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ANALYSIS OF HOTSPOT DISTRIBUTION ON LAND USE PATTERNS IN RASAU JAYA DISTRICT IN 2022

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Abstract: Rasau Jaya Sub-District has six villages that experience frequent forest and land fires every year. Forest and land fires are caused by climatic and human factors that have an impact on health, socio-economic locally and globally, as well as damage to land cover vegetation. Forest and land fires can be identified by monitoring hotspots on satellite imagery. This research was conducted to identify the distribution of hotspots on land use patterns in the Kecamatan Rasau Jaya. The method used is quantitative descriptive with overlay analysis method using intersect tools on hotspot maps, land-use, and administrative maps. The distribution of hotspots in the Rasau Jaya District in 2022 is relatively large in the western part of the Rasau Jaya District, namely Pematang Tujuh Village and Bintang Mas Village. The type of land use that has a high potential for forest and land fires is agricultural land with 134 hotspots and 91 land use shrubs. Overall, the villages that have the potential for forest and land fires are Pematang Tujuh Village, Bintang Mas Village, and Rasau Jaya Umum Village.

Keywords: hotspots, land use, forest and land fire

INTRODUCTION

Forest and land fires in Indonesia are a national disaster that often occurs when the dry season arrives. The large islands in Indonesia that experience the most forest and land fires are Kalimantan and Sumatra (Asyrowi, Saharjo, Putra, 2021). The Ministry of Environment and Forestry (KLHK) stated that the area of forest and land fires in Indonesia in 2019 reached around 1,649,258 hectares. The impact of forest and land fires affects various aspects, including health and socio-economic both locally and nationally.

In general, forest and land fires occur due to several main factors, namely human factors and natural factors. Natural factors are considered to be a support for the occurrence of fires because climatic phenomena such as El-Nino in an area can affect the level of drought, the spread of fire, and the availability of oxygen. While the human factor includes fire used in the preparation and/or clearing of agricultural land, plantations, industrial plantation forests, and for transmigration (Arisanty et al, 2020).

In another context, Rozi, Akbar, & Kadaria (2020) argue that communities also use fire as a weapon in land conflicts. Population growth is also considered a driver of land fires due to large-scale land clearing, this occurs because there is population pressure on land needs (Kumalawati, Yuliarti, Anggraeni, & Murliawan, 2021). In addition, the type of vegetation and soil also affect the occurrence of fires.

Organic soil or peat is soil with different characteristics and specifications related to constituent materials, maturity and living environment. The specific characteristics of peat soil are it dries quickly (irreversible drying), easily sinks or collapses (subsidence), has low carrying capacity (bearing capacity), chemical nutrient content and low fertility (nutrients), resistant to pressure, and a limited number of microorganisms (Noor, Masganti , & Agus, 2014). Peat soil will experience an irreversible drying process if the water content is <100% according to weight in general, so that these conditions can make the peat easily burn and easily carried away by water (Widjaja-Adhi, 1988).

According to the Soil Taxonomy, the distribution of peatlands in West Kalimantan includes Pontianak, Mempawah, Sambas, Ketapang, Putussibau, Sintang and Kubu Raya (Soil Survey Staff, 2003). Kubu Raya Regency is the district that has the largest peatland area of the 14 regencies in West Kalimantan with an area percentage of 33.69% or an area of 521,517.52 hectares (BBSLP, 2019). World Agroforestry (ICRAF) said that of the 31 KHG that had burned in West Kalimantan, seven of them were located in Kubu Raya Regency, so that Kubu Raya Regency was considered the Regency with the most extensive burned area. From the seven KHGs in Kubu Raya Regency, one of them is the Sungai Punggur Besar-Kapuas River KHG which consists of villages in the Rasau Jaya District, the Rasau Jaya District and the Sungai Kakap District.

Table 1. Area of Forest and Land Fires 2021-2022

No	Village	Year and Area (ha)	
		2021	2022
1	Rasau Jaya Umum	5.00	17,3
2	Rasau Jaya Satu	-	6,3
3	Rasau Jaya Dua	3.00	-
4	Rasau Jaya Tiga	8.00	-
5	Pematang Tujuh	-	3.00
6	Bintang Mas	7,5	-

Source: DAOPS Manggala Agni

Based on the table above, the largest area of forest and land fires occurred in Rasau Jaya Umum Village with a total of 5 hectares in 2021 and 17.3 hectares in 2022. Meanwhile, the second largest area of forest and land fires was followed by Rasau Jaya Tiga Village in 2021, namely 8 hectares. Forest and land fires can be identified by monitoring hotspots on satellite imagery. Hotspots represent points that have a certain temperature value within a threshold from the interpretation of satellite imagery which is used as an indication of forest and land fires (KLHK, 2018).

The Regional Disaster Management Agency of West Kalimantan Province stated that as many as 26,325 hotspots were spread across West Kalimantan in 2019, one of which was Kubu Raya Regency. This is due to the large area of peat in Kubu Raya Regency, making it has a large potential risk of fire disaster on peatlands, especially in the Sungai Raya and Rasau Jaya Districts. Besides the influence of the characteristics of flammable peatlands, the distribution of hotspots is also influenced by the condition of the land cover pattern (Hidayati, Sutikno, & Qomar, 2022).

If the scattered hotspots are not followed up immediately, they will turn into forest and land fires, especially on hotspots with red dots which means there is a high potential for land fires.

In the case of forest and land fires, hotspots can be monitored via satellite which shows the frequency of fire occurrences (Kunarso et al., 2019). However, monitored hotspots cannot be said to be occurrences of forest and land fires. Therefore, checks can be carried out directly in the field to ensure this. This was done as a form of validation of the occurrence of forest and land fires (Asyrowi, Saharjo, Putra, 2021). Therefore, the focus of this research lies on land use and hotspots, which affect forest and land fires in the District of Rasau Jaya.

This study aims to identify the distribution of hotspots on land use patterns in the District of Rasau Jaya. The distribution of hotspots is expected to be the first step in preventing and controlling forest and land fires in the District of Rasau Jaya.

LITERATURE REVIEW

1. Hotspots

Hotspots are points that represent the temperature in a land use which can be used as a sign of the occurrence of forest and land fires. In the Minister of Environment and Forestry Regulation, hotspots can be interpreted as a pixel that has a temperature value above a certain threshold from remote sensing results, which can be used as an indication of forest and land fires.

Hotspots can also be said to be points in the image shown in red, green and yellow as symbols of high and low temperatures associated with active fire or flames of fire on the earth's surface (Putra et. al, 2018). The distribution of hotspots is also influenced by climatic conditions or rainfall in an area at a certain time (Syaufina, 2008). Currently, information on hotspots can be obtained through remote sensing data (satellite). This information includes an indication of the number and extent of the burned area (Syaufina, Siwi & Nurhayati, 2014). It can be seen that the distribution of hotspots is influenced by rainfall in an area and at a certain time (Syaufina, 2008).

2. Land Use

Land use is a utilization effort that is carried out based on the function of the embodiment of land cover forms. According to Sitorus (2016), land use can be interpreted as the utilization of a plot of land by one or more (multiple) such as grasslands, plantation or agricultural land, forests and others.

One of the aspects of the study of land use relates to the classification of hierarchical forms of land use types. Two types of land use differentiate, the first is the general land use or the major king of land use which is qualitative including irrigated rice fields, dry land, agriculture, and so on, and the second is the type of land use or land utilization type, which is a more detailed level than the general type of use.

In its classification, the National Land Use Database has classified land use into several divisions, including (1) agriculture, (2) forest areas, (3) grasslands, (4) water and wetlands, (5) rocks and coastal soils, (6) mining goods and landfills, (7) recreation, (8) transportation, (9) settlements, (10) public buildings, (11)

industrial and commercial, and (12) vacant land/buildings. Grouping is done based on the similarities between characteristics and certain attribute criteria.

RESEARCH METHODS

This research was conducted in the District of Rasau Jaya, Kubu Raya Regency. The method used in this research is quantitative descriptive research. Descriptive research is research that aims to describe phenomena that occur in a factual and actual manner regarding facts, characteristics and their relationship to the phenomena being studied (Rukajat, 2018). The phenomena that become objects are hotspots and land use patterns using the secondary data overlay method. The population in this study is land in the District of Rasau Jaya, while the sample represents a portion of the population in this study, namely hotspots that are in certain land use patterns. The phenomena that are the object of observation are land use which includes forests, dry land, agriculture, built-up land, shrubs and wet vegetation.

The type of data in this study is secondary data because the phenomena studied include the physical appearance of objects. Field verification tests were carried out as a form of testing the validity of research data. The data used in this study is secondary data including data on the topographical map of Indonesia, hotspot data, forest and land fire area data, and land use data. These data are obtained from published data by third parties or secondary which can be accessed by the general public. The research data used was obtained from official data provider websites (authorized agencies) such as the National Innovation and Research Agency, the Geospatial Information Agency, Manggala Agni and other geospatial data providers.

In mapping the potential for land fire disasters, it is carried out through several stages of spatial analysis including map overlays with the Intersect tool in ArcMap 10.3 on hotspot data, land use data, and administrative boundary data for the District of Rasau Jaya, which is carried out to obtain a map of the distribution of hotspots based on the type of land use in the District of Rasau Jaya. The map indicates the occurrence of forest and land fires that occur in land use so that land use classes that are prone to fires will be identified based on the number of hotspots in the area.

RESULTS AND DISCUSSION

1. Distribution of hot spots in the District of Rasau Jaya

Hotspots in the District of Rasau Jaya in 2022 are spread as a whole with a different number of hotspots in each village. The distribution of hotspots in the District can be seen in more detail in the following table.

Table 2. Distribution of Hot Spots in Rasau Jaya

Village	Hotspot distribution
Bintang Mas	70
Pematang Tujuh	117
Rasau Jaya Dua	16
Rasau Jaya One	36
Rasau Jaya Tiga	1
Rasau Jaya Umum	65
Amount	305

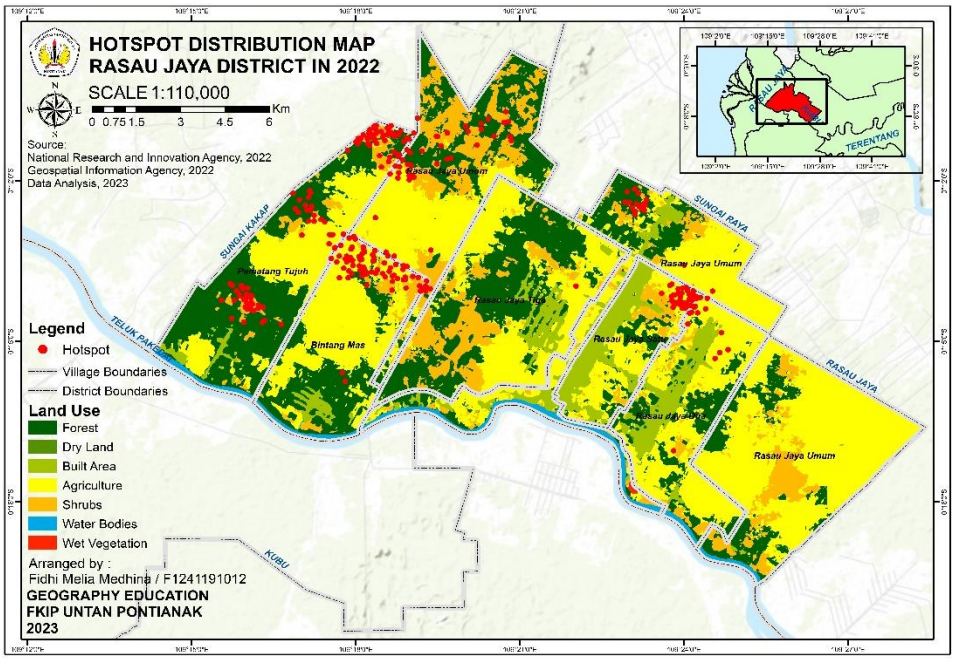
Source: BRIN, 2022

A relatively large collection of hotspots is spread across the western part of the District of Rasau Jaya which includes Pematang Tujuh Village with 117 hotspots and Bintang Mas Village with 70 hotspots. Furthermore, hotspots are spread in the Village of Rasau Jaya Umum with a total of 65 hotspots, Rasau Jaya Satu Village is 36 points, Rasau Jaya Dua Village is 16 points and the least is the Village of Rasau Jaya Tiga 1 point.

2. Distribution of Hotspots Based on Land Use

The results of the analysis using the overlay intersect method in 2022 obtained 7 classes of land use in Rasau Jaya District, including forest, dry land, built-up land, agriculture, shrubs, rivers or water bodies and wet vegetation. The results of the land use map overlay and the distribution of hotspots can be seen in the following figure.

Figure 1. Map of Distribution of Hotspots in the District of Rasau Jaya in 2022



The forest and land fires that often occur in the District of Rasau Jaya is strongly influenced by the type of land use or vegetation that covers the land. Different types of land use also have a big influence on how difficult or easy the land is to burn. The most dominant types of land use in the District of Rasau Jaya include agricultural land, forest, built-up land and shrubs. This is in line with research by Antomi (2019) which states that the distribution of hotspots in vulnerable areas is found in land cover in the form of plantations, dry land agriculture, shrubs/shrubs, mixed dry land agriculture and open land cover.

The results of the analysis of hotspots map distribution based on land use obtained the highest number of hotspots, namely 117 points located in Pematang Tujuh Village, which are spread across forest land use, agriculture and shrubs. This is in line with research by Syaufina & Hafni (2018) which states that unproductive swamp scrubland and vacant

land have a high chance of forest and land fires. A total of 70 points in Bintang Mas Village are spread over land use in the form of forest, agricultural land and shrubs, 65 points in the General Rasau Jaya Village covering the use of forest land, agricultural land and shrubs, 36 points in the Village of Rasau Jaya Satu and 16 points in the Village Rasau Jaya Dua is spread over the use of agricultural land and shrubs, while 1 point in the village of Rasau Jaya Tiga is spread over the use of agricultural land.

CONCLUSION

The distribution of hotspots in Rasau Jaya District in 2022 is spread throughout all villages. A collection of hotspots is relatively widely spread in the western part of the District of Rasau Jaya, namely Pematang Tujuh Village and Bintang Mas Village. The type of land use that has the potential for forest and land fires is agricultural land with a total of 134 hotspots and 91 shrubs. Overall, the villages that have the potential for forest and land fires are Pematang Tujuh, Bintang Mas, and Rasau Jaya Umum villages.

Further research can be carried out with different variables but still on the same research object. Forest and land fire prevention activities should be emphasized in areas with fire indications based on land use as a result of the analysis in this study. In addition, hotspot monitoring activities through satellite imagery can be increased again as a form of effort to reduce hotspots and prevent forest and land fires.

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