Environmental communication network on Indonesian forest fires on Twitter in pandemic COVID-19 era

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Abstract. The study aims to reveal the communication network on Twitter about forest fires in Indonesia during the COVID-19 pandemic. The research method used is descriptive qualitative. The theory used in this research is communication networking. The analysis technique uses Social Networking Analysis or SNA. Conversation data on Twitter is pulled through emprit drones by entering keywords fire, forest, and land. The research findings show; Conversation volume was 617 conversations, with five actors mentioning the most, namely @VICE-ID, @BBCIndonesia, @totoroeksib, @GoldenMiryu, and @ari_trismana with 16 conversations. Of the 617 conversations, 243 had negative sentiments, 368 had positive sentiments and 6 were neutral. The five words that appear the most in the discussion of forest and land fires are forest - hutan (with a small h) 459 times, land - lahan 147 times, Forest - Hutan (with large H) 80 times, disaster - bencana 60 times, and smoke - asap 56 times. During the 10 days of talking, there were 67 hashtags, with the top five being #hijabbugil, #eksibisionis, and # exhibition with 27 mentions, following #PreventedKarhutla with 16 mentions, and 13 mentions #KoperasiPerkuatPertuangan.

1. Introduction

The number of forests and land fires in Indonesia in the last six years has decreased, as shown in the table 1 [1]. For 2020, it is estimated that the amount of forest and land burning is not expected to be as large as 2019, reaching more than 1.6 million hectares [2] [3].

| Area of Forest and Land Burned (in hectares) | Years |
|---------------------------------------------|-------|
| 2.611,411,4                                | 2015  |
| 438,363,19                                 | 2016  |
| 165,483,92                                 | 2017  |
| 529,266,64                                 | 2018  |
| 1,649,258,00                               | 2019  |
| 120,534,00 (Until September 2020)           | 2020  |

Source: Ministry of Environment (2020) [1]
Although in general the area of forest and land burned (karhutla) decreases, it is fluctuating every year [4]. Although the area of karhutla in 2020 is not as large as in 2019, stakeholders who are in charge of forest and land fire handling must increase awareness [5]. Even President Joko Widodo asked officers to increase the frequency of patrols in locations prone to fires. He said that surveillance has an important role in preventing forest and land fires from spreading [6]. There are six provinces, namely North Sumatra, Riau, Jambi, South Sumatra, West Kalimantan, and Central Kalimantan, which are predicted to experience forest and land fires [7].

The Singapore Institute of International Affairs (SIIA) Haze Outlook 2020 states, Indonesia faces major challenges in tackling forest and land fires amid the Covid-19 pandemic. These challenges include social restrictions, stopping direct monitoring in the field, and cutting the forest and land fire control budget allocated for handling COVID-19 [2]. Director-General of Climate Change Control, Ministry of Environment and Forestry (KLHK), Ruandha Agung Sugardiman admitted that the Covid-19 pandemic made it difficult to deploy officers to the field due to policies to maintain physical distancing in several provinces [3].

During the pandemic, news in the majority of mass media fills with information about the Covid-19 cases as well as government policies in dealing with it. This is reasonable because one of the roles of the media is to provide information and education to the public to know how covid-19 is transmitted and how to avoid it [8] [9]. As a result, issues other than the Covid-19 pandemic do not have a place in news coverage in the mass media. Even if there are but in small portions. If the issue of forest and land fires lacked a place in the mass media during the pandemic, what about the conversation on Twitter? For example, the issue of the Covid-19 vaccine on Twitter, from 21-28 September 2020, based on data from drone emprit, there were 10498 mentions [10].

Research on the issue of discussing forest fires on social media has been conducted by researchers before. Triningsih and Kurniawan discussed social media listening to the issue of forest fires from Instagram data [11]. Evelina et.al examined the use of Instagram as a media campaign for forest fire management carried out by Walhi and the Ministry of Environment and Forestry [12]. The question in this research is how is the communication network for discussing the issue of forest fires in Indonesia that appears on Twitter? The communication networks that will be disclosed in this study are the volume and trend of conversations, social network analysis maps, top twits, conversation origin location and emotional analysis of conversations.

To discuss the campaign carried out by the NGO Environment and framing the Institute through social networking theory, the concept social campaign on Instagram, virtual community and social interaction.

1.1. Development of social media

The development of technology is closely related to the development of social interaction today. The emergence of social media can make it easier for individuals to interact with other individuals or communities through the virtual world. Based on the results of We are social Hoot suite's research in January 2019, social media users in Indonesia reached 150 million or 56% of the total population. This number is up 20% from the previous survey. Meanwhile, mobile social media (gadget) users reach 130 million or around 48% of the population [13].

Michael Cross gave the term for social media, which is a variety of technologies used to bind individuals in a particular collaboration, exchange information and interact through web-based message content [14]. The development of the internet which is always changing causes technology, the features available to users also frequently change. In its development of harmonizing technological discoveries, social media has shifted from a basic tool and website to a large unit that fundamentally changes the way people relate and communicate with corporations, governments, traditional media with one another [15]. Meike and Young in [16] give the meaning of social media as a convergence between personal communication and which means sharing between individuals and public media to be shared with all audiences without any individual differences.
Nasrullah [16] mentioned special characteristics on social media, namely:

1) Social media has a network (network) to connect a computer or mobile phone with other devices, networks or connections needed in communication between these computer devices;

2) Users can disseminate information through social media so that they can represent information related to identity, content and make information-based interactions;

3) Social media can be a place to store information because of its unlimited capacity so that Kanapnu can access it, anywhere and through any device for social media users;

4) The formation of social media networks between users builds interaction between social media users;

5) Social media has a unique and unique pattern because it is able to create social simulations and make it characteristic of people in the virtual world. In some cases, this simulation is not found in real society;

6) Content on social media is owned by the account owner's contribution so it is known as user generated content. However, this is a symbiotic relationship in the new media culture so that social media users can participate in developing the content created [16].

1.2. Use of Twitter for social interaction

One of the biggest social media with users almost all over the world and active in providing information is twitter. According to Pfeffer et al. [17] twitter is a social media that sends short messages, is easy to use and is fast in sending when compared to other media. Twitter users also find it easy to read and reply to tweets from other users they follow. Another convenience is that twitter users can search for topics to discuss through keywords called "hashtags" from other users that they don't follow [18].

Although Twitter's original purpose was to make it easier for users to comment, in its development, social media, known as chirping, has become a tool in social campaigns in social media. According to Sisira, social media marketing is a strategic and systematic organization of users on social media platforms, online communities and social networks to convince stakeholders' who influence them by means of meaning, use so as to maintain a reputation and brand [19]. However, using Twitter to be successful must also consider the condition of the message, the sender of the message and the environment.

Shankman's research provides an example of how successful campaigns on social media are [20]. At that time, hosts from Airbnb around the world became part of the company's campaign with the hashtag #OneLessStranger. Participants can create videos or photos from their experiences so that they can promote viral company name. However, social media campaigns can also have a detrimental impact, such as research from Lee et al. Indicating that social media can manipulate, sign up, search engine spamming, vote stuffing, and miscellany [21].

1.3. Online social network

Social media network is a community connected through friendship, values, relationships, ideas, and work. Meanwhile Seufert et al. also in [22], have a definition of social networking sites, namely a number of people, resources that are connected to gather knowledge to create value. So, the concept of social networking is a unit of web 2.0 tools and forms the basis of literature in the 2.0 era [22].

In today's online era, social media networks are in demand by many people in communicating [23]. Social networking sites offer users to share ideas, information in the form of photos and visuals with other people around the world online.

Kaplan and Haenlein as quoted by Indrawati et al [24], stated that there are six types of social media, namely: Collaborative Projects, such as Wikipedia, Blogs, and microblogs. Twitter, Content Communities like YouTube, Social Networking Sites like Facebook and Instagram, Virtual Game Worlds like World of Warcraft, and Virtual Social Worlds, for example Second Life [24].
2. Materials and methods
This research is descriptive type, which describes in detail the structure and actors in communication networks in Indonesia [25]. The technique used is social network analysis (SNA). SNA is an analytical technique that focuses on the structure of relationships with important assumptions. User topology position is a major concern in tracking information flow and human interaction and has been applied in various fields [26] [27].

The centrality index is the most common measure of the importance of users in a network [28]. A single entity (for example, a person or something) is defined as a node and the relationship between two vertices is defined as an edge. Analysis of relationship characteristics is continued by calculating centrality, cohesion, and the relationship between nodes and edges. With SNA, we were able to determine the most influential users [29].

The research only examines conversations about forest fires in Indonesia that appear on Twitter, for ten days, 18-27 September 2020. The data in this study are structural actors from each Twitter account regarding the issue of forest fires in Indonesia. In addition, there is a data set on conversation volume, conversation trends, Social Network Analysis (SNA) maps, Twit top and emotion analysis.

The processing of data sourced from Twitter starts with data retrieval (Twitter data crawling), data storage (storing Twitter data), data analysis (analysing Twitter data), and data visualization (visualizing Twitter data) [30]. Data retrieval using droneemprit software by entering keywords for forest and land fires [10].

3. Results and discussion
The results of the research generally illustrate that the issue of land and forest fires has received less attention from Twitter users who are in locations where land and forest fires occur. This issue has also received less attention from the national media.

3.1. Conversation volume or total mention
For ten days from 18-27 September 2020 there were 617 conversations on Twitter with the keyword forest and land fires.

Figure 1. Conversation volume about Karhutla in Twitter.

Within ten days, the highest conversation occurred on September 20 with 94 conversations, followed by September 24 with 84 conversations. Next came September 26 and 25 with 76 and 72 conversations.
Figure 2. Conversation volume about forest and land fires in days.

3.2. Conversation origin location
The province from which the most conversations came was DKI Jakarta with 49 conversations, followed by East Java with 32 conversations; West Java with 26 conversations and 59 other mentions spread across a number of provinces. Meanwhile, the city with the most mention of *karhutla* was Jakarta with 49 times, followed by Surabaya 17 times, Yogyakarta 14 times. The remaining 59 are scattered in various cities. The distribution of these conversations is in line with the cities of active Twitter users in Indonesia, namely Jakarta, Bandung and Surabaya [31]. Jakarta is even one of the cities with the most active Twitter users in the world.

Figure 3. City of origin of the conversation.

3.3. Map of SNA and actors involved in the conversation
There were 139 actors involved in the forest and land fire conversation. Five accounts with the highest conversations are @VICE-ID with 54 conversations, @BBCIndonesia with 51 conversations, @totoroeksib with 27 conversations, @GoldenMuru with 21 conversations and @ari_trismana with 16 conversations. The Twitter users are ordinary people, not figures or public figures. @VICE-ID and @BBCIndonesia are Indonesian-language foreign media, while @totoroeksib, @GoldenMuru, @ari_trismana are Twitter users from the ordinary people, not figures or public figures.
Two actors with the highest conversations are media accounts that are affiliated with foreign media. @VICE-ID is the official account of VICE Indonesia, a network of VICE Media Group, which has operations in various countries. Meanwhile, @BBCIndonesia is the official account of BBC Indonesia, the Indonesian edition of BBC English. Meanwhile, national media that are not affiliated with foreign media groups, such as @antaranews, are in 26th place with three talks. The Twitter account belonging to the Ministry of Environment and Forestry @KementerianLHK itself is in seventh place with 13 conversations. What's interesting is, the two accounts that entered the top five conversations are @totoroeksib, and @ari_trismana and @GoldenMiry. The three of them are accounts belonging to ordinary citizens, who are always updating issues related to forest and land fires.

3.4. Mention sentiment and emotional analysis
Of the 617 conversations, 243 had negative sentiments, 368 had positive sentiments and 6 were neutral.

Meanwhile, the emotions that appeared in the conversation were surprise with 12 posts, sadness 10 times, fear and trust 7 times, disgust, anger and anticipation 2 times, joy 3 times posts.

Figure 4. The five actors who have the most conversations.

Figure 5. Conversation sentiment diagram.
3.5. Word of cloud

Five words that appeared the most in the forest and land fire conversation from September 18-27 were forest –hutan (with a small h) 459 times, land –lahan 147 times, forest –Hutan (with large H) 80 times, disaster –bencana 60 times, and smoke –asap 56 times.

3.6. Top hashtags

During the 10 days of talking, there were 67 hashtags, with the top ten being #hijabbugil, #eksibisionis and #exhibition with 27 mentions. Next #preventkarhutla with 16 mentions, 13 mentions of #KoperasiPerkuatPertensi, #SobatHijau and #aksikitaindo 8 mentions. #Kebakaran 7 mentions, #dirumahaja 6 mentions, and #ManggalaAgni mentions 5. Of the top ten hashtags, three of them have tags not related to kahutla or environment like other hashtags. Three hashtags are the top hashtags because they are often mentioned by other accounts.

From the original location of the conversation, this research confirms that Twitter is a phenomenon in big cities in Indonesia, especially in Java. The top three locations from which the conversation originated were Jakarta, East Java and West Java, where there were no major fire incidents, such as in Sumatra and Kalimantan. This research is in line with a survey conducted by the Semiocast Institute in 2012, which showed that Jakarta and Bandung were the cities with the most Twitter users in Indonesia [31].

Meanwhile, in terms of the actors involved, there were no accounts from the media in Indonesia which occupied the two accounts with the highest conversations, @ VICE-ID and @BBCIndonesia.
Both Twitter accounts belong to international media networks. During the research period, the media in Indonesia was only carried out by @antaranews, the official account belonging to Antara, which still talks about forest and land treasures. Meanwhile, other media did not appear.

In addition, during 2020 forest and land fires in Indonesia decreased compared to 2019, and their impact was not as large as in 2019. This indicates that the issue of forest and land fires for most of the media in Indonesia during the COVID-19 pandemic was not a concern.

The results of the Focus Group Discussion with Indonesian media journalists stated that the impact caused by forest and land fires in Indonesia had disrupted the activities of residents at the location of the fire.

What's interesting about top #Hashtags, the top five are not related to forest fires, land or anything related to it. This indicates that forest and land fires were not a concern of twitter users in Indonesia during the research period.

4. Conclusions
Research on the Forest Fire Communication Network on Twitter, which took 10 days of conversation, from 18-27 September 2020 with the keywords fire, forest and land, concluded; Conversation volume was 617 conversations, with five actors mentioning the most, namely @ VICE-ID, BBCIndonesia, @totoroeksib, @GoldenMirus and @ari_trisman with 16 conversations. Of the 617 conversations, 243 had negative sentiments, 368 had positive sentiments and 6 were neutral. The emotions that appeared in the conversation were surprise with 12 posts, sadness 10 times, fear, and trust 7 times, disgust, anger, and anticipation 2 times, joy 3 times. The five words that appear the most in the discussion of forest and land fires are forest (with a small h) 459 times, land 147 times, forest (with large H) 80 times, disaster 60 times, smoke 56 times. During the 10 days of conversations on Twitter, there were 67 hashtags, with the top five being #hijabbugil, #eksibisionis and # exhibition with 27 mentions. Next # preventkarhutla with 16 mentions, #KoperasiPerkuatPertuangan as many as 13 mentions.

Theoretically, this research implies that during the COVID-19 pandemic, Twitter cannot be used as a complete reference for assessing the response and response of the community in responding to forest and land fires in Indonesia. Although forest and land fires during COVID-19 still occurred in Indonesia, the public and media did not pay special attention to cases of forest and land fires.

Meanwhile practically speaking, this research implies the need for media and other means so that attention and the public remain concerned and give attention to cases of land and forest fires in Indonesia, even during the pandemic COVID-19. If not, handling forest and land fires will experience obstacles, while the fires will continue to occur.

This study has a number of limitations, namely the duration of data retrieval on Twitter is only one week. This happens because of the restrictions that Twitter has put in place to retrieve conversation data that is only one week. For Future research that can be done is about the use of twitter for campaigns to prevent and handle the dangers of forest and land fires in locations prone to forest and land fires.

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