Economics Bulletin

Volume 36, Issue 4

Natural Disaster and Local Bank Non-Performing Loan: Case of Nias Tsunami 2004

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Abstract

There is dilemma of Indonesia government to give fund relief in assisting the non—performing credit of natural disaster-affected area. This is due to the argument that natural disaster may not have any impact on banking performance of those affected areas. The fund relief is accused as another moral hazard from government. Hence, this research aims to investigate the effects of natural disaster on the local bank non-performing loan. We use event study and pair t-test to examine the effects of Nias tsunami on Indonesian banking sector. The study is motivated by the hypothesis that there are impacts towards the Indonesian banking institution before and after the natural disaster happens in 2004. The results show that there are increment in the good and under-supervision credit rating, while the other credit rating has decrement after the event. This might be due to the regulation the restriction of loan borrowing to mitigate the crisis hit towards the banking profitability. The NPL of local bank is also significantly different between before and after the tsunami. Using event study approach, the results shows also the significant impact of Aceh Tsunami on local bank non-performing loan.

The authors acknowledge the Financial support from the Centre for Business, Economics and Finance Forecasting (BEFfore) in University Malaysia Sarawak (UNIMAS) via top-down research grant: 03(TD04)/1054/2013(02).
Citation: Rayenda Brahmana and Chin hong Puah and Michael Chai, (2016) "Natural Disaster and Local Bank Non-Performing Loan: Case of Nias Tsunami 2004", *Economics Bulletin*, Volume 36, Issue 4, pages 2413-2421
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Submitted: April 17, 2016. **Published:** December 10, 2016.

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1. Background of study

Indonesia offers unique characteristics in terms of economics of natural disasters. This country is good in term of economy growth as one of the emerging countries; yet, its geographical location makes this country as one of the countries that often hit by natural disasters. There have been around 14 major natural disasters that took around 1000 deaths each occasion since 2005. This leads the government has to rethink its public policy, especially those related with financial sectors[1].

The economy effect of natural disaster is many of the victims are not able to repay their debt. It is a dilemma of Indonesian government to bail out those non-performing credit because it may affect the national account and it may also trigger the moral hazard condition. Meanwhile, the proponent of this bail-out argues that the natural disaster has given high expenses to the affected community. Therefore, it is important to assist the victims to rebuild the economy. The proponent argument is consistent with prior research such Guimaraes et al, (1993), Freeman (2000), Kahn (2005), Toya and Skidmore (2007), and Noy (2009) who documented the natural hazards poses not only as negative short-term effect (i.e. infrastructure damage, life loss, crops and livestock destruction, and financial loss) but also influences in long-term that might causes such economy slowdown, negative impact psychologically on residence (social change) and landscape changes. To rebuild from the beginning, the debt owed by the victims has to be bailed out.

This research aims to investigate empirically the effects of natural disasters on the non-performing loan of those affected community. We choose Nias Tsunami as the proxy of natural disaster because it is one of the biggest natural disasters happened in Indonesian. Jaffe et al (2006) and Hosono et al (2012) documented that Nias after the Tusnami has difficulties in fulfilling the daily goods. There was no business run for months and hundreds of houses were destroyed. The community faced issue in capital to replant and re-fishing. Steinberg (2007) documented how tsunami destroyed housing in Nias and cause huge of capital to rebuild it. There is also Nazara and Resosudarmo (2007) who documented the impact of tsunami on Nias unemployment and entrepreneurship activities. However, rarely found a research investigates the impact of Tsunami on local bank activity.

It is noteworthy that Nias tsunami wave stroked with 9.15-magnitude earthquake at the north of the island in 2004. There was official reported by newspaper that 130,000 people dead, 37,000 missing and 500,000 others displaced as tsunami hit in Indonesia. According to the Table 1 below, number of affected in few district victims in Indonesia was recorded. Overall, there were total of 166,671 people dead, 2,961 people injured, 6,244 people missing, 4,326,687 people suffering on loss, and 440,192 people evacuated. In the corporation point of view, there will be lack of workforce and intellects to achieve corporation objectives due to death of population. Employees of a company might be the victim of the disaster may affect corporation performance. This might leads to failure/loss on investment or business due to the inefficiency of operation.

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[1] Read http://bisnis.liputan6.com/read/559290/bank-pemerintah-usul-hapus-tagihan-kredit-korban-kebakaran-pasar. Retrieved on 6th December 2015
Read http://www.thejakartapost.com/news/2014/03/05/disaster-affected-people-may-get-new-loans-lenders.html. Retrieved on 6th December 2015

Table 1: Aftermath Effect of Earthquake and Tsunami in Northern Sumatera 2004

DISTRICT	DEATH	INJURED	EVACUATED
NIAS	980	6,000	2700
BENER MERIAH	10	3	1204
ACEH UTARA	2238	384	28268
ACEH TAMIANG	0	0	3100
GAYO LUES	3	1	293
KOTA LANGSA	0	0	10370
SIMEULUE	7	119	22849
ACEH JAYA	19661	0	29273
SUMATERA UTARA	130	1832	4012
ACEH SINGKIL	0	0	0
ACEH BESAR	47784	0	116984
ACEH TIMUR	224	6	2356
ACEH BARAT DAYA	9	3	13600
ACEH TENGGARA	26	0	0

Sources: Indonesian National Board for Disaster Management (2015).

According to the statistics figure from Indonesian National Board for Disaster Management (2015), there are the total of 322,821 badly-damaged houses, 96,576 mild-damaged houses, 250 health facilities, 1248 education facilities, 34884km road damaged, and 58087 hectare damaged. This statistic shows there were many homeless and infrastructures devastated, and it increased the living cost due to accessibility matter. This is also one of the reason corporation might have losses as their asset is being destroyed as a result it could not to generate income. At the same time, the repairment cost for the asset face by the organization would be high. For example, recovery cost about $7.2 billion was disbursed to rebuild in Aceh, Indonesia (Paddock, 2014). It is estimated that North Sumatra and Aceh suffered damages and losses totaling about 13.4 trillion rupiah.

Does the tsunami affect the lending performance of bank in Nias? This is the main question that this research aims to tackle. Vast literature has tried to answer this question but it is limited in three senses. First, most of researches investigate how natural disasters affect farming and plantation industry. For instance, Cavallo, Galiani, Noy, and Pantano (2011), Strobl (2012), and Zylberberg (2012) have found that there are negative effects on the economic growth due to the occurence of natural disaster. Second, most of research investigates the impact of natural disaster using aggregate national data. For instance, Skidmore and Toya (2005) and Kim (2010) investigate the effect of natural disaster on economic activity of economic growth, capital investment, and human capital investment. Yet, the data used in the research is national data even though only one fraction of that country has been hit by natural disaster. Lastly, several research such Marianti (2007) and Noy (2009) use survey study and rely on the perceived of the natural disaster victim to explore the impact.

Prior research has examined the role of natural disaster on banking performance. For instance Kaoru et al (2012) showed that the Great Hanshin-Awaji (Kobe) Earthquake in 1995 weakened lending capacity of damaged banks exacerbated the borrowing constraints on the investment of their undamaged client firms. They also found that the negative impact is robust for two alternative measures of bank damage: that to the bank headquarters and that to the branch network. However, the impacts of the two are different in timing; while that of the former emerged immediately after the earthquake, the latter emerged with a one-year lag. Other studies such Hosono et al (2012) and Miyakawa et al (2014) found also the significant

relationship on the effectiveness of bank performance which is damaged by natural disasters particularly towards loans for capital investment research and exports.

In Indonesia context, two or three research has documented the effect of natural disaster on business performance. For instance, there is Consultative Group on Indonesia (2015) research which reported the unfavourable effect of natural disaster on non-performing loans faced by Indonesian banks. There are also Steinberg (2007) and Nazara and Resosudarmo (2007) who documented the impact of 2004 tsunami to economy activity of affected area. Yet, it is very rare to found a research that documented the impact of 2004 tsunami to Indonesia local bank activity, especially in Nias' tsunami context.

The findings of this study might be fruitful for policy maker. It would guide tsunami policy-making that related to banking performance. Learning from the case of Yogyakarta earthquake, where there was huge debate among politician about to pass the policy of loan-write off financial aid for the victims, this research may give empirical perspective to justify that similar aided for future disaster effect. This tsunami policy is being implied for the future disaster occurrence to ensure the capital or asset is sufficient for the losses cause which is referring as a contingency fund reserved or capital adequacy. Moreover, there is also possibility that the findings may assist government in conducting budgeting or a decision-making for investments and reinvestments related to banking lending as suggested by Paulais (2012). This could secure banking and non-banking institution to be in upright/standby position for economy downturn which is referring as risk reduction management (Froot & Stein, 1998).

2. Methodology

We obtain the natural disaster data from the central bank of Indonesia (Bank Indonesia) for the period 2000 to 2013. Our sample consists of average the banking data that operated in Nias. There are four Indonesian banks which provided the data of non-performing loan (NPL), and we took the average of all those banking data.

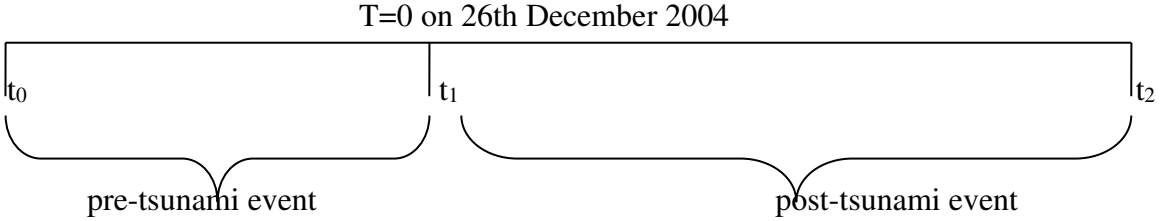
Unlike prior studies in banking performance such Li (2003) and Lin and Zhang (2009), the non-performing loan is not a calculated measurement, instead, it is the real reported data from Bank Indonesia. This data is a quarterly data where we treat the fourth quarter 2004 as the mid-point of the event study as the tsunami occurred in 26th December 2004.

This study collected two groups of observations for event study. The observations are tested before and after the event is being taken place which refers to Tsunami Nias in 2004.Since then, pair t-test is used to measure the distinct between the mean of two groups as such prior and after the event happens. The t-test formula is as follows**:**

$$\mathbf{t_{statistic}} = \frac{\bar{\mathbf{X}}_1 - \bar{\mathbf{X}}_2}{\mathbf{s}_{\bar{\mathbf{X}}_1 - \bar{\mathbf{X}}_2}} \mathbf{(1)}$$

where, $\bar{\mathbf{X}}_1$ represents the mean of the group prior to the tsunami while $\bar{\mathbf{X}}_2$ represents the mean of the group after the tsunami happens and $\mathbf{s}_{\bar{\mathbf{X}}_1 - \bar{\mathbf{X}}_2}$ refers to the standard deviation of the two groups.

Figure2: Timeline of the event study



Based on figure 2, the interval t_0 until t_1 is known as the pre-tsunami period start from first quarter in year 2000 until third quarter in year 2004, the interval t_1 until t_2 is known as the post-tsunami period start from first quarter in year 2005 until fourth quarter in year 2013 while the interval t = 0 refers to the occurrence of Nias tsunami on fourth quarter in year 2004.

The abnormal NPL of the bank in Nias can be measured by taking the residual, e_t. This residual error can be computed for each period as in Equation (2):

$$e_t = NPL_{bank,t} - (\alpha + \beta NPL_{province,t}) \quad (2)$$

Where $NPL_{bank,t}$ is Nias bank's NPL; $\beta NPL_{province,t}$ is province level of bank's NPL.

In this event study, the Average Abnormal NPL (*ANPLs*) can be defined over the sample of Nias bank's NPL, *N* at each quarter *t* which aimed to eliminate idiosyncrasies in measurement of such particular bank. The estimator of the average abnormal NPL for each NPL *t* can be computed as follows in Equation (3):

$$ANPL_t = \frac{1}{N}\sum_{j=1}^{N} e_t \quad (3)$$

where

$ANPL_t$ = average abnormal NPL in period *t*
e_t = the estimator of the abnormal NPL for Bank *j*
N = number of firms in the sample

We then follow the procedure from announcement impact model from Brown and Warner (1980) and Panayides and Gong (2002). The statistical significance follows the basic statistic concept, where t-value is calculated based on null hypothesis testing. The null hypothesis is there is no impact of natural disaster on bank's NPL. The null hypothesis is defined as follows:

$$H_0: E(e_t) \geq 0 \quad (4)$$

For a given sample, *t*-test has been used to determine the significance level of natural disaster impact as well as to estimate standard error of the returns to ensure its reliability and stability from the time series of *ANPL* for the estimation period. The *t*-test formula for *ANPL* is computed as follows:

$$ANPL_t\ t\ stat = \frac{ANPL_t}{\sigma(ANPL_t)} \quad (5)$$

3. Results

Descriptive Results

First, we analyze by using the descriptive statistics of bank's total credit in Nias. The data is split into two events: pre and post tsunami. Then, we take the average from all the banks of each year for those two separate events. Table 2 displays the results.

Table 2 documents that before the tsunami (end of 2004), the mean of total credit from each bank in Nias was around Rp 143 million. This means that each bank in Nias gave loan averagely Rp 143 million or USD 10215 (assuming USD 1 equal to Rp 14.000) to people of Nias before Tsunami. However, the mean of the total bank's credit after tsunami increase to Rp180million or USD 12857. This means that each bank in Nias has total loan

around Rp180 million[2]. The huge increase between pre and post tsunami may be due to the need of re-development.

Interestingly, the non-performing loan of banks in Nias also has significant difference between pre and post tsunami. Bank in Nias had NPL 3.41 at the highest before tsunami. However, the bank had NPL 20.44% after the tsunami. Averagely, the bank's NPL was 2.47% before tsunami, and then has significant increase to 11.34% after tsunami. This shows that tsunami has huge impact to the performance of banks in Nias.

Table2: Descriptive statistics for banking institutions in Indonesia performance-based

		Total	NPL
Before	Max	Rp 182.638 million	3.41%
	Min	Rp 76.384 million	1.00%
	Mean	Rp 143.8245 million	2.47%
After	Max	Rp 187.695 million	20.44%
	Min	Rp 177.235 million	4.65%
	Mean	Rp 180.86475 million	11.34%

The impact of Natural Disaster on Bank's NPL

The result in table 3 shows that the impact of the natural disaster on Bank's NPL. The mean of the before-after event is -0.0934 with a standard deviation of 0.0683. The average value of the difference in the event is negative which might show having negative relationship between the natural disaster and the banking institution. This is in line with the argument of Consultative Group on Indonesia (2015) which argued that there is the existence of negative impacts in Nias economy, and it might have brought towards the banking institution after the tsunami. The value also seems to be relatively big and might be influential as it nearly reaches 10 percent in decrement due to the Nias tsunami. There are not only unfavorable impacts towards the mean or the profit but also the standard deviation representing the risk is more than 5 percent. This refers that the disaster might have caused the banking operation prone to be in loss as mentioned by Zylberberg (2012).

The result shows there is significant difference pre and post disaster at 5 percent with t-test result of -3.3321. This means that the null hypothesis can be rejected at 95 percent confidence level. As a result, the occurrences of the disaster give significant difference between the NPL before disaster and NPL after disaster. In short, T-test in Table 3 shows the difference between the pre-tsunami and the post-tsunami is significant at the 5 percent level of significance. This represents default in loan tends to be increased due to the natural disaster

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Table 3 T-Test result

	Mean	Std. Deviation	t	Sig. (2-tailed)
Before - After	-.0934	.0683	-3.3321	.0417

[2] Note that the GDP per capital of Nias in 2013 was only Rp 4.587.471 or USD 327; assuming USD 1 equal to Rp 14000

Table 4 consists of event study results showing the impact of natural disaster on non-performing loans. The first column of table 4 represents the trading period while the second column is percentage of average abnormal non-performing loan. The cutting point (T = 0) is fourth quarter in year 2004.

Table **Error! No text of specified style in document.**: Event Study Analysis Results

Trading Days	ANPL (%)	ANPL t-stat
Q12000	3.521	1.221
Q22000	…	…
Q32000	3.3668	1.2981
Q42000	4.0133	1.3915
Q12001	4.0248	1.677*
Q22001	3.9885	1.5978
Q32001	4.3595	1.4681
Q42001	3.0680	1.0366
Q12002	4.0937	1.4160
Q22002	3.9608	1.3447
Q32002	3.5323	1.4030
Q42002	3.3246	1.2592
Q12003	4.1472	1.728*
Q22003	3.9992	1.3990
Q32003	4.1205	1.5163
Q42003	3.2420	1.2812
Q12004	2.7597	1.3722
Q22004	2.7054	1.2680
Q32004	4.1054	1.3578
Q42004	2.7667	1.1017
Q12005	5.8680	2.2713**
Q22005	9.2375	3.5756***
Q32005	12.2789	4.7528***
Q42005	10.3898	4.0216***
Q12006	6.8526	2.6525***
Q22006	5.3790	2.182**
Q32006	5.1220	1.982**
Q42006	4.9655	1.872*
Q12007	3.6234	1.4020
Q22007	3.2474	1.2570
Q32007	3.4041	1.3179
Q42007	2.6234	1.0156
Q12008	2.4120	1.0930
Q22008	…	…
Q42013	2.1634	0.83755

The results show that when Nias Tsunami occurred, the impact was not there yet. The Nias tsunami start to has impact on the non-performing loan on first quarter of year 2015 and the percentage of average abnormal non-performing loan amounted to 5.8680 percent, and it is statistically significance at 5 percent level. This shows that the tsunami started to have

impact on the non-performing loan on first quarter in year 2005 and the impact of tsunami last until the fourth quarter of 2006 amounted to 4.9655 percent. The impact on tsunami remained until the first quarter of year 2007. This implies that in the first quarter of 2007, the effect of tsunami on Nias NPL had been disappeared.

The findings of this research are consistent with prior studies such as Guimaraes et al, (1993), Freeman (2000), Kahn (2005), Toya and Skidmore (2007), and Noy (2009). This implies that natural disaster has created economy catastrophe to society. For the case of Nias, tsunami swept the economy activity and shut down the income generator for the society. Nias people who are dominated by farmers grew crops and breed live stocks, and had applied for loan to operate their business. They used up their loan to purchase all of the crops, live stocks, machineries and lands. When the natural disasters occurred, they did not yet harvesting their plants, or generating income from their newly purchased machineries. As the tsunami brought destruction to all their properties and businesses, they did not have any capabilities to repay the loan. Therefore, it created the increase of non-performing loan to banks that operated in Nias. Meanwhile, government only gave temporary shelter and foods to assist them. However, government did not assist them to rebuild their business through loan facilities. As the concluding remark, government should assist the society that destructed by natural disaster like Nias through bad debt allowance. By doing this, government is not only helping the society, but also the banks.

4. Conclusion

This research investigates the effects of natural disasters on bank's non-performing loan (NPL). First, this research uses descriptive approach to explore the NPL of Nias' banks. It shows the percentage of non-performing loan was higher after the occurrence of natural disaster. Then, we test the pre-post tsunami difference of Nias bank's NPL. The mean of the pre and post tsunami is amounted to -0.0934 with a standard deviation of 0.0683. Then, we found there is significant difference between pre and post tsunami for the bank's NPL. The value of 0.0934 shows that it is relatively big as the value is near to 10 percent in decrement due to the occurrence of Nias tsunami. The standard deviation of the results represents the high risk of default that is more than 5 percent. Additionally, the event study method is also used to find out the impact of natural disaster on non-performing loans. The results show that the Nias tsunami started having impact on the non-performing loan on first quarter of year 2005.

Therefore, it can be concluded that natural disaster does have significant effect on bank's performance. This can be shown from the case of Nias Tsunami in Indonesia. It shows that there is significant effect of tsunami on bank's NPL in Nias. This research might give insight for Indonesian government: it is important to consider lending facilities or eliminating the loan credit to those communities that affected by natural disasters. The findings of this research can be used as the empirical dossier of the importance of credit assistance in affected area. An incentive such as fund relief as provided in past for certain district in Indonesia (Yogyakarta case) could be done to Nias people in order to mitigate the disaster impact. The findings of this study have a number of important implications for future practice as such construction for new credit regulations.

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