Community perceptions and conceptions of the impact of forest and land fires in Bengkalis Regency, Riau Province

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Abstract. Forest and land fires have a very bad impact on the economic, social, health and ecological sectors. Forest and land fires in Bengkalis Regency are influenced by several factors, including human Negligence, and land contour factors, according to BPPT 69.69% of the Bengkalis area is a peat area that is prone to decreasing water levels causing drought. Drought on peatlands triggers forest and land fires in the dry season. This research was conducted to determine the community's perception and conception of the impact of forest and land fires. Primary data and research information were obtained through observation and interviews. The research sample was obtained from 12 villages from 4 sub-districts in Bengkalis Regency, the names of the villages are Bukit Kerikil, Tanjung Leban, Sepahat, Temiang, Bad Bakul, Dompas, Muara Dua, Bandar Jaya, Sumber Jaya, Tasik Serai Barat, East Serai Lake, Cliff Lake. Lemongrass. Respondents who have been interviewed as many as 120 people. Data analysis was done descriptively. From the interviews conducted, it was found that the public perception was quite high. Communities understand that their participation in and monitoring of forest and land use is critical to reducing forest and land fires.

1. Introduction
Forest fires are one of the environmental problems that often occur so that they become local and global concerns [1]. Forest and land fires are one of the contributors to the forestry sector's carbon emissions. According to the Copernicus Atmosphere Monitoring Service (CAMS) of the European Union, forest and land fires in Indonesia have released 709 million tons of carbon dioxide into the air. This amount is equivalent to Canada's annual carbon dioxide emissions [1].

Forest and land fires also have a serious impact on the destruction of ecosystems and loss of biodiversity on the island of Sumatra. LIPI noted, the island of Sumatra has 8,931 types of flora and 1891 are endemic flora. Referring to the 1998 fires, forest and land fires resulted in 90 percent of trees per hectare or 204 trees dying due to fires [2].

Riau is the 5th largest contributor to forest and land fires in Indonesia with an area of 418619.46 ha of fires in a certain period of time. As of September 2019, the number of hotspots in the province reached 1616 points. One of the regencies that often occurs in forest and land fires in the Riau Province of the region is Bengkalis Regency, both mainland Bengkalis and the Bengkalis archipelago.
Forest fires are one of the causes of reduced quality of natural ecosystems, such as damage to forest land and vegetation [3]. Changes in the composition of forest ecosystems [4], and plant physiology [5]. The threat of loss of natural habitat for animals and the destruction of biodiversity is getting bigger, because forest fires cause 80% of terrestrial animal species living in forests to be threatened with extinction, forests and land require a very long recovery period of 30-50 years. Forest and land fires cause a significant increase in greenhouse gas emissions [5].

On this background research is needed perception and conception of society, to see how the public perception of control of land and forest fires, as well as the impacts of land and forest fires, the information will be through the study of perception in the form of data age, occupation, knowledge menganai penyebab fire, land management, and how to handle it can be a reference for handling forest and land fires.

1.1. Research site conditions

The area of Bengkalis Regency has a topography which is generally low land, the height only reaches 2 - 6.1 meters above sea level, with the composition of the soil mostly organosol material, namely soil that contains a lot of organic elements. There are rivers, lakes (Tasik) and 26 islands with large islands such as Rupat Island (1,524.85 km²), Tebing Tinggi Island (1,436.88 km²), Padang Island and Merbabu Island (1,348.91 km²), Bengkalis Island (938.40 km²) and Pulau Ranggah (922.10 km²). The area is dominated by peatlands whose thickness is (>200 cm) with a percentage of 80% [6] (Bengkalis dalam angka, 2018).

The sample villages taken were 12 villages from 4 sub-districts, which are rings one, two, and three forest and land fires (Manggala Agni Daops Siak, 2019). Bandar Lasmana sub-district with the villages of Bukit Pebble, Tanjung Leban, Sepahat and Timiang, Bukit Batu District with Villages, Bad Bakul and Dompas. Siak Kecil sub-district with villages, Muara Dua, Bandar Jaya, and Sumber Jaya. Talang Mandau District with villages, West Serai Lake, East Serai Lake, and Serai Cliff Lake.

The villages where this research is located are mostly plantations or HTI, villages such as Temiang, Bukit Kerikil, Bandar Jaya, Sepahat are crossed by large rivers, and bordered by beaches, there are also villages that have lakes or lakes. The soil contour in the research villages is dominated by peat soil. The majority of the people in the research location work as oil palm farmers, plantation workers, and fishermen.

The research location is located directly adjacent to the Giam Siak Kecil Wildlife Sanctuary (GSK)-Bukit Batu, GSK-Bukit Batu is a Biosphere reserve area which is the habitat of many rare flora and fauna that are threatened with extinction such as the Sumatran tiger (Panthera tigris sumatrae), leopard (Panthera tigris sumatrae), and the leopard (Panthera tigris sumatrae). Neofelis nebulosa), binturong or cat bear (Arctictis binturong), sun bear (Helarctos malayanus), gibbon (Hylobates syndactylus), pangolin (Manis javanica), tapir (Tapirus indicus) and various endangered tree species (BBKSDA Riau 2019)

2. Research methods

The research location is in Bengkalis Regency, Riau Province. The sample of villages taken was 12 villages from 4 sub-districts, Bandar Lasmana District and Bukit Kerikil, Tanjung Leban, Sepahat and Temiang villages, Bukit Batu District with villages, Bad Bakul and Dompas. Siak Kecil sub-district with villages, Muara Dua, Bandar Jaya, and Sumber Jaya. Talang Mandau District with villages, West Serai Lake, East Serai Lake, and Serai Cliff Lake.

The tools used in this research are GPS (Global Positioning System), Sony cyber shoot pro-summer camera, Sony ICD PX240 Digital Voice Recorder voice recorder, interview guide, observation guide, observation sheet, questionnaire sheet, and stationery. The materials used in this study include data on general conditions in Bengkalis Regency and data on forest and land fires in Bengkalis Regency, Microsoft Word, Microsoft Excel, and SPSS 28.0 programs.

Determination of the research location is done by purposive sampling. Interviews were conducted with people from twelve villages, consisting of village officials and community leaders. The selected
communities have good knowledge about forest and land fires and forest use. Respondents were determined by *purposive sampling* with key informants with 10 respondents in each village. The determination of respondents was based on the community who were directly involved in forest use or directly involved in handling fires [7], had experience in managing plantations and forest use for more than 10 years [8], and had productive age over 18 years [9].

Analysis of the data and characteristics of respondents obtained from the interviews, tabulated using SPSS 28.0 and explained descriptively. Data analysis of community perceptions of forests in Bengkalis Regency will be done by tabulation using SPSS 28.0 and will be explained descriptively. Analysis of community perception data on forest and land fire control will be done by tabulation using SPSS 28.0 and then explained descriptively. Each will be explained and described regarding the relationship of each data obtained presented through tables and paragraphs. The measurement of the meaness of the relationship between variables was used *Spearman’s test*. *Spearman* correlation test is a statistical test used to determine the relationship between variables [10].

3. Results and discussion

3.1. Fire frequency

Bengkalis Regency is a Regency that often experiences forest and land fires, this incident keeps repeating itself every year.

| No | Regency       | 2015 Large (ha) | 2015 % | 2016 Large (ha) | 2016 % | 2017 Large (ha) | 2017 % | 2018 Large (ha) | 2018 % | 2019 Large (ha) | 2019 % |
|----|---------------|-----------------|--------|-----------------|--------|-----------------|--------|-----------------|--------|-----------------|--------|
| 1  | Bengkalis     | 36              | 0.07   | 97              | 0.19   | 28.5            | 0.05   | 25.5            | 0.05   | 170             | 0.33   |
| 2  | Bantan        | 48.7            | 0.11   | 252             | 0.59   | 0.5             | 0.01   | 2               | 0.01   | 155             | 0.36   |
| 3  | Bukit Batu    | 34              | 0.02   | 169             | 0.35   | 0               | 0      | 3               | 0.01   | 44.5            | 0.09   |
| 4  | Siak Kecil    | 15.7            | 0.02   | 111             | 0.15   | 56              | 0.07   | 12              | 0.02   | 107             | 0.14   |
| 5  | Bandar Lasmana| 0               | 0      | 0               | 0      | 15.1            | 0.02   | 25.7            | 0.04   | 60              | 0.09   |
| 6  | Mandau        | 118             | 0.65   | 211             | 1.17   | 33              | 0.18   | 41              | 0.23   | 36              | 0.02   |
| 7  | Bathin Solapan| 0               | 0      | 0               | 0      | 44.5            | 0.06   | 114             | 0.15   | 205.5           | 0.27   |
| 8  | Talang Mandau | 0               | 0      | 0               | 0      | 0               | 0      | 32              | 0.04   | 105             | 0.09   |
| 9  | Pinggir       | 159             | 0.12   | 286             | 0.21   | 12              | 0.01   | 1.5             | 0.01   | 130.2           | 0.01   |
| 10 | Rupat         | 325             | 0.92   | 216             | 0.24   | 16              | 0.02   | 78              | 0.09   | 1,144           | 1.28   |
|    | Total         | 1,236.40        | 1.342  | 205.6           | 2.33   |

The fire incident in 2019 was the largest fire with 2,157.2 ha, while the fire with the smallest area occurred in 2017 which was 205.6 ha. This is due to the large number of human activities, both in land clearing or land *clearing* by intentionally burning *Merun*, although the location of the burning is relatively small, but the summer is windy and the majority of the land is peat soil, making sparks easily spread and will be difficult to extinguish. Lack of human resources, both officers and the community under supervision, even though the dry season starts from June to November, the fires have started from January.

In addition to this, there are other factors that cause forest and land fires, namely the construction of large canals by companies for irrigating oil palm plantations or acacia plantations, these large canals cause drought in the surrounding area, the long summer that occurs makes the litter on the forest floor dry and fuel becomes abundant. Based on data obtained from fire incidents in Bengkalis Regency, fires often occur in shrubs, neglected land, oil palm plantation areas.

3.2. Characteristics of respondents

Based on table 1, it can be seen that the productive age group that is the respondent in Bengkalis Regency is dominated by the age of 20-39 years as much as 50%. From the 12 research villages, the age group of
respondents was 20-39, the age group most often found in this age group working as laborers, farmers, or employees in the village. Meanwhile, in the sample villages, there were no respondents with an age class > 80 years.

Based on table 2, it can be seen that the dominance of education in Bengkalis Regency is different. The district is dominated by respondents with high school education, as many as 62 respondents or 50.82%, then second place is occupied by junior high school education or the equivalent, which is 21 respondents or 17.21%, Bachelor level, which is 18 respondents or 14.75%, elementary school level which is 16 respondents or 13.11% and not in school totaling 5 respondents or 4.10%.

Based on table 3, it can be seen that Bengkalis Regency is dominated by respondents with moderate income (Rp 1,000,000-Rp 2,000,000) with a total of 53 respondents or 43.44%, with the majority working as farmers, and in the service sector such as plantation workers.

### Table 2. Distribution of respondents by age at the study site.

| No. | Age            | Number (Soul) | %   |
|-----|----------------|---------------|-----|
| 1.  | (<20) years    | 7             | 5,737 |
| 2.  | (20-39) years  | 61            | 50  |
| 3.  | (40-59 years old) | 53            | 43.44 |
| 4.  | (60-79) years  | 1             | 0.8 |
| 5.  | (>80) years    | 0             | 0   |

**Total** 122 100

### Table 3. Distribution of respondents based on the level of formal education in the research location.

| No. | Education                  | Number (Soul) | %   |
|-----|-----------------------------|---------------|-----|
| 1.  | No school                   | 5             | 4.10 |
| 2.  | Elementary school (SD)      | 16            | 13.11 |
| 3.  | Junior High School (SMP)    | 21            | 17.21 |
| 4.  | High School (SMA)           | 62            | 50.82 |
| 5.  | College                     | 18            | 14.75 |

**Total** 122 100

### Table 4. Distribution of respondents based on income level at the research site.

| No. | Income            | Number (Soul) | %   |
|-----|-------------------|---------------|-----|
| 1.  | <500,000          | 6             | 4.92 |
| 2.  | 500,000-1,000,000 | 34            | 27.87 |
| 3.  | 1,000,000-2,000,000 | 53            | 43.44 |
| 4.  | 2,000,000-3,000,000 | 11            | 9.02 |
| 5.  | 3,000,000-5,000,000 | 13            | 10.66 |
| 6.  | >5,000,000        | 5             | 4.10 |

**Total** 122 100

### 3.3. Community perceptions and conceptions of forests in Bengkalis District

Based on interviews conducted with people in Bengkalis, with a sample of 12 villages and the respondent as many as 122 with a percentage of 67% have a high perception of the existence of forest in Bengkalis (Figure 1). This perception arises because the community feels the benefits of the existence of the forest. Respondents think that the forest in Bengkalis Regency is decreasing in size, which causes drought, water and air quality to get worse. The community is starting to know that protecting and preserving the forest is a shared responsibility. As many as 15 respondents with a percentage of 12% have a moderate level of perception, the community has not felt the benefits of the existence of the forest.
forest, because the existing forest is categorized into protected forest and industrial plantation forest. They realize that protecting this forest is necessary, but they don't know how to do it properly. 12 respondents have a low perception and 1 person has a very low perception, with a percentage of 9.92% of respondents arguing that agricultural land is more profitable than forests, this community believes that protecting forests is the responsibility of the government alone.

![Figure 1. Community perceptions of forests in Bengkalis Regency.](source: 2019 primary data processing)

It can be seen (Figure 2) that the community has a high level of perception of forest and land fires in Bengkalis Regency. The majority of respondents are aware that burning forest and land is an act that will be detrimental and such activities should be prohibited. The community understands that their participation and supervision of forest and land use is very important so as not to be misused by certain elements.

![Figure 2. Community perceptions regarding the prohibition of burning forest and land in 12 sample villages in Bengkalis Regency.](source: primary screening, 2019)

The 12 sample villages, these villages are ring 1 and ring 2 for forest and land fires, meaning that the village has a high intensity of fires. The fires started with the onset of the dry season between June
and November, but in several villages such as Sumber Jaya, Bukit Pebble and Sungai Linau, the fires started from early January with low intensity and continued to recur. Respondents in 12 villages generally know the causes of forest and land fires. Some of the respondents admitted that they had burned while clearing or clearing land.

4. Conclusions and suggestions

4.1. Conclusion
The level of public perception of forest and land fires and its control is already high, based on the scoring results of the assessment, 90 out of 120 respondents are aware of the dangers of forest and land fires, 82 of 120 respondents have high perceptions of forests. People are starting to understand the importance of forests.

4.2. Suggestions
- In an effort to control forest and land fires, the government through several related institutions must continue to disseminate information about the causes, impacts, and government regulations related to forest and land fires.
- Bengkalis is a district that has a fairly high productive age, 90% of respondents are of productive age. The government’s focus on tackling forest and land fires is in the productive age group. Activities to tackle forest and land fires can be in the form of counseling, training and supervision.

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