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Level of Community Participation in Prevention To Forest and Land Fires in the District Ulin Landing in Banjarbaru City

Muhammad Sigit Pangestu*, Parida Angriani, Karunia Puji Hastuti, Sidharta Adyatma, Nevy Farista Aristin
Geography Education Study Program, Universitas Lambung Mangkurat
*sigidnew9@gmail.com

Abstract

Forest and land fires affected Indonesia from January to August 2023, burning a total of 267,935.59 hectares across 38 provinces. In South Kalimantan Province, the fires ranked 4th in severity, with a total of 24,588 hectares burned. The El Niño phenomenon in 2023 contributed to the occurrence of these forest and land fires, while human activities, such as land clearing, also played a role. In South Kalimantan Province, forest and land fires occurred in 13 districts/cities, including Banjarmasin, Banjarbaru, Banjar, Tapin, South Hulu Sungai, Central Hulu Sungai, North Hulu Sungai, Balangan, Tabalong, Barito Kuala, Tanah Laut, Tanah Bumbu, and Kotabaru. The province has four districts/cities classified as high-risk areas for forest and land fires: Banjarbaru City, Tanah Laut Regency, Banjar Regency, and Barito Kuala Regency. A particularly vital area in this region is Syamsudin Noor Airport, located in Syamsudin Noor Subdistrict, Landasan Ulin District. According to the South Kalimantan BPBD Operations Control Center, the highest number of forest fire incidents occurred in Banjarbaru City. The total burned area reached 1,015.03 hectares between March and November 2023, with incidents recorded as follows Landasan Ulin District 206 incidents (452.53 hectares), Liang Anggang District: 98 incidents (238.02 hectares), Cempaka District: 115 incidents (278.69 hectares), North Banjarbaru District: 17 incidents (29.32 hectares), South Banjarbaru District: 22 incidents (16.48 hectares). The objective of this research is to analyze the level of public participation in forest and land fire prevention in Landasan Ulin District. The study examines factors such as controlled burning practices, removal of flammable materials, and timing of land clearing activities. This study employs a descriptive quantitative method, using percentage calculations and average questionnaire values to process and interpret the collected data. The findings indicate that public participation in forest and land fire prevention in Landasan Ulin District falls into the "Moderate" category, suggesting a sufficient level of involvement in fire prevention efforts.

Keywords: Forest and Land Fires**,** Prevention, Participation public.

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**Corresponding Author*

1. Introduction

Indonesia is the country with the second-largest forest area in the world after Brazil. According to the Global Forest Resources Assessment 2020 report released by the Food and Agriculture Organization (FAO), the protected forest area in Indonesia reached 51.7 million hectares, while Brazil's reached 149.6 million hectares (FAO, 2020).

Indonesia plays a crucial role in stabilizing global temperatures. Forests help regulate the local climate, including temperature and humidity in their surrounding environment (Rambaradellangga et al., 2018). Indonesia's forests support diverse ecosystems, ranging from lowland tropical forests and highland forests to peat swamp forests, freshwater swamps, and mangrove forests (Siagian & Arifin, 2022).

Prolonged drought and the El Niño phenomenon pose a significant threat to forest ecosystems as they trigger the emergence of fire hotspots, leading to forest and land fires. Peat swamp forests are particularly prone to burning. Peatlands contain combustible organic material in the form of decomposed plant remains beneath the surface. Once ignited, peat fires spread slowly underground, making them difficult to detect and extinguish while producing thick smoke (Fathoni et al., 2023).

Indications of forest and land fires were recorded in several regions of Indonesia between January and August 2023, with the affected area reaching 267,935.59 hectares (Ahdiat, 2023). These fires occurred across 38 provinces (Sipongi, 2023). South Kalimantan ranked fourth, with 24,588 hectares of forest and land burned (Ahdiat, 2023). In South Kalimantan, four districts/cities are categorized as high-risk fire-prone areas: Banjarbaru City, Tanah Laut Regency, Banjar Regency, and Barito Kuala Regency (Yulianus, 2023).

Banjarbaru City, in particular, has vital infrastructure, including Syamsudin Noor Airport, Syamsudin Noor Village, and Landasan Ulin District. The South Kalimantan Regional Disaster Management Agency (BPBD) designated these areas as high-risk fire-prone zones, making them a priority for disaster prevention efforts, particularly to mitigate haze pollution (Ridwan, 2023). According to the South Kalimantan BPBD, as of September 29, 2023, Banjarbaru City had the highest number of forest and land fire incidents in the province (Ariandi, 2023).

Between March and November 2023, a total of 1,015.03 hectares of land were burned in Banjarbaru City, affecting the following districts Landasan Ulin 206 incidents (452.53 Ha), Liang Anggang District 98 incidents (238.02 Ha), Cempaka District 115 incidents (278.69 Ha), North Banjarbaru 17 incidents (29.32 Ha), and Sub-district South Banjarbaru 22 incidents (16.48 Ha) (BPBD Banjarbaru City, 2023). (BPBD Banjarbaru City, 2023). According to BPBD Banjarbaru City, forest and land fires most frequently occurred in Landasan Ulin District, with 206 recorded incidents.

Forest fire disaster management is carried out by a joint task force comprising the BPBD of Banjarbaru City/Regency, the Indonesian National Police (POLRI), the Indonesian National Armed Forces (TNI), the Fire Department (DAMKAR), the Disaster Preparedness Cadets (TAGANA), the Social Services Agency, and the Health Services Agency. Efforts undertaken by the task force include aerial water bombing (dropping water directly from helicopters), using water pump machines to wet the land, and conducting 24-hour monitoring to ensure the fires are completely extinguished (Saleh, 2023).

Despite these efforts, several challenges remain in forest fire management, including the vast affected area compared to the limited number of personnel, law enforcement issues, difficult access to fire locations, limited water sources, inadequate infrastructure and equipment, and low public awareness (Arief, 2023).

According to Banjarbaru Mayor Regulation No. 51 of 2021 concerning land fires, Article 17 states that the government encourages public participation in forest fire prevention and control efforts. Community involvement is essential, with the expectation that land clearing activities will be conducted without burning, or at least through controlled burning with community oversight to prevent and mitigate land fires.

Based on this background, the objective of this study is to analyze the level of public participation in forest and land fire prevention efforts in Landasan Ulin District, Banjarbaru City.

2. Method

The research method used is quantitative descriptive. The study was conducted in Landasan Ulin District, Banjarbaru City, which has the highest hotspot distribution and includes a vital object, namely Syamsudin Noor International Airport. The research was carried out from January to June 2024, covering preparation, data collection, and report compilation.

The population in this study consists of neighborhood units (RTs) with the highest incidents of forest and land fires, based on observations from the Head of RT. The selected RTs include RT.003, Landasan Ulin Timur, with 86 families, RT.012, Guntung Payung, with 90 families, RT.044, Syamsudin Noor, with 105 families, RT.024, Guntung Manggis, with 80 families. Thus, the total number of families is 361. The sample size was determined using Krejcie and Morgan's formula and simple random sampling.:

$$\mathrm{n} = \frac{X^2.N.P(1-P)}{(N-1)\,d^2+X^2.P(1-P)} \tag{1}$$

$$\mathrm{n} = \frac{3{,}841.361.0{,}5\,(1-0{,}5)}{(361-1)\,0{,}05^2 + 3{,}841.0{,}5(1-0{,}5)}$$

$$\mathrm{n} = 186 \text{ be rounded}$$

Calculation scoring in study This use scale guttman with measurement score 1 for “Yes” and score 0 for “No”. The data analysis used with technique analysis percentage with formula as following (Loren et al., 2015):

$$\mathrm{P} = \frac{Respondent's\ answer}{Total\ respondent\ answers}\ \mathrm{X}\ 100^{\%} \tag{2}$$

After that, the average value was calculated with the objective of grouping the roles and public involvement in forest and land fire prevention, using the formula from Rusitawati (2021) as follows:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \tag{3}$$

Based on the results of the formula, each variable was grouped to determine the level

of involvement and role. The following table presents the grouping based on the average value (Rusitawati, 2021).:

Table 1. Average Value

Average value	Group
<1.5	Low
1.5 – 2.5	Moderate
>2.5	High

3. Results and Discussion

A. Research Result

The research results on the role of the public in forest and land fire prevention were obtained from a questionnaire filled out by 186 respondents. The aspects measured in public involvement include four key factors: partitioning burned areas, clearing materials that trigger surface fires, conducting controlled burning, and considering the timing of burning.

The study results are presented in the form of percentages and descriptive analysis, as follows:

1. Cleaning Materials (Triggers Fire) on the Surface Stand / Land

Out of 186 respondents, 110 indicated that although they do not engage in gardening or farming, they still eradicate weeds/wild plants and clean up organic litter/garbage by burning, spraying pesticides, or using simple tools such as hoes around their yards. When burning weeds or dry leaves and twigs, the process is always supervised to prevent the fire from spreading to neighboring land or yards. Burning is conducted either three times a week or once a month, depending on the size of the respondent's land.

Table 2. Analysis of Cleaning Trigger Materials Fire

No	Cleaning Materials (Triggers) Fire) on the Surface Stand / Land	Guttman Scale	Frequency	Percentage (%)	Total
1	Do activity farming	1	65	35	186
		0	121	65	
2	Do eradication weeds / wild plants with method burned	1	130	70	186
		0	56	30	
3	Clean litter / rubbish organic with method burned	1	165	89	186
		0	21	11	
4	Clean land with method burned	1	80	43	186
		0	106	57	

Information:

1 = Yes

0 = No

2. Fire Break

Out of 186 respondents, 136 are already aware of firebreaks and plan to create them in the event of a forest or land fire near their homes or agricultural land. By establishing firebreaks, it is hoped that forest and land fires can be prevented.

Table 3. Fire Break Analysis

No.	Fire Break	Guttman Scale	Frequency	Percentage (%)	Total
1	Know partition burn	1	127	68	186
		0	59	32	
2	Make partition burn	1	130	70	186
		0	56	30	
3	Prevent Forest Fire with partition burn	1	147	80	186
		0	39	20	

Information:
1 = Yes
0 = No

Respondents create firebreaks, known as "yellow burn tracks," as an effort to prevent forest and land fires. A yellow burn track is a barrier or ditch made using a simple method, typically with a hoe. Firebreaks generally serve to separate burned areas from areas that need protection.

By creating firebreaks and utilizing natural fire barriers, respondents help prevent forest and land fires by isolating burned areas. However, forest and land fires can still occur, as burning leaves or branches carried by the wind may spread the fire beyond the designated area.

Figure 1. Artificial Fire Break

3. Controlled Burning

A total of 104 out of 186 respondents did not consider wind direction when burning land. However, the burning was carried out on a small scale or gradually. If land burning is conducted when the wind direction is unfavorable and blowing strongly, the fire can spread uncontrollably, increasing the risk of forest and land fires as the flames may be carried by the wind.

The burning process was conducted under supervision. If left unattended, remaining embers could reignite due to gusts of wind. By closely monitoring the burning process, the fire can be prevented from spreading and affecting the surrounding land. Some respondents also took precautions by dousing the area with water.

Table 4. Combustion Analysis Controlled

No	Controlled Burning	Guttman Scale	Frequency	Percentage (%)	Total
1	Notice direction wind	1	75	40	186
		0	111	60	
2	Burning done in a way gradual (in scale small)	1	124	67	186
		0	62	33	
3	Burning done until fire truly blackout	1	114	61	186
		0	72	39	

Information:
1 = Yes
0 = No

4. Pay Attention to Burning Time

A total of 95 out of 186 respondents were aware of the importance of burning time and avoided burning during the dry season. However, some respondents still conducted burning in the morning or evening, even during the dry season. Respondents also avoided burning during the daytime in the dry season. The preferred burning time was in the morning or afternoon because fires tend to be more intense during the daytime, spreading more rapidly due to stronger winds.

Table 5. Analysis Taking Burning Time into Account

No	Pay Attention to Burning Time	Guttman Scale	Frequency	Percentage (%)	Total
1	Burning land in season drought	1	88	47	186
		0	98	53	
2	Burning done in the morning/evening	1	142	76	186
		0	44	24	
3	Burning done during the day day in season drought	1	54	29	186
		0	132	71	

Information:
1 = Yes
0 = No

Figure 2. Burning in the Afternoon

The average value of the calculations for the four sub-variables is as follows:

Table 6. Average Value

Sub Variables	Average value	Group
Fire Break	2,172	Moderate
Cleaning Materials (Triggers Fire) on the Surface Stand / Land	2,365	Moderate
Do Burning Controlled	1,682	Moderate
Pay Attention to Burning Time	1,526	Moderate

Table 7. Percentage

Sub Variables	Percentage
Fire Break	72.39%
Cleaning Materials (Triggers Fire) on the Surface Stand / Land	59.13%
Do Burning Controlled	56.09%
Pay Attention to Burning Time	50.89%

B. Discussion

Forest and land fires are natural phenomena that cannot be controlled and can spread freely. Communities often become victims of forest and land fires because these fires can cause the loss of property. Additionally, prolonged land fires can result in long-term haze. Therefore, public participation in preventing forest and land fires is essential.

1. Cleaning Fire-Triggering Materials on the Land Surface

The purpose of cleaning fire-triggering materials is to reduce the amount of combustible material in forests. By doing so, if a forest or land fire occurs, the intensity of the flames, the spread rate, and the duration of the fire can be minimized. Common fire-triggering materials that need to be reduced include surface fuel such as dry litter, undergrowth, and logging waste.

Research results indicate that cleaning fire-triggering materials on land surfaces in the Ulin Foundation District for fire prevention falls into the "Moderate" category. The parameter for land material cleaning is categorized as "Moderate" because, although respondents do not engage in gardening or farming activities, they do remove weeds and organic litter by burning them and/or spraying them with pesticides. Some also use simple tools such as hoes to clean the area around their homes or agricultural land.

This aligns with Akbar (2016), who stated that weed removal can be done using herbicides, mechanical grass-cutting machines, or manually with a sickle. After spraying pesticides, communities often burn the remaining weeds or wild plants. Similarly, Juriyah et al. (2024) explained that land clearing is done by cutting small trees, followed by logging larger trees and trimming their branches before burning the debris and finalizing the cleaning process.

The "Moderate" rating for cleaning fire-triggering materials on land surfaces is mainly due to the common practice of burning organic waste and weeds, as it is an easy and cost-effective method. Communities typically use simple tools like hoes and sickles. Although burning is practiced, people remain cautious and monitor the fire to prevent it from spreading uncontrollably.

2. Understanding Fire Breaks

Knowledge is a learning process for the public, either through institutions/schools or based on personal experiences, that helps individuals understand a particular matter. Public knowledge in the Landasan Ulin District regarding firebreaks is essential, as this district is highly vulnerable to forest and land fires. By understanding and constructing firebreaks, it is hoped that fires can be effectively managed.

Research results show that the public's level of knowledge about firebreaks in Landasan Ulin District for forest and land fire prevention falls into the "Moderate" category. This is because some members of the public have already learned about firebreaks through various media, such as the internet, local community discussions, and socialization efforts by the City BPBD/Manggala Agni. They have also implemented firebreaks around their homes or agricultural land with the hope that these barriers can prevent fires from spreading to their land in the event of a forest or land fire. This finding aligns with Agustarina (2019), who states that creating firebreaks aims to protect agricultural or plantation land so that, if a fire occurs, its spread does not encroach upon these areas.

Studies also indicate that developing and strengthening fire prevention infrastructure—such as firebreaks, monitoring posts, and adequate firefighting facilities—is necessary to aid in fire prevention and control (Ashari, 2024). Meanwhile, the firebreaks created by respondents in this study are categorized as yellow track firebreaks. According to Agustina (2019), a yellow track firebreak is a simple type of firebreak, such as a ditch. Creating firebreaks can be done using tools like hoes, machetes, axes, and rakes. If there are roots or piles of leaves along the firebreak path, they should be removed (Rahman et al., 2007).

The implementation of forest and land fire prevention also requires socialization efforts. This socialization is conducted to provide an understanding of the negative impacts caused by forest and land fires. The main goal of socialization is to explain the importance of public participation in assisting the government in addressing forest and land fires (Ananda et al., 2022).

3. Controlled Burning

Controlled burning can be carried out by the public to prevent forest and land fires when clearing land. Based on research results, controlled burning conducted by the community in the Ulin Foundation District falls into the "Moderate" category. This is because, in practicing controlled burning, some respondents do not pay attention to wind direction during burning. However, burning is carried out on a small or gradual scale. If done on a large scale, it can cause land fires, as fire can spread uncontrollably.

Burning shrubs and thickets gradually and on a small scale ensures that the fire is carefully managed and controlled (Saputra et al., 2017). Burning is conducted at several points along the edges of the land and directed toward the center. The boundaries between the land being burned and other land are secured by clearing bushes approximately four meters wide (Pasaribu & Friyatno, 2020). If burning is necessary, wind direction must be considered, and burning should not be done during strong wind seasons (Fera et al., 2024).

4. Paying Attention to Burning Time

Choosing the right time for burning is crucial, as it should be done under appropriate environmental conditions. Land burning is not recommended during the dry season due to its high potential to cause forest and land fires. Burning should ideally be done in the morning or late afternoon.

Research results indicate that the community in the Ulin Foundation District considers burning time, placing it in the "Moderate" category. This is because respondents avoid burning during the dry season and prefer to burn in the morning or evening. They also refrain from burning during the daytime in the dry season. This aligns with research by Rachmawati & Susilawati (2012), which states that burning should be conducted on days that are not too hot or windy.

The ideal burning time is in the morning or late afternoon, as fire tends to be more intense during the day and spreads more quickly with strong winds. Related research has found that during the dry season, when forest conditions and surrounding areas are highly flammable, even a cigarette butt falling on dry leaves can trigger a fire (Ardita & Sadewo, 2022).

4. Conclusion

The results of the research conducted to determine the level of public participation in forest and land fire prevention in Landasan Ulin District, Banjarbaru City, indicate that the community in Landasan Ulin District plays a "sufficient" role in preventing forest and land fires. The most common fire prevention measures taken by the community include clearing materials that could trigger surface fires, creating firebreaks around their homes or agricultural land, and conducting controlled burning while paying attention to proper timing.

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