Google Trends and Disaster Risk Communications in The Seroja Tropical Cyclone Disaster Series in Indonesia

[1]Budi Purwanto, [2]Mario Beko Sihombing

[1,2]Disaster Management Department of Akbara Polytechnic, Surakarta, Indonesia
Corresponding email: akubudi89@gmail.com

Abstract:
Internet users in Indonesia in early 2021 reached 202.6 million people, which was ranked third in Asia Pacific and internet penetration in Indonesia in early 2021 reached 73.7 percent. As a country that has various disaster threats, the Indonesian people are required to have awareness of the existing disaster risks. The form of public awareness that they are in a disaster risk area can be seen, among others, in efforts to increase their knowledge of disaster, one of which can be done by searching for news online through the google search engine. Google search engine is used by 97.65% of internet users in Indonesia or as many as 197.83 million users. This study aims to find out the search trends of Indonesian people before, during, and after the occurrence of a series of tropical cyclones seroja using Google Trends Analysis on three keywords, namely "Cyclone", "Tropical Cyclone", and "Tropical Cyclone Seroja". Before the disaster, the average daily trend of google on the three search keywords was 33.61; 12.90 and 0. During the disaster it was 31.03; 16.55; and 2.42, and after the disaster was 37.67; 15.23 and 2.71. Google's trend of tropical cyclone disaster in Indonesia increased after the disaster occurred. In the pre-disaster phase, early warnings delivered to the public by the authorities (BMKG) have not made the Google trend increase due to lack of coverage by the media, both local and national. When a disaster occurs, there is a significant increase in the trend. After a series of disasters, google search trends tend to be high during the emergency response phase. Disaster risk communication becomes a very urgent matter to be carried out with the help of mass media that reaches the community so that the risk due to tropical cyclone disasters can be reduced in the future.

Keywords:
Google trends, Tropical Cyclone Seroja, disaster risk communication

JEL: D22, D23

INTRODUCTION

Internet users in Indonesia in early 2021 reached 202.6 million people, which ranks third in Asia Pacific. This number increased by 15.5 percent or 27 million people when compared to January 2020. The current population of Indonesia is 274.9 million people. This means that internet penetration in Indonesia in early 2021 will reach 73.7 percent. Internet user activity in Indonesia in the third quarter of 2020 was dominated by the use of watching videos, streaming music, vlogs, listening to podcasts and listening to radio online (Statista, 2021). In addition to the activities mentioned above, the search for information through search engines also cannot be excluded from the activities of internet users.

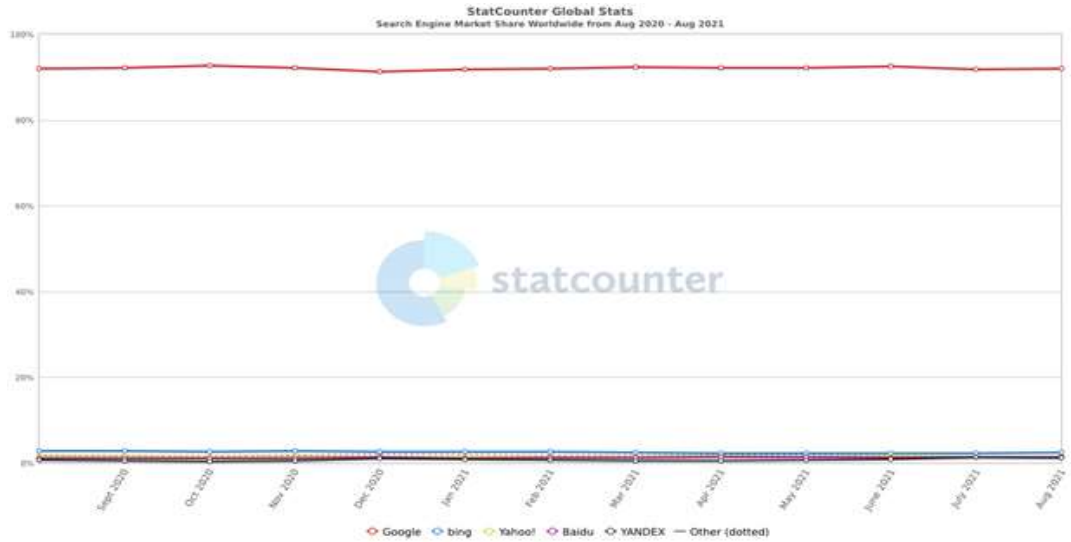

Figure 1. Graph of Number of Search Engine Users Worldwide

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 (google search). The google search engine is also the most popular source of information search in Indonesia, the market share of the google search engine in August 2021 in Indonesia is 97.65% or as many as 197.83 million users (Statcounter, 2021).

Indonesia is located in the Pacific Ring of Fire, which causes Indonesia to become a country that has various types of disasters, both geological and hydro meteorological disasters. In 2021, until April 15, BNPB stated that there had been 1125 disasters in Indonesia (BNPB, 2021). A series of disasters that recently occurred in Indonesia in April 2021, among others, occurred in the Provinces of East Nusa Tenggara and West Nusa Tenggara Provinces. This is the impact of the occurrence of Tropical Cyclone Seroja in Indonesian waters. This Seroja cyclone seed causes an increase in rainfall around the cyclone and causes extreme weather in East Nusa Tenggara (BPPT, 2021). This Tropical Cyclone triggered various kinds of disasters such as strong winds, landslides, floods and tidal waves that occurred in the Provinces of East Nusa Tenggara and West Nusa Tenggara.

As a country that has vulnerability to various types of disasters, disaster prevention and management in Indonesia is not only the responsibility of one party, all parties must take part in this disaster management effort. The framework by involving five parties (Pentahelix) in disaster management is the answer to the importance of cooperation between various parties in disaster management in Indonesia. Pentahelix is a party that has a role, interest and character in disaster management. They consist of the government, the community, the business world, academics or experts and the mass media. When an individual has more experience with a disaster, that experience will shape their perception, and when there is a lack of experience with a disaster, it is more likely that the assessment of a disaster is based on information obtained through the media, own intuition and information from social networks. Information from the media about natural hazards can also influence perceptions of an event (Alcántara-Ayala & Moreno, 2016)

Development communication can be divided into three forms, namely 1) Media for development approach, content approach 2) Media development approach, which emphasizes structure and 3) Participatory communication approach which emphasizes process, people centered development. Media for the approach to disaster development can be reflected in disaster risk communication in disaster reporting. Risk communication is an important component of disaster risk management because it shapes people's perceptions of risk and influences their actions in disaster preparedness and response. Credibility of information sources takes a long time to build and needs to be built well before a disaster occurs (Shaw et al., 2012). This is intended so that the community has awareness, then can be empowered in dealing with disasters. The form of public awareness that they are in a disaster risk area is to

have an effort to increase their disaster knowledge, one of which can be done by searching for news online through the google search engine. Google Trends is an Internet service that provides a unique opportunity to rate the "importance" of a particular topic (in this study a tropical cyclone disaster). If information can be provided when people have a high interest in learning, it can have a profound effect on increasing public knowledge about current and future events. Ignorance/lack of community capacity can be replaced with knowledge, and fear with understanding (Linkov et al., 2010).

This study aims to determine the search trends of Indonesian people before, during, and after the occurrence of a series of tropical cyclone disasters using Google Trends Analysis. Google Trends analysis provides an index based on the relative web search volume of a given topic over time. This index can be retrieved based on the selected geographic area or on a world scale. Interpretation of the Google Trends index is very easy: the higher the given Google Trends index value, the more public attention will be paid to the topic (Costola et al., 2020). There are several reasons why Google Trends is a popular source for research, including: Google Search provides an excellent platform for observing consumer information search activity, Google Trends is also easy to use because it not only collects data but also provides various comparison options. (Jun et al., 2014). The growth of internet users in Indonesia should be an opportunity for the mass media to take part in improving community preparedness in dealing with disasters. The problem of risk communication which results in a high risk of tropical cyclone disasters is one indicator of failure in development communication, namely disaster risk communication. The role of the mass media in disaster risk reduction is needed to strengthen disaster literacy so that pentahelix synergy in disaster management can be achieved.

RESEARCH METHODOLOGY

This study aims to determine the search trends of Indonesian people before, during, and after the occurrence of a series of tropical cyclone disasters using Google Trends Analysis. The instrument used in this research is Google Trends Analysis to determine public interest in finding information about tropical cyclone disasters. The keywords used in the Google Trends Analysis to find people's search interest in Indonesia in the series of tropical cyclone disasters are "cyclone", "tropical cyclone", and "tropical cyclone seroja" for 3 months (4 March 2021-6 June 2021).

RESULT & DISCUSSION

Tropical Cyclone in Indonesia

Figure 2. Tropical Cyclone Seed Movement 99S (Seroja)

A tropical cyclone is a regional-scale phenomenon that appears in the tropical ocean. The impact of tropical cyclones is influenced by the position, intensity of the cyclone and also depends on air circulation factors in the territory of Indonesia. When there are indications of the growth of cyclone seedlings, in some areas the weather tends to worsen (Prasetya et al., 2014). A tropical cyclone hit East Nusa Tenggara Province on April 4, 2021. This tropical cyclone triggered various kinds of disasters such as strong winds, landslides, floods and tidal waves. According to a release issued by the National Disaster Management Agency (BNPB) on April 6, 2021, disaster-affected areas include East Flores, Malacca, Lembata, Ngada, Alor, East Sumba, Sabu Raijua, Rote Ndao, South Central Timor, Ende and Kupang City (BNPB, 2021).

Tropical Cyclones are storms of great strength. The average radius of a tropical cyclone is 150 to 200 km. Tropical cyclones form over vast oceans which generally have a warm sea surface temperature of more than 26.5°C. Technically, a tropical cyclone is defined as a synoptic-scale non-frontal low-pressure system that grows over warm waters with areas of convective cloud and maximum wind speeds of at least 34 knots in more than half of the area surrounding its center, and lasting at least six hours. The average life span of a tropical cyclone is from 3 to 18 days. Tropical cyclones are known by various terms around the world, namely "tropical storm" or "typhoon" or "cyclone" if it forms in the Western Pacific Ocean, "cyclone" or "cyclone" if it forms around India or Australia, and "hurricane" if formed in the Atlantic Ocean (BMKG, 2021).

Seroja tropical cyclone seeds appeared together with cyclone 90S seeds which since April 2, 2021, this incident caused a series of catastrophic events such as strong winds, landslides, floods and tidal waves which resulted in the death of 181 people and 47 missing people (updated on April 14, 2021) .

Trends in Pre-Disaster Google Search (Before April 4, 2021)

Disaster management activities are cyclical in nature, that is, they always exist even though there has never been a disaster in the area. Law Number 24 of 2007 concerning Disaster Management (Pemerintah Republik Indonesia, 2007) mentioned that there were several activities prior to the occurrence of a disaster including prevention, preparedness, early warning and mitigation activities.

1. Disaster prevention is a series of activities carried out to eliminate and or reduce disaster risk.
2. Preparedness is an activity carried out to anticipate disasters through organization and through appropriate and efficient steps.
3. Early warning is a series of activities to give warning as soon as possible to the community about the possibility of a disaster occurring by the authorized institution.
4. Disaster mitigation is a series of efforts to reduce disaster risk that can be done through physical development, awareness, and capacity building to face disaster threats.

The impact of disasters can be significantly reduced through increased disaster preparedness, one of which can be done by increasing public knowledge. Sharing information and knowledge can be done offline or online. During this method, the community will receive information and knowledge from the media or any method that does not allow feedback from the community. Knowledge management is about delivering the right knowledge, in the right place, at the right time (Kusumastuti et al., 2021). Therefore, the lack of effective information and knowledge sharing, and knowledge creation on disaster management strategies can be identified as one of the main reasons behind the unsatisfactory performance level of current disaster management practices. (Seneviratne et al., 2010).

There are various ways an individual obtains information and knowledge about disasters. One of the easiest ways to obtain disaster information is through the internet, which can be widely accessed by people in Indonesia. According to (Davis & Davis, 2017) The content that individuals receive and consume depends on others such as journalists, strategic public relations professionals, or the productive curatorial efforts of their social contacts, as well as the computer algorithms of search engines or social media, as well as media sites. Individuals also rely on technological design or manual effort to allocate attention to the content they want

to explore further. Public interest in searching for information using internet sources, one of which can be seen in Google trends using certain specific keywords.

Prior to the peak of the series of disasters caused by the seroja tropical cyclone on April 4, 2021, the Google trend in searching for information with the keywords “cyclone”, “tropical cyclone”, and “seroja tropical cyclone” was as follows:

Table 1. Pre-disaster Tropical Cyclone Google Trend Seroja

Tanggal	Kata Kunci		
	Siklon	Siklon Tropis	Siklon Tropis Seroja
4 Maret 2021	0	0	0
5 Maret 2021	53	0	0
6 Maret 2021	0	0	0
7 Maret 2021	0	0	0
8 Maret 2021	25	0	0
9 Maret 2021	0	0	0
10 Maret 2021	49	0	0
11 Maret 2021	30	30	0
12 Maret 2021	0	0	0
13 Maret 2021	0	0	0
14 Maret 2021	29	29	0
15 Maret 2021	20	0	0
16 Maret 2021	18	18	0
17 Maret 2021	97	24	0
18 Maret 2021	74	50	0
19 Maret 2021	27	0	0
20 Maret 2021	88	59	0
21 Maret 2021	31	0	0
22 Maret 2021	76	25	0
23 Maret 2021	0	0	0
24 Maret 2021	100	50	0
25 Maret 2021	52	0	0
26 Maret 2021	81	27	0
27 Maret 2021	0	0	0
28 Maret 2021	30	30	0
29 Maret 2021	0	0	0
30 Maret 2021	26	0	0
31 Maret 2021	51	0	0
01 April 2021	54	27	0
02 April 2021	0	0	0
03 April 2021	31	31	0
Rata-rata	33,61	12,90	0,00

Source: Google Trends Analysis 2021

On March 4, 2021 - April 3, 2021, Google trends show that in Indonesia there have been searches conducted with the keywords "cyclone" and "tropical cyclone". In the keyword "cyclone" the average google trend score before the disaster was 33.61 (scale 100). The highest trend occurred on April 2, 2021, when the BMKG Weather Early Warning update was

published in online media portals such as tribunnews.com. For the keyword "tropical cyclone" the average Google trend score before the disaster was 12.90, the highest was on March 20, 2021 with a score of 59. Before April 4, 2021, tropical cyclone seeds were still referred to as 99S so that the keyword "Seroja tropical cyclone" had trend 0 to 3 April 2021. Google search trends on the three keywords “cyclone”, “tropical cyclone”, and “Seroja tropical cyclone” in Indonesia prior to the disaster are presented in the following graph.

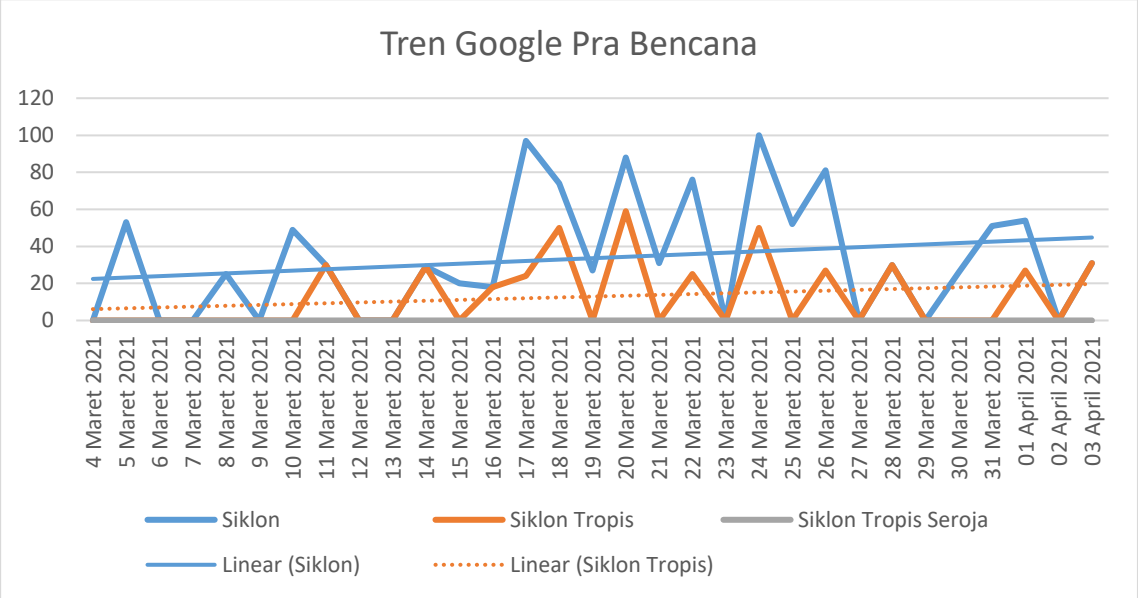

Figure 3. Google search trends before the disaster

Tropical cyclones have the potential to cause harm to communities, not only coastal communities but also communities living far from the coast. Due to the potentially damaging threat posed by tropical cyclones to life and property, early warning along creates an important role in tropical cyclone disaster risk reduction (Tolwinski-Ward, 2015). Tropical cyclone early warning systems play a very important role in disaster risk reduction programs. Communities have different affordability of information on cyclone early warning. According to the Head of BMKG (Karnawati, 2021) explained that as the competent authority, BMKG has routinely updated weather developments and early warnings, but the community does not yet have the attitude and culture to monitor weather and climate conditions. Risk communication is an important component of disaster risk management because it shapes people's perceptions of risk and influences their actions in disaster preparedness and response. Credibility of information sources takes a long time to build and needs to be built well before a disaster occurs (Shaw et al., 2012). The function of pre-disaster communication is to convey information that encourages and provides knowledge to the community to anticipate disaster events (UNICEF, 2015). Tropical cyclone disaster risk communication needs to be improved so that people have knowledge and are aware that they are in disaster-prone areas, and must have preparedness to face disasters.

Google Trends in Disasters (4 April - 6 May 2021)

The community is active in receiving and sharing information when a disaster occurs. Nonetheless, given the cyclical nature of disaster management, relatively little attention is paid to the information behavior of individuals in other phases of disaster management such as mitigation and preparedness (Lai & Tang, 2018). A series of hydrometeorological disasters caused by tropical cyclone Seroja occurred on April 4, 2021. Tropical Cyclone Seroja seeds caused an increase in rainfall around the cyclone and caused extreme weather in East Nusa Tenggara (BPPT, 2021). This Tropical Cyclone triggered various kinds of disasters such as strong winds, landslides, floods and tidal waves that occurred in the Provinces of East Nusa Tenggara and West Nusa Tenggara. Google search trends on the three keywords “cyclone”,

"tropical cyclone", and "Seroja tropical cyclone" in Indonesia during a disaster caused by the tropical cyclone Seroja are presented in the following table.

Table 2. Google Trends During Tropical Cyclone Disasters

Tanggal	Siklon	Siklon Tropis	Siklon Tropis Seroja
04 April 2021	45	26	8
05 April 2021	100	47	6
06 April 2021	70	37	15
07 April 2021	34	15	6
08 April 2021	28	16	3
09 April 2021	23	16	3
10 April 2021	29	11	0
11 April 2021	49	15	4
12 April 2021	28	12	3
13 April 2021	45	28	3
14 April 2021	79	51	0
15 April 2021	74	60	3
16 April 2021	34	27	0
17 April 2021	32	21	0
18 April 2021	50	29	0
19 April 2021	13	6	0
20 April 2021	13	10	0
21 April 2021	13	6	3
22 April 2021	10	3	0
23 April 2021	7	3	0
24 April 2021	0	0	0
25 April 2021	0	0	0
26 April 2021	6	0	0
27 April 2021	6	0	0
28 April 2021	3	0	0
29 April 2021	6	6	0
30 April 2021	13	7	0
1 Mei 2021	4	0	0
2 Mei 2021	0	0	0
3 Mei 2021	23	0	0
4 Mei 2021	70	47	0
5 Mei 2021	70	23	23
6 Mei 2021	47	24	0
Rata-rata	31,03	16,55	2,42

Source: Google Trends Analysis 2021

The increase in the google search trend for the three search keywords increased significantly on April 4, 2021, this shows that people in Indonesia are only starting to realize the existence of the seroja tropical cyclone when the disaster has occurred. The keyword "cyclone" before the disaster had a trend of 31 on the google search engine but significantly

increased until it reached 45 and 100 on the day of the disaster (4 and 5 April 2021). The keyword "Seroja tropical cyclone" experienced a trend spike from 0 to 8 and 6 on the day of the disaster. The graph of the google trend during the tropical cyclone disaster is presented in Figure 4.

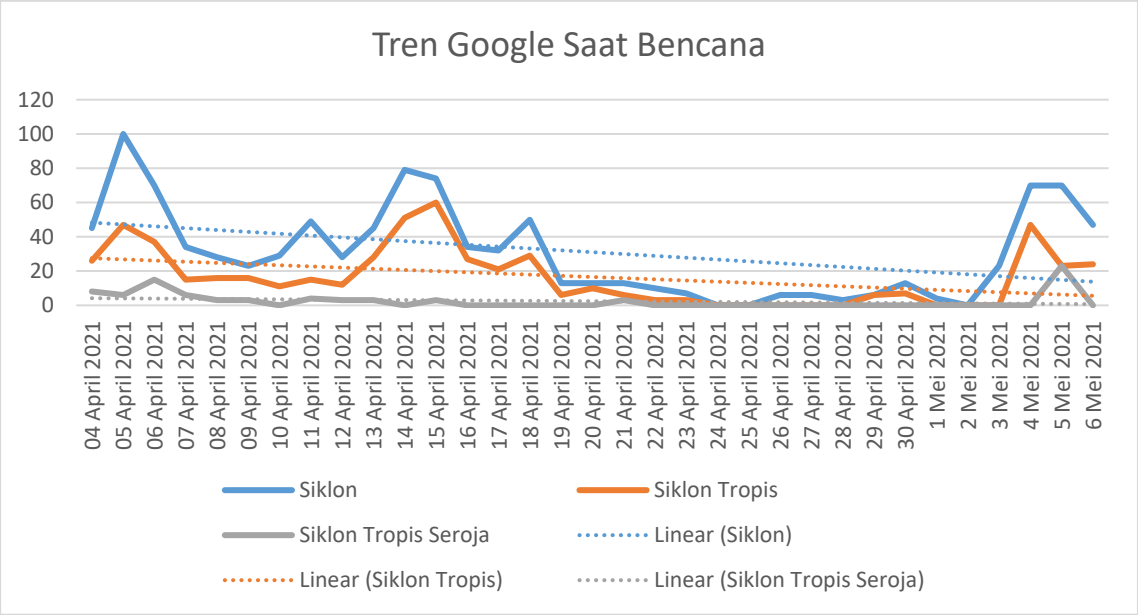

Figure 4. Google Search Trends WHEN Disaster Strikes

The high trend of Google in searching for a keyword indicates more and more public attention on the topic (Costola et al., 2020). This phenomenon shows that the Google trend in disaster events will be high when a disaster has occurred, the media tends to massively raise disaster news when a disaster has occurred as expressed by (Parida et al., 2021) that media coverage will increase towards a disaster or other extreme event and will disappear afterward.

After the disaster occurred on April 4, 2021, a lot of news emerged related to the disaster incident. People began to realize that a series of great disasters had occurred due to the tropical cyclone Seroja. Many reports have appeared related to tropical cyclone seroja, including the recent impacts caused by tropical cyclone seroja, origins of tropical cyclone seroja, as well as tropical cyclone alert warnings for areas that are expected to experience its effects. Massive coverage of the disaster in both the mass media and social media has made people interested in seeking information about the tropical cyclone Seroja. The emergency response phase of the Tropical Cyclone Seroja disaster in East Nusa Tenggara Province was determined through Decree No. 118/KEP/HK/2021 dated April 6, 2021, i.e. from April 6, 2021-6 May 2021. According to (Pemerintah Republik Indonesia, 2007) Disaster emergency response is a series of activities that are carried out immediately at the time of a disaster to deal with the adverse effects caused, which include rescue and evacuation of victims, property, fulfillment of basic needs, protection, management of refugees, rescue, and restoration of infrastructure and facilities. When a disaster occurs (response phase) communication must provide notification to the public, warnings, evacuations, and reports of the current disaster situation (UNICEF, 2015).

Post-Disaster Google Trends (After 7 May 2021)

The emergency response phase of the tropical cyclone seroja ended on May 6, 2021. After the peak of the disaster on April 4, 2021, a lot of news emerged related to disaster events such as reporting on disaster victims and activities related to disaster emergency response. Google trend data after the tropical cyclone Seroja disaster in Indonesia is presented in the following table.

Table 3. Google Trends After Tropical Cyclone Disaster Seroja

Tanggal	siklon	siklon tropis	siklon tropis seroja
7 Mei 2021	28	0	0
8 Mei 2021	90	60	30
9 Mei 2021	94	31	0
10 Mei 2021	29	0	0
11 Mei 2021	0	0	0
12 Mei 2021	0	0	0
13 Mei 2021	0	0	0
14 Mei 2021	0	0	0
15 Mei 2021	0	0	0
16 Mei 2021	0	0	0
17 Mei 2021	56	28	0
18 Mei 2021	55	0	0
19 Mei 2021	0	0	0
20 Mei 2021	0	0	0
21 Mei 2021	54	27	27
22 Mei 2021	29	29	0
23 Mei 2021	0	0	0
24 Mei 2021	76	0	0
25 Mei 2021	79	0	0
26 Mei 2021	56	28	0
27 Mei 2021	0	0	0
28 Mei 2021	79	26	0
29 Mei 2021	0	0	0
30 Mei 2021	88	88	0
31 Mei 2021	75	75	0
1 Juni 2021	28	0	0
2 Juni 2021	48	24	0
3 Juni 2021	48	0	0
4 Juni 2021	100	0	0
5 Juni 2021	27	27	27
6 Juni 2021	29	29	0
Rata-rata	37,68	15,23	2,71

Source: Google Trends Analysis 2021

Google trends on the keywords "cyclone", "tropical cyclone", and "tropical cyclone seroja" have the highest average trend on the keyword "cyclone", this is because after tropical cyclone Seroja appeared several cyclone seeds, namely cyclone Odette. The graph of Google trends after the tropical cyclone disaster in Indonesia is presented in the following image.

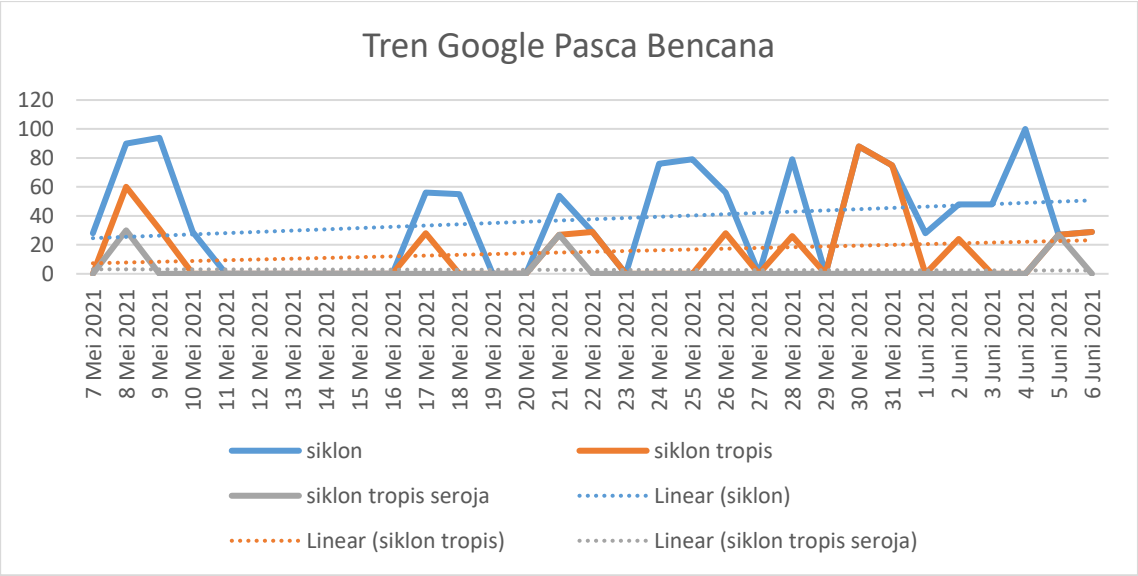

Figure 5. Post-disaster Google Search Trends

After a disaster event, reports, discussions, statements and impressions of the ongoing situation produced and reproduced by the media have a role in shaping public opinion and influencing decisions taken, actions followed, and how the disaster event is interpreted to improve disaster preparedness. (Few et al., 2021). As in the case of typhoon amphan, the media in India and Bangladesh, which framed the disaster as a natural event, did not report in depth about the causes of the incident so that they did not support disaster preparedness and climate change adaptation in the future (Parida et al., 2021).

Disaster risk reduction must be carried out by all parties, including the mass media. Disaster preparedness is one of the stages that can be carried out massively by the mass media because of its wide reach. Individual or community knowledge about the risks of a disaster threat that is in the vicinity is the key to taking appropriate action to deal with the disaster risk. BNPB (2021) reveals that as an effort to disseminate information about a disaster risk, appropriate communication methods are needed in accordance with the goals and objectives of the communication, for example by using universal, easy-to-understand language, and communication media that can be reached by the communication target. The information conveyed in post-disaster communications (recovery phase) should provide information to affected individuals and communities on how to obtain disaster assistance and how to prevent infectious diseases and epidemics and other problems faced at the central level. In addition, in the mitigation phase, the role of communication promotes actions that can reduce the loss of life, as well as property in the event of an upcoming disaster (UNICEF, 2015).

CONCLUSION

Google's trend of tropical cyclone disaster in Indonesia increased after the disaster occurred. In the pre-disaster phase, early warnings delivered to the public by the authorities (BMKG) have not made the Google trend increase due to the lack of coverage by the media, both local and national. After a series of disasters caused by tropical cyclone seroja, google trends increased significantly during the emergency response phase (BNPB, 2021).

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