

# DISCOURSE ANALYSIS OF FOREST AND LAND FIRE MANAGEMENT IN INDONESIA

*Analisis Diskursus Pengendalian Kebakaran Hutan dan Lahan di Indonesia*

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## ABSTRACT

The agriculture, forestry, and land use (AFOLU) sector is Indonesia's largest contributor to greenhouse gas emissions. Within this sector, forest and peatland fires has a major emissions impact. Optimizing fire management requires collaboration among various parties and should address the underlying causes of burning. Scientific media provides insights into important actors, potential causes, and implementation of forest fire control at national and local levels. This research uses discourse analysis to analyze the role of scientific media in providing information regarding forest fires and fire management activities. It finds an inconsistency between scientific articles and observational data. Furthermore, there is a bias in addressing the causes and efforts to control forest fires. National journals indicate that forest and land fire management in Indonesia focus primarily on ecological aspects and do not take into economic factors, despite economic reasons being the most common cause of fires.

Keywords: discourse, forest fire, management, scientific media

## ABSTRAK

Sektor pertanian, kehutanan dan penggunaan lahan (AFOLU) merupakan sektor terbesar penyumbang emisi gas rumah kaca di Indonesia. Dalam sector ini, kebakaran hutan dan lahan gambut memberikan dampak yang besar. Optimalisasi pengendalian kebakaran perlu melibatkan berbagai pihak dan harusnya menjadi solusi terhadap penyebab kebakaran. Media ilmiah nasional mampu memberikan wawasan mengenai aktor-aktor penting, potensi penyebab, dan implementasi pengendalian kebakaran hutan di tingkat nasional dan lokal. Penelitian ini menggunakan analisis diskursus yang bertujuan menganalisis peran media ilmiah dalam memberikan informasi mengenai fenomena kebakaran hutan dan segala bentuk aktivitas pengendalian kebakaran. Hasil analisis menunjukkan adanya gap atau ketidaksejajaran antara tren artikel ilmiah dengan data tren kebakaran. Selain itu, ditemukan bias antara penyebab dan upaya pengendalian kebakaran hutan. Diskursus jurnal nasional menunjukkan upaya pengendalian kebakaran hutan dan lahan di Indonesia lebih berorientasi pada aspek ekologis dan belum memperhatikan aspek ekonomi, padahal faktor ekonomi dinyatakan paling banyak sebagai faktor penyebab kebakaran.

Kata kunci: diskursus, kebakaran hutan, pengendalian, media ilmiah

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**INTRODUCTION**

Population growth and human activities are the primary contributors to climate change due to their high rates of Greenhouse Gas (GHG) emissions. The Global Climate Risk Index (CRI) conducted by Germanwatch ranked Indonesia as the 14th most affected country out of 180 for extreme weather events related to climate change in 2019 (Eckstein *et al.* 2021). Indonesia's Nationally Determined Contribution (NDC) states that the agriculture, forestry, and land use (AFOLU) sector is the largest contributor to greenhouse gas emissions in Indonesia (Mukti and Koestoeer 2023). Peatland fires are one of the most important drivers of emissions within this sector (Boer *et al.* 2018).

In wet tropical areas like Indonesia, fire incidents are mainly caused by human activity as the conditions for natural fire outbreaks are rare (Saharjo and Amalina 2016). This situation is worsened by extreme weather changes, such as the El Niño phenomenon (Wibowo *et al.* 2021; Anggraini and Trisakti 2011). This demonstrates the interconnectedness between forest fires and climate change, each impacting the other. The occurrence of forest and land fires has garnered widespread attention from diverse segments of society, including scholars and researchers, leading to a multitude of viewpoints. One challenge confronted by the government in addressing the issue of forest and land fires in Indonesia is disproportionate of these incidents in local, national, regional, and international public perceptions (KLHK 2020).

The government, as a stakeholder, has implemented various approaches and strategies to manage fire disasters. Often, the adoption of fire management measures at a given location is determined through research found in scientific publications. The content presented in scientific publications thus have the potential to construct a reality, serve as a gauge for institutional performance, and provide valuable material for policymaking and management decisions. This research analyzes the role of scientific media in providing information on forest fires and mapping all forms of forest fire control activities through discourse analysis.

**RESEARCH METHODS**

**Research Time and Place**

Data collection through content analysis of electronic scientific media was conducted from August to September 2021, focusing on forest and land fire incidents in Indonesia.

**Research Materials and Tools**

The tools used in this research Microsoft Excel software and Zoom Meeting application. Data sources included: (1) Article within selected national journals from 2016 to 2020, (2) Forest and land fire data in Indonesia from 2015-2019, (3) Data on the distribution of hotspots in Indonesia (2015-2019), (4) stakeholder interview data.

**Data Collection and Analysis**

1. Article Selection

The article selection process entailed utilizing the keyword "Kebakaran hutan dan lahan" in the Google Scholar search system to locate articles published between 2016 and 2020. Article screening involved reviewing the title and contents of articles to determine the primary concepts discussed and evaluate whether or not the article should be included in this analysis. Articles that contained information on the cause of fires or fire management strategies were included and provided data for discourse analysis.

2. Creating an Analysis Framework (Framing)

Semetko and Valkenburg (2000) in Nurrochmat *et al.* (2016) stated that framing activities include selecting the aspects to emphasize in content analysis. Several key aspects chosen for framing in this research are (1) Frequency of articles related to forest and land fire management in Indonesia within the 2016-2020 period published in online national journals, (2) The causal factors of forest and land fire, (3) the various forms of fire management activity.

3. Content Analysis

Content analysis is a method of interviewing text. Unlike human interviews, textual interviews cannot provide clarifications on questions asked (Nurrochmat *et al.* 2016). The process of conducting a content analysis study thus involves two primary stages:

a. Building System Categories

The system category is used as a tool that provides guidance or serves as an interview guide or "questionnaire" for texts to answer research problems (Nurrochmat *et al.* 2016). Referring to the system categories developed by Ekayani (2011), the system categories in this research cover the aspects in Table 1. These categories were further expanded into sub-categories to provide more detailed, specific, and systematic information.

b. Coding

The coding process involved translating units of information from the text into codes based on different aspects within the category system. Afterward, a Pivot Table in Microsoft Excel was used to cross-tabulate and generate quantitative data. The data was then interpreted using descriptive analysis.

Table 1 System category

| Category                        | Sub-Category             |
|---------------------------------|--------------------------|
| General information             | Coder                    |
|                                 | Journal No.              |
|                                 | Writer                   |
|                                 | Publication year         |
|                                 | Journal Title            |
| Event                           | Publication              |
|                                 | Province                 |
|                                 | City/district            |
|                                 | Causal factor            |
| Forest and land fire management | Fire management aspect   |
|                                 | Fire management activity |
|                                 | Fire management actor    |

#### 4. Interview key person (stakeholders)

Interviews with key person were conducted to validate the accuracy of information in national journals about forest and land fires in Indonesia. The purpose of the interviews was to gather detailed insights into the issue. The interviews were semi-structured, and the respondents included stakeholders such as community, government, companies, and NGOs who are involved in addressing forest and land fires in Indonesia. The findings from the interviews were then compared with the results of discourse analysis in national journals.

### Results and Discussion

Scientific publications are an essential source of information for both the academic community and the general public. They play a crucial role in the advancement of science (Fatmawati 2013; Kristina 2018; Astuti and Isharijadi 2019), serving as valuable resources for policy-making and as indicators of institutional progress. Scientific publications are the result of rigorous research methods and thoughtful analysis by researchers to ensure accountability. The role of researchers as primary contributors to scientific publications encompasses their roles as planners, data collectors, and research analysts. Law of The Republic of Indonesia Article 99 Law No. 12 of 2011 underscores the importance of researchers, emphasizing their involvement in the formulation of laws, provincial and regency/city regional regulations. This aligns with the statement of Ekayani *et al.* (2015) that researchers and scientists play crucial part in shaping the policy agenda.

The relationship between the quantity of articles and the frequency of hotspots (Figure 1) on an annual basis does not demonstrate consistent alignment or a uniform trend. In 2020, for example, there was a notable decrease in the number of hotspots compared to the previous year, while there was a simultaneous increase in the number of articles related to forest and land fires. This discrepancy in the timing of scientific publications and the actual occurrence of forest fires during that period may be attributed to the lag between the fire incident and the publication of scientific articles, as well as the time gap between conducting the research and publishing the article. As highlighted by Purwanto *et al.* (2020), the publication

process is time-consuming, and therefore, publications are not reflective of real-time fire occurrences.

According to Figure 2, between 2016 and 2020, 12 provinces were primarily featured in scientific articles. However, the distribution of hotspots does not consistently reflect this trend. Riau Province was referenced most frequently, in contrast to the Ministry of Environment and Forestry's fire recapitulation data, which identifies Papua Province as having the highest frequency of hotspots. Additionally, the findings of the content analysis did not mention Papua Province as the primary focus of research.

This can be suggested by several reasons. **First**, hotspots do not always indicate fire incidents, but rather the presence of high temperatures in a specific area. Therefore, on-site inspections are imperative to ascertain whether the high temperature is attributed to forest or land fires. According to Minister of Environment and Forestry Regulation No.8 of 2018, hotspot inspection involves (a) the classification of the location, (b) categorization of the hotspot based on confidence level, and (c) determination of inspection priorities. **Second**, Riau Province's extensive peatlands make it highly influential in the event of a fire. Its strategic position in relation to neighboring countries frequently garners global attention due to transboundary haze pollution. **Third**, the accessibility and knowledge of scientific media writers with the research locations

influence their selection. **Fourth**, the level of attention given by government and media to forest and land fires in specific regions can influence researchers' interest in focusing on their research. Generally, scientific media researchers tend to concentrate on events that are compelling, important, actual and factual. The extensive coverage of an event in the media is closely connected to its newsworthiness, which is determined by its perceived importance, interest, and newsworthiness. **Lastly**, the availability of field data streamlines the process of drafting scientific papers.

The "Articles on Google Scholar" displays the total number of results from total scientific articles (journals and non-journal) sources for the keyword "kebakaran hutan" during the time period of 2016-2020. The search results indicate a yearly increase in the number of articles (Table 2). This demonstrates the significant attention given by the scientific or researchers to the issue of forest and land fires in Indonesia over the years.

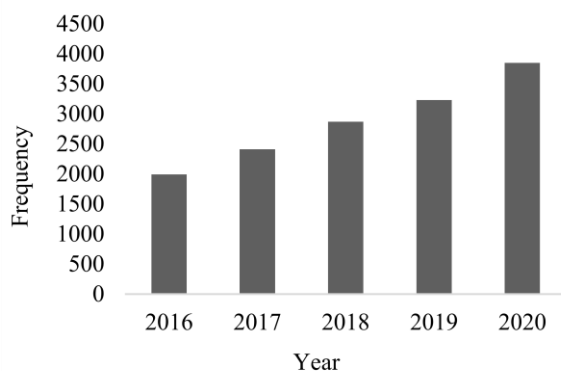


Figure 2 Frequency of scientific articles in Indonesia during the 2016-2020 period

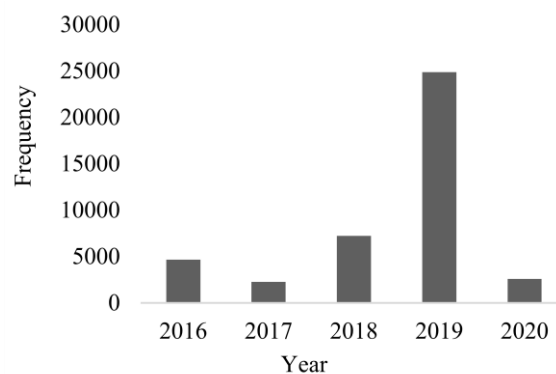


Figure 2 Frequency of hotspots in Indonesia during the 2016-2020 period

Articles related to forest and land fires on Google Scholar are selected according to specific criteria. The term "Selected national journals" denotes the quantity of national journals related to the topic of forest and land fire management. The findings reveal that out of 14,350 articles addressing forest and land fires in general, only 62, or less than 1%, address management efforts. This indicates that the attention given by researchers to forest and land fire management activities remains limited.

**Discourse Analysis of Forest and Land Fire Control Efforts in Indonesia**

The occurrence of forest fires in Indonesia can be attributed to natural causes or human activities. Of these two categories, human activities are the more common cause of forest and land fires in Indonesia (Solikhan 2016).

Figure 3 shows that 89% statements on national journals mentioned forest and land fires are attributed to human factors, while 8.33% of other statements indicated that forest and land fires were caused by natural factors, particularly prolonged drought. Syaufina (2008), as cited in Nurhayati and Yusup (2019), claimed that 99% of forest and land fires result from human factors, with only 1% being caused by natural factors. This is because in Indonesia, lightning is almost always accompanied by rain and wet conditions, making it impossible to ignite a fire. Interestingly, 10.42% of statements suggested that cigarette butts could ignite forest fires. However, this conflicts with Syaufina's (2008) assertion that burning

experiments using cigarette butts demonstrate their inability to cause forest and land fires.

Regulation of the minister of environment and forestry of the republic of Indonesia P32/MenLHK/Setjen/Kum.1/3/2016 stated forest and land fire management activities involve prevention, early suppression, and post-fire management. The majority of national journals emphasize prevention efforts. Social aspects of preventing forest and land fires are more frequently addressed compared to ecological and economic aspects (Figure 4). Socialization and discussion are the most commonly cited activities in these publications. This indicates that forest and land fire prevention efforts in Indonesia are primarily focused on providing information. Providing such information can contribute to enhancing a community's comprehension, motivation, and actions in preventing forest and land fires (Nuridin *et al.* 2018). In studies of environmental governance more broadly, providing information through discussion and in combination with decision-making are most impactful for changing environmental behaviors (Erbaugh *et al.* 2024).

The analysis of fire suppression efforts referenced in national journals places a greater emphasis on social aspects. The coordination between involved parties emerges as the most commonly cited firefighting strategy. Typically, fire suppression activities are led by officers located near the forest fire. In cases where manpower is insufficient, these officers seek support from the Forest Village Community Organization (LMDH) and the surrounding community (Saharjo and Amalina 2016).

Direct firefighting is typically carried out using manual equipment such as fire broom for small-scale fires. For larger fires, suppression activities may involve creating firebreaks, back-burning, using fire engines, or even water bombing with the assistance of helicopters (Budiningsih 2017). Another approach to mitigating forest and land fire disasters involves Weather Modification Technology (*Teknologi Modifikasi Cuaca--TMC*), which includes creating artificial rain at fire locations and in fire-prone areas such as dry peatlands (Yunvi *et al.* 2021). The management of forest fires encompasses extinguishing the fire itself as well as managing the post-burning area to minimize the impact on human and animal life. Discourse

Table 2 Search results for articles and national journals on Google Scholar

| Year         | Articles on Google Scholar | Selected National Journal |
|--------------|----------------------------|---------------------------|
| 2016         | 1990                       | 12                        |
| 2017         | 2410                       | 12                        |
| 2018         | 2870                       | 13                        |
| 2019         | 3230                       | 13                        |
| 2020         | 3850                       | 12                        |
| <b>TOTAL</b> | <b>14350</b>               | <b>62</b>                 |

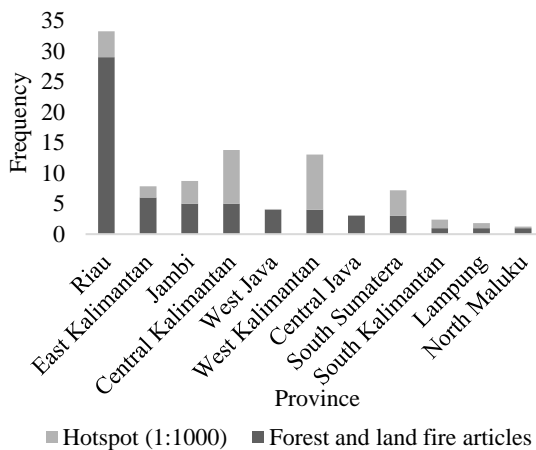


Figure 3 Frequency of articles and hotspots in 12 provinces in Indonesia during 2016-2020 period

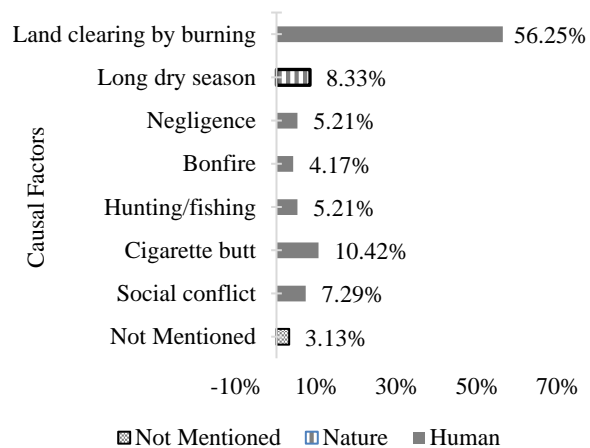


Figure 3 Factors causing forest and land fires in Indonesia stated in national journals

analysis results in Figure 6 demonstrate that national journals often emphasize the social aspects of post-forest fire management, such as producing fire incident reports, assisting affected communities, and addressing criminal acts of arson. In accordance with the research conducted by Syaufina and Fitiriana (2021) and Saharjo and Artaningsih (2022), post-fire activities involve gathering fire incident information through incident reports. Additionally, the government undertakes various measures to assist affected communities, including evacuation, providing of health services, and distributing health masks to mitigate the impact of fire smoke. Furthermore, post-fire procedures include the investigation of arsonists and law enforcement, as highlighted in national journals, to serve as a deterrent to perpetrators. According to Asteriniah and Sutina (2017), post-fire law enforcement not only entails persuasive actions but also emphasizes criminal or civil law, necessitating the support of skilled human resources, technology, and strong commitment from law enforcement and government authorities.

According to the data presented in Table 3, the recurring forest and land fires in Indonesia, as documented in national journals, are primarily attributed to economic factors, particularly the widespread practice of land clearance through burning both the public and private sectors. Empirical evidence indicates that the burned areas are typically those that have undergone burning as part of the initial land preparation for agricultural or plantation purposes. This is attributed to the perceived cost-effectiveness and efficiency of burning compared to Non-burning Land Clearing techniques (*Pembukaan Lahan Tanpa Bakar--PLTB*). The Non-burning Land Clearing (*PLTB*) method requires an investment of 3-5 million rupiah per hectare, whereas the burning technique entails a maximum cost of only 450 thousand rupiah (Wahyunto 2009 in Friscalia D 2016). Furthermore, research by Maranathan EI and Kusmayadi IM (2020) highlights that companies play a key role in instigating forest and land fires by incentivizing individuals, with economic

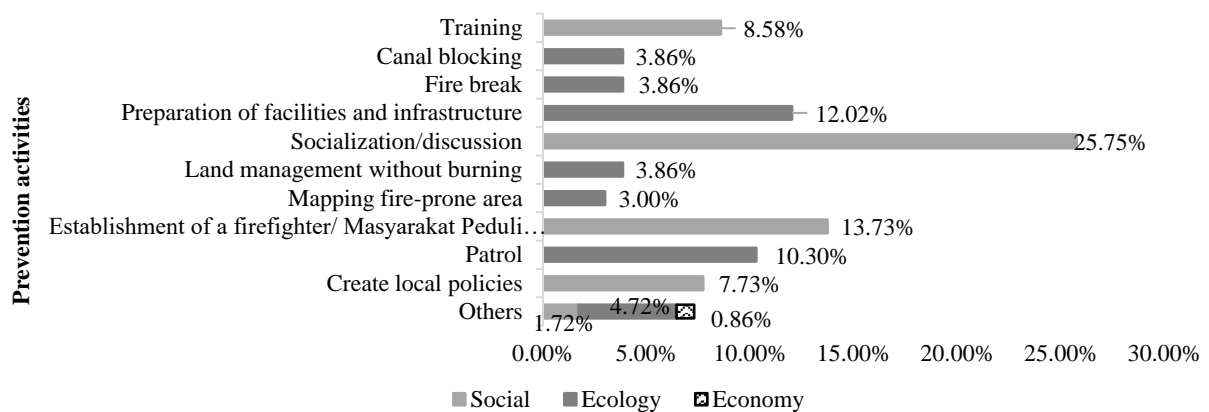


Figure 4 Prevention of forest and land fires stated in national journals

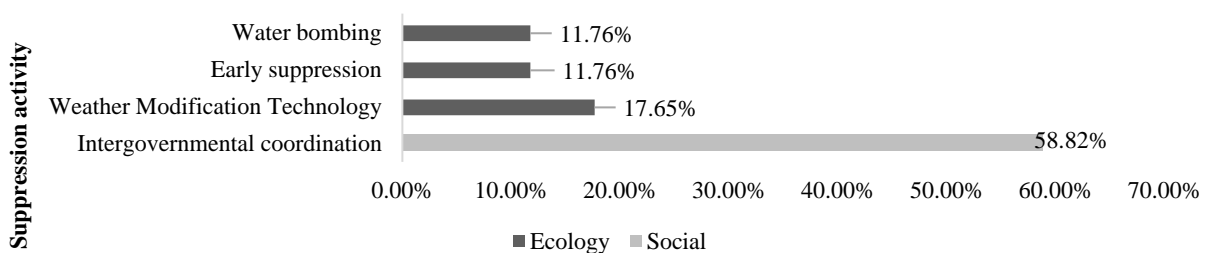


Figure 5 Forest and land fire suppression in Indonesia stated in national journals

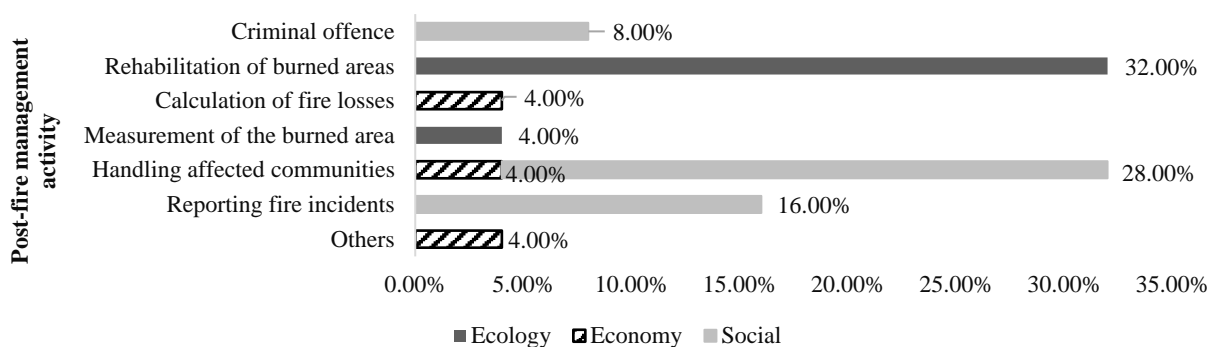


Figure 6 Post-forest fire management in Indonesia stated in national journals

considerations being the primary driver behind people's acceptance of these offers from companies.

Identification of the causes of fires is a critical component in formulating effective strategies for the control of forest and land fires. However, 41.09% national journals primarily focus on an ecological approach (Table 3). In this case, if national journals are utilized as a reference or a tool to describe actual conditions, the discrepancy between the causes of fires and management strategies may lead to the repeated occurrence of forest and land fires. Research by Nursanto HA (2016) in Maranath and Kusmayadi IM (2020) also highlights the mismatch between the causes and fire managements as portrayed in mass media, which affects public awareness and efforts to reduce the incidence of forest and land fires.

The content analysis in national journals is supported by stakeholder perceptions, aimed at identifying similarities and confirming or strengthening information. Interviews were conducted with key person involved in forest and land fire incidents, including community members, government representatives, companies, and NGOs. In Indonesia, the responsibility of forest and land fire management falls on all stakeholders in their respective

areas. Presently, the Ministry of Environment and Forestry (*Kementrian Lingkungan Hidup dan Kehutanan--KLHK*) and the Ministry of Agriculture (*Kementrian Pertanian*) oversee the specialized tasks and functions related to forest and land fire control, which involve apparatus individual (both civil servants and contractual workers) as well as non-apparatus individuals (community members and volunteers) (Maksum *et al.* 2019).

Each actor plays a distinct role in forest and land fire management. Based on stakeholder interviews and discussions in national journals (Table 4), it is evident that the government and the community are the primary actors involved in fire management. The government holds the responsibility for regulating all aspects related to forests, forest areas, and forest products. This underscores the government's crucial role in forest preservation and environmental damage control, including forest and land fires. Meanwhile, the communities residing around forests are crucial in controlling forest fires, as their awareness is fundamental for successful fire management. Additionally, companies are also involved in forest and land fire operations, particularly within their respective areas. As highlighted by Suhendri and Purnomo EP (2017), in the

Table 3 Compilation of causes and forest and land fire management based on discourse in national journals

| Category                        | Activity Aspect |        |         |        |        |        |       |         |
|---------------------------------|-----------------|--------|---------|--------|--------|--------|-------|---------|
|                                 | Ecology         |        | Economy |        | Social |        | Total |         |
|                                 | n               | %      | n       | %      | n      | %      | n     | %       |
| Causes                          | 9               | 9.28%  | 54      | 55.67% | 34     | 35.05% | 97    | 100.00% |
| Forest and land fire management | 113             | 41.09% | 5       | 1.82%  | 157    | 57.09% | 275   | 100.00% |
| Prevention                      | 97              | 35.27% | 2       | 0.73%  | 134    | 48.73% | 233   | 84.73%  |
| Fire suppression                | 7               | 2.55%  | 0       | 0.00%  | 10     | 3.64%  | 17    | 6.18%   |
| Post-fire management            | 9               | 3.27%  | 3       | 1.09%  | 13     | 4.73%  | 25    | 9.09%   |

Table 4 Role of related actors in forest and land fire management based on stakeholder perceptions and discourse in national journals

| Fire Management Activity  | Management Actor |   |     |   |            |   |         |   |
|---|------------------|---|-----|---|------------|---|---------|---|
|   | Community        |   | NGO |   | Government |   | Company |   |
| <b>Prevention</b>   | ✓                | ✓ | ✓   | ✓ | ✓          | ✓ | ✓       | ✓ |
| Create local policies   | -                | ✓ | ✓   | - | ✓          | ✓ | -       | - |
| Patrol  | ✓                | ✓ | ✓   | - | ✓          | ✓ | ✓       | ✓ |
| Training  | ✓                | ✓ | ✓   | - | ✓          | ✓ | ✓       | ✓ |
| Establishment of firefighter and <i>Masyarakat Peduli Api (MPA)</i> | ✓                | ✓ | ✓   | - | ✓          | ✓ | ✓       | ✓ |
| Mapping fire-prone areas  | ✓                | ✓ | ✓   | - | ✓          | ✓ | ✓       | ✓ |
| Land clearing without burning                                       | ✓                | ✓ | ✓   | - | -          | ✓ | ✓       | - |
| Socialization/discussion  | ✓                | ✓ | ✓   | - | ✓          | ✓ | ✓       | ✓ |
| Preparation of facilities and infrastructure                        | ✓                | ✓ | ✓   | ✓ | ✓          | ✓ | ✓       | ✓ |
| Fire breaks   | ✓                | ✓ | -   | - | ✓          | ✓ | ✓       | ✓ |
| Canal blocking  | ✓                | ✓ | -   | - | ✓          | ✓ | ✓       | - |
| Others  | ✓                | ✓ | -   | - | ✓          | ✓ | ✓       | ✓ |
| <b>Suppression</b>  | ✓                | ✓ | ✓   | - | ✓          | ✓ | ✓       | ✓ |
| Intergovernmental coordination                                      | ✓                | ✓ | ✓   | - | ✓          | ✓ | ✓       | ✓ |
| Weather Modification Technology                                     | -                | - | -   | - | ✓          | ✓ | -       | - |
| Early suppression   | ✓                | ✓ | ✓   | - | ✓          | ✓ | ✓       | - |
| Water bombing   | -                | - | -   | - | ✓          | ✓ | -       | - |
| <b>Post-fire management</b>   | ✓                | ✓ | -   | - | ✓          | ✓ | ✓       | ✓ |
| Fire incidents reporting  | ✓                | ✓ | -   | - | ✓          | ✓ | ✓       | - |
| Measurement of the area burned                                      | -                | ✓ | -   | - | ✓          | ✓ | ✓       | - |
| Calculation of losses   | -                | - | -   | - | ✓          | ✓ | -       | - |
| Rehabilitation of burned areas                                      | -                | ✓ | -   | - | ✓          | ✓ | -       | ✓ |
| Criminal offence  | -                | - | -   | - | ✓          | ✓ | -       | - |

event of a fire within a concession area, the business permit holder remains accountable for the fire on their area, even if they are not the cause of the fire.

According to stakeholder interviews, almost all parties, including the community, government, NGOs, and companies, are actively involved in efforts to prevent and suppress forest and land fires (Table 4). However, not all stakeholders participate in post-fire activities. This contrasts with the information reported in national journals, which do not mention NGOs in extinguishing efforts. Instead, the role of NGOs primarily provide support by facilitating and inspiring community groups. Furthermore, NGOs engage in policy advocacy, capacity development, consultation, public campaigns, knowledge management, and field implementation through collective complaints. These efforts have the potential to influence regulations, strengthen law enforcement, impact the private sector, and promote better local land management practices (Ardhian D *et al.* 2016).

## CONCLUSION AND RECOMMENDATION

### Conclusion

Scientific publications play a crucial role for advancing scientific knowledge, informing policy formulation, and assessing institutional advancement. The relationship between the frequency of scientific articles and the incidence of forest and land fires in Indonesia does not consistently demonstrate parallel trends. This discrepancy may be due to time gap between fire occurrences and research is conducted, or between research conduct and the publication of the article. National journals tend to focus on prevention efforts to mitigate the impact of fire risks, but there is a mismatch between the economic factors causing the fires and the predominantly ecological approach to fire control. This disconnect may contribute to the recurrence of forest and land fires. All stakeholders, including community, government, company, and NGO, contribute to forest and land fire management. Discourse analysis of national journals finds that all stakeholders engage in preventive actions, but not all stakeholders participate in post-fire management efforts.

### Recommendation

The findings published in scientific journals play a crucial role in shaping policies and guiding further efforts to manage and prevent forest and land fires. However, research currently focused on forest and land fire management does not consider important elements of forest and land fire management. Therefore, it is essential to enhance research efforts and increase the frequency of scientific publications in this area. Additionally, addressing the economic aspect of forest and land fire control in Indonesia is important to find sustainable solutions. Developing efficient, rapid, cost-effective, and environmentally friendly technologies and methods for land clearing without burning may help financial burdens on families and reduce operational costs for companies.

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