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THE RELATIONSHIP BETWEEN GOOGLE SEARCH VOLUME AND FLOOD EVENTS IN INDONESIA: A GOOGLE TRENDS ANALYSIS

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Abstract

The increasing number of floods every year brings a wide impact; the average loss caused by floods every year reaches 4.64T (Rp). Information about floods is very important to improve the preparedness of people living in disaster-prone areas. If information can be provided when people have a high interest in learning, it can have a profound effect on increasing public knowledge. To carry out effective risk communication in flood disasters, knowledge about flood disaster patterns is needed, as well as knowledge about community behavior in seeking information. One of the people's behavior in searching for information can be seen from the Google Trends analysis. The purposes of this study are to analyse the relationship between public interest in finding information through google trends with the keyword "flood" with flood events in Indonesia for 10 years. This research is a quantitative descriptive study by processing data obtained from Google Trends and BNPB flood event data using the Spearman Rank Correlation statistical test with SPSS software. The results showed that Google Trends with the keyword "Flood" and the pattern of flood events had a strong positive relationship with a correlation coefficient of 0.64, this indicates that the increase in the incidence of disasters causes an increase in public interest in seeking information about flood disasters. Risk communication that was carried out before the disaster occurred was not yet optimal in reaching the community. Risk communication needs to be carried out before the months that are predicted to be the peak of flood events. Risk communication is carried out to form the preparedness of the Indonesian people so that the risk of flood disasters can be reduced.

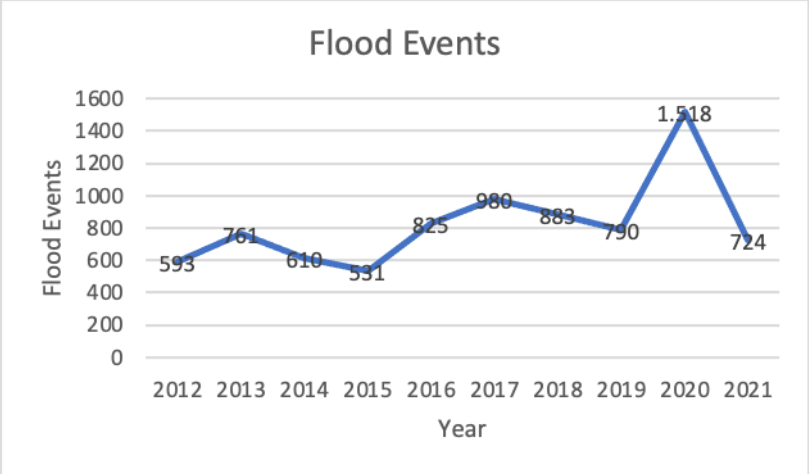
Keywords: *Google Trends, Flood, Disaster Risk Communication*

Introduction

Floods are a disaster that has the highest incident intensity in Indonesia. In 2022, there were 1,175 hydrometeorological natural disasters during the period

from 1 January to 3 April 2022 which were dominated by floods with a total of 428 incidents. As a result of the flood disaster, 80 people died, 10 people were missing, 1.67 million people were displaced, and 605 people were injured. Flood disasters in Indonesia tend to increase from year to year, with the highest occurrence in 2020 with 1518 events (BNPB 2022).

Figure 1. Floods Events In Indonesia 2012-2021



Source: Results of data analysis, 2022

The increasing intensity of floods from year to year causes huge losses, the average loss caused by floods every year reaches 4.64T (Kebijakan and Kementerian Keuangan 2018). Flood disaster is a disaster with recurring occurrences in Indonesia, public awareness of flood disaster along with prevention and preparedness measures needs to be possessed by the community.

Information is very important to increase the preparedness of people living in disaster-prone areas. When an individual has more experience with disasters, that experience will shape their perception, and when there is a lack of experience with a disaster, it is likely that the assessment of a disaster is based on information obtained through the media, own intuition and information from social networks owned. Information about floods is very important to improve the preparedness of people living in disaster-prone areas. If information can be provided when people have a high interest in learning, it can have a profound effect on increasing public knowledge. To carry out effective risk communication in flood disasters, knowledge about flood disaster patterns is needed, as well as knowledge about community behavior in seeking information. One of the people's behavior in searching for information can be seen from the Google Trends analysis. The purposes of this study are to analyse the relationship between public interest in finding information through google trends with the keyword "flood" with flood events in Indonesia for 10 years.

Literature Review

Information from the media about natural hazards can also affect perceptions of an event (Alcántara-Ayala and Moreno 2016).The form of public awareness that they are in a disaster risk area is having efforts to increase their

disaster knowledge, one of which can be done by searching for information online through the Google search engine.

According to the We Are Social report there were 204.7 million internet users in Indonesia in January 2022. This number increased by 1.03% compared to 2021. The internet penetration rate in Indonesia reached 73.7% of the total population in early 2022 (Total population of 277.7 million) (We are Social 2022). According to (Hampton & Goulet, 2011; Schroeder, 2018) people use the internet for two main activities, namely to communicate (socialization) and to search for information. For the purposes of searching for information via the internet, people use search engines such as Google, Bing, Yahoo, etc. The most popular search engine (has a market share of more than 92.03% of users) of the world's population is the Google search engine. The Google search engine is also the most popular source of information search in Indonesia. Google's market share in August 2021 in Indonesia reached 97.65% or 197.83 million users (Statcounter, 2021).

Big Data is generally considered as information that can be linked, with large volumes of data and complex data structures (Khoury and Ioannidis 2014). Utilization of big data for academic purposes, for example, with social media data, cell phone call records, commercial website data, individual geographic information, search engine data, smart card data, and taxi route data (Liu et al. 2016). Big data analysis can help generate better solutions to address issues related to the health, education, transportation, housing, aid, and inclusion sectors of certain socially, demographically, and geographically disadvantaged groups(Rodríguez, Palomino, and Mondaca 2017) .

Google Trends TM is one of the most widely used tools for this purpose. The analysis of relative internet search volumes (RSV) provides information regarding the extent of public attention (Effenberger et al. 2020). Google Trends is a unique data set that can be examined for deeper insights into social search behavior during extreme events such as floods, droughts, heatwaves, wildfires and landslides (Thompson et al. 2022). The Google Trends offers a special chance to gauge the "interest" in disasters. If information can be made available when individuals are most eager to learn, this can have a significant impact on raising the general public's awareness of recent and upcoming events. Knowledge can replace ignorance, and understanding can replace fear (Linkov et al. 2010). The purposes of this study are to analysed the relationship between public interest in finding information through google trends with the keyword "flood" with flood events in Indonesia for 10 years. To assess the association of public interest to flood, we used Google Trends Analyses. Google Trends is a public website owned by Google Inc. and offers data based on Google Search that shows how often certain search terms are entered compared to all other search terms in different regions and languages (Google, 2021). Google Trends does not display the total number of searches over time, but provides population-adjusted data that reflects the popularity of searches at any given time (Pullan and Dey 2021). The data is anonymous as no name or other personal user information is disclosed. Google Trends provides comparisons of up to five search terms or topics. The results for each search term or topic are associated with a maximum value of 100 (Kaatz et al. 2022). Prior to publication, data is anonymized, categorized, aggregated and

undergoes normalization to be rescaled and converted into a popularity index with a value between 0 and 100 (Google, 2021).

Research Method

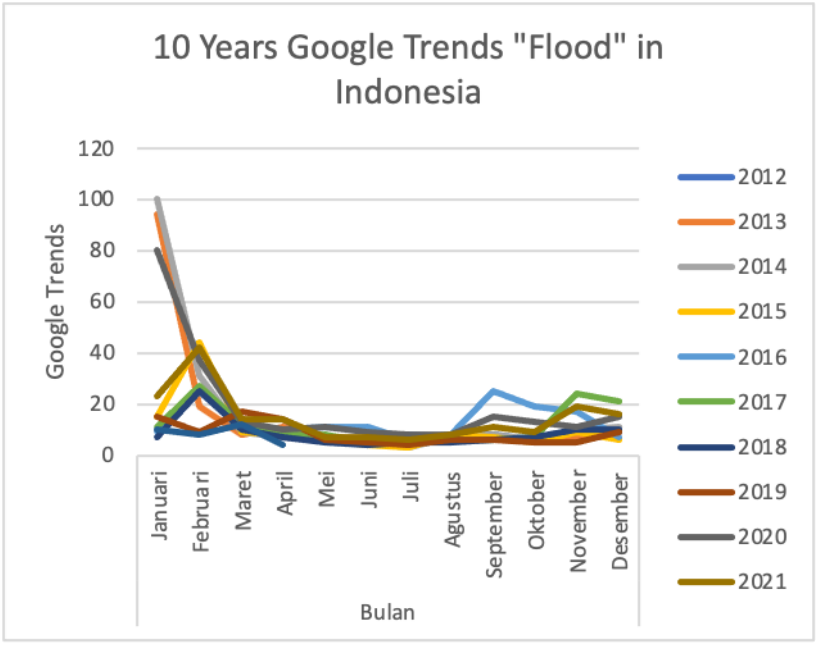
This research is descriptive quantitative research. Data were collected from two sources. Google trends data obtained through settings on Google Trends (https://trends.google.com/trends): period set for 10 years "March 2012-April 2022", region selected as "Indonesia" and "all categories" and "web search". Data on flood events was obtained from the BNPB website by setting an event period of 10 years from March 2012-April 2022. Spearman's Rank Correlation Analysis was carried out using SPSS software to find out the relationship between Google search trends and flood events over a 10 years period (March 2012-April 2022).

Results and Discussions

Google Trends "Flood" in Indonesia

Google trends with the keyword "flood" with the topic "disaster" during the research period (10 years) had a high trend at the beginning of the year (January-February) and had the highest trend in January 2014. The following presents a Google Trends chart for the keyword "flood" during the period March 2012-April 2022.

Figure 2. Google Trends "Flood" for the period March 2012-April 2022

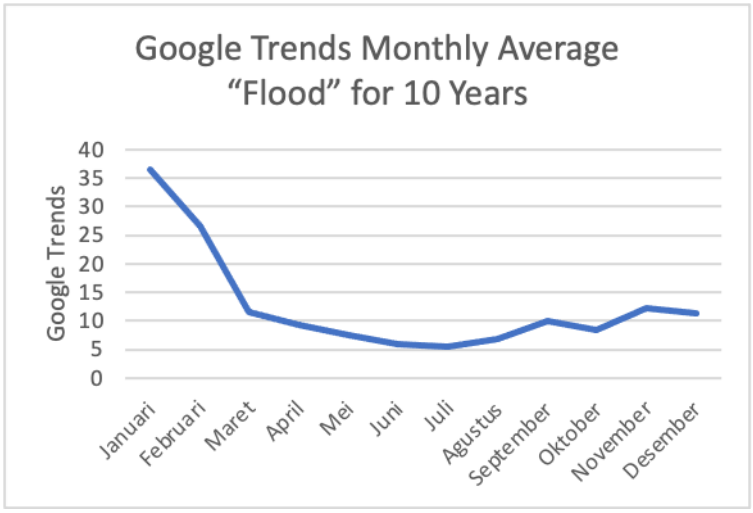


Source: Results of data analysis, 2022

Data over a 10 years period is presented by monthly trend averages to see patterns from Google Trends. Search trends have gradually increased starting in

August, decreasing in October. The peak of the search trend is experienced in January, remains high until February, and gradually decreases in March-July.

Figure 3. Google Trends Monthly Average "Flood" for the period March 2012-April 2022

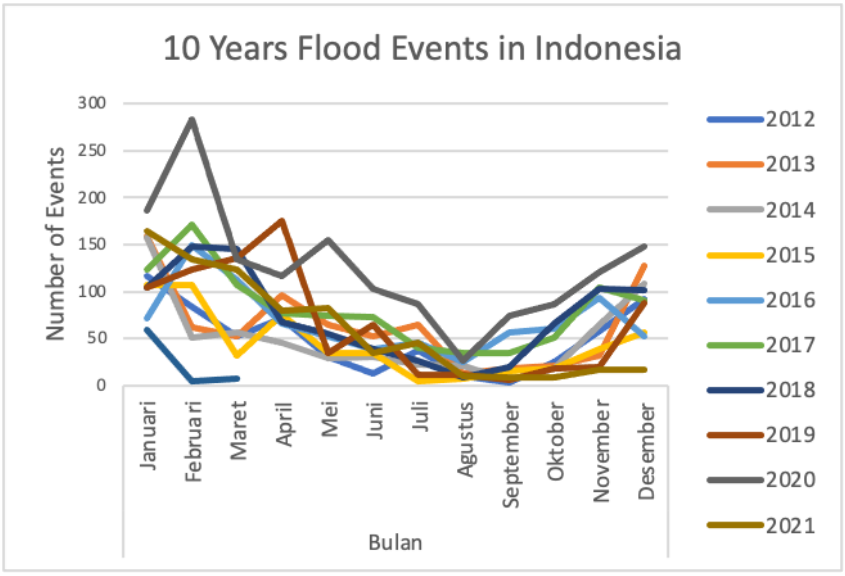


Source: Results of data analysis, 2022

3.2 Floods in Indonesia

Flood events were accessed from BNPB data starting in 2012-2022. The data shows that Indonesia has a high intensity of flood events with a total of 8285 incidents. February 2020 is the month with the highest flood events, namely 283 events. August is the month that has the lowest number of flood events compared to other months. A graph of flood events in Indonesia over a 10 years period is presented in the following figure.

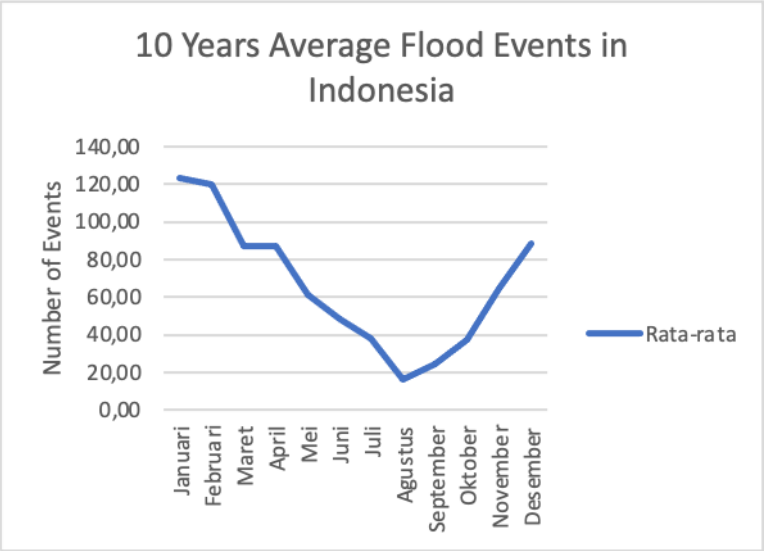
Figure 4. 10 Years Floods events in Indonesia



Source: Results of data analysis, 2022

To see trends in flood events, flood data obtained from BNPB over a 10 years period are presented with monthly average events. From the graph, it can be seen that flood events began to increase in September and reached a peak in January-February. In March-August the incidence of flooding has decreased. The lowest number of flood events occurred in August, then increased linearly towards the end of the year. Graph of average monthly flood events over a 10 years period is presented in the following figure.

Figure 5. 10 Years Average Floods events in Indonesia



Source: Results of data analysis, 2022

3.3. Correlation between Google Trends and Flood Events in Indonesia

Spearman's correlation analysis was carried out to determine the relationship between Google trends on the keyword "flood" and the number of flood events for 10 years. The results of the correlation analysis show that the google trend on the keyword "flood" and the number of flood events for 10 years has a significant correlation (sig 0.000), and a positive correlation coefficient of 0.640 (strong correlation). This shows that the google trend on the keyword "flood" and flood events for 10 years has a strong positive relationship, the high number of flood events will be followed by an increase in the google trend on the keyword "flood". The results of Spearman's correlation analysis presented as bellow.

Figure 5. The results of Spearman's correlation analysis

Correlations

			Google_Trend_Banjir	Kejadian_Banjir
Spearman's rho	Google_Trend_Banjir	Correlation Coefficient	1.000	.640**
		Sig. (2-tailed)	.	.000
		N	118	118
	Kejadian_Banjir	Correlation Coefficient	.640**	1.000
		Sig. (2-tailed)	.000	.
		N	118	118

**. Correlation is significant at the 0.01 level (2-tailed).

Flood events in Indonesia have experienced a positive trend increase, this shows that more and more flood disasters occur in Indonesia every year. This phenomenon shows that the community's flood preparedness must always be improved because an increase in the intensity of flood events will increase the risk of disaster to the community. Flood events are a patterned annual cycle in Indonesia. The results of data analysis show that the intensity of flood events began to increase in December and experienced a peak in February. This shows that

Overall, the analysis shows that there is empirical evidence regarding the relationship between the intensity of flood events and the search volume for "flood" on the Google search engine. This analysis confirms that public interest increases when there is an increase in the number of flood events. The increase in public interest in searching for the keyword "flood" on the Google search engine has a positive and strong correlation with the number of flood events in Indonesia. This finding is in line with the results of a study (Bakshy et al. 2012) which states that Google Trends tracks search interests during the flood. There is a trend of increased interest in events that have received widespread media coverage or where deaths have been reported. This is not surprising given that post-flooding messages have appeared online and netizens are likely to see them on their timelines. Additionally, when flood reports are published online, users are more likely to share them on social media, further driving search interest in the topic (Bakshy et al. 2012). Thompson et al. (2022) also found results similar to this study. Research (Thompson et al. 2022) shows that there is a significant correlation between monthly average search interest and monthly rainfall in Kenya and Uganda over a five-year time period.

Public interest in searching for information on Google has a positive correlation with extreme events such as increased rain intensity and flood event

intensity. This is in line with the statement (Alcántara-Ayala and Moreno 2016) that information is very important to increase the preparedness of people living in disaster-prone areas (Alcántara-Ayala and Moreno 2016).

The correlation between Google search trends and flood events in Indonesia shows that people are starting to be interested in finding information about flood disasters when there is an increase in incidents. Communities still tend to be responsive to disasters. When there was an increase in flood incidents, the mass media began to cover news about the chronology, victims, losses, and fundraising. Social media also began to react to the disaster that occurred, causing an increase in traffic regarding the flood disaster and increasing public interest in seeking information about the flood disaster.

Disaster risk communication is an effort to increase community preparedness through the provision of information on hazards quickly and accurately, as well as information on the response needed to reduce disaster risk. The role of disaster risk communication is fundamental in disaster communication management. Mass media support in communication or coordination management activities can reduce disaster risk or reduce the level of vulnerability and danger due to disasters (Asteria 2016). Public awareness of the risk of floods can be an illustration for determining strategic steps for reducing the risk of floods in Indonesia.

During the critical period before the peak months of flood events, it is necessary to quickly and accurately provide information regarding flood disasters to the public through various existing media. This is done as an effort to increase community preparedness in dealing with disasters and reduce disaster risk.

Conclusions

Google's trend regarding floods has increased gradually starting in August and has decreased in October. The peak of the search trend is experienced in January to February, and falls in March-July. Flood events have increased gradually starting in September and reaching a peak in January-February. Flood events began to decrease and experienced the lowest number of incidents in August. Google Trends with the keyword "Flood" and patterns of flood events have a strong positive relationship with a correlation coefficient of 0.64, this shows that an increase in disaster events has led to an increase in public interest in finding information about flood disasters. Risk communication needs to be carried out before the months that are predicted to be the peak of flood disasters. Risk communication is useful in shaping the preparedness of the Indonesian people to reduce the risk of flood disasters.

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