



Factors Affecting Forest and Land Fires in the Media Frame for Future Disaster Mitigation

Faktor-Faktor yang Mempengaruhi Kebakaran Hutan dan Lahan dalam Bingkai Media untuk Mitigasi Bencana Kedepan

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ABSTRACT

Forest and land fires were national and international disasters that caused crucial environmental problems and were a local and global concern. This research was conducted to determine the factors that affected forest and land fires in the media frame for future disaster mitigation in addition to the existing restoration efforts such as rewetting, revegetation, and community economic revitalization to minimize its impact. Data were collected from 2012 to 2021 through the framing method and analyzed using content analysis. The results showed that the factors affecting forest and land fires from September 2019 to June 2021 were associated with human activity and natural events. The dominant human activities were land preparation for agriculture and settlements, illegal logging, and lack of public awareness. Meanwhile, the natural factors were the dry season, lightning strikes, and areas with less intensive management, such as non-residential areas.

INTISARI

Kebakaran hutan dan lahan merupakan bencana nasional dan internasional yang menimbulkan masalah lingkungan yang krusial serta menjadi perhatian lokal dan global. Penelitian ini dilakukan untuk mengetahui pemetaan yang mempengaruhi kebakaran lahan dalam bingkai media dapat digunakan untuk mitigasi bencana sehingga dampak kebakaran dapat diminimalkan di masa depan. Selain itu dengan mitigasi, diharapkan kebakaran dapat dikurangi, yaitu melalui program restorasi, meliputi pembasahan, revegetasi dan revitalisasi ekonomi masyarakat. Penelitian ini menggunakan data deret waktu (*time series*) tahun 2012-2021 dan menggunakan metode analisis framing dan analisis isi. Hasil penelitian diketahui pemetaan yang mempengaruhi kebakaran lahan di daerah penelitian dari beberapa media dari September 2019 hingga Juni 2021 adalah faktor aktivitas manusia dan faktor alam. Sangat sedikit berita yang menggambarkan bahwa kebakaran hutan dan lahan dipengaruhi faktor jenis tanah dan lahan yang mudah sekali terbakar dengan sendirinya di saat musim kemarau. Aktivitas manusia yang dominan menyebabkan kebakaran di daerah penelitian adalah pembukaan lahan untuk pertanian dan permukiman, penyiapan lahan, pembalakan liar, dan kurangnya kesadaran masyarakat terhadap bahaya kebakaran, Faktor alam yang menyebabkan kebakaran di daerah penelitian adalah musim kemarau, bukan daerah permukiman, daerah alang-alang dan semak belukar, sambaran petir dan daerah gambut.

Introduction

Land and peatland fires occur every dry season, with an annual increase in frequency, which cannot be controlled optimally (Arisanty et al. 2019; Kumalawati et al. 2019; Kumalawati et al. 2019; Kumalawati et al. 2021). A previous study stated that land fires are natural disasters that are influenced by weather conditions and led to greenhouse gas (GHG) emissions (de Diego et al. 2019). Land fires are categorized as national and international disasters that cause crucial environmental problems locally and globally (Cahyono et al. 2015). It occurs in various countries, including several areas in Indonesia (Fernandez-González et al. 2014) such as South Kalimantan (Masganti et al. 2014). According to Gunawan et al. (2019), approximately 14.9 million ha of peatlands in Indonesia spread across Sumatra, Kalimantan, and Papua, consisting of 36.7 gigatonnes of carbon.

Land fires in Kalimantan have occurred since the 17th century, leading to severe physical and social environmental losses. Land fires also caused increased greenhouse gas (GHG) emissions (JICA 2017) and smog (Erwinsyah 2018), impacting various countries such as Malaysia, Singapore, Thailand, and the Philippines (Sabani et al. 2019). In Indonesia, smog always occurs during the dry season, from August to October, or during the transitional period. The number of hotspots increases during these months, as shown in Table 1. The higher the number of hotspots, the greater the fire potential and the occurrence of smog.

The biggest fire event in South Kalimantan between 2012 and 2021 was recorded in 2015, with an area of approximately eighteen thousand hectares of peat burnt (Kumalawati et al. 2021). Such a big fire event occurred parallelly with El Nino's Southern Oscillation (Kumalawati et al. 2019; Wooster et al. 2011). Afterward, there was a decrease in subsequent

Table 1. Number of monthly hotspots in South Kalimantan 2012-2021

MONTH	NUMBER OF HOTSPOTS
January	688
February	474
March	446
April	434
May	778
June	969
July	2,864
August	11,980
September	45,112
October	35,703
November	7,588
December	749
TOTAL	107,785

Source: Secondary data, 2012-2021; Primary data, 2021

cases, although occasionally there were slight increases but not too high. Fires were unexpectedly caused by direct and indirect sources and human activities. Fires can be caused by natural events and human activities (Kumalawati et al. 2021a; Kumalawati et al. 2021c). Human activities, such as land preparation for the planting season by burning, illegal logging, and other deliberate activities caused this disaster to become more widespread (Kumalawati et al. 2019a; Arisanty et al. 2019).

Additionally, factors that affect fires can also be deduced from the media frame. These include online media, which plays an essential role in defining specific problems and framing environmental issues (Jönsson 2011). Online media helps the public access various information locally, regionally, nationally, and in other parts of the world. Moreover, online media also facilitates the public to gain information about the factors affecting fires, potential fire events, and experiences in dealing with fires. This information could improve mitigation and minimize potential fire events. This is especially because fire mitigation efforts, including in the forestry sector which experiences recurrent fire events, need substantial financial support from various parties (Nurfatriani et al. 2019).

The media acts as a bridge by transmitting information on fire prevention from an authorized party or communicators to the community or communicant. The information on fire prevention is essential to educate the public and becomes part of an early warning system to minimize the risks associated with fire events. The easier it is for the public to get information on fire prevention, the better it is for disaster mitigation by suppressing its potential. The government could use media to inform the community about the simple techniques to urgently extinguish fire outbreaks before the fire brigade arrived and took over the tasks.

The media is a vital part of the news system and has a very important influence on the public in disseminating information, including information about natural disasters such as forest and land fires, particularly for residents who live in fire-prone areas such as South Kalimantan. For this reason, the media could play a central actor in information dissemination, awareness, capacity building, and disaster management. To play this role, the media should be given a special portion for broadcasts, articles, and actual coverage of disaster mitigation and management without being over-dramatized or excessive.

Based on the aforementioned background, it was deemed necessary to conduct a study entitled 'Factors Affecting Forest and Land Fires in the Media Frame for Future Disaster Mitigation'. Moreover, the ability to discern factors that affect land fires in the media frame can be used for disaster mitigation to minimize future fire events in addition to the mitigation activities through restoration programs such as rewetting, revegetation, and community economic revitalization, monitoring the distribution of hotspots, enforcing the law for those who intentionally burn lands, and constructing canals and reservoirs (Kumalawati et al. 2021).

Methods

Analytical Framework

The annual recurrent fire events had detrimental effects on peatlands and peat swamp forests (Arisanty et al. 2016) due to the alteration of vegetation composition and loss of carbon stocks. This led to economic and environmental losses, including the destruction of biodiversity, and various negative impacts on humans such as health and life (Kumalawati et al. 2021), and livelihoods (Susanti et al. 2017). Peat swamp forest was the world's main carbon stock (Larasati et al. 2019). The peat fires had led to carbon emissions and adverse impacts on the livelihoods of both local and regional communities. Therefore, the government had been trying to restore peatlands and their carbon stocks (Qirom et al. 2018) through fire-resistant vegetation selection (Qirom 2016; Sulistyono et al. 2020).

Online media was part of communication technology development and had changed the way humans communicate and obtain information, especially during the COVID-19 pandemic (Sujoko et al. 2020). Its development was the background for the easy dissemination of information to all corners of the world (Pamungkas 2017), including those concerning disasters such as fire events in diverse regions and peat restoration efforts adopted by the government. The number of internet users in Indonesia had increased during the pandemic (Jayani & Widowati 2009; Pratomo 2019) and this indicated the growing roles of online media in supplying information and influencing public perception. Using online media to disseminate information on various disasters would accelerate its transmission to the public.

Information about factors affecting fire events shared through online media increased its accessibility because online media had become the main source of information for most modern societies (Sujoko et al. 2020). However, the interests of the

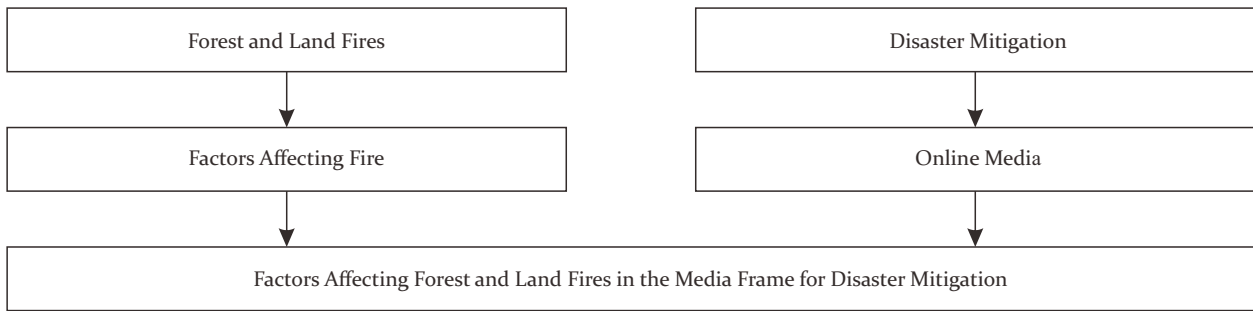


Figure 1. Factors affecting forest and land fires in the media frame for disaster mitigation

media owners significantly influenced the content or programs delivered to the public (Hapsari 2012) and shaped public opinion. Their commercial interests had led to the degradation of the public sphere (Deuze & Mc Quail 2020). Therefore, the media implemented an editorial policy to filter published information to ensure that the general public was not misinformed.

The media could empower communities by broadcasting information about natural disasters such as fire events and factors that affected fire disasters to raise community awareness. This awareness could stimulate the communities to actively participate in tacking and mitigating fire disasters (see Figure 1).

Data collection and analysis

The research was in the form of a documentation study (Pujileksono 2015). This study employed time-series data (Cahyono et al. 2015) between 2012 and 2021. The hotspot data were obtained from Fire Information for Resources Management system (FIRMS) and factors affecting forest and land fires in the media frame were obtained from local online media in South Kalimantan from September 2019 to June 2021. The news selection was based on the

following keywords: "forest and land fires". Experts analyzed the obtained news and the framing performed by the media.

A hybrid qualitative-quantitative analysis was used in this research (Hadrianti & Hendrakusumah 2019). This study used the Zhongdang Pan and Gerald M. Kosicki (Sujoko et al. 2020) framing analysis method and content analysis (Danang et al. 2017) to describe a particular message or text (Dani & Mediantara 2020) regarding factors affecting forest and land fires in the online media. This descriptive qualitative analysis was employed to understand phenomena based on the existing theory that served as an explanatory material (Loren et al. 2015). Quantitative analysis using descriptive statistics was used to summarize data and determine the dominant factor that induced land and forest fires.

This research conducted 100 interviews to gather information on factors affecting land fires. The respondents were purposely selected who lived surrounding the areas with high numbers of hotspots (11359-17007) and high level of confidence (549-821) as depicted in Table 2. The percentage of factors affecting land fires was calculated using the following formula.

$$\text{Percentage of factors affecting land fires} = \frac{\text{Number of respondent mentioning the factor}}{\text{Number of total respondent}} \times 100$$

Table 2. Number of hotspots their confidence level in South Kalimantan 2012-2021

Districts	Confidence			Number of Hotspots
	Low	Nominal	High	
Banjarmasin	11	47	6	64
Banjar	1291	15048	668	17007
Tapin	949	13551	368	14868
Hulu Sungai Selatan	960	10922	243	12125
Hulu Sungai Tengah	178	1937	62	2177
Hulu Sungai Utara	402	4469	109	4980
Tabalong	91	4764	83	4938
Tanah Laut	1104	10212	406	11722
Barito Kuala	630	6772	416	7818
Kota Baru	970	13508	821	15299
Banjarbaru	254	2552	86	2892
Tanah Bumbu	603	9189	402	10194
Balangan	124	3478	99	3701
TOTAL	7567	96449	3769	107785

Source: <https://firms.modaps.eosdis.nasa.gov/download/>

The instruments used for data analysis were developed from the Pan and Kosicki Model (Santi 2012) as follows:

1. Syntactic analysis was used to discover how journalists compiled facts through headlines, leads, background information, quote source, statement, and closing.
2. Scripts were employed to determine how they published these facts through elements of completeness (5W+1H)
3. Thematic analysis was used to find out how certain facts were depicted using paragraphs, propositions, as well as the ability to discern the relationship between these sentences.
4. Rhetorical analysis was adopted to discover how journalists emphasized these facts using selected words, idioms, pictures, photos, and graphics.

Result and Discussion

The uncontrollable forest and land fires were usually beyond the ability and desire of individuals and were also caused by them intentionally or unintentionally. Forest and land fires had major impacts on health, environmental, economic, and transportation sectors (Cahyono et al. 2015; Sabani et al. 2019; Kumalawati et al. 2019). Land preparation using fires was the intentional human activity that

induced fire events (Irwandi et al. 2016). The frequency of land and forest fires induced by land preparation using fires increased every year because no proper fire management procedure had been implemented to date. The number of hotspots reached 4,077 points in several areas as reported by Regional Disaster Management Agency/Badan Penanggulangan Bencana Daerah (BNPB) (Putsanra 2019).

Hadrianti and Hendrakusumah (2019) stated that forest and land fires were affected by human activities and natural factors. This study analyzed those two factors in the online local media frame of South Kalimantan to contribute to the formulation of more precise fire control efforts (Irwandi et al. 2016; Arisanty et al. 2019; Nasution et al. 2019). The human activities and natural factors that affected forest and land fires in the study area were analyzed in the following section.

1. Human Activity

Human activities were factors that affect fire events in the research area. These included land preparation and clearing, illegal logging, human negligence, flammable fuels, fire jumps, accidental, lack of public awareness, and government policies (Table 3). The use of fire to clear lands was cheaper,

Table 3. Human activity affecting fires in the research area

No.	Human Activity	Answer	Total	Percentage (%)
1	Land Preparation	Yes	90	90
		No	10	10
2	Illegal Logging	Yes	87	87
		No	13	13
3	Clearing land for agriculture and settlement	Yes	92	92
		No	8	8
4	Human negligence for throwing cigarette butts carelessly	Yes	80	80
		No	20	20
5	Presence of combustible fuel or dry material	Yes	78	78
		No	22	22
6	The sparks of fire that came from another region	Yes	75	75
		No	25	25
7	Accidental (burning garbage)	Yes	81	81
		No	19	19
8	Lack of public awareness of the dangers of fire	Yes	85	85
		No	15	15
9	Government policy (changing forest concessions, converting natural forests into plantations, transmigration, and agricultural expansion)	Yes	77	77
		No	23	23

easier, and more effective in terms of time, and the results achieved were quite satisfactory (Aryadi et al. 2017).

Unsupervised burning of lands led to uncontrolled fires that resulted in smog disaster (Mulyana 2019). Human activities became the prominent cause of fires in the study area (>72%). The dominant ones were land clearing for agriculture and settlements (92%), land preparation (90%), illegal logging (87%), and lack of public awareness of the dangers of fire (85%). Additionally, other human activities that led to this disaster were inadvertently burning of trash (81%), careless disposal of cigarette butts (80%), the presence of flammable materials (78%), jumping fire from other areas (75%), and government policies (72%). In the 1980s, government

policies that led to forest concessions, the conversion of natural forests into plantations, transmigration, irrigation development, and agricultural expansion allegedly increased forest fires (Cahyono et al. 2015). National policies that encouraged land-use change caused forest and land fires.

2. Natural Factors

Natural factors also caused forest and land fires (Hadrianti & Hendrakusumah 2019) in the study area (Table 4). Rainfall was the climatic condition that affected the drought levels and triggered fire events in each region. Rainfall also influenced the number of hotspots, although there was no constant trend. In circumstances where there was a decrease in rainfall, the hotspots tended to increase and vice versa.

Table 4. Natural factors affecting fires in the research area

No.	Natural Factor	Answer	Total	Percentage (%)
1	Dry Season	Yes	90	90
		No	10	10
2	Lightning Strike	Yes	80	80
		No	20	20
3	Peat Area	Yes	78	78
		No	22	22
4	Non Residential Area	Yes	88	88
		No	12	12
5	Area of Reeds and shrubs	Yes	85	85
		No	15	15

The dominant natural factors that caused fires in the study area were dry season (90%) and lightning strikes (80%). Forest and land fires occurred mainly during the dry seasons with low rainfall, especially from May to October. The rainfall intensity affected air pressures among these regions, triggered the monsoon climate, and affected the forest and land fire events. Forest and land fires also mainly occurred in the areas with less intensive management, such as non-residential areas (88%), reeds and shrubs (85%), and peat areas (78%). These areas were usually overgrown with weeds and shrubs, which had a high potential to fuel the fires. Land fires rarely occurred in residential areas because the community prioritized the maintenance of their homes rather than vacant land areas.

However, the government and the community had to prioritize such areas to minimize impacts and victims of forest and land fires, especially peat fires that were generally very intense and challenging to control. Knowledge about natural factors that affect fire events could contribute to the formulation of prevention and mitigation efforts to minimize the numerous impacts of forest and land fires, such as smog, economic losses, and public health.

3. Factors Affecting Fire in the Media Frame

This research analyzed the factors affecting forest and land fires in the online media frame in South Kalimantan Province. This includes Kalimantan post.com, banjarmasin.tribunnews.com, media banjarmasin.com, matabanua.co.id, Kanal kalimantan.com, and newspaperbanjar.net. The online or digital media used the internet on the network. The delivery of information in the online media depended on the journalists, whose reports were guided by a journalistic code of ethics (Muliawanti 2018). These were assessed using

Framing (Eriyanto 2012) and content analyses.

Natural disaster management in Indonesia, especially forest and land fires, needed the media's support to communicate relevant information to the public (Asteria 2016). This information includes the factors affecting forest and land fires. The keys to successful and effective public communication were the clarity and accuracy of the information and understandable delivery (Moore 2014).

The public had high expectations of the media as a reliable source of information in virtually all disaster-related stages. It started from warning of a disaster, detailed and complete post-disaster information, to post-disaster recovery, including its role in providing accurate reports regarding the root cause of a fire event. The way the online media collected data in the fields and presented it in the news narratives to the public described how the media framed the factors affecting forest and land fires in South Kalimantan province (Table 5).

The news framing and content analyses revealed that human activities became the prominent cause of fires in South Kalimantan Province. Land clearing was one of the reasons why forest and land fires were rampant. Few studies also reported that soil types that quickly burn by themselves during the dry season had influenced these disasters. The existing policies and regulations on forest and land fire management focused on procedures to extinguish forest fires, but future policies and regulations should be directed toward preventing fire events. This paradigm shift needed information dissemination, budget, human resources, and equipment. Hotspot monitoring using longitudinal satellite data and community participation at the site level determined the effectiveness of forest and land fire mitigation (Cahyono et al. 2015) and its future impact.

Table 5. Framing and content analyses of online media on factors affecting forest and land fires in South Kalimantan

No.	Media	News Title	Date of Issue	Framing Result
1	mediabanjarmasin.com	Kapolda Kalsel Berjibaku Turun Langsung Padamkan Kebakaran Hutan dan Lahan/The South Kalimantan Police Chief Struggles to Go Down and Put Out Forest and Land Fires	Sep 17, 2019	The news narrative illustrated the government's desire to ensure that the people do not engage in burning activities for any reason. It shows that the community had contributed to the number of hot spots in Banjarbaru district, South Kalimantan province.
2	kanalkalimantan.com	WWF Sebut Karhutla Indonesia Terkait Penguasaan Lahan/WWF Calls Indonesia's Karhutla Related to Land Tenure	Sep 17, 2019	The World Wildlife Fund (WWF) Indonesia reported that forest and land fires (Karhutla) in several areas were caused by human activities, one of which was related to land tenure. Cukong (it refers to entrepreneurs who own large companies in Indonesia) were said to be behind all forms of burning in the community.
3	kanalkalimantan.com	Catatan Karhutla 2019 Kegigihan 1512 Personil Satgas BNPB Melawan Api Dan Kepungan Asap/ Karhutla Notes 2019 Persistence of 1512 Regional Disaster Management Agency/ Badan Penanggulangan Bencana Daerah (BNPB) Task Force Personnel Against Fire and Smoke Siege	Nov 11, 2019	The condition of forest and land fires in South Kalimantan were inseparable from many abandoned peatlands. It was even confirmed that the smog that covered this island originated from peatlands fires. When the dry season was over, the peat swamp dried up because it was not managed by anyone.
4	Kalimantanpost.com	Penyuluh Kehutanan bagikan Poster Larangan Membakar Hutan/ Agricultural Extension Officers Distribute Forest Burning Prohibition Posters	Jun 15, 2020	In the news, socialization of forest fire prevention was conveyed to ensure it does not re-occur, besides it was reported that human involvement was the cause of this disaster.
5	koranbanjar.net	Lahan Guntung Damar Terbakar Kapolda Kalsel Turun Tangan/ Guntung Damar Land Burned by South Kalimantan Police Chief intervenes	Aug 5, 2020	In the fire prevention simulation, the Karhutla handling process was directly led by the South Kalimantan Police Chief Inspector General Pol. Dr. Nico Afinta stated that all types of disasters were caused by human activities, such as environmental damages and fires that have threatened people's lives.
6	kanalkalimantan.com	BPBD Banjarbaru Catat 9 Ha Lahan Sudah Terbakar Diduga Faktor Kesengajaan/ Regional Disaster Management Agency/ Badan Penanggulangan Bencana Daerah (BNPB) Banjarbaru Records 9 ha of Land Already Burned, Suspected of Deliberate Factors	Aug 24, 2020	Quoting the Regional Disaster Management Agency/Badan Penanggulangan Bencana Daerah (BNPB) Banjarbaru, it was suspected that a deliberate factor triggered land fires in Banjarbaru. In this case, it was presumed that individuals intentionally cleared land by burning.
7	tribunnews.com	Lahan di kota Banjarbaru kembali terbakar BPBD sebut dari bakaran sampah/ The land in the city of Banjarbaru has been burned again by the BPBD, it is called from burning garbage	Apr 30, 2021	The news reported that the fire incident was caused by unscrupulous people who burned garbage and was quickly spread because the dryland was overgrown with weeds.
8	matabanua.co.id	BPBD Bersama Tim Melakukan Cegah Karhutla/ Regional Disaster Management Agency/ Badan Penanggulangan Bencana Daerah (BNPB) and team to prevent forest and land fires	Jun 9, 2021	The head of Regional Disaster Management Agency/Badan Penanggulangan Bencana Daerah (BNPB) for Hulu Sungai Utara Regency reported that 90% of the occurrence of forest and land fires were intentional, one of which was the clearing of land for agricultural purposes or plantations by burning and the inability to control it because the land is too wide.

Conclusion

The online media frame analysis on factors affecting forest and land fires in South Kalimantan revealed human activities and the natural factors affecting forest and land fires in the research area. The dominant human activities were land clearing and preparation for agricultural purposes and settlements, illegal logging, and a lack of public awareness. Meanwhile, the natural factors were the dry season, lightning strikes, and areas with less intensive management, such as non-residential areas.

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