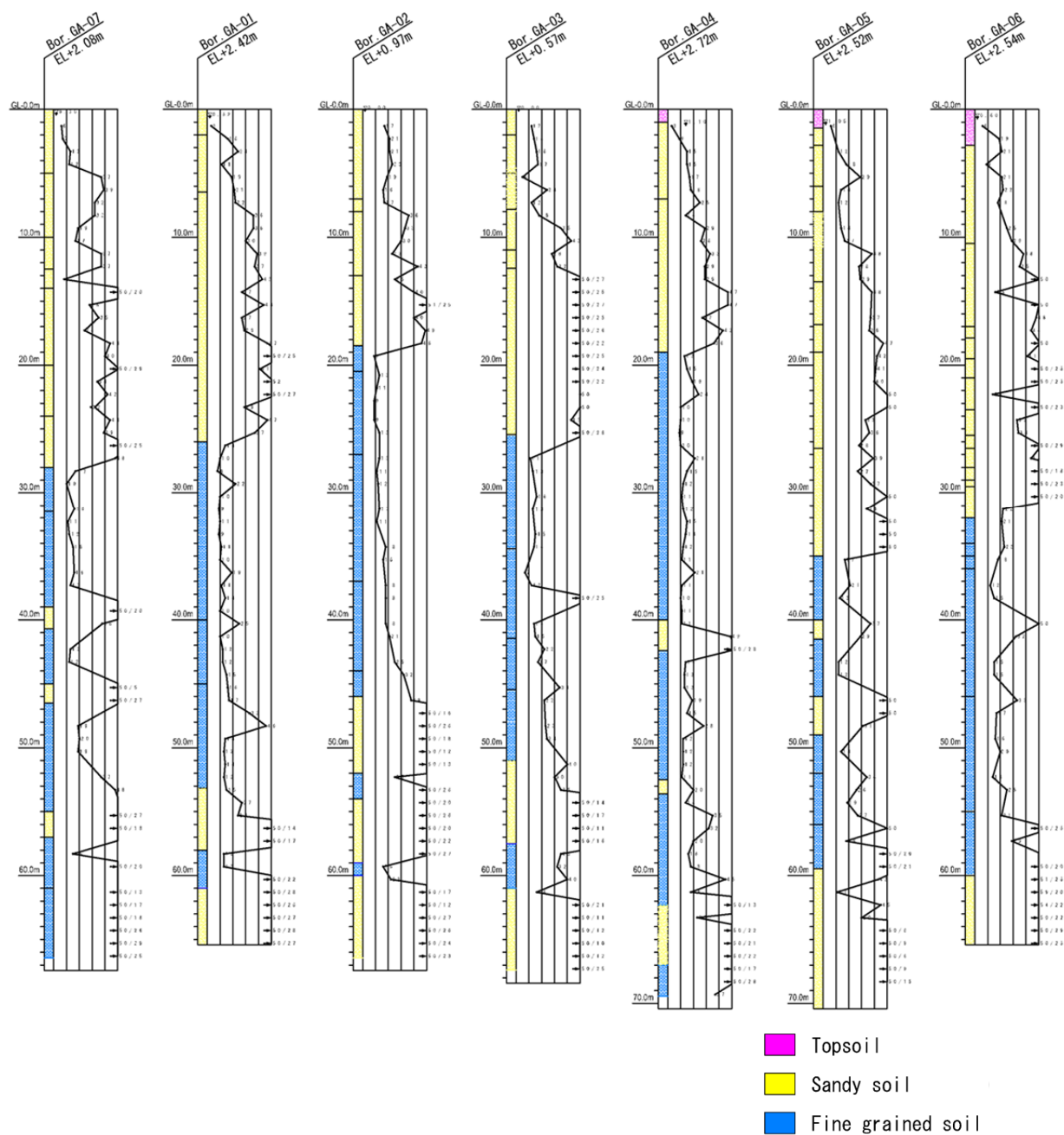
Table 1-2-5 Implementation criteria for boring surveys and laboratory test

ASTM Ref.	TYPE OF INVESTIGATION WORKS
GENERAL	
D420	Standard guide for investigating and sampling soil and rock
EXPLORATORY BORING, CLASSIFICATION, LOGGING AND SAMPLING	
D1587	Standard practice for thin-walled tube sampling of soils
D2113	Standard practice for diamond core drilling for site investigation
D2487	Standard classification of soils for engineering purposes (unified soil classification system)
D2488	Standard practice for description and identification of soils (visual-manual procedure)
D4220	Standard practice for preserving and transporting soil samples
IN-SITU TESTING	
D6089	Standard method for groundwater level measurement
D1586	Standard test method for penetration test and split-barrel sampling of soils
LABORATORY TESTING	
D422	Standard test method for particle-size analysis
D854	Standard test method for specific gravity of soils
D698	Test method for laboratory compaction characteristics of soil using standard effort (12,400 ft-lbs/ft ³ (600 kN-m/m ³))
D2166	Standard Test Method for Unconfined Compressive Strength of Cohesive Soil
D2216	Standard test method for laboratory determination of water (moisture) content of soil and rock
D2217	Standard practice for wet preparation of soil samples for particle size analysis and determination of soil constants
D2435	Standard test method for one-dimensional consolidation properties of soils
D2850	Standard test method for unconsolidated un-drained compressive strength of cohesive soils in triaxial compression
D4318	Standard test method for liquid limit, plastic limit, and plasticity index of soils
D4643	Standard test method for determination of water (moisture) content of soil by the microwave oven method

Source: JICA Study Team

2) Boring survey results

The results of the boring survey are shown in Figure 1-2-9. Soil quality is classified into topsoil, sandy soil and fine grained soil. The results of the SPT test conducted every 1 m were also described.

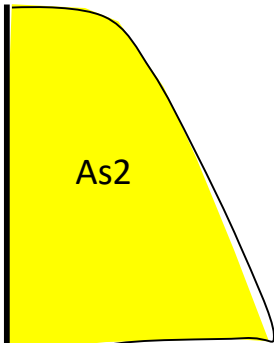
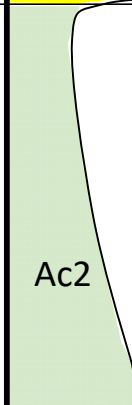
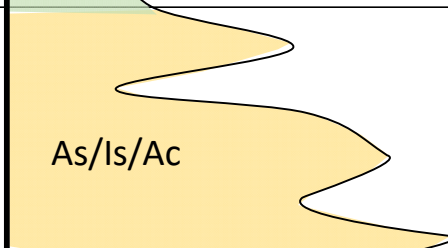



Source: JICA Study Team

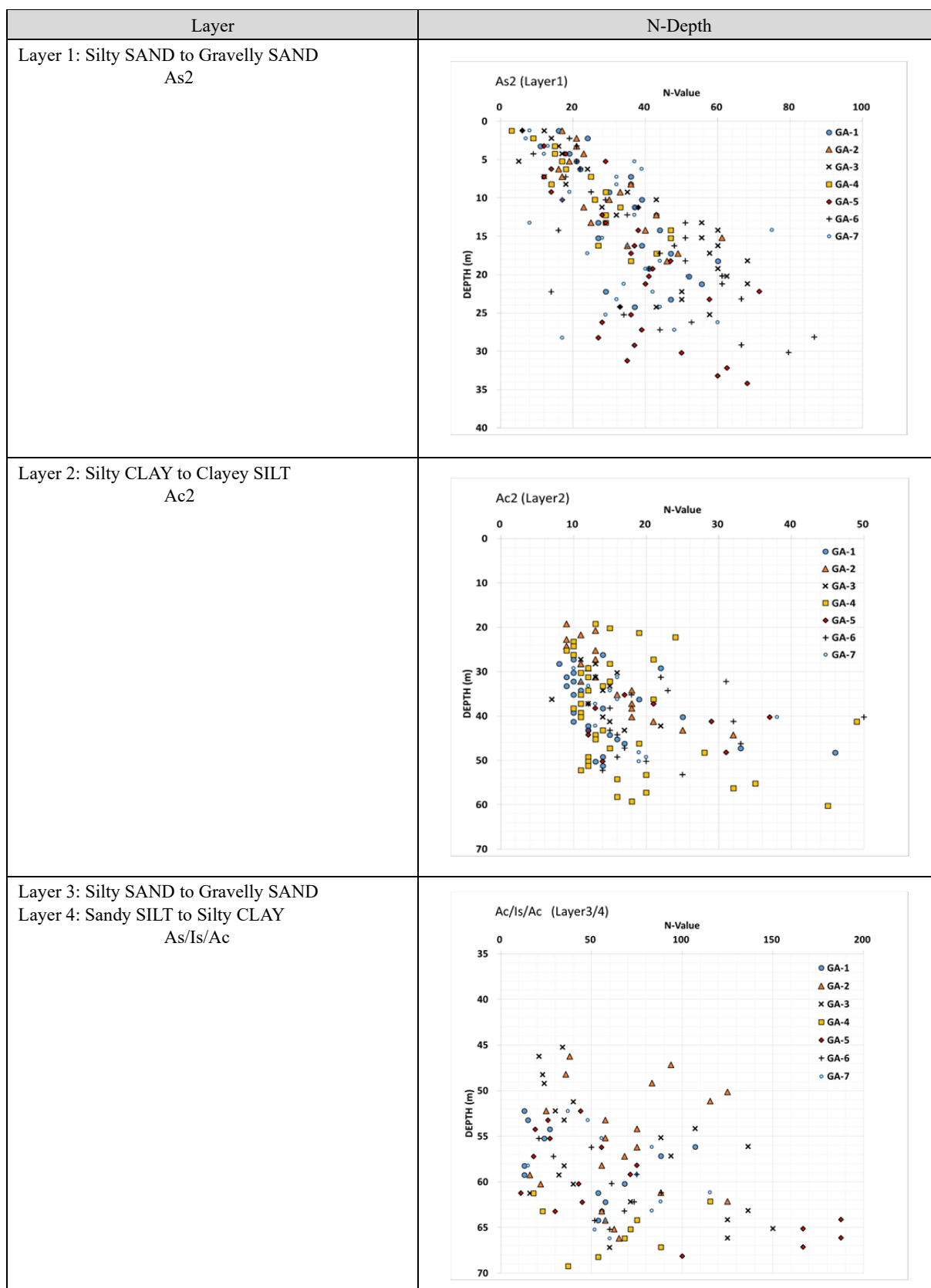
Figure 1-2-9 Boring outline column chart

The soil composition and stratigraphy of the Palu river mouth are summarized in Table 1-2-6 Figure 1-2-10 is the N value-depth distribution chart of each layer, and Table 1-2-7 is the N value and particle size characteristics for each boring hole.

Table 1-2-6 Implementation criteria for boring surveys and laboratory test

Stratum	Overview	Columnar
<p>▪ Layer 1: Silty SAND to Gravelly SAND</p> <p>As2</p>	<p>Layer 1 mostly consist grayish brown to dark gray Silty SAND to Gravelly SAND and yellowish brown sand with consistency loose up to very dense.</p> <p>Mostly the SPT value of this layer is 3 up to >50, and the thickness of this layer is about 19 meters up to 35 meters.</p>	
<p>▪ Layer 2: Silty CLAY to Clayey SILT</p> <p>Ac2</p>	<p>Layer 2 mostly consist dark gray Silty CLAY to Clayey SILT insertion gray Sandy GRAVEL, and Clayey SAND to Silty SAND with low to high plasticity and consistency medium stiff up to hard.</p> <p>Mostly the SPT value of this layer is 8 up to >50, and the thickness of this layer is about 21 meters up to 42 meters.</p>	
<p>▪ Layer 3: Silty SAND to Gravelly SAND</p> <p>As/Is/Ac</p>	<p>Layer 3 mostly consist gray Silty SAND to Gravelly SAND with consistency very stiff up to dense.</p> <p>Mostly the SPT value of this layer is 15 up to >50, and the thickness of this layer is about 1 meters up to 12 meters.</p>	
<p>▪ Layer 4: Sandy SILT to Silty CLAY</p> <p>Ac</p>	<p>Layer 4 mostly consist gray Sandy SILT to Silty CLAY with consistency hard.</p> <p>Mostly the SPT value of this layer is up to >50, and the thickness of this layer is about 1 meter up to 4.5 meters.</p>	

Source: JICA Study Team



Source: JICA Study Team

Figure 1-2-10 Stratified N-value depth distribution

Table 1-2-7 N value and grain size characteristics for each boring

Boring	N value and grain size characteristics for each soil type											
GA-01 Depth 66.00m	35 GA-01											
		N av	N med	N max	N min	N count a	std	Av- STD/ 2	Gravel av	Sand	Silt and Clay av	
	As2	35.0	36.5	60.0	11.0	24	12.4	28.76	17.0	76.8	6.2	
	Ac2	13.1	12.0	25.0	8.0	24	4.2	11.05	0.0	6.7	93.3	
	As	51.5	53.6	107.1	13.0	11	28.7	37.11	0.2	75.1	24.7	
	Ac	40.6	40.6	68.2	13.0	2	27.6	26.8				
	Is	30.7	33.0	46.0	13.0	3	13.6	23.9	0.0	37.5	62.5	
GA-02 Depth 66.38m	31 GA-02											
		N av	N med	N max	N min	N count a	std	Av- STD/ 2	Gravel av	Sand	Silt and Clay av	wet densit y
	As2	30.0	25.0	61.2	16.0	17	12.4	23.8	17.8	69.2	13.0	
	Ac2	15.3	13.0	32.0	9.0	20	5.8	12.4	0.0	8.4	91.7	1.74
	As	72.0	65.2	125.0	22.0	18	29.1	57.4	0.0	81.9	18.1	
	Ac	20.5	20.5	25.0	16.0	2	4.5	18.3	0.0	10.4	89.6	
	Is	66.3	66.3	75.0	57.7	3	8.7	62.0	0.0	40.0	60.0	1.94
GA-03 Depth 67.40m	40 GA-03											
		N av	N med	N max	N min	N count a	std	Av- STD/ 2	Gravel av	Sand	Silt and Clay av	wet densit y
	As2	40.2	43.0	68.2	5.0	25	20.2	30.1	19.0	68.7	12.4	
	Ac2	13.4	14.0	17.0	7.0	11	2.6	12.1	0.0	14.2	85.8	1.685
	As	77.7	65.7	150.0	16.0	16	44.8	55.3	0.8	81.4	17.8	
	Ac	53.6	35.0	93.8	32.0	3	28.4	39.4	0.0	13.3	86.7	
	Is	25.5	23.5	34.0	21.0	7	5.0	23.0	0.0	29.2	70.8	1.87
GA-04 Depth 69.45m	27 GA-4											
		N av	N med	N max	N min	N count a	std	Av- STD/ 2	Gravel av	Sand	Silt and Clay av	
	As2	27.0	27.0	47.0	9.0	17	11.3	21.4	16.0	72.7	11.3	
	Ac2	14.6	13.0	32.0	9.0	36	4.8	12.2	0.0	7.3	92.7	
	As	62.4	68.2	115.4	18.0	9	28.9	48.0	0.0	47.5	52.5	
	Ac	45.3	45.3	53.6	37.0	2	8.3	41.1	0.0	13.1	86.9	
	Is	26.3	28.0	35.0	16.0	3	7.8	22.4	0.0	24.9	75.1	
GA-05 Depth 68.30m	#N/A GA-5											
		N av	N med	N max	N min	N count a	std	Av- STD/ 2	Gravel av	Sand	Silt and Clay av	wet densit y
	As2	36.6	36.5	71.4	12.0	30	15.9	28.6	22.1	65.5	12.4	
	Ac2	14.8	13.5	21.0	12.0	6	3.2	13.2	3.5	11.3	85.2	1.74
	As	104.1	100.0	187.5	11.0	9	69.2	69.5	6.3	92.9	0.8	
	Ac	19.0	19.0	19.0	19.0	1	0.0	19.0	0.0	8.1	91.9	
	Is	43.8	40.5	75.0	18.0	13	17.9	34.8	16.8	37.1	46.1	1.74
GA-06 Depth 65.45m	#N/A GA-6											
		N av	N med	N max	N min	N count a	std	Av- STD/ 2	Gravel av	Sand	Silt and Clay av	wet densit y
	As2	39.5	38.0	86.7	6.0	29	20.7	29.1	7.2	84.0	8.8	
	Ac2	20.6	18.0	33.0	12.0	15	6.6	17.3	0.0	6.6	93.4	
	As	60.6	61.2	88.5	21.0	8	19.5	50.9	0.0	63.7	36.3	
	Ac	29.0	29.0	29.0	29.0	1	0.0	29.0	0.0	6.6	93.4	
	Is	58.3	50.0	75.0	50.0	3	11.8	52.4	0.0	48.8	51.2	
GA-07 Depth 66.40m	32 GA-7											
		N av	N med	N max	N min	N count a	std	Av- STD/ 2	Gravel av	Sand	Silt and Clay av	wet densit y
	As2	32.2	33.0	75.0	7.0	28	15.9	24.2	11.1	75.7	13.2	
	Ac2	14.5	13.0	20.0	10.0	12	3.3	12.9	0.0	6.8	93.2	
	As	96.9	55.6	300.0	16.0	6	103.4	45.2	48.7	48.5	2.8	
	Ac	50.4	55.9	75.0	15.0	5	22.1	39.4	0.0	4.6	95.5	
	Is	71.1	70.5	115.4	37.0	8	24.2	59.0	0.0	25.0	75.0	

Source: JICA Study Team

Groundwater level; Boring is carried out at the estuary of the Palu River, 50 to 100 m away from the coastline, and the groundwater level is distributed shallower than GL-2 m.

Table 1-2-8 Water level in borehole

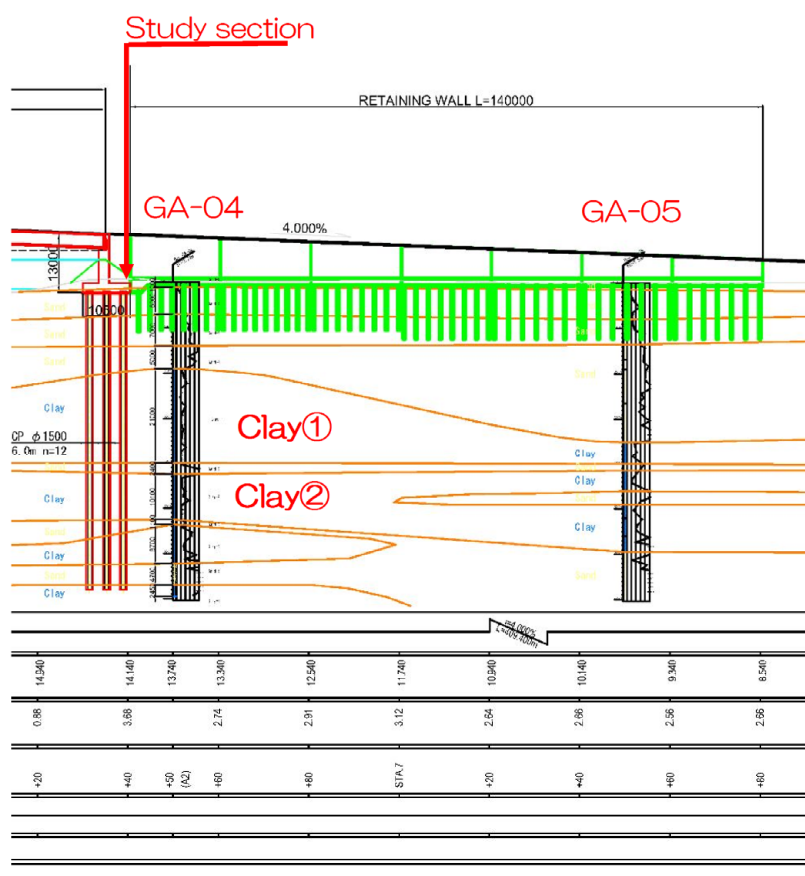
No.	Borehole ID#	Ground Water Level (GL- m)
1	GA-01	0.52
2	GA-02	0.00 (on river)
3	GA-03	0.00 (on river)
4	GA-04	1.1
5	GA-05	1.5
6	GA-06	0.6
7	GA-07	0.3

Source: JICA Study Team

3) Rough settlement examination of embankment

(a) Examination cross section

The study section was the east side abutment back surface embankment with the largest embankment height and thickness of cohesive soil.

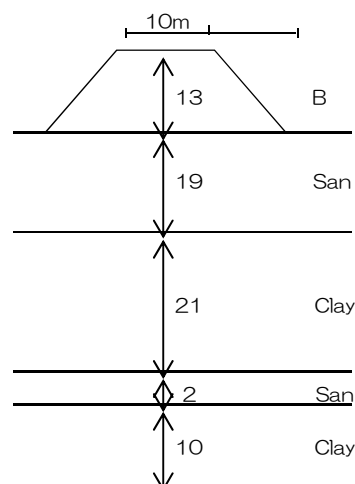


Source: JICA Study Team

Figure 1-2-11 Settlement study section

(b) Examination model

Clay1 and Clay2 were targeted as main consolidation target layers.



Source: JICA Study Team

Figure 1-2-12 Examination model

(c) Study results

Consolidation settlement amount of Clay①

The influence values of the vertical effective stress at the position of the depth z in the trapezoidal strip-shaped embankment with the road width and the slope width b is as follows from FIG.

$$a = 26, b = 5, z = 29$$

$$\frac{a}{z} = 0.9, \frac{b}{z} = 0.2, I = 0.3 \text{ (Assuming a symmetrical embankment } I = 0.6)$$

Thus, the increased vertical effective stress at depth Z is:

$$\Delta p = I \cdot \delta_E = I \cdot H_E \cdot \gamma_E = 0.6 \times 13 \times 20 = 156 \text{ kN/m}^2$$

The amount of consolidation settlement in the Δe method is as follows.

$$P_o = 18 \times 19 + 17 \times 10 = 512 \text{ kN/m}^2$$

$$P_o + \Delta P = 512 + 156 = 668 \text{ kN/m}^2$$

$$\Delta e = 0.05, \quad e_o = 0.92$$

$$S = \frac{\Delta e}{1 + e_o} H = \frac{0.05}{1 + 0.92} \times 21 = 0.55 \text{ m}$$

Consolidation settlement amount of Clay ②

Calculate like Clay1

$$a = 26, b = 5, z = 47$$

$$\frac{a}{z} = 0.55 \quad \frac{b}{z} = 0.11 \quad I = 0.2 \text{ (Assuming a symmetrical embankment } I = 0.4 \text{)}$$

$$\Delta p = I \cdot \delta_E = I \cdot H_E \cdot \gamma_E = 0.4 \times 13 \times 20 = 104 \text{ kN/m}^2$$

$$P_o = 18 \times 19 + 17 \times 21 + 18 \times 2 + 17 \times 5 = 820 \text{ kN/m}^2$$

$$P_o + \Delta P = 820 + 104 = 924 \text{ kN/m}^2$$

$$\Delta e = 0.03, \quad e_o = 0.88$$

$$S = \frac{\Delta e}{1 + e_o} H = \frac{0.03}{1 + 0.88} \times 10 = 0.16 \text{ m}$$

Consolidation settlement amount of Clay1 + Clay2

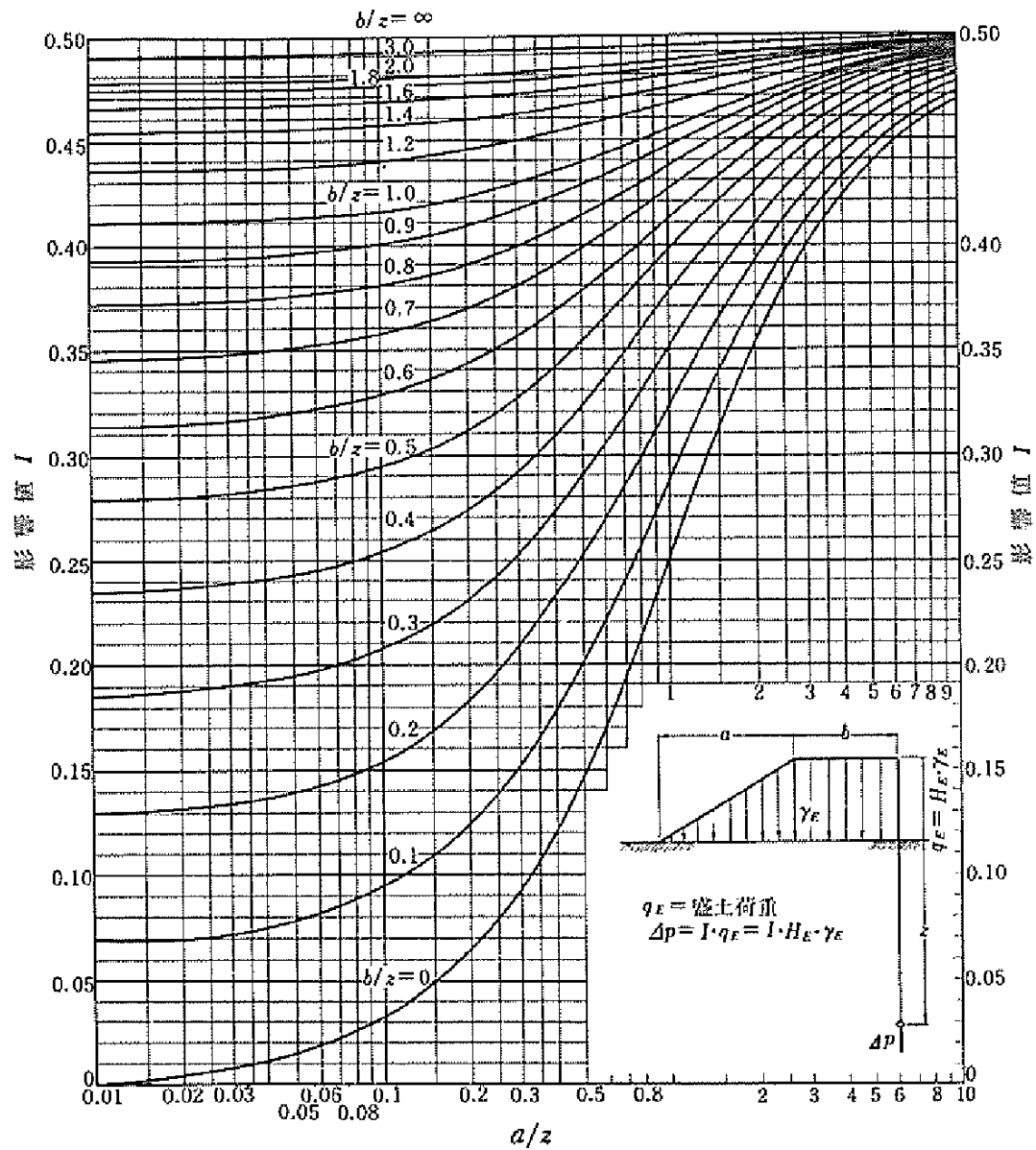
$$S = 0.55 + 0.16 = 0.71 \text{ m}$$

Consolidation settling time of Clay 1

$$t = \frac{\left(\frac{H}{2}\right)^2}{C_v} T_v = \frac{\left(\frac{2100}{2}\right)^2}{0.05} 0.848 = 18700000 \text{ min} = 12985 \text{ day} = 35 \text{ year}$$

T_v: Time factor (at 90% consolidation)

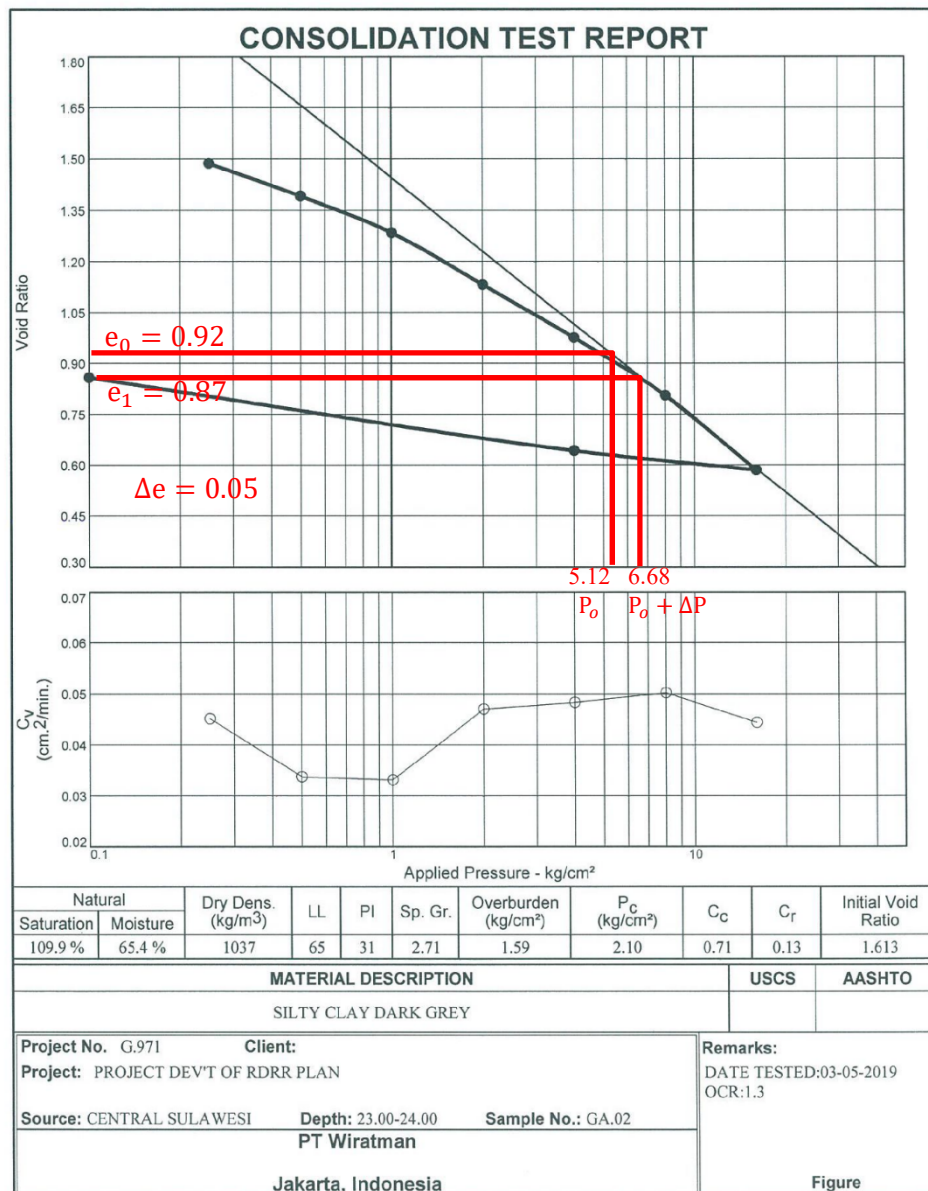
From the above, the total settlement amount is about 70 cm and the consolidation period is about 35 years.



Source: Japanese Standard

Figure 1-2-13 Vertical stress influence value in ground by trapezoidal band load

Clay①

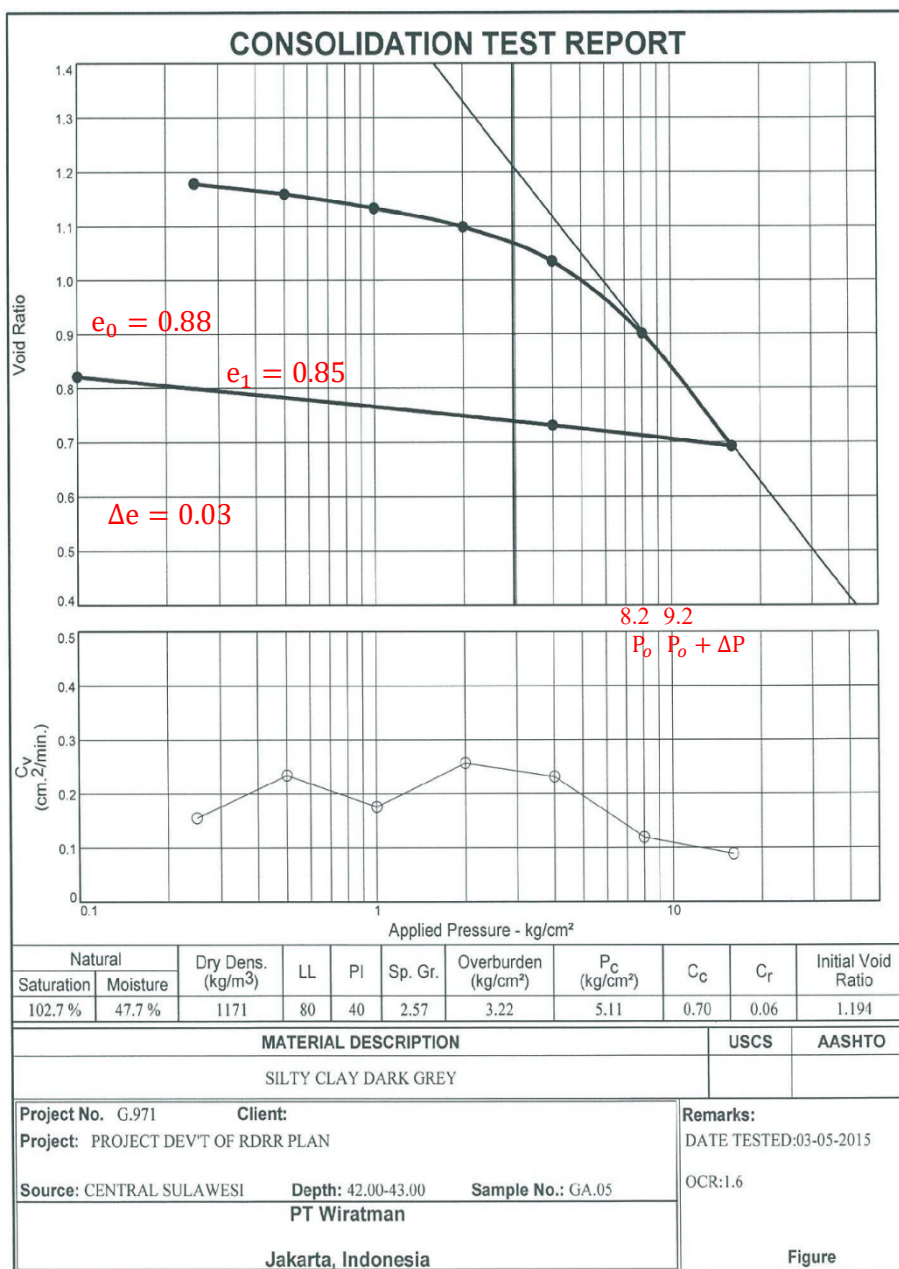


Tested By: DD Checked By: SH

Source: JICA Study Team

Figure 1-2-14 Clay① e-logP Curve (Boring GA.02, GL-23-24m)

Clay②



Tested By: DD Checked By: SH

Source: JICA Study Team

Figure 1-2-15 Clay② e-logP Curve (Boring GA.05, GL-42-43m)

1-3 Environmental and Social Considerations

1-3-1 Environmental and Social Considerations

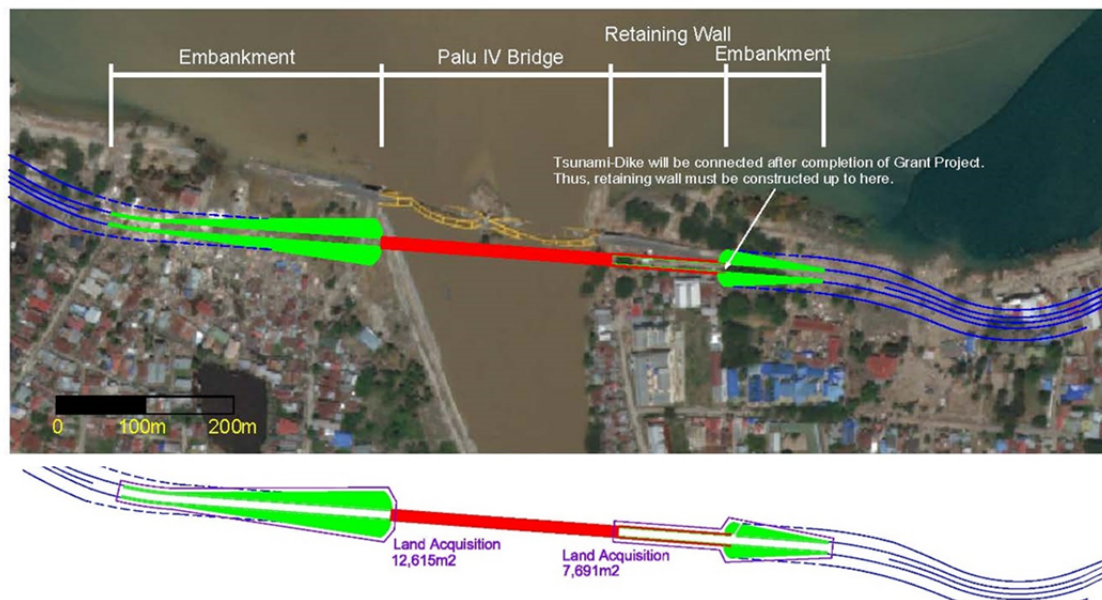
1-3-1-1 Project Component

The outline of the Grant Project is summarized in Table 1-3-1. It is a reconstruction of original Palu 4 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. Detailed design will be conducted in April and May 2019 and address further technical issues.

Table 1-3-1 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 ² (including about 3,000 m ² of existing road) Left bank: about 12,620 m ² , Total: about 20,320 m ²
* 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 1-3-1 Outline of the Project as of April 1, 2019

1-3-1-2 Existing environment and social conditions

(1) Pollution

1) Air Quality, Noise and Odor

In Palu City and Central Sulawesi province, detailed data on air quality, noise and odor cannot be obtained through investigation.

2) Water quality

(a) Surface water

In Central Sulawesi province, detailed data on surface water quality has not been able to be obtained.

In Palu city, regarding surface water quality, monitoring data is shown in tables below.

Palu City performed surface water quality monitoring permukaan on 24 April 2018 based on the thresholds set by the Republic of Indonesia Government Regulation No. 82 of 2001 in three locations, namely:

- River water, Kampung Lere Village, West Palu Subdistrict
- Palu River water, Tatanga Village
- River water under Bridge I Palu

Table 1-3-2 River Water Quality Monitoring Results in Palu Rver

No	Parameters	Unit	Standard by Water Class				Palu Lere	Palu Palul	Palu Tatanga
			I	II	III	IV			
Physical									
1	Temperature	°C	Deviasi 3	Deviasi 3	Deviasi 3	Deviasi 3	30/27	30/29	30/29
2	Turbidity	NTU	-	-	-	-	1.35	78.9	78.9
3	Dissolved Solid	mg/L	1.000	1.000	1.000	2.000	151	135	135
4	Suspended Solid	mg/L	50	50	400	400	355	372	372
5	DHL	μS	-	-	-	-	109	98	98
Chemical									
1	Iron, Fe	mg/L	0.3	-	-	-	<u>0.36</u>	0.10	0.10
2	BOD	mg/L	2	3	6	12	<u>8.45</u>	<u>8.0</u>	<u>8.0</u>
3	COD	mg/L	10	25	50	100	< 25	< 25	< 25
4	DO	mg/L	6	4	3	0	3.25	3.15	3.15
5	Chloride	mg/L	-	600	-	-	6.5	10.3	10.3
6	Manganese	mg/L	0.1	-	-	-	0.01	<u>0.24</u>	0.24
7	Oils and Grease	mg/L	1.000	1.000	1.000	-	Nihil	Nihil	Nihil
8	Nitrate, NO ₃ -N	mg/L	10	10	20	20	0.19	0.24	0.24
9	Nitrite, NO ₂ -N	mg/L	0.06	0.06	0.06	-	< 0.003	< 0.003	< 0.003
10	pH	-	6-9	6-9	6-9	5-9	6.65	5.98	5.98
11	Free Ammonium, NH ₃ -N	mg/L	0.5	-	-	-	0.13	0.11	0.11
12	Zinc, Zn	mg/L	0.05	0.05	0.05	2	< 0.01	< 0.01	< 0.01
13	Cyanide, CN [#]	mg/L	0.02	0.02	0.02	-	< 0.002	<u>0.09</u>	<u>0.09</u>
14	Sulfide, H ₂ S	mg/L	400	-	-	-	27.0	17.5	17.5
15	Mercury, Hg [#]	mg/L	0.03	0.03	0.03	1	< 0.01	< 0.01	< 0.01
16	Surfactants, MBAS	ug/L	200	200	200	-	< 0.01	< 0.01	< 0.01
17	Organic Matter	mg/L	-	-	-	-	3.35	8.25	8.25
Biological									
1	E. Coli	MPN/100 ml	1000	5000	10000	10000	139	39	39
2	Coliform	MPN/100 ml	100	1000	2000	2000	139	39	39

Source : Environmental Agency of Palu City Surface water In Palu city, regarding ground water quality, monitoring data is shown in tables below.

Table 1-3-3 Results of Groundwater Quality Monitoring in Palu City

No	Parameters	Unit	Water Class				Lagarutu Road	TPA Kawatuna
			I	II	III	IV		
Physical								
1	Odor	-	-	-	-	-	No odor	No odor
2	Taste	-	-	-	-	-	No taste	No taste
3	Temperature	°C	Deviasi 3	Deviasi 3	Deviasi 3	Deviasi 3	28/30	27/29
4	Colour	TCU	-	-	-	-	< 5	< 5
5	Turbidity	NTU	-	-	-	-	0.59	0.81
6	Dissolved Solid	mg/L	1.000	1.000	1.000	2.000	322	499
7	Suspended Solid	mg/L	50	50	400	400	120	98
Chemical								
1	Iron, Fe	mg/L	0.3	-	-	-	0.04	< 0.01
2	BOD	mg/L	2	3	6	12	0.09	0.10
3	COD	mg/L	10	25	50	100	< 0.01	< 0.01
4	DO	mg/L	6	4	3	0	190.50	217,98
5	Chloride	mg/L	-	600	-	-	4.98	6.51
6	Manganese	mg/L	0.1	-	-	-	< 0.01	< 0.01
7	Oils and Grease	mg/L	1.000	1.000	1.000	-	Nihil	Nihil
8	Nitrate, NO ₃ -N	mg/L	10	10	20	20	< 0.01	1.13
9	Nitrite, NO ₂ -N	mg/L	0.06	0.06	0.06	-	< 0.003	< 0.003
10	pH	-	6-9	6-9	6-9	5-9	6.64	6.75
11	Surfactants, MBAS	ug/L	200	200	200	-	< 0.01	< 0.01
12	Organic Matter	mg/L	-	-	-	-	2.5	1.99
Biological								
1	E. Coli	MPN/100 ml	1000	5000	10000	10000	95	76
2	Coliform	MPN/100 ml	100	1000	2000	2000	95	76

Source: Environmental Agency of Palu City

(2) Natural Environment

1) Meteorology/Weather

In Central Sulawesi Province, regarding data of meteorology/weather, there are four monitoring station. Location of monitoring station is in Banggai Regency, Poso Regency, Tolitoli Regency, and Palu City. Monitoring result in 2017 in each monitoring station is shown table below.

Table 1-3-4 Monitoring result in 2017

Information	Station			
	Palu	Poso	Tolitoli	Luwuk
Annual Maximum Temperature (°C)	33.8	32.8	32.0	32.2
Annual Minimum Temperature (°C)	23.5	22.7	22.3	23.9
Annul Average Temperature (°C)	27.5	27.7	27.0	28.0
Annual Average Humidity (percent)	79.3	83.6	83.4	77.2
Annual Average Atmospheric Pressure (mb)	1,008.2	1,009.3	1,010.2	1,011.1
Annual Average Wind Velocity (knot)	4.5	2.3	2.0	3.4
Annual Average Precipitation (mm)	71,7	169,6	217,8	134,6
Annual Average Duration of Sunshine (percent)	59.0	54.8	57.4	-

Source: Central Sulawesi Province in Figures 2018

In Palu city, monthly average of temperature and humidity 2017 is shown in table below. Minimum temperature is 21.9 °C in January and maximum temperature is 33.8 °C in April and the lowest monthly average temperature is 27.0 °C in January and the highest monthly average temperature is 28.3 °C in December. Regarding humidity, the lowest monthly average is 75.5% in April and the highest monthly average is 84.0 % in June.

Table 1-3-5 Monthly Average of temperature and humidity in Palu City 2017

Month	Temperature (°C)			Humidity (%)
	Minimum	Maximum	Average	
January	21.9	32.3	27.0	79.4
February	23.9	32.7	27.4	78.8
March	23.8	32.9	27.3	78.2
April	24.2	33.8	28.1	75.5
May	24.6	33.5	28.0	80.1
June	23.7	30.9	26.7	84.0
July	23.5	31.7	26.8	82.6
August	23.7	31.8	26.9	82.3
September	23.6	32.8	27.4	80.1
October	24.0	32.9	27.9	78.8
November	24.4	33.1	28.2	77.1
December	24.2	33.2	28.3	74.9

Source: Palu City in Figures 2018

Monthly Average of Air Pressure, Wind Velocity and The Most of Wind Direction in Palu City is shown in table below. Regarding air pressure, July are the highest, 1,012.0 mb and June is the lowest, 978.1 mb. Wind velocity is stable and it's 4 or 5 knots. The most of wind direction is North or North West.

Table 1-3-6 Monthly Average of Air Pressure, Wind Velocity and The Most of Wind Direction in Palu City, 2017

Month	Air Pressure (mb)	Wind Velocity (knots)	The Most of Wind Direction
January	1,010.9	4	North
February	1,011.4	5	North
March	1,011.5	5	North
April	1,010.4	5	NorthWest
May	1,011.0	5	NorthWest
June	978.1	4	NorthWest
July	1,012.0	4	NorthWest
August	1,011.3	4	NorthWest
September	1,011.5	4	NorthWest
October	1,010.4	5	NorthWest
November	1,009.3	5	NorthWest
December	1,011.1	4	NorthWest

Source: Palu City in Figures 2018

Monthly Average of Rainy Day, Rainfall and Length of Daylight in Palu City Based On Month, 2017 is shown in table below. Regarding number of rainy day, period from June to November is more than

20 days. Regarding rain fall, June is the highest, 166 mm, and December is the lowest, 25 mm. Regarding length of day light, October is the highest, 67 %, and February is the lowest, 49%.

Table 1-3-7 Monthly Avergae of Rainy Day, Rainfall and Length of Daylight in Palu City 2017

Month	The Number of Rain (Day)	Rain fall (mm)	Length of Daylight (%)
January	11	44	61
February	19	52	49
March	22	43	56
April	18	37	62
May	16	72	64
June	22	166	50
July	23	95	58
August	23	121	54
September	24	86	64
October	25	85	67
November	20	36	65
December	14	25	59

Source: Palu City in Figures 2018

2) Topography and geology

Topography and geology around the project area are described in the chapter 1-2-3.

3) Hydrology

In Palu city, detailed data on hydrology has not been able to be obtained through investigation.

4) Land Use

In Central Sulawesi province and Palu City, detailed data on land use has not been able to be obtained through investigation.

5) Flora and Fauna

In Central Sulawesi province including Palu city, Sigi regency and Donggala regency, regarding data on flora and fauna, endemic species are shown in table below.

Table 1-3-8 Endemic species of flora in Central Sulawesi

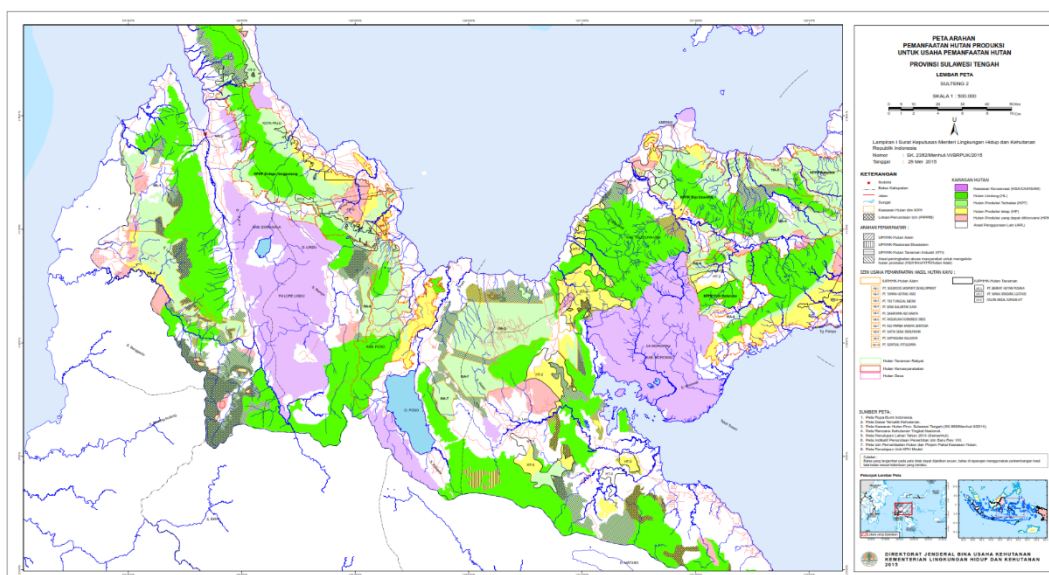
No.	Name	No.	Name
Flora		Mammalia	
Lowland Forest			
1	<i>Mussaendopsis beccariana</i>	1	<i>Anoa quarlesi</i>
2	<i>Strychnos axillaris</i> ,	2	<i>Anoa depressicornis</i>
3	<i>Celtis sp.</i> ,	3	<i>Babyrousa babyrussa</i>
4	<i>Pterospermum subpeltatum</i> ,	4	<i>Sus celebensis</i>
5	<i>Canarium odoratum</i> ,	5	<i>Macaca tonkeana</i>
6	<i>Durio zibenthinus</i>	6	<i>Phalanger ursinus</i>
Low Mountains Forest		7	<i>Phalanger celebensis</i>
7	<i>Castanopsis argentea</i>	8	<i>Tarsius spectrum</i>
8	<i>Lithocarpus spp.</i> ,	9	<i>Cervus timorensis</i>
9	<i>Dacrydium falcifolia</i> ,	Aves	
10	<i>Phyllocladus hypophyllus</i> ,	10	<i>Tanygnathus sumatrana</i>
11	<i>Tristania sp.</i> ,	11	<i>Loriculus exilis</i>
12	<i>Calophyllum spp.</i> ,	12	<i>Trichoglossus platyrus</i>
13	<i>Garcinia spp.</i> ,	13	<i>Cacatua sulphurea</i>
High Plateau/Forest		14	<i>Buceros rhinoceros</i>
14	<i>Podocarpus neriifolia</i>	15	<i>Aceros cassidix</i>
15	<i>Podocarpus imbricatus</i>	16	<i>Anhinga rufa</i>
16	<i>Nephtes sp.</i>	17	<i>Rallus platen</i>
Glass Plant		18	<i>Scolopax celebensis</i>
17	<i>Orthosiphon aristatus</i> ,	19	<i>Tyto inexpectata</i>
18	<i>Curcuma longa</i> ,	20	<i>Geomalia heinrichi</i>
19	<i>Pangium edule</i>	21	<i>Macrocephalon maleo</i>
		Reptile	
		22	<i>Phyton reticulatus</i>
		23	<i>Ophiophagus Hannah</i>
		24	<i>Elaphe erythrura</i>
		Beaste	
		25	<i>Papilio blumei</i>
		26	<i>Graphium androcles</i>
		27	<i>Appies spp</i>

Source: Lore Lindu National Park

6) Protected Area

The Map of Protected Forest and Utilization Forest in Central Sulawesi Province has been drawn up based on the Regulation of Environment and Forestry Ministry Number SK.2383/ Menhut-VI /BRPUK/ 2015. The forest is categorized into five (5) as follows in Indonesia.

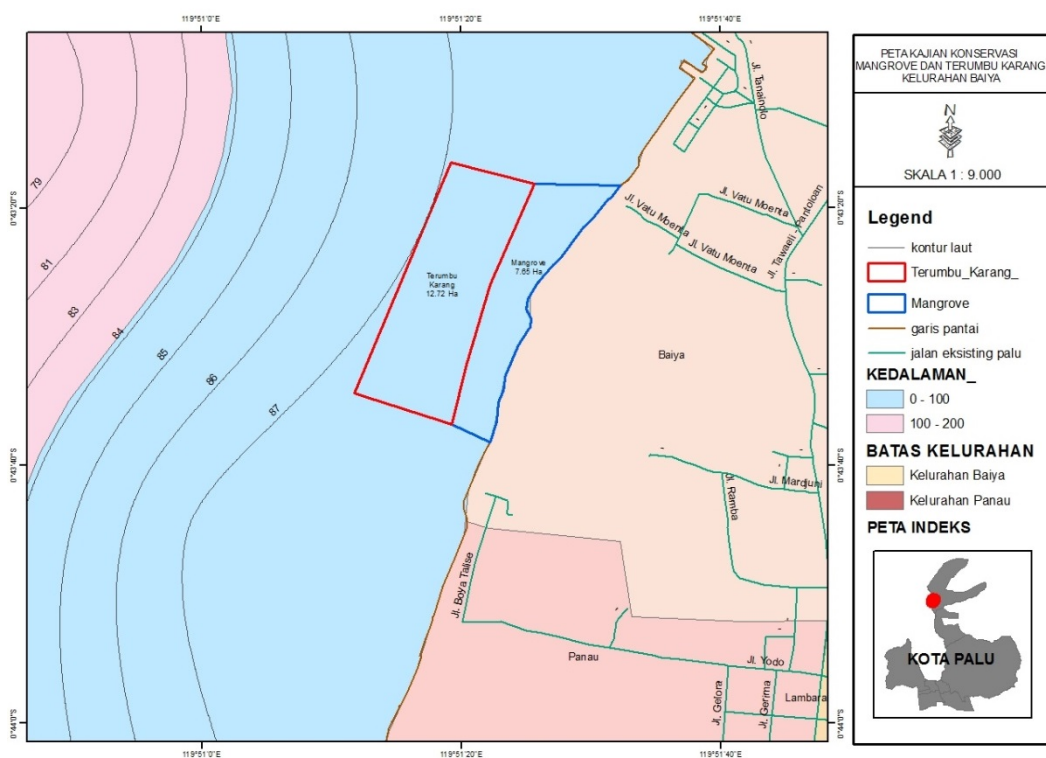
- Conservation Forest
- Protected Forest
- Limited Production Forest
- Production Forest
- Conversion Forest



Source: Map of Protected Forest and Utilization Forest in Central Sulawesi Province 2015

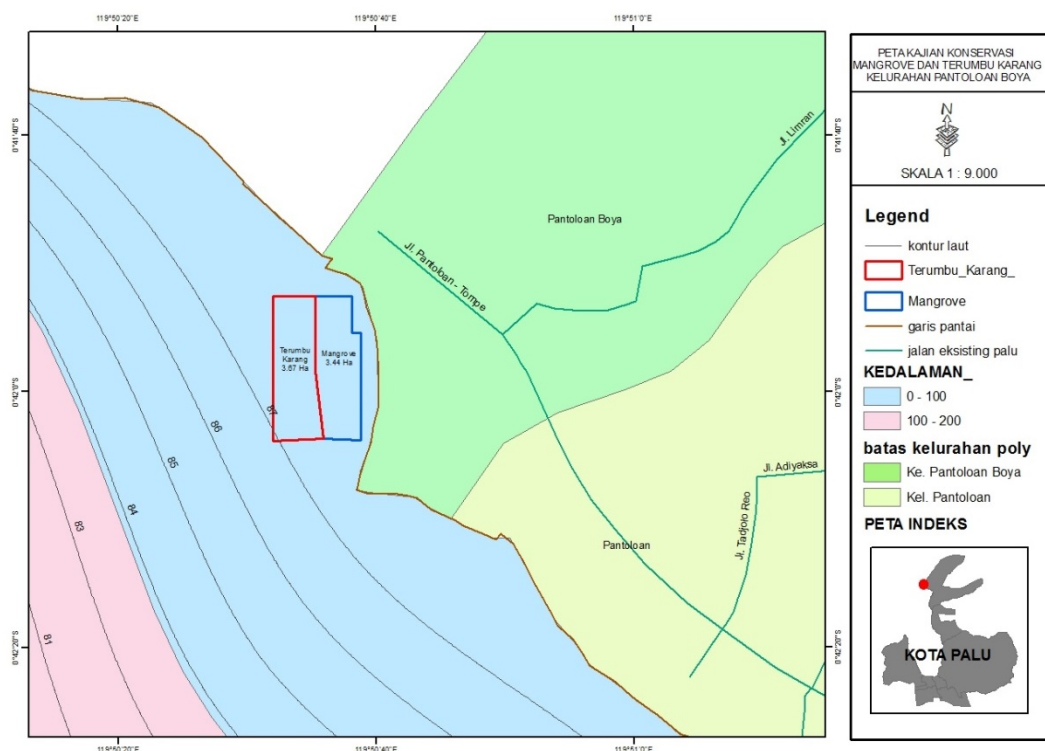
Figure 1-3-2 Forest Map of Central Sulawesi

Palu City has some protected area in the form of coral reef and mangrove that can be seen in Figure 1-3-3, Figure 1-3-4, and Figure 1-3-5. Figure 1-3-5 shows 1.06 ha of mangrove near the Palu 4 Bridge. It is recommended to confirm recent condition after the earthquake.



Source: Map of Coral reef and mangrove in Baiya Subdistrict

Figure 1-3-3 Coral reef and mangrove in Baiya Subdistrict



Source: Map of Coral reef and mangrove in Pantoloan Boya Subdistrict

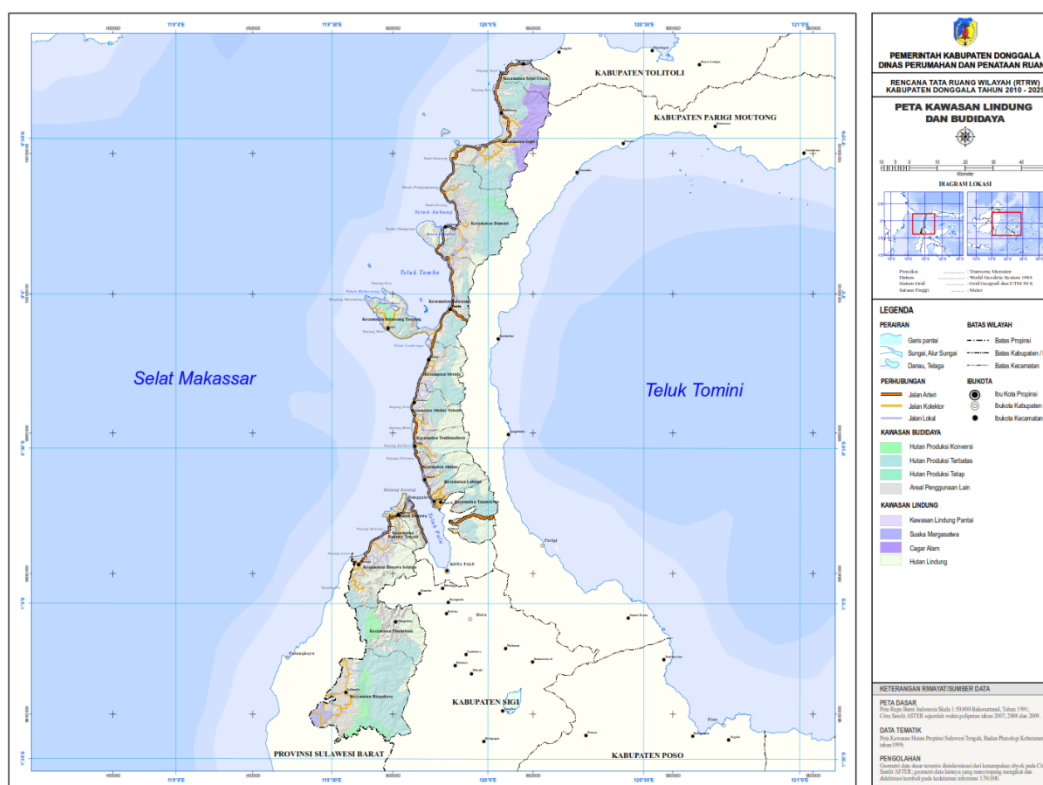
Figure 1-3-4 Coral reef and mangrove in Pantoloan Boya Subdistrict



Source: Map of Coral reef and mangrove in West Besusu Subdistrict

Figure 1-3-5 Coral reef and mangrove in West Besusu Subdistrict

In Donggala regency including Palu Gulf, regarding protected is, map of protected area is shown in figures below.



Source: Map of Protected Area of Donggala Regency

Figure 1-3-6 Protected Area of Donggala Regency

(3) Social Environment

1) Population

In Central Sulawesi, regarding population, there are 2,966,325 people as of 2017 and population growth rate from 2000 to 2017 is 1.65 %. Population data of 1971 to 2017 including ratio of male and female is shown in table below.

Table 1-3-9 Population in Central Sulawesi

Population Census (years)	Sex		Total (Person)	Population Growth (%)
	Male (Person)	Female (Person)		
1971	467,166	446,496	913,662	2.83(1961-1971)
1980	655,285	624,350	1,289,635	3.87(1971-1980)
1990	877,039	834,288	1,711,327	2.87(1980-1990)
2000	1,113,212	1,062,781	2,175,993	2.52(1990-2000)
2010	1,350,844	1,284,165	2,635,009	1.95(2000-2010)
2017	1,514,457	1,451,868	2,966,325	1.65(2000-2017)

Source: Central Sulawesi Province in Figures 2018

Break down of population for each regency and city of Central Sulawesi is shown table below. As of 2017, Palu city has the most population, 379,800 people.

Table 1-3-10 Population and Growth Rate of Population Based on Regency/City in Central Sulawesi Province

Province/City	Population (thousand)			Growth Rate per Year (%)	
	2010	2016	2017	2010-2017	2016-2017
Palu City	338.0	374.0	379.8	1.68	1.54
Donggala	278.6	296.4	299.2	1.02	0.94
Sigi	215.8	232.2	234.6	1.20	1.04
Parigi Moutong	415.3	465.9	474.3	1.92	1.82
Banggai	325.1	360.0	365.6	1.69	1.55
Tolitoli	212.1	228.5	231.0	1.23	1.09
Poso	210.2	240.8	246.0	2.27	2.15
Tojo Una-Una	138.3	149.2	150.8	1.20	1.04
Buol	133.0	152.3	155.6	2.26	2.16
Banggai Kepulauan	109.8	116.0	116.8	0.89	0.69
Morowali Utara	104.6	120.3	123.0	2.34	2.21
Morowali	102.7	115.2	117.3	1.92	1.85
Banggai Laut	62.5	70.9	72.3	2.10	1.99

Source: Central Sulawesi Province in Figures 2018

Population characteristics is shown table below.

Table 1-3-11 Population Based on Age Group and Sex in Central Sulawesi Province

Age Group	Sex (person)		
	Male	Female	Total
0-4	159,585	153,237	312,822
5-9	144,721	136,236	280,957
10-14	142,423	135,127	277,550
15-19	140,886	135,094	275,980
20-24	128,639	124,913	253,552
25-29	125,817	122,396	248,213
30-34	125,904	123,553	249,457
35-39	121,329	116,214	237,543
40-44	107,796	102,176	209,972
45-49	88,8694	83,230	171,924
50-54	70,857	65,886	136,743
55-59	54,973	50,279	105,252
60-64	39,298	36,283	75,581
65+	63,535	67,244	130,779
Total	1,514,457	1,451,868	2,966,325

Source: Central Sulawesi Province in Figures 2018

In Palu city, regarding population, population and population and population growth is shown in table below. As of 2017, Palu Timur district has the biggest number of people in Palu city, 71,452 people, and Tatangan district is the highest population growth in Palu city, 1.60%.

Table 1-3-12 Population and Population Growth Rate by Subdistrict in Palu City, 2017

Districts	Population			Population Growth (%)
	2010 (people)	2016 (people)	2017 (people)	
Palu Barat	98,739	61,424	62,293	1.41
Tatanga	-	39,369	39,997	1.60
Ulujadi	-	27,319	27,763	1.63
Palu Selatan	122,752	69,492	70,571	1.55
Palu Timur	75,967	70,378	71,452	1.53
Mantikulore	-	62,822	63,804	1.56
Palu Utara	39,074	22,834	23,196	1.59
Tawaeli	-	20,382	20,706	1.59
Palu City	336,352	374,020	379,782	1.54

Source: Palu City in Figures 2018

Regarding population and sex ration in each district in Palu city as of 2017 is shown in table below. Excepting Palu Timur District, regarding sex ratio, people of male is more than female in Palu city.

Table 1-3-13 Population and Sex Ratio by Subdistrict in Palu City, 2017

Districts	Sex			Sex ratio
	Male (people)	Female (people)	Total (people)	
Palu Barat	31,194	31,099	61,293	100
Tatanga	20,265	19,732	39,997	103
Ulujadi	13,970	13,793	27,763	101
Palu Selatan	35,583	34,988	70,571	102
Palu Timur	35,409	36,043	71,452	98
Mantikulore	32,332	31,472	63,804	103
Palu Utara	11,608	11,588	23,196	100
Tawaeli	10,519	10,187	20,706	103
Palu City	190,880	188,902	379,782	101

Source: Palu City in Figures 2018

Regarding population for each age group, population by age group and gender in Palu city as of 2017 is shown in table below.

Table 1-3-14 Population by Age Group and Gender in Palu City, 2017

Age Group	Gender (people)		
	Male	Female	Total
0-4	17,239	16,657	33,896
5-9	15,277	14,388	29,665
10-14	15,253	14,627	29,880
15-19	20,719	21,718	42,437
20-24	23,655	22,850	46,505
25-29	16,791	15,926	32,717
30-34	15,341	14,784	30,125
35-39	14,049	14,692	28,741
40-44	13,869	14,286	28,155
45-49	12,200	11,835	24,035
50-54	9,679	9,018	18,697
55-59	6,951	6,712	13,663
60-64	4,559	4,544	9,103
65+	5,298	6,865	12,163
Total	190,880	188,902	379,782

Source: Palu City in Figures 2018

2) Literacy rate

In Central Sulawesi including Palu city, Sigi regency, and Donggala regency, regarding data of literacy rate, data has not been able to be obtained through investigation.

According to World Bank statistics, the adult literacy rate for all of Indonesia in 2016 is 95.377%.

3) Number of Earthquake Victims

In Palu city, regarding number of suffers, number of suffers of earthquake for each district is shown in table below.

Table 1-3-15 Number of Earthquake Victims in Palu City, 2018

Districts	Number of Casualties	Victims	
		Dead	Lost
Mantikulare	319	255	64
Palu Selatan	581	427	154
Tatanga	110	65	45
Tawaeli	155	149	6
Palu Timur	306	279	27
Palu Utara	69	54	15
Palu Barat	943	780	163
Ulujadi	180	122	58
Total	2,663	2,131	532

Source: Bappeda of Palu City 2018

4) Indigenous people

In Central Sulawesi province, regarding indigenous people, Isolated Traditional Communities in Central Sulawesi Province 2017 is shown in table below. The ethnic groups in Central Sulawesi are mostly of Kaili tribe. The Kaili tribe is divided to small traditional communities spread in Central Sulawesi Province under different tribe names in each area.

Table 1-3-16 Isolated Traditional Communities in Central Sulawesi Province, 2017

No	Regency	Name of Tribe	Population
1	Banggai Kepulauan	1.Sea-sea, 2Bajo	1,155-
2	Banggai	1.Loinang (saluam),2. Wana,3Balantak/Masama	5,858-
3	Morowali	1.Wana(Taa)	1,1960
4	Poso	1.Wana	470
5	Donggala	1.Tolare/Da'a, 2.Kori Rai, 3,Unde,5.Tajio, 6.Pendau, 7.Ado,8.Tado, 9.Uma, 10.Tara, 11.Ledo, 12.Lauje, 13.Kaili	5,795
6	Tolitoli	1.Lauje, 2.Pandau, 3.Dondo, 4.Pandau and Dondo, 5.Lanje, 6.Hanje,7.Bajo	17,810
7	Parigi Moutong	1.Lauje, 2.Tara, 3.Pendau	11,885
8	Tojo Una-Una	1.Wana	5,785
9	Sigi	1.Da'a	14,790
10	Banggai Laut	1.Banggai, 2.Banggai Bajo	4,860
11	Morowali Utara		5,160

Source: Central Sulawesi Province in Figures 2018

In Palu city, regarding indigenous people, following information has been obtained through investigation.

The ethnic group in Palu City is of Kaili tribe. Each village in Palu City has a customary institution, therefore there are 46 customary institutions spread in Palu City, as many as the number of villages in the city. All members of the customary institutions are traditional societies.

Traditional societies can be categorized into three elements, i.e. traditional leaders, customary stakeholders, and customary perpetrators:

- ✓ Traditional Leaders (Tokoh Adat) are also known as Indigenous Elders (Tetua Adat), or people considered to be the elders among those in the customary institutions, however not all customary institution has a traditional leader. The number of traditional leaders in Palu City would be different from one institution to another, with a maximum of five traditional leaders in one institution.
- ✓ Customary Perpetrators (Pelaku Adat) are those who are known to be able to perform Traditional Rituals. The number of customary stakeholders in each customary institution would be different. Some data acquired revealed the following numbers: Balaroa 33 people, Duyu 17 people, Donggala koin 31 people, Kabonena 15 people, Silae 14 people, Tipu 23 people, Buluri 9 people, Watusampu 27 people.

- ✓ Palu City Customary Stakeholders include everyone involved in a customary institution. Each customary institution would have 13 customary stakeholders. With 46 villages in Palu City, there are a total of 598 customary stakeholders (13 people x 46 villages) in Palu City.

In Sigi regency and Donggla regency, regarding indigenous people, data has not been able to be obtained through investigation.

5) Livelihood and local economy

In Central Sulawesi province, regarding livelihood and local economy, number of people for each work field is shown in table below.

The ratio of the number of employees in agriculture, forestry and fisheries is the largest. Next, there are a large number of employees in commerce, restaurants and hotels. Also, although the gender ratio of workers varies greatly depending on the field, the total number of workers is almost the same for both men and women.

Table 1-3-17 The Number of People Aged Over 15 Who Work in a Week by The Main Work Field and Gender in Central Sulawesi Province in 2017

Main Work Field	Gender		
	Male	Female	Total
Agriculture, Forestry, Hunting, and Fisheries	444,092	164,654	608,746
Mining and Quarrying	26,071	4,420	30,491
Manufacturing Industry	50,233	36,763	86,986
Municipal electricity, gas and water	2,424	559	2,983
Constructions	82,334	1,184	83,518
Retail, Restaurants, and Hotels	83,491	134,511	218,002
Transportation, warehousing and communication	43,393	1,520	44,913
Finance, Insurance, Real Estate, and Business Services	14,273	6,632	20,905
Personal and social services	139,771	137,899	277,670

Source: Central Sulawesi Province in Figures 2018

6) School and Education

The final educational background in Central Sulawesi as of 2017 is shown in Table 1-3-18. Regarding the final educational background, the senior high school graduates are the most in Palu City but the elementary school graduates are the most in other cities.

Table 1-3-18 Educational Background in Central Sulawesi 2017

Regency/City	Education (%)							
	Not Completed Elementary School	Elementary School	Junior High School	Senior High School	Vocational Senior High School	Diploma I/II	Academy/ Diploma III	Bachelor/ Diploma IV
Palu City	10.79	19.86	17.20	30.50	6.16	1.31	2.56	11.62
Sigi	16.19	37.32	17.09	19.15	3.15	0.26	0.88	5.96
Donggala	20.72	40.88	16.26	15.41	2.30	0.48	0.42	3.53
Parigi Moutong	25.05	38.76	18.64	12.87	1.75	0.05	0.51	2.37
Tojo Una-Una	23.41	36.04	16.15	15.31	3.29	0.58	1.23	3.99
Tolitoli	19.27	34.69	18.26	14.74	3.88	0.53	1.08	7.55
Buol	18.47	35.39	19.11	15.51	3.27	0.91	1.71	5.63
Banggai Kepulauan	17.93	38.91	16.68	16.84	2.61	0.45	0.84	5.74
Morowali	16.65	31.22	18.65	19.99	2.12	0.45	2.46	8.46
Banggai	16.13	39.19	18.08	16.49	3.57	0.76	1.14	4.64
Morowali Utara	14.88	26.89	17.34	19.95	3.65	0.85	1.05	5.39
Poso	14.18	34.79	19.21	19.83	3.61	0.75	1.14	6.49
Banggai Laut	13.64	40.96	18.71	16.10	1.65	0.42	1.57	6.95

Source: Central Sulawesi Province in Figures 2018

In Palu city, Sigi regency, and Donggala regency, regarding school, number of school has been identified as follows. Each city and regency, there are Elementary school, Junior high school, Senior high school, and Vocational senior high school.

Table 1-3-19 Number of schools in Palu city, Sigi regency, and Donggala regency

No.	School	Number		
		Palu	Sigi	Donggala
1	Kindergarten	149	216	N.A.
2	Elementary school	168	272	353
3	Junior high school	47	93	95
4	Senior high school	26	32	19
5	Vocational senior high school	27	12	13

Source: JICA Study Team

7) Cultural Heritage

In Central Sulawesi province including Palu city, Sigi regency and Donggala regency, there are cultural heritage such as Caves, Megalithic Sites, The Tomb of The King, Mosques and Churches, Traditional Houses, and The Castle of The King. Detailed data is under investigation.

8) Waste and waste management

In Palu city, in 2017, the volume of waste reached 279,574 m³. To manage the vast number of waste, Palu City owns a waste management with 64 waste containers, 8 units of waste processing plants with reduce, reuse recycle waste hierarchy (TPS3R), and Kawatuna final waste deposit area (TPA).

9) Health

(a) Main illnesses

In Central Sulawesi province, there are 10 most common illnesses as shown in table below.

Table 1-3-20 Number of Cases of the 10 Most Common Illnesses in Central Sulawesi Province, 2017

No	Types of Illnesses	Number of Cases
1	Upper respiratory infection/URTI	244,805
2	Gastritis/stomach inflammation	173,026
3	Hypertension/high blood pressure	109,765
4	Gastroenteritis/diarrhea/stomach flu	39,896
5	Allergic skin diseases	39,320
6	Other diseases on upper respiratory	19,089
7	Hypotension/low blood pressure	18,646
8	Influenza	17,361
9	Nervous system disorder and other neurological diseases	13,180
10	Rheumatoid arthritis	12,235

Source: Central Sulawesi Province in Figures 2018

In Palu city, there are 10 most common illnesses as shown in table below.

Table 1-3-21 Number of Cases of the 10 Most Common Illnesses in Palu City, 2017

No	Types of Illnesses	Number of Cases
1	Upper Respiratory Tract Infection	43,507
2	Gastritis	18,206
3	Other diseases of the respiratory tract	17,953
4	Diseases of the muscular system/organ binder	14,986
5	Allergic skin disease	10,540
6	High blood pressure (hypertension)	10,253
7	Nervous system diseases and disorders	9,408
8	Diseases of pulp and periapical tissues	7,382
9	Diarrhea	6,451
10	Tonsillitis	6,204

Source: Palu City in Figures 2018

(b) Current situation of infectious of HIV

In Central Sulawesi province, number of cases of HIV, AIDS, and Sexually Transmitted Infection for each regency/city is as shown in table below.

Table 1-3-22 Number of Cases of HIV, AIDS, and Sexually Transmitted Infection by Regency/City in Central Sulawesi Province, 2017

Regency/City	Number		
	HIV	AIDS	Sexually Transmitted Infection
Palu City	121	18	61
Sigi	25	3	1
Donggala	9	3	4
Banggai Kepulauan	-	-	-
Banggai	37	26	-
Morowali	8	-	-
Poso	23	21	125
Tolitoli	7	-	6
Buol	7	-	12
Parigi Moutong	7	13	66
Tojo Una-Una	9	2	-
Banggai Laut	2	2	1
Morowali Utara	5	5	-
Total	266	93	276

Source: Central Sulawesi Province in Figure 2018

(c) Number of hospitals

In Central Sulawesi province, there are 32 hospitals. Undata Regional Public Hospital Palu and Madani Regional Public Hospital Palu are owned by Central Sulawesi province. Number of hospital and health facilities for each regency and city in Central Sulawesi is as shown in table below.

Table 1-3-23 Number of Health Facilities by Regency/City in Central Sulawesi Province, 2017

Regency/City	Hospital	Maternity Hospital	Public Health Center	Child Health Center
Banggai Kepulauan	1	-	13	173
Banggai	2	-	26	388
Morowali	1	-	9	153
Poso	2	-	21	280
Donggala	2	-	15	442
Tolitoli	1	-	14	260
Buol	1	-	11	160
Parigi Moutong	3	1	23	452
Tojo Una-Una	2	-	13	196
Sigi	1	-	19	363
Banggai Laut	1	-	5	89
Morowali Utara	1	-	12	167
Palu City	14	4	13	223
Total	32	93	194	3,346

Source: Central Sulawesi Province in Figures 2018

In Palu city, there are 9 hospitals. Number of hospital and health facilities for each district in Palu City is shown in table below.

Table 1-3-24 Number of Health Facilities by District in Palu City, 2017

District	Hospital	Maternity Hospital	Public Health Center	Child Health Center
Palu Barat	2	1	1	28
Tatanga	-	-	2	24
Ulujadi	-	-	1	28
Palu Selatan	3	1	3	32
Palu Timur	2	2	1	32
Mantikulore	1	-	2	37
Palu Utara	1	-	2	37
Tawaeli	-	-	2	23
Total	9	4	13	224

Source: Palu City in Figures 2018

1-3-1-3 Laws, Regulations, Institutions Related to Environmental and Social Impact Assessment and Management

(1) Legal Framework of Indonesia

Public works in Indonesia shall be planned, designed and implemented in accordance with the regulations on EIA (AMDAL (Analisis Mengenai Dampak Lingkungan, Environmental Impact Analysis) in Bahasa Indonesia) issued by Ministry of Environment and Forestry. Major regulations on AMDAL are summarized below. (Source: Check list March 14, 2019)

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

This is the main Indonesian law on environmental management. The law states to conduct AMDAL, UKL-UPL (Formulir Upaya Pengelolaan Lingkungan Hidup dan Upaya Pemantauan Lingkungan Hidup, Environmental Management Efforts Form and Environmental Monitoring Efforts) or SPPL (Surat Pernyataan Kesanggupan Pengelolaan dan Pemantauan Lingkungan Hidup, Statement of Environmental Management and Monitoring) according to significance of possible impact. The law stipulates necessity of environmental permission.

The Grant Loan Project is the reconstruction of Palu 4 Bridge at the length of about 260 m. According to Appendix 1, I. Public Works Sector, No. 8 b, a bridge construction with a length of over 500 m is required an AMDAL. The Project shorter than 500 m, and is, therefore, subject to UKL-UPL. The table below shows AMDAL's criteria for the bridge project.

Table 1-3-25 AMDAL Criteria for Field Public Works

No.	Criteria for AMDAL
I. Field of Public Works	
8.	a. Development <i>Underpass, tunnel, flyover</i> , with a length of ≥ 2 km b. Bridge construction, with a length of ≥ 500 m

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

Ministry of Environment Regulation No. 5 of 2012

The regulation defines screening procedures and types of projects required AMDAL.

Ministry of Environment Regulation No. 8 of 2013

The regulation defines contents to be included in ANDAL, UKL-UPL and SPPL.

(2) Institutional Responsibility

1) In the Planning Stage

As this project is a project of Palu City Road, Palu City Environment Department will be the examination organization.

Implementing Agency (IA) prepares UKL-UPL report, and the Environment Department of Pal city examines and issues Environmental Clearance.

2) In the Construction Stage

IA will conduct the EMP and EMOP described in UKL-UPL. Monitoring results will be reported from IA to Indonesian government and JICA.

3) In the Operation Stage

Same as in the construction phase, IA will conduct EMP and EMOP described in UKL-UPL. Monitoring results will be reported from IA to Indonesian government and JICA.

(3) Review Steps of UPL-UKL

Table 1-3-26 explains the review steps of UPL-UKL for the Grant Project. The review process of UKL-UPL will require minimum 14 working days according to MOE Regulation No. 08/2013. According to the interview with Palu City Environment Division on March 18, 2019, the UPL-UKL of the reconstruction of Palu 4 Bridge will be reviewed by Palu City.

Coordination with IA (expected to be Provincial Balai Bina Marga at Palu) and Palu City UKL-UPL Secretariat about how and when to incorporate the above steps with the JICA-required 2 public consultations as well as the submission of IEE report to JICA.

Table 1-3-26 Review Steps of UPL-UKL

Steps	Action
1	The Implementation Agency (IA, expected to be Provincial Balai Bina Marga at Palu) will prepare UKL-UPL and submit the report to the Palu City UKL-UPL Secretariat.
2	The Palu City UKL-UPL Secretariat will check if the format of the report is according to the requirement.
3	When confirmed, Palu City Mayor will publish that the City received the report.
4	The Palu City UKL-UPL Secretariat will conduct technical review of the contents of the report within 14 working days after the publish by the Mayor.
5	When it is found that the report passes the technical review, the Mayor will issue the Environmental Clearance (EC).
6	The Mayor will publish a notice on the review results of the UKL-UPL. The report and the review results will be made available for public review.

Source: IGES, 2018

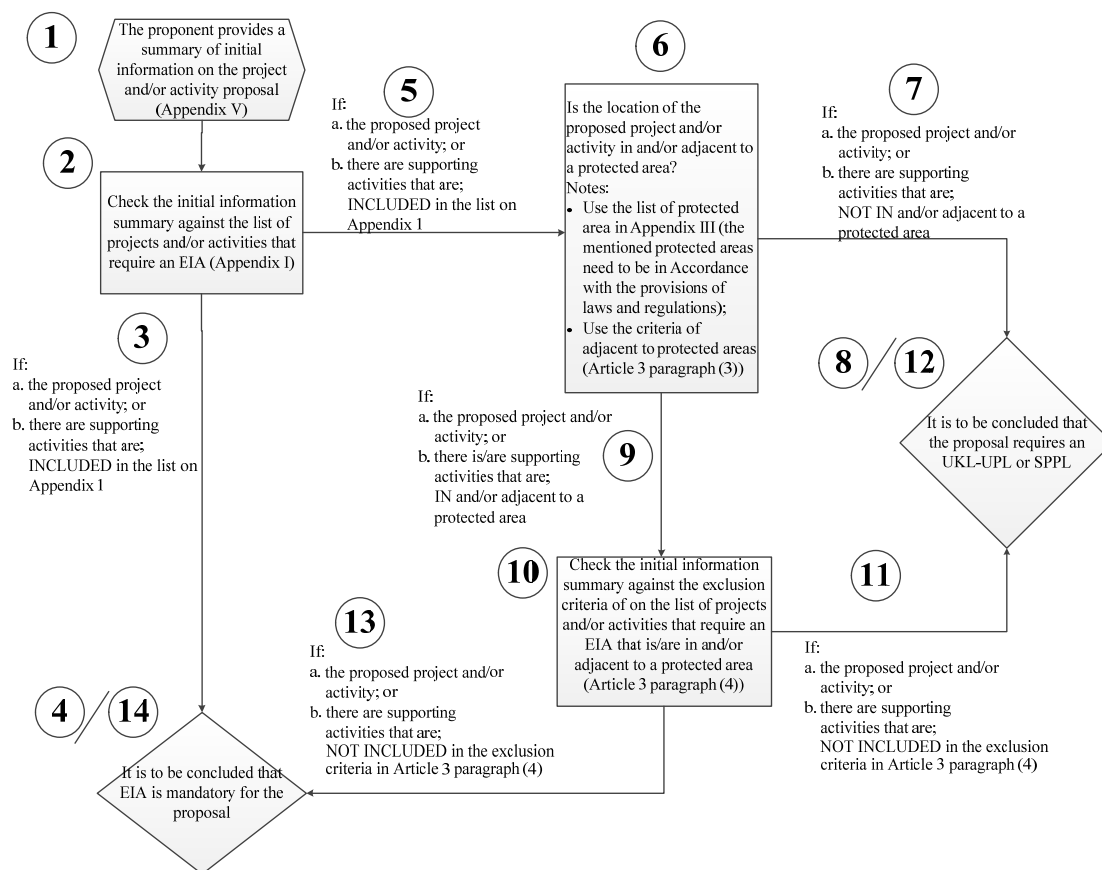


Figure 1-3-7 UPL-UKL Examination Procedure Flow

(4) JICA Guidelines

According to “JICA Guidelines for Environmental and Social Considerations 2010” (JICA Guidelines 2010), projects are categorized mainly depending upon the significance of the negative impacts. (Table 1-3-27) Appendix 3 of JICA Guidelines 2010 lists projects in the sector of road and bridge as ‘the sector that may cause significant negative impacts.’

The ESMF (Environmental and Social 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 4 Bridge, the Project can be categorized as B.

Table 1-3-27 Categorization Criteria of JICA Guideline

Category	Categorization Criteria
Category A	<ul style="list-style-type: none"> Proposed projects are classified as Category A if they are likely to have significant adverse impacts on the environment and society. Projects with complicated or unprecedented impacts that are difficult to assess, or projects with a wide range of impacts or irreversible impacts, are also classified as Category A. These impacts may affect an area broader than the sites or facilities subject to physical construction. Category A, in principle, includes projects in sensitive sectors, projects that have characteristics that are liable to cause adverse environmental impacts, and projects located in or near sensitive areas.
Category B	<ul style="list-style-type: none"> The project may have adverse impacts on the environment or society, but these impacts are less significant than those of Category A projects. These impacts are site-specific; few, if any, of them are irreversible; in most cases, they can be mitigated more readily than Category A projects. Responsibilities of the project proponents include the planning and monitoring of necessary Environmental and Social Consideration (ESC) activities. ESC procedures such as Strategic Environmental Assessment for Master Plan projects and stakeholder participation may be required, depending on the scale and nature of the adverse impacts.

Source: JICA Guideline 2010

(5) GAP Analysis

Table 1-3-28 summarizes the key differences between the JICA Guidelines and Indonesian Law No. 32 of 2009 and related Ministry Regulations. The policies of the Project to bridge the gaps is also explained in Table 1-3-28.

Table 1-3-28 GAP Analysis

Target	JICA Guideline	Law No. 32 of 2009 Ministry Reg. No. 5 of 2012 Ministry Reg. No. 8 of 2013	Gaps Between JICA Guidelines and Indonesian Laws, Bridging Measures
Underlying Principles	<ul style="list-style-type: none"> Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage. 	<ul style="list-style-type: none"> Public works in Indonesia shall be planned, designed and implemented in accordance with the regulations on EIA issued by Ministry of Environment and Forestry. 	<ul style="list-style-type: none"> No gap. The Project will be subject to UKL-UPL review process.
	<ul style="list-style-type: none"> Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and incorporated into the project plan. JICA Guidelines Appendix 1, 1.1 	<ul style="list-style-type: none"> Mitigation measures to avoid or minimize adverse impacts must be proposed by the Implementing Agency in both AMDAL and UKL-UPL, and incorporated into the Project Plan. Alternative study is not required, but the conformity of the Project with the official Spatial Plan must be explained. 	<ul style="list-style-type: none"> Alternative study is not required. JICA Mission Team will incorporate alternative plans of the Project that were studied during the preparatory design stage, and the reasons of selection of preferred plan in the Report.
Information dissemination	<ul style="list-style-type: none"> EIA reports (which may be referred to differently in different systems) must be written in the official language or in a language widely used in the country in which the project is to be implemented. 	<ul style="list-style-type: none"> AMDAL and UKL-UPL will be written in Bahasa Indonesia. 	<ul style="list-style-type: none"> No gap. The same contents will be provided in English for JICA review.

Target	JICA Guideline	Law No. 32 of 2009 Ministry Reg. No. 5 of 2012 Ministry Reg. No. 8 of 2013	Gaps Between JICA Guidelines and Indonesian Laws, Bridging Measures
	<ul style="list-style-type: none"> When explaining projects to local residents, written materials must be provided in a language and form understandable to them; 	<ul style="list-style-type: none"> When explaining projects to local residents, written materials will be provided in Bahasa Indonesia. 	<ul style="list-style-type: none"> No gap. Further discussion with IA and Palu City is desirable for the Project to check if materials in local Kaili language must be considered.
	<ul style="list-style-type: none"> EIA reports are required to be made available to the local residents of the country in which the project is to be implemented. The EIA reports are required to be available at all times for perusal by project stakeholders such as local residents and copying must be permitted; Appendix 2 Forewords 	<ul style="list-style-type: none"> AMDAL-related documents are available for public throughout the review process, starting from the first step (announcement of the project by the project owner) to the final step (announcement of issuing the environmental clearance). UKL-UPL-related documents are available for public at two stages; the first after the official receive of UKL-UPL by the reviewing agency, and the second after the announcement of issuing the environmental clearance 	<ul style="list-style-type: none"> No gap UKL-UPL will be made available to the local residents.
Social Acceptability	<ul style="list-style-type: none"> For projects with a potentially large environmental impact, sufficient consultations with local stakeholders, such as local residents, must be conducted via disclosure of information at an early stage, at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into the contents of project plans. Appendix 1, 5.1 In preparing EIA reports, consultations with stakeholders, such as local residents, must take place after sufficient information has been disclosed. Records of such consultations must be prepared; Consultations with relevant stakeholders, such as local residents, should take place if necessary throughout the preparation and implementation stages of a project. Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected, and when the draft report is being prepared. Appendix 2 Forewords 	<ul style="list-style-type: none"> In the project subject to AMDAL process, the project owner must hold a public consultation before the submission of draft TOR of AMDAL to the reviewing agency. Besides the public consultation, general public may submit opinions during 10 working days after the announcement of the project by the project owner. After receiving the draft AMDAL from the project owner, the reviewing agency invites public opinion for 10 working days. AMDAL technical secretary will instruct the project owner for revision when necessary. AMDAL committee will hold public hearing during the review process. For the project subject to UKL-UPL, which is considered to cause smaller environmental impact, no public consultation is mandated. 	<ul style="list-style-type: none"> For the project subject to UKL-UPL, no public consultation is mandated. At least two public consultations (called socialization in local system) will be held for the Project, one at early stage of the IEE study, and one after the environmental assessment is drafted.

Target	JICA Guideline	Law No. 32 of 2009 Ministry Reg. No. 5 of 2012 Ministry Reg. No. 8 of 2013	Gaps Between JICA Guidelines and Indonesian Laws, Bridging Measures
Scope of Impacts to Be Assessed	<ul style="list-style-type: none"> The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety. Appendix 1, 3.1 	<ul style="list-style-type: none"> The impacts to be assessed in AMDAL and UKL-UPL include impacts on pollution, natural environment, and social and economic environment. The impacts to be assessed, however, are selected from the project activities. No such standard check list of environmental items is available. 	<ul style="list-style-type: none"> No standard check list of environmental items is available. In the impact scoping stage of the Project, the standard list of impacts will be referred to identify potential impacts.
	<ul style="list-style-type: none"> In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent. It is also desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project. Appendix 1, 3.2 	<ul style="list-style-type: none"> No clear requirement of examination and assessment of derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project. 	<ul style="list-style-type: none"> Derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the Project will be examined and assessed to a reasonable extent. The impacts that can occur throughout the life cycle of the Project will also be examined and assessed to a reasonable extent.

Target	JICA Guideline	Law No. 32 of 2009 Ministry Reg. No. 5 of 2012 Ministry Reg. No. 8 of 2013	Gaps Between JICA Guidelines and Indonesian Laws, Bridging Measures
Monitoring and resolving problems	<ul style="list-style-type: none"> Project proponents etc. should make efforts to make the results of the monitoring process available to local project stakeholders. Appendix 1, 8.3 When third parties point out, in concrete terms, that environmental and social considerations are not being fully undertaken, forums for discussion and examination of countermeasures are established based on sufficient information disclosure, including stakeholders' participation in relevant projects. Project proponents etc. should make efforts to reach an agreement on procedures to be adopted with a view to resolving problems. Appendix 1, 8.4. 	<ul style="list-style-type: none"> In Construction Stage, EMP and EMOP prepared as a part of AMDAL or UKL-UPL will be implemented, and periodic monitoring will be conducted. Monitoring result will be report to the concerned authorities in Indonesia and JICA, according to the reporting method to be stipulated in AMDAL or UKL-UPL. Unforeseen environmental problems and issues raised by surrounding communities or others during the construction stage can be handled by the grievance redress mechanism to be established according to ESMF. In Operation Stage, monitoring and reporting will be implemented in accordance with EMOP and grievance will be handled in the grievance redress mechanism to be established. 	<ul style="list-style-type: none"> No gap Environmental Management Plan and Monitoring Plan for the Project will be reviewed and approved by Palu City. The Plans will be made available to general public. The IA will be responsible to implement, monitor and report the EMP and EMOP throughout the Construction and Operation Stage.
Ecosystem and Biota	<ul style="list-style-type: none"> Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests. Appendix 1. 6.1. 	<ul style="list-style-type: none"> No specific description on the limitation of project impacts. 	<ul style="list-style-type: none"> In the draft Environmental and Social Management Framework (ESMF), it is declared that to be financed, the sub-projects will need to be Category B or C under the JICA Guidelines 2010. No gap.
Indigenous Peoples	<ul style="list-style-type: none"> Any adverse impacts that a project may have on indigenous peoples are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures must be taken to minimize impacts and to compensate indigenous peoples for their losses. Appendix 1, 8.1. 	<ul style="list-style-type: none"> No specific description on the limitation of project impacts. 	<ul style="list-style-type: none"> In the draft Environmental and Social Management Framework (ESMF), it is declared that to be financed, the sub-projects will need to be Category B or C under the JICA Guidelines 2010. Projects to be called Category B or C will not affect Sensitive Areas nationally-designated protected areas (areas for ethnic minorities or indigenous peoples designated by national governments) nor areas inhabited by ethnic minorities, indigenous peoples, or nomadic peoples with traditional ways of life, and other areas with special social value. No gap.

Source: JICA Study Team

1-3-1-4 Project Alternatives

In the initial phase of the Study, various projects were proposed for the grant project by Indonesia side and JICA side, including projects such as a new Palu 4 Bridge down stream of Palu I bridge, improvement of damaged existing bridges, and reconstruction of Palu 4 Bridge as a foot bridge.

After detailed discussion between both sides, both in Jakarta and Palu, the Reconstruction of Palu 4 Bridge for car and foot traffic were selected in 18 February 2019.

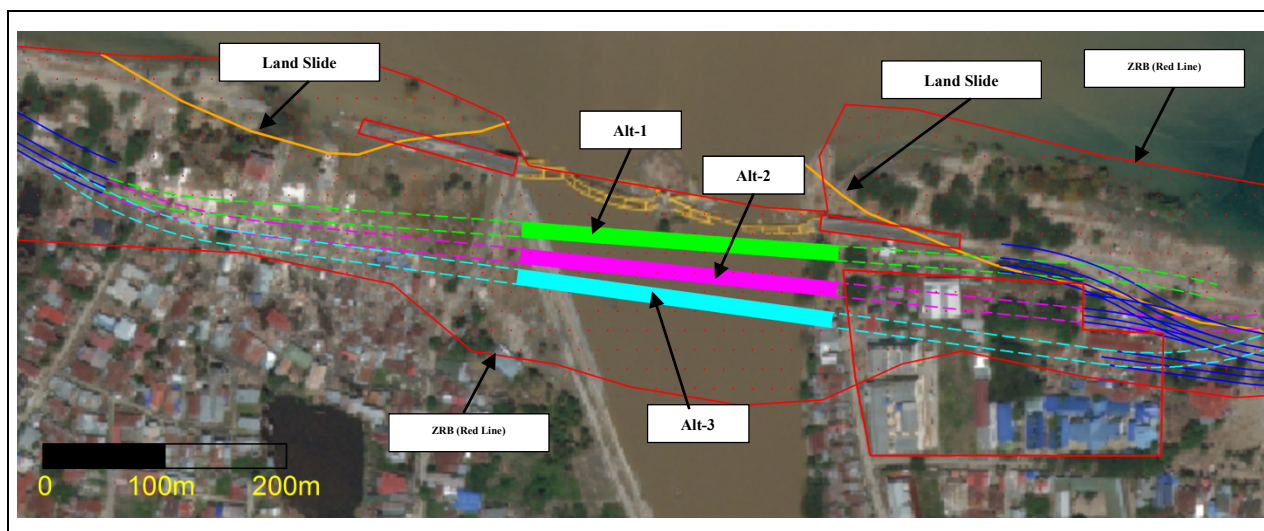
Then, four alternatives of the Project were developed as shown in the following table. Open discussion on-site with Mr. Arie (Chief of Task Force, PU), Chief of BPN of Palu City, and JICA Study Team on March 26, 2019, Alternative 1 was recommended mainly because of the least impact on standing structures (Table 1-3-29).

Further technical alternatives are studied in the outline design phase that continues till the end of April. After the outline design is agreed with all stakeholders, detailed design activity will take place between May and July 2019.

Table 1-3-29 Project Alternatives and Comparative Evaluation

Alternatives		No Project	Alternative -1	Alternative -2	Alternative -3
Outline		Collapsed Palu 4 bridge will not be reconstruction.	The route of right bank side avoids the housing area.	The approach road except for access road of right bank side avoids the land slide area.	The route is planned along the ZRB according to the spatial planning.
Bridge Length *		-	approx. 260m	approx. 260m	approx. 260m
Approach Road Length *		0m	approx. 170m (Both sides)	approx. 170m (Both sides)	approx. 170m (Both sides)
Access Road Length*	Left bank	0m	approx. 170m	approx. 170m	approx. 220m
	Right bank	0m	approx. 140m	approx. 300m	approx. 320m
Impact to housing *		nil (0)	nil (0)	3 housings	3 housings, 1 big facility
Existing (remaining) bridge portion		No influence	No influence	No influence	No influence
Recommendation		No land acquisition will be necessary. Heavy transportation vehicles, including dump trucks, chemical tankers and container trailers, that used the former Palu 4 Bridge to bypass the city, will keep using other bridges located in the city, by running through city roads.	Although the available land area is limited on the right bank, no impacts on standing structure or remaining bridge parts can be avoided.	There are impacted structures (residential structures and a futsal court) by the project.	The big facility (Police) is impacted by the project.
		×	◎ Recommended	○	△

Source: JICA Study Team



Source: JICA Study Team

Figure 1-3-8 Comparison of Alternatives of the Project

1-3-1-5 Scoping and Survey TOR

(1) Scoping

1) Project Components and Typically Expected Environmental and Social Impacts

Table 1-3-30 explains expected project components and activities, and typical direct impacts from them.

Table 1-3-30 Project Components and Typically Expected Environmental and Social Impacts

Phase	Project components and activities		Typical impacts from project components and activities
Planning phase	Demarcation of work area	<ul style="list-style-type: none"> Notification of the Project and restriction of land use Land acquisition Staking and construction of border fence Lease contract of land parcel(s) for stock yard, site office, etc. Decision of trees to be felled 	<ul style="list-style-type: none"> Notification of unavailability and relocation of existing land use and trespassing (vendor shack, utilities (electric poles, underground utilities, utilities attached to the existing bridge structure), road and foot path, foot path to the river, etc.) Notification of loss of private properties Temporary ban of use of the land parcel(s) selected for stock yard, etc.
Construction phase	Preparation		
	Set up of stock yard	<ul style="list-style-type: none"> Set up of concrete yard Set up of asphalt plant Storage of oils and chemicals Machine repair, re-fuelling 	<ul style="list-style-type: none"> Risk of oil and chemical spill (soil contamination) Generation of water demand for the concrete plant Storage of asphalt materials Concrete and asphalt may be procured from the market
		<ul style="list-style-type: none"> Storage of other materials and tools 	<ul style="list-style-type: none"> Risk of robbery (crime)

Phase	Project components and activities		Typical impacts from project components and activities
	Set up of office	<ul style="list-style-type: none"> Existence of engineers and office staff 	<ul style="list-style-type: none"> Water demand Generation of waste water Generation of sewer Generation of wastes
	Set up of work area	<ul style="list-style-type: none"> Existence of work crew 	<ul style="list-style-type: none"> Water demand Generation of waste water Generation of sewer Generation of wastes
	Removal works (existing road, bridge, etc.)	<ul style="list-style-type: none"> Removal of existing structures and vegetation Removal and relocation of utilities in ROW 	<ul style="list-style-type: none"> Generation of construction waste Generation of needs for alternate water sources
	Set up of temporal structures Removal of temporal structures (Detour road, etc.)	<ul style="list-style-type: none"> Slow speed at the detour road Removal of existing structures and vegetation 	<ul style="list-style-type: none"> Increased risk of local occurrence of traffic jam Increased risk of occurrence of traffic accidents Generation of construction waste
	Earth works	<ul style="list-style-type: none"> Procurement of fill material 	<ul style="list-style-type: none"> Alteration of land form (at quarry site)
		<ul style="list-style-type: none"> Generation of transportation vehicle (mainly to transport road bed and pavement material) 	<ul style="list-style-type: none"> Generation of exhaust gas(off-site) Generation of noise (off-site) Generation of traffic jam (off-site) Increased risk of accidents (off-site)
	Earth works on river bed	<ul style="list-style-type: none"> Partial closure of river way Digging on river bed Construction of bridge footage 	<ul style="list-style-type: none"> Change of river cross section Generation of muddy water in river bed Activities of heavy construction machines on river bed
	Construction general	<ul style="list-style-type: none"> Operation of construction machinery and vehicles Use of generators 	<ul style="list-style-type: none"> Emission of exhaust Emission of noise
		<ul style="list-style-type: none"> Disposal of construction wastes 	<ul style="list-style-type: none"> Disposal of construction wastes
		<ul style="list-style-type: none"> Generation of employment Procurement of materials, etc. 	<ul style="list-style-type: none"> Direct and indirect positive impact to local economy
Maintenance phase	Opening of bridge and new road sections		<ul style="list-style-type: none"> Improved traffic network in Palu, Central Sulawesi, that leads to less emission of exhaust gas and noise along existing arterial road
	Existence of upgraded road		<ul style="list-style-type: none"> Increased generation of exhaust gas Increased generation of noise Existence of major bridge in tidal area

The necessity of workers camp cannot be decided at this phase of the Study.

Source: JICA Study Team

2) Scoping of Impacts

Based on the Project components and existing environmental and social conditions, scoping of potential impacts were studied and summarized in Table 1-3-31.

Table 1-3-31 Scoping

	Item	Evaluation		Reason for evaluation
		BC/ DC	AC	
1	Air quality	B-	D	DC: Temporary air pollution by equipment operation is expected. AC: 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	DC: Temporary water pollution by works in the river area is expected. AC: No additional water pollution is expected.
3	Waste	B-	D	DC: Wastes will be generated such as debris of removed existing structures and bags and containers of materials and paints used for the works. AC: No additional waste generation is expected.
4	Soil contamination	B-	D	DC: In case fuel, oil, grease, and paints used for the works are spilled on the ground, soil contamination may occur at the work area. AC: No additional waste generation is expected.
5	Noise and vibrations	B-	D	DC: Temporary noise pollution and vibrations by equipment operation is expected. AC: 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.
Natural Environment				
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.
Social Environment				
13	Involuntary resettlement	B-/C	D	DC: About 2 ha of land will be used for the Project. As of April 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 unused as of April 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+	DC: 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. AC: 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.

	Item	Evaluation		Reason for evaluation
		BC/ DC	AC	
16	Local economy (Employment and livelihood)	B±	B+	DC: Jobs will be generated for construction workers, service for such workers, and local procurement of construction materials and equipment. AC: 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+	DC: 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. AC: 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.
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	DC: 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. AC: No additional risk for infectious disease is expected.
28	Occupational Health (including work safety)	B-	D	DC: Work accidents may occur during the construction. AC: No additional work accident is expected.

	Item	Evaluation		Reason for evaluation
		BC/ DC	AC	
Other				
29	Accident	B-	D	DC: General public may be involved in accidents at or near the work areas or with transportation vehicle. AC: 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

(2) Survey TOR

In the scoping (Table 1-3-31), environmental items that may be negatively affected by the Project were chosen. With the results of Detailed Design, further survey, including site observation and data collection must be implemented to identify the area and significance of the impacts as shown in Table 1-3-32.

Table 1-3-32 Survey TOR

	Item	Objectives	Methods
Pollution			
1	Air quality	<ol style="list-style-type: none"> 1. Clarification of standards of air quality to be applied 2. Understanding the normal condition of air quality without the Project, pre-quake and post-quake condition 3. Understanding of generators, construction machineries, and transportation vehicles that will be used in the Construction. 4. Identification of vulnerable facilities against air pollution 	<ol style="list-style-type: none"> 1. Literature survey. Confirmation with Environmental Office of Palu City (DLH) 2. Literature survey and field observation 3. Hearing with engineers. 4. Field observation
2	Water quality	<ol style="list-style-type: none"> 1. Clarification of standards of water quality to be applied 2. Understanding the normal condition of water quality without the Project, and the potential impact by muddy water from the Project 3. Understanding of construction methods to be used for the Project especially for the works in the river bed, including preventive measures of generating and/or releasing muddy water 	<ol style="list-style-type: none"> 1. Literature survey. Confirmation with Environmental Office of Palu City (DLH) 2. Literature survey and field observation 3. Hearing with engineers
3	Waste	<ol style="list-style-type: none"> 1. Listing of potential construction debris and wastes 2. Understanding standard measures handling wastes listed above 	<ol style="list-style-type: none"> 1. Hearing with engineers 2. Discussion with IA.
4	Soil contamination	<ol style="list-style-type: none"> 1. Listing of potential toxic substances that may be used or stored by the Project 2. Preventive measures that are used in standard construction operated by IA 	<ol style="list-style-type: none"> 1. Hearing with engineers 2. Discussion with IA.

	Item	Objectives	Methods
5	Noise and vibrations	<ol style="list-style-type: none"> 1. Clarification of standards of noise and vibration to be applied 2. Measurement of distance between the Project Area and vulnerable facilities including residential area 3. Understanding of construction methods and heavy machineries to be used for the Project 	<ol style="list-style-type: none"> 1. Literature survey. Confirmation with Environmental Office of Palu City (DLH) 2. Field observation 3. Hearing with engineers.
Natural Environment			
10	Ecosystem	<ol style="list-style-type: none"> 1. Ecosystem in downstream of the project area 	<ol style="list-style-type: none"> 1. Literature survey. Confirmation with Environmental Office of Palu City (DLH), Field observation
Social Environment			
13	Involuntary resettlement	<ol style="list-style-type: none"> 1. Size and location of land acquisition. 2. Number and current residential location of land owners and other affected persons 3. Coordination with stakeholder agencies about the process, timing, and pricing of land acquisition (Palu City, Provincial BPN, Provincial Bina Marga, SATGAS, Central Bina Marga, PU, Spatial Planning, Tsunami Dike Planning) 	<ol style="list-style-type: none"> 1. Overlay of Detailed Design with the land registration data stored by Provincial BPN in Palu 2. Results of IP4T survey by Provincial BPN in Palu (to be conducted) (IP4T identifies the land owner, the asset owner, land and assets to be compensated) 3. Comments in Stakeholder meeting
14	Poverty	<ol style="list-style-type: none"> 1. Consideration of necessity of any additional assistances for the PAPs because of their economic conditions. 	<ol style="list-style-type: none"> 1. Understanding of pre-quake condition and post-quake condition 2. Understanding the impacts of the land acquisition for the PAPs 3. Coordination with assistances for quake-affected people to improve their economic conditions when necessary
16	Local economy (Employment and livelihood)	<ol style="list-style-type: none"> 1. Understanding the demand and opinion of local people 2. Existence status of local economy in the site 	<ol style="list-style-type: none"> 1,2, Literature survey., SHM discussion if found necessary and suitable.
19	Existing social infrastructure and service	<ol style="list-style-type: none"> 1. Location of Work Area boundary 2. Existence, character and number of residents and users adjacent to the Work Area 3. Traffic plan during and after the Construction (vulnerable facilities along the new detour route) 	<ol style="list-style-type: none"> 1, 2, 3. Discussion with engineers. On-site observation.
27	Infectious disease and HIV/AIDS	<ol style="list-style-type: none"> 1. High risk group of HIV infection in Indonesia and Central Sulawesi Province 2. Agencies that provide awareness training in Central Sulawesi Province 3. Popular mosquito-related infectious diseases and available prevention training and materials 	<ol style="list-style-type: none"> 1, 2, 3. Information collection from UNAIDS, Central Sulawesi Province and Palu City
28	Occupational Health (including work safety)	<ol style="list-style-type: none"> 1. Work safety plan 	<ol style="list-style-type: none"> 1. Collection of work safety plan approved by the same Implementation Agency
Other			
29	Accident	<ol style="list-style-type: none"> 1. Possibility of accidents during construction (Location of work area, location of residents, draft plan for traffic restriction and detour, standard safety measures taken in Palu) 	<ol style="list-style-type: none"> 1. Study of detailed design and construction plan. On-site observation.

Source: JICA Study Team

1-3-1-6 Survey Results (including Impact Prediction)

Based on the results of the field survey, the environmental impact is shown in Table 1-3-33 for the items classified as B- and C in the results of scoping of ESIA. This table will be updated after the field survey.

Table 1-3-33 Survey Results (including Impact Prediction)

No	Item	Main Factors Affecting Environmental Impact and Estimated Potential Impact
Pollution		
1	Air Quality	The air quality information will be updated based on the field survey results. 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.
2	Water Quality	There is a risk of temporary induce erosion/siltation due to excavation during the rainy season at downstream of the project site.
3	Soil Contamination	Oil/fuel and waste spills from the construction area due to the repairing and maintenance works of equipment/vehicles on-site. It is necessary to prepare the well controlled management plan before construction by contractor.
4	Solid Waste	Construction soil and construction waste will be generated due to the clearing of the existing site because the damaged facilities of existing bridge by the disaster still remained in site.
5	Noise and Vibration	The noise and vibration data will be updated based on the field survey results. However,
6	Ecosystem	(1)Project site The new bridges will be constructed within the right of way. There is no natural fauna and flora. (2) <u>Downstream of the site</u> There is a risk of temporary induce erosion/siltation due to excavation during the rainy season at downstream of the project site. There might be not sensitive biological area such as coral reef protection area. Field survey in the downstream area will be conducted to grasp the ecosystem.
7	Involuntary resettlement	About 2 ha of land will be used for the Project. As of April 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 unused as of April 2019. Further, repeated site survey is necessary to clarify whether there are residents in those buildings.
8	Poverty	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.
9	Local economy (Employment and livelihood)	Jobs will be generated for construction workers, service for such workers, and local procurement of construction materials and equipment.
10	Existing Social Infrastructure and Services	(1) <u>Traffic Congestion in the during the construction site</u> There is a possibility of traffic accidents caused by vehicle for transportation of construction soil and construction material near the project area. However, the impact will not significant due to the project scale. (2) <u>Recovery of the function of the existing bridge</u> The vertical shaft will be constructed on the existing road. Due to the reconstruction, 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.
11	Sanitation, infectious diseases such as HIV/AIDs	There is a possibility to increase the risks of infectious diseases due to the influx of construction workers into the project site under insanitary condition.
12	Working Conditions	Impacts on occupational health and safety are inevitable due to the construction/operation work. It is necessary to prepare the adequate mitigation measures.
13	Accidents	There is a possibility of traffic accidents caused by vehicle for transportation of construction soil and construction material near the project area.

Source: JICA Study Team

1-3-1-7 Impact Assessment

The tentative environmental evaluation results are shown in Table 1-3-34. This table will be updated after the field survey.

Table 1-3-34 Environmental Evaluation (Tentative)

	Item	Scoping		Evaluation		Reason for evaluation
		BC/ DC	A C	BC/ DC	AC	
Pollution						
1	Air quality	B-	D	B-	D	DC: Temporary air pollution by equipment operation is expected. AC: 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-	D	DC: Temporary water pollution by construction works in the downstream of Palu river area is expected. However, the impact is not significant due to construction work scale. AC: No additional water pollution is expected.
3	Waste	B-	D	B-	D	DC: Wastes will be generated such as debris of removed existing structures and bags and containers of materials and paints used for the works. The constractor should prepare adequate waste management plan and needs to thoroughly process based on it. AC: No additional waste generation is expected.
4	Soil contamination	B-	D	B-	D	DC: In case fuel, oil, grease, and paints used for the works are spilled on the ground, soil contamination may occur at the work area. AC: No additional waste generation is expected.
5	Noise and vibrations	B-	D	B-	D	DC: Noise pollution and vibrations by construction equipment operation is expected. The impact is expected to be minor and temporary due to the project site location. AC: 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	N/A	N/A	There is no factor to cause negative impact by the project on the item.
7	Offensive odor	D	D	N/A	N/A	There is no factor to cause negative impact by the project on the item.
8	Bottom Sediment	D	D	N/A	N/A	There is no factor to cause negative impact by the project on the item.
Natural Environment						
9	Protected area	D	D	N/A	N/A	There is no factor to cause negative impact by the project on the item.
10	Ecosystem	C	D	B-	N/A	DC: During construction, there is a risk of temporary water pollution due to turbid water by construction works. The water pollution has the possibility to give an impact on the ecosystem of the downstream area of the construction site temporality. AC: No additional impact is expected.
11	Hydrology	D	D	N/A	N/A	There is no factor to cause negative impact by the project on the item.
12	Topography and geology	D	D	N/A	N/A	There is no factor to cause negative impact by the project on the item.
Social Environment						
13	Involuntary resettlement	B-/C	D	C	N/A	DC: About 2 ha of land will be used for the Project. As of April 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 unused as of April 2019. Further, repeated site survey is necessary to clarify whether there are residents in those buildings. AC: No additional negative impact is expected.

	Item	Scoping		Evaluation		Reason for evaluation
		BC/ DC	A C	BC/ DC	AC	
14	Poverty	C	B+	C	B+	DC: 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. AC: 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	N/A	N/A	There is no factor to cause negative impact by the project on the item.
16	Local economy (Employment and livelihood)	B±	B±	B±	B+	DC: Jobs will be generated for construction workers, service for such workers, and local procurement of construction materials and equipment. AC: 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	N/A	N/A	There is no factor to cause negative impact by the project on the item.
18	Water usage	D	D	N/A	N/A	There is no factor to cause negative impact by the project on the item.
19	Existing social infrastructure and service	B-	B+	B-	B+	DC: 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. AC: 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	N/A	N/A	There is no factor to cause negative impact by the project on the item.
21	Misdistribution of damage and benefit	D	D	N/A	N/A	There is no factor to cause negative impact by the project on the item.
22	Local conflict of interest	D	D	N/A	N/A	There is no factor to cause negative impact by the project on the item.
23	Cultural heritage	D	D	N/A	N/A	There is no factor to cause negative impact by the project on the item.
24	Landscape	D	D	N/A	N/A	There is no factor to cause negative impact by the project on the item.
25	Gender	D	D	N/A	N/A	There is no factor to cause negative impact by the project on the item.
26	Children's rights	D	D	N/A	N/A	There is no factor to cause negative impact by the project on the item.

	Item	Scoping		Evaluation		Reason for evaluation
		BC/ DC	A C	BC/ DC	AC	
27	Infectious disease and HIV/AIDS	B-	D	B-	N/A	DC: 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. AC: No additional risk for infectious disease is expected.
28	Occupational Health (including work safety)	B-	D	B-	N/A	DC: Work accidents may occur during the construction. AC: There is no factor to cause negative impact by the project on the item.
Other						
29	Accident	B-	D	B-	N/A	DC: General public may be involved in accidents at or near the work areas or with transportation vehicle. AC: 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	N/A	N/A	There is no factor to cause negative impact by the project on the item.

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

1-3-1-8 Mitigation Plan and Necessary Budget

Mitigation plan, necessary budget, and institutional coordination will be studied, discussed with stakeholders, and described after the assessment of the impacts.

1-3-1-9 Monitoring Plan and Budget

Monitoring plan, necessary budget, and institutional coordination will be studied, discussed with stakeholders, and described after the assessment of the impacts.

1-3-1-10 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 1-3-35 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 4 Bridge
		18		X	SATGAS Bina Marga			* Alternatives of Palu 4 Bridge
		21	X	X				* Alternatives of Palu 4 Bridge
		27	X	X				* Alternatives of Palu 4 Bridge
		25		X	ATR			* Spatial Plan
		30	X	X				* Project Schedule
	2	1	X	X	Bina Marga			* Alternatives of Palu 4 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 4 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 4 Bridge
		22	X	X	Bina Marga			* Alternatives of Palu 4 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 4 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

Stakeholder meeting will be held in the following programs for residents in the project area in late June 2019.

Table 1-3-36 Contents of the planned stakeholder Meeting (Tentative)

Item	Main Factors Affecting Environmental Impact and Estimated Potential Impact
Purpose	<ul style="list-style-type: none"> - The purpose of this meeting is to explain the project activities including environmental and social important impact to local community and to collect their opinion, which should be reflected into the project adequately. - This meeting is conducted in line with JICA guidelines for environmental and social considerations. - Indonesia regulation require to conduct the public meeting for AMDAL project, no-need for UKL-UPL project. Palu IV bridge is categorized into UKL-UPL project in limerence to MoE Regulation No.5/2012
Date	<ul style="list-style-type: none"> - 26 June, 2019 (BPJN and head of Palu Barat District prefer 26 June, 2019) - At 10 am
Venue of SHM	<ul style="list-style-type: none"> - Palu Barat District office at Jalan WR. Supratman No 2 (room capacity > 50 persons)
To be invited persons	<ul style="list-style-type: none"> (1) Local community <ul style="list-style-type: none"> - Village leaders (head of Besusu Barat Village, head of Lere Village) - District leaders (head of Palu Timur District and head of Palu Barat District) - Representative land owners (left-bank and right bank) (approximately 10-15 persons) - Residence along the bridge (left-bank and right bank) (approximately 10-15 persons) (2) Local government (will be decided after 18 June, 2019) <ul style="list-style-type: none"> - P2JN Kota Palu (Pengawasan Jalan Nasional) - Dinas Pekerjaan Umum Kota Palu (Departmen of Public Work Palu City) - Bappeda Palu

Source: JICA Study Team

1-3-2 Land Acquisition, Relocation and Resettlement

1-3-2-1 Necessity of Land Acquisition and Relocation, Resettlement

The Project aims to ‘reconstruct of Palu 4 Bridge in Central Sulawesi Province’ located south of the original Palu 4 Bridge at the mouth of Palu River. Land acquisition is necessary Since new access road of about 250 m long and about 20 m wide, including shoulders, will be necessary on the right (east) and left (west) side of the 260 m bridge.

The site photograph taken on March 26, 2019 is shown in the Figure 1-3-9.

No relocation of residents is expected by the land acquisition since the land is either road area (right bank) or vacant land after the impact of tsunami. Relocation of temporal stall(s) may be necessary on the right bank. Voluntary removal or relocation may be possible with appropriate discussion and negotiation between Palu City and the shop owner.

Existing condition on Left Bank	Existing condition on Right Bank
	
Looking toward planned bridge from remaining Jalan Cumi Cumi. Planned road will divert left-side from the point in front of the remaining house on the right.	The existing road seen on the left in the photo will be extended straight, between the remaining original approach slope and the building on the left, to approach the planned bridge.
	
The approach road is planned right-side of the standing building and the reconstruction bridge will land left side of the woods in the center on the right bank (pointed by the arrow)	New approach road is planned between the original on the right and the remaining futsal court on the left
	
Original approach road(s) are shown by the arrows. The planned road and bridge will pass the right-side of the original route	The stall set up using the public bench and shade. Existing road in the center will be used for the planned approach road

Source: JICA Study Team, March 26, 2019

Figure 1-3-9 Site Condition

1-3-2-2 Legal Framework of Land Acquisition and Relocation, Resettlement

(1) Legal Framework of Indonesia

Legal Framework of Indonesia on Land Acquisition for Public Interest is summarised in Table 1-3-37. The Law No. 2 of 2012 stipulates that land acquisition shall be carried out by National Land Agency (BPN) involving all entitled holders and concerned stakeholders. The law states to compensate for not only physical loss but also no-physical loss such as income loss and restriction or limitation to access to natural resources.

Presidential Regulation No. 71 on Land Acquisition and its amendments, and Regulation of the Head of BPN RI No. 5 of 2012 on Technical Guidelines on the Implementation of the Land Acquisition are also to be applied.

The required land for the Project is about 20,320 m². For land acquisition smaller than 5 ha, the Implementing Agency (IA) is allowed to negotiate directly with the affected land owner(s) according to the Presidential Decree No. 40, 2014.

The JICA Mission Team will need to consult with the Balai Bina Marga Palu (expected IA), BPN Palu and other related agencies about the steps of land acquisition for the Project to secure that the steps will be in harmony with the requirements of the JICA Guidelines. (Table 1-3-38)

Table 1-3-37 Legal Framework of Indonesia on Land Acquisition for Public Interest

Land Law 1960	Defines various rights on the land, including legal rights and customary rights Sovereign ownership resides with national government
Land Acquisition Law 2012 Law No. 2 of 2012	Defines about land acquisition for public interest. Chapter I General Chapter II Objectives Chapter III Fundamentals Chapter IV Performance of acquisition of land (Survey, Consultation, Compensation, Monitoring) Chapter V Sources of fund for acquisition of land Chapter VI Rights, obligations, and public participation Chapter VII Transitional provisions Chapter VIII Concluding provisions
Presidential Decree No. 71, 2012	Defines details about land acquisition for public interest. Chapter I General Chapter II Land procurement planning Chapter III Land procurement preparation Chapter IV Land procurement implementation Chapter V Transfer of result of land procurement Chapter VI Monitoring and evaluation Chapter VII Fund sources of land procurement Chapter VIII Small scale land procurement Chapter IX Taxation incentive Chapter X Transfer provisions Chapter XI Closing provisions

Presidential Decree No. 40, 2014	<p>Presidential Decree No. 71 Year 2012, Article 121 is amended as follows:</p> <p>In order to efficiency and effectiveness, land procurement for the Public Interest that the extent of not more than 5 (five) hectare, can be done directly by the agency requiring the land with the holders of land rights, by buying and selling of sale or exchange or any other way agreed by both parties.</p>
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Source: JICA Study Team

Table 1-3-38 Steps of Land Acquisition Following the Law No. 2, 2012

Phase	Responsible Body	L	Action (necessary days in the law)	Law
Planning phase	Institution who needs the land	1.	Feasibility Study and planning document that include conformity with spatial plan and environmental and social impacts	Art. 14, 15
		2.	Request for land acquisition permit	
Preparation phase	By the Governor, can be delegated to Mayor	3.	Notification of the Development Plan to community (20 days)	Art. 17
		4.	Forming preparation team (10 days) (Consisted of Governor, Related Mayor, Related provincial agencies, Agency who needs the land, Other related agencies)	Presidential Decree No. 71, 2012
		5.	Preliminary data collection (= early inventory of PAP and asset) (IP4T study) (30 days)	Art. 18
		6.	Public consultation to agree on project location (60 days)	Art. 19
		7.	Collected data, the development plan, and compensation calculation method the appraiser may apply will be explained.	
		8.	If objection is raised, second consultation will be held inviting those who objected.	Art. 20
	Governor	9.	Location permit (14 days)	Art. 19 (6)
		10.	Location announcement to public (17 days)	Art. 26
Execution	Institution who needs the land	11.	Submit the Land Acquisition Implementation Request to the Land Administrator (Lembaga Pertanahan, BPN)	Art. 27
	By Head of BPN	12.	Final inventory & identification of PAPs (30 days) and announcement (14 days)	Art. 28, 29
		13.	When objection is raised, another verification and improvement shall be made.	
		14.	BPN confirms on the ground on which the Entitled Parties to Compensation are determined.	Art. 30
		15.	Stipulation of Appraiser (30 days) and Valuation (30 days)	Art. 31 - 36
		16.	Final negotiation with PAPs on type and amount of compensation (30 days)	Art. 37
		17.	Objection may be filed with the local district court regarding the amount of compensation.	Art. 38
		18.	Compensation payment and land title release (7 days)	Art. 40, 41
		19.	Monitoring and evaluation of the performance of Acquisition of Land is made by the Government	Art. 51
		20.	Monitoring and evaluation of the results of the handover of the Acquisition of Land is made by the Land Administrator	Art. 51
Land delivery	From Head of Land Acquisition to the Institution who needs the land	21.	Land delivery (7 days)	Art. 48
		22.	Agency needing land may begin to perform the construction activities upon the handover of the results of the Acquisition of land	
		23.	Land Certification and Registration (30 days)	Art. 50

Source: JICA Study Team

(2) GAP Analysis

If a subproject requires land acquisition and resettlement, LARAP will be prepared based on ESMF for the entire sector loan, and monitoring on LARAP will be done. A gap between JICA Guidelines and laws in Indonesia is summarized in Table 1-3-39.

Since the required land for the Project is smaller than 5 ha, the process of acquisition in the mind of Implementing Agency (IA) and other stake holder agencies are not clear as of April 2019.

The JICA Mission Team need to consult with the Balai Bina Marga Palu (expected IA), BPN Palu and other related agencies about the steps of land acquisition for the Project to secure that the steps will be in harmony with the requirements of the JICA Guidelines.

Table 1-3-39 Gaps between JICA Guideline and Laws in Indonesia

	JICA Guidelines, WB OPs	Law No.2 of 2012 and related Presidential Decrees	Gap	Bridging Measures to be taken in the Project
1	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.	In the Land Acquisition Plan and attached Feasibility Study, environmental impacts and social impacts will be included. (Article 14, 15) Above is not mandated for land acquisition smaller than 5 ha.	Exploration of alternative and effort of avoidance of impacts are not mandated.	Exploration of alternative and effort of avoidance of impacts will be explained in the Public Consultations and will be recorded in the Report.
2	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken.	In the Land Acquisition Plan and attached Feasibility Study, environmental impacts and social impacts will be included. (Article 14, 15) Preliminary data collection will identify the size and location of population displacement. (Article 16) Above is not mandated for land acquisition smaller than 5 ha.	Minimizing the population displacement is not mandated.	Minimizing measures of the impacts on existing structures will be explained in the Public Consultations and will be recorded in the Report.
3	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels.	“Compensation” means any reasonable and fair reward given to the entitled party in exchange for acquisition of land. (Article 1, No. 10) Acquisition of Land in the Public Interest shall be performed by giving reasonable and fair Compensation. (Article 9 (2)) Appraisal of the amount of Compensation by the Appraiser shall be made on a parcel-by-parcel basis, including: a. land; b. over ground and underground space; c. buildings; d. plants; e. objects related to land; and/or f. other appraisable loss. “Other appraisable loss” means nonphysical loss equivalent to money value, for example, loss due to loss of business or job, cost of change of location, cost of change of profession, and loss of value of the remaining property. (Article 33) Above is not mandated for land acquisition smaller than 5 ha.	The law does not mention about that the PAPs must be able to improve or at least restore their standard of living, income opportunities and production levels to pre-project levels.	As of April 2019, the Project is considered not to generate involuntary resettlement nor hindering livelihood. Reasonable and fair measures will be discussed with IA based on the results of the Census and the Socio-Economic Survey.
4	Compensation must be based on the full replacement cost as much as possible.	Compensation will be provided based on valuation of independent appraiser for a parcel by parcel of land that include i) land; ii) over ground and underground spaces; iii) building; iv) plants; v) objects related to land and/or; vi) other appraisable loss such loss of business, jobs, change of profession, and moving costs. (Article 33) For affected buildings, MAPPI applies solatium (emotional compensation) of 10% - 30% of the total compensation for physical loss. Above is not mandated for land acquisition smaller than 5 ha.	The law is silent on the issue of whether or not depreciation will be applied when calculating compensation for affected land and land-attached assets.	The principle of full replacement cost will be applied. Valuation standard set by Independent appraisers association (MAPPI) indicates in principles, no depreciation will apply for affected structures.

	JICA Guidelines, WB OPs	Law No.2 of 2012 and related Presidential Decrees	Gap	Bridging Measures to be taken in the Project
			Tax incentive is provided to: a) person who supports the project; b) does not file a complaint related to project location determination and/or compensation.	Capital gains tax and the costs of transferring ownership, including the cost of new land certificates, will not be deducted from the compensation of those who will lose lands.
5	Compensation and other kinds of assistance must be provided prior to displacement.	When Compensation and Release of Titles have been made, or the Compensation given has been deposited with the district court, such land shall be in the direct possession of the state. (Article 43) Above is not mandated for land acquisition smaller than 5 ha.	The Law is silent about the timing of displacement.	As of April 2019, the Project is considered not to generate involuntary resettlement. Compensation and other kinds of assistance will be provided prior to displacement if any displacement is found necessary after the Detailed Design.
6	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public.	In the Land Acquisition Plan and attached Feasibility Study, environmental impacts and social impacts will be included. (Article 14, 15) Preliminary data collection will identify the size and location of population displacement. (Article 16) Above is not mandated for land acquisition smaller than 5 ha.	The Law does not require a resettlement action plan made available to the public.	As of April 2019, the Project is considered not to generate involuntary resettlement. Abbreviated RAP will be prepared following the JICA Guidelines because the Project will require land acquisition.
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.	The law defines three opportunities of consultations, either in public or private: 1. Notification of the Development Plan to community Method may be socialization (public meeting), face to face (in person), or notification letter. (Pres. Decree No. 71, 2012 Art. 12) 2. Public consultation to agree on project location. Results of Inventory, the development plan, and compensation calculation method the appraiser may apply will be explained. 3. Final negotiation with PAPs (in private) on type and amount of compensation	The Governor approves the location of the Project before the first chance of consultation, and before the inventory survey.	As of April 2019, the public consultation with general public on the Spatial Plan is planned in June. JICA Mission Team will propose the IA to hold a public consultation meeting after the consultation on the Spatial Plan in June and before the commencement of the official survey of the PAPs
8	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.	“Public Consultation” means any communication process by a dialogue and consultation among parties in interest to achieve understanding and agreement in the planning of acquisition of land for development in the public interest. (Article 1, No. 8) In the performance of Acquisition of Land, the Entitled Parties shall have the rights to:	No clear guidance about the form, manner, and language in the consultations.	The Public Consultations will be organized by the IA and the project explanation will be given in Bahasa Indonesia orally and in slides and in handouts.

	JICA Guidelines, WB OPs	Law No.2 of 2012 and related Presidential Decrees	Gap	Bridging Measures to be taken in the Project
9	Appropriate participation of affected people must be promoted in the planning, implementation, and monitoring of resettlement action plans.	<p>a. have knowledge of the performance of the Acquisition of Land; and</p> <p>b. receive information about the Acquisition of Land. (Article 55)</p> <p>In the performance of Acquisition of Land in the Public Interest, the public may participate to, inter alia:</p> <p>a. provide inputs either in writing or orally of the Acquisition of Land; and</p> <p>b. support the performance of Acquisition of Land. (Article 57)</p>	No clear guidance about promotion of participation in the planning, implementation and monitoring of land acquisition.	Necessity of use of Kaili language will be asked during the Census. JICA Mission Team will discuss and propose to IA about involving the representative(s) of PAPs in implementation and monitoring of land acquisition.
10	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.	<p>There are three timings of raising objections.</p> <p>1. If within a sixty (60) working day period of the Public Consultation on a development plan there is a party objecting to the planned location of development, a(nother) Public Consultation shall be repeated by engagement of the objecting party within thirty (30) working days.</p> <p>A party objecting to the planned location of development shall present his/her objections in writing along with the reasons therefor. (Article 20)</p> <p>If in the repeated Public Consultation there are still parties objecting to the planned location of development, the Agency needing land shall report such an objection to the local governor.</p> <p>The governor shall form a team to make a study of the objections to the planned location of development. (Article 21)</p> <p>2. Where the Entitled Party does not receive the results of the inventory as intended, he/she may file an objection with the Land Administrator within fourteen (14) working days of the announcement of the results of the inventory.</p> <p>Where there is an objection to the results of the inventory, verification and improvement thereof shall be made within fourteen (14) working days of the receipt of the filing of an objection to the results of the inventory. (Article 29)</p> <p>3. Where there is agreement on the form and/or the amount of Compensation, The Entitled Parties may file an objection with the local district court within fourteen (14) working days of the negotiation on determination of Compensation.</p> <p>The district court shall decide the form and/or the amount of Compensation within thirty (30) working days of the receipt of the filing of objection. (Article 38)</p>	Timing and method of filing grievance are clearly stated. Those who are not the owner of land or asset to be affected can not file grievance in the latter 2 timings.	JICA Mission Team will strongly propose IA to open a contact window (telephone, email, SNS) to receive and record opinions and complaints about the Project.
11	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial	<p>(1) Inventory and identification of possession, ownership, use, and utilization of land shall include:</p> <p>a. surveying and mapping on a parcel-by-parcel basis; and</p> <p>b. gathering data on the Entitled Parties and the Objects of the Acquired</p>	Although the term 'Cut-off date' is not used, the inventory must be finished within 30 working days	The official survey of the land, asset and ownership will set the Cut-off date. (Either the start date or the end date will be discussed

	JICA Guidelines, WB OPs	Law No.2 of 2012 and related Presidential Decrees	Gap	Bridging Measures to be taken in the Project
	baseline survey (including population census that serves as an eligibility cut-off date , asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advantage of such benefits. (WB OP4.12, Para. 6)	Land. (2) Inventory and identification of possession, ownership, use, and utilization of land shall be conducted within thirty (30) working days. Inventory and identification shall be conducted to ascertain the Entitled Parties and Objects of the Acquired Land. The results of the inventory and identification shall contain the list of the nominated Entitled Parties and Objects of the Acquired Land. The Entitled Parties shall include the items of name, address, and employment of the parties who possess/own the land. The Objects of the Acquired Land shall include the items of location, size, status, and type of use and utilization of land. (Article 28) The results of the inventory and identification of possession, ownership, use, and utilization of land must be announced at the urban/rural village administration office, the subdistrict office, and at the place where Acquisition of Land is conducted, for fourteen (14) working days. (Article 29)	after the commencement, or after the Location Announcement by the Governor. It will be easy to set the eligibility cut-off date at the start date of the inventory. The results of the inventory that will be considered for compensation is published at the public office. Those who are not listed will not be compensated unless he/she files a public objection. No gap.	with IA in later phase of the Project) Publishing the survey results at the public office will prevent influx of encroachers on the Project Area.
12	Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP4.12 Para. 15)	“Entitled Party” means any party by whom objects of the acquired land are possessed or owned. (Article 1, No. 3) The giving of Compensation must in principle be given directly to the Party Entitled to Compensation. Failing him/her, the Entitled Party may by operation of law assign the powers to other party or successor. The attorney-in-fact may only receive the powers from one person entitled to Compensation. Those entitled shall be, inter alia: a. landholders; b. land concessionaires; c. waqf organizers, in the case of waqf land; d. ex-customary land owners; e. indigenous people; f. parties in possession of the state land in good faith (customary residents/ occupants on public land without registration); g. land tenure holders; and/or h. owners of buildings, plants or other objects related to land. As regulated, Compensation shall be given to the landholder. In the case that the right to build or the right to use over the land is not his/her own, Compensation shall be given to the holder of the right to build or the right to use over the building, plants or other objects related to land owned by or belong to the him/her, whereas Compensation for his/her land shall be given to the title holder or the concessionaire. (Article 40)	No gap.	Eligibility of benefits will be defined according to the Law No. 2 of 2012 and to the WB OP 4.12.

	JICA Guidelines, WB OPs	Law No.2 of 2012 and related Presidential Decrees	Gap	Bridging Measures to be taken in the Project
13	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para. 11)	<p>The giving of Compensation may be made in the form of:</p> <ul style="list-style-type: none"> a. money; b. substitute land; c. resettlements; <p>“Resettlements” means a process of replacing the Entitled Party’s land with the land of different location as agreed upon during the process of Acquisition of Land.</p> <ul style="list-style-type: none"> d. shareholding; or <p>“Shareholding” means placement of shares in the relevant development activities in the public interest and/or the management thereof is made by agreement of the parties.</p> <ul style="list-style-type: none"> e. other forms as agreed upon by both parties. <p>Other forms as agreed upon by both parties are, for example, a combination of two (2) or more forms of Compensation as intended by point (a), point (b), point (c), and point (d). (Article 36)</p> <p>Compensation for indigenous land shall be given in the form of substitute land, resettlements, or other forms as agreed upon by the relevant indigenous people.</p> <p>Parties in possession of the state land that may be given Compensation shall be the state land users providing in compliance with or not in violation of the provisions of laws and regulations. For example, ex-right holders (whose tenure has expired) still using or utilizing the relevant land, parties in possession of the state land on a lease basis, or other parties using or utilizing the free and unclaimed state land not in violation of the provisions of laws and regulations. (Art. 40)</p>	Although no preference is stated, substitute land can be the form of compensation. No gap.	(There is high possibility that the Project will not cause any displacement) Preference will be given to land-based resettlement strategies if any displacement of land-based persons is found necessary after the Detailed Design.
14	Provide support for the transition period (between displacement and livelihood restoration). (WB OP4.12 Para. 6)	No provision of support during the transition period.	No provision of support during the transition period.	(There is high possibility that the Project will not cause any displacement) Support for the transition period will be provided if any displacement is found necessary after the Detailed Design.
15	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP4.12 Para. 8)	No particular description about handling of the vulnerable groups.	No particular description about handling of the vulnerable groups.	(There is high possibility that the Project will not cause any displacement) Particular attention and assistance will be provided to vulnerable groups if any displacement of them is found necessary after the Detailed Design.

Source: JICA Study Team

1-3-2-3 Size and Location of Land Acquisition, Relocation and Resettlement

(1) Size and Location of Land Acquisition, Relocation and Resettlement

The Detailed Study to be implemented in May to July 2019 will clarify the boundary of land area necessary for the Project.

According to the field observation in March 26, 2019, no resident was observed in the area including the potential project site. One or two stall(s) on the right bank may be affected if these stalls did not move out voluntarily before the implementation of the Project.

Palu City Road Division is expected to be the main land owner on the right bank.

Private residential houses on the left bank were destroyed by the tsunami. The ownerships are expected to be registered with the Provincial Land Department (BPN) in Palu.

(2) Data Collection

Data of the Project PAPs will be collected after the boundary of the land area required by the Project is drafted by the JICA Mission Team.

According to the Law No. 2, 2012, the information of the land parcel to be required for public purpose will be surveyed by the Preparation Team using data available at Land Department (BPN) in Palu.

BPN has already collected land data of about 5,000 lots affected by the liquefaction in December 2018. The survey follows the standard survey method called IP4T. The results are available in GIS format.

The same survey by BPN is necessary to be done for the land necessary for the Project. The timing of the survey is shown in the Line 6 of Table 1-3-38. In parallel, JICA Mission Team will need to conduct population census and socio-economic survey of the PAPs to collect the information that will not be covered by the BPN survey.

All the PAPs of the Project is non-resident land owners. Identifying the survey target PAPs may need cooperation of local community and all other available method.

1-3-2-4 Measures of Compensations and Assistances

As a result of gap analysis, it is expected to occur no major gap in the concrete measures for compensation and support of the project compared to the JICA guidelines. On the other hand, the following points need to be coordinated with related organizations.

(1) Coordination with related organizations in the future

After discussion and agreement with the relevant organizations on the details of land acquisition, it is necessary to disclose information such as cut-off date, qualifications for compensation and support, contents and scale to PAPs

(2) Issues requiring future examination and adjustment of land in coastal areas

In an interview between the Mayor of Pal and the JICA Study Team on April 2, 2019, the Mayor clarified that the necessary land for the project would be acquired as a public works site.

As of June 2019, the relevant agencies have not sufficiently discussed the use of land in the RED zone of the coastal area and the response to purchase requests from land owners in the zone. There is a possibility that the conclusion and agreement of the discussion have not been made even when the land acquisition phase of the Project.

Land acquisition related to free projects will be implemented early among the series of support projects. Therefore, IA, relevant organizations, and the JICA Study Team need to exchange views with the local people and try to form a cooperative public opinion for the whole series of support JICA projects in the local community.

1-3-2-5 Grievance Mechanisms

There are three timings of raising objections in the Law No.2 of 2012.

1. If within a sixty (60) working day period of the Public Consultation on a development plan there is a party objecting to the planned location of development, a(nother) Public Consultation shall be repeated by engagement of the objecting party within thirty (30) working days.

A party objecting to the planned location of development shall present his/her objections in writing along with the reasons therefor. (Article 20)

If in the repeated Public Consultation there are still parties objecting to the planned location of development, the Agency needing land shall report such an objection to the local governor.

The governor shall form a team to make a study of the objections to the planned location of development. (Article 21)

2. Where the Entitled Party does not receive the results of the inventory as intended, he/she may file an objection with the Land Administrator within fourteen (14) working days of the announcement of the results of the inventory.

Where there is an objection to the results of the inventory, verification and improvement thereof shall be made within fourteen (14) working days of the receipt of the filing of an objection to the results of the inventory. (Article 29)

3. Where there is agreement on the form and/or the amount of Compensation, The Entitled Parties may file an objection with the local district court within fourteen (14) working days of the negotiation on determination of Compensation.

The district court shall decide the form and/or the amount of Compensation within thirty (30) working days of the receipt of the filing of objection. (Article 38)

1-3-2-6 Institutional Coordination and Sharing Responsibilities

As of June 2019, the Executing Agency is decided as Bina Marga (Road Department at national level). The Implementing Agency, however, and the coordination and sharing responsibilities with province and city offices are not yet decided.

1-3-2-7 Implementation Schedule

(1) Draft project schedule as of March 2019

As of March 2019, the draft project schedule proposed by the JICA Study Team is to finish the land acquisition by the end of August 2019 as shown in Table 1-3-40. In typical JICA Grant Project, registration of land to the Implementing Agency is required by the hand-over of drawings to the bidder, which is expected in October 1, 2019.

Since the required land is either road area or tsunami affected area, land clearance requirement before the commencement of the preparation work in December 2019 will not be a great issue in this Project.

Table 1-3-40 Draft Schedule of Land Acquisition and Project Implementation

			Start	End
Design & Tender	1	Outline Design	Jan. 2019	April 2019
	2	Detailed Design & Tender Document Preparation	May 2019	July 2019
	3	JICA Approval of Cost Estimation	July 2019	August 2019
	4	LARAP must be submitted to JICA and DG of Highways (IA) before PQ to the latest (ESMF)		August 2019
	5	Agreement to sell must be obtained from 100 % land owners before PQ (Grant Project)		August 2019
	6	PQ/Tender/Contract	Sep. 2019	Nov. 2019
	7	Site clearance, and resettlement/relocation if any, to be finished before Preparatory Work starts (JICA Project)		Nov. 2019
Construction	8	Preparatory Work & Temporary Bridge	Dec. 2019	March 2020
	9	Foundation Pile & Substructure	April 2020	Sep. 2020
	10	Superstructure	Aug. 2020	March 2021
	11	Surface Work & Clearance Work	April 2021	July 2021

Source: JICA Study Team

(2) Remaining works

To achieve the target schedule, further coordination and reality check of the schedule with all the stake holder agencies is necessary. A question not solved at the time of writing, April 2, 2019, is recorded in the far right column in Table 1-3-41.

Table 1-3-41 Comparison of Indonesian and JICA Requirement and Remaining Questions

Law No.2, 2012 Land Acquisition for Public Purpose				JICA Guidelines	Remaining Issues for Reconstruction of Palu IV Bridge
Phase	Responsible Body	L	Action (necessary days in the law)		
Planning phase	Institution who needs the land	1	Apply to the Governor with results of Feasibility Study, and the early inventory of PAPs and assets		Do we need the FS study? Do we need to apply to the Governor?
Preparation phase	By the Governor, can be delegated to Mayor	2	Notification to community (20 days)		May be prior to the Spatial Planning consultation with residents?

Law No.2, 2012 Land Acquisition for Public Purpose				JICA Guidelines	Remaining Issues for Reconstruction of Palu IV Bridge
Phase	Responsible Body	L	Action (necessary days in the law)		
		3	Forming preparation team (10 days)		Where the preparation team will be formed, province or city?
		4		1st public consultation prior to the survey to explain the Project and purpose of the survey	
		5		CUT-OFF DATE: START DATE OF THE SURVEY	(preliminary cut-off date)
		6	Preliminary data collection (30 days) (IP4T)	<ul style="list-style-type: none"> ● Population census <ul style="list-style-type: none"> ➢ including Vulnerability recognition ● Asset census ● Socio-economic condition of Project Affected person, household, business ● Preference of measure of compensation ● Opinions on the Project 	<p>About how many land owners will be affected?</p> <p>Do we need to share the survey between the Preparation Team and the JICA Study Team?</p> <p>Or the Preparation Team will have a sociologist?</p>
		7	OUTPUT: Temporary Location Plan List		Is it overlay with the design and land parcel map (cadastral map)?
		8		DEVELOPMENT OF ELIGIBILITY CRITERIA AND ENTITLEMENT	JICA Stud Team need to work together with the City and Province in this step.
		9	Second public consultation TO AGREE ON THE PROJECT LOCATION (60 days)	Second public consultation TO AGREE ON THE POLICY/CALCULATION OF ELIGIBILITY AND ENTITLEMENT	Need to emphasize that this is the acquisition for the bridge reconstruction project. (differ from land use restriction because of the zoning, or land for tsunami dike project)
		10			Submission of LAPRAP to JICA
	Governor	11	Location stipulation (14 days)		
		12	Location announcement (17 days)		
Execution	By Head of BPN	13	Final inventory & identification of PAPs (30 days) and announcement (14 days)		JICA Study Team will conduct monitoring.
		14	Stipulation of Appraiser (30 days) and Valuation (30 days)		
		15	Final negotiation with PAPs on type and amount of compensation (30 days)		
		16	Compensation payment and land title release (7 days)		

Law No.2, 2012 Land Acquisition for Public Purpose				JICA Guidelines	Remaining Issues for Reconstruction of Palu IV Bridge
Phase	Responsible Body	L	Action (necessary days in the law)		
Land delivery	From Head of Land Acquisition to the Institution who needs the land	17	Land delivery (7 days)		
		18	Land Certification and Registration (30 days)		Grant Project is usually required Registration Certificate (or at least a proof of the process started) before distribution of bidding document (TARGET: October 1)
		19			All removal of private assets is required before the start of construction works (TARGET: November 30) Which institution (village?) will be responsible to keep the land vacant, without any influx?

Source: JICA Study Team

1-3-2-8 Budget and Funding Source

Detailed design of the Project is to be conducted in June to August 2019. During the detailed design phase, following works will be implemented.

- ✓ The survey results will be used to calculate the necessary budget.
- ✓ Further discussions and coordination between the city, province and national stakeholders will clarify the funding sources and shared responsibilities in the Project.

1-3-2-9 Institutional Structure for Monitoring

(1) Institutional Structure

Article 51 of the Law 2012 says that;

- 1) Monitoring and evaluation of the performance of acquisition of land shall be made by the Government.
- 2) Monitoring and evaluation of the results of the handover of the acquisition of land shall be made by the Land Administrator (BPN/ATR Palu City)

At this timing of reporting, it is not clear whether the monitoring 1) is conducted by Palu City or Central Sulawesi Province.

Further clarifications and information collection is needed about the institutional structure for monitoring.

(2) Monitoring Forms

Figure 1-3-10 shows the sample format for monitoring of implementation of the land acquisition and resettlement.

Preparation of Resettlement Sites (where necessary)

No.	Explanation of the site (e.g. Area, no. of resettlement HH, etc.)	Status (Completed (date) / not complete)	Details (e.g. Site selection, identification of candidate sites, discussion with PAPs, Development of the site, etc.)	Expected Date of Completion
1				
2				

Public Consultation

No.	Date	Place	Contents of the consultation / main comments and answers
1			
2			

Resettlement Activities	Planned Total	Unit	Progress in Quantity			Progress in %		Expected Date of Completion	Responsible Organisation
			During the Quarter	Till the Last Quarter	Up to the Quarter	Till the Last Quarter	Up to the Quarter		
Preparation of RAP									TANESCO
Employment of Consultants		Man-month							
Implementation of Census Survey (including Socioeconomic Survey)									
Approval of RAP			Date of Approval:						
Finalization of PAPs List		No. of PAPs							
Progress of Compensation Payment		No. of HHs							
Lot 1		No. of HHs							
Lot 2		No. of HHs							
Lot 3		No. of HHs							
Lot 4		No. of HHs							
Progress of Land Acquisition (All Lots)		ha							
Lot 1		ha							
Lot 2		ha							
Lot 3		ha							
Lot 4		ha							
Progress of Asset Replacement (All Lots)		No. of HHs							
Lot 1		No. of HHs							
Lot 2		No. of HHs							
Lot 3		No. of HHs							
Lot 4		ha							
Progress of Relocation of People (All Lots)		No. of HHs							
Lot 1		No. of HHs							
Lot 2		No. of HHs							
Lot 3		No. of HHs							
Lot 4		ha							

Source: JICA 2017

Figure 1-3-10 Sample Monitoring Format for Land Acquisition

1-3-2-10 Public consultations

Law No. 2 and 2012, which are land acquisition related laws and regulations in Indonesia, require the implementation of consultations with local residents. However, the land acquisition range in this case is around 2 ha, and land acquisition can be carried out only in consultation with individual right holders. Palu city as responsible section is expected to carry out this procedure.

JICA Guidelines require the first consultation before the start of the land acquisition survey. At the end of June, the land acquisition department in Pal City will explain the future compensation policy and procedures in planned stakeholder meeting.

1-3-2-11 Environmental Monitoring Form

The format will be prepared after field survey and environmental evaluation.

1-3-2-12 Environmental Checklist

The format will be prepared after field survey and environmental evaluation.

1-3-2-13 Other

None.

1-4 Others

1-4-1 Confirmation of Tax Exemption

Results of hearing from PU bureau of International cooperation and budgeting planning is written below.

1-4-1-1 Overseas procurement

Materials might be tax-exempted if stated in the minutes of discussion regarding the procurement list.

1-4-1-2 Domestic sourcing

There is no regulation in Indonesia for tax exemption regarding domestic sourcing. It is therefore necessary to follow the refund application method. The refund application procedure is the following:

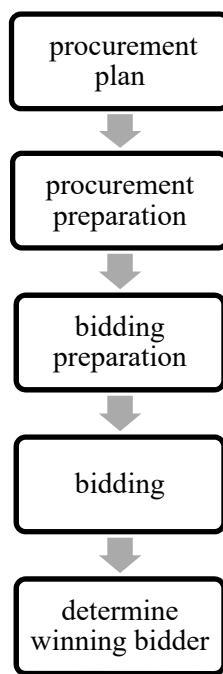
- The Contractor of a Grant aid project shall request JICA to send an official letter to the PU for notifying the refund application
- JICA send an official letter to PU regarding the Contractor's application for a tax refund in relation to a Grant Aid Project
- PU report to the State secretary of Ministry regarding the Contractor's application for a tax refund and ask for the approval of the Contractor's application
- State of ministry investigates the rightness of the Contractor's application
- State of ministry request the Ministry of Finance to refund tax to the Contractor once the application is completed
- The Contractor then submits all of the required documents to the Ministry of Finance.
- The Contractor is refunded at local tax office after approval of the Ministry of finance.

The refund process in Indonesia is not common procedure and it might take couple years or more to get refund.

1-4-2 Bidding System in Indonesia

The method of bidding in Indonesia is described in chapters III to VI of Peraturan Menteri PUPR Nomor 07 / PRT / M / 2019. The bidding procedure is shown in Figure 1-4-1. In case of Bidding, PUPR plans the necessary projects to achieve the target based on the national development plan. After setting various conditions such as project packages and project budget for project implementation, a draft contract will

be prepared for consulting companies and construction companies who will implement the project. Then, after organizing bidding committee and deciding on qualification screening methods and bidding evaluation methods for the participants, the bidding committee will prepare a bidding book. Once the preparation for bidding is completed, the bidding is carried out to determine the winning bidder among the eligible participants.



Source: JICA Study Team

Figure 1-4-1 Procurement process in Indonesia

1-4-2-1 Procurement plan

Procurement planning will be implemented based on the principles of sustainable development. At first, a demand analysis is conducted. Demand analysis is conducted based on the development plan defined by the ministries. In the demand analysis, it is necessary to determine the construction work based on the achievement target of the national development plan. In addition, after deciding the construction level to be implemented, plan a project that small and medium-sized company can also participate in. It is also obliged to conduct a construction feasibility study prior to implementation. Next, determine the selection conditions for the construction consulting company necessary for project implementation. When selecting a construction consulting company, it is necessary to consider the setting of service level, target setting, work execution timing, contract type (single year / multiple years), and the number of required experts. Then, plan the project implementation schedule. The project implementation schedule includes the project implementation schedule defined by the project owner and the period from the project implementation schedule proposed by the project winning bidder and also period of the delivery of the product. Then, formulate a procurement budget plan. The procurement budget includes all the costs needed to implement the project. Then, set the technical specifications / TOR. The technical specifications include the specifications of construction materials and construction methods,

implementation methods and work methods. Technical standards should be as compliant as possible to SNI. In addition, for the implementation of work, the minimum quantity necessary for the implementation of the project is stipulated. TOR includes the content of work to be performed, work execution schedule, expert performance, company performance, and work execution cost. Then we will decide the Project packages. Project “packaging” is based on the principle of efficiency, sound competition, and technical quality assurance and packaging will be conducted to enable small and medium-sized company to participate as much as possible. In case of bidding, participation qualifications differ depending on the package budget. For small packages, from Rp100 million to Rp1 billion, only small and medium companies are eligible to bid. For packages from Rp 1 billion to Rp 2.5 billion, only mid-sized companies are eligible to bid. For larger packages, only large companies are eligible to bid.

1-4-2-2 Procurement preparation

In preparation for procurement, it is necessary to review and make decisions on technical specifications and TOR. After reviewing the technical specifications and TOR based on the latest materials and information, it is necessary to receive approval from the project owner. A detailed design survey to select a construction company and calculate the construction cost will then be carried out. On the basis of the calculated construction costs, project owner defines the project implementation budget 28 days before the tender documents submission or prior examination documents submission. Then, draft the contract. The contract for construction consulting company is either a lump-sum contract or a man-month contract. Contracts for contractors are either lump-sum contracts or unit price contracts. The draft contract must include the type of contract, scope of work, deliverables, and level of work, duration of work, period of payment, payment method, work plan, subcontractor rules, and dispute resolution options.

1-4-2-3 Bidding preparation

Bid preparation and bidding will be conducted by the bidding committee. As preparation for bidding, first, review the documents created during procurement preparation. Next, determine the qualification examination method. Two qualification screening methods have been introduced: pre-qualification screening and post-qualification screening. For prequalification procedure, the prospective bidders shall apply for the qualification certificate and submit the qualification documents through the designated website. The bidding committee will issue the short list results after having evaluated the prequalification documents. At that time, the participant can make an objection to the project owner regarding the result. Subsequently, a bid evaluation method is determined. In the case of construction consulting companies, there are quality price evaluation, quality evaluation, budget upper limit and lowest price evaluation. The type of the project determines the appropriate bidding method. Also, depending on the bidding method, the selection method of participants is different. In case of a project which quality is considered important, invitations are sent to participants who have been listed as candidates in advance, and bids are made. In the case of contractors, two types of methods have been implemented: value system evaluation methods and minimum price evaluation methods when technical quality is required. A bidding book should then be established consisting of qualification certificate, construction consulting contractor

selection document, and construction bidding document. A certificate of qualification is a document that describes general instructions to participants, a qualification data sheet, and a method for evaluating qualification. The construction consulting company selection document is a document including an invitation letter, an instruction sheet for participants, a TOR, and a bid document format. The construction bid document is a document in which an invitation letter, an instruction sheet for participants, and a bidding document format are described.

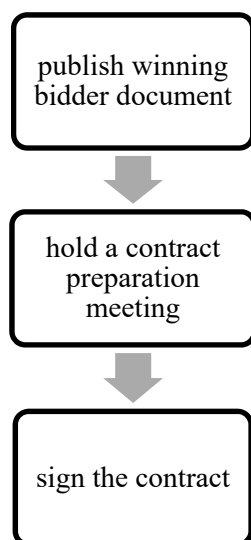
1-4-2-4 Bidding

After bid preparation has been implemented, bidding for the project will be implemented. At the time of bidding, the Bid Committee announces the project. After the announcement of the project, the participants submit the qualification form to the website defined by the employer according to the schedule. Based on the submitted qualification form, the bidding committee will verify qualifications and only those who pass will qualify. An appeal period will be established within 5 business days from the announcement of the examination results. Within 3 business days after the objection period, the Bid Committee will provide a written response to these objections, as necessary. If there are less than 3 participants who are eligible for bidding, the qualification will be redone. If two participants are eligible for bidding, we will then proceed to the subsequent bidding process. If only one participant is qualified to bid, we will proceed directly to contract negotiations. The bidding committee should report the result of re-qualification to the client.

After the bidding participants have been decided, the bidding committee will convene all the eligible participants and announce how to bid. The invited participants electronically register and download the bid book through the designated website. By the deadline for submission of tender documents, participants submit tender documents on the website. The bidding committee may postponed by 1 day the deadline if the participant does not submit the bidding documents by the bidding document submission deadline. After the submission deadline, the bidding committee will evaluate the bidding documents.

1-4-3 Form of Contract in Indonesia

The contract method is described in chapters VII to X of Peraturan Menteri PUPR Nomor 07 / PRT / M / 2019. The contracting process of Indonesia is shown in Figure 1-4-2. After the successful bidder is selected by bidding, the project owner issues a notice of appointment to the successful bidder. After the notification of selection is issued, a preparatory meeting will be held to sign the contract. The contents discussed at the preparatory meeting will be recorded in the minutes. When signing a contract, it is necessary to incorporate the opinions of construction experts, but if there is no suitable person, the opinion of the team formed by the relevant ministries can be reflected. Contract signatures must be made within 14 business days after the issuance of the letter of appointment.



Source: JICA Study Team

Figure 1-4-2 Contract process in Indonesia