MADANI Insight

"The Picture of Indonesian Palm Oil Industry, Answering Assumptions with Facts and Figures"

Volume VII
April 2020

HIGHLIGHTS

- The Loss of Forest Cover and Recurring Disasters in Riau
  There is an observable pattern from the research on five districts in Riau. It shows that the loss of forest cover in 2010-2013 has increased the opportunity for disasters occurrence (drought, landslides, storm, forest and land fires and floods) in the following two or three years.
- The Potential Economic Loss from Carbon Emission Release from the 2019 Forest and Land Fires in Peatland Palm Oil Concessions in Riau
  Based on the carbon value, the potential loss due to fires on peatland ecosystem inside palm oil concessions during the 2019 forest and land fires in Riau is estimated to reach 1.5 trillion rupiah until the damaged peatlands are fully recovered.
- Disaster and Disaster Management Capacity in the Village around Palm Oil Plantations in Riau
  8 out of 10 villages located around palm oil plantations in 6 districts with the largest area of planted palm oil are prone to disaster. Only 15% have disaster management capacity.

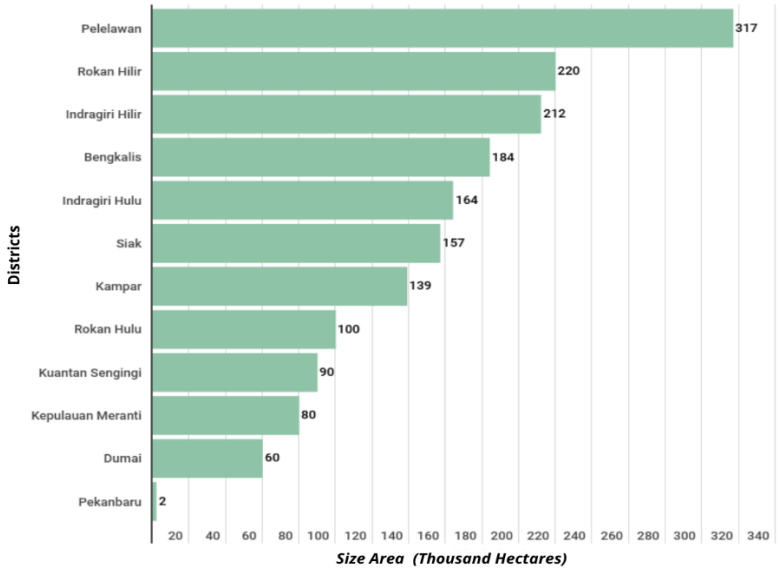
DISASTER: A CONSEQUENCE OF THE LOST OF FOREST COVER IN RIAU

The loss of forest cover in a region, either triggered by population growth or converted for other purposes, is not without negative consequences [1]. The most inevitable long-term negative consequences are changes in extreme weather and the global climate.[2] Moreover, tangible and direct negative consequences in the form of disruption on the cycle of hydrological balance can increase the rate of erosion, loss of flora and fauna diversity,[3] as well as vegetation composition.[4] In addition, environmental risks that are related to ecological disasters such as increased frequency of flooding[5], drought, tornado[6], and landslides have the potential to threaten the welfare of the community on a larger scale .[7]

During the 2010-2018 period, there were 1.7 million hectares [8] of lost forest cover in Riau, or equal to an average of 190 thousand hectares annually. It is interesting to study the patterns that emerge from the connection between tree cover loss and the frequency of occurring ecological disasters. One of the simple methods is to identify districts with the largest forest cover loss in Riau through public data taken from the Global Forest Watch (GFW). The data are then compared to data on disaster frequency from the National Board for Disaster Management (BNPB). The scope of ecological disasters in this insight includes floods, landslides, tornadoes, and drought in the 2010-2018 period.

The analysis found that there are five districts with the largest loss of forest cover in the period of 2010-2018. Pelalawan District ranks 1st as district with the largest area of forest cover loss in Riau with the total area of 316 thousand hectares or five times the size of Singapore,[9] followed by Rokan Hilir (220 thousand hectares), Indragiri Hilir (212 thousand hectares), Bengkalis (184 thousand hectares), and Indragiri Hulu (163 thousand hectares) respectively. More detailed explanation can be seen in the chart below.

The Size of Forest Cover Loss in Districts/Municipalities in Riau during 2010-2018



Source: Global Forest Watch (2020)

There is a unique pattern that can be analyzed in the 5 districts in Riau in relation to the loss of forest cover and the frequency of ecological disasters. It can be seen that the 5 districts have a fairly high loss of forest cover at the beginning of the period, then in subsequent years, the trend is declining. This fact is the opposite of the pattern of ecological disaster frequency in the 5 districts.

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[1] Barredo JI, Engelen G. 2010. Land use scenario modeling for flood risk mitigation. Sustainability 2:1327–1344. doi:10.3390/ su2051327

[2] Butler, R. 2019. Consequences of Deforestation. Accessed from https://rainforests.mongabay.com/09-consequences-of-deforestation.html on 22/4/2020

[3] Giupponi, Carlo & Jakeman, A.J. & Karssenberg, D.J. & Hare, M.P. 2006. Sustainable Management of Water Resources: An Integrated Approach.

[4] Ghimire, S., Higaki, D., Bhattarai, T. 2013. Estimation of soil erosion rates and eroded sediment in a degraded catchment of the Siwalik Hills, Nepal. Land 2:370–391. doi:10.3390/land2030370

[5] Ibid

[6] Forest Watch Indonesia. 2019. Angka Deforestasi Sebagai "Alarm" Memburuknya Hutan Indonesia. Accessed from http://fwi.or.id/wp-content/uploads/2019/10/FS_Deforestasi_FWI_small.pdf on 30/4/2020

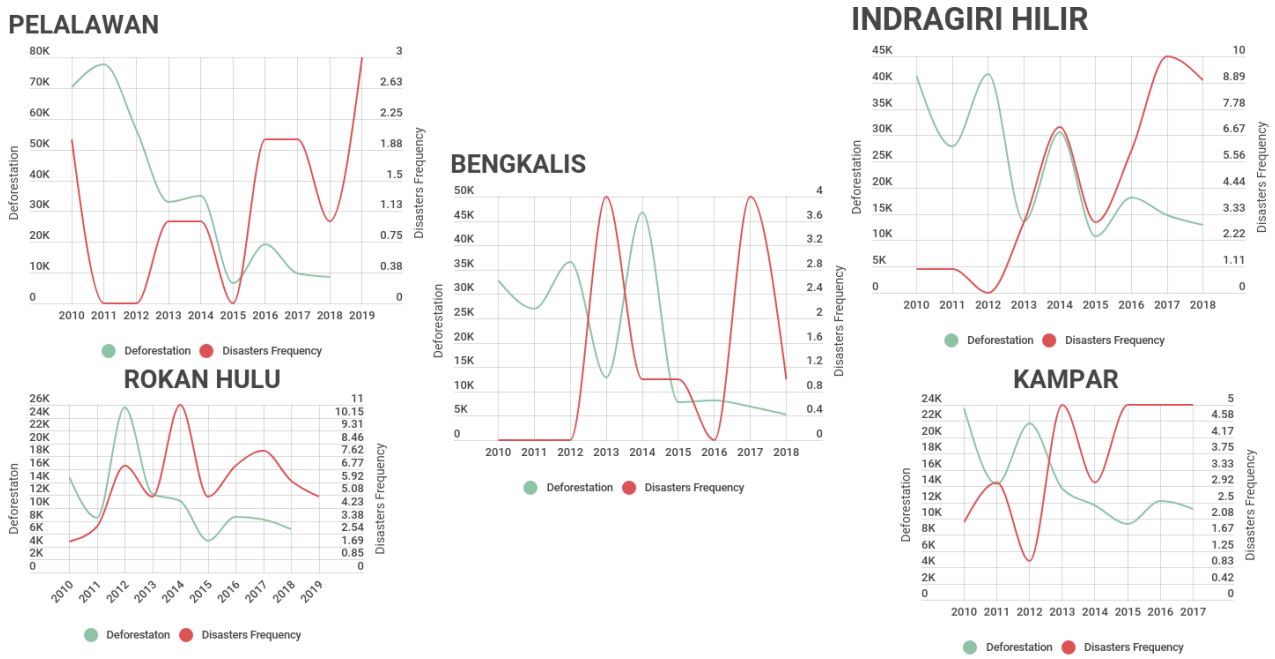
[7] Glade, T., 2013. Landslide occurrence as a response to land use change: A review of evidence from New Zealand. Catena 51:297–314. doi:10.1016/S0341-8162(02)00170-4

[8] Global Forest Watch. 2019. Accessed from https://www.globalforestwatch.org/dashboards/country/IDN/24

[9] Total Land Area of Singapore. Accessed from https://data.gov.sg/dataset/total-land-area-of-singapore on 24/4/2020

Compared to the last 5 years of the period, the frequency of ecological disasters was lower in the beginning of the period. The detailed explanation can be seen in the chart below.

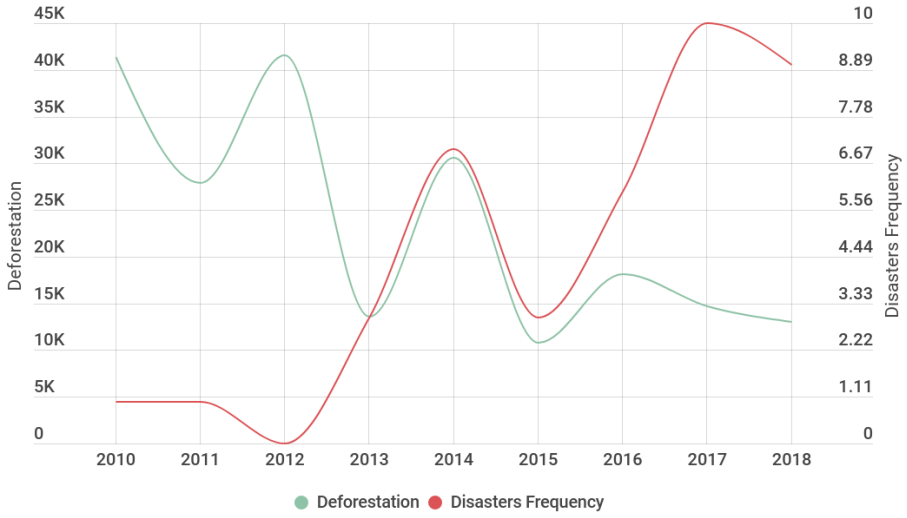
Chart on the Connection between Deforestation and Disaster Frequency from 2010 - 2018



Sources: Global Forest Watch (2020) and BNPB (2020)

The above chart shows a direct relation between the peak curve of forest cover loss and the peak of ecological disaster incidents in a district with a waiting period of around 2-3 years. In a simpler way, the chart shows a linear relationship between the two factors where an increase in deforestation will increase the ecological disasters incidents in the following year. Unfortunately, among these patterns, the period of 2017 to 2019 was a disaster "harvesting" period which was a consequence of the loss of forest cover in the period of 2011-2015. Indragiri Hilir is a district with a very distinctive pattern compared to the 4 other districts where 83% of its total land area is categorized as peatland. It is interesting to note that when forest loss peaked in this district, the frequency of ecological disaster had also reached its peak after one or two years of waiting period. More detailed explanation can be seen in the following Chart.

Relation between Deforestation and Disasters Frequency in Indragiri Hilir District



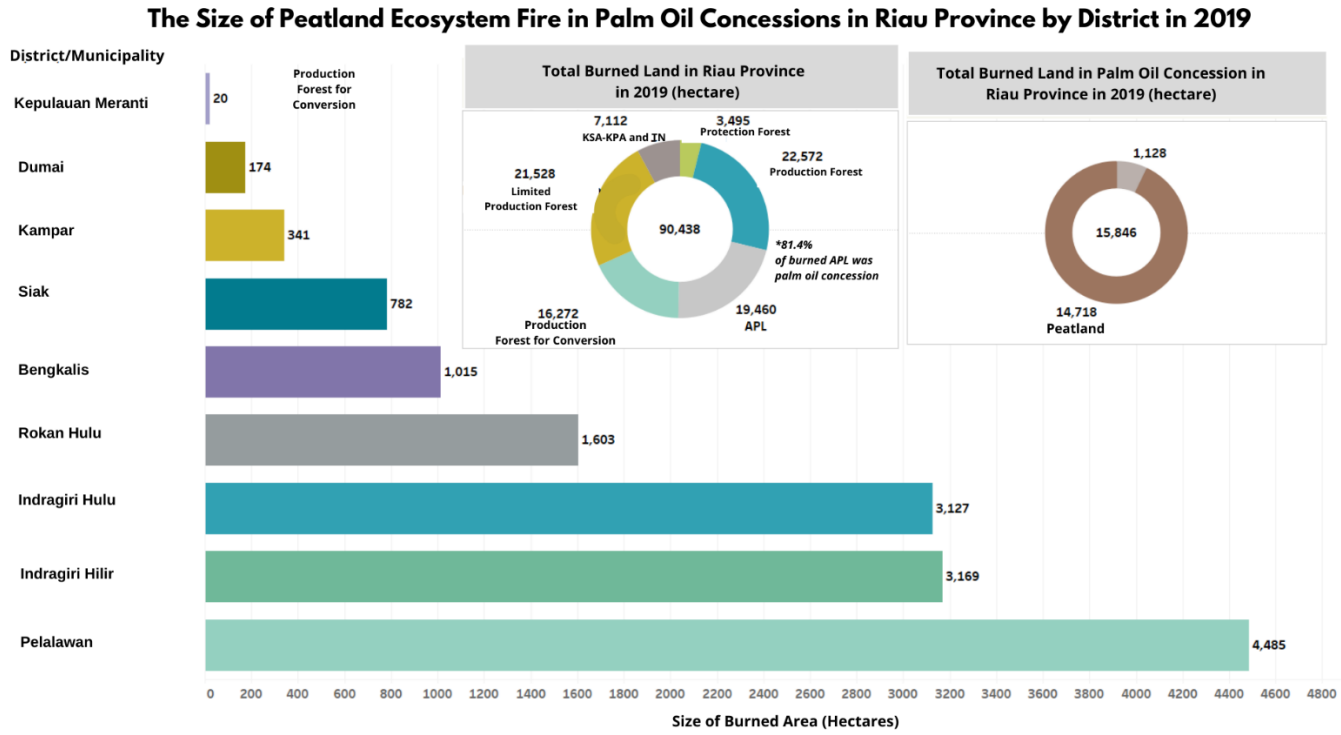
Sources: Global Forest Watch (2020) and BNPB (2020)

Although the loss of forest cover in Riau has relatively declined in the period 2010-2018, the negative consequences of ecological disasters will continue in the years ahead.[10] Destruction of forest does not only affect the ecosystems, but also the community. There are at least 194 villages where communities rely their livelihood on the existence of forests.[11] It is obvious that the destruction of forests and continued forest cover loss will threaten the livelihoods of the people in these villages. The result of the analysis can provide an illustration that, to stop the loss of forest cover, a multi-stakeholder commitment in Riau is required. The analysis also provides an indication that can be utilized by local governments in formulating development priorities that prioritize the carrying and supporting capacity of the region to minimize the possibility of future ecological disasters.

ECONOMIC LOSS OF CARBON VALUE DURING THE 2019 FOREST AND LAND FIRES IN PALM OIL CONCESSIONS THAT HAVE PEATLAND AREA

In 2019, forest and land fires in Indonesia were recorded at 1.6 million hectares.[12] Around 217.5 thousand hectares or 13.67% of such fires occurred in the concessions of companies, where 59.66% of them are categorized as peatland ecosystem. Several palm oil concession areas are identified as having been cleared by burning. In addition, many palm oil concession areas are intersecting with peatlands. This is because land burning has an advantage of lower cost in land clearing and preparation. The cost of burning is cheaper than using heavy equipment to clear the land.[13]

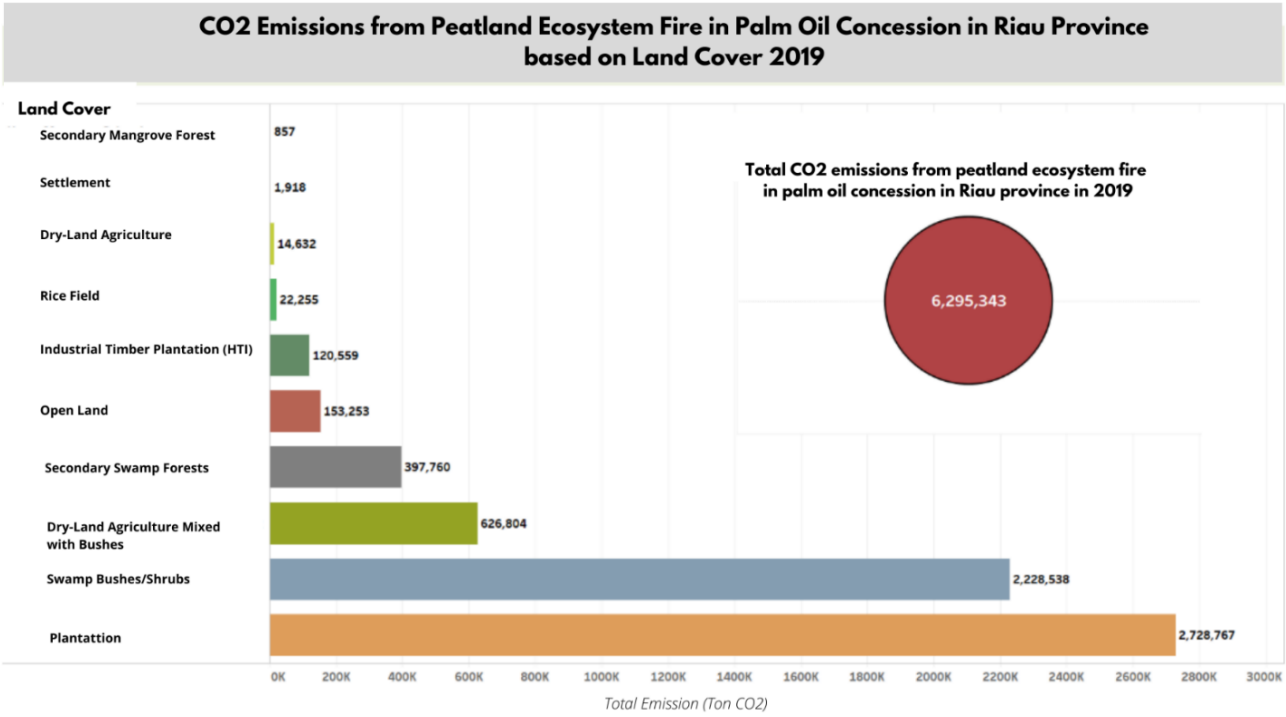
As a province with the largest planted palm oil area in Indonesia, Riau is inseparable from the traces of fires that originated from palm oil plantation permit area. During 2019, forest and land fires in Riau reached 90.4 thousand hectares, where 15,846 hectares occurred inside palm oil plantation permit area (81.4% of the burned non-forest area/APL or 17.52% of the total burned land). The detailed number of land fires in Riau can be seen in the chart below.



Source: Ministry of Environment and Forestry (2020) processed by Madani Berkelanjutan

[10] Rosa *et al*. 2016. The Environmental Legacy of Modern Tropical Deforestation. *Current Biology*, DOI: 10.1016/j.cub.2016.06.013
[11] [BPS] Badan Pusat Statistik. 2018. BPS: Potensi Desa Indonesia
[12] Kementerian Lingkungan Hidup dan Kehutanan. 2018. Accessed from http://sipongi.menlhk.go.id/hotspot/luas_kebakaran
[13] Simorangkir, D. 2006. *Fire use: Is it really the cheaper land preparation method for large-scale plantations? Mitigation and Adaptation Strategies for Global Change, 12(1), 147–164.* doi:10.1007/s11027-006-9049-2

Based on the chart above, we can see that the percentage of burned peatland ecosystems in palm oil concessions in Riau is quite large, up to 92.88% or equal to 14.7 thousand hectares. Pelalawan District made the biggest contribution to peatland fire located inside palm oil permit area, covering 4,485 hectares of burned area, followed by Indragiri Hilir (3,169 hectares); and Indragiri Hulu (3,127 hectares). Due to peatland fires in palm oil concession area, an increase in CO_2 emissions has been estimated at around 6.2 million tons of CO_2. The majority of these emissions are contributed by the loss of land cover and bush/swamp shrubs for plantation purposes. The details on the total emissions by land cover type is shown in the Chart below.



Source: The Ministry of Environment and Forestry (2020) processed by Madani Berkelanjutan

In this insight, economic loss from the land fires is only calculated from the amount of CO_2 emissions from the fires, which was quantified into monetary values, also called as economic valuation method using the market prices (Market Price Approach). This market price method uses the prices of traded goods and services on the commercial market to determine the value of ecosystem services.[14] The analysis results from the calculation estimates the potential loss in terms of carbon value caused by the 2019 peatland ecosystem fires located inside palm oil concession area in Riau up to Rp 1.5 trillion per year until the burned peatlands are recovered completely.

This is apart from the potentially huge economic loss due to peatland fires in concession which directly eliminated its ecological functions. In the global context, the Indonesian government has actually committed itself to reduce GHG emissions by 29% (834 million tons equivalent to CO_2), where 17.2% of the target comes from the forestry sector, which is including peat fires.[15] Although the management rights for palm oil plantations are entirely borne by the holder of plantation business licenses, peatland clearing by burning is prohibited by Government Regulation No. 57 of 2017.[16] Therefore, the monitoring role of the government, such as through permit review, is highly required to avoid recurring land fires that cause a huge economic loss.

DISASTER AND DISASTER MANAGEMENT CAPACITY IN THE VILLAGES AROUND PALM OIL PLANTATIONS IN RIAU

At present, palm oil plantation plays an important role in the national economy as a notable contributor to foreign exchange from export, employment providers, as well as the primary livelihoods of millions of farmer families. However, due to poor governance of palm oil plantations, there are also a host of environmental problems caused by the industry, one of which is ecological disaster.

[14] Carson, R.M., Bergstrom J.C. 2003. A Review of Ecosystem Valuation Techniques.
[15] Kementerian Lingkungan Hidup dan Kehutanan. 2018. Laporan Inventarisasi Gas Rumah Kaca dan Monitoring, Pelaporan Verifikasi. Jakarta.
[16] [RI]. Republik Indonesia. 2017. Peraturan Pemerintah Nomor 57 tentang Perlindungan dan Pengelolaan Ekosistem Gambut.

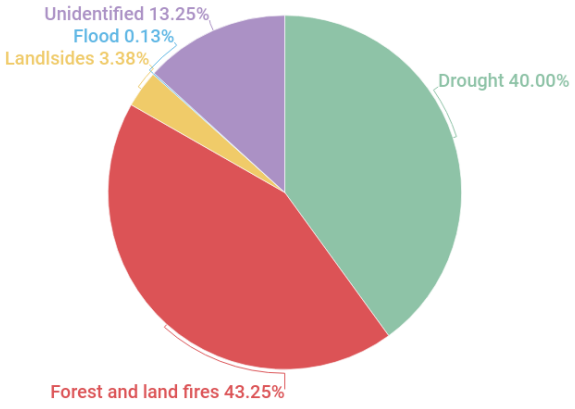
Ecological disasters occur in the region adjacent to palm oil plantations due to the conversion of forests into monoculture palm oil plantations.[17] Furthermore, ecological disasters that are most likely to occur due to the emergence of palm oil plantations in a particular area are forest and land fires, drought or water crisis, landslides, and floods[18].

As a province with the largest palm oil area in Indonesia, Riau is still facing the problem of ecological disaster. Until 2019, palm oil area in Riau was recorded at 3.4 million hectares or equal to 20% of the total national palm oil area. As of 2018, there were six (6) districts with the largest area of planted palm oil area, namely: Kampar (430 thousand hectares); Rokan Hulu (410 thousand hectares); Siak (347 thousand hectares); Pelalawan (325 thousand hectares); Rokan Hilir (282 thousand hectares), and Indragiri Hilir (227 thousand hectares). Various publications mention the correlation between the massive palm oil plantations expansion and ecological disasters. CIFOR, for example, concluded in their publications that forest and land fires in Riau were caused by exploitation of natural resources, massive development of palm oil plantations being the biggest contributor to the disaster.[19] Similar facts related to floods, landslides and drought were revealed by Jikalahari. Jikalahari stated that the three disasters were caused by the declining quality of the environment along with the environmental carrying capacity. Palm oil was one of the contributors to such disaster.[20]

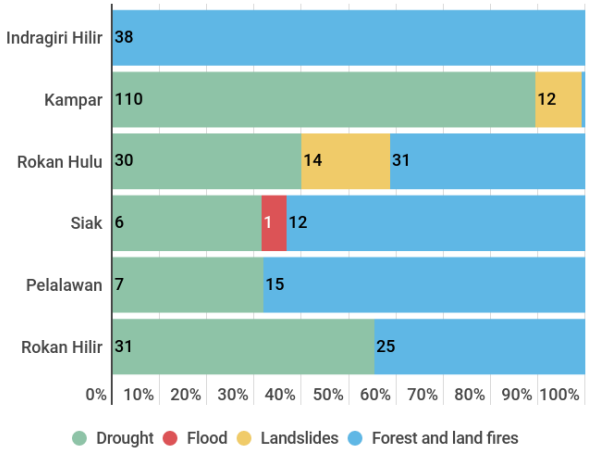
However, there are only few comprehensive analyses related to the vulnerability of the smallest level (rural area) to ecological disasters and the disaster management capacity possessed by a village. Riau government requires a more detailed understanding before they could initiate governance reform. A fair way to look at this situation is to use the whole perspective both from the civil society and the government. The most possible measure is to identify the number of villages around palm oil plantations using the data on plantation that have been collected by various civil society organizations from the Ministry of Spatial Planning (ATR/BPN). This data is then compared to the vulnerability index and the capacity of village disaster management issued by the government, namely the data on village potential from the Central Bureau of Statistics (BPS) and the National Board for Disaster Management (BNPB). In this edition of Madani Insight, we will focus on villages in 6 districts with the largest planted palm oil area in Riau.

The results of the analysis found that there are 573 villages located around palm oil plantation in the 6 districts. Kampar has the highest number of villages around palm oil plantations (137 villages), followed by Indragiri Hilir (98 villages), Rokan Hulu (96 villages), Siak (92 villages), Pelalawan (89 villages) and Rokan Hilir (61 villages). With these numbers, the types of ecological disaster vulnerability faced by a village are different from one to another. However, in general, 82% (471 villages) or 8 out of 10 villages around palm oil plantations in Riau are identified as villages that are prone to ecological disasters. More detailed figures can be viewed in following Chart.

Percentage of Ecological Disaster Types in 6 Districts with the Largest Area of Planted Palm Oil in Riau



The Number of Villages with Palm Oil Prone to Ecological Disasters

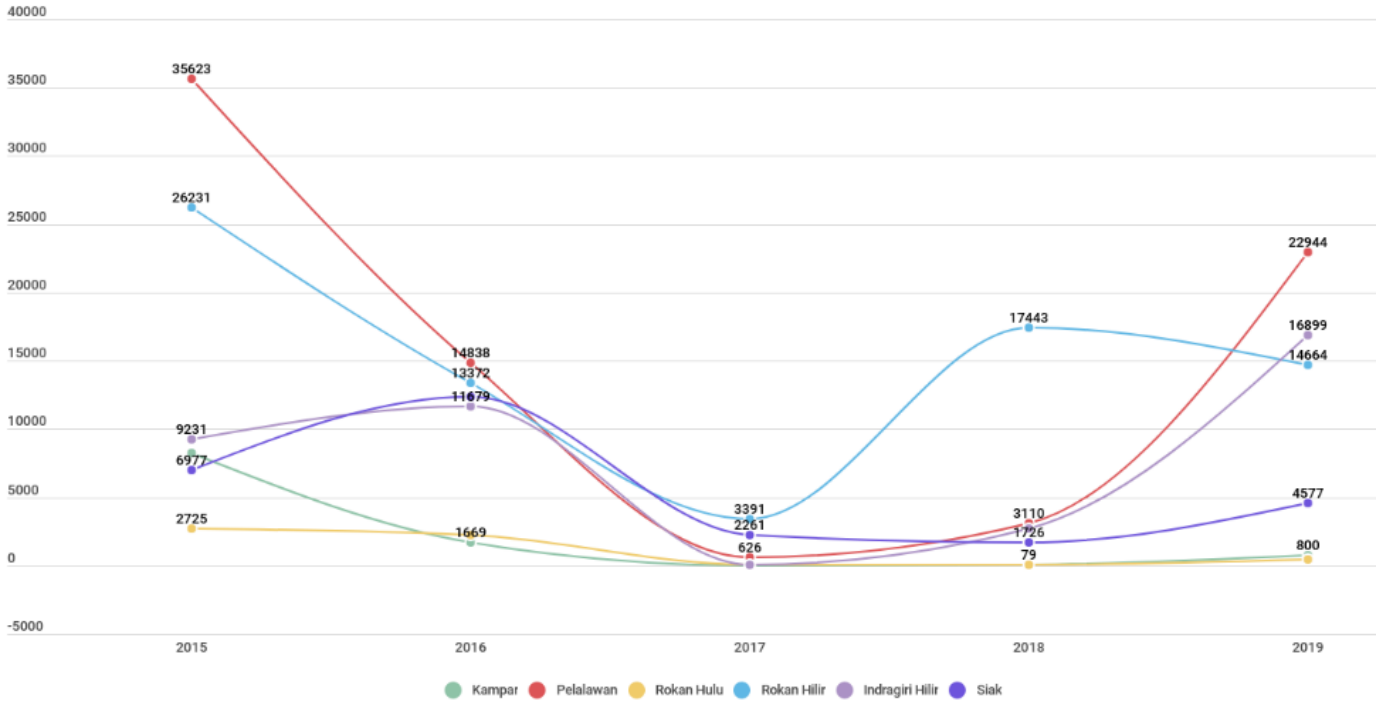


Sources: BNPB (2019) and ATR / BPN (processed)

[17] Rival A and Levang P. 2014. Palms of controversies: Oil palm and development challenges. Bogor, Indonesia: CIFOR.
[18] Herry P., Beni O., *et al*. 2018. Reducing forest and land fires through good palm oil value chain Governance. Forest Policy and Economics: Volume 91. Pages 94-106. ISSN 1389-9341,
[19] Suyanto, S., Chokkalingam, U. and Wibowo, P. 2004. Kebakaran Di Lahan Rawa/Gambut Di Sumatera: Masalah Dan Solusi. [online] Cifor.org.
[20] Jikalahari. 2016. Fakta Kritis Analisis. Jikalahari:Riau

The above chart emphasizes that the predominant disasters occurring in 6 districts with the largest area of planted palm oil in Riau are forest and land fires and drought. For forest and land fires, villages in 5 out of 6 districts have significant vulnerability to forest and land fires, which include Indragiri Hulu, Rokan Hulu, Rokan Hilir, Siak, and Pelalawan. The size of burned area in the 5 districts are presented in the Chart below. During 2015-2019, not a single year passed without the occurrence of forest and land fires. The full details regarding the burned area in the 6 districts can be seen in the chart below.

The Size of Burned Area in 6 Districts with the Largest Palm Oil Area in Riau



Source: Ministry of Environment and Forestry (2015 - 2019)

The above chart explains that, compared to the other 6 districts, Pelalawan is a district with the largest burned area. Periodically, 2015 and 2019 are the year when the fire reached its peaks in this district. In 2015, Pelalawan was the district with the highest number of hotspots in Riau.[21] By examining distribution pattern of burned areas, the high number of burned area in 6 districts is almost similar to Pelalawan. Looking back to 2015, there were great fires[22] in several regions in Indonesia, Riau is one of them. Various analysis results concluded that it was caused by several factors, such as, the activity of land clearing in Industrial Timber Plantation and palm oil concessions[23], as well as weather anomalies like *El Nino*.[24] Moreover, from 471 villages that are located around palm oil plantations and identified as disaster prone, 210 villages, or 43.25% of them, are prone to forest and land fires.

Furthermore, it is interesting to take a quick look at Kampar. The district is the only district with a disaster hazard different to the other 5 districts. From 137 villages that are located around palm oil plantations in Kampar, 90% of them are drought-prone villages. Until now, the common stigma attached to palm oil is that its existence has been causing drought. There is an assumption that the development of palm oil plantations will drain the water level in their wells[25]. Palm oil indeed requires huge amount of water supply to maintain its growth. But, the real problem lies in the physiology of shallow-rooted palm trees. Shallow-root in palm trees is the main

[21] British Broadcasting Corporation (BBC). 2015. Titik Api Meningkat, Kebakaran Hutan di Riau Bisa Meluas. Accessed from https://www.bbc.com/indonesia/berita_indonesia/2015/07/150730_indonesia_kabutasap_riau on 15/4/2020

[22] Cable News Network (CNN). 2019. Membandingkan Karhutla di Indonesia on 2015 dan 2019. Accessed from https://www.cnnindonesia.com/teknologi/20190918104533-199-431485/membandingkan-karhutla-di-indonesia-on-2015-dan-2019 on 15/4/2020

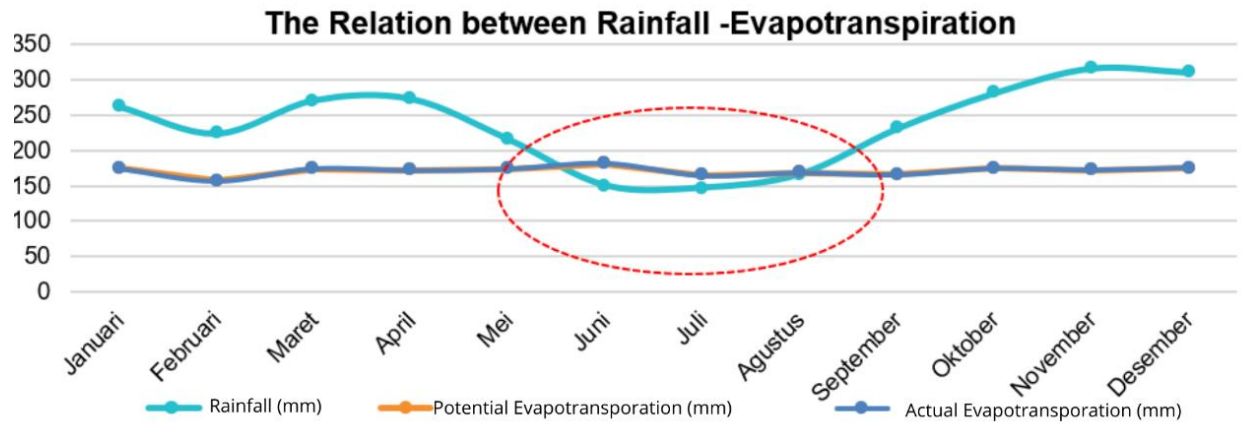
[23] Idham, A M. 2019. Penyebab dan Akibat Kebakaran Hutan di Kalimantan Hingga Sumatera. Accessed from https://tirto.id/penyebab-dan-akibat-kebakaran-hutan-di-kalimantan-hingga-sumatera-eic3 on 15/4/2020

[24] British Broadcasting Corporation (BBC). 2015. El Nino Pengaruhi Kebakaran Hutan di Indonesia. Accessed from https://www.bbc.com/indonesia/berita_indonesia/2015/08/150825_indonesia_kebakaranhutan on 15/4/2020

[25] Baskoro, Dwi P T. 2017. Kelapa Sawit: Benarkah Rakus Air?. Accessed from http://faperta.ipb.ac.id/buletin/2017/08/14/kelapa-sawit-benarkah-rakus-air/ on 15/4/2020

cause for low level absorption of rainwater.[26] Therefore, when the rain falls, the water will not be fully absorbed by the soil and escaped as run-off water. In flat land, the shallow ground water will cause waterlogging and flooding. Thus, when the rainwater is not fully absorbed by the ground, it will escape from the soil layer and end up as water puddle on other surfaces.[27]

These facts are also supported by the analysis results on drought calculations that are based on the data of rainfall from 1979 to 2012. It shows that there were 3 consecutive months that showed deficit in water balance during the dry months in Kampar. Even though the calculations only consider the water needs of palm oil plants and exclude the element of domestic water needs from residents in the villages around the palm oil plantation, it means that there is a possibility where drought occurs longer than the calculated result. More detailed description can be seen in the following Chart.



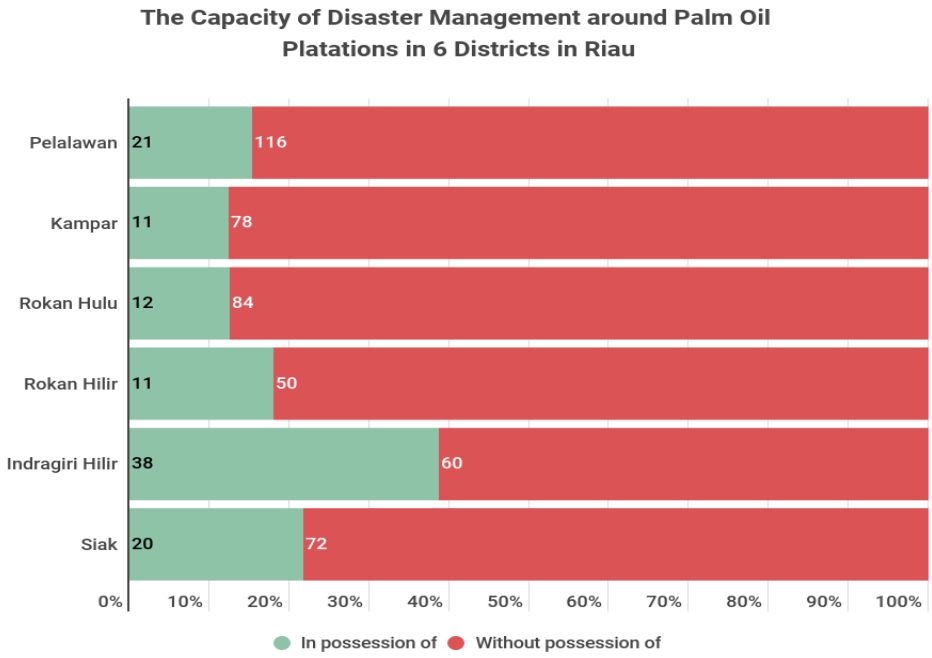
Source: Climate-Data.org (2019) (processed)

The drought will have a direct impact on the daily life of the communities who live in the affected area. It will affect people's access to drinkable water and clean water to meet domestic needs. In fact, 62% of the people in Kampar have been using ground water and surface water as the main water source for drinking water and domestic needs[28]. In other words, 62% of the community could lose its access to resources of their basic living needs.

Disaster Management Capacity in the Villages Around Palm Oil Plantations

Despite the high potential of disasters in the villages in the 6 districts with palm oil plantations, only 76 villages are already equipped with disaster management capacity.[29] In other words, 85% of disaster-prone villages around palm oil plantations in Riau have not been equipped with disaster management capacity. The distribution of villages with disaster management capacity are as follows: Indragiri Hilir (38 villages), Kampar (11 villages), Pelalawan (21 villages), Rokan Hilir (11 villages), Rokan Hulu (12 villages), and Siak (20 villages). Among these districts, with a total of 38 villages, Indragiri Hilir has the highest number of villages around palm oil plantations that are already equipped with disaster management capacity. More detailed illustration can be seen in the following Chart.

[26] Ibid
[27] Ibid
[28] [BPS] Badan Pusat Statistik. 2018. Statistik Kesejahteraan Rakyat Riau 2018.
[29] [BPS] Badan Pusat Statistik. 2018. Potensi Desa Indonesia 2018.



Source: Podes (2018) and ATR/BPN (processed)

The description from the above chart is a strong proof that only few villages around palm oil plantation area in Riau have a capacity for disaster management. In addition, the analysis results can provide a picture, that in the future, multi-stakeholder cooperation is important to resolve this issue. As one of the alternatives, village funds can be allocated to increase village capacity in responding to disasters. This has implications for reducing the risk of loss due to the occurrence of disasters. As explained above, the facts can be used as a highlight for local governments to start focusing on building disaster management capacity in these villages.

CONCLUSION

The loss of forest cover and the presence of palm oil plantations at the district and village levels are in fact correlating with the occurrence of ecological disasters. The results of analysis in the five districts that had the largest loss of forest cover show a distinctive and noticeable pattern. It can be concluded that the loss of forest cover in the 2010-2013 period have triggered a catastrophic effect in the following two or three years. At the district level, 8 out of 10 villages that are located around palm oil plantations in 6 districts that become the locus of analysis were identified as having high vulnerability to disasters. 5 out of 6 districts are prone to forest and land forest while 1 other district is prone to drought. Regarding forest and land fires, from the carbon value, the potential loss from the 2019 peat fires in palm oil concession area is huge. At least, 1.5 trillion rupiah per year is lost and the loss continues until the peat ecosystem condition returns to full recovery. Despite the high level of disaster vulnerability in the villages around palm oil plantations, only 15% have been equipped with disaster management capacity.

Although the current number is insignificant, a multi-stakeholder commitment is needed to stop the loss of natural forest cover in Riau province. The analysis can provide an indication for local governments to set its development priorities by considering the carrying and supporting capacity to minimize the possibility of future ecological disasters. Analysis of disaster potential and vulnerability should be a priority in the formulation of the Provincial Spatial Plan or District Spatial Plan to avoid and minimize disasters that can threaten human life. Lack of disaster management capacity in the villages located around palm oil plantation in Riau must be perceived as a serious concern for the government since 8 out of 10 villages are prone to disasters. Multi-stakeholder collaborative efforts, either through the village fund allocation scheme or the integration of TJSL program from the private sector, are very possible to create a resilient village with good disaster management capacity. Ecological fiscal transfer mechanism from the Ministry of Finance can be utilized by local governments, both provincial (TAPE) and district (TANE) levels, in Riau to reduce the loss of forest cover that lead to forest and land fires. This mechanism enables local governments to obtain fair benefits by maintaining their forests and peat hydrological system.