



Improving the Handling of Humanitarian Disaster in the Indonesian Ring of Fire by Utilizing the Detection of Output from Banten Underwater Mountain

Diena Noviarini^{1,*}, Raihaanah Nabiilah Rahmaniyah², Aulia Virлина³, Dewi Arianti⁴, Eko Arif Syaefuddin⁵, Wachid Rowinanto⁶

¹ Department of Business Digital, Eurasia Research Honorary Advisory Member, State University of Jakarta, 13390, Indonesia

² Department of Nursery, Faculty of Health, Indonesian University, Indonesia

³ Department of Management, State Polytechnic of Jakarta, 13390, Indonesia

⁴ Department of Computer, Faculty of Computer, Gunadarma University, 13390, Indonesia

⁵ Department of Machine Technic, State University of Jakarta, 13390, Indonesia

⁶ Department of Law, Faculty of Law, Bhayangkara University, Indonesia

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ABSTRACT

The activities of this International Collaboration product program are in the form of utilizing the Internet of Things as the development of information technology with the concept of Improving Humanitarian Disaster Management in the Indonesian Ring of Fire Area by Utilizing Lava Output Detection from the Banten Undersea Mountains into the latest information technology. This application uses a series of information technologies as a platform, including the Internet of Things, Big Data, Cloud computing and artificial intelligence to process and transform the natural disaster early warning system so that the application is efficient and convenient for users. The aim is to introduce and familiarize the application of information technology using several devices such as smartphones and personal computers to village communities around the ring of fire area, it is hoped that this can improve the conditions and capabilities of natural disaster data processing into appropriate information to prevent human casualties. The research instrument uses data and samples used are the use of application prototypes. The Research Team has conducted initial observations and interviews regarding the need for information technology infrastructure that will be implemented in the southern part of Banten Province in order to improve humanitarian disaster management in the Indonesian ring of fire area. The final result of the first year's activities will be a training on the information system technology system in the humanitarian disaster handling system so that the government and independent learning students can access the humanitarian disaster handling system that is implemented into the curriculum and quality standards that are registered in their rights so that consumer users are able to adapt the model of scientific and technological progress into the work and efforts they do regarding disaster response applications presented in international media and published in SINTA 1 and Scopus indexed journals as a result of international collaboration in the first year. Then this activity will be published in Sinta and Scopus indexed journals in the second year.

* Corresponding author.

E-mail address: diena_1601@yahoo.com

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1. Introduction

As reported on October 9, 2022, an earthquake with a magnitude of 5.5 occurred in the southern waters of Banten which was felt as far as Jakarta [6]. Indonesia is known to have 13 Megathrust earthquake source segments and more than 295 active fault earthquake source segments caused by its location in the ring of fire area [2]. The location in Indonesia where three of the world's tectonic plates meet, namely Indo-Australia, Eurasia, and the Pacific, causes Indonesia to often experience earthquakes and volcanic eruptions.

Megathrust earthquakes are earthquakes that originate from subduction zones, an event where one of the earth's tectonic plates is pushed under another tectonic plate. The force of the two plates that continue to move forward and rub against each other, causes a very powerful earthquake under the sea and has the potential to cause a tsunami. Data from the Head of the Earthquake and Tsunami Center of the Meteorology, Climatology, and Geophysics Agency (BMKG) the potential for a Megathrust earthquake can be seen from the seismic gap in the Megathrust zone of the Sunda Strait and Mentawai - Siberut [4]. The morphology of the Banten area is generally plains, undulating plains, and undulating to steep hills [6]. The area is generally composed of tertiary rocks in the form of sedimentary rocks (sandstone, claystone, siltstone, limestone) and volcanic debris rocks. There are quaternary deposits in the form of coastal alluvial deposits, river alluvial, swamp alluvial and young volcanic debris rocks.

Tectonic activity from the sediments that occur causes the formation of a series of volcanoes (volcanic arc) along the islands of Sumatra, Java-Bali-Nusa Tenggara, northern Sulawesi-Maluku, to Papua. The series of volcanoes is part of a series of volcanoes along the Asia-Pacific, namely the circum-Pacific series.

In general, rocks formed in the western region of Indonesia are dominated by rocks of Cenozoic age, ranging from Paleogene to Quaternary (formed between 66 million years ago to the present).

The existence of fault and volcanic activity in the Indonesian region, in addition to providing many natural resource gifts including soil fertility, also contributes to the formation of the risk of several types of disasters.

Volcanic eruption disasters where there are sedimentary rocks/sediments which are the result of volcanic eruption deposits in the form of a mixture of gravel so that steep slopes are prone to landslides. The distribution of rocks and faults in Indonesia that have the potential to cause earthquakes and tsunamis can be seen in the Geological Map of Indonesia compiled by the Geological Agency (Figure 1) [8].

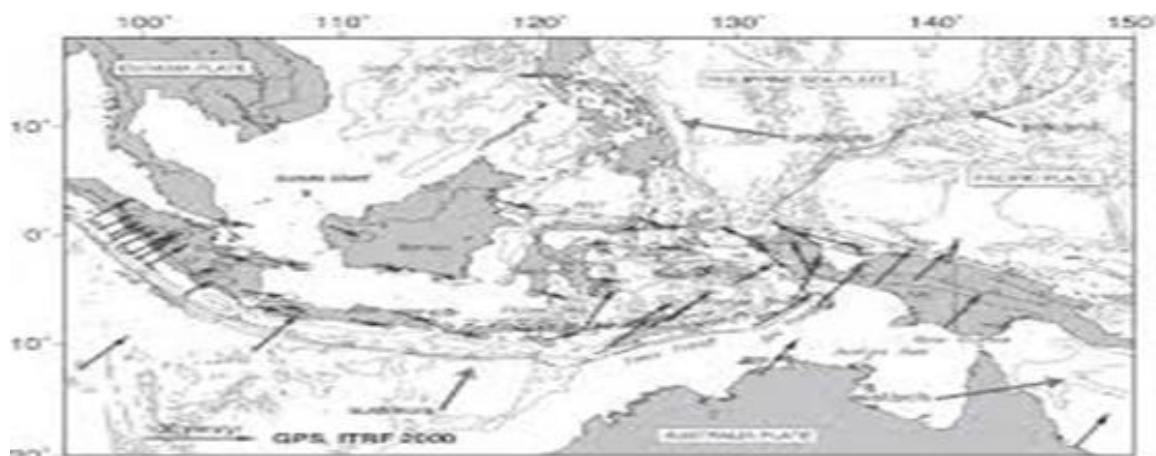


Fig. 1. Tectonic map of the Indonesian archipelago and its surroundings [8,12]

Based on this topology, the Banten region has the potential for expanding the monitoring and response area for humanitarian disasters with the potential for underwater volcanic lava landslides in the southern Banten region [9] which has the potential to be used as material for expanding the southern Banten region as well as assembling detection equipment for underwater lava landslides as a means of detecting potential tsunamis and high tidal waves [15].

This research activity aims to determine the potential for regional development by utilizing mapping of marine and land potential with sedimentology media technology. Although this type of sedimentologist' technology is widely used to expand regional economic development transportation but the material that has gone through mechanical, chemical and biological processes could not be extracted yet. Research on sedimentary structures and their relation to sedimentation processes using sedimentation process technology and utilization of each potential mineral deposit in the area transported by the initial mining process and traces of mineral properties in transitional areas, shallow seas and deep seas using satellite imagery that can be used by the government, foreign partner research institutions, educational institutions for disaster prevention and management purposes were proposed in this research.

2. Methodology

With this research activity, the problems that are being solved with target partners will be identified, including:

- i. The discovery of new minerals and potential sedimentary rocks can be used to map marine and land deposits to develop regional economic potential in expanding its territory even though there is regional authority and regulations. In regional economics, studies on economic development and growth using mineral deposits and sedimentary rocks can be used to expand regional areas and develop basic models for regional economic development by dividing the economy into two sectors, the base sector and the non-base sector.
- ii. The inevitability of developing growth and economic models in expanding regional areas always results in conflicts over the use of mineral resources and the potential for marine and land deposits that are the same in the nearest and surrounding areas.
- iii. Regional civilization conflicts can result in the depletion of mineral deposits and force authorities to find new mineral deposits using regional demographic typologies. The results of this activity are to provide a significant contribution to the growth and development of the regional economy through the expansion of regional potential and the discovery of sedimentology material technology devices that can be used widely and generally.

Literature Review is the methodology used by the Abdullah *et al.*, [1] in this study. The steps in a systematic literature review are as follows:

- i. Formulating the problem, identifying research questions to direct the literature search and focus of analysis.
- ii. Collecting data, by reviewing all scientific works, journals, and other sources relevant to the title of this activity.
- iii. Evaluating the feasibility of data, used to verify the accuracy of the data used in the literature review.
- iv. Analyzing and interpreting relevant data.

- v. Organizing and presenting data, and clear and easy-to-understand data presentation will help readers understand the information well [3].

Then the analysis method uses a fishbone diagram to see the effects and causes that create or contribute to the effects systematically [11]. The method is used to examine the problems faced by the Banten provincial government work units. The design method is used by using hardware, software, brain ware server and client specifications to design a software prototype design that can solve problems faced by the government, Indonesian society and foreign partners [10].

3. Results

Ultimately, disaster events and disaster management aspects are humanitarian operations so that important determinant factors need to be developed, trained and applied. Factors that are often problematic are communication, collaboration, coordination and cooperation. Especially if it involves various institutions/community components, the approach that needs to be known, understood and implemented with humanitarian principles is a system approach, which is a synergistic and integrated effort from institutions assigned to handle disasters and other supporting institutions, so that it becomes a strong teamwork. Activities to provide disaster prevention and handling solutions include:

- i. Outdoor sedimentation survey activities
- ii. Designing Avalanche Detection Tools
- iii. Detection of lava avalanches
- iv. Increasing the literacy of information technology in the Banten community by 90% in accessing underwater volcanic lava avalanche detection tools.
- v. Partner groups are able to create underwater volcanic tool content.

4. Conclusions

The results of the activities will be as follows:

- i. Early indications of earthquake disaster information and there has never been a complete visual information media about mapping using GIS data, so the author provides a solution to overcome these problems, including by utilizing an information system model, namely a geographic-based early warning system for a fire catcher model using website access and offline data processing using the NASA Earth database [14].
- ii. By utilizing the offline website, users can be helped to get complete information about early indications of an earthquake disaster.

After conducting the research process for designing an early warning system model using a geographic information system, the results of the study can be explained as follows:

- i. The structure of the early warning system for the lava avalanche vibration catcher model is a description of how a GIS application is formed and what menu features it has. To form the GIS model structure, what needs to be known first is the GIS communication architecture model, because with this model it will be seen who needs the structure of each user.
- ii. In accordance with the communication architecture, it can be seen how the communication pattern is in the GIS model early warning system in data processing. The data processed in the GIS model consists of spatial and non-spatial data. The spatial data

used is the coordinate data of the southern location of Banten province, while the non-spatial data (attributes) used is the JICA map change data.

By utilizing the website model early warning system, users can be helped to obtain complete information about disaster prevention as a solution to the problem of avoiding humanitarian disasters.

The design of Intellectual Property Rights e-learning software uses cloud computing web server hardware with client hardware and Multi Platforms programming e- learning software, interpreter and big data and e-learning software for clients [16].

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