



Hotspots Invasion: Review of the 2019 Forest and Land Fires and Fire-Prone Area of 2020

May 2020

Ten Main Findings

1. **The majority of land burned in 2019 is non-forested land**, the largest of which is swamp bush/shrub with 538,742.99 hectares, followed by savanna with 179,978.19 hectares, and plantations with 159,656.90 hectares. Compared to non-forested land, the size of burned natural forests is relatively small, which is 74,997 hectares or 4.6 percent of the total burned area in 2019. Intact natural forests must be preserved to prevent fires during dry seasons because cleared or degraded forest are more vulnerable to fires, especially in peat ecosystem.
2. **Forty-four percent (44 percent) of fires in 2019 affected peat ecosystem** with a significant size of 727.972 hectares. The majority of burned peat ecosystem (54.71 percent) is peat ecosystem with protection function (*Fungsi Lindung Ekosistem Gambut/FLEG*). Fires in peat ecosystem are dangerous because they are very difficult to extinguish and cause a significant amount of carbon pollution (greenhouse gas emissions), way greater than fires in mineral land. Fires in peat ecosystem also generate toxic haze that is very harmful to human health.
3. **More than 1 million hectares (63.28 percent) of burned area in 2019 are newly burned areas** that had never burned before since 2015. Most of these new fires occurred in Central Kalimantan with 202,486.86 hectares, followed by South Sumatera with 185,125.12 hectares and West Kalimantan with 125,058.60 hectares. The three provinces also saw the highest rate of planted palm oil area increase in the 2015-2018 period, the highest being in West Kalimantan with 129,471 hectares per year, followed by Central Kalimantan with 123,444 hectares per year, and South Sumatera with 78,607 hectares per year. This indicates a correlation between the high expansion rate of planted palm oil area and the size of newly burned area in the three provinces.
4. **South Sumatera and Central Kalimantan were the most affected provinces with the largest burned area** in 2019, amounting to 40.12 percent of the total burned area. Both provinces have a significant size of peat ecosystem and are priority provinces for peatland restoration in the period of 2016-2020. At the district level, five districts were the most affected by fires, namely Ogan Komering Ilir (South Sumatera), Merauke (Papua), Ketapang (West Kalimantan), Pulang Pisau (Central Kalimantan), and Kapuas (Central Kalimantan).
5. **The 2019 fires mainly occurred in the forest zone (54.88 percent)**. The majority of fires in the forest zone occurred in production forest (classified further into permanent, limited, and conversion production forests), which constitutes 61.5 percent of the total burned area in the forest zone. However, fires also affected

conservation and protected forest zones with 25.2 percent and 13.3 percent respectively. The majority of fires in production forest (58.97 percent) occurred in areas encumbered by large-scale permits or concessions, especially palm oil, industrial timber plantation /IUPHHK-HT, and logging/IUPHHK-HA permits. Among the three types of permits/concessions, the largest burned area was found in industrial timber plantations (51.57 percent). Most of the fires in production forest affected peat ecosystem (51.44 percent), slightly larger in peat ecosystem with cultivation function (FBEG) than in peat ecosystem with protection function (FLEG).

6. **Despite of its status as protected area, fires still affected the 2019 moratorium area (PIPIB)** amounting to 31.35 percent of the total burned area. Most of the fires in the moratorium area affected peat ecosystem (64.41 percent), the majority of which was protected peat (FLEG). The majority of burned area inside the moratorium map (53.23 percent) is adjacent to and or overlapping with palm oil and industrial timber plantation permits/IUPHHK-HT. Based on land cover type, most of the fires inside the moratorium area (65.84 percent) affected non-forested land.
7. **Eight percent (8 percent) of the 2019 fires occurred inside the indicative social forestry area (PIAPS)**. Fires inside PIAPS may have been linked to the proximity to plantation and forestry permits/concessions. More than 37 percent of PIAPS is adjacent to and or overlapping with plantation and forestry permits/concessions, especially palm oil and industrial timber plantations. This finding is in line with the study of Truly et al. (2020), which suggests that approximately 40 percent of the area under the Social Forestry scheme is located near palm oil and industrial timber plantation permits/concessions.¹ Fifty-seven percent (57.46 percent) fires in PIAPS were also adjacent to palm oil and industrial timber plantations.
8. **Among palm oil plantation, industrial timber plantation (IUPHHK HT), and logging (IUPHHK HA), the largest burned area is found inside palm oil plantation permits with 217,497 hectares, followed by industrial timber plantation permits (IUPHHK HT) with 190,831 hectares, and logging permits (IUPHHK HA) with 30,813 hectares.** Most of the fires in palm oil plantation permits occurred in peat ecosystem (59.66 percent), most of which in peat ecosystem with cultivation function (FBEG). The size of burned area in peat ecosystem inside timber plantation permits is smaller but still significant with 38.66 percent, mostly also found in peat ecosystem with cultivation function (FBEG).
9. **Five provinces with the largest size of Fire-Prone Areas (“FPA”) require special attention and early preventive measures to minimize forest and land fires,** namely Central Kalimantan with 12,841,157.58 hectares, West Kalimantan with

¹ Santika, Truly., Struebig, Matthew., Budiharta, Sugeng. 2020. *Riset: Perhutanan Sosial di Indonesia Mampu Lindungi Lingkungan dan Turunkan Tingkat Kemiskinan*. Accessed from <https://theconversation.com/riset-perhutanan-sosial-di-indonesia-mampu-lindungi-lingkungan-dan-turunkan-tingkat-kemiskinan-130607> on April 21, 2020

11,278,709.32 hectares, Papua with 10,796,019.78 hectares, East Kalimantan with 9,529,942.71 hectares, and South Sumatera with 8,251,872.47 hectares.

10. **From January - March 2020, 12,488 hotspots were recorded in Indonesia with a Potential Burned Area ("PBA") of 42,312.44 hectares.** Three provinces with the largest size of Potential Burned Area are Riau, Riau Islands, and North Sumatra with 16,728 hectares, 3,550 hectares, and 3,235 hectares respectively.

1. Introduction

Forest and land fires threaten to undermine the achievement of Indonesia's climate commitment. From 2010 to 2017, peatland fires were one of the top three major contributors of greenhouse gas emissions from forest and land sector and were the largest contributor in 2014 and 2015.² Forest and land fires result in a toxic haze disaster, which causes various respiratory problems and even premature death³ of millions of Indonesians as well as diplomatic tension with the neighbouring countries.⁴ In 2019, forest and land fires in Indonesia burned 1.6 million hectares of land, the second most devastating in the last five years since the 2015 Great Fires.

As a civil society organization that supports governance improvement in forest and land sector, Yayasan Madani Berkelanjutan has a mission to bridge information among stakeholders to ensure the achievement of Indonesia's climate commitment and economic development without destroying the environment, especially forests. One of the strategic measures to achieve them is by stopping forest and land fires through early warning and prevention. This study presents a review of the 2019 forest and land fires, a model of Fire-Prone Area of 2020, and an estimate of Potential Burned Area of 2020 based on the observation of hotspots distribution during the period of January - March 2020.

From the review, we discovered with concern that there were more than 1 million hectares of newly burned area in 2019. From our modelling of Fire-Prone Area, there are corridors and areas in 5 provinces that require special attention and optimum precaution. Finally, from the 2020 Potential Burned Area model, there are three provinces with the largest Potential Burned Area with the total size of 42 thousand hectares in the period of January to March 2020.

² The Presentation of the Director of Greenhouse Gas Inventory and MRV, the Directorate General of Climate Change, "Peran Non-Party Stakeholders dalam Inventarisasi GRK," presented on April 4, 2019.

³ Leah Burrows, "Haze from 2015 Indonesian fires may have caused 100,000 premature deaths | Harvard John A. Paulson School of Engineering and Applied Sciences," accessed from <https://www.seas.harvard.edu/news/2016/09/haze-2015-indonesian-fires-may-have-caused-100000-premature-deaths> on May 8, 2020.

⁴ Yudono Yanuar, "Malaysia-Singapura Protes Asap, Menteri Siti: Tak Hanya dari Sini," accessed from <https://tekno.tempo.co/read/1246486/malaysia-singapura-protas-asap-menteri-siti-tak-hanya-dari-sini> on May 8, 2020.

2. Review of the 2019 Forest and Land Fires

2.1 Most of the Fires in 2019 Affected Non-Forested Land

Most of the fires that happened in 2019 burned lands categorized as shrubs or swamp bushes with an estimated size of 538,742 hectares or 32.67 percent of the total burned area. The second largest burned area is savanna with 179,978 hectares or 10.91 percent and the third largest is plantations with 159,656 hectares or 9.68 percent (see figure 1).

Compared to non-forested land, the size of burned natural forests is relatively small, which is 74,997 hectares or 4.6 percent of the total burned area in 2019. Most of fires in natural forests burned secondary forests with 69,568 hectares (92.8 percent). Meanwhile, burned area in primary natural forest is much smaller, namely 5,428 hectares or only 7.2 percent. This shows that intact natural forest cover can keep the land from fires, even in a very dry season. In contrast, cleared land or degraded forests are more likely to burn in the dry season, especially in peat ecosystem.

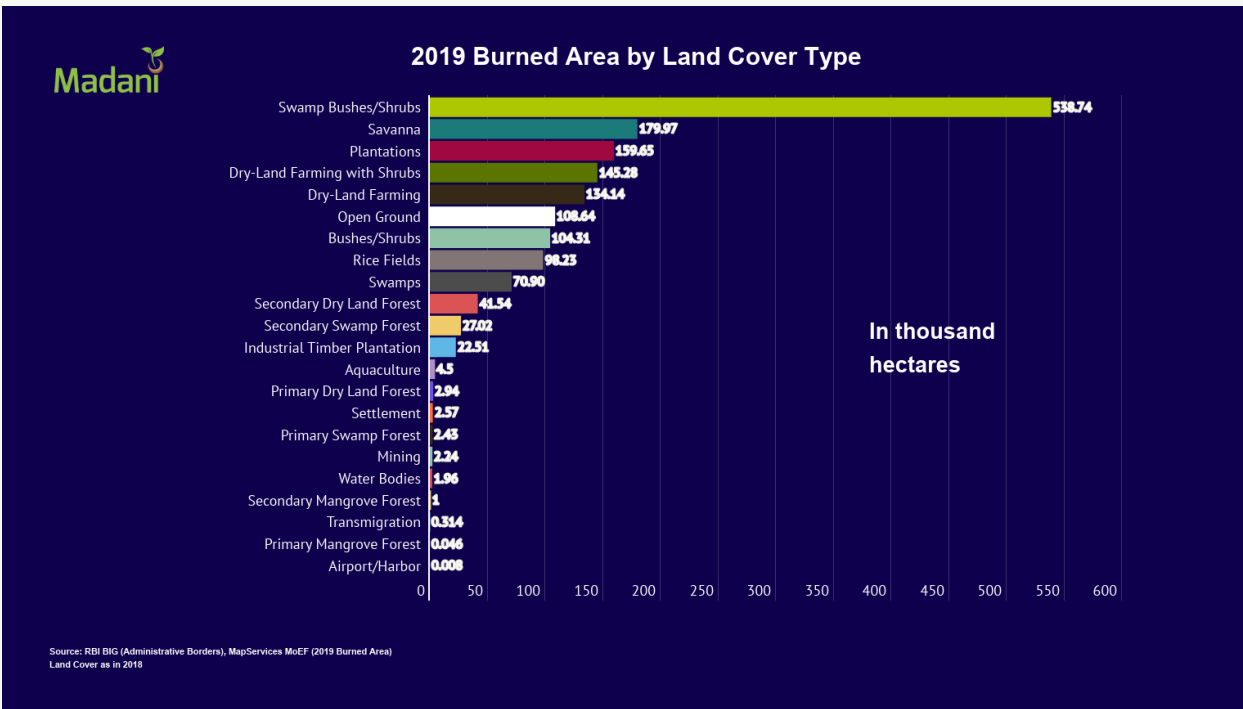


Figure 1. 2019 Burned Area by Land Cover Type

2.2 Forty-four Percent (44%) of the 2019 Fires Affected Peat Ecosystem, Mostly Protected Peat

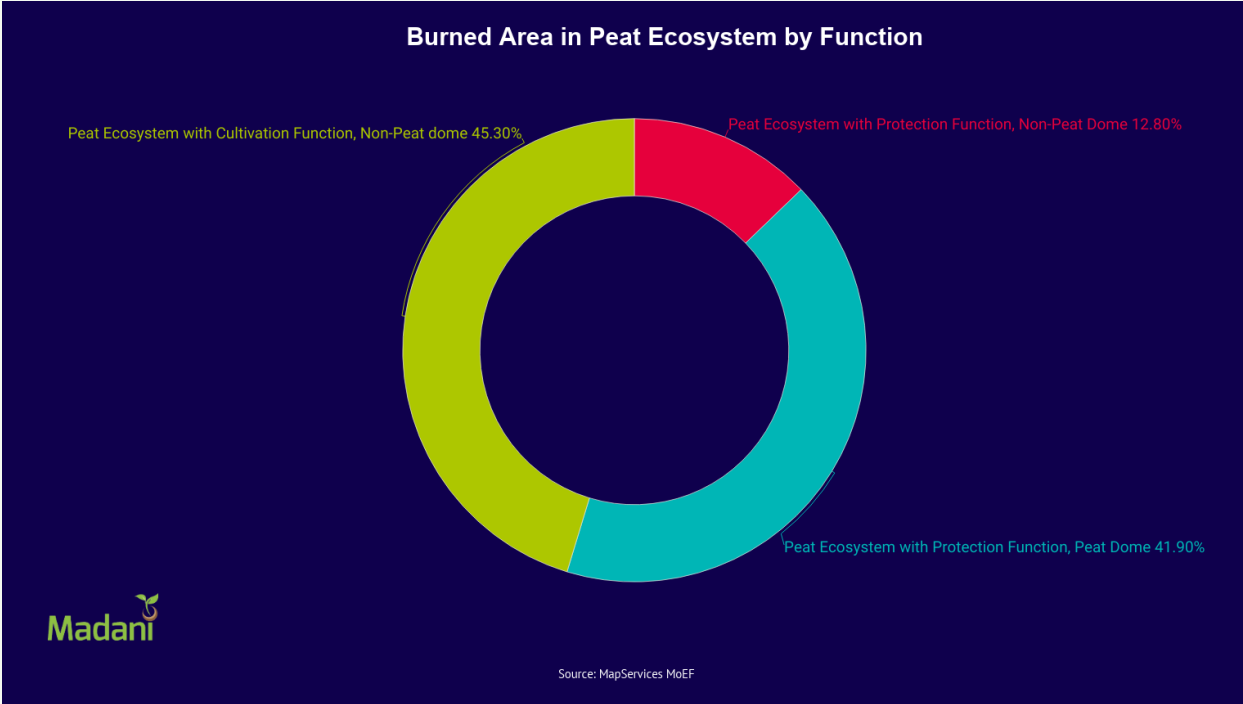


Figure 2. Burned Area in Peat Ecosystem by Function

The size of 2019 burned area in peat ecosystem is quite significant. It represents 44 percent of the total burned area in 2019 or equivalent to 727,972 hectares. Moreover, 398,182 hectares (54.71 percent) of burned peat ecosystem is protection peat (FLEG), 305,001 hectares (42 percent) of which happened in protected peat ecosystem with peat dome and 93,181 hectares (12.8 percent) in protected peat without peat dome. Meanwhile, the fires that burned peat ecosystem with cultivation function (FBEG) reached 329,798 hectares; equivalent to 45.3 percent of the total fire in peat ecosystem (see Figure 2).

Fires in the peat ecosystem are very dangerous because it is difficult to extinguish and causes carbon pollution greater than fires in mineral land. In addition, fires in peat also cause toxic haze that contains micro particles very harmful to human health.⁵

⁵ See <https://pantaugambut.id/pelajari/dampak-kerusakan-lahan-gambut/kebakaran-hutan>, accessed on May 8, 2020.

2.3 More than 1 Million Hectares (63 percent) of Burned Area in 2019 are Newly Burned Area

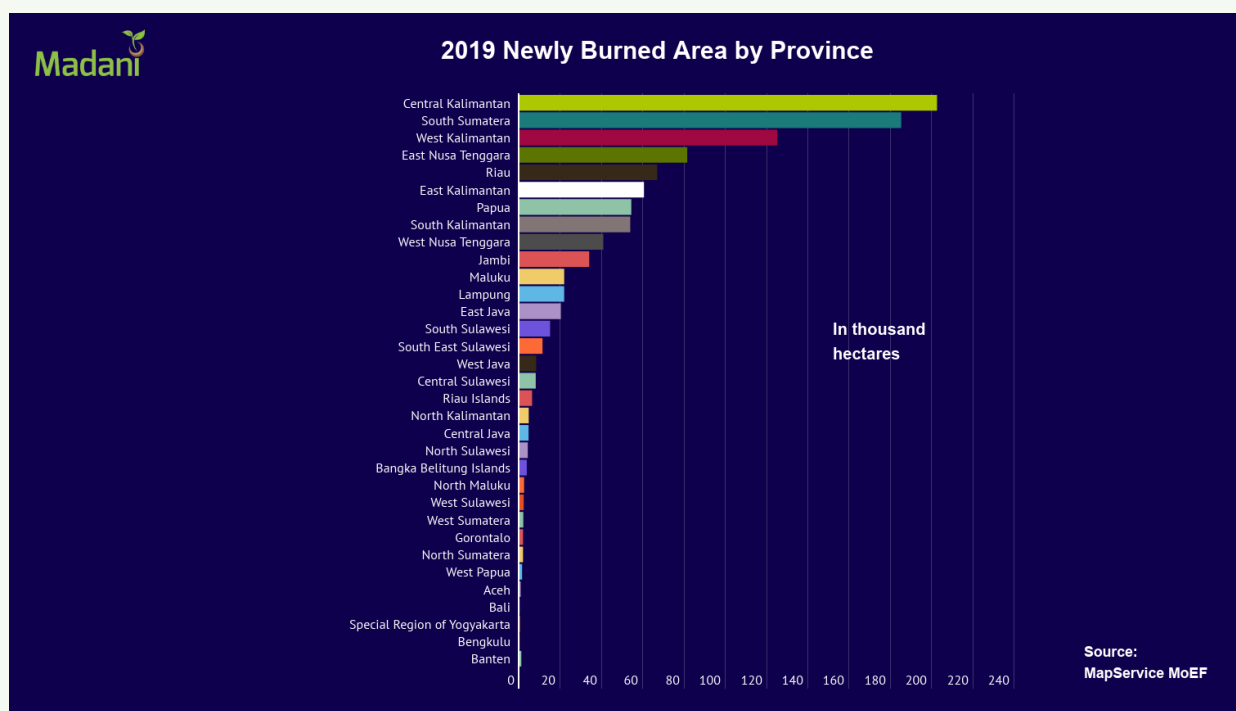


Figure 3. 2019 Newly Burned Area by Province

Another concerning fact about the 2019 forest and land fires is that 63 percent; or 1,043,626 hectares of the total burned area in 2019 were burned for the first time in 2019 during the 2015-2019 period. In other words, more than 1 million hectares of burned land in 2019 are newly burned area while 37 percent are areas that had been burned repeatedly during the 2015-2019 period. **Central Kalimantan** has the largest newly burned area (202,486 hectares), followed by **South Sumatera** with 185,125 hectares and **West Kalimantan** with 125,058 hectares (see Figure 3).

Based on the data from Directorate General of Plantation of the Ministry of Agriculture (Ditjenbun)⁶, during the 2015-2018 period, the area of planted palm oil in Central Kalimantan has increased with the rate of 123,444 hectares per year. In the same period, the area of planted palm oil in South Sumatera has also increased with the rate of 78,607 hectares per year and West Kalimantan with the rate of 129,471 hectares per year. This indicates a correlation between the high expansion rate of palm oil planted area and the size of newly burned areas in these three provinces.

⁶ Directorate General of Plantation, Statistik Perkebunan 2015-2018, compiled.

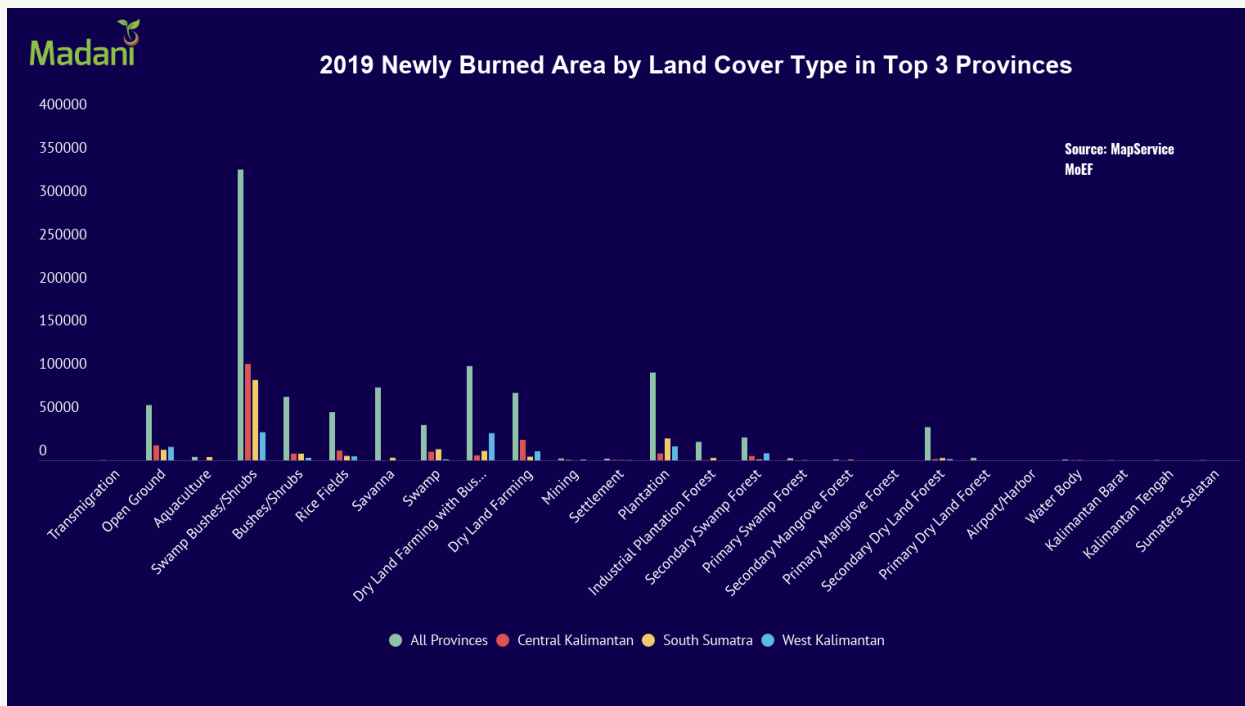


Figure 4. 2019 Newly Burned Area by Land Cover Type in Top 3 Provinces

The newly burned area in 2019 is dominated by swamp shrub/scrub cover with 336,254 hectares, followed by dry-land agricultural cover with 108,937 hectares. The newly burned plantation area was also significant in size. It reached 101,441 hectares while the newly burned area in dry land farm reached 77,927 hectares. Surprisingly, 94 percent; or equivalent to 70,805 hectares of burned area in natural forest in 2019 is categorized as newly burned area (see Figure 4). The largest newly burned area in natural forest occurred in secondary natural forest with 65,568 hectares of burned area or 92.6 percent of the total burned natural forest.

As mentioned above, the provinces with the largest newly burned areas are Central Kalimantan, South Sumatera, and West Kalimantan. Newly burned area in the provinces by the types of land cover was dominated by shrub or swamp. This finding is in line with the national burned area data. Especially for West Kalimantan, newly burned area in swamp shrubs is almost the same with the size of newly burned area in dry land farming with shrubs. Overall, the new fires that occurred in 2019 mostly affected non-forested land.

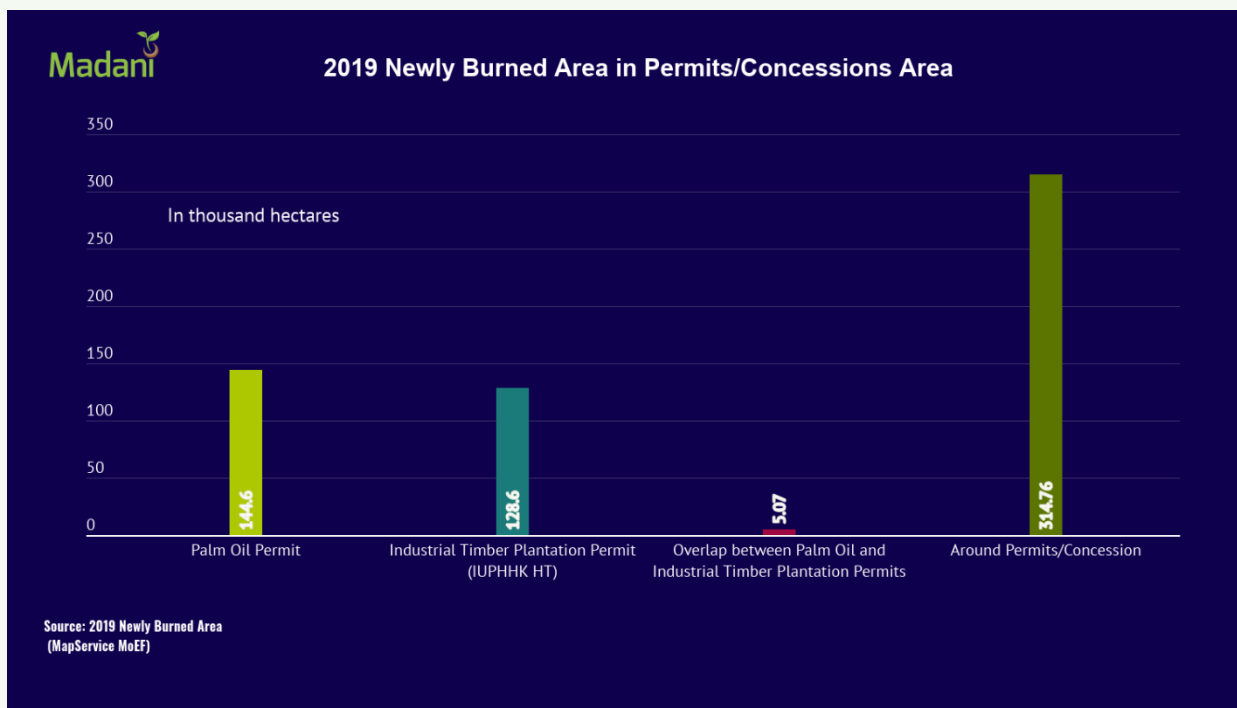


Figure 5. 2019 Newly Burned Area in Permits/Concessions Area

Around 144,659.87 hectares or 13.86 percent of the total newly burned area in 2019 are found within palm oil plantation permits, 128,629.10 hectares or 12.33 percent in timber plantation permits or IUPHHK HT, and 5,072 hectares or 0.49 percent in the overlapping area between the two permits. Meanwhile, 314,755.21 hectares or 30.16 percent of newly burned area of 2019 are located near or around the permits area (see Figure 5). Therefore, the size of newly burned area in 2019 is closely related to the presence of permits, especially palm oil and industrial timber plantation.

2.4 The Largest Burned Area in 2019 is Found in South Sumatra and Central Kalimantan Provinces

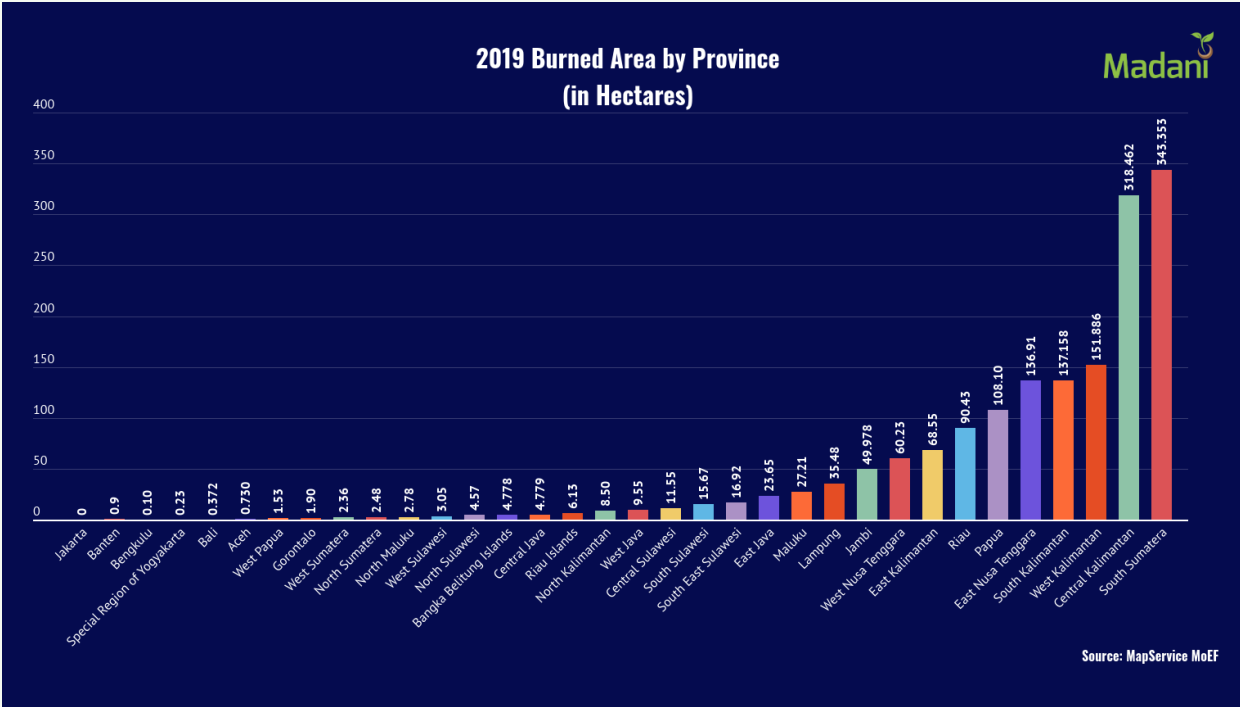


Figure 6. 2019 Burned Area by Province

Based on burned scar data in 34 provinces (Figure 6), the 2019 fires burned 1,649,198 hectares of land. South Sumatra and Central Kalimantan have the largest burned area with 343,353 hectares and 318,462 hectares respectively. The size of burned area in the two provinces constitutes 40.13 percent of the total burned area in 2019. South Sumatra and Central Kalimantan are also on the priority list for peatland restoration in the 2016-2020 period. Priority area for peatland restoration in South Sumatra is 615,908 hectares, 713,076 hectares for Central Kalimantan, most of which are located inside permit/concession area.⁷

The distribution of the 2019 Burned Area across Indonesia can be seen in Figure 7 below (in red). Forest and land fires in Sumatera occurred primarily in 4 provinces, namely Riau, Jambi, South Sumatera, and Lampung. In Kalimantan, they happened primarily in 4 provinces, namely West Kalimantan, Central Kalimantan, South Kalimantan, and East Kalimantan. For Sulawesi, in West Sulawesi, Central Sulawesi, Southeast Sulawesi, and South Sulawesi. For Papua Island, fires were concentrated in Papua province. For Southern Indonesia, burned areas were mostly found in West Nusa Tenggara and East Nusa Tenggara.

⁷ Badan Restorasi Gambut, Strategic Plan of Peatland Restoration Agency 2016-2020, p. 23, downloaded from <https://brg.go.id/rencana-strategis-badan-restorasi-gambut-2016-2020/>

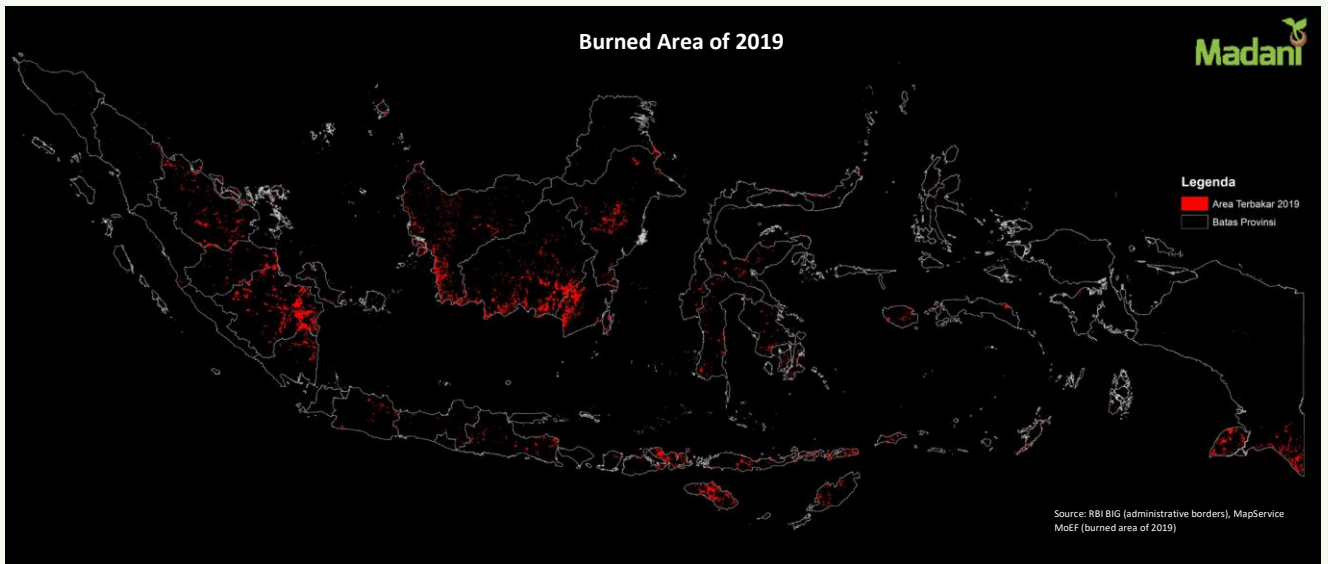


Figure 7. 2019 Burned Area Distribution across Indonesia

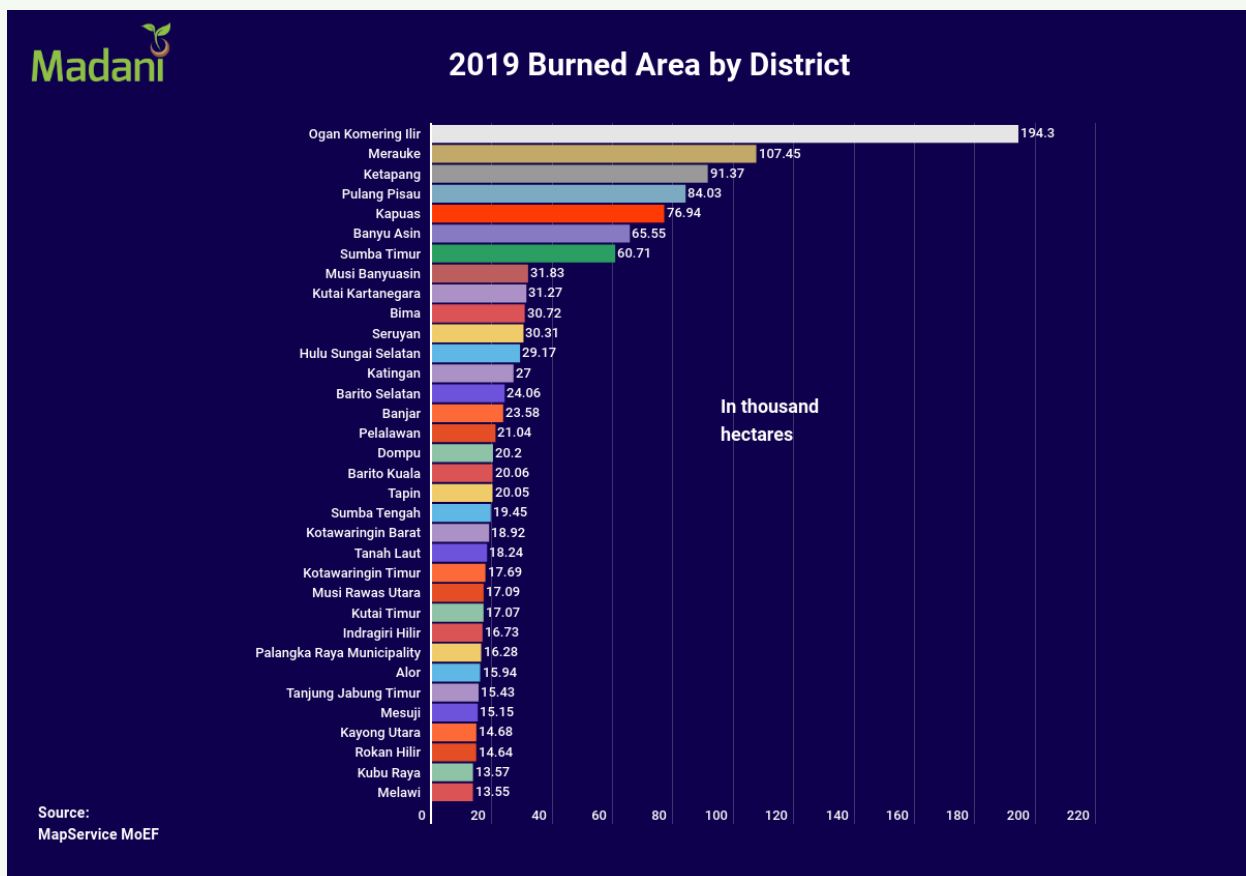


Figure 8. 2019 Burned Area by District

At the district/municipal level, the largest burned area was recorded in Ogan Komering Ilir (OKI) district of South Sumatera with 194,301 hectares, followed by Merauke district in Papua with 107,453 hectares, Ketapang district in West Kalimantan with 91,373 hectares, Pulang Pisau

district in Central Kalimantan with 84,030 hectares, and Kapuas district in Central Kalimantan with 76,947 hectares (see Figure 8). OKI and Pulang Pisau are peatland restoration priorities as stipulated in the beginning of the Peatland Restoration Agency (BRG) establishment in 2016.⁸

Provinces and districts with a significant size of burned area in 2019 have large peat ecosystem and are listed as peatland restoration priorities. This underlines the importance of restoring and preserving peat ecosystem and to keep them wet to prevent fires in the coming years.

In the meantime, Merauke district houses the second largest burned area during the 2019 fires. Vast forest and land fires in Merauke may be caused by the rapidly declining forest cover in the region, which increases the risk of fires during the dry season. This is supported by the fact that 73.98 percent of the total burned areas in 2019 is non-forested land, i.e., dry-land farms, savanna, swamp bush, and cleared/open ground. This highlights the importance of preserving intact natural forests to prevent land fires in the dry season. In contrast, cleared land or degraded forest are proven to be more prone to land fires.

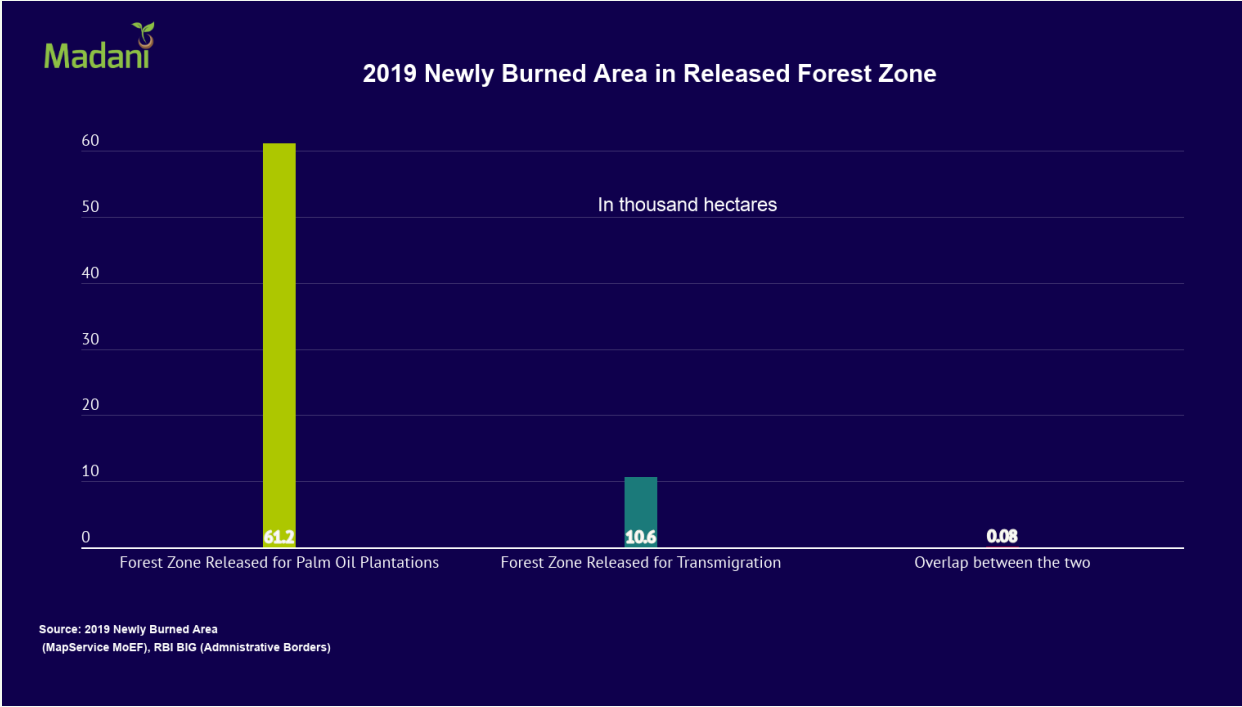


Figure 9. 2019 Newly Burned Area in Released Forest Zone

Approximately 61,177.57 hectares or 5.86 percent of the 2019 newly burned area are located in forest zone released for palm oil plantations and 10,638.09 hectares or 1.02 percent in forest zone released for transmigration. A small amount of fires with the size of 77.45 hectares or 0.01 percent occurred in areas of overlap between the two (see figure 9).

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2.5 Most of Fires in 2019 is Found in Forest Zone, Mostly in Production Forest Burdened with Industrial Timber Plantation Permits and in Peat Ecosystem

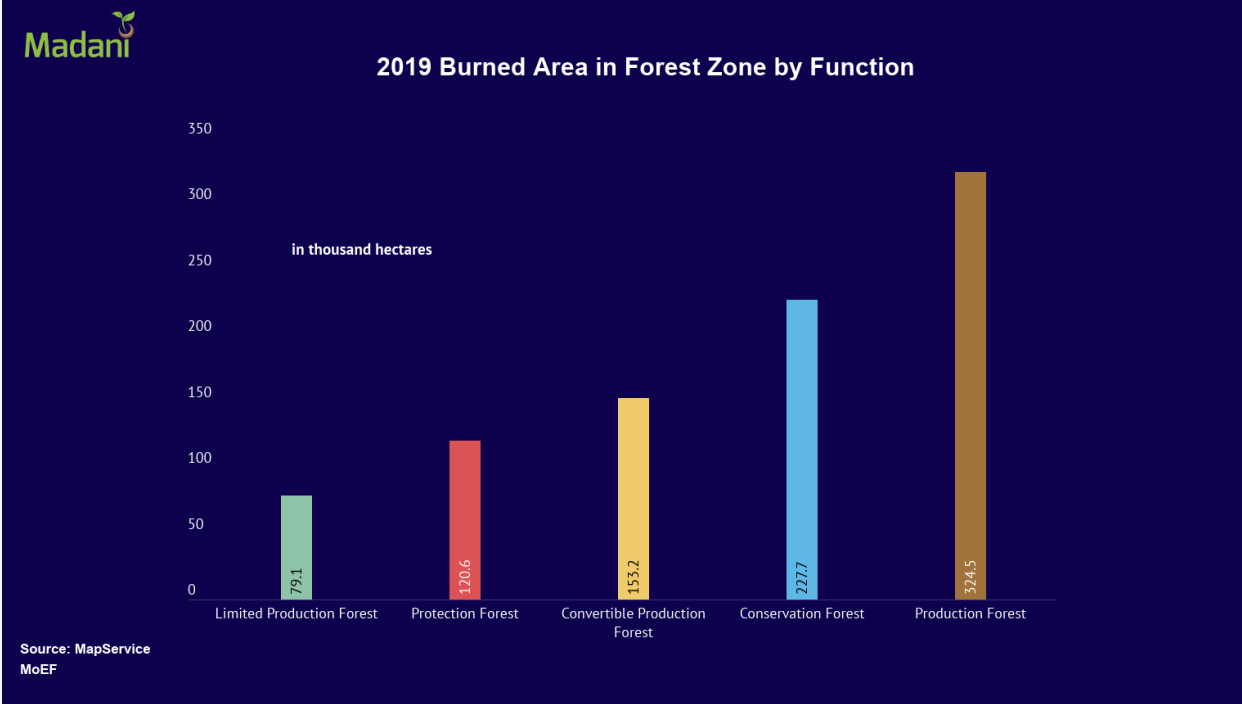
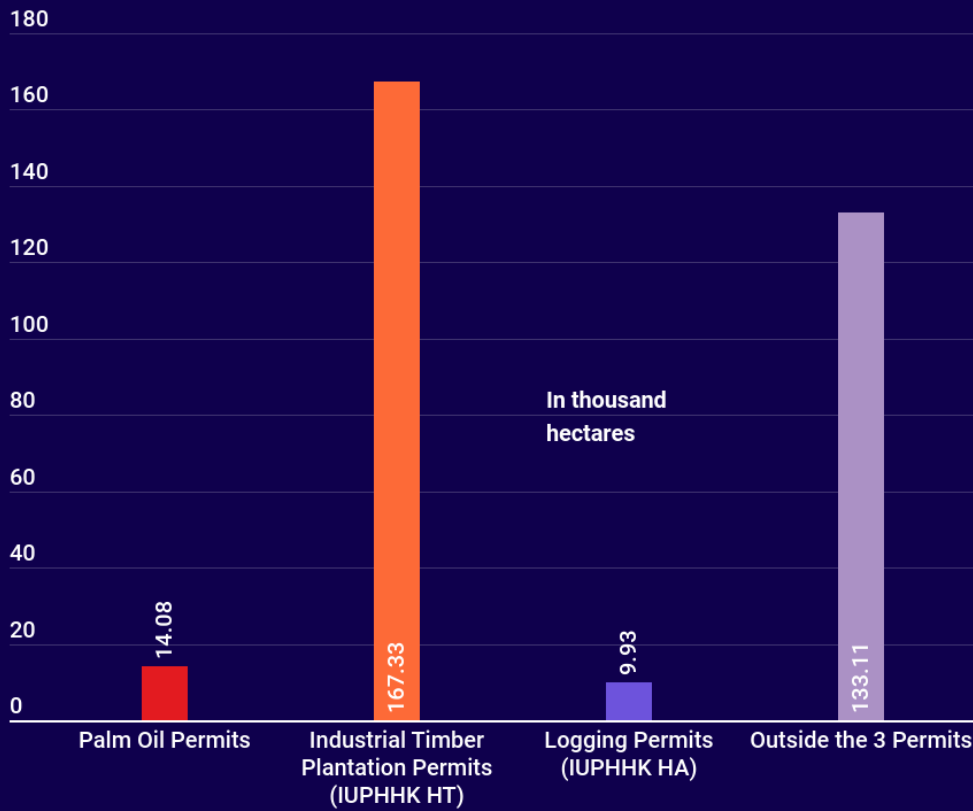


Figure 10. 2019 Burned Area in Forest Zone by Function

Approximately 905,011 hectares (54.88 percent) of the total burned area in 2019 is found in forest zone while 45.12 percent or 744,189 hectares is found in non-forest zone. In the forest zone, fires mostly occurred in production forest with 324,464 hectares (35.9 percent), followed by conservation forest that includes Nature Conservation Area (*Kawasan Suaka Alam/KSA*), Nature Protection Area (*Kawasan Perlindungan Alam/KPA*) and Hunting Park (*Taman Buru/TB*) with 227,692 hectares (25.2 percent), then convertible production forest with 153,216 hectares (16.9 percent), protected forest with 120,580 hectares (13.3 percent), and finally limited production forest with 79,056 hectares (8.7 percent) (see Figure 10). The majority of fires in forest zone in 2019 occurred in production forest zone (permanent, limited and convertible), amounting to 61.5 percent of the total forest zone affected by fires.

2019 Burned Area in Production Forest Zone by Permits/Concessions Type

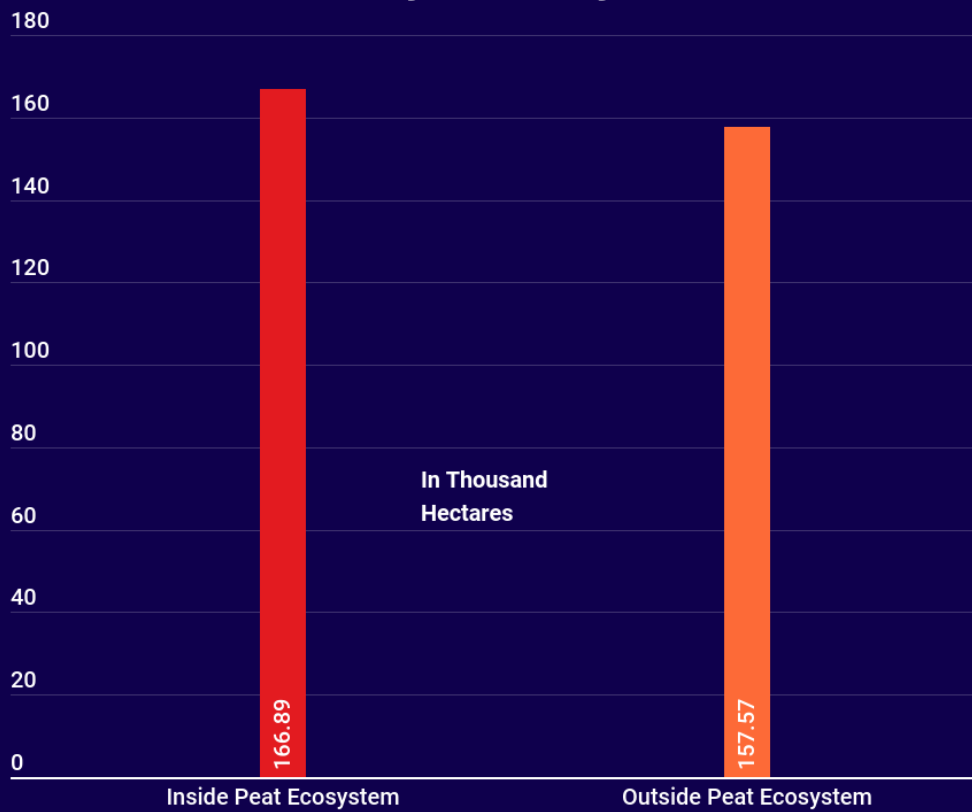


Source: MapService MoEF

Figure 11. Burned Area in Production Forest Zone by Permits/Concessions Type

Around 191,350.07 hectares (58.97 percent) of burned production forest zone were areas that overlap with palm oil plantation, industrial timber plantations/IUPHHK HT, and logging/IUPHHK HA permits. The majority of burned production forest with the size of 167,335.79 hectares (51.57 percent) is inside industrial timber plantation permits, followed by palm oil plantations permits with 14,083.14 hectares (4.34 percent) and timber utilization (logging) permits with 9,931.14 hectares (3.06 percent) (see Figure 11).

2019 Burned Area in Production Forest Zone by Peat Ecosystem



Source: MapService MoEF

Figure 12. 2019 Burned Area in Production Forest Zone by Peat Ecosystem

The alarming fact is that the majority of fires in production forest zone affected peat ecosystem with the size of 166,891.92 hectares (51.44 percent) (see Figure 12). Out of the number, 58 percent occurred in peat ecosystem with cultivation function (FBEG) - equivalent to 29.97 percent of the total burned area in the production forest. The other 42 percent occurred in peat ecosystem with protection function (FLEG) - equivalent to 21.46 percent of the total burned area in production forest (see Figure 12).

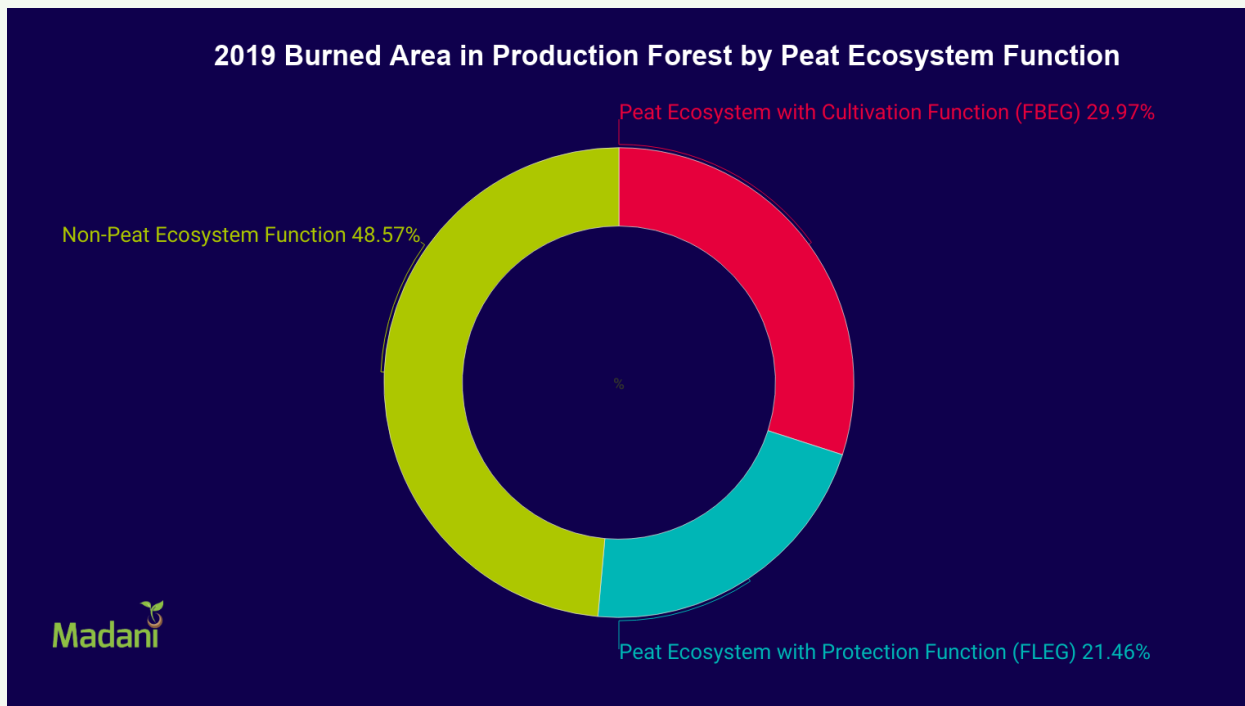


Figure 13. 2019 Burned Area in Production Forest by Peat Ecosystem Function

Compared to the size of burned area in production forest, peat ecosystem fires in conservation forest are smaller in size but still significant. It represents 39.5 percent of the total burned area in conservation forest that reached 227,692 hectares. From that number, 39.48 percent affected peat ecosystem with protection function (FLEG) (see Figure 13).

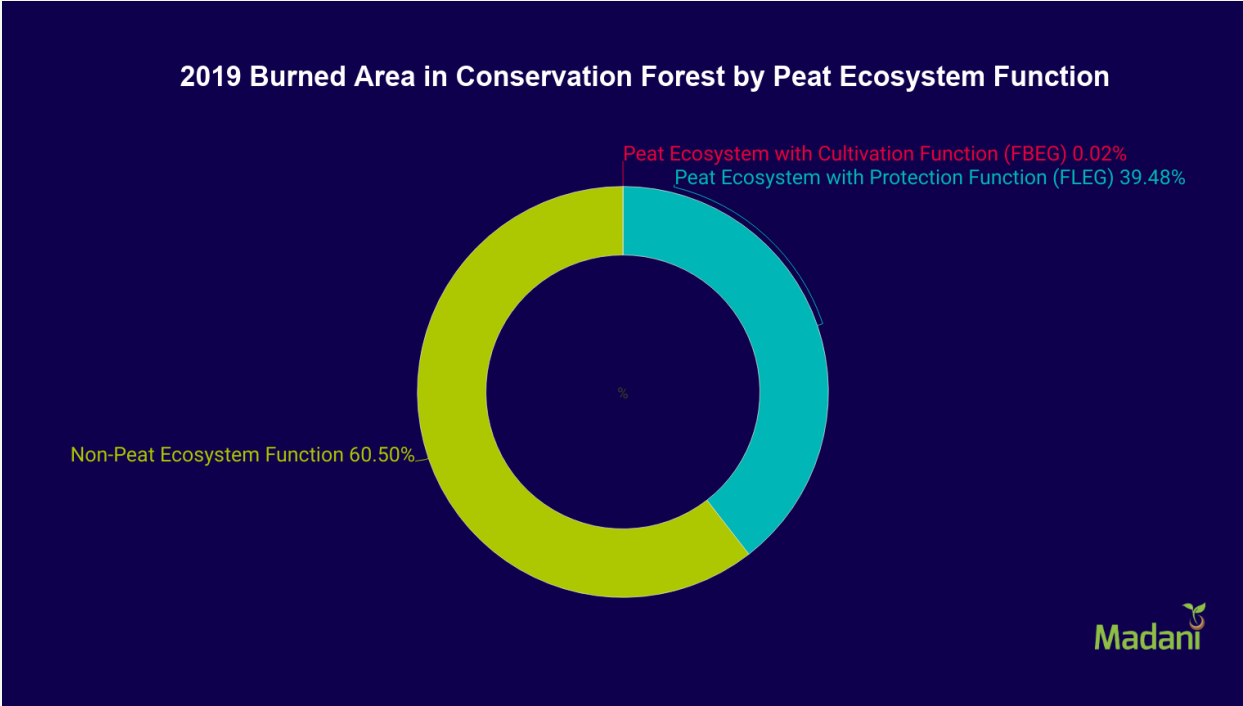
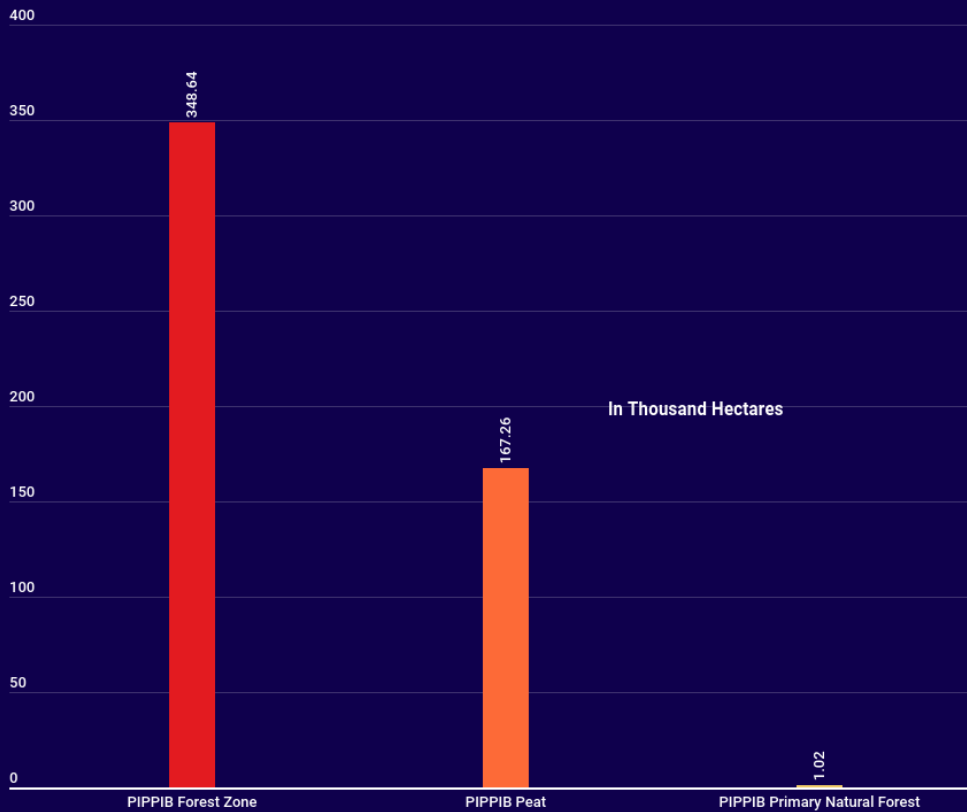


Figure 14. 2019 Burned Area in Conservation Forest by Peat Ecosystem Function

2.6 Thirty-one Percent (31%) of the 2019 Fires Affected the Moratorium Area, the Majority around Permits and in Peat Ecosystem

Burned Area in 2019 Moratorium Map (PIPPIB)



Source: MapService MoEF

Figure 15. Burned Area in 2019 Moratorium Map (PIPPIB)

Until 2019, forest and land fires still occurred in the moratorium area as indicated by the 2019 indicative moratorium map (PIPPIB) that was supposed to be protected. Fires affected 516,926 hectares of area inside PIPPIB (31.35 percent of the total burned area). Broken down by category, fires affected 348,640 hectares of area classified as PIPPIB forest zone, 167,263 hectares classified as PIPPIB peat area, and 1,022 hectares as PIPPIB primary natural forest zone (see Figure 15).

Fires inside the moratorium area mostly affected swamp bush/shrub area with 45.08 percent, savanna with 11.06 percent and open ground with 9.7 percent. In other words, the majority (65.84 percent) of fires within the moratorium area affected non-forested land.

However, the majority of fires in the moratorium area affected peat. Burned peat ecosystem reached 332,953.03 hectares (64.41 percent of fires in the moratorium area). Broken down by function, 13.67 percent of burned peat is in cultivation function or FBEG and 50.74 percent in

protection function or FLEG. Around 183,972.98 hectares (35.59 percent) of fires inside the moratorium area occurred outside peat ecosystem (see Figure 16).

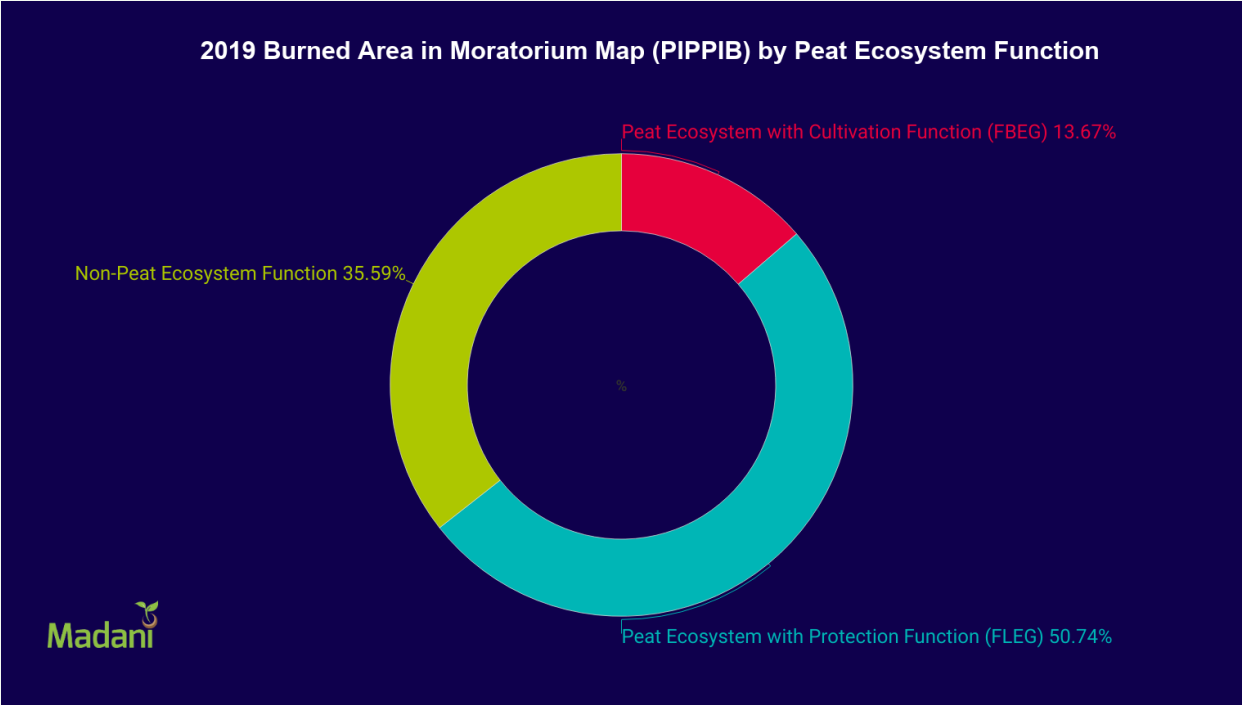


Figure 16. 2019 Burned Area in Moratorium Map (PIPIB) by Peat Ecosystem Function

Most of the fires affecting the moratorium area (51.82 percent) are adjacent to permits and concessions, sometimes even overlapping with them, especially palm oil and industrial timber plantation permits. Only 46.77 percent of burned moratorium area are located far from permits and concessions (see Figure 17).

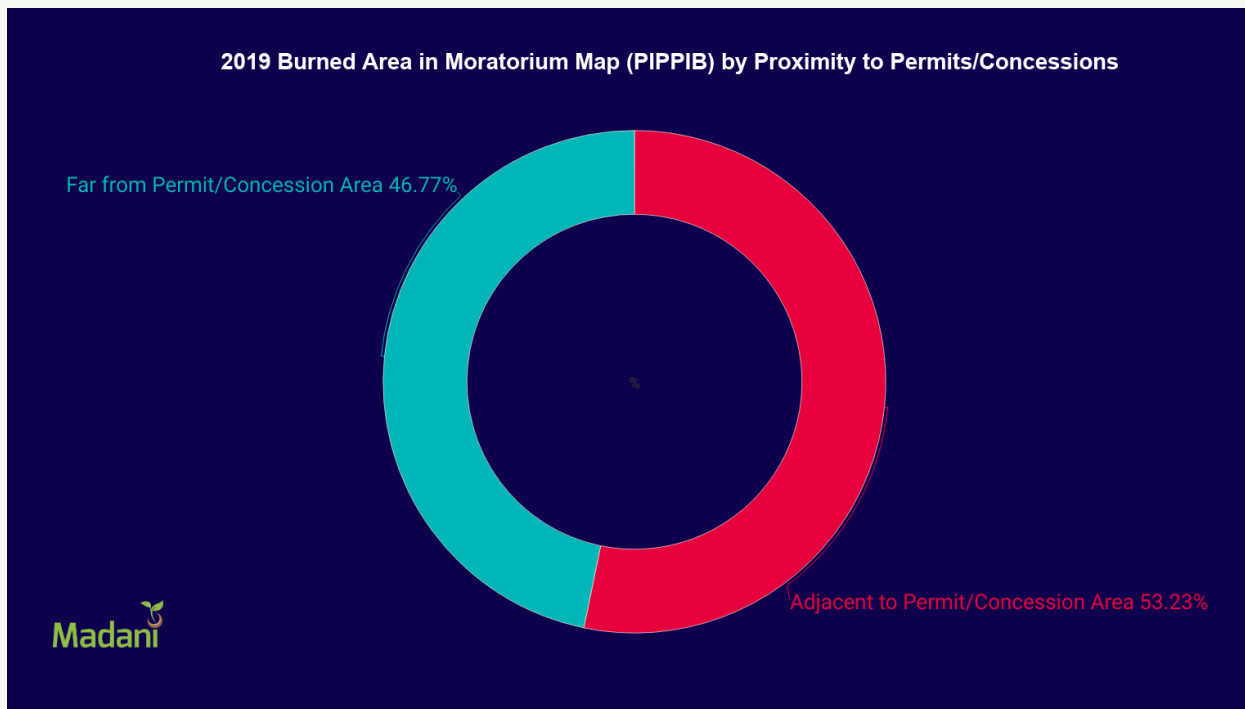
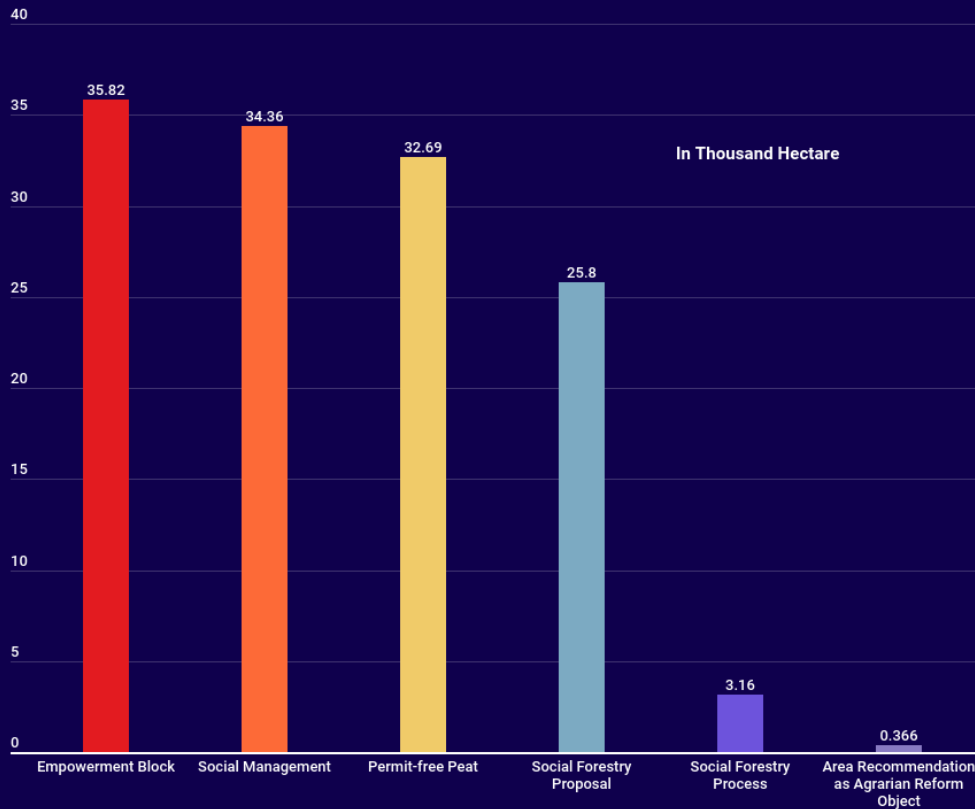


Figure 17. 2019 Burned Area in Moratorium Map (PIPPIB) by Proximity to Permits/Concessions

2.7 Eight Percent (8%) of the 2019 Fires Occurred in the Indicative Social Forestry Map (PIAPS), Mostly Near Permits/Concessions

Burned Area in Indicative Social Forestry Area Revision 04

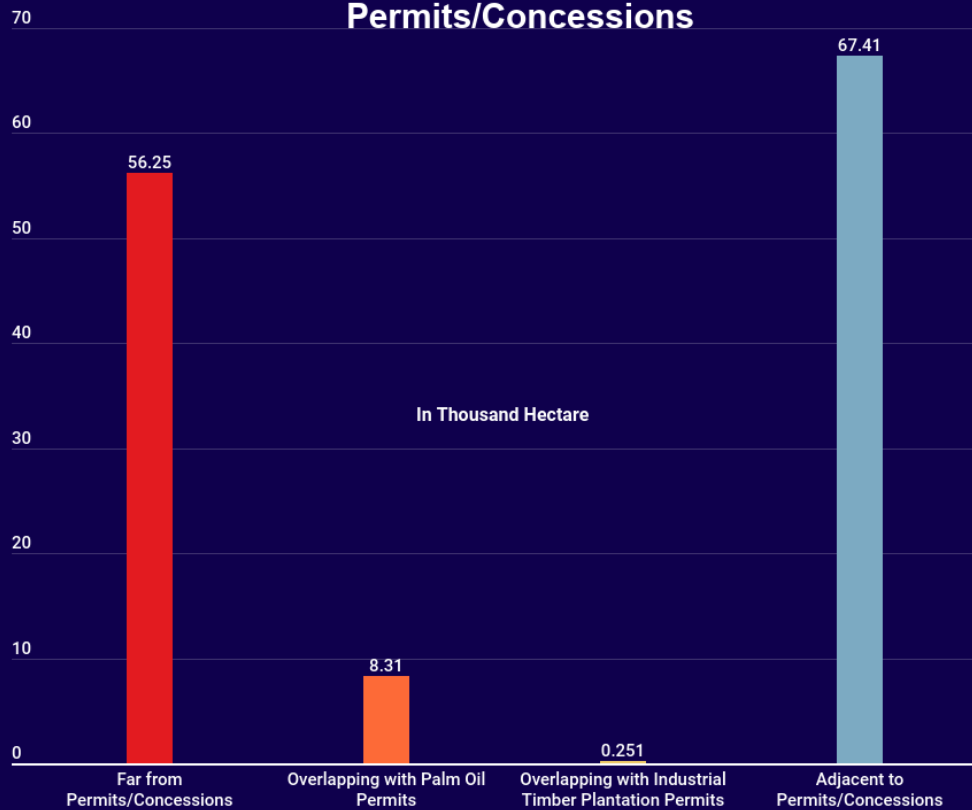


Source: MapService MoEF

Figure 18. Burned Area in Indicative Social Forestry Area Revision 04

In addition to the moratorium area, the 2019 fires also affected the indicative social forestry area (PIAPS) with 132,235 hectares or 8 percent of the total burned area in 2019. From this number, 35,828 hectares have the status of Empowerment Block, 34,369 hectares of Social Management, 32,699 hectares of Permit-Free Peat, 25,804 hectares of Social Forestry Proposal, and 366.71 hectares of Recommendation for Agrarian Reform Object (TORA) (see Figure 18).

2019 Burned Area in Indicative Social Forestry Map by Proximity to Permits/Concessions



Source: MapService MoEF

Figure 19. 2019 Burned Area in Indicative Social Forestry Map by Proximity to Permits/Concessions

From the 132,235.42 hectares of burned area in PIAPS, 57.46 percent or 75,981.57 hectares are located near or overlapping with permits/concessions, especially palm oil and industrial timber plantation permits. Only 56,253.85 hectares (42.54 percent) are located far from permits/concessions (see Figure 19). Attention to areas in and surrounding these permits is required to prevent recurring fires in the indicative social forestry area in 2020.

2.8 Palm Oil Permits Dominate the 2019 Burned Area inside Permits and Concessions, Followed by Industrial Timber Plantation

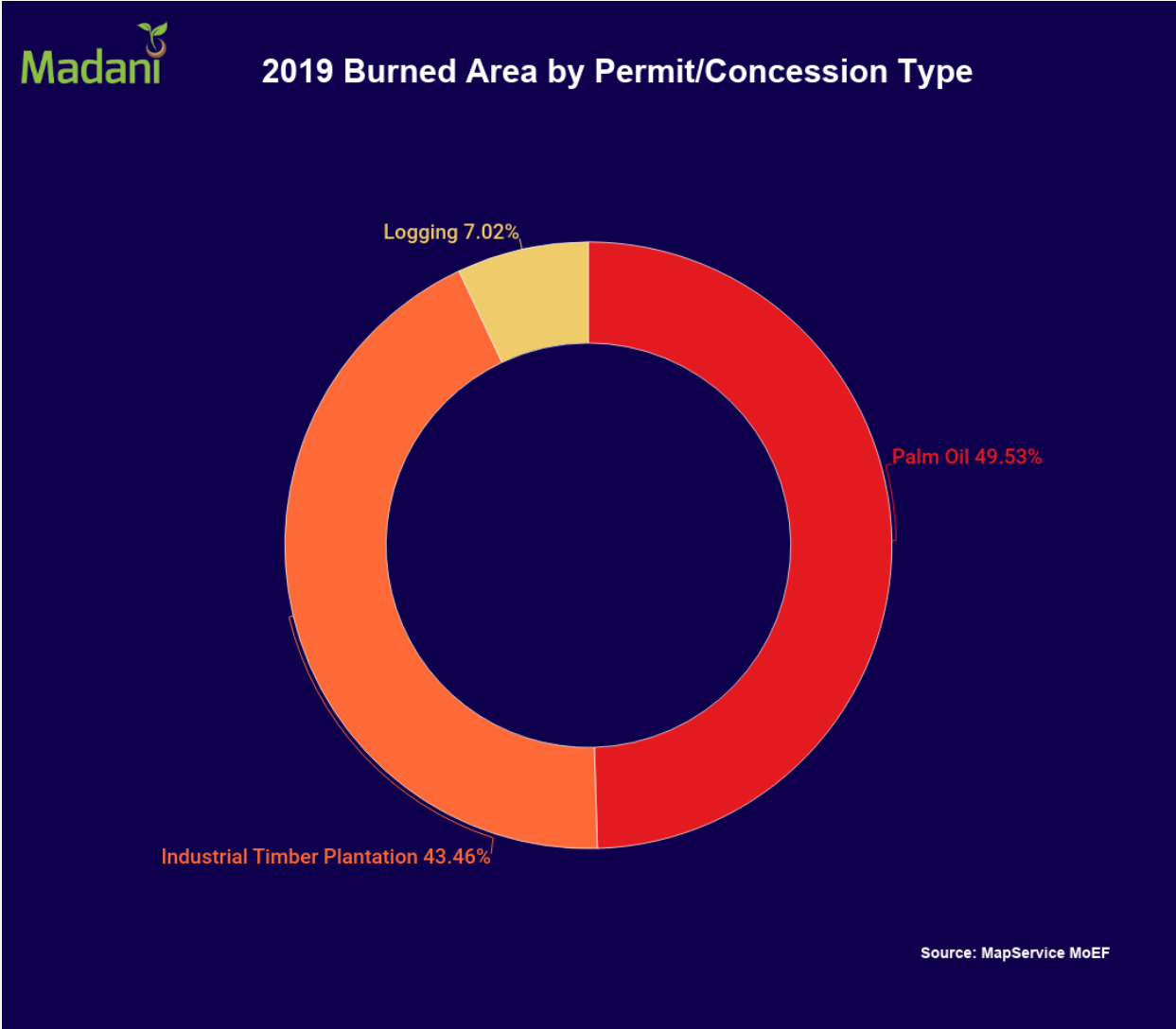


Figure 20. 2019 Burned Area by Permit/Concession Type

Among three types of permits/concessions; palm oil, industrial timber plantation (IUPHHK HT), and logging (IUPHHK HA), forest and land fires in 2019 mostly occurred in palm oil permits with 217,497 hectares, followed by timber plantation with 190,831 hectares, and logging with 30,813 hectares (see Figure 20).

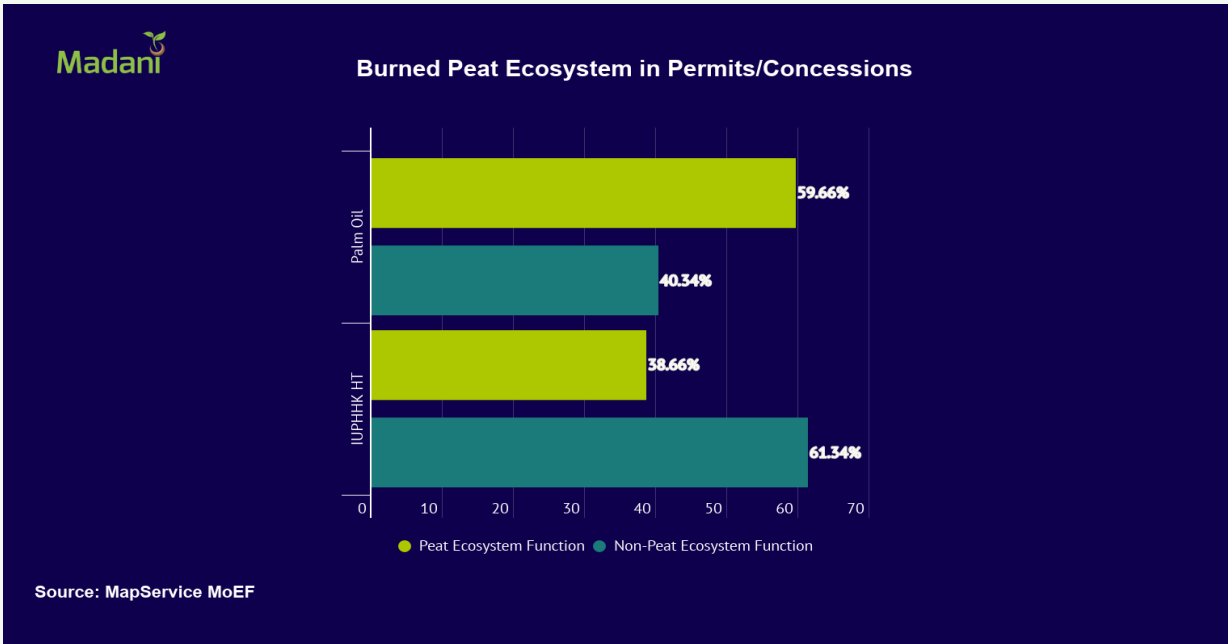


Figure 21. Burned Peat Ecosystem in Permits/Concessions

Most fires in palm oil permits in 2019 (59.66 percent) affected peat ecosystem, mostly peat with cultivation function (FBEG) with 31.37 percent, slightly higher than peat with protection function (FLEG) with 28,29 percent. Around 40.34 percent of fires in palm oil permits occurred outside peat ecosystem. In timber plantation permits, a lower percentage of fires (38.66 percent) affected peat ecosystem with 23.16 percent in cultivation function (FBEG) and 15.51 percent in protection function (FLEG). The majority of fires in timber plantation permits (61.34 percent) occurred outside peat ecosystem (see Figure 21 and 22).

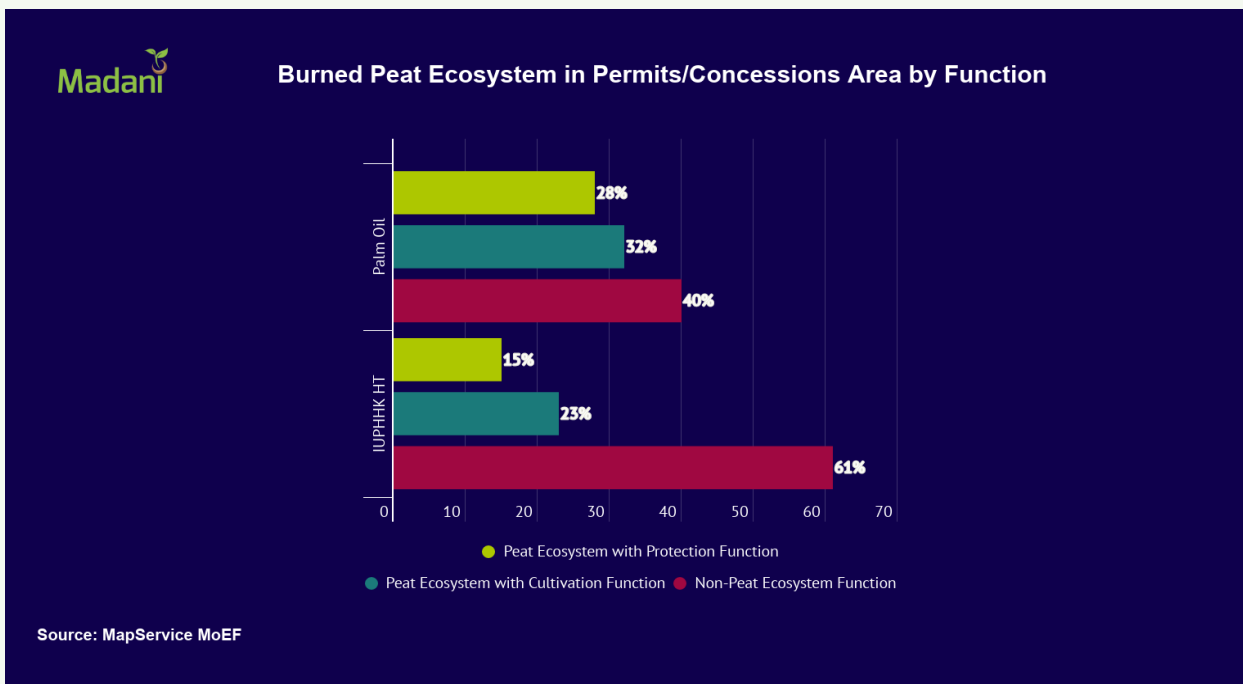


Figure 22. Burned Peat Ecosystem in Permits/Concessions Area by Function

3. Red Flags: Regions with the Largest Fire-Prone Area in 2020

The 2015 and 2019 great fires must be prevented from recurring for Indonesia to achieve its climate commitment and to avoid a haze disaster that inflicts material losses, costs lives, and causes premature deaths. In this section, a model is developed to determine Fire-Prone Areas in 2020 that require special attention from the central government, local governments, law enforcement, permit-holders, communities, and other stakeholders.

3.1. Method to Determine Fire-Prone Area of 2020

3.1.1 Fire-Prone Area Model

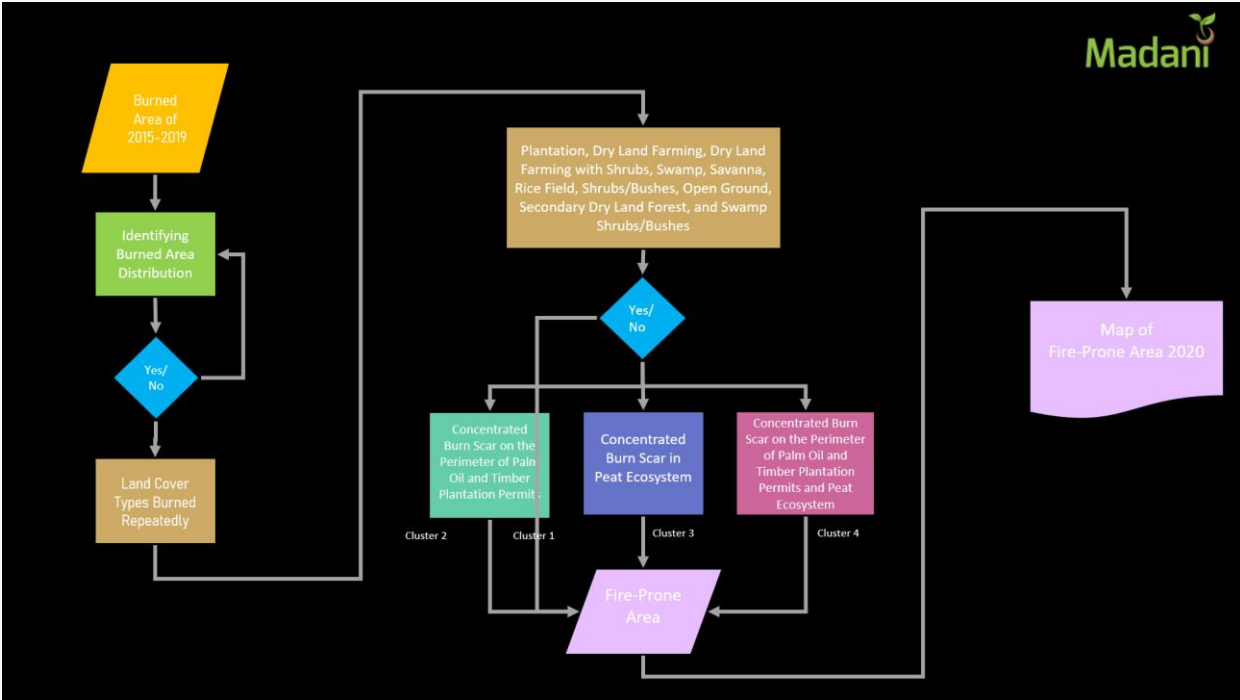


Figure 23. 2020 Fire-Prone Area Model

To determine regions classified as Fire-Prone Area of 2020, we first conducted data inventory of burn scar from 2015 to 2019.⁹ From the data, we identified 31 possible conditions, which include the following three categories: 1) areas where fires keep recurring in the subsequent years (at

⁹ Data Sourced from <https://geoportal.menlhk.go.id/arcgis/rest/services/KLHK>

least in two different years), 2) areas where fires do not recur in the subsequent years (only burned in 2015), 3) areas that were newly burned in 2019. Next, we determined four clusters to indicate fire-prone areas with increasing vulnerability from cluster (level) 1 to cluster (level) 4 (see Figure 23).

Cluster 1 is obtained by overlaying the 2015-2019 burn scar with land cover map. We found that areas that kept burning in the 2015-2019 period are mostly the following ten classes of land: Plantation, dry-land farming, dry-land farming with shrubs, swamp, savanna, rice fields, shrubs, open ground, secondary dry-land forest, and swamp shrub. Cluster 1 has the lowest vulnerability level among the 4 clusters.

Cluster 2 is based on overlaying fire-prone area by land cover (cluster 1) with burn scars concentrated on the perimeter of or near palm oil and industrial timber plantations because, based on the burn scar data, high density of fires was seen in the areas adjacent to those permits.

Cluster 3 is obtained by overlaying fire-prone area by land cover (cluster 1) with burn scars concentrated in peat ecosystem (FEG) consisting of cultivation/FBEG and protection function/FLEG. From the traces of burn scars, it was found that many burn scars were located in the peat ecosystem.

Cluster 4 is based on the results of the overlay between fire-prone area by land cover (cluster 1) with burn scars concentrated around/near or on the perimeter of palm oil and industrial timber plantations as well as burn scars concentrated in peat ecosystem both FBEG and FLEG. Cluster 4 has the highest level of vulnerability to fire.

The four clusters are presented in the following Map of Fire-Prone Area 2020 (see Figure 24).

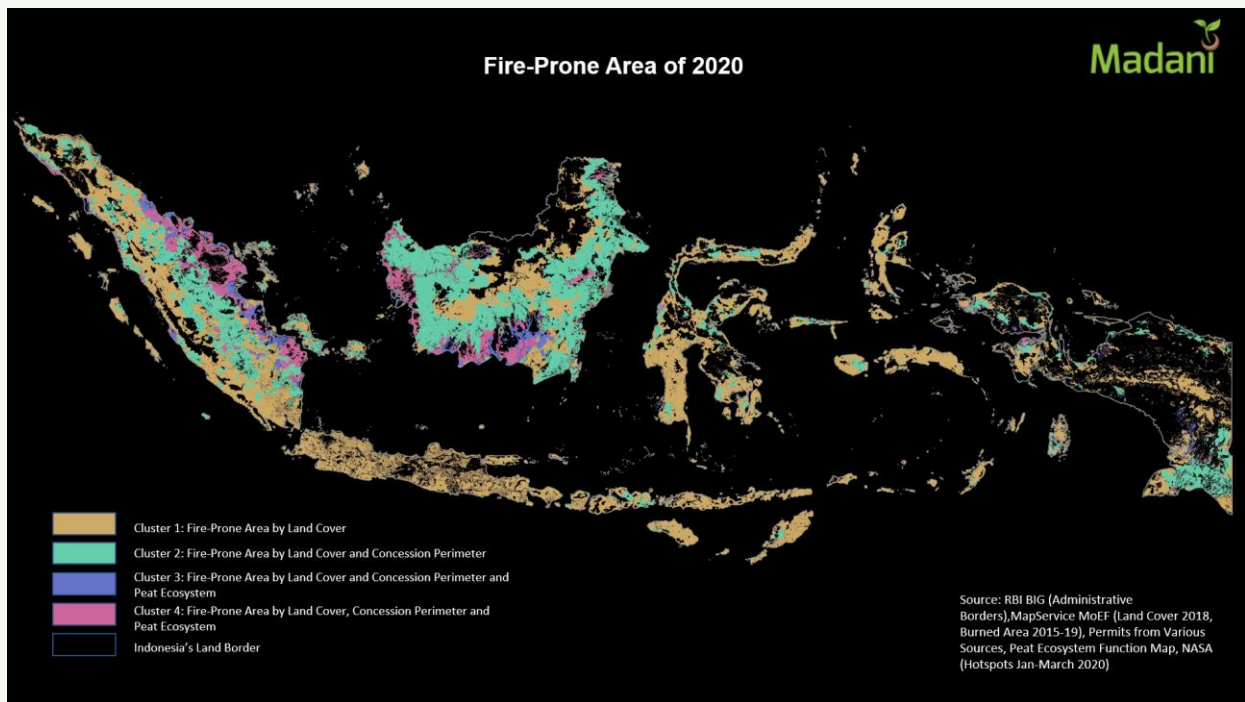


Figure 24. Map of Fire-Prone Area 2020

The above map has 4 clusters that reflect an increasing level of vulnerability.

Cluster 1 (brownish-yellow) is fire-prone area by land cover, which means that the land cover types were burned in the period of 2015 to 2019.

Cluster 2 (green) is fire-prone area by land cover and proximity to palm oil and industrial timber plantations. In addition to historical burn scars in the land cover types, the area's vulnerability to fire increases due to its proximity to palm oil and industrial timber plantations.

Cluster 3 (purple) is fire-prone area by land cover and peat ecosystem. In addition to historical burn scars in such land cover types, its vulnerability to fire increases due to its location in peat ecosystem.

Cluster 4 (pink) is a fire-prone area by land cover, proximity to palm oil and industrial timber plantations, and peat ecosystem (the highest level of vulnerability). In addition to the historical burn scars in such land cover types, the area's vulnerability to fire increases due to its proximity to palm oil and industrial timber plantations and its being located in peat ecosystem.

3.1.2 2015-2019 Burn Scars by Land Cover, Concession Permit, and Peat Ecosystem

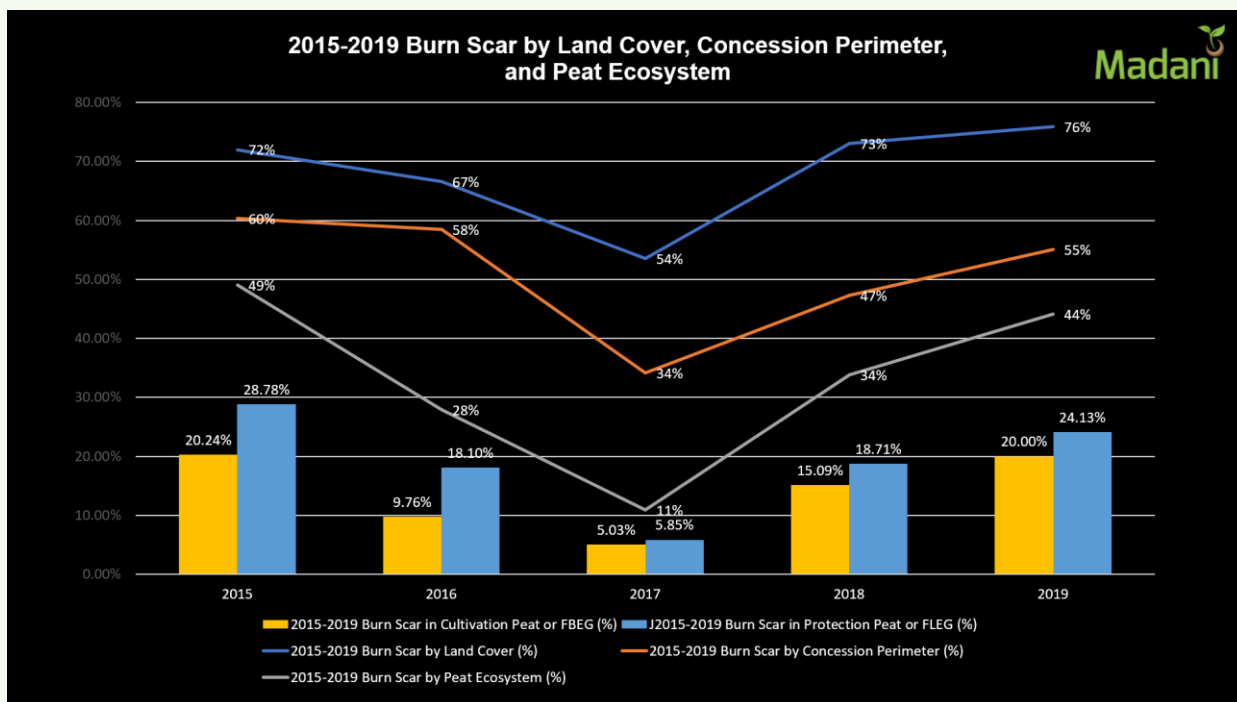


Figure 25. 2015-2019 Burn Scars by Land Cover, Concession Permit and Peat Ecosystem

Based on the historical data of the 2015-2019 burn scar, fires affecting the 10 land cover types classified as fire-prone area¹⁰ occurred with the highest percentage in 2019 with 75.87 percent of the total burned area in 2019, while the lowest percentage occurred in 2017 with 53.53 percent (see Figure 25).

Meanwhile, the highest percentage of fires near palm oil and industrial timber plantations occurred in 2015 with 60.39 percent of the total burned area and the lowest occurred in 2017 with 34.15.

The highest percentage of fires in peat ecosystem occurred in 2015 with 49.02 percent of the total burned area that year. Fires on peat ecosystem continued to decline from 2016 to 2018 only to increase in 2019 with 44.13 percent of the 2019 total burned area.

¹⁰ Data of Fire-prone land covers including Plantation, Dry Land Farming, Dry Land Farming with Shrubs, Swamp, Savanna, Rice Field, Shrubs/Bushes, Open Ground, Secondary Dry Land Forest, and Swamp Shrubs/Bushes

3.2. 2015-2019 Burn Scar VS 2020 Fire-Prone Area

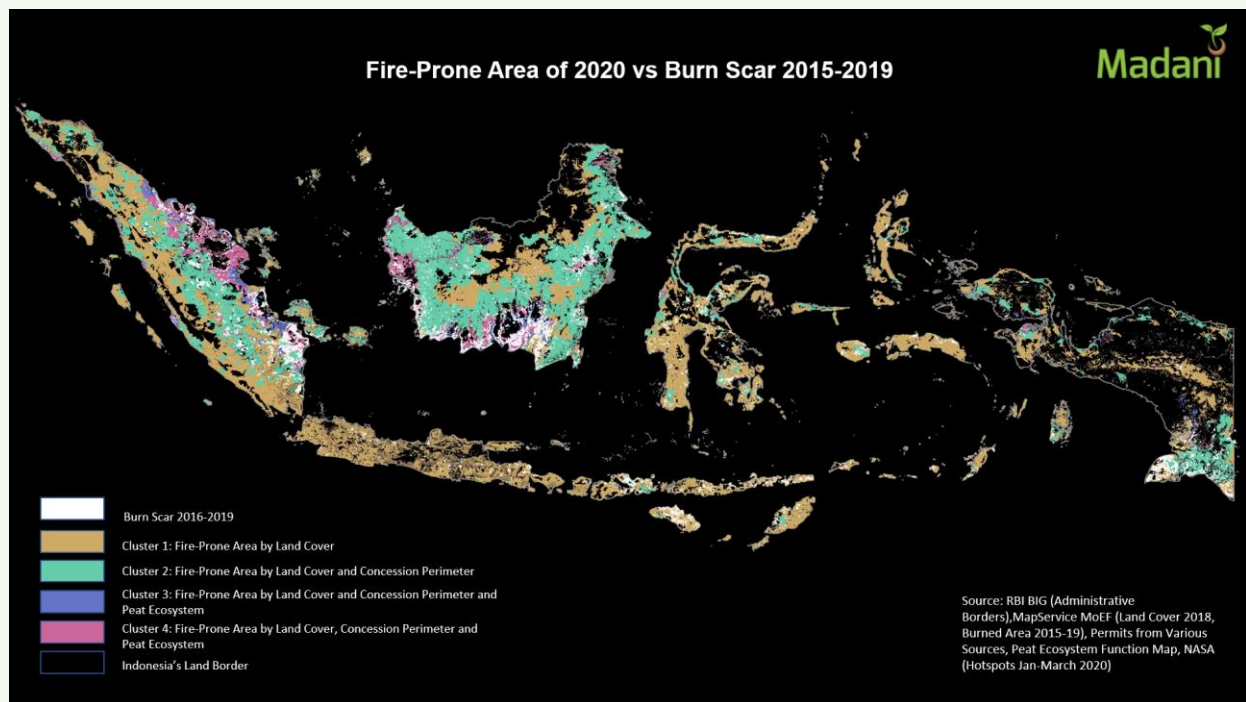


Figure 26. 2015-2019 Burn Scar VS 2020 Fire-Prone Area

As shown in Figure 26 above, fire-prone areas by island in general are as follows:

- Sumatra and Kalimantan Islands are the most vulnerable areas in Indonesia with the highest concentration of Fire-Prone Area with the highest level of vulnerability to fire or Cluster 4 (fire-prone land cover + proximity to permits/concessions + peat ecosystem).
- Java island in general is still prone to fire but with low vulnerability because most of the fire-prone areas are Cluster 1 or 10 type of land cover vulnerable to fire.
- In Sulawesi, the 2020 burn scars and fire-prone areas are distributed in the Central region to the Southeast and South regions. Those areas are dominated by Cluster 1 (fire-prone land cover types) and Cluster 2 (fire-prone land cover types + proximity to permits/concessions).
- In Papua, the 2020 burn scars and fire-prone areas are only distributed in the southern region and dominated by Cluster 2 (fire-prone land cover types + proximity to permits/concessions).
- In Lombok and Nusa Tenggara, burn scars and fire-prone areas are distributed in almost all regions and dominated by Cluster 1 (fire-prone land cover types). However, there are

some spots dominated by Cluster 2 (fire-prone land cover types + proximity to permits/concessions).

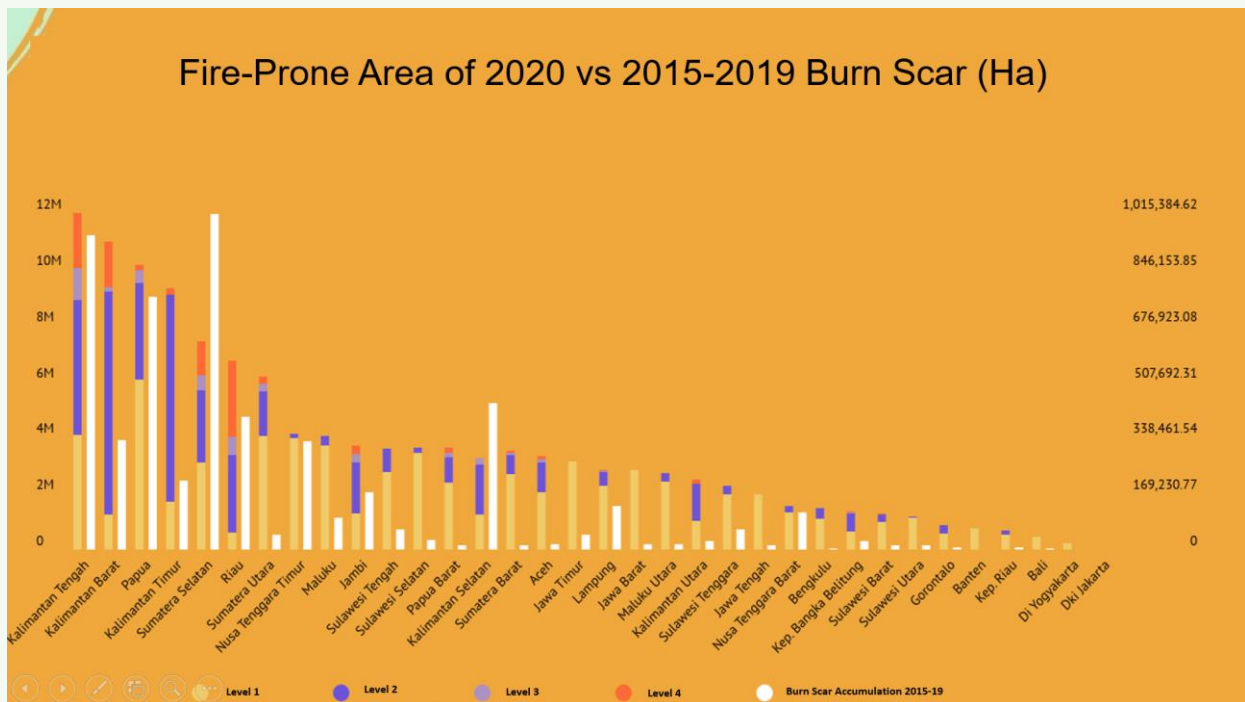


Figure 27. 2020 Fire-prone Area (ART) VS 2015-2019 Total Burn Area

The above chart shows the 2020 Fire-Prone Area against the 2015-2019 burn scars (Fig. 27). Each province has different vulnerability levels. However, if we accumulate the entire 4 levels, there are 5 provinces with the largest Fire-Prone Area, namely **Central Kalimantan** (12,841,157 hectares), **West Kalimantan** (11,278,709 hectares), **Papua** (10,796,019 hectares), **East Kalimantan** (9,529,942 hectares), and **South Sumatera** (8,251,872 hectares).

If we overlay the data with the 2015-2019 burn scars data, provinces that historically have the most widespread burned area from 2015 to 2019 are **South Sumatera** (1,013,538 hectares), **Central Kalimantan** (949,607 hectares), and **Papua** (764,700 hectares). The provinces that historically have the largest burn scar and the largest fire-prone area in 2020 should be monitoring priorities to minimize fires in 2020.

3.3. Hotspots in Fire-Prone Area (January-March 2020)

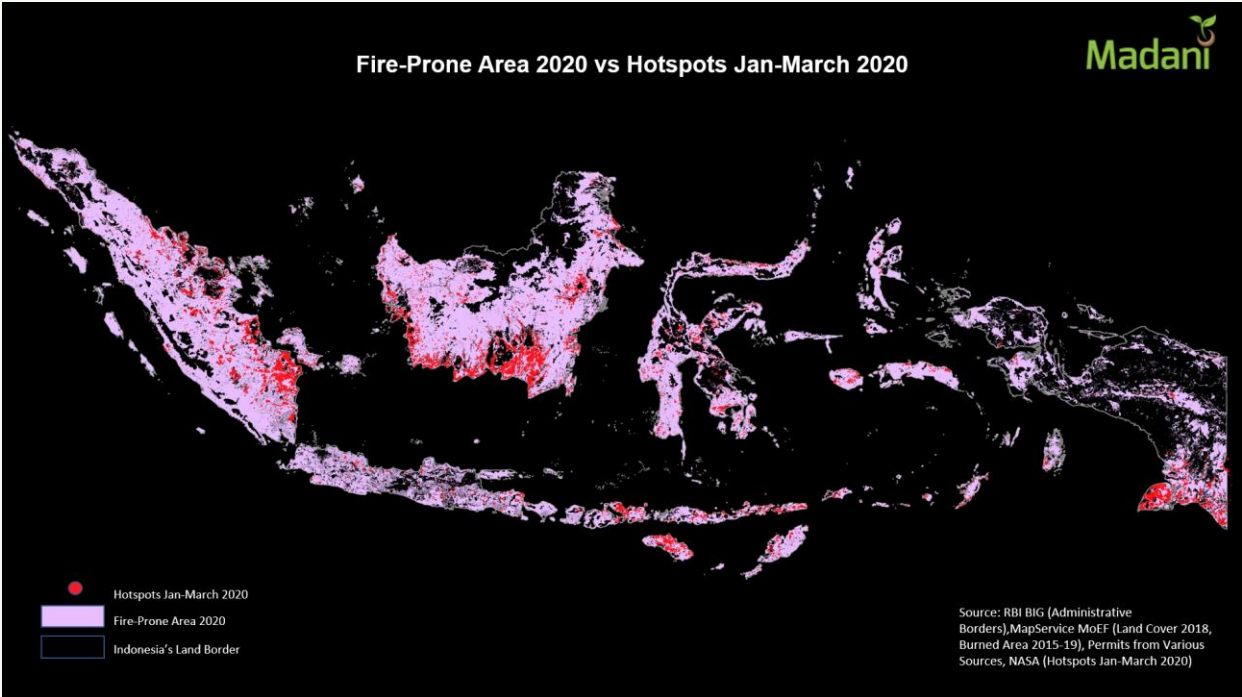


Figure 28. Hotspots Distribution in Fire-Prone Area Jan-March 2020

From 12,488 hotspots detected from January-March 2020, at least 9,960 or 79.75 percent are located in the 2020 Fire-Prone Area Map (see Figure 28). Hotspots outside the map are still located in the perimeter of the 2020 Fire-Prone Area Map. This means that the area represents corridors that must be carefully monitored to minimize fires in 2020. Although a more in-depth examination is required, the 2020 Fire-Prone Area can be a basis for early warning and prevention for various parties to minimize fires in 2020.

4. 2020 Hotspots Update

4.1. National Hotspots Distribution

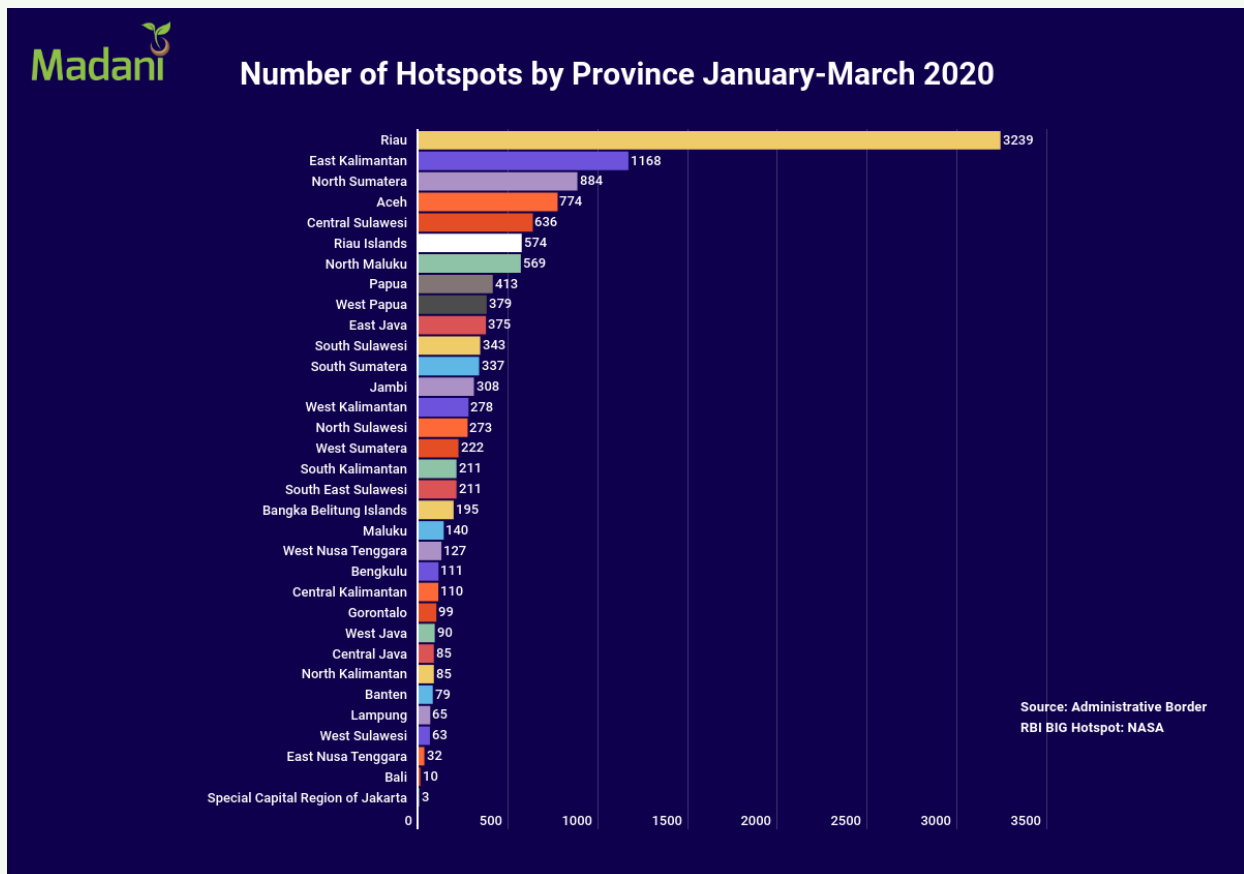


Figure 29. Number of Hotspots by Province January - March 2020

During hotspots monitoring from January to March 2020, the largest number of hotspots were detected in March (4,907 points), followed by January (3,823 points), while February has the lowest number of hotspots with 3,753 points. Riau has the most hotspots (768 points). In addition, it is notable that hotspots in Riau are located very close to each other (representing high density) resulting in a significant size of Potentially Burned Area (see Figure 29).

4.2. Potentially Burned Area

4.2.1. Method of Determination

Potentially Burned Area or PBA represents hotspots that are located close to each other. It is a higher-level early warning for all parties to immediately take measures to prevent and suppress

fires. PBA cannot pinpoint the exact location of burned area because it only delineates areas where a high density of hotspots is recorded by satellites. Burned area could continue expanding until the fires are extinguished.

The method to determine PBA is by transforming the hotspots data into Potentially Burned Area by observing the location of grouped hotspots area. A significant number of hotspots and their being close to each other indicates a Potentially Burned Area. High number of hotspots do not necessarily correlate with large PBA since the proximity of hotspots to each other should also be considered. The most representative approach in determining the PBA is by delineating a group of hotspots in 2 Km radius.

4.2.2. Potentially Burned Area by Province

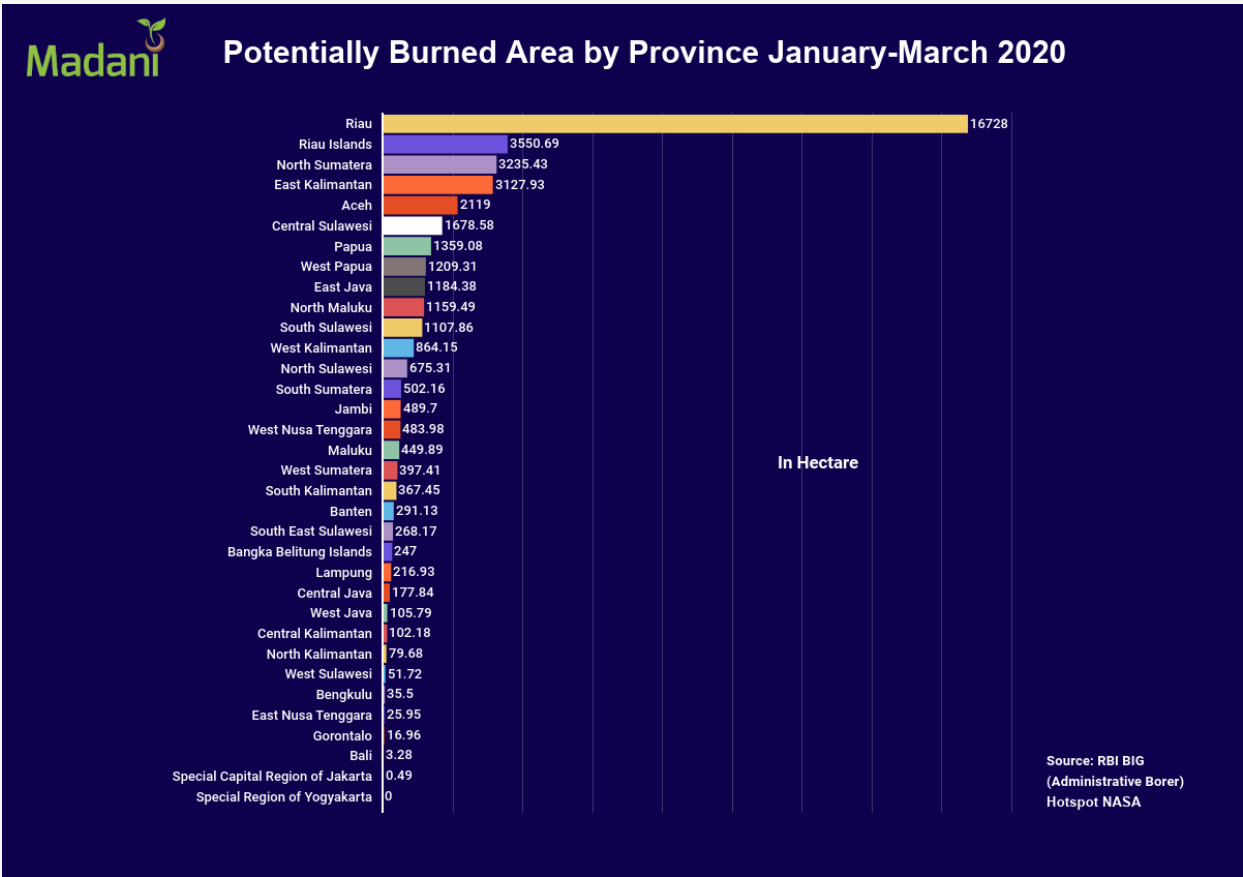


Figure 30. Potentially Burned Area by Province January - March 2020

During the observation from January-March 2020, 12,488 hotspots were recorded in Indonesia. This resulted in 42,312.44 hectares of Potentially Burned Area (see figure 30). Three provinces with the highest PBA in the first 3 months in 2020 are **Riau**, **Riau Islands**, and **North Sumatera** with 16,728 hectares, 3,550 hectares, and 3,235 hectares respectively.

Potentially Burned Area by Province January 2020

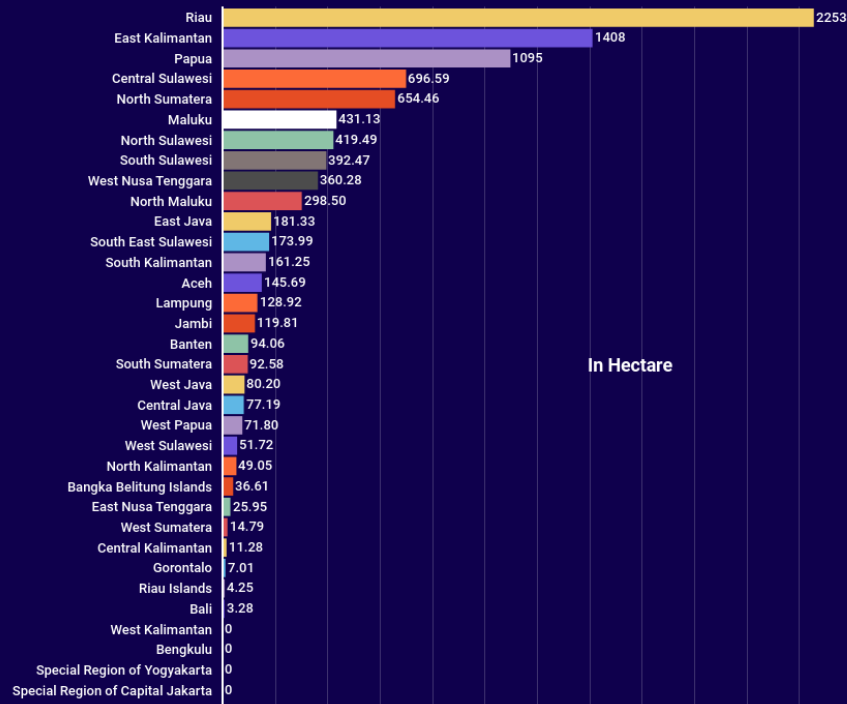


Figure 31. Potentially Burned Area by Province January 2020

Three provinces with the largest Potentially Burned Area in January are Riau, East Kalimantan, and Papua with 2,253 hectares, 1,408 hectares, and 1,095 hectares respectively (see figure 31).

Potentially Burned Area by Province February 2020

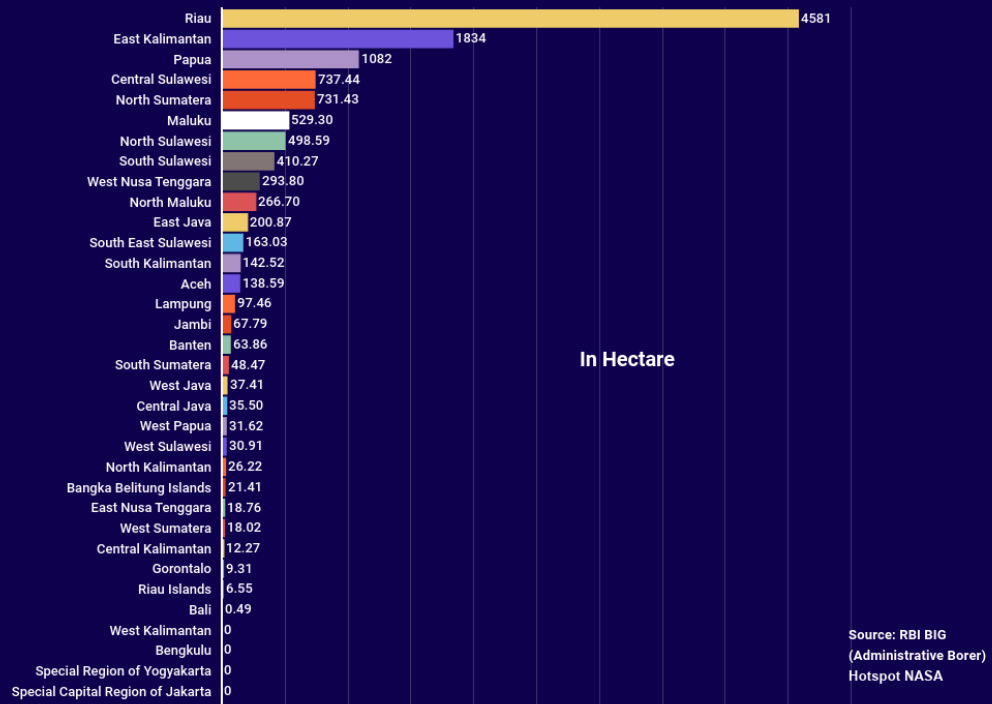


Figure 32. Potentially Burned Area by Province February 2020

In February, three provinces with the highest number of Potentially Burned Area are Riau, North Sumatera, and West Papua with 4,581 hectares, 1,834 hectares, and 1,082 hectares respectively (see Figure 32).

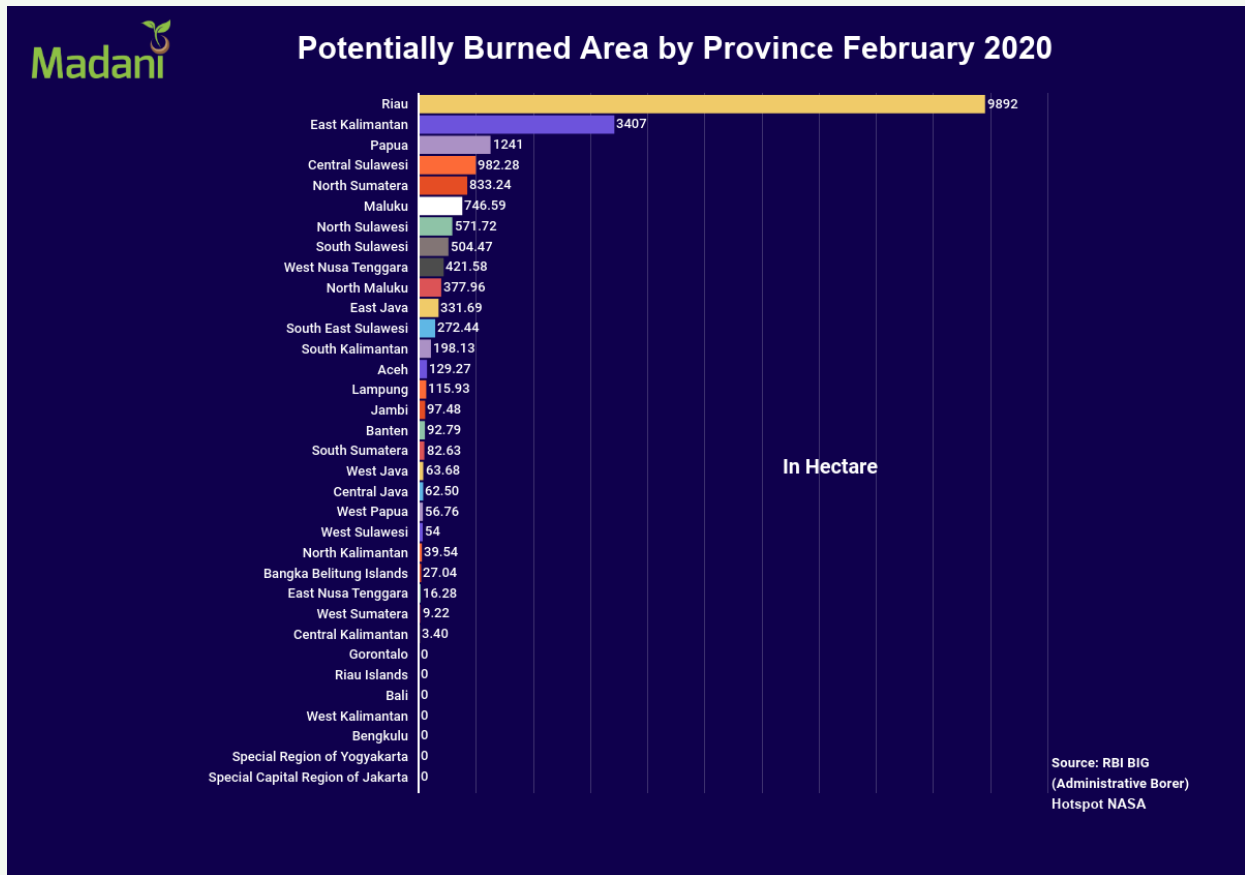


Figure 33. Size of Potentially Burned Area by Province March 2020

Meanwhile, three provinces with the highest number of Potentially Burned Area in March are Riau, Riau Islands, and Aceh with 9,892 hectares, 3,407 hectares, and 1,241 hectares respectively (see Figure 33).

Conclusions and Recommendations

1. In 2019, the size of burned areas in peat ecosystem is quite significant, both inside and outside permits/concessions, mainly palm oil and industrial timber plantations, including in the Indicative Moratorium Map (PIPIB) and Social Forestry Map (PIAPS). Therefore:
 - a. Peatland restoration must be a main strategy for the government and permit/concession holders to prevent fires in 2020 and onward.
 - b. The President needs to clarify the strategy for accelerating peatland restoration after the expiration of the Peatland Restoration Agency's (BRG) mandate in 2020. Provided that the BRG's mandate is extended, it must be equipped with adequate authority to ensure compliance of permit/concession holders in implementing peatland restoration in their territories since the realization of peatland restoration in permit/concession areas during the 2016-2020 period is dismal.
 - c. Law enforcement against permit holders who still drain peatland and fail to fulfil their obligation to restore peatland in their areas must be escalated.
 - d. Fire-related programs such as Peat Care Village (*Desa Peduli Gambut/DPG*), Fire Care Community (*Masyarakat Peduli Api/MPA*), and Disaster Resilient Village (*Desa Tangguh Bencana/Destana*) initiated by different agencies must be integrated or synergized at the site level, especially in villages around permits/concessions and in peat ecosystem.
 - e. Considering the extensive fires in peat ecosystem with protection function, the regulation that weakens the protection of peat dome (The Decision of The Minister of Environment and Forestry No. 10 of 2019) should be revoked.
2. The 2019 fires inside permits/concessions are dominated by palm oil and industrial timber plantations. The majority of PIPPIB and PIAPS burned in 2019 are also located near or around permit/concessions, especially palm oil and industrial timber plantations. Fires in the forest zone are also dominated by fires in these areas, particularly in industrial timber plantations. Thus:
 - a. Supervision of fire prevention/control facilities/infrastructure in permits/concessions area must be strengthened.
 - b. Law enforcement against permit/concessions holders whose areas burn must be escalated.
 - c. Legislation efforts that weaken law enforcement against permits/concessions holders whose areas burn, i.e. the Job Creation Bill must be halted.

3. Most of the 2019 fires occurred in non-forested land. Thus, efforts to reduce deforestation and forest degradation and rehabilitation of forests and degraded land should be integrated to fire prevention measures since intact forests will reduce the risk of land degradation and fires, especially during very dry season.
4. More than 1 million hectares (63 percent) of the 2019 Burned Area were Newly Burned Area. Most of them were found in Central Kalimantan, South Sumatera, and West Kalimantan. The significant number of Newly Burned Area in these three provinces during 2019 correlates with the high expansion rate of planted palm oil area in the 2015-2018 period. Thus:
 - a. There is a need to control the expansion of palm oil plantations in these three provinces by optimizing the implementation of the Presidential Instruction No. 8 of 2018 and Presidential Instruction No. 6 of 2019.
 - b. There is a need to conduct in depth investigations to find the causes of the newly burned area to arrive at comprehensive preventive measures.
5. Central Kalimantan, West Kalimantan, Papua, East Kalimantan, and South Sumatera are five provinces with the largest fire-prone area in 2020 and requires immediate attention. A detailed mapping of fires-risk as well as early fire prevention efforts must be conducted up to the site level in these five provinces.

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Spatial Data

Burned Area (MapService MoEF)

Batas Administrasi RBI BIG

2018 Land Cover (MapService MoEF)

Permits and Concessions Area (Various Sources)

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