



Earthquake, Tsunami and Liquefaction in the City of Palu: Efforts to Enhance the Sustainability of SMEs in the Future

Submitted Date:
10 June 2023

Accepted Date:
25 June 2023

Published Date:
29 June 2023

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How to cite:

Lestari, I., Abdullah, I. M., Furqan, C. A. 2023. Earthquake, Tsunami and Liquefaction in the City of Palu: Efforts to Enhance the Sustainability of SMEs in the Future. *Jurnal Bisnis dan Manajemen*, Vol. 10 Iss 1 pp. 121-128.

Abstract:

This study aims to identify and analyze the impact of disasters on the financial performance of micro, small, and medium enterprises (MSMEs), as well as to analyze the differences in financial performance of MSMEs before and after disasters based on their business type and sector. The study was conducted in the city of Palu, with a sample of 1,504 MSMEs affected by earthquakes, tsunamis, and liquefaction. The research findings indicate that natural disasters have a negative impact on the financial performance of MSMEs in Palu. This means that the earthquakes, tsunamis, and liquefaction that occurred in Palu and its surrounding areas in 2018 resulted in a decline in the financial performance of MSMEs in the city, across industrial, service, and trade sectors. Additionally, this study provides new insights to the local government, highlighting the need to encourage MSMEs to develop disaster risk mitigation strategies, particularly to maintain financial stability in the aftermath of natural disasters.

Keywords Natural Disasters, Financial Performance, SMEs

Abstrak:

Penelitian ini bertujuan untuk mengidentifikasi dan menganalisis dampak bencana terhadap kinerja keuangan usaha mikro, kecil, dan menengah (UMKM), serta menganalisis perbedaan kinerja keuangan UMKM sebelum dan setelah bencana berdasarkan jenis usaha dan sektor. Penelitian ini dilakukan di kota Palu, dengan sampel sebanyak 1.504 UMKM yang terdampak oleh gempa bumi, tsunami, dan likuifaksi. Temuan penelitian menunjukkan bahwa bencana alam memiliki dampak negatif terhadap kinerja keuangan UMKM di Palu. Hal ini berarti bahwa gempa bumi, tsunami, dan likuifaksi yang terjadi di Palu dan sekitarnya pada tahun 2018 menyebabkan penurunan kinerja keuangan UMKM di kota tersebut, di sektor industri, jasa, dan perdagangan. Selain itu, penelitian ini memberikan wawasan baru kepada pemerintah setempat, menyoroti perlunya mendorong UMKM untuk mengembangkan strategi mitigasi risiko bencana, terutama untuk menjaga stabilitas keuangan pasca bencana alam.

Keywords Bencana Alam, Kinerja Keuangan, UMKM

Introduction

Financial performance is the measurement of success for a micro, small, or medium enterprise (MSME) or company in generating profits and sustainability. Financial performance reflects the financial condition of an MSME and is measured through financial analysis, allowing an assessment of the MSME's financial condition over a specific period. The measurement of financial performance is used to evaluate the efficiency and effectiveness of an MSME in generating profits and maintaining a certain cash position. Through the measurement of financial performance, the growth and development prospects of the MSME can be assessed, either in general or specific

to that particular MSME, based on the utilization of its resources. An MSME can be considered successful when it achieves a predetermined level of performance (Indiary *dkk*, 2017).

On September 28, 2018, an earthquake with a magnitude of 7.7 struck the city of Palu and its surrounding areas. As is typical with any disaster, the resulting impact often hampers the activities of micro and small enterprises (MSMEs). The occurrence of this disaster has shown a negative impact on all types of businesses, particularly on small and medium-sized enterprises (SMEs) across all sectors, including the industrial, service, and trade sectors. This is because micro and small businesses have fewer financial and technical resources to mitigate the risks of natural disasters. The earthquake event can result in significant loss of human lives, environmental damage, property losses, and even psychological impacts. In managing the financial performance of MSMEs, it is essential to consider and address the potential risks and threats to their business that may arise unpredictably (Abdullah & Furqan, 2021). In managing the financial performance of MSMEs, it is inseparable from the threat of unpredictable business risks that can emerge at any time. MSMEs can be considered highly vulnerable to the impacts of disasters due to their relatively limited resources and lack of resilience in terms of preparedness (Sharif, 2021).

This study aims to reduce the risks of natural disasters on the sustainability and performance of MSMEs in the future. Therefore, it is necessary to implement disaster risk mitigation strategies for MSMEs, particularly to maintain the stability of their asset turnover ratios. The impact of natural disasters significantly affects the business performance and continuity of MSMEs. Risk management is crucial for MSMEs to identify the readiness of their businesses in facing potential natural disasters such as earthquakes, tsunamis, and liquefaction in the future. The city of Palu is known to have a high vulnerability to natural disasters, including earthquakes, tsunamis, and liquefaction.

The research was conducted in the city of Palu, with a sample of Micro and Small Enterprises (MSEs) that had data on revenue and assets for the years 2017 and 2019. The purpose of this research is to provide insights and knowledge to MSEs and stakeholders regarding the impact of disasters on the financial performance of MSEs in Palu. Financial performance is an assessment of the financial condition of an MSE over a specific period, measured using asset turnover ratios that indicate the level of efficiency in managing assets to generate income. Post-disaster, such as earthquakes, tsunamis, and liquefaction, several findings can be summarized as follows :

Firstly, regarding the impact of disasters on the financial performance of micro and small enterprises, the research findings indicate a significant difference. It can be concluded that the impact of disasters tends to lead to a decline in financial performance. This is because MSEs are considered highly vulnerable in disaster situations, as they have limited resources and lack preparedness to face such disasters. The results of this study contribute to an additional explanation of previous research (Sharif, 2021); (Auzzir et al., 2018); and (Samantha, 2018), that disasters indeed have a significant impact on the financial performance of not only MSEs but also other workforce members. As a result, MSE operators need to seek alternative logistical support to continue their businesses after being affected by natural disasters.

Secondly, in terms of the impact of disasters on financial performance based on business types, it is observed that there is a decline in the financial performance of MSEs. The findings of this research indicate that among the different business types, micro-enterprises are the most affected. This can be attributed to the characteristics of micro-enterprises, as they have a larger number of businesses compared to small enterprises, and the scale of their operations is limited with a maximum annual revenue of 300 million and maximum assets of 50 million. This suggests that micro-enterprises often lack entrepreneurial spirit in developing their businesses, making them more vulnerable to the impacts of disasters and experiencing slower recovery compared to other types of businesses (LPPI & BI, 2015).

Thirdly, in addition to business types, disasters also impact financial performance based on the sector of operation, namely the industrial, services, and trade sectors. The research findings show that the trade sector is the most affected. This is because trade activities are closely linked to suppliers, as they involve buying and selling goods. Disasters can disrupt the supply chain and limit the access to suppliers, which significantly affects trade sector businesses that rely on a steady supply of goods. On the other hand, the industrial sector experiences a lower impact compared to other sectors. This is attributed to the fact that a significant portion of the industrial sector

operates in the home-based and creative fields, where raw materials can be adjusted based on what is available, minimizing the dependency on specific raw materials (LPPI & BI, 2015).

Therefore, based on the above explanation, it can be concluded that the financial performance of MSEs before the disaster (2017) tends to be better than the financial performance after the disaster (2019). This indicates that disasters have a negative impact on the financial performance of MSEs in Palu, both in terms of business types and sectors.

Literature Review

Disaster Event

Disasters are events that threaten and disrupt people's lives and MSE actors (Undang-Undang Republik Indonesia Nomor 20 Tahun, 2008). Earthquake occurrences can be triggered by both natural and human-induced factors. These events have the potential to cause significant loss of life, destruction of property, and have long-lasting psychological effects (Abdullah & Furqan, 2021). Disasters have become an intriguing issue for policies and practices, given the occurrence of large-scale natural disasters worldwide and their significant impact on the local economy and SMEs (Dasanayaka & Wedawatta, 2014). Emergency response to disasters involves a series of activities carried out during a disaster event to mitigate the negative impacts. These activities include rescue and evacuation of victims, protection and retrieval of assets, meeting basic needs, providing shelter and care for refugees, search and rescue operations, as well as the restoration of infrastructure and facilities. In disaster management, efforts are made to eliminate and/or reduce the threats posed by disasters. Preparedness involves a series of activities undertaken to anticipate disasters through organization and the implementation of appropriate and effective measures (Undang-Undang Republik Indonesia Nomor 20 Tahun, 2008).

Financial Performance - Asset Turnover Ratio

Performance is an effort that can be carried out by MSMEs with the aim of evaluating various efficiencies, effectiveness, and even the activities of MSMEs within a specific period. Financial performance can provide an overview of MSME reporting, giving an indication of the work achievements within a certain period. The measurement of financial performance is used to assess the success of an MSME or company in generating profits. In this research, the financial condition of MSMEs is described using the asset turnover ratio to illustrate the level of efficiency in managing assets to generate income. Total asset turnover measures the turnover of the entire assets of an MSME, and the ratio is calculated by dividing the revenue by the total assets. When the asset turnover of an MSME is higher, it indicates more efficient utilization of assets in generating revenue (Allfian, 2015).

The Effect of Disaster on the Financial Performance of MSEs in Palu City

With the increasing interest of students focusing on micro and small enterprises (MSMEs), it is widely recognized that MSMEs play a crucial role in economic growth. The measurement tool used in this study can help demonstrate the financial performance of an MSME. Large-scale natural disasters and their significant impacts on MSMEs highlight the importance of disaster mitigation. It is crucial to foster resilience and predictability in reducing disaster risks (Sharif, 2021). Risk perception is the most consistent factor in influencing preparedness actions in facing natural disasters. Therefore, disasters have shown significant consequences on the financial performance of MSMEs in 2019, leading to a decrease in the asset turnover percentage. This indicates that the earthquake disaster that occurred in Palu in 2018 has caused a decline in the financial performance of micro and small enterprises (MSMEs), particularly in terms of asset turnover rate (Hashim et al., 2021).

Research Method

Data

The data used in this study consists of a database of micro and small enterprises (MSMEs) in Palu for the years 2017 and 2019. The database for the year 2017 comprises 1,533 observations, while the available database for the year 2019 consists of 1,504 observations. Therefore, the total number of observations used in this study is 1,504. All the data used in this study are sourced from the Department of Cooperatives and SMEs of Central Sulawesi Province. The sample characteristics obtained are as follows: for micro enterprises, the industrial sector has 79 business owners, the service sector has 159 business owners, and the trade sector has 1,089 business

owners. As for small enterprises, the industrial sector has 3 business owners, the service sector has 273 business owners, and the trade sector has 1,149 business owners.

Variable Empirical and Operational Models

In answering research problems and at the same time testing hypotheses, the empirical model in this study is as follows:

$$t = \frac{d}{sd \sqrt{n}}$$

and the standard deviation (s) is formulated as follows:

$$s = \frac{n \frac{\sum d^2 - (\sum d)^2}{n - 1}}$$

Information :

t = Value of the distribution

td = Mean difference between paired observations

Sd = Standard deviation of the difference between paired observations

n = Number of paired observations

d = Difference between paired data

Paired samples refer to the same subjects but with different treatments. This type of analysis can be used to examine research models with a pre-test and post-test design. Paired Sample T-Test is a statistical method used to assess the effectiveness of treatments by comparing the differences before and after the treatment. In the use of the paired sample t-test, it is necessary for each pair of observations to be in the same condition. The reason for using the paired sample t-test in the study is that it involves paired or matched samples. In this study, the paired samples refer to the same subject, which is the financial performance in both the pre-test and post-test periods (Sultoni *dkk*, 2018). The financial performance in the study was measured using data on revenue and assets. Generally, the majority of the samples used in this study were micro and small enterprises operating in the sectors of industry, services, and trade.

Results and Discussion

Based on the research results that tested the financial performance of micro and small enterprises in Palu before and after a disaster, considering the type of business and sector, several findings can be explained in this study, as follows:

Descriptive Statistics

Disasters are measured using a dummy variable, with a value of "1" indicating the period after the disaster and a value of "0" indicating the period before the disaster. Performance is measured using the asset turnover ratio. D_industry is a sector variable measured using a dummy variable, with a value of "1" indicating the industrial sector and a value of "0" indicating other sectors. D_Service is a sector variable measured using a dummy variable, with a value of "1" indicating the service sector and a value of "0" indicating other sectors. D_trade is a sector variable measured using a dummy variable, with a value of "1" indicating the trade sector and a value of "0" indicating other sectors. Descriptive statistics of the research data are presented in two conditions: before the disaster and after the disaster. The complete information can be seen in the following Table 1:

Table 1. Variable Descriptive Statistics

	Obs	Mean	Std. Dev.	Min	Max
Disaster	3.008	0,5	0,5	0	1
Performance	3.008	0,372	0,321	0,056	4,667
D_industry	3.008	0.054	0.227	0	1
D_Service	3.008	0.181	0.385	0	1

	Obs	Mean	Std. Dev.	Min	Max
D_trade	3.008	0.763	0.424	0	1

In Table 1, descriptive statistics for the variables analyzed in this study are presented. The total number of observed data points for each variable is 3,008. The data analysis results indicate that the mean for the variable "disaster" is 0.5, which implies a 5 percent change during a disaster event. The variable "kinerja" has a mean of 0.372, suggesting that UMKs have an average asset turnover of 0.372. Table 2 also shows that the average mean value for the industrial sector is 0.054, the service sector has an average mean value of 0.181, while the trade sector has an average mean value of 0.763. This implies that the research sample is predominantly composed of UMKs in the trade sector.

Table 2. Variable Correlation Analysis

	performance	disaster	d_industry	d_service	d_trade
performance	1.000				
disaster	-0.476*** 0.000	1.000			
d_industry	0.076*** 0.000	0.000 1.000	1.000		
d_service	-0.001 0.924	0.000 1.000	-0.113*** 0.000	1.000	
d_trade	-0.039** 0.031	0.000 1.000	-0.432*** 0.000	-0.847*** 0.000	1.000

Table 2 specifically depicts the correlation among variables with an observation size of 3,008. The correlation analysis results show that the "disaster" variable is negatively correlated with financial performance at a significance level of 1 percent. The service sector does not have a significant correlation with financial performance, meaning that there is no difference in financial performance between the service sector and other sectors. However, the trade sector exhibits a significant negative correlation with financial performance at a significance level of 5 percent, indicating that the trade sector has lower financial performance compared to other sectors. Additionally, the research findings indicate a positive correlation between the industrial sector and financial performance at a significance level of 1 percent, suggesting that the financial performance in the industrial sector is better than in other sectors.

Hypothesis Testing

In testing this hypothesis, a paired sample t-test was conducted using STATA-14 software. The results of the hypothesis testing are as follows:

Table 3. Hypothesis Testing

Variable	Obs	Mean before disaster	Mean After Disaster	T	Sig	Decision
Financial performance	-	0,526	0,219	53.662	0.000***	Accepted
D_mikro	1,427	0,515	0,216	51.720	0.000***	Accepted
D_small	77	0,725	0,277	16.752	0.000***	Accepted
D_industry	82	0,616	0,334	6.106	0.000***	Accepted
D_service	273	0,498	0,244	16.455	0.000***	Accepted
D_trade	1149	0,526	0,205	57.620	0.000***	Accepted
M_industry	79	0,614	0,332	5.902	0.000***	Accepted
M_service	259	0,485	0,238	15.561	0.000***	Accepted
M_trade	1.089	0,511	0,200	56.574	0.000***	Accepted
S_industry	3	0,666	0,375	1.941	0.191	Not Accepted
S_service	14	0,744	0,353	6.622	0.000***	Accepted
S_trade	60	0,807	0,300	17.409	0.000***	Accepted

Table 3 shows that there is a significant difference in the mean financial performance of MSMEs before and after a disaster event, at a confidence level of 0.05. Based on these results, it is evident that earthquakes, liquefaction, and tsunamis have a significant impact on financial performance, with a significance level of 0.000. Therefore, the research hypothesis can be accepted. The results obtained from hypothesis testing indicate a significant difference in financial performance, with better financial performance observed before the disaster compared to the post-disaster period. This demonstrates that disasters have an influence on the financial performance of micro and small businesses in the city of Palu, which is consistent with the findings of previous research (Istanti, 2008). The study found a significant difference in the business profits of BRI Unit before and after the Lapindo hot mud disaster. The significant difference indicates that the impact of the disaster tends to result in a decline in financial performance. This suggests that micro and small businesses (UMK) are highly vulnerable in disaster situations, as they are relatively limited in resources and lack preparedness to face disasters. This condition is supported by previous research findings (Sharif, 2021). Asset turnover measures the efficiency of utilizing all the assets of MSMEs by calculating the ratio of revenue to total assets. When the asset turnover of an MSME is higher, it indicates more efficient use of assets to generate revenue (Alfian, 2015). Based on the analysis results, the difference in financial performance of MSMEs before and after a disaster can be interpreted as a significant impact of the disaster on their financial performance. Specifically, there is a decrease in the financial performance of MSMEs after experiencing a disaster, particularly in terms of asset turnover, which is influenced by earthquake, liquefaction, and tsunami disasters. These findings are supported by previous studies conducted by (Sharif, 2021) and (Dasanayaka & Wedawatta, 2014), which also found that disaster events had a significant impact on MSMEs in Bangladesh. The occurrence of widespread natural disasters and their significant impact on MSMEs highlight the importance of disaster mitigation efforts to build resilience and predictability in reducing disaster risks.

Furthermore, table 3 indicates a significant difference in the mean financial performance of micro businesses before and after natural disasters, with a significance level of 1 percent. This implies that the earthquake, liquefaction, and tsunami natural disasters that occurred in Palu in 2018 have led to a decline in the financial performance of micro businesses. The table also shows a significant difference in the mean financial performance of small businesses before and after natural disasters, with a significance level of 1 percent. This suggests that the earthquake, liquefaction, and tsunami natural disasters that occurred in Palu in 2018 have resulted in a decrease in the financial performance of small businesses. Micro and small businesses (MSMEs) play a crucial role in driving the Indonesian economy. These businesses are managed in a simple manner and require relatively small capital, but they are vulnerable to natural disasters. Therefore, the activities carried out by micro and small business owners cannot be separated from the community's needs in meeting their livelihood requirements, and they have high flexibility in their operations. MSMEs in Indonesia have informal characteristics, including the lack of legal status, financial record-keeping systems, the use of basic technology, and inadequate risk management and preparedness for natural disasters. These factors undoubtedly affect the income generated by MSMEs (Statistik, 2018). From the results of the analysis on the difference in financial performance before and after the earthquake, liquefaction, and tsunami disasters based on the type of business, both micro and small businesses were affected by the disasters in Palu. This is evident from the decline in financial performance of micro and small businesses after the disasters. Among these business types, micro businesses were the most impacted, given their larger representation in terms of numbers. Micro businesses have a maximum annual turnover of 300 million and maximum assets of 50 million, and they exhibit common characteristics where entrepreneurial spirit is often lacking for business development (LPPI & BI, 2015). This study is consistent with the findings of (Sarmiento et al., 2019), which highlight that smaller businesses have lower levels of Disaster Risk Reduction (DRR) compared to larger businesses. These findings underline the importance of proactively building and developing capabilities in risk management and disaster preparedness, as well as the need to resume operations earlier after a disaster.

Besides that, table 3 shows that there is a significant difference in the mean financial performance of the industrial sector before and after the earthquake, liquefaction, and tsunami disasters, with a significance level of 1 percent. This indicates that the natural disasters that occurred in Palu in 2018 have led to a decline in the financial performance of micro and small businesses in the industrial sector. The results for the service sector indicate a significant difference in the mean financial performance before and after the natural disasters, with a significance level of 1 percent. This means that the earthquake, liquefaction, and tsunami disasters in Palu in 2018 have also resulted in a decline in the financial performance of micro and small businesses in the service sector. Other results also indicate a significant difference in the mean financial performance of the trade sector before and after the earthquake, liquefaction, and tsunami disasters, with a significance level of 1 percent. This means that the natural disasters that occurred in Palu in 2018 have led to a decline in the financial performance of micro and small businesses in the trade sector.

Other than that, table 3 shows that there is a significant difference in the mean performance of micro-enterprises in the industrial sector before and after a natural disaster. The significance level is 1 percent. This means that the earthquake, liquefaction, and tsunami disaster that occurred in Palu City in 2018 has led to a decrease in the financial performance of micro-enterprises in the industrial sector. The results for the service sector indicate a significant difference in the mean financial performance before and after the natural disaster, with a significance level of 1 percent. This implies that the earthquake, liquefaction, and tsunami disaster in Palu City in 2018 have caused a decline in the financial performance of micro-enterprises in the service sector after the disaster. Similarly, the results for the trade sector also show a significant difference in the mean financial performance before and after the natural disaster, with a significance level of 1 percent. This means that the earthquake, liquefaction, and tsunami disaster in Palu City in 2018 have caused a decline in the financial performance of micro-enterprises in the trade sector after the disaster. Therefore, it can be concluded that the micro-enterprises in the industrial, service, and trade sectors have been impacted by the earthquake, liquefaction, and tsunami disaster in Palu City, as evidenced by the decrease in financial performance, particularly in terms of asset turnover percentage.

Even farther, table 3 shows that there is no significant difference in the mean financial performance of the industrial sector before and after a natural disaster, with a significance level of 1 percent. However, it should be noted that the data for small businesses in the industrial sector is very limited, with only 3 small businesses observed. The results for the service sector indicate a significant difference in the mean financial performance before and after the natural disaster, with a significance level of 1 percent. This means that the earthquake, liquefaction, and tsunami disaster in Palu City in 2018 have caused a decrease in the financial performance of small businesses in the service sector after the disaster. Similarly, the results for the trade sector also show a significant difference in the mean financial performance before and after the natural disaster, with a significance level of 1 percent. This means that the earthquake, liquefaction, and tsunami disaster in Palu City in 2018 have caused a decline in the financial performance of small businesses in the trade sector after the disaster. Therefore, it can be concluded that the small businesses in the industrial, service, and trade sectors have been impacted by the earthquake, liquefaction, and tsunami disaster in Palu City, as evidenced by the decrease in financial performance, particularly in terms of asset turnover percentage. In summary, the testing indicates differences in the financial performance of the industrial, service, and trade sectors, as well as differences within the micro and small businesses. The results suggest that both micro and small businesses in the industrial, service, and trade sectors have been affected by the earthquake, liquefaction, and tsunami disaster in Palu City, leading to a decline in financial performance. The trade sector appears to be the most affected sector, as indicated by the higher t-value compared to other sectors. This is because the trade sector involves resale activities, and the impact of the disaster disrupts supply chains, reduces trade volume, and decreases consumer spending. Consequently, many businesses in the trade sector face financial issues, resulting in employee layoffs, terminations, and temporary closures. On the other hand, the industrial sector appears to have a lower impact compared to other sectors due to its focus on home-based and creative activities, which minimize the use of raw materials and make them easily accessible.

Conclusion

The research findings indicate a significant difference in the mean financial performance of micro and small businesses (MSMEs) before and after a disaster event. This demonstrates that earthquakes, liquefaction, and tsunamis have a significant impact on the financial performance of MSMEs. The results support previous research and highlight the vulnerability of MSMEs in disaster situations due to their limited resources and lack of preparedness. Specifically, there is a decrease in the financial performance of MSMEs after experiencing a disaster, particularly in terms of asset turnover. Micro and small businesses in Palu City were significantly affected by the earthquake, liquefaction, and tsunami disasters, with micro businesses being the most impacted due to their larger representation in numbers. The industrial, service, and trade sectors all experienced a decline in financial performance after the disasters, with the trade sector being the most affected. The findings emphasize the importance of proactive disaster mitigation efforts, risk management, and building resilience in reducing disaster risks for MSMEs. The study concludes that MSMEs in Palu City, especially micro and small businesses, need to develop capabilities in risk management, disaster preparedness, and early resumption of operations after a

disaster. The results also suggest that the industrial sector, with its focus on home-based and creative activities, experienced a relatively lower impact compared to the service and trade sectors.

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