

## **Earthquake And Landslide Disaster Risk Assessment At The University Of Defense: A Preliminary Study**

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### **Abstract**

*The geographical location of the University of Defense in Bogor Regency, Citereup Sub-district, Bogor, West Java, is a sloping terrain that can potentially cause landslides. The InaRISK map released by BNPB, shows that the Defense University is located in an area of Bogor Regency that is prone to disasters, especially landslides. Disaster risk assessment is an approach to show the potential negative impacts that may arise due to a potential disaster. The potential negative impacts are calculated based on the level of vulnerability and capacity of the area. This potential negative impact is seen from the potential number of people exposed, property loss, and environmental damage (PERKA BNPB, 2012). Researchers conducted an analysis of landslide and earthquake disaster vulnerability at the University of Defense. A study of building and population vulnerability to potential earthquakes and landslides was conducted at the University of Defense. The components of social vulnerability at the University of Defense in the event of an earthquake and landslide were obtained. Researchers obtained data on population capacity and building conditions at the University of Defense. Landslide and earthquake disaster risks have the potential to occur at the University of Defense. The University of Defense has the potential threat of landslides because the buildings of the University of Defense are located on hilly slopes. The vulnerability of the University of Defense buildings, the University of Defense buildings have not been designed to be entirely earthquake resistant. This can be seen in some buildings that have visible cracks. It is necessary to retrofit or strengthen the foundations of buildings in the Defense University area that have experienced a decrease in performance such as cracking, shifting, displacement. An important component where the University community and students need self-protection and rescue skills through training.*

**Keywords:** *University of Defense, Landslide, Earthquake, Vulnerability*

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## **INTRODUCTION**

The Defense University (IDU) was established through the Letter of the Minister of National Education Number 29/MPN/OT/2009 dated March 6, 2009, regarding the Establishment of IDU and inaugurated by President Susilo Bambang Yudhoyono on March 11, 2009, at the State Palace. The geographical location of Defense University is a campus located in Bogor Regency, Citereup District, Bogor, West Java, more precisely located in the Indonesia Peace and Secure Center (IPSC) area. The Indonesia Peace and Secure Center (IPSC) area is a sloping terrain that can potentially cause landslides. The InaRISK map released by BNPB shows that the Defense University is located in an area of Bogor Regency that is prone to disasters, especially landslides. Furthermore, the Defense University is located in Citereup Sub-district which is relatively not highly vulnerable to earthquakes. However, the Defense University could potentially be affected and shaken by earthquakes that occur in surrounding areas that have a high level of vulnerability to earthquakes, such as Cibinong Sub-district and Gunung Puteri Sub-district.

In the Defense University area, there are many cracks in the buildings that are thought to have been triggered by shifting ground. The Indonesia Peace and Secure Center (IPSC) area is directly adjacent to Hambalang village. Hambalang village, which is located across the valley of Hambalang hill, has experienced a severe landslide. According to Ade, the landslide that occurred in late 2001 resulted in 50 families being relocated to a new village on higher ground.

Based on the above phenomenon, it is necessary to conduct a disaster risk assessment at the University of Defense. The disaster risk assessment is an approach to show the potential negative impacts that may arise due to a potential disaster. The potential negative impacts that arise are calculated based on the level of vulnerability and capacity of the area. This potential negative impact is seen from the potential number of people exposed, property losses, and environmental damage (PERKA BNPB, 2012).

## RESEARCH METHODS

This research approach uses descriptive qualitative research whose research form uses a case study method or approach. This research focuses intensively on one particular object and examines it as a case. The case study method allows researchers to remain holistic and significant. According to Arikunto (2013), research methods are the methods used by researchers to collect research data. The research conducted by the author is an earthquake and landslide disaster risk assessment at the University of Defense: a preliminary study.

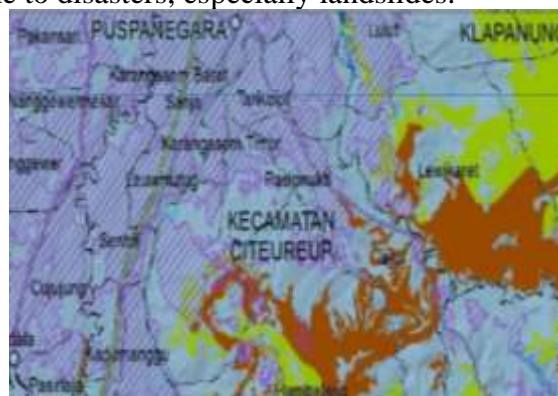
Descriptive qualitative research with a case approach. Qualitative research is research that produces descriptive results. Nawawi (2003) states that "case study data can be obtained from all interested parties, in other words, the data in this study were collected from various sources".

As a case study, the data collected comes from various sources and the results of this research only apply to the case under study. Furthermore, Arikunto (1986) states that "the case study method as one type of descriptive approach is research that is carried out intensively, in detail and in-depth on an organism (individual), institution or certain symptoms with a narrow area or subject"

## RESULT AND DISCUSSION

### **Analysis of Landslide and Earthquake Disaster Vulnerability in Defense University**

Based on the InaRISK map released by BNPB, Defense University is included in the Bogor Regency area that is prone to disasters, especially landslides.



**Figure 1: Landslide Hazard Map of Citeureup Sub-district, Bogor Regency**

From the map above, it can be seen that Citeureup sub-district which is the administrative area of the Defense University has a high vulnerability marked by many red and yellow areas indicating that the area is prone to landslides because it is located on a fairly high ground although based on its location, the Defense University is at a point that is not directly affected by landslides.



**Figure 2: Earthquake Hazard Map of Citeureup Sub-district, Bogor District**

Meanwhile, when viewed from the Earthquake vulnerability map, Citeureup Sub-district has relatively no high vulnerability to earthquakes. However, the surrounding areas such as Cibinong Sub-district and Gunung Puteri Sub-district have a fairly high vulnerability because they are marked with many red and yellow signs in the area. Thus, when there is an earthquake in the area, the Defense University located in the Citeureup Sub-district area will be affected and shaken by the earthquake according to the scale or strength of the earthquake.

### **Vulnerability Assessment of Buildings and Population to Potential Earthquakes and Landslides at the University of Defense**

#### ***Defense University Building Vulnerability Assessment***

The University of Defense is part of the Indonesian Peace and Security Center Complex which has the potential threat of landslides and earthquakes. Defense University has a potential threat of landslides with the following conditions:

- a. The Defense University campus is located on a hilly slope area.
- b. The Defense University campus is located in an area prone to landslides.
- c. The Defense University academic community has not received training or simulation for rescue from landslides.

To see the vulnerability of a building, it can be seen based on the following aspects:

#### **Structural Component**

Structural components can be seen from foundations, beams, and columns. The Defense University building has a foundation system under the building. This foundation can withstand various horizontal and vertical loads in a stable condition to produce construction stability.



**Figure 3. Cracks in the Dam of the Deanery Building of the Faculty of Defense Strategy**



**Figure 4. Cracks in the Columns of the Defense University Auditorium Building**



**Figure 5. Cracks in the Defense University Rectorate Building**

Floors and Ceramics

The Defense University building as a whole has floors that are free of cracks and floor tiles that are all intact.



**Figure 6. Floor Cracks in the Auditorium Building of the Defense University**

a. Furniture and Contents

Important equipment at the University of Defense has not been properly secured to prevent it from sliding off shelves or tables. Telephones placed on tables are far enough away from the edge that they will not fall. Speakers, computers and other electronic equipment have not been secured properly, which could hinder evacuation routes in the event of an earthquake. However, important information in the computers is periodically stored elsewhere as a backup.

The shelves at the University of Defense are in good condition and not rotten but have not been properly anchored to the walls or floor. The bookshelves are also not equipped with supports or cables at the edges to keep books from falling.

b. Utilities and surroundings

The connections on the piping are strong enough to avoid damage during an earthquake because the construction planning did not pay attention to earthquake-resistant construction.

The Defense University building has a fire extinguisher on each floor. Fire extinguisher is one of the safety requirements of a building to anticipate a fire.



**Figure 7. Fire Extinguisher in the Dean's Building of the Faculty of National Security, University of Defense**

The Defense University building already has three evacuation sites or open fields. The evacuation routes are fairly safe from falling objects.

#### **Social Vulnerability Assessment of Defense University**

Bakornas PB (2007) suggests that vulnerability factors are divided into physical vulnerability, economic vulnerability, environmental vulnerability, and social vulnerability. In the classification of social vulnerability, variables are determined that will limit and direct the objectives of this research. The variables that will be used in this research are:

a. Total Population

The larger the population in an area will greater the effect of social vulnerability. Because a high population will have a higher chance of loss of life and property.

b. Children and Old Age Population

Human age can be divided into several ranges or groups and each group describes the stage of human growth. One division of age groups or age categories is issued by the Indonesian Ministry of Health (2009) on its official website, depkes.go.id as follows:

**Table 1. Division of Age Groups or Age Categories**

Toddlerhood	0 – 5
Childhood	6 – 11
Early adolescence	12 – 16
Late adolescence	17 – 25
Early adulthood	26 – 35
Late adulthood	36 – 45
Early old age	46 – 55
Late elderly period	56 – 65
Elderly period	> 65

When discussing the vulnerability of communities, children (< 5 years old) and the elderly (> 65 years old) are prioritized. This is because the child population and the elderly population are considered to have low evacuation capabilities. In the Defense University environment, the child population is considered non-existent while the elderly population is only in the range of 3% of the entire Defense University community

## **Data on Population Capacity and Building Condition of Defense University**

### **Population**

The following is the population data of the University of Defense based on the Building at the University of Defense:

**Table 2. Defense University Population Data by Building**

No	Building	Civitas	Student
1	Auditorium	0	214
2	Rectorate	34	0
3	General Bureau	55	0
4	Planning Bureau and AK	43	0
5	Faculty. Defense Strategy	32	0
6	Fak. Defense Management	26	0
7	Fak. National Security	20	0
8	Fak. Defense Technology	19	0
9	Dining Hall	5	48
Amount		234	262

We traced the population data of the Defense University community and students at the General Bureau unit as a consideration of disaster risk capacity with the numbers listed in Table 2. We found that there is a dense population concentration in the auditorium building with 214 people and a sparse population in the Faculty of Defense Technology building with 19 people.

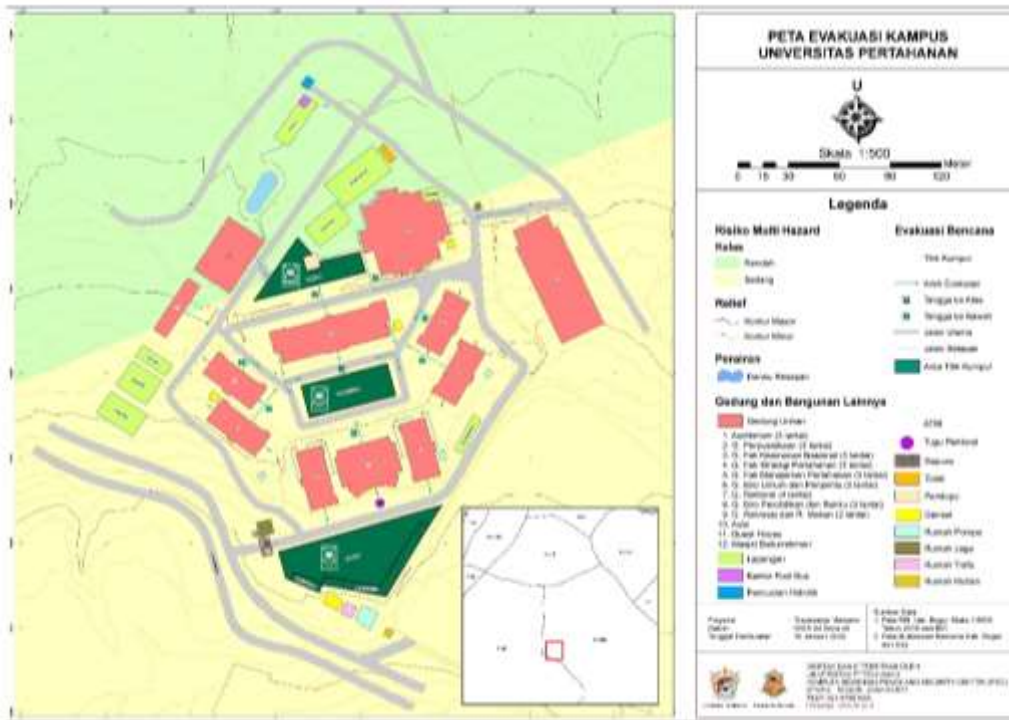
### **Population Capacity**

The population capacity on the campus of Indonesia Defense University can be categorized as relatively low because the disaster knowledge possessed by the entire academic community is lacking and uneven. In addition, there has been no training or simulation of self-protection and rescue skills received by the entire population in the campus environment. The disaster awareness culture of each individual must be further enhanced through the socialization of safety signs and understanding of disaster risks that threaten the campus environment of the University of Defense.

The academic community of the Faculty of National Security has received training education related to Basic Disaster Management so that they already can deal with disasters. Thus, empowering the academic community of the Faculty of National Security can be done as a disaster preparedness agent on the campus of the Defense University. This disaster preparedness agent can be implemented by providing socialization to other communities. However, this needs to be supported by the initiative and awareness of individual members of

the academic community of the Faculty of National Security in disseminating basic disaster management knowledge.

### Building Condition



**Figure 8. Map of Defense University Building Distribution**

The distribution of buildings on sloping slopes supports buildings that can be categorized as landslide-threatened. The University of Defense is located on a plateau that can cause land movement to lower surfaces. Therefore, we traced the building distribution data as a consideration of disaster risk capacity with the map listed in Figure 8.

### Risk of Landslide and Earthquake Disasters at Defense University

Disaster risk assessment by carrying out disaster risk mapping does not yet provide standardization in preparing disaster risk maps, so each institution or agency has a different method. Likewise, the assessment of the risk of landslides and earthquakes was carried out at the Defense University which is located in the Indonesia Peace and Security Center (IPSC) area. The risk mapping for landslides and earthquakes in this research has certain criteria and parameters which may not be much different from other institutions and agencies, but still has the same basic map study parameter principles. Several studies that have been carried out and used as references in this research include the following.

- Research conducted by Hasan, F., Master of Natural Disaster Management, Postgraduate Program, Faculty of Engineering, Gadjah Mada University, Yogyakarta in 2008 with the title Evaluation of Rockfall Risk in Parts of Gunung Kelir Hamlet, Girimulyo District, Kulonprogo Regency.
- Research conducted by Haryanto, D., Master of Natural Disaster Management, Postgraduate Program, Faculty of Engineering, Gadjah Mada University, Yogyakarta in 2009 with the title Landslide Risk Study in Semarang City, Central Java Province.

The research that has been carried out is still in a global format, so it is necessary to carry out more detailed research regarding disaster risk studies, especially landslides and earthquakes located at the Indonesian Regional Defense University Peace and Security Center (IPSC).

Disaster risk formula for landslide and earthquake risk assessment is based on three parameters according to the formula agreed in the Hyogo Framework for Action, namely:

Information :

R = Risk

H = Hazard (Threat)

C = Capacity (Capacity)

V = Vulnerability (Kerentanan)

$$R = X V$$

This landslide disaster risk analysis study is not only based on scientific considerations alone but also takes into consideration participatory patterns that involve environmental residents.

The components in a disaster risk assessment that must be fulfilled are the level of vulnerability, threat, and capacity. New mapping can be carried out after all indicator data for each component is obtained from a predetermined data source. Data collection is then adjusted for each component. The data obtained was then divided into 3 classes, namely vulnerability, threat, and capacity, namely low, medium, and high. The assessment of landslide and earthquake risk is based on Perka No. 2 of 2012 concerning General Guidelines for Disaster Risk Assessment. The study is expected to produce a risk level for each disaster threat that exists in an area. This level of disaster risk is the main basis for preparing a Disaster Management Plan.

A study of the Defense University environment was carried out to analyze the level of vulnerability, threat level, and capacity level of each element within the Defense University environment. A disaster risk study at the Defense University needs to be carried out because the location of the Defense University is in the Citeureup District, which is an area prone to landslides. Meanwhile, for earthquakes, Citeureup District is not a high potential vulnerable area, but it has the potential to be affected by surrounding areas such as Cibinong District if an earthquake occurs.

Existing vulnerabilities in the Defense University environment must be reduced to reduce the risk of potential landslides and earthquakes. The condition of the building is designed to be earthquake resistant, this has reduced the vulnerability of the building. Vulnerability in terms of population must also be reduced by increasing population capacity.

Then for population capacity, based on research it is known that the population capacity at the Defense University can be categorized as low because the population at the Defense University requires knowledge about disaster risk. Apart from population capacity, you must also pay attention to building capacity, where building capacity has an important role in the

## CONCLUSION

The location of the Defense University is at a point where there is no direct impact from landslides, although if you look at the disaster vulnerability map, the Citeureup sub-district, which is the administrative area of the Defense University, has quite high vulnerability. However, Defense University can be affected by the impact and shock of an earthquake according to the scale or strength of the earthquake. Therefore, the Defense University has the potential threat of landslides because the Defense University building is located in a hillside area.

In addition, according to the Defense University building vulnerability study, the Defense University building has not been designed to be completely earthquake-resistant. This can be seen in several buildings where cracks are visible, namely in the Dam of the Dean's Building of the Faculty of Defense Strategy and the Columns of the Defense University Auditorium

Building. In other places, some buildings have glass doors and glass windows without cross ties between the corners as lateral ties to the structure.

The student population needs serious attention because there is a dense concentration of population in the auditorium building, numbering 214 people. The population capacity at the Defense University is categorized as low because knowledge about disasters is lacking and not evenly distributed across several faculties and staff at the Defense University. Apart from that, the distribution of buildings on sloping slopes can be categorized as being threatened by landslides. This is because the Defense University is located on a plateau which can cause ground movement to lower surfaces. Several buildings have experienced cracks in the pillars and stairs of one of the buildings.

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