

# Hazard Study of Earthquake and Liquefaction in Correctional Institution Palu, Central Sulawesi

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(Received 22 April, 2022; Accepted 14 July, 2022)

## ABSTRACT

Earthquakes in Palu and surroundings area on 28 September 2018 gave the significant impacts to public facilities damage, such as the Correctional Institution Class II A Palu. The correctional institution area where was located only  $\pm 300$  metres from the liquefaction zones in Petobo also hit by the phenomenon of liquefaction triggered by the earthquake. Based on The Regulation of Ministry of Laws and Human Rights Republic of Indonesia article 4 point (d) stated that correctional institutions are located far away from the possibility of natural hazards (earthquakes, floods, landslides) and integrated with wastewater disposal to avoid environmental effects (Minister of Law and Human Rights Regulations, 2011). The disasters that occurred should be the challenge and the problems for Correctional Institutions Palu in undertaking the compulsories and the functions in disaster-prone area. The first objective of this study was to analyse the earthquakes and liquefaction threat in Correctional Institution Palu area. Threat level index of Correctional Institutions Palu obtained from the threat level zone maps within the 2018 events by DIBI and USGS. The hazard map conducted through analysing types of earthquake threat related to disaster events in the study area. Moreover, observation and interview conducted for the data collection. This study found the Correctional Institutions Palu area was categorized as earthquakes-prone area, as the impact re-establishing of special patterns for correctional institutions location should be re-investigated.

**Keywords:** *Correctional institutions, Earthquakes, Liquefaction, Minister of Law and Human Rights Regulations, Threat*

## Introduction

Central Sulawesi is one area in Indonesia that is categorized as high threat of earthquakes since the province is located over active faults (Pakpahan *et al.*, 2015). Based on disaster events recorded, earthquakes hit Palu since 1907. The historical events proved 13 earthquakes noted with the maximum magnitude reached 7.6 SR as it was centered at 0.5 LS-125.3 BT on May 20, 1938 (Ramadhani, 2011). One of impacts triggered by the earthquakes is the phenomenon of loss of ground force due to vibra-

tion called liquefaction. Liquefaction is often occurred on sandy soil and poor gradation patterned. Putra (2018) found Palu is the vulnerable area towards liquefaction when a big magnitude earthquake occurs.

Earthquake that hit Palu and surrounding areas on 28 September 2018 destroyed public facilities, such as Correctional Institutions Class II A Palu. The correctional institution area is only located  $\pm 300$  metres from the liquefaction zone in Petobo whereas stricken by the liquefaction as well. According to the previous studies by Kurniawan *et al.* (2016) ex-

explored the result calculation on public facilities in Palu showed the resonance potential of Birobuli Clinic, Mayor's Office of Palu, Mutiara Airport, Santika Hotel is included in threat zones, whereas Elementary School 2 of Birobuli is categorized as danger zones. Moreover, other necessary public facilities is Correctional Institutions Class II A Palu. Cited from The Regulation of Ministry of Laws and Human Rights Republic of Indonesia M.HH-07.OT.01.03 Years 2011 Concerning Master Plan for Correctional Technical Implementation Unit within the Ministry of Law and Human Rights article 4 point (d) explained the correctional institutions area should be safe-located from the possibility of disaster events (earthquakes, floods, landslide) as well as it is facilitated with wastewater disposal in order to avoid environmental effects.

The high of tectonic activity in Palu should be in line with the practice of infrastructure with earthquake resistance based and the related regulation as well. Citing from Minister of Law and Human Rights Regulations, this study aims to explore the level of threat within the Correctional Institutions area. The method applied is qualitative with case studies at Correctional Institution Palu. Previous literature studies added into this study to verify the level of threat. Furthermore, the data collected through observation and semi-structure interview involved 3 informants as the authority representative of Correctional Institutions Class II A Palu, Central Sulawesi. The result of interviews processed through coding to filter the important information as data reduction. The observation practiced through several visits to correctional institutions due to inside condition. The hazards maps obtained with the process of analysing the soils as well as earthquake events within the observation and literature studies methods.

## Literature Reviews

### Hazard

HAZARD is any substance, phenomenon or situation, which has the potential to cause disruption or damage to people, their property, their services and their environment (Asian Disaster Preparedness Center, 2017). A hazard can be defined as a potentially damaging physical event, social and economic disruption or environmental degradation. Typical examples of hazards can be absence of rain (leading

to drought) or the abundance thereof (leading to floods). Chemical manufacturing plants near settlements and incorrect agricultural techniques, can also been seen as hazards which could lead to possible disasters. Hazards can be the creation of man or the environment (Western Cape Government 2017).

### Disaster

Disaster is the event or a series of events that threaten and disrupt people's lives and livelihoods caused by both natural and/or non-natural factors as well as human factors resulting in human casualties, environmental damage, property losses, and psychological impacts (Law Number 24 Years 2007). As (BNPB, 2017) defines disaster is events caused by natural phenomenon or man-made, which is suddenly or slowly occurs that can give the impacts to the loss of lives, properties, environmental degradation, the incidents happened beyond the ability of community with all its resources. Based on those two definitions, disaster is the event that resulting deprivation, damages, and loss that impact to the living elements on earth. It is also supported by UNISDR (2015) : (Anam *et al.*, 2018) definition "a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources". One type of natural disasters that often hit Palu is earthquakes. Earthquake is natural events triggered by vibration on the earth's surface due to the sudden release from the epicenter. Earthquake is described as natural vibration, happened in certain location, and uncontinued. The earthquakes caused of sudden plates movements. The unexpected slips occurs as the existence of force which formed from nature and human factors (artificial earthquakes). Earthquakes is divided into two types, i.e. tectonic and volcanic earthquakes. Tectonic earthquakes formed caused by energy release triggered by the slipped plates, while volcanic earthquakes emerge affected from eruptions or volcanic activities (Pawirodikromo, 2012).

### Liquefaction

Based on the understanding of the United States Geological Survey, liquefaction is a phenomenon when the soil loses its ability to bind to one another due to sudden pressure like an earthquake. Earthquakes increase water pressure in saturated soils

and cause particles in the soil to lose contact with each other, causing the soil (especially sandy soil) to act like a liquid. In a geological framework, there are three main components to determine the vulnerability of liquefaction in an area, namely:

1. The existence of a layer of soil in the form of sand at a depth of less than twelve meters
2. Depth of ground water level lower than ten meters
3. Earthquake magnitude.

Liquefaction is a term used to describe various phenomena where the strength and stiffness of soil sediment are reduced as a result of water pressure generation. Although liquefaction may be caused by static loading, it is most often caused by earthquakes. Melting occurs most commonly in loose, saturated, clean to muddy sand but has also been observed in gravel and non-plastic melt. Failures with characteristics similar to liquefaction failures have been observed in muds low plasticity. Melting can produce damage ranging from small slumps and lateral spreads to large slide flows with displacement measured in tens of meters. This can cause the foundation and structure of the anchor to settle and / or tilt, or can separate it through large differential displacement.

Earthquake events that occur on hammers trigger other events such as liquefaction. Earthquakes can cause secondary effects or non-tectonic processes on the surface triggered by the earthquake. One of these secondary effects is the phenomenon of soil liquefaction due to cyclic loads or known as liquefaction. Liquidity events generally occur in the consistency of saturated granular soils that are loose to moderate with drainage properties in the soil. Soil deposits or deposits that have the potential to experience liquefaction when given a cyclic load are fine sand (sand), silty sand (silty sand), and loose sand (loose sand). Because it only occurs in saturated soils, liquefaction generally occurs near rivers, bays, or other bodies of water (Kramer, 1996).

The following phenomena after big earthquakes caused by the loss of soil strength triggered from the earthquake vibration. Liquefaction is often existed in the area with sandy soil structure and poor gradation patterned (Youd and Perkins in Soebowo *et al.*, 2014).

### Research Methods

The applicable methods of this research are case study qualitative and literature studies. The case

study conducted at a Correctional Institution Palu. Literature studies collected through previous researches to prove the level of threat. Furthermore, this study practices observation and semi-structure interview with 3 (three) informants as the authority representatives of Correctional Institution Class II A Palu, Central Sulawesi. The result of interview processed through coding for data reduction. The observation implemented in several visits conforming the conducive situation inside the Correctional Institutions.

### The Threat of Earthquake and Liquefaction at Correctional Institution Class II A Palu, Central Sulawesi

In term of Relocation Studies of Earthquakes Hypocenter at Palu Koro and Matano Faults Applying Geiger Method stated the earthquakes that hit Palu dominated by shallow hypocenter with the depth of 0-70 kilometers and the magnitude of 2-5 SR, however medium earthquake centered in offshore. The inventions prove the area of Palu Koro and Matano Faults indicated as the area with high tectonic activity followed by the characteristic of shallow depth amongst 0-60 kilometers triggered by active faults movements. Table 1 displays the historical events of earthquakes in Palu since 1907. The document notes 13 earthquakes with the highest magnitude reached 7.6 SR centered at 0,5 SL-125,3 EL on 20 May 1938 (Ramadhani, 2011).

The high of tectonic activity in Palu should be followed with the existence of earthquake-based infrastructure and the related regulation as well. The resilient infrastructure towards earthquake hazards is a long-term asset of government in sustainable development in the city of Palu. USGS mapped out the city of Palu after the 2018 earthquake as displayed in Figure 1. Based on Figure 1, Correctional Institution Class II A Palu is categorized as 6-7 zone with the MMI earthquake intensity (USGS, 2018). It is supported with the field observation conducted in this study that the earthquake gives the impact towards the damage of public facilities, in this case is the Correctional Institutions Class II A Palu. The significant damage found at the correctional institution is the wall collapse of the building, thus the earthquake leads the liquefaction phenomena at correctional institution area.

### Results and Discussion

The team conducted research for two weeks, on July

23 - 5, 2019. During the observation the researchers conducted interviews with several informants in Lapas Class II A Palu, Central Sulawesi. When we were doing research on June 23, 2018, the prison was preparing to build a facility to repair damaged facilities in the form of a perimeter fence that had collapsed due to the earthquake and liquefaction in the prison environment.

Reports from several media mentioned that the ministry of law and human rights is preparing a form of mitigation non-structurally for the next step in anticipating disasters like this one again and strengthening prison capacity in dealing with disaster situations in Lapas class II A Palu, Central

Sulawesi (Malaha, 2019). Based on the results of interviews with Kalapas as the party responsible in Lapas Class II A Palu mentioned that. There is no specific SOP that regulates emergency response to natural disasters in Class II A Lapas in Palu, Central Sulawesi in Lapas Palu. According to the breath, the SOP still needs development, especially for types of disasters such as liquefaction. From the results of these interviews the researchers summarize the implementation of SOPs that occur in Class II A Lapas in Palu in the table below:

Field observation found the earthquake triggers liquefaction at Correctional Institutions Class II A area in Palu, Central Sulawesi. The findings strengthened through the information explained by the Head of Correctional Institution Office in interview session that stated panic condition experienced by the convicts increase when the meeting points stricken by liquefaction, followed by the collapse of wall buildings. According to the interview with 3 (three) informants at the correctional institution, this study generates the scenario when earthquake happens at the correctional institution as presented in Figure 2.

The leader of security team explained the chronology when earthquake happens the prisoners in locked position. The prisoners gathered at meeting point for evacuation, however the greater magnitude of aftershock occurred. The aftershock gave the effect to the collapse of guardrail and liquefaction at the meeting point. The Head of Correctional Institution Office and security team gave the instruction to the correctional institutions to self-evacuate through the damaged guardrail. Based on the earthquake scenario, Correctional Institutions Class II A Palu is

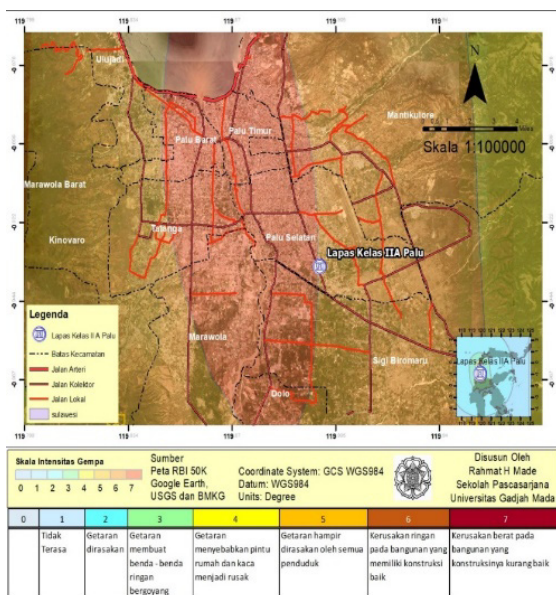


Fig. 1. Earthquake Scale Intensity Maps at Correctional Institution Class II A Palu, Central Sulawesi

Table 1. The Historical Events of Earthquakes in Palu, Central Sulawesi

No.	Date	Epicenter	Magnitue	Depth	Note
1	20 May 1938	0,5 SL-125,3 EL	7,6 SR	33 km	The whole parts of Sulawesi
2	14 August 1968	0,7 NL - 119,8 EL (Makassar Strait)	6,0 SR	23 km	Liquefaction in Kambayang (Sabang)
3	22 August 1982	0,07 NL - 121,08 EL	4,5 SR	33 km	A small island
4	25 October 1983	1,13 NL - 120,86 EL	5,8 SR	33 km	-
5	2 January 1994	Tomini Bay	5,9 SR	33 km	Sausu, Parigi
6	14 December 1996	0,60 NL-119,92 EL	7,0 SR	39 km	Palu, Donggala and ToliToli
7	11 October 1998		6,1 SR	Normal	Palu and Donggala
8	20 June 2000	Banggai Archipelago	6,2 SR	36 km	Bangkep, Luwuk, Poso, Palu
9	August 2002	1,0 NL-121.05EL (Tomini Bay)	5,8 SR	60 km	Tojo Earthquake Water recede up to 100-200 m
10	24 January 2005	Bora-Palolo	6,2 SR	33 km	Palu, Donggala, Parimo, Pantai Barat

Source: Ramadhani (2011)



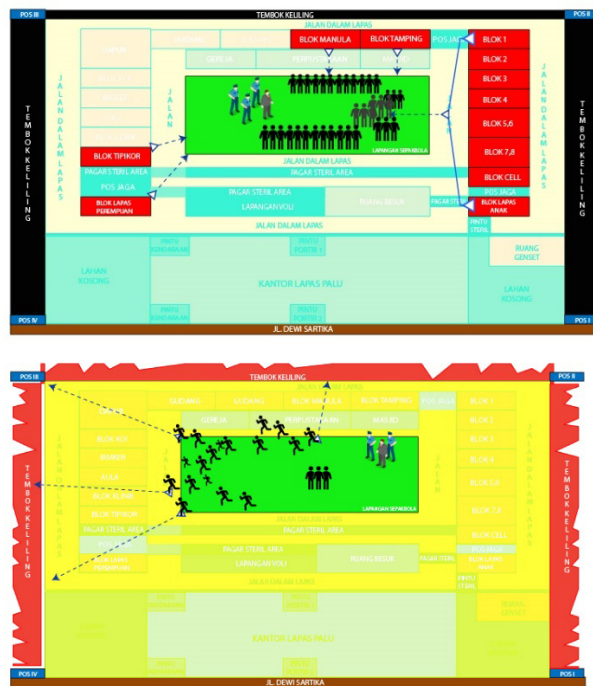


Fig. 2. Earthquake and Liquefaction Scenario  
Source: Interview at Correctional Institution Class II A Palu, Central Sulawesi

classified as vulnerable area of earthquake as proven in Figure 3. The process of returning prisoners to prison is carried out gradually or slowly. This is because the appeals conveyed through social media and collaboration with relevant stakeholders.

Kurniawan *et al.* (2016) studied about the soil seismic vulnerability towards natural frequency of buildings in Palu. Microtremor analysis investigated

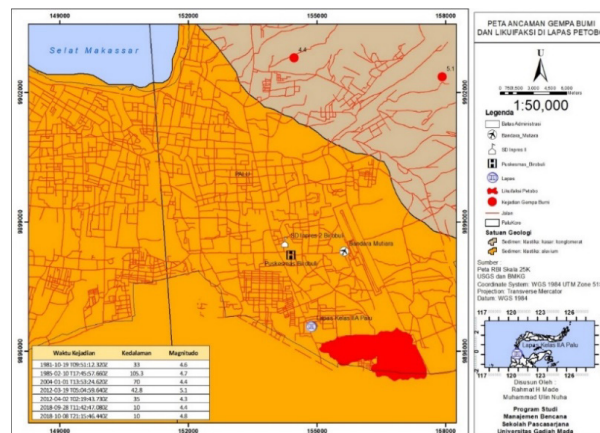


Fig. 3. Earthquake and Liquefaction Threat Map at Correctional Institutions Class II A Palu, Central Sulawesi  
Source: RBI Map on 25K Scale, USGS, and Geology Map of Palu, Central Sulawesi

that public facilities buildings as the part of 5.9% sample were potentially resonated. The resonance buildings are more damageable when the earthquake strikes, whilst the non-resonance buildings have the lower vulnerability to be potentially collapsed. According to observation, numbers of public facilities in Palu have potentially resonated, such as Birobuli Clinic, Mayor’s Office of Palu, Mutiara Airport, Santika Hotel in prone area, whereas Elementary Elementary School II Birobuli in dangerous zone.

The factual location of correctional institution is not suitable with the spatial planning pattern, as the result it should be such attentional control for the local government. The Regulation of Ministry of Laws and Human Rights Republic of Indonesia Number: M.01.PL.01.01. Years 2003 concerning Patterns of Correctional Technical Implementation Unit Building article 4 explained the area of technical implementation unit buildings are located out of the possibility of natural hazards (earthquakes, floods, landslides) and integrated with wastewater disposal to avoid environmental degradation impacts (Permenhumham, 2011). The explanation of ministry regulation proves there is no coherence with the factual condition whereas the correctional institutions is spotted in dangerous zones of natural hazards. Furthermore, it may interfere tasks and functions of the penitentiary in term of prisoners training at Correctional Institution Class II A Palu. In addition to the ministry regulation, based on Disaster Prone Area Map of Palu proved the Correctional Institutions area is included in 3L category, which means Very-High Vulnerability of Liquefaction Zones. The spatial instruction after disaster (the land use provisions) for this area, followings:

1. The prohibition for the new settlement and public facilities in risk zones (corresponding to SNI 1726, i.e. hospitals, schools, meeting halls, stadiums, energy centres, telecommunication centres)
2. The settlement reconstructions should be strengthened as the legal standards (SNI 1726)(BSN, 2012)
3. Protected area function or non-built cultivation (agriculture, plantation, and forestry) are on undeveloped area in very-high prone zone of liquefaction and ground movements.

The next literature studies by Putra (2018) about *Gemuruh di Lombok, Palu dan Donggala, Senyap di Selat Sunda* mentioned there are three main compo-

**Table** Summary the implementation SOP for emergency response of natural disaster in Maesa detention centre (Source : Master Thesis by Rahmat)

No.	Informant	action	Implementation	Expected Output	Equipment	information
1	Head prison warden	Deciding an emergency response if the scale of disaster increase (point 6)	Could not be done because of panic condition when followed by a larger scale earthquake	Decided the emergency reponse	Communication instrument and loudspeaker	Could not be done
2	Head prison warden	Mobilize all officers to help evacuate in accordance with the evacuation plan that has been made (poin 7)	Heads prison warden directed the officers to get the prisoners out of their respective block cells	Evacuate prisoners to safety place	Communication instrument and loudspeaker	done
3	Head prison warden	Transferring and securing prisoners head of the security and holding them in the nearest prison and detention or higher locations in the event of a flood, tsunami and volcano eruption (Point 9) a larger earthquake	Head prison warden together with the team tried to secure the prisoners to the evacuation point but the transfer process did not work because of the aftershocks with scale.	The situation is an under control	Communication instrument, peralatan pengamanan, peralatan pengawalan	done
4	Head prison warden	Make a chronological report of a short event and instant report to the Correctional Division of the Kemenkumham Regional Office and the Directorate of Security and Order of the Directorate General of Social and Political Affairs (Point 13)	Head prison has coordinated with PMI and Basarnas yet after the earthquakethere has been no response to the detention center	Chronological report	stationary	Could not be done
5	Head prison warden	Returning detainees who were evacuated to return to occupy shelters and clean up the environment in prisons and detention centers supervised by security officers and security assistance by the Indonesian	The appeal was only verbal, and several social media.	Return of prisoners to the residentia room	Communication equipment, security equipment, escort equipment	Could not be done

6	Head prison warden	National Police / TNI (Point 15) Check the impact of natural disasters (Point 16)	Head prison warden conducted an inspection with prisoners who returned after the earthquake (some of which made the Bui Squad team)	Check up result	Investigation equipment	Could not be done
7	Head prison warden	move prisoners from each room for rescue (point 2).	The prisoners were moved from their respective cell blocks to the assembly point at the detention center	Evacuate prisoners	Communication tool	done
8	Head prison warden	Save the prisoners and Counting the them (point 3)	The calculation was not carried out because the prisoners forced to come out to save themselves from the Prison. Reports are only in oral form, not in document	The situation is under control	Safety equipment and documentation	done
9	Head prison warden	Provide reports to the Head of Security and Head of Prisons (Point 4)	Reports are only in oral form, not in document	Report	stationary	Could not be done
10	Head prison warden	Give an appeal for prisoners to remain seated, calm, follow the rules and not make an escape attempt (Point 5)	The prisoners were secured in the central field as a safe assembly point with Karutan	The situation is under control	Loud speaker	done
11	Head prison warden	Establish an emergency post consisting of: public kitchen, health service, public toilet, information center for recovery purposes when the scale of natural disasters damages all Lapas and Rutan service facilities (Point 12)	The post was made during the post-emergency response period in the Detention Center	Establishment of Emergency Command Post	Rutan peralatan posko darurat	Could not be done
12	Head prison warden	Make a report related to natural disasters (Point 17)	During the emergency response situation	Full report	Stationary and documentation	Could not be done

			inside the detention center did not go well, there were only a few inmates who centered the volunteer team who were directed to several evacuation points			
13	Bui Squad team	Provide information and alarms to all prison and detainee officials that prisons or detention centers have experienced natural disasters (Point 1).	Siren alarm cannot be turned on because of a power outage	Give alarm signals	Alarm Equipment	Could not be done
14	Bui Squad team	rescue prisoners from inside the room to a safer or open place (Point 2).		Evacuate prisoners to safety	the key and the lock	done
15	Bui Squad team	move prisoners from inside the room to a safer or open place (Point 2).	The prisoners cannot all be gathered and only a few will return today	The situation is under control	The situation is under control	Could not be done
16	Bui Squad team	Increase preparedness at each guard post to prevent panic or other security disturbances and increase security of main doors (Point 8).	The prisoners were forced to gather with the prisoners in the middle field to evacuate.	The situation is under control	Communication equipment, security equipment	Could not be done
17	Bui Squad team	Request assistance from the Police and (National Disaster Management Agency) BNPB (Poin 10).	Did not get a response from the police because all the officers were not present.	Request for assistance	Communication equipment, stationary	Could not be done
18	Bui Squad team	Save important documents, register books, electrical substations and their networks, warehouses for food supplies, warehouses for goods, vehicles, weapons and ammunition and other state assets (Point 11).	All systems have been integrated or backed up through the Ditjen Lapas website system	important documents, and important equipment saved	important documents, equipment saved	Could not be done



nents in geology framework to determine liquefaction vulnerability in an area:

1. The existence of sandy soil layer in less than twelve meters depth,
2. The depth of water ground lower than ten meters,
3. Earthquake's magnitude.

As three liquefaction factors listed, Palu is classified as very-high vulnerability towards liquefaction phenomena as great earthquake occurs. Generally, Palu City and the surrounding area are alluvial soils throughout north-south lengthwise and bordered by slopes and mountainous area on both sides of valley, whereas Salo Palu Rivers flowing in-between. The plain is dominated by Holosen's alluvium lithology unit that consists of muds, clays, sands, and gravels. These conditions make theregions that have this character very vulnerable to the threat of liquefaction, this is in accordance with research conducted by (Soebowo et al., 2007) regarding the study of liquefaction potential in the Opak Fault Zone and Bantul Fault Zone, Yogyakarta which suggests that geology Patalan, Bantul, Jogjakarta, and surrounding areas are exposed to fluviatil and alluvium deposits which are located in Bantul Graben which in the east is bounded by active faults of Opak which are directed almost northeast of the southwest.

The previous studies related to liquefaction in Palu, Central Sulawesi conducted by Widyaningrum (2012) in The Investigation of Geology Engineering focusing soil texture structures and water level in Palu-Koro faults and the potential liquefaction area in Palu, Central Sulawesi. The report found that a large part of Palu is alluvial sediments with the composition of sandy layers in the depth of 1-7.2 meters, furthermore slit and clay layers exist at the bottom (Wydianingrum, 2012). The investigation mentioned the depth of ground water reached 0.5-16 meters. The settlement and infrastructure development should be avoided the area along Palu-Koro and other hazardous faults. In addition, the implementation of development in the city of Palu is necessarily based on SNI (Indonesian National Standard) guidance in term of earthquake resilient building (Geological Agency, 2018).

Palu area is an area that has catastrophic potential, particularly the earthquake and the liquidity of the Petobo area. The assumption indicates that the area has a threat level to the prison occupants, namely prisoners/convicts and prison officers. Under LAW No. 24 of 2007 disaster management is a

set of efforts that include setting up a development policy that is at risk of disaster, disaster prevention, emergency response and rehabilitation activities. The process of organizing referred to in LAW No. 24 of 2007 covers all phases of disaster. In the pre-disaster phase you need a practical action or step in disaster management in the form of mitigation while the emergency response phase requires a strategic step for proper evacuation measures. The pre-disaster phase is a phase for rehabilitation and reconstruction both physically and nonphysically. Overall the action involves coordination between the domain of public works to strengthen in the structural mitigation phase in the form of a building capacity should be in the safe location of the disaster. The assumption is in accordance with the Decree of the Minister of Justice and Human Rights Republic of Indonesia Number: M. 01. PL. 01.01 years 2003 on building patterns of technical implementation Unit of correctional in the general provisions of article 4 (four) stated that "UPT building areas are located in free or far away from the possibility of natural disasters (earthquake, flood, landslide) and have waste water disposal so that it does not lead to unhealthy environmental impact."

In addition to structural reinforcement strengthening capacity in emergency response also desper-

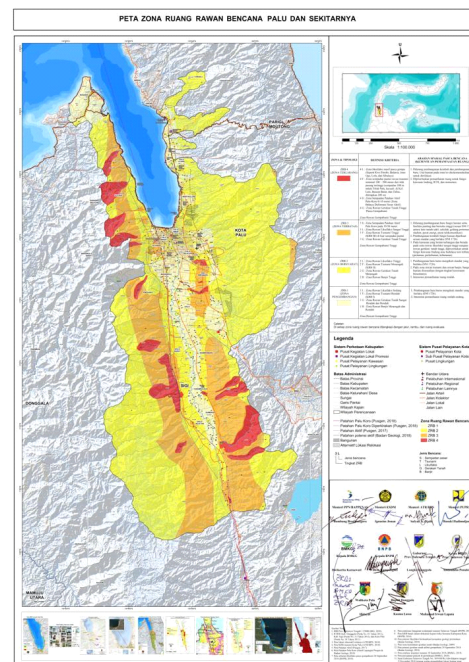


Figure 5. Disaster Prone Area of Palu City Maps, Central Sulawesi

Source: <https://www.humanitarianresponse.info>

ately needs attention from the government where prisoners are included in vulnerable groups that should be a priority in emergency response. Since there are 7 vulnerable groups in LAW No. 24 of 2007 are: A. Infants, toddlers, and children; B. Mothers who are pregnant or breastfeeding; C. Disability; and d. Elderly people. The State of criminal and legal convicts is heavily dependent on prison authorities during the emergency response process, making it highly to be included in the priority of vulnerable groups.

## Conclusion

According to the findings in term of earthquake and liquefaction at the area of Correctional Institution Class II A Palu, the conclusions of this study following:

- The Correctional Institution area is located in earthquake and liquefaction prone area,
- The existed location in danger zones may interfere the functions and roles of the Correctional Institution as law enforcement institution in Palu, Central Sulawesi
- Spatial Planning zones are not accordance with spatial-based instruction in Palu, Central Sulawesi

## Recommendation

In line with the findings of earthquakes and liquefaction impacts at Correctional Institution Class II A Palu, the recommendation listed as following:

1. The re-arrangement of spatial planning for the location of Correctional Institution to avoid the danger zones of earthquake and liquefaction
2. The necessity of earthquake building standard reviews at the Correctional Institution, specifically on perimeter wall as the security barriers at the Correctional Institution
3. The refinement of procedure in term of earthquake and liquefaction prevention in the area of Correctional Institution
4. The revision of spatial planning regulation for the Correctional Institution location.

## Acknowledgement

Thank you to the Research Directorate of Universitas Gadjah Mada for funding assistance in the 2019 Final Assignment Recognition Program (RTA).

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