Spatial Analysis of 2019 Peat Fire in South Sumatra Conservation Area

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Abstract. In 2019, Indonesia seasoned another haze disaster due to peat fires. In the South Sumatra province, fires occurred in most of the peatland areas. The research aims to identify peat fires that occur in protected forest areas in The South Sumatra. The boundary of the protected forest area is obtained from the Forest Department of South Sumatra Province. Meanwhile, the fire events in the study area were analyzed by the hotspot distributions data during the dry season 2019 (Juni-November). The identification of fires (hotspot data) on the peat area uses peat distribution data from the Indonesian Ministry of Environment and Forestry. The geographic information system technique with a spatial analysis method is used in this research. The identification results show that only a small part of the peatland in the study area has the status of protected forest areas. Most of the protected forests in the South Sumatra peat area burned in 2019. The results of this study indicate that the natural conditions of the peat ecosystem in protected forest areas have been degraded due to fire events. On the other hand, peat fires in protected forest areas indicate human activity for resource use and land use in the area.

Keywords: Peat fire, Hotspot, Protected Forest, Peatland

1. Introduction

Peatlands found in Southeast Asia are mainly concentrated on the island of Sumatra and the island of Kalimantan [1]. Peat fires have a negative impact on various aspects of life such as the environment, economy and health. This is due to the important role that peat plays, one of which is a carbon stock. So that changes that occur in peatlands will have an impact on life on earth [2]. Emissions from land fires as a result of land use change will have an impact on air quality and climate [3]. For example, peat fires were a major contributor to the phenomenon of air pollution and photochemical smog in Indonesia between 2001-2010 [4]. Tropical peatland fires in Indonesia caused by illegal human activity, such as land clearing for agriculture, and caused of peatland to be drier and susceptible to fire when the dry season comes [5]. This study aim is identify peat fires that occur in protected forest areas in The South Sumatra of 2019 peat fire.
2. Method

2.1 Study Area

The focus of the study is in South Sumatra’s peatlands that located in several conservation area. As it is well known that not all peat is in conservation areas.

2.2 Data and Method

By using one of the GIS techniques, namely the spatial overlay method, several data were analyzed. The data obtained is mainly in the form of maps from central and local government of South Sumatera province. Table 1 shows the data used in this study and their sources.

| Data                  | Periods          | Source                                                                 | Resolution         |
|-----------------------|------------------|------------------------------------------------------------------------|--------------------|
| Peat Distribution     | 2017             | Indonesian Ministry of Environment and Forestry                        |                    |
| Hotspot               | June-Nov 2019    | Fire Information for Resource Management System (FIRMS)                | 1 km for MODIS     |
|                       |                  | [https://firms.modaps.eosdis.nasa.gov](https://firms.modaps.eosdis.nasa.gov) | 0.375 km for VIIRS |
| Conservation area     | 2013             | Forestry office of South Sumatera Province                             |                    |

3. Results and Discussion

In this study we determined the location of peatland area that burned in South Sumatera Province. First we identified peatland that located in conservation area by using spatial overlay technique. Map of peat distribution data from Indonesian Ministry of Environment and Forestry was overlayed with conservation area map from Forestry office of South Sumatera Province. Figure 1 shows the result of the overlayed map.
Figure 1. Peatland located in conservation area of South Sumatera Province

The grey color represent the peatland area in South Sumatera Province. Meanwhile the green color represent the peatland that located in conservation area. From analyzing the map it can be known that peatland in South Sumatera Province is located in several conservation area. They are:

- Suaka margasatwa (SM) or wildlife reserve Padang Sugihan;
- Taman nasional (TN) or Sembilang national park; and
- Hutan lindung (HL) or protected forest.

Next, by using the same technique, the fire events in the study area were analyzed by the hotspot distributions data during the dry season 2019 (June to November). The identification of fires (hotspot data) on the peat area uses peat distribution data from the Indonesian Ministry of Environment and Forestry and hotspot data from Fire Information for Resource Management System (FIRMS). The result shown in Figure 2.
Figure 2. Peatland Hotspot distribution in conservation area of South Sumatera Province

The red color represents hotspot of fire that occurred in peat conservation area. The largest number of hotspot in peat conservation area are found in Suaka Margasatwa Padang Sugihan with 2,817 hotspot. Then Taman nasional Sembilang with 1,440 hotspot and hutan lindung with 83 spread of hotspot. From the analysis it is known that there are more hotspot density (per 1,000 hectare) in Taman nasional Sembilang than in Suaka Margasatwa Padang Sugihan. Table 2 show the data of hotspot distribution and hotspot density in peat conservation area in South Sumatera Province.

Table 2. hotspot distribution and hotspot density in peat conservation area in South Sumatera Province

| Conservation Area     | Hotspot | Areas (Ha)     | Hotspot Density (per 1000 Ha) |
|-----------------------|---------|----------------|-------------------------------|
| SM Padang Sugihan     | 2817    | 87706,02       | 32                            |
| TN Sembilang          | 1440    | 41097,33       | 35                            |
| HL Sumatera Selatan   | 83      | 73844,64       | 1                             |
| **TOTAL**             | **4340**| **202647,99**  | **21**                        |

Conservation area is an area where the activities that can be done in it are very limited. It also applied in peat conservation area. As we know that the number of hotspot is one of indicator of peat fire that happen in some area [6]. The incidence of fires is closely related to land use change. It is mainly because fire is one of the causes of land degradation [7]. It is possible that one of the causes of fires in peatlands is due to human activities in protected areas.
Research by Dohong et al [8] shows that some of the causes of peatland degradation in South-East Asia are logging, land use change to industrial plantation, draining peat with drainage, and peat fires. The problem of land use change itself is a real problem for the sustainability of the existence of peatlands. A study by Elz et al [9] shows that under the BAU scenario, the area of peat swamp in Jambi province will decrease by 37% in the next 30 years. The same thing is not impossible to happen to peat in conservation areas in South Sumatra province.

4. Conclusion
The results showed that in 2019 peat in the protected areas of South Sumatra Province were burned. The biggest fire during the observation period took place at Padang Sugihan Wildlife Reserve with 2,817 hotspots, while the densest hotspot distribution was in Sembilang National Park with 35 hotspots per 1,000 hectare.

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