

A Review Mitigation Efforts and Natural Disaster Insurance Schemes in Indonesia

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Abstract

Natural disasters that occur experience a significant increase every year. Likewise, the risk of natural disasters that occurs continues to increase. The increase that occurred was in the form of casualties and losses due to natural disasters. Thus, a new alternative policy is needed as a mitigation effort to minimize the risk of disasters that occur. In this study, it aims to determine the alternative and efficient natural disaster management insurance scheme. The method used in natural disaster mitigation and insurance schemes is the Systematic Literature Review. Based on the research results, alternative natural disaster management requires synergy between the government and the community. So that it can form a disaster mitigation group that is responsive, active and resilient in implementing policies to anticipate natural disasters. Meanwhile, the disaster insurance scheme uses a cross-subsidy system and the premium is charged to the local government. Where, provinces with low economic growth while the potential for natural disasters are high can be helped and receive subsidies from provinces with high economic growth but low potential for natural disasters. So that areas with low economic growth while the potential for natural disasters are high, no longer need to be burdened with huge natural disaster insurance premiums.

Keywords: Natural disasters, casualties, losses, mitigation, insurance schemes.

1. Introduction

Natural disasters are a problem faced by every country in the world. Indonesia is a country that is prone to natural disasters. This is because Indonesia is located at the confluence of three continental plates. The three plates are the Pacific, Eurasian, and Indo-Australian plates (Pramono, et al., 2020). The meeting of these three plates has plunged Indonesia's territory into the Pacific ring of fire which can cause a devastating earthquake and tsunami. Natural disasters that occur in Indonesia can be in the form of floods, landslides, earthquakes, tsunamis, storms, tornadoes and volcanic eruptions (Pratama and Sumitra, 2020). Looking at the events and experiences of natural disasters that have occurred, the disaster management that has occurred for several years has been less effective. This is evidenced by data on cases of natural disasters that have occurred in Indonesia which continues to increase (BNPB, 2020). The

increase that occurs can be in the form of natural disaster events and losses which continue to increase every year. Therefore, starting from the cases that have occurred, the Indonesian government needs to make new policies or alternatives in an effort to deal with natural disasters more effectively. Efforts to deal with natural disasters must pay attention to the problem of incidence and loss.

Some cases of natural disasters that occur, such as earthquakes, tsunamis, hurricanes, tornadoes and volcanic eruptions, cannot be prevented. However, the impending disaster can be predicted beforehand, so that anticipatory steps can be taken. With the anticipation that is carried out, it can minimize the risks that occur and apply preventive measures. In addition, prevention efforts are the responsibility of all parties, namely the government, the private sector and the community itself (Pramono, et al., 2020). The government as a policy maker needs to determine an alternative for effective natural disaster management. Meanwhile, people who feel the most impact of natural disasters, of course, have a better understanding of natural disaster management. Therefore, the government and society need to work in synergy in anticipating disasters as an effort to overcome greater disaster risks. The role of the community is needed as an effort to anticipate disasters, where the community must be responsive, active and resilient in implementing policies for disaster anticipation efforts (Fitriani, and Oktorie, 2019).

Efforts to anticipate natural disasters have been widely implemented by other countries. Among them are disaster management efforts that have been implemented by developed countries in managing risks due to disasters, namely mitigation and insurance. For example, in the research of Surminski et al (2015), analyzing the relationship of disaster insurance with the risk of floods that occur in the European Union region. The existence of an increase in flooding that has occurred requires the role and policies of the European Union as an effort to reduce the risk of flood disasters. Cooperation between policy makers and industry has developed a disaster compensation mechanism with flood insurance. However, the current EU policy is not effective, this is influenced by the broad scope and role of the State in the European Union region which is less effective. In the research of McAneney et al (2019), conducted an analysis of the normalization of natural disaster insurance that occurred in Australia. This was done because of an increase in the cost of natural disaster management. From the analysis, it is found that global warming has an effect and there is an increase in the cost of handling natural disaster risks. The increase occurred due to global warming which resulted in increased natural disasters. In addition, global warming is causing extreme and erratic weather changes that trigger increased forest fires and floods. In addition, in the research of Mol et al (2018), conducted experiments on home owners in floodplain areas and this experiment was carried out in the Netherlands. The experiment was carried out by varying the types of insurance in the form of compulsory public and private voluntary and the existence of different premium discounts. From the analysis, it is found that investment in public and private insurance has increased due to the premium discount given. In the research Peng (2019) conducted research related to the desire for insurance in mountainous areas that are prone to landslides, where the research location is located in the mountains of western China. Data collection was carried out by giving questionnaires to communities affected by landslides. Meanwhile, data analysts use partial least squares structural equation modeling (PLS-SEM). The results of the analysis show that risk perceptions and public institutions have a direct effect on willingness to purchase disaster insurance. From these results, it can provide an overview in decision making related to disaster risk mitigation for the government regarding disaster insurance.

Based on the description above, in this study a literature review (review article) was carried out related to “mitigation efforts and natural disaster insurance schemes in Indonesia”. In this study, several literatures were reviewed that have relevance to mitigation problems and natural disaster insurance schemes. Furthermore, it is hoped that based on a literature review, an efficient and optimal natural disaster mitigation and insurance scheme can be found to be implemented in Indonesia. So that this result can be used as a consideration by the government as a new policy in dealing with natural disasters in Indonesia.

2. Material and Method

Material

The material used in this study is articles that are relevant to the research topic. In this study, articles were reviewed relating to mitigation issues and natural disaster insurance schemes. In addition, this study uses secondary data related to natural disasters obtained from the National Disaster Management Agency.

Method

The method used in this study is a Systematic Literature Review. Systematic literature review is a literature review method that is carried out by identifying, assessing, and interpreting all the findings that have been read from a research topic, related to mitigation issues and natural disaster insurance schemes. From the findings, it can help answer predetermined research questions. The systematic literature review method is carried out systematically by following

the steps and protocols that allow the literature review process to avoid bias and subjective understanding of the researchers.

3. Literature Reviews

Natural Disaster Mitigation

A natural disaster is an event caused by nature, and has a major impact on human life in the form of casualties and economic losses. Natural disasters that occur can include floods, volcanic eruptions, earthquakes, tsunamis, landslides, blizzards, droughts, hail, heat waves, hurricanes, tropical storms, typhoons, tornadoes and wild fires. Therefore, disaster mitigation efforts are needed to reduce the risks that occur due to natural disasters. Disaster mitigation is an effort made to reduce or eliminate risks that may arise from a disaster in the form of casualties and economic losses. Disaster mitigation is very important in carrying out activities before the occurrence of a disaster which is expected to reduce the impact or risk of a disaster (Passarella, et al., 2018). Disaster mitigation can be divided into two ways, namely structural and non-structural. Structural activities are in the form of technical efforts, both natural and man-made related to facilities and infrastructure in mitigation. Meanwhile, non-structural activities are non-technical efforts related to adjustment and regulation of human activities in mitigation and other efforts. To overcome disasters, comprehensive mitigation that involves both structural (construction of infrastructure and control facilities) and non-structural must be carried out, which must involve the relevant agencies (Perry, 2007).

Mitigation efforts will run well if the stages in disaster management run effectively. The stages in disaster mitigation efforts are as follows (He and Zhuang, 2016; Kim and Marcouiller 2018):

- a) Adventure before the disaster occurs. These activities include providing information and making maps of disaster-prone areas, building earthquake-resistant buildings, planting mangroves, reforesting forests, and providing education and raising awareness of people living in disaster-prone areas.
- b) Preparedness is planning for how to respond to disaster events. Planning is made based on disasters that have occurred and other disasters that may occur. The aim is to minimize casualties and damage to public service facilities and infrastructure, including efforts to reduce the level of risk, manage community resources, and train residents in disaster-prone areas.
- c) Response is an effort to minimize the danger caused by a disaster. This stage takes place shortly after the disaster. Disaster management plans are implemented with a focus on efforts to help disaster victims and anticipate damage caused by disasters.
- d) Recovery is an effort to restore the community's condition to its original state. At this stage, the focus is focused on providing temporary shelter for victims and rebuilding damaged infrastructure and facilities. In addition, an evaluation of the disaster management measures taken is carried out.

Disaster Insurance

Insurance is an insurance or an agreement between two parties, in which one party is obliged to pay a predetermined premium. Meanwhile, the other party has the obligation to provide full guarantee to the premium payer if something happens to the first party or their property in accordance with the agreement that has been made (Sukono, et al., 2018a). Meanwhile, natural disaster insurance is a form of risk control due to natural disasters which is carried out by transferring risk from one party to another, in this case an insurance company (Sukono, et al., 2018b).

Premium is money that must be paid by the policy holder to the insurance company in return for the insurer agreement to pay the benefits agreed in the insurance policy. Benefits or compensation is the amount of money that must be paid by the insurance company to policyholders to receive policy benefits when the insured experiences insurance risk (Sukono, et al., 2017; Saputra, et al., 2018). The premium itself is divided into two types, namely Net Single Premium and Gross Premium. Pure premium is the premium paid before adding a loading factor or other factors. Meanwhile, gross premium is a pure premium plus a certain amount of money that is charged to policyholders. While Claims are compensation for the risks that occur (Sidi, 2017).

Natural Disaster Insurance Model

The occurrence of risk in an insured insurance system can lead to claims. Claims are compensation for a risk of loss. If the risk occurs individually, it is called an individual claim, while a combined claim on individual claims is called an aggregation claim. Usually, claims have an exponential distribution or other distributions that are still family with an exponential distribution such as Normal, Poisson, Gamma, Binomial and Inverse Gauss [Anderson, 2007].

In the collective risk model or aggregation claims, it is assumed that following a mixed distribution with aggregation claims which is the sum of N individual claims, namely:

$$S = X_1 + X_2 + \dots + X_N$$

$$S = \sum_{i=1}^N X_i \tag{1}$$

The probability density function of the Weibull distribution is:

$$f(x) = \frac{\beta x^{\beta-1}}{\alpha^\beta} \exp\left[-\left(\frac{x}{\alpha}\right)^\beta\right], x \geq 0, \beta > 0, \alpha > 0$$

With the average

$$E[x] = \int_0^\infty x \frac{\beta x^{\beta-1}}{\alpha^\beta} \exp\left[-\left(\frac{x}{\alpha}\right)^\beta\right] dx$$

$$E[x] = \alpha \Gamma\left(\frac{1}{\beta} + 1\right) \tag{2}$$

The variance of random variables with Weibull distribution is as follows:

$$Var(x) = \int_0^\infty x^2 \frac{\beta x^{\beta-1}}{\alpha^\beta} \exp\left[-\left(\frac{x}{\alpha}\right)^\beta\right] dx - E^2[x]$$

$$Var(x) = \alpha^2 \left\{ \Gamma\left(\frac{2}{\beta} + 1\right) - \Gamma^2\left(\frac{1}{\beta} + 1\right) \right\} \tag{3}$$

Where Γ is the defined Gamma function

$$\Gamma(\gamma) = \int_0^\infty x^{\gamma-1} e^{-x} dx \tag{4}$$

The Rayleigh distribution is a special case of the Weibull distribution. The Rayleigh distribution has the following probability density functions:

$$f(x) = kx \exp\left[-\left(\frac{kx^2}{2}\right)\right] \tag{5}$$

where k is a single parameter which is equivalent to the Weibull distribution when $\beta = 2$ and $k = \frac{2}{\alpha^2}$.

the mean and variance of random variables with Rayleigh distribution is:

$$E[x] = \int_0^\infty x kx \exp\left[-\left(\frac{kx^2}{2}\right)\right] dx$$

$$E[x] = \sqrt{\frac{2}{k}} \Gamma\left(\frac{3}{2}\right) \tag{6}$$

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$$Var(x) = \int_0^\infty x^2 kx \exp\left[-\left(\frac{kx^2}{2}\right)\right] dx - E^2[x]$$

$$Var(x) = \frac{2}{k} \left\{ \Gamma(2) - \Gamma^2\left(\frac{3}{2}\right) \right\} \tag{7}$$

The distribution of the number of claims is usually used the Poisson distribution, because the Poisson is the distribution for rare events. This means that the risk occurs in a short interval of time or a narrow area is proportional to the length of the time interval or the area of the area and does not depend on the many risks that occur outside the time interval or area. If N has a Poisson distribution, then it has a probability density function

$$f_N(n) = \frac{e^{-\lambda} \lambda^n}{n!}, \lambda > 0, n = 0, 1, 2, \dots$$

The average number of claims in a Poisson distribution is obtained:

$$E[N] = \sum_0^\infty n \frac{e^{-\lambda} \lambda^n}{n!} \tag{8}$$

Variance of the number of claims:

$$Var[N] = e^{-\lambda} \sum_0^\infty \frac{\lambda^{n-2}}{(n-2)!} \lambda^2 + \lambda = E^2[N] \tag{9}$$

Value at Risk (VaR)

Value at Risk (VAR) is a method to measure possible risk exposure. In the calculation of VaR, a number is obtained which indicates the amount of potential funds (capital reserve) that must be reserved to anticipate possible risks. In general cases, VaR is the amount of capital needed to ensure that a company does not technically go bankrupt (Bon, 2018). Mathematically, the VaR calculation can use the following formula:

$$Var_p(X) = p \times \sigma \times B \quad (10)$$

Where X denotes the random variable of loss and $p = 1 - \alpha$ and for α is the level of confidence, σ is the standard of division and B is the benefit value

Black-Scholes model

The Black-Scholes model is one method that can be used to price options. This model was developed by Fisher Black and Myron Scholes starting in 1973, in this case the model is used to determine the value of options in a stock price contract. The model can be written in the following equation (Okine, 2014; Kalfin, et al., 2020):

$$C(S, t) = Se^{-\delta t} N(d_1) - Ke^{-rt} N(d_2) \quad (11)$$

$$P(S, t) = Ke^{-rt} N(-d_2) - Se^{-\delta t} N(-d_1) \quad (12)$$

with

$$d_1 = \frac{\ln\left(\frac{Se^{-\delta t}}{Ke^{-rt}}\right) + (0,5\sigma^2)t}{\sigma\sqrt{t}} = \frac{\ln\left(\frac{S}{K}\right) + (r + \delta + 0,5\sigma^2)t}{\sigma\sqrt{t}} \quad (13)$$

$$d_2 = \frac{\ln\left(\frac{Se^{-\delta t}}{Ke^{-rt}}\right) + (0,5\sigma^2)t}{\sigma\sqrt{t}} = \frac{\ln\left(\frac{S}{K}\right) + (r - \delta + 0,5\sigma^2)t}{\sigma\sqrt{t}} \quad (14)$$

Where (S, t) is the price of the call option, $P(S, t)$ is the price of the put option, S is the initial stock price, K is the strike price of the option, r is the risk-free interest rate, μ is the level of deviation S , σ is the standard deviation of stock movements, expressing time, δ is the dividend rate (stock returns) and $N(x)$ is a standard normal cumulative distribution function.

Analyzing with equation (14), the value of natural disaster insurance premiums can be calculated by first looking for the cumulative distribution value d_2 with the following equation:

$$d_2 = \frac{\ln\left(\frac{R_0}{R_T}\right) + \left(r - \frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}} \quad (15)$$

Where R_0 is the value of the number of recent natural disaster cases and R_T is the benchmark value.

The value of natural disaster insurance premiums can be calculated by the following equation:

$$Premi = Ke^{-rt} N(-d_2) \quad (16)$$

where K is the amount insured, and r is the risk free interest rate.

4. Results

Disaster Mitigation Planning

Disaster management planning is prepared based on the results of disaster risk analysis and management efforts which are elaborated in the disaster management activity program. Disaster risk analysis can be carried out by mapping disaster-prone risks in each province in Indonesia. Natural disaster risk mapping is carried out to visualize the level of disaster risk in an area. Based on a disaster risk assessment of an area, mapping is carried out by looking at the level of danger, vulnerability, hazard components and capacity of natural disasters that will occur in each region. Hazard components can be seen based on natural phenomena that can cause disasters such as earthquakes, volcanic eruptions, tsunamis, floods, and others. The vulnerability component is seen based on the physical, socio-cultural, economic and environmental conditions that are prone to disaster exposure. Meanwhile, the capacity component is seen from elements of regional resilience such as institutions, mitigation capacity, prevention, and others. With the mapping of disaster-prone areas, disaster management efforts can be carried out efficiently and precisely. According to Tran et al (2009), disaster risk mapping can also analyze the relationship between hazard risk and loss / damage caused by natural disasters. So that with a disaster risk map, the right policies can be made in reducing the risks posed by natural disasters. In addition, according to Ntajal et al (2017), making a disaster risk map can help the community to identify areas that are included in areas with low or relatively high disaster risk. So, by doing so, the community gets an early warning that they live in a disaster-prone area and can determine the early actions that need to be taken. One of the early actions that can be taken by the community is the design and construction of residential buildings in accordance

with the disaster risk in the area they live in. For example, building houses with designs and constructions that are resistant to floods, landslides and other disasters.

Natural disaster mitigation efforts can be carried out by making and placing warning signs and evacuation routes in the event of a disaster. This needs to be prepared early on by disaster management agencies in each region in direct coordination with the central government. According to Harits, et al. (2019), disaster management efforts such as early warning, evacuation routes, emergency response plans, as well as employee and community preparedness levels need to be continuously trained and increased in intensity in dealing with upcoming disasters. Community and local government preparedness is needed in minimizing the risk of disasters caused (Esteban, et al., 2013; Sakurai, et al., 2017). In addition, development planning must be considered early on as a program / activity related to prevention, mitigation and preparedness that is included in long-term and medium-term development plans. Therefore, as an effort in disaster management, the government needs to pay attention to development planning by making efficient spatial regulations, making appropriate building designs and construction, building permits and relocating residents in disaster-prone areas (Pearce, 2003; Suharini, et al., 2014).

The construction of structures that function to prevent, secure and reduce the impacts caused by disasters needs to be prepared. The building referred to is the construction of embankments, dams, coastal erosion resistance, earthquake resistant buildings and the like. Development is adjusted to the types and risks of natural disasters faced by each region in Indonesia. For example, the flood disaster that occurs requires an appropriate development based on the problems of each region in Indonesia. Therefore we need a long-term project to overcome the floods that occur. In general, to overcome the flood disaster that occurs requires a construction of embankments, dams and river dredging (Burrel et al., 2007). River dredging is carried out to overcome sediment that occurs in river. In addition, it is necessary to make embankments on the edge of the river as an effort to reduce erosion on the riverbanks resulting in sedimentation in the river flow. Making a dam is needed to accommodate water during the rainy season so that there is no river overflow to the mainland. In addition, the construction of dams can be used to control sedimentation caused by erosion so that it can prevent and reduce silting in the downstream part of the river (Shrestha, et al., 2008).

Global warming that occurs is causing the ice sheet in the Earth's polar regions to melt (Wang, et al., 2020; Laufkötter, et al., 2020). This results in the condition of the coastline in every region in Indonesia experiencing changes due to abrasion and flooding caused by tidal waves entering the mainland. Detailed identification of damage to the occurrence of these natural phenomena is needed to avoid a more severe level of damage to the coast. To avoid this, it can be done in several ways including making mangrove forests around the coast, building breakwaters, and building retaining walls or revetments (Williams, et al., 2018).

Natural Disaster Insurance

Natural disasters that occur not only have an impact on casualties, but also impact economic losses (Aidi, and Farida, 2020). Economic losses due to natural disasters can be protected or handled by purchasing natural disaster insurance. Natural disaster insurance is very important and needs to be applied to countries that are prone to natural disasters, including Indonesia. Where Indonesia is one of the countries that is prone to disasters because it is located on a series of tectonic plates. Thus, Indonesia experiences a high frequency of natural disasters. This has caused considerable losses in various economies and other fields. Until now, the process of natural disaster management in Indonesia still relies on the State Budget. However, in reality the disaster management that occurred was not very effective. This is influenced by the fact that the natural disasters that occur every year fluctuate so that the funds provided by the government are few, while the funds that must be spent are so large. Therefore, natural disaster insurance needs to be applied in Indonesia to reduce the losses incurred. However, insurance costs are very high, it is necessary to control risk through natural disaster mitigation as an effort to reduce the total cost of insurance issued by the government (Okada, 2016).

Natural disaster insurance has been widely applied in various countries. For example, disaster insurance has been implemented by Japan since the Niigata earthquake in 1964. Disaster insurance was originally designed to cover the huge losses caused by the Niigata earthquake. Prevention is more focused on post-disaster management to reduce government spending as an effort to recover from disasters (Sunarsip et al 2007). Where the insurance claim is divided into four, namely total loss, half large loss, half small loss, or partial loss with the management system carried out by the private sector. As time goes by, insurance customers in Japan continue to increase. This is influenced by the level of public awareness of the importance of disaster insurance. In 2019, the Japanese government will bear the burden of natural disaster insurance, which is issued through a disaster reinsurance scheme.

In addition, another country prone to disasters is New Zealand. Where in New Zealand is one of the countries prone to earthquakes. The consequences of the earthquake caused huge losses due to the natural disaster. In 1945, the local government was looking for solutions to reduce the losses caused by the earthquake. In the end, the New Zealand government formed an Earthquake Commission under a state-owned company whose implementing procedures were

like insurance. Where the Earthquake Commission aims to deal with losses caused by natural disasters. This institution protects community property in the form of residential buildings and personal items from damage caused by natural disasters. However, these institutions do not protect commercial property or assets owned by local communities. However, if the local community wants to protect their assets, it can be done by using insurance products offered by private insurance companies (Nguyen and Noy, 2017).

5. Discussion

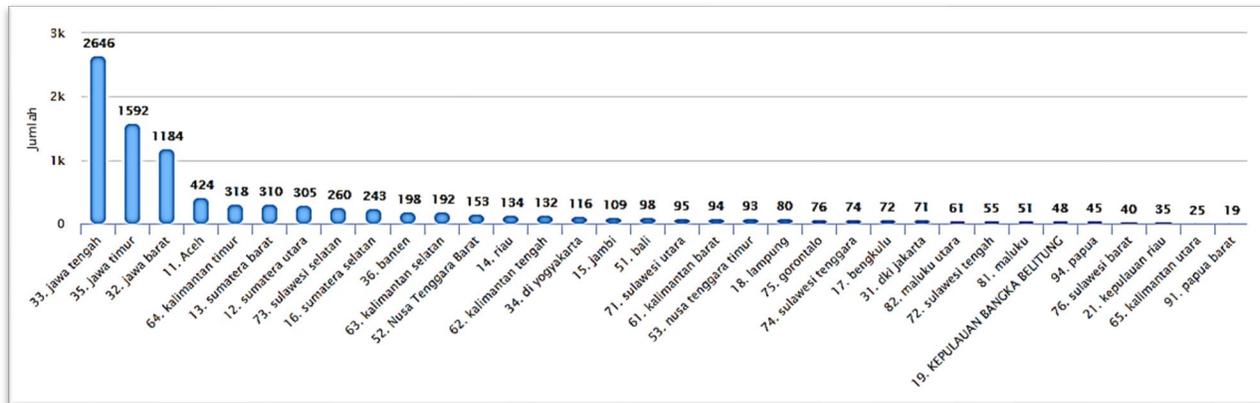
Natural disasters that occur in Indonesia can be seen from the data on cases of natural disasters that occur every year. Natural disasters that occur in Indonesia change every year, this can be seen in Figure 1.



Source: BPNB 2020

Figure 1. Cases of Natural Disasters in Indonesia from 2000-2019

Based on Figure 1, it can be seen that cases of natural disasters that have occurred have increased from 2000 to 2017. This has caused enormous losses for the Indonesian government. Indonesia in its natural disaster loss management system uses the State Revenue and Expenditure Budget. This is considered ineffective, where the budget provided is not in accordance with the budget spent. In some cases the budget provided is small, but in reality the expenditure that must be provided is so large. For example, the tsunami disaster caused by the eruption of Anak Krakatau in the Sunda Strait in 2018, hit the coastal areas of Banten and Lampung. At least 426 people were killed and 7,202 injured and 23 people were missing as a result of this incident as well as the earthquake, liquefaction and Tsunami in Central Sulawesi in the same year, namely 2018, causing so many casualties and damaged infrastructure resulting in enormous losses. The available budget is insufficient for dealing with natural disasters that occur in the area. In the end, economic growth in these areas experienced a delay due to post-disaster response that was not resolved quickly. Therefore it is necessary to take countermeasures seriously in overcoming natural disasters, namely by forming an institution or an insurance system managed by the government or in collaboration with the private sector.



Source: BPNB 2020

Figure 2. Cases of Natural Disasters 2015-2020 in Each Province in Indonesia

The potential for natural disasters in Indonesia can be mapped in each province. Therefore, natural disaster insurance in Indonesia can be differentiated in each province. Based on Figure 2, the provinces of Central Java, East Java and West Java are the largest disaster-prone areas that occur in Indonesia. Based on data from the National Disaster Management Agency for the last five years (2015-2020) as shown in Figure 2, the rate of cases of natural disasters that occurred in each region in Indonesia varies. In addition, the level of economic loss due to natural disasters will be different for each province. Thus the level of claims and premiums that will be paid by insurance customers in each province in Indonesia will also vary.

The economic growth that occurs in every province in Indonesia is not very evenly distributed, so that it causes some regions with small economic growth to have to pay such a large premium. In addition, the condition of Indonesian society is that many are still low-income. The government's role is needed to directly pay insurance premiums using the Regional Revenue and Expenditure Budget. Therefore, natural disaster insurance with a cross subsidy system is very suitable for the economic situation in Indonesia. With the cross subsidy system, the insurance premiums must be paid evenly. In this case, provinces with small regional income can be helped by provinces with large regional revenues. So that economic growth in each province can develop rapidly.

6. Conclusion

This paper, based on the review literature that has been reviewed on natural disaster mitigation and insurance schemes, needs serious attention from the Indonesian government. In addition, the Indonesian government needs to carry out mitigation and monitoring efforts in a sustainable manner in disaster-prone areas. Supervision is carried out to reduce the impact of risks based on the mapping of disaster-prone areas. Not only that, long-term and medium-term development also needs attention. Development is needed and carefully planned to reduce natural disasters that occur. Construction that can be carried out includes the construction of embankments, dams, earthquake resistant houses, dams, and other buildings. Apart from that, the most important thing is the need for strict supervision and building permits from the government as the holder of power. This is necessary to maintain a maintained environmental ecosystem. In addition, supervision and building permits are needed to minimize the impact that may arise in the present and in the future due to the construction carried out. Meanwhile, to minimize the incurred economic losses, natural disaster insurance can be done. The insurance scheme with a cross-subsidy system is very appropriate to the economic situation and the potential for disasters that occur in different provinces. The cross subsidized insurance system is intended to meet and cover the needs of each province. Provinces with low economic growth while the potential for natural disasters are high can be helped by provinces with high economic growth but low potential for natural disasters. So that areas with low economic growth while the potential for natural disasters are high, no longer need to be burdened with huge natural disaster insurance premiums. In addition, the disaster insurance premium is charged to the government of each province. Insurance premiums that must be paid by the local government using the Regional Revenue and Expenditure Budget.

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