



# Monitoring of Forest and Land Fires by the Regional Disaster Management Agency of South Kalimantan Province through the LAPAN Application: Fire Hotspot

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## Abstrak

*As a country that has a very high potential related to forest and land fires (karhutla), Indonesia especially South Kalimantan Province needs to have media that can be used in efforts to manage disasters such as forest and land fires more effectively. The benefit of this study is to find out the efforts of the South Kalimantan Disaster Management Agency (BPBD) in tackling the karhutla disaster that occurred. The method used is a descriptive qualitative study which is carried out through the study of literature related to the topic of discussion, journals, articles, books, to research results. The result of our study to show up how the utility of LAPAN : Fire Hotspot as one of the ICT-based media in dealing with disasters such as forest and land fires has various benefits and great advantages. This media can provide an overview related to disasters, especially forest and land fires such as statistical data, risk indexes, and spatial planning. From this study, we can conclude this LAPAN : Fire Hotspot will have great benefits if it is used properly by the community, government, and other interested parties. Therefore, it is necessary to provide sufficient literacy and information regarding the use of this application, especially to the South Kalimantan BPBD as the front guard in tackling the problem of forest fires in South Kalimantan.*

**Keywords:** Karhutla, BPBD, LAPAN

## A. Introduction

Forest fires often occur in Indonesia, especially during the dry season. In the last three decades, forest fires in Indonesia have become increasingly worrying. Sumatra and Kalimantan are regions in Indonesia that regularly contribute to carbon emissions and toxic gases from smoke from forest and forest fires (Tan et al., 2020). Forest fires which are hydrometeorological disasters often hit provinces with extensive peatland cover, such as Riau, Jambi and South Sumatra on Sumatra Island, as well as West Kalimantan, Central Kalimantan, South Kalimantan, and East Kalimantan on Kalimantan Island (Prayoga & Koestoer, 2021) Deforestation caused by burning peat forests contributes 15% of the world's greenhouse gas emissions. As one of the countries with the largest tropical forests in the world, Indonesia has cleared 1.13 hectares of forest every year (2009-2013 period) or the equivalent of 3 times the size of a football field per minute. While there is good news with decreasing deforestation rates, the numbers are still high. This condition states that deforestation, especially on peatlands, is one of the main causes of greenhouse gas emissions in Indonesia (Sumarga, 2017).

Peatland is an essential wetland ecosystem made of peat soil with an organic layer that decomposes in waterlogged conditions and lacks oxygen. Its unique ecosystem with a complex hydrological system has an important role as a provider of ecosystem services such as carbon sequestration and storage, protection of biodiversity, water catchment control, flood mitigation and prevention of saltwater intrusion (Amalia & Amalia, n.d.). Indonesia has the fourth largest peat area in the world after Canada, Russia and the United States. However, in recent decades, peatland areas in Indonesia are increasingly under threat. peatland is converted for various purposes, including agricultural land, plantations, forestry, and settlements, all of which cause peatlands to become degraded (Nurhayati et al., 2021).

Forests and peatlands have a high diversity of flora/vegetation, with various adaptable plants, but compared to tropical rain forests, the diversity of vegetation is much lower. However, the diversity of vegetation has a higher proportion of species characteristics than dryland ecosystems in the same biogeographical zone. Management strategies aimed at conserving biodiversity rely on hydrogeological and hydrographic criteria that can be widely applied and provide tools for assessing levels of biodiversity (Syahza et al., 2020). One of the areas prone to forest and land fires (karthula) this is the province of South Kalimantan.

The governor plays a role in the preparation of Provincial Regulations related to forest and land fires, optimizing BPBD (Regional Disaster Management Agency), requiring agricultural entrepreneurs to have infrastructure and providing sanctions to land burning perpetrators, and allocating budgets for controlling forest fires and land fires in the regions ( Rochmayanto et al., 2021). Meanwhile, the Land and Forest Fire Task Force (Satgas Karhutla) was formed when the situation was in a state of emergency. permanent but only an institution that is usually limited to one year in carrying out its duties (Bakti & Fadlurrahman, 2020).

The forest and land fires task force will generally start working when the forest and land fire alert status is established and end when the forest and land fire emergency status is lifted. This task force is generally under the coordination of the Regional Disaster Management Agency (BPBD) (Ambarita, 2021). , South Kalimantan BPBD needs to make efforts to prevent Karthula regularly and regularly, not only when problems occur. One of the efforts that BPBD can do is through the use of the LAPAN application: Fire Hotspot. LAPAN: Fire Hotspot is a website portal that contains information on hotspots in Indonesia. Based on this background, researchers will conduct a study on the use of the LAPAN application: Fire Hotspot BPBD South Kalimantan Province as one of the BPBD strategies to deal with the Karthula disaster.

## **B. Method**

The research design used by the researcher is a literature review research and field study. This field study was conducted at the Regional Disaster Management Agency in South Kalimantan Province. In addition, this research will conduct an assessment and critique of ideas, scientific findings, knowledge and findings that are scientific in nature and have a contribution to academic orientation. Not only that, this research is expected to be able to contribute both methodically and theoretically to the topics that have been chosen by the researchers. The study that has been carried out

will be carried out with a descriptive analysis. This means that researchers will analyze and describe the problems that occur and develop solutions that can be given and do for now. The approach used is a qualitative approach, so this research is a qualitative descriptive study. Various definitions from experts regarding qualitative research as proposed by Meolong (2013: 6), namely:

Research that intends to understand phenomena about what is experienced by research subjects such as behavior, perceptions, motivations, actions, etc., holistically by means of descriptions in the form of words and language, in a special natural context and by utilizing methods natural.

The aim is to obtain data about facts and issues that have occurred. This study will describe and explain how the efforts of the Regional Disaster Management Agency of South Kalimantan Province in preventing forest and land fires through the LAPAN application: Fire Hotspot.

### C. Results and Discussion

#### 1. Forest and Land Fires in South Kalimantan Province

In the 21st century, the phenomenon of forest and land fires is seen increasingly common not only in mountainous areas (slopes) but also in wetland areas (sloping). Some researchers argue that this condition is related to climate change, forest reduction and massive human activities (Susilawati et al. al., 2018). About 10% of all forest and land fires are caused by natural factors. However, fires that occur as a result of natural causes vary from area to area depending on vegetation, weather, climate and topography. There are only two main natural causes that usually occur namely lightning and volcanic eruptions. Every time lightning strikes, sparks are generated which can start a fire. The type of lightning associated with forest fires is known as hot lightning. It has less current but strikes repeatedly for a longer time(Sarmiasih & Primary, 2019).

Referring to data from the Ministry of Environment and Forestry (KLHK), forest fires in Indonesia in the 2014-2020 period have burned at least 5.7 million hectares of forest and land area. In the last decade, the two worst forest fires occurred in 2015 and 2019, with an area of 2.5 million and 1.5 million hectares of land burned. Forest fires that spread to a wider area will certainly harm not only materially but also environmental losses, especially damage to forest ecosystems. Nationally, the National Disaster Management Agency (BNPB) regarding The World Bank estimates that losses due to forest and land fires in 2019 will reach IDR 75 trillion (Utami & Nazir Salim, 2021). In South Kalimantan alone, the phenomenon of forest and land fires can be seen in table 1. as follows.

**Table 1**

Total Karhutla of South Kalimantan Province in 2018 – 2021

Year	Total Forest and Land Burned (ha)
2018	3.913,17
2019	7.102,03
2020	2.319,94
2021	2.813,45

Source: Recap of Karhutla BPBD South Kalimantan Province 2018 - 2021

In table 1, it is known that the number of forest and land burned in units of hectares in South Kalimantan Province in 2018 - 2021. The figures above illustrate that the burned land is slowly decreasing although there is an increase but not to 7,000 hectares per year which is a the highest number during that time . However, it should be noted that the reduction in the number of fires that occur does not necessarily make the government, especially the provincial government, to be careless in carrying out their duties. The regional government together with the South Kalimantan BPBD Regional Disaster Management Agency must remain vigilant and take strategic steps to tackle and overcome the problem of forest and land fires in South Kalimantan.

## **2. Monitoring of forest and land fires through the use of the Lapan Fire Hotspot Application**

Mastery of Information and Communication Technology (ICT) is very important in the era of globalization. ICTs play an important role in disaster prevention, mitigation, and management. In the digital age, computers are used to access, process, and present information. They are also used to explore intranets (intranets) and international networks (internet), individually or in groups. Berawi et al., 2019).

Forest fire risk is the probability of fire occurrence, related fire behavior, and fire impact. Risk mitigation is achieved when one of the three parameters (probability, behavior and/or impact) is reduced. Forest fire risk has been defined in various ways. However, most of them refers only to the likelihood and behavior of fires and does not consider the expected fire impacts. Recent advances in modeling landscape forest fire behavior have resulted in a number of new tools and approaches for applying risk frameworks to forest fire management problems that allow land managers to estimate all components of fire risk primary forest mentioned above to a number of high value resources located within forest stands and land (Johann Goldammer et al., 2017).

Computer models are now able to perform spatially explicit fire simulations on heterogeneous fuels and map fire behavior characteristics across large landscapes. These approaches have recently been included as a key element for assessing risk in forest fire management. used to support tactical and strategic decisions related to forest fire risk mitigation, post-fire impacts, forest carbon stock estimation, forest restoration, and post-fire soil erosion (Tomar et al., 2021). One strategy that can be done regarding the use of technology and information by the BPBD of South Kalimantan Province is through the use of the LAPAN application: Fire Hotspot.

The extent of forests in Indonesia is one of the challenges in detecting the exact location of forest fires. Satellite imagery data is mostly used to find the location of forest fires because it offers extensive and frequently updated data. The need for spatial information on forest and land fires has grown for a fast response to fire fighting activities and crime investigations(Hayasaka et al., 2020)s. The Indonesian government is increasingly concerned about the high accuracy and frequent availability of early detection of forest and land fires. Over the years, early detection of forest and land fires has been based on the utilization and analysis of data hotspots provided by the National Institute of Aeronautics and Space (LAPAN) based on interpretation of its satellite imagery (Purbahapsari & Batoarung, 2022).

Over the years, early detection of forest and land fires has been carried out using hotspot data provided by the National Aeronautics and Space Administration (LAPAN), based on interpretation of satellite imagery. Hotspot data is very helpful in firefighting

efforts and further law enforcement. this system has several drawbacks, mainly due to its inability to distinguish forest and land fires from other hot surfaces or fires caused by ordinary human activities. In addition, this method also requires labor-intensive verification, and relies heavily on human factors for analysis and level validation. further (Sari et al., 2020).

Currently, the Directorate General of Law Enforcement of the Ministry of Environment and Forestry (Ditjen KLHK) has pioneered a new approach through the advancement of artificial intelligence, called Geospatial Artificial Intelligence (GeoAI). By utilizing satellite imagery data recorded from 2017 - 2019, the machine has been trained to recognize the pattern and tone of the imagery in the burned area so as to validate the presence of the burned area based on the historical Sentinel-2 imagery for the burned area. The Directorate General of KLHK found that data on burned areas processed by GeoAI had better accuracy than the number of hotspots for the identification of forest and land fires. In addition, GeoAI can facilitate the analysis and verification of forest and land fires by automatically overlaying forest areas and company concessions in burned areas (Mora et al., 2019).

GeoAI's innovation in monitoring forest and land fires can produce data for early detection of forest and land fires that is more accurate and complete than current hotspot data. The results of hotspot clustering that detect fires can assist firefighters in extinguishing fires quickly, and support law enforcement officials in determining the exact target location. Thus, GeoAI technology can increase the effectiveness and efficiency of resources allocated by law enforcement officials in providing better and responsive public services (Sepriando et al., 2020).

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## LAPAN: Fire Hotspot APK

**Figure 1.** Lapan Application Face: Hotspot Fire



**Figure 2.** Home Page of Lapan Application: Hotspot Fire

In detail the advantages resulting from the use of the LAPAN Application: Fire Hotspot by the Regional Disaster Management Agency of South Kalimantan Province are as follows.

1. As a dissemination tool for LAPAN: Fire Hotspots can be used as the basis for the government, both Central, Regional and other parties in planning programs and activities aimed at reducing the risk index caused by forest and land fires.
2. As initial information regarding areas and times that are at risk of forest and land fires to occur to dig deeper information/confirmation and coordination with Regency/Municipal BPBDs.
3. As a basis for preparing strategic steps before, during implementation and evaluation in an effort to reduce the fire and forest fire risk index at the regional and national levels.
4. As information that helps BPBD South Kalimantan Province to map the area with the most hotspots.
5. Assist in determining the route for early patrols and land wetting by BPBD of South Kalimantan Province together with related SKPD.
6. Provide the data needed for analysis needs and so on

However, the LAPAN application: Fire Hotspot also has several drawbacks, namely:

1. Unable to be a differentiator in determining forest and land fires caused by human activities with other factors.
2. This application still requires labor-intensive verification, that is, it still requires human assistance in conducting further analysis and validation.
3. Limited availability, which is only available on the Android system while on iOS it is not available.

#### **D. Conclusion**

In this study, it is known that Indonesia is one of the countries that has a very high level of potential for forest and land fires (karhutla) including South Kalimantan Province. Some of the results obtained from this research are:

1. This forest and land fires is not only caused by Indonesia's tropical climate but also by human activities such as land clearing. In fact, these forests and peatlands are the best ecosystems for various flora and fauna as well as a source of world oxygen.
2. Therefore, it is necessary to have an appropriate effort to overcome this karhutla. Indonesia in its strategic step has a Regional Disaster Management Agency (BPBD) in dealing with disasters that occur. However, in the Kahutla phenomenon, the Kahutla Task Force will only be formed when a forest fire disaster occurs. So it is necessary to have countermeasures that can still be monitored at any time. One of them is through the use of the LAPAN application: Fire Hotspot. This application provides various information related to forest and forest fires, starting from disaster statistics, spatial/location planning to the possible timing of forest and land fires.
3. LAPAN: This Fire Hotspot can be used by various groups including the public for disaster information and literacy facilities. Especially for the central, regional and other stakeholders, LAPAN: Fire Hotspot will be very useful if it is used as a tool and media for program planning, implementation and evaluation. Not only that, LAPAN: Fire Hotspot will greatly assist the government in monitoring hotspots for the risk of forest and land fires to prevent the risk of forest and land fires disasters.

Suggestions from researchers for BPBD of South Kalimantan Province should make an application that is fully owned by BPBD related to forest and land fires in South Kalimantan which contains information and coordination of Regency/City BPBD with Provincial BPBD as well as education on handling forest and land fires to be submitted to the wider community as a form of effective and efficient digital-based public service.

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