

# The influence of natural disaster regional information on investment flows in Aceh

Dianlopa Kamata<sup>1</sup>, Taqwaddin<sup>2\*</sup>, and Iskandarsyah<sup>3</sup>

<sup>1</sup>Universitas Syiah Kuala, Graduate Program in Disaster Science, 23111 Banda Aceh, Indonesia

<sup>2</sup>Universitas Syiah Kuala, Faculty of Law, 23111 Banda Aceh, Indonesia

<sup>3</sup>Universitas Syiah Kuala, Faculty of Economy, 23111 Banda Aceh, Indonesia

**Abstract.** This research explores the impact of information on disaster areas on Foreign Direct Investment (FDI) in Aceh. This study aims to explain the relationship between information on disaster areas and FDI decisions to increase understanding of the factors influencing investment opportunities in Aceh. This study used qualitative methods to examine the relationship between information on disaster-prone areas and foreign investment. Qualitative analysis involves the relationship between the provision of information on disaster areas and the level of foreign investment in Aceh. Preliminary results indicate that the availability and accuracy of information on disaster areas has a major impact on foreign investors' risk perceptions and evaluations. Provision of timely and transparent information on disaster risks, mitigation measures, and government response strategies was observed to have a positive impact on investor confidence. Conversely, limited access to reliable information or perceptions of inadequate disaster preparedness may discourage potential investors from engaging in investment activities. The results showed that the level of information on disaster areas in Aceh was not satisfactory and tended to affect the level of investment in Aceh Province. Aceh has very limited resources and information compared to other provinces. The level of investment in Aceh is also not very high compared to other provinces which have also experienced major disasters. It is necessary to increase the provision of information on disaster areas and the integration between the disaster management office and the investment service also needs to be improved.

## 1 Introduction

Disasters cause direct and indirect [1] losses to the business sector. In addition to the disaster business sector, it also causes ripple effects to a higher level such as the regional and national economies [2]. For example, tourism and clothing industry revenues decreased by 40% or \$500,000,000 after the 9-11 World Trade Center incident [3] and losses in the productive sector reached \$860,000,000 after the 2004 Indian Ocean Tsunami hit Aceh [4]

One way to rebuild and redevelop a business damaged by a disaster is to invest large amounts of capital through foreign direct investment (FDI). Foreign Direct Investment is an economic activity in which investors from foreign countries invest long-term capital, both in the form of financial and management, to a business within a country [5]. Foreign direct investment is one of the country's important incomes and also a means to build a better business and business

The business sector has several risks that need to be considered for business continuity, such as competitive environment and adaptability to change [6] An example of a change that affects business continuity is a disaster. Therefore, business requires adjustments in the process of business risk reduction procedures [7], [8]. Business design adjustments are carried out through the

Discovery and Planning stages. The Discovery and Planning stages include the process of risk assessment and information analysis so that businesses can manage the situation more effectively [9].

Access to information regarding disaster risk is a major problem for businesses, especially small and medium businesses [10]. Provision of complete and actual information can predict events and possibilities that will occur. The provision of information has an impact on many parties, especially the government and stakeholders [11]. The information provided is aimed at paying attention to community safety, health and security issues, as well as planning the process of reconstruction and restoration of the livelihoods of affected communities [12]. Information on affected areas can be used to determine land use regulations that could hinder infrastructure reconstruction in those areas. This approach aims to avoid the return of disaster risks that have occurred [13].

Aceh is known as an area with a high level of vulnerability to natural disasters. One of the disasters that had a major impact on damage and loss was the 2004 Indian Ocean Tsunami. This event can be a factor that investors consider in making investment decisions in Aceh. The availability of accurate and up-to-date information enables investors to plan appropriate risk mitigation measures. In fact, information on disasters is

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\* Corresponding author: taqwaddinhusin@yahoo.co.id

not specifically provided by the One-Stop Integrated Investment and Service Office (DPMPTSP) Aceh, both in physical and digital form. The institution is the Gate for investors to learn and ask the permit for investment in Aceh which is fully functional but did not included the information for disaster.

This study aims to identify and compare the provision of disaster information in Aceh such as disaster risk maps, disaster event infographics, notification of disaster events to another region in Indonesia which can be accessed through online. This research also looks for the relationship between the provision of disaster information on investment flows in Aceh.

## 2 Methods

This research was carried out by collecting secondary data, namely the value of foreign investment in Aceh Province, level of provisions information on disaster-prone areas, and disaster policies sourced from Statistic Centre Agency (BPS), One-Stop Integrated Investment and Service Office (DPMPTSP) Aceh, National Disaster Prevention Agency (BNPB), Aceh Disaster Prevention Agency (BPBA), Regional Disaster Prevention Agency (BPBD) in Jakarta, Yogyakarta, and Sulawesi Tengah. These data were collected through three stages [14], namely; (1) secondary data editing; (2) organize data based on time series; and (3) finding. Data from Aceh will be compared to Yogyakarta and Sulawesi Tengah. The research method is shown in Figure 1. The selection for the area based on the disaster that happen in that area and also the similarities in nature in each province. The data will be analyzed and compared through the percentage of investment incline before the information distributed and after the distribution

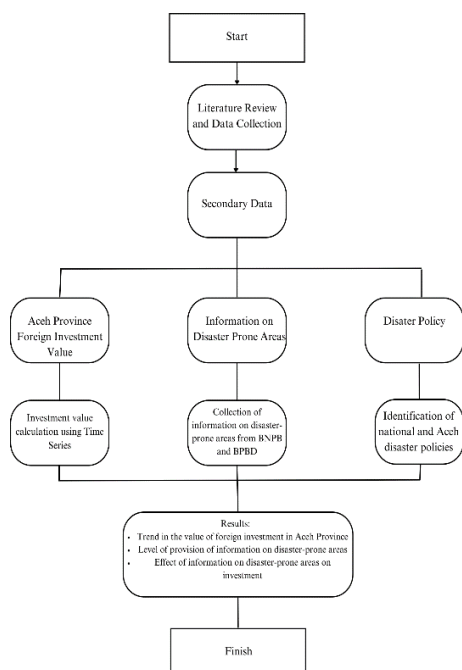


Fig. 1. Research Method

## 3 Result

The results show that the provision of information on disaster areas in Indonesia is divided into two levels, national and regional. Nationally, information on disaster areas is provided through a website, namely Inarisk (inarisk.bnpb.go) and smartphone applications, namely Inarisk personal and BMKG info. Inarisk displays an information feature on the level of disasters that have occurred in an area and also the level of vulnerability that the area has. Inarisk also displays information based on the type of disaster that occurred such as earthquakes, floods, landslides and so on. In contrast to the website, the information provided is through a user-friendly smartphone-based application that prioritizes the convenience of its users in accessing information. The conveniences received are information on potential disaster areas in the user's area, videos on disaster management, and instant pop-up notifications immediately after a disaster occurs.

At the regional level, disaster information is obtained through the official BPBD website in each region. The information provided is generally in the form of weather forecasts, disaster infographics, and maps of disaster events. The type of information provided by each BPBD differs according to regional conditions. The different types of information are summarized in Table 1.

Table 1. Provision of information on the BPBD website

BPBD Jakarta	Information types	Sea level monitoring	Weather forecast	Rainfall forecast	Sea waves	Covid-19 monitoring	Disaster infographic
	Update	23-Jun-23	23-Jun-23	23-Jun-23	23-Jun-23	10-Apr-23	Mar-23
BPBD Yogyakarta	Information types	Merapi volcano state	Weather forecast	Earthquake notification	Disaster infographic	Disaster management	
	Update	24-Jun-23	24-Jun-23	23-Jun-23	Jan-23	12-Jul-22	
BPBA Aceh	Information types	Disaster infographic	Disaster catastrophic	SIGANA Tableids			
	Update	2022	2021	2022			

BPBD Sulteng	Information types	Disaster map	Disaster infographic	Disaster event data			
	Update	2023	2023	2023			

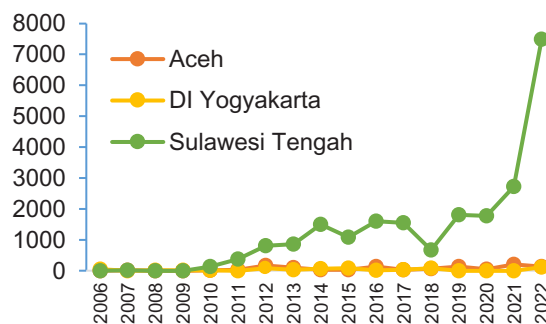
Based on Table 1, BPBA's official website has drawbacks when compared to other official websites. Judging from the similarity of disaster experiences with large levels of damage and losses [4], [15], [16], the level of provision of disaster information in Aceh is less complete and slower to update than other official regional websites. To obtain complete disaster information, one must go through bureaucratic channels, such as submitting an official letter from the requesting agency.

All the information that being provided in national and regional level can be easily obtained but the community rarely knew about this. It is proved by the lack of people using the apps that being made by government for this cause. The disaster institution and government still lacking in promoting and sharing about this privilege. The lack of knowledge can lead to low level of capabilities in community. the government needs to add this facility in everyday life so that people are accustomed to receiving disaster information.

#### 4 Discussion

The level of investment in Aceh has experienced dynamics in recent years. Investment in Aceh experienced an increase and decrease in the value of investment received by the government. When compared to other provinces, Aceh does not yet have a satisfactory score. Aceh Province has a relatively low level of investment when viewed from the area or potential owned by the Aceh Province region.

The effect of disaster area information on investment in Aceh has not yet had a significant effect. This is due to the lack of available and accessible information from related parties. The Aceh government should start adapting to current technological developments in disseminating information related to disasters and disaster-prone areas. Many studies conducted by economic and disaster experts say that adaptation measures can assist in formulating policies, both economic and disaster policies. This aims not only to maintain assets that are owned but also to prepare for disasters that will occur in the future [17]



**Fig. 2.** Foreign Direct Investment Values (million USD)

Aceh's level of investment is not much different from Yogyakarta but the provision of information on Yogyakarta's disaster areas is better than Aceh's. There are several factors that affect the attractiveness of foreign investors who will invest their money in Yogyakarta. One of the factors mentioned is the location and geographical factors of Yogyakarta Province [18]. The researcher argues that the location factor which is in a disaster-prone area has a negative effect on incoming investment flows. The higher the level of disaster occurrence, the lower the investment value that will enter the area.

The condition of the geographical area is one of the attractive factors for investors to invest [19]. In addition to having profitable natural resources, investors also pay attention to the level of risk that may occur in the area. The decision to make an investment is influenced by the level of information obtained by the company or investment decision maker. Uncertainty about information or sources will affect the direction of decisions to be taken [20]. The higher the level of information provided, the higher the possibility of making a decision to make an investment which will have an effect on increasing investment flows in the area.

Based on the explanation mentioned above, the authors found that there was an influence between the provision of information on disaster areas on investment flows into the destination area. The provinces of Yogyakarta and Central Sulawesi show a positive value for the influence between information on disaster areas and investment. These provinces have relatively good levels of providing information on natural disaster areas so that they get good attention from incoming foreign investors because they provide a sense of security and increase trust.

**Table 2.** The Comparison in Investment

Name	BPBD establishment	Before BPBD	After BPBD	Rise (%)
Aceh	2010	21 M USD	22 M USD	4,5%
Yogyakarta	2011	76 M USD	84 M USD	9,5%
Sulawesi Tengah	2010	179 M USD	370 M USD	51,6 %

Based on the tables that already provided, the Aceh government should start paying attention to providing information on disaster areas. The influence of information on disaster areas on investment in Aceh has not had a significant effect. This is due to the lack of available and accessible information from related parties. The Investment Agency needs to include points regarding disaster in the strategic plan developed to attract investors to Aceh. Provision of information, especially in disaster areas, is an obligation of the local government and is the right of incoming investors.

## 5 Conclusion

The provision of disaster information can influence the willingness of investor to have investment in areas that have potential. Based on the analysis, the Aceh government has not provided facilities and a place to get the information other than through the BPBD. According to the staff in the related institution, Information is only provided if investors ask first. BPBD also does not yet have integration with other agencies in providing disaster information. This may be due to the fact that the provision of comprehensive and integrated information on disaster areas has not yet become the main concern of the Aceh government itself. Therefore, the Government also needs to align disaster-related agencies with investment agencies. Increased knowledge about disasters also needs to be improved at the community level, such as conducting seminars and general classes. The government needs to pay attention to the provision of disaster information and inform all existing agencies.

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