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# THE IMPACT OF NATURAL DISASTERS ON ECONOMY IN NUSA TENGGARA BARAT IN 2018

Suci Nurmaya Tangkudung



**AFFILIATION:**

Badan Pusat Statistik Provinsi  
Kepulauan Riau.

**\*CORRESPONDENCE:**

suci\_nt@bps.go.id

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**Abstract:** One of the provinces in Indonesia that has a high level of disaster vulnerability is Nusa Tenggara Barat (NTB). The series of earthquakes in July-August 2018 had caused direct losses in the form of casualties and physical damage to infrastructures such as houses, roads, bridges and production facilities. Disasters also caused indirect impacts that can be measured through changes in macroeconomic indicators such as economic growth, foreign tourist visits, the number of passengers on land and air transportation, the occupancy rates of a star hotel and non-star hotel rooms, export-import, unemployment, and inflation. Through literature review and descriptive analysis of official statistical data produced by the Indonesian Statistics Bureau (BPS), it was found that the response and sensitivity of these indicators were different from the shock of the earthquake. In general, almost all of these indicators show negative changes after the earthquake, except inflation. This reflects that earthquake natural disasters have a negative impact on the economy in NTB.

**Keywords:** Disaster vulnerability; Earthquakes; Economic conditions.

**JEL Classification:** Q54, O44

## Introduction

The combination of geographical location and conditions makes Indonesia very vulnerable to natural disasters, such as earthquakes, volcanic eruptions, tsunamis, floods, droughts, and landslides. Natural disasters can make changes in the structure and economic development of a region. One of the biggest disasters in Indonesia's history was the earthquake and tsunami in Aceh and North Sumatra at the end of 2004. As a result of the earthquake and tsunami, the post-disaster Aceh economy contracted around 0.12 percent in 2005. Aceh also experienced a significant shift in structure sectoral economy which has resulted in changes in employment in several sectors (Ardi, 2009).

Natural disasters not only damage homes and businesses but also affect the livelihoods and economic conditions of the community (Cannon, 1994). Approximately 32 thousand workers in Bantul Regency are estimated to lose their jobs, especially in the manufacturing, service and trade industries after the earthquake that occurred in Yogyakarta in 2005. These conditions

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have implications for the economic life of the community, indicated by an increase in the number of poor families, namely 3.3 percent, from 262,257 families before the disaster became 266,277 families after the disaster (Hidayati, 2012).

Disasters can disrupt and even destroy various functions and institutions in one instance and can have a socio-economic impact on the wider community. In its development, disasters are not only caused by nature as a trigger, but can also be caused by human behavior (violence, technology, and deterioration as a trigger) (Pelling, Özerdem, & Barakat, 2002).

It can be concluded from an economic perspective that a disaster is an event or series of events from nature and non-nature that creates a concern for the economic system that creates a systemic impact on the structure and economic development of a region (Bull, 1994). Furthermore, the long-term impact that might arise is the occurrence of socio-economic problems in the region.

Disaster events have an impact on an individual scale or on a national scale (macroeconomics). The impact of the individual scale is relatively difficult to calculate because the values and perceptions between individuals are relatively different due to disasters. One way to look at the impact of a disaster is to look at some macroeconomic indicators that are likely to be affected by the disaster (Medioda, Rodriguez, Garcia, Paris, 2013). The economic structure of the affected areas reflected through the Gross Regional Domestic Product (GRDP) is likely to experience a shift in the pattern of growth in several sectors (Albala-Bertrand, 1993). Investment is also likely to decline due to the cancellation of projects in the affected area (Mechler, 2003). The balance of payments will also experience a deficit due to a decline in the value of exports and a decline in tourism activities (Sharpley, 2005). Inflation can also occur due to increased demand for certain commodities during the post-disaster recovery process (Popp, 2006). Changes in the structure of employment at the time of disaster and post-disaster are also possible due to the cessation of the production process of several sectors and the transfer of labor in the post-disaster recovery process.

One of the provinces in Indonesia that has a high level of vulnerability to disasters is West Nusa Tenggara (NTB). Based on data from the National Disaster Management Agency (BNPB) it can be concluded that of the 14 types of potential disasters that exist in Indonesia, 11 of them are in the NTB region. The main cause is the geographical condition and geological vulnerability of NTB in the form of mountains and coastlines. 339 disasters occurred in NTB over the past ten years (BNPB, 2018). When viewed from the value of the 2016 Disaster Risk Index (IRB), the incidence of disasters in NTB has considerable potential losses. This is reflected in the composition of the Disaster Risk Index (IRB) which shows the potential loss of more than 4,000 physical victims and potential economic losses of more than 7 trillion Rupiah.

The disasters that have occurred in NTB are very diverse, such as floods, landslides, tidal waves, tornadoes, droughts, volcanic eruptions, and earthquakes. According to data compiled by BNPB, the occurrence of earthquakes in NTB occurred 10 times in the period 2008-2018.

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**Table 1** Data on Damage and/or Loss Due to the Earthquake in NTB 2018

Component	Damage and/or Loss
Society	564 people died, 1,584 were injured, and 445,343 were displaced.
Housing	180,163 damaged houses consisting of approximately 33,000 heavily damaged, medium damaged around 20,000 and around 127,000 slightly damaged.
Infrastructure	97 irrigation network units were damaged, 61 road sections were damaged, 32 drinking water supply systems were damaged, 17 bridges were damaged.
Education	1,194 schools damaged, consisting of 254 PAUDs, 639 elementary schools, 155 junior high schools, 72 high schools, 56 vocational schools, and 8 special schools.
Health Facilities	321 health facilities damaged, consisting of 86 puskesmas, 115 poskesdes/ polindes, 9 hospitals, 111 other health facilities.
Worship Place	630 mosques, 461 small mosques, 1 church, 1 monastery, and 50 temples.
Economic Facility	46 market, 566 kiosks/shops, 138 hotels damaged

The event that was enough to capture national and international attention was the occurrence of the earthquake on 29 July 2018 (6.4 SR), 5 August 2018 (7 SR), and 19 August 2018 (6.9 SR). This disaster caused more than 380 deaths, more than 13,000 people were injured, and nearly 400,000 people were registered as refugees. From an economic standpoint, the losses from this disaster are estimated at Rp. 7.45 trillion (Wismabrata, 2018). The high estimated value of the loss is due to a large amount of damage that occurs in residential areas, public infrastructure, production facilities, offices, and other public facilities. Estimates of the value of these losses have not included potential post-disaster losses such as declining population productivity in the economy, reduced tourist visits, and decreased investor confidence in investing in Indonesia, especially in the NTB region.

The post-disaster economic impact in the affected areas has recently received much attention from researchers. This is because the intensity and opportunities for natural disasters are getting higher (Noy & Vu, 2010). As explained earlier, the measurement of economic losses caused by natural disasters is still difficult to calculate. On the other hand, the government needs to think of a post-disaster recovery policy strategy in accordance with its estimated impact (Dunn, 2015).

## Research Method

This study used a qualitative descriptive approach, an approach used to describe systematically, factually, and accurately about the facts between the investigated phenomena (Arikunto, 2002). This study used literature studies and was based on official statistical data from the Central Statistics Agency (BPS) to see the economic impact of the post-earthquake disaster in NTB through a descriptive analysis of the comparison of several macroeconomic indicators before the disaster and post-disaster earthquake in 2018 in NTB.

## **Result and Discussion**

Natural disasters can have a negative economic impact in the short term because they can reduce the production of goods and services. This decrease can be reflected in changes in the value of post-disaster Gross Regional Domestic Product (GRDP). The magnitude of the impact of natural disasters on decreasing GDP is very dependent on the type of disaster experienced and the structure of the economic strength of a region.

Based on data from the contribution of Quarter 3 GRDP in 2018, more than a quarter (25.31 percent) of the economic strength of NTB is supported by agriculture, forestry, and fisheries. Furthermore, the wholesale and retail trade sector, car and motorcycle repairs contributed significantly, which was 14.93 percent. The existence of PT. Amman Mineral Nusa Tenggara (PT. AMNT) engaged in copper and gold mining contributed significantly to the mining and quarrying sector which contributed 11.68 percent to the creation of added value in NTB.

The earthquake made the NTB economy in quarter 3 2018 contracted by 2.14 percent compared to the previous quarter (q to q). Almost all GRDP sectors contracted in Q3 2018. Only four sectors were able to maintain positive growth, manufacturing industry 64.38 percent; information and communication 2.54 percent; health services and social activities 1.96 percent; and other services by 9.99 percent. The biggest contraction occurred in the construction sector, which amounted to -16.53 percent. This happened due to a delay or even the cancellation of plans for several infrastructure development projects in the event of an earthquake. The mining and quarrying sector also experienced a significant contraction of 12.56 percent. However, if we look more closely at the contractions that occur in the mining and quarrying sector, they are not fully caused by earthquakes. A negative growth trend in this sector has begun to be seen since 2017 which contracted by -19.86 percent (y on y). It is increasingly clear if we see economic growth (q to q) without the metal ore mining sub-sector contracting by 0.36 percent. Another sector that was negatively affected by the earthquake was the provision of accommodation and food and drink sectors which contracted by -10.29 percent compared to the previous quarter. This happened because of the decline in tourism activities after the earthquake. As one of the national and international tourist destinations, NTB tourism performance had decreased after the earthquake. This can be seen through the number of foreign tourists coming to NTB through the entrance of Lombok International Airport (BIL) in August 2018 which decreased by 69.18 percent compared to July 2018. This condition continued until the following month. Foreign tourist visits in September still experienced negative growth, although not as big as the July-August decline, which was down by 10.26 percent. Tourism activities can also be seen through the total of passengers who arrive and depart by air or sea lanes. Before the earthquake, the number of passengers arriving and departing each month showed a positive trend. However, after the earthquake, there was a significant decrease in the number of passengers who came to NTB by sea. In July 2018 there was a decrease in the number of passengers arriving by sea by 27.70 percent compared to June 2018. The peak was in August 2018 which experienced a decline in the number of passengers arriving by sea by 40.26 percent. The same thing happened to the number of passengers who came through domestic flight routes in August which fell by 23.41 percent from July 2018.

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Another tourism indicator that shows a decline in tourism performance in NTB after the earthquake is the star-rated hotel and non-star hotel room occupancy rates (TPK). Room occupancy rates (TPK) of star-rated hotels in NTB before the earthquake struck ranged between 40-53 percent. However, after the earthquake, room occupancy rates (TPK) for star-rated hotels in August was only 28.18 percent. This figure means that only 28.18 percent of rooms are available in star-rated hotels in August 2018 used by visiting guests. This figure fell 30.61 points from the same period of the previous year which reached 54.99 percent. In line with that, non-star hotels' TPK only reached 16.48 percent. When compared to the same period of the previous year (y on y), non-star room occupancy rates (TPK) for hotels fell 10.93 points from 27.41 percent in August 2017.

Apart from tourism, the earthquake disaster also affected the export-import activities in NTB. As a copper-producing region, the dominance of non-oil/mineral mining goods is very large against the value of exports every month in NTB. At least more than 80 percent of NTB export value is obtained from non-oil mining/quarrying goods, namely copper concentrate. The NTB export value during July 2018-October 2018 was quite fluctuating, in July it fell by 45.67 percent, in August it fell by 21.06 percent, in September it rose 29.67 percent, and in October it fell by 95.73 percent. Fluctuations in the value of exports occurred not in full due to the occurrence of the earthquake but were influenced by the performance of mining companies in NTB. The impact of the earthquake was seen in the increase in the value of imports in the post-disaster. In August 2018 there was an increase in import value by 37.36 percent compared to July 2018, September experienced a decrease of 69.33 percent and October increased by 159.6 percent. The trend of an increase in import values in the post-disaster time is unavoidable because most of the goods needed to continue the production process in the industrial sector and also after the disaster needs of reconstruction cannot be met by domestic goods. As a result of the tendency of falling export values and rising import values, the positive trade balance of NTB began to decline. The NTB export trade net in the third quarter of 2018 was recorded to still experience a surplus of US \$30.85 million. This value had fallen considerably compared to the condition of the previous 3 years, which reached US \$393.69 million.

Natural disasters can also result in a shift in the labor structure of a region (Ohtake, Okuyama, Sasaki, Yasui, 2012). This happened due to the damage of production capacity and infrastructure which could make residents lose their livelihoods. In addition, the post-disaster reconstruction and rehabilitation process made the population faced with two choices, continue working as usual or focus on participating in the post-disaster reconstruction and rehabilitation process, especially for themselves and their families, and their place of residence (Gordon, 2004). The area that was most affected by the NTB earthquake was North Lombok Regency. Therefore, the August 2018 employment statistics released by BPS did not cover North Lombok regency because the August 2018 National Labor Force Survey (Sakernas) could not be carried out in North Lombok Regency. Thus, the NTB employment data in the condition of August 2018 that will be discussed does not cover North Lombok Regency. To maintain comparability between times, the data that will be used is the regency/city level data, especially the regencies/cities that were most severely affected by the NTB earthquake, City of Mataram.

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**Table 2** Summary of Macroeconomic Indicators of the Impact of Earthquakes in NTB

Indicator	Period						Change
	Qr. II 2018	Qr. III 2018	July 2018	August 2018	August 2017	August 2018	
GRDP (Trillion Rupiah)	23,04	22,55					-2,14 percent
Foreign Tourist (Visits)			13.980	4.308			-69,18 percent
Number of sea passengers (pax)			14.685	8.969			-40,26 percent
Number of air passengers (pax)			217.210	164.185			-23,41 percent
ROR of Star-rated Hotel (percent)					54,99	28,18	-30,61 point
ROR of Non-star-rated Hotel (percent)					27,41	16,48	-10,93 point
Export (million US\$)	171,54	119,55					-30,31 percent
Import (million US\$)	75,84	88,7					+17,42 percent
Nett Export (million US\$)	95,7	30,85					-67,76 percent
OUR* Mataram city (percent)					5,35	6,72	+1,37 point
CPI / Inflation			132,69	132,56			0,10 percent

**Source:** (BPS, 2018c, 2018d, 2018e, 2018a, 2018b, 2018f)

The open unemployment rate (TPT) in the city of Mataram in August 2018 rose 1.37 points to 6.72 percent from 5.35 percent in August 2017. If seen from the business structure of the working population, there was a decrease in the percentage of the population working in the agricultural sector of the total working population in August 2018 compared to August 2017, which was 35.81 percent to 33.48 percent. This is normal because one of the impacts of the NTB earthquake was the destruction of the main infrastructure and agricultural support such as irrigation networks, roads, and bridges. In line with the contraction in the construction sector GRDP, the percentage of the population working in the construction sector against the total working population also declined to 6.91 percent from 7.41 percent in August 2017.

The shift in the structure of employment also caused the potential for reducing the income of the population. With the income of the population which tended to decrease due to the loss of employment, the purchasing power of goods and services became relatively weak. However, this condition was not exacerbated by fluctuations in the inflation value which usually also rose due to the scarcity of goods and services in the post-disaster market. The combined inflation of two cities in NTB during the two months' post-disaster (August and September) showed a controlled figure, even deflation occurred in the second month, which was 0.10 percent in August 2018 and deflation of 0.28 percent in September 2018. However, if seen based on expenditure groups, it was evident that deflation in August was more due to the decline in the transportation, communication, and financial services index. This is due to the low demand for air transportation that makes the index. Air transport consumer prices fell by 0.24 percent.

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## Conclusion

Based on macroeconomic data discussed in the previous section the earthquake that occurred in NTB in July-August 2018 caused a negative impact on the economy.

The response and sensitivity of several macroeconomic indicators vary. Some indicators respond directly to the disaster which can be seen through a decrease in these indicators when compared to the period before the disaster.

Indicators that reflect tourism activities respond quickly to these events, including decreasing foreign tourist visits, decreasing the number of passengers on the sea and air transportation, and decreasing ROR of star-rated hotel and non-star hotels.

Other indicators such as export and import, economic growth, open unemployment rate, and inflation tend to respond more slowly and new changes will be seen in the medium to long term.

## Recommendations

Based on the results of the study, several policy recommendations can be given related to efforts to minimize the impact of earthquake natural disasters on the economy of a region, especially NTB Local governments need to find out the damaged economic units and provide financial stimulus through easy access to capital loans to financial institutions in order to maintain the momentum of business productivity to provide added value to the regional economy. Local governments need to collaborate with the private sector that has large-scale business capacities to assist small-scale economic units affected by the earthquake through the Corporate Social Responsibility (CSR) program.

Local governments and the central government need to design disaster insurance schemes for community houses and especially business units to maintain financial certainty if similar disasters occur again in the future.

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