

Crosstab Analysis Method to Examine the Relationship between Types of Natural Disasters and Districts/Cities in the Province of DIY

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Abstract

Disaster is a natural event, man-made or a combination of both that occurs suddenly, causing a devastating negative impact on the continuity of life. This study aims to determine the descriptive tendency of disaster types in the province of Yogyakarta Istimewah Area (DIY) and determine the relationship between districts and types of natural disasters including strong winds, floods, building fires, landslides, forest and land fires, in DIY Province namely Gunung Kidul, Bantul, Sleman, Kulonprogo, and Yogyakarta City. The method used in this research is Crosstabs analysis to find out the relationship between disaster types and districts/cities in Yogyakarta Province in 2023. The results of the analysis show that there is a significant relationship between districts/cities and types of natural disasters.

Keywords: : *Disaster; Regency/City; Chi Square; Crosstabs Analysis..*

Abstrak

Bencana adalah suatu kejadian alam, buatan manusia atau perpaduan antara keduanya yang terjadi secara tiba-tiba sehingga menimbulkan dampak negatif yang dahsyat bagi kelangsungan kehidupan. Pada penelitian ini bertujuan untuk mengetahui deskriptif kecenderungan jenis bencana di provinsi Daerah Istimewah Yogyakarta (DIY) dan mengetahui hubungan antara kabupaten dengan jenis bencana alam meliputi bencana angin kencang, banjir, kebakaran bangunan, tanah longsor, kebakaran hutan dan lahan, di Provinsi DIY yaitu Kabupaten Gunung Kidul, Bantul, Sleman, Kulonprogo, dan Kota Yogyakarta. Metode yang digunakan dalam penelitian ini adalah analisis Crosstabs untuk mengetahui hubungan jenis bencana dengan wilayah kabupaten/kota di Provinsi DIY tahun 2023. Hasil analisis menunjukkan bahwa terdapat hubungan yang signifikan antara kabupaten/kota dengan jenis bencana alam.

Kata Kunci: Bencana; Kabupaten/Kota; Chi Square; Analisis Crosstabs.

INTRODUCTION

Indonesia is the largest archipelago in the world. Geographically, Indonesia is located between two continents, Asia and Australia, and between two oceans, the Pacific and the Indian Ocean. (Handayaningsih, 2018). Despite its extraordinary natural wealth and beauty, the Indonesian people need to be aware that the archipelago lies at the confluence of three active plates: the Indo-Australian, Eurasian, and Pacific. Indonesia's location at this confluence places it at risk of natural disasters. (Wijaya, Rifal, & Wardhani, 2018) (Hermon, 2015) (Fernalia, Anggita, & Lista, 2023).

According to data compiled in the Indonesian Disaster Information Database (DIBI)-BNPB, it can be seen that more than 25,487 disasters occurred in the period from 2015 to 2021, more than 74.10% (78,890) of the disasters were hydrometeorological disasters and only around 25.90% (6,604) were geological disasters. Hydrometeorological disasters include floods, extreme waves, land and forest fires, droughts, and extreme weather. Meanwhile, the geological disasters that frequently occur are earthquakes, tsunamis, volcanic eruptions, and landslides. The total number of disasters for both types of disasters continues to increase. (Shalih, et al., 2023) Entering 2023, 173 disasters were recorded across Indonesia. In January, which typically marks the peak of the rainy season, 97% of the disasters were hydrometeorological disasters. These disasters included both wet and dry hydrometeorological disasters. Wet hydrometeorological disasters were still dominated by floods, extreme weather, and landslides. (Assaudi, 2023).

A disaster is a natural event, man-made event or a combination of the two that occurs suddenly and has a devastating negative impact on the continuity of life. (Arie, 2015) BNPB. (2023) (Widyaswara Suwaryo & Yuwono, 2015). According to Law Number 24 of 2007 concerning Disaster Management, a disaster is an event or series of events that threaten and disrupt the lives and livelihoods of the community caused by natural and/or non-natural factors as well as human factors, resulting in human casualties, environmental damage, property losses, and psychological impacts. (Margianto, Monggilo, Aghnia, & Deni, 2021; DIY, 2019) (Nazaruddin, 2015)

Characteristics of a disaster:

1. Disruption to normal life

A major disruption that occurs suddenly, covers a wide area, and lasts a significant amount of time.

2. Disrupts life and well-being

Psychological impacts, disrupting comfort and health, causing minor injuries, serious injuries, and even loss of life.

3. Impacts social life

Damage to nature and the environment, as well as to telecommunications and public services.

4. Mobilizes community empathy

Humanitarian solidarity (provision of shelter, food, medicine, etc.)
(Sigit, Novidiantoko, & Candrawinata, 2018)

Based on its geographical, geological, hydrological, and demographic conditions, the Special Region of Yogyakarta has a high potential for disasters, whether caused by natural, non-natural, or human factors. For example, strong winds that initially only occurred in the Sleman and Yogyakarta areas have now hit other areas, namely Bantul and Gunung Kidul Regencies, causing many losses for people living in these disaster-prone areas, ranging from damaged houses, damaged road access due to fallen trees, and electricity and internet disruptions due to many fallen electricity poles.

In general, in Indonesia, the types of disasters are categorized into several disaster threats, including: Tornadoes/strong winds are strong winds that come suddenly, have a center, move in a circle like a spiral at a speed of 40-50 km/hour until they touch the surface of the earth and will disappear in a short time (3-5 minutes). Floods are events or conditions where an area or land is submerged due to increased water volume. Fires are situations where buildings in a place such as houses/settlements, factories, markets, buildings and others are engulfed in fire which causes victims and/or losses. Forest and land fires are a condition where

forests and land are engulfed in fire, resulting in forest and land damage which causes economic losses and/or environmental value.

Forest and land fires often cause smoke disasters that can disrupt the activities and health of surrounding communities. Landslides are a type of mass movement of soil or rock, or a combination of both, down or off a slope due to disruption of the stability of the soil or rock that make up the slope. (Isnaini, 2019). (Wijaya, Rifal, & Wardhani, 2018)

Based on previous research, there is a comparison of the dynamics of flood events in the city of Surabaya. (Katherina, 2017) and the relationship between the level of disaster knowledge and community preparedness in Wonogiri sub-district (Fauzi, Hidayati, Subagyo, Sukini, & Latif, 2017; DIY, 2019), Meanwhile, in the Special Region of Yogyakarta Province, there has been little research on the relationship between districts and types of natural disasters. Therefore, in this study, researchers aimed to examine the relationship between districts and types of natural disasters using crosstab analysis with SPSS statistical software.

RESEARCH METHODS

The first step the researcher took was to formulate the problem. The problem formulation was derived from the background description, broken down into broad questions. In this study, the researcher sought to determine the relationship between the types of natural disasters and district/city areas using crosstab analysis. This was followed by data collection. The data used by the researcher was obtained from the Yogyakarta Regional Disaster Management Agency. The data collection process was carried out by inputting data one by one into Microsoft Excel.

After the data has been successfully collected, researchers will see an initial overview of the data through descriptive analysis before conducting further analysis. After the descriptive analysis, a crosstab analysis is conducted to determine the expected count value to meet the chi-square test. At this stage, the sum of the values for each district/city variable is calculated, multiplied by each disaster type variable, and then divided by the sum of the values for all districts/cities or disaster types. If the result is greater than 5, the chi-square test can

be continued. Next, analyze the p-value. From the chi-square results, researchers draw conclusions based on the Pearson Chi-Square Significance value and $\alpha = 0.05$.

RESULTS AND DISCUSSION

Descriptive analysis aims to provide an overview of data so that the data presented is easy to understand and informative. The characteristics of the data used in this study can be seen using descriptive statistics. The following presents some of the information obtained related to the research results. This information includes the district (where the disaster occurred), the type of natural disaster, and the district with the type of natural disaster.

(i) Bencana

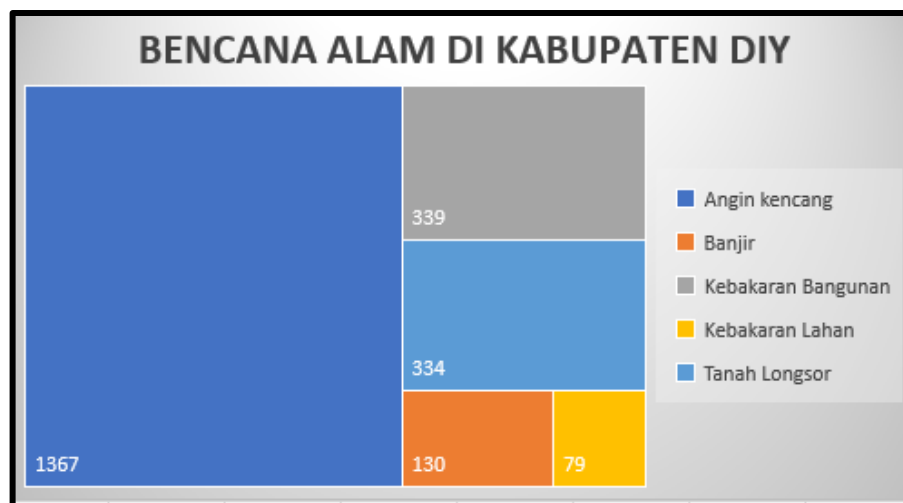


Figure 1. Natural Disaster Graph

Based on Figure 1, the most frequent natural disasters in the Special Region of Yogyakarta (DIY) Regency are strong winds, with 1,367 occurring. Second in importance are building fires, with 339 occurring.

(ii) District where the disaster occurred

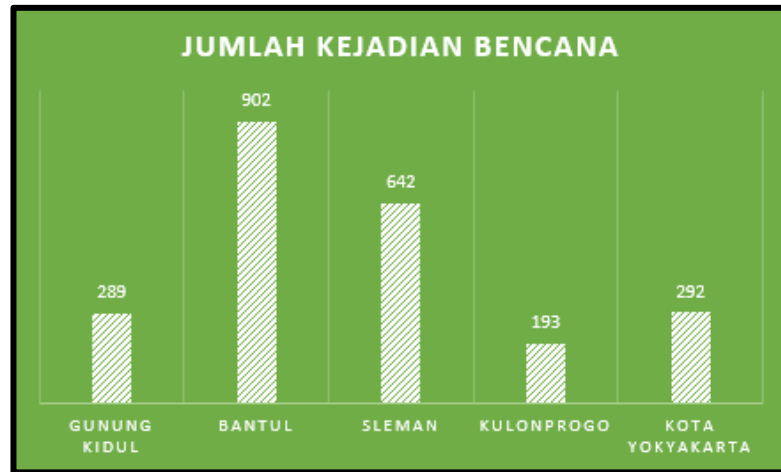


Figure 2. Graph of Districts Where Disasters Occurred

From Figure 2, it can be seen that the majority of natural disasters in the DIY Province occurred in Bantul Regency with 902 incidents, followed by Sleman Regency with 642 incidents, Yogyakarta City Regency with 291 incidents, Gunung Kidul Regency with 289 incidents, and finally Kulon Progo Regency with 193 incidents.

(ii) Relationship between Districts and Types of Natural Disasters

To find out whether there is a relationship between the Regency/City area and the type of natural disaster, this can be seen in Table 1.

Table 1. Crostabulation of Districts with Natural Disasters

			Jenis Bencana Alam					Total
			Angin Kencang	Banjir	Kebakaran Bangunan	Kebakaran Lahan	Tanah Longs or	
Kabupaten Bantul /kota	Bantul	Count	572	62	116	35	96	881
		Expected Count	535.5	50.9	132.8	30.9	130.8	881.0
	Gunung Kidul	Count	79	51	42	12	105	289
		Expected Count	175.7	16.7	43.6	10.2	42.9	289.0
	Kota Yogyakarta	Count	118	12	102	21	20	273
		Expected Count	165.9	15.8	41.2	9.6	40.5	273.0
	Kulon Progo	Count	104	2	39	6	41	192
		Expected Count	116.7	11.1	28.9	6.7	28.5	192.0
	Sleman	Count	494	3	40	5	72	614
		Expected Count	373.2	35.5	92.6	21.6	91.2	614.0
Total		Count	1367	130	339	79	334	2249
		Expected Count	1367.0	130.0	339.0	79.0	334.0	2249.0

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	492.664 ^a	16	.000
Likelihood Ratio	464.149	16	.000
Linear-by-Linear Association	59.080	1	.000
N of Valid Cases	2249		
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.74.			

Figure 3. Chi-Square of Sub-districts by Type of Natural Disaster

From Table 1, namely cross tabulation to see the expected value to fulfill the Chi-Square test requirements where all cells in the cross tabulation expected value must be greater than 5, it can be seen in the output that all *The expected value in the cell is more than 5 so the Chi-Square test can be continued.* To test the hypothesis of the relationship between Regency/City and the type of natural disaster, the following can be done:

Hypothesis

H_0 : There is no significant relationship between the Regency/City variables and the type of natural disaster.

H_1 : There is a significant relationship between the Regency/City variables and the type of natural disaster.

a) Significant Level

$$\alpha = 0.05$$

b) Critical area

$$H_0 \text{ rejected if or } X_{hitung}^2 > X_{\{(b-1)(k-1);\alpha\}}^2$$

$$H_0 \text{ rejected if the value is significant } < 0.05$$

c) Statistics test

$$\text{Significant value} = 0.000 < \alpha = 0.05$$

d) Conclusion

Because the Pearson Chi-Square significance value obtained in Figure 3. $0.000 < 0.05$, then H_0 is rejected. So the conclusion is that there is a significant relationship between the type of natural disaster and the Regency/City area.

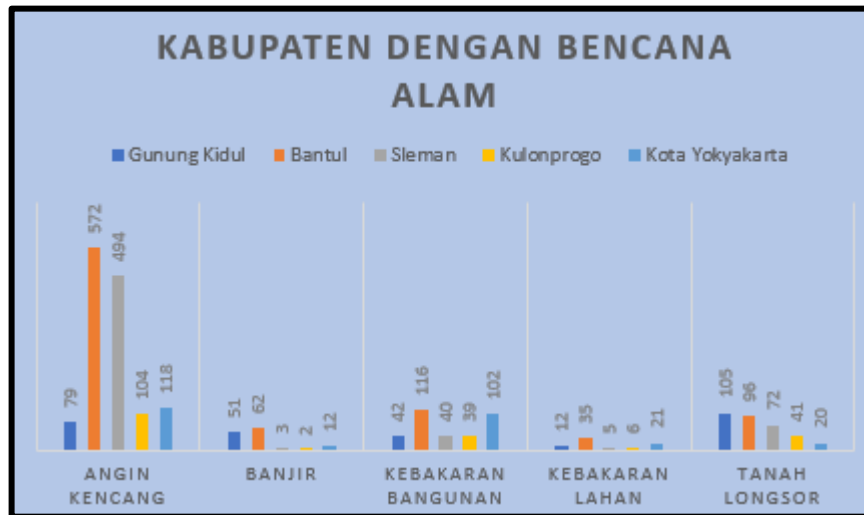


Figure 4. Profile of Disaster Events in Districts/Cities

The relationship between disaster types and district/city areas in the Special Region of Yogyakarta Province can be seen in Figure 4, where strong wind disasters occurred in Gunung Kidul Regency with 79 incidents, Bantul Regency with 572 incidents, Sleman Regency with 494 incidents, Kulonprogo Regency with 104 incidents, and Yogyakarta City with 118 incidents. Flood disasters occurred in Gunung Kidul Regency with 51 incidents, Bantul Regency with 62 incidents, Sleman Regency with 3 incidents, Kulonprogo Regency with 2 incidents, and Yogyakarta City with 12 incidents. Building fires occurred in Gunung Kidul Regency with 42 incidents, Bantul Regency with 116 incidents, Sleman Regency with 40 incidents, Kulonprogo Regency with 39 incidents, and Yogyakarta City with 102 incidents. Land fires occurred in Gunung Kidul Regency with 12 incidents, followed by Bantul Regency with 35 incidents, Sleman Regency with 5 incidents, Kulonprogo Regency with 6 incidents, and Yogyakarta City with 21 incidents. Building fires occurred in Gunung Kidul Regency with 105 incidents, Bantul Regency with 96 incidents, Sleman Regency with 72 incidents, Kulonprogo Regency with 41 incidents, and Yogyakarta City with 20 incidents.

CONCLUSION

There is a significant relationship between district/city and the type of natural disaster. Meanwhile, Bantul Regency experienced the most disasters, with 902 incidents, while Kulonprogo Regency experienced the least, with 193 incidents.

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