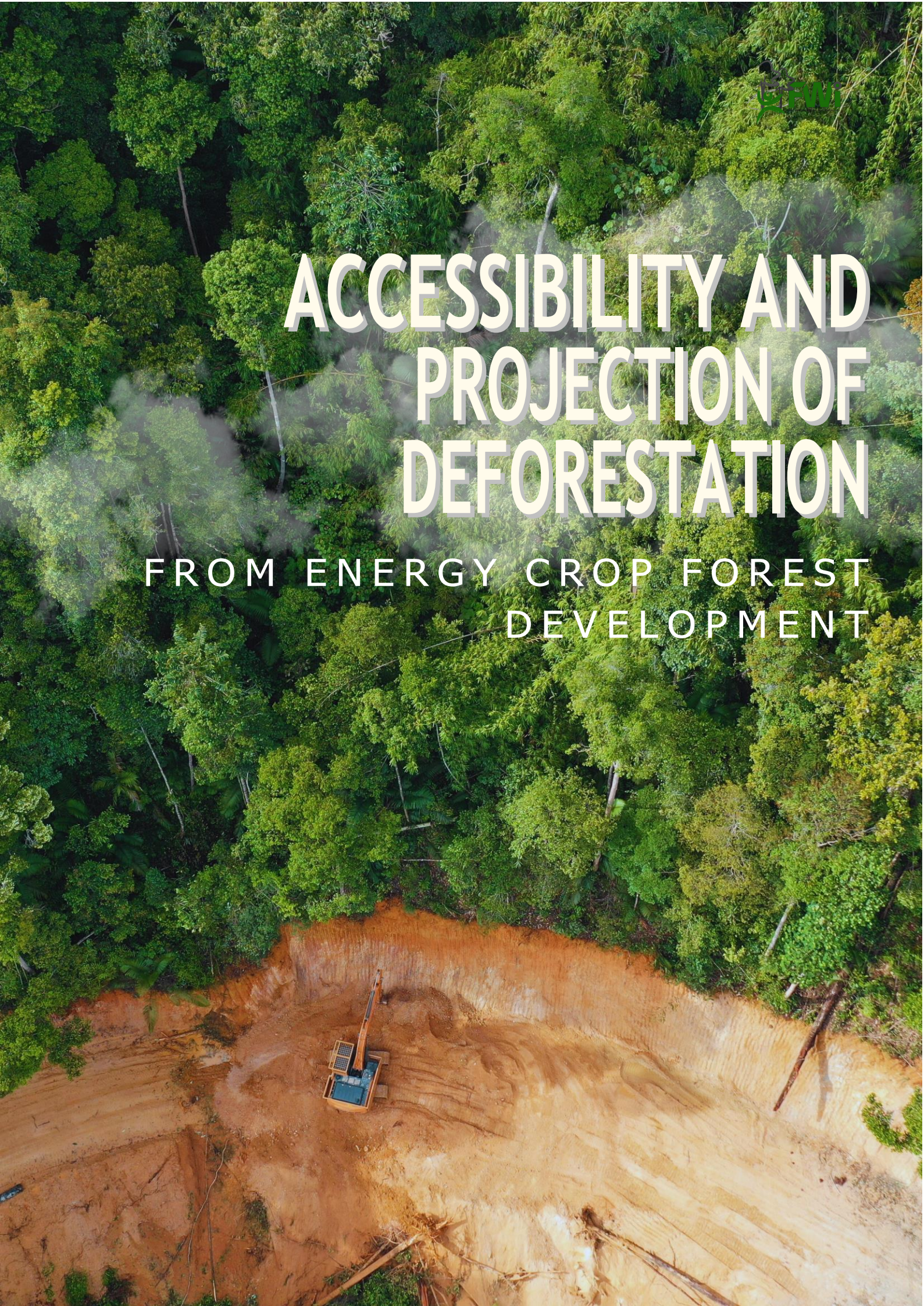

ACCESSIBILITY AND PROJECTION OF DEFORESTATION

FROM ENERGY CROP FOREST DEVELOPMENT

ACCESSIBILITY AND PROJECTION OF DEFORESTATION FROM ENERGY CROP FOREST DEVELOPMENT

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ACCESSIBILITY AND PROJECTION OF DEFORESTATION FROM ENERGY CROP FOREST DEVELOPMENT

The chosen means to increase the new renewable energy mix to 23 percent in 2025 and 31 percent in 2050 have significant consequences for the forest and land sectors. The use of biomass from wood is claimed to be a breakthrough strategy to increase the share of new renewable energy as stated in the 2017 National Energy General Plan. In RUPTL[1] document, the National Electricity Company (PLN) is committed to implementing a cofiring mix of up to 10 percent in 52 Steam Power Plants (PLTUs) in Indonesia as a part of an energy transition project. Biomass based on certain proportion targets will replace the final energy of coal and be burned simultaneously with coal. This may then be claimed as clean energy from the use of biomass as a renewable energy source. This practice is carried out in the context of reducing emissions from the energy sector including forests and land.

New and Renewable Energy Acceleration Strategy[2] are stated as follows:

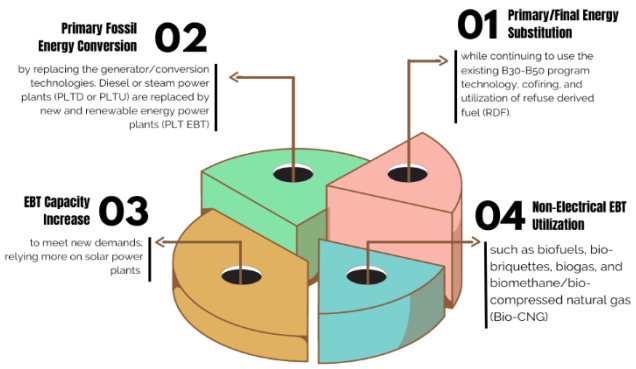


Figure 1.New and Renewable Energy Acceleration Strategy

Currently, there are 13 companies holding IUPHHK-HT (HTI-Industrial Plantation Forest) permits that have applied for Forest Utilization Permits (PBPH) and have even developed Energy Plantation Forests in their permit/concession areas. The 13 HTI companies have allocated an area of 142,172 hectares for energy plantations, and as of 2020, 8,848 hectares has been actualized. There are still 18 other HTI companies that have committed to transform by proposing PBPH for energy to build Energy Plantation Forests (HTE). In Java, Perum Perhutani is also committed to allocate 120 thousand hectares for energy which 28 thousand hectares[3] of it has been actualized in March 2021. The Ministry of Environment and Forestry is targeting the construction of 31 HTEs with areas of 1.29 million hectares in order to meet the demand for biomass production from forests.

1. Electricity Supply Action Plan (Rencana Usaha Penyediaan Tenaga Listrik, RUPTL) PT PLN Persero documents, page III-31
2. Delivered by Director of Bioenergy, Ministry of Energy and Mineral Resources on a Talkshow held by BPDLH

Forest Watch Indonesia (FWI) has found an intriguing finding: 13 HTI companies, which have transformed their business units to Energy Plantation Forests, experienced forest loss in their concessions. Deforestation of 55.54 thousand hectares out of the total HTI concessions of 570.97 thousand hectares, which is almost 10 percent, has occurred from 2017 to 2021. Furthermore, an area of 166.94 thousand hectares of natural forest remaining in the concession is threatened as it is in included in the deforestation plan.

The performance of these companies in developing energy plantations cannot guarantee the safety of natural forests. From these findings, FWI followed up to conduct a more in-depth estimation of deforestation projections of all forest concession right (HPH) and HTI companies in Indonesia. Through the forestry multi-business scheme as stipulated in the Minister of Environment and Forestry Regulation No. 8 Year 2021 on Forest Management and Preparation of Forest Management Plans, as well as Forest Utilization in Protection Forests and Production Forests, which provides broader business opportunities for IUPHHK-HA and IUPHHK-HT holders to engage in HTE development. These Include opportunities for deforestation from Social Forestry management which is also accommodated by recent policies on biomass energy business.

Table 1. List of companies that are committed to HTE development and their deforestation

IUPHHK-HT holder	Province	Non-forest (Ha)	Deforestation 2017-2021 (Ha)	Natural Forest 2021 (Ha)	HTE area (Ha)
PT CIPTA MAS BUMI SUBUR	SOUTH SUMATERA	6.353,49	372,42	819,2	7.545,11
PT DHARMA HUTANI MAKMUR	EAST KALIMANTAN	27.952,37	4.128,99	9.013,61	41.094,97
PT FIGUREU SELARAS ALAM	WEST KALIMANTAN	14.547,71	2.918,15	2.903,05	20.368,91
PT HIJAU ARTHA NUSA	JAMBI	14.497,19	4.834,52	12.857,39	32.189,10
PT HUTAN KETAPANG IND (DH. KERTAS BASUKI R)	WEST KALIMANTAN	79.059,00	3.968,13	14.936,30	97.963,43
PT JHONLIN AGRO MANDIRI	SOUTH KALIMANTAN	6.474,70	1.764,08	9.242,92	17.481,69
PT KORINTIGA HUTANI	CENTRAL KALIMANTAN	73.002,50	16.381,25	4.991,80	94.375,55
PT MUARA SUNGAI LANDAK	WEST KALIMANTAN	1.609,69	223,51	10.014,00	11.847,20
PT SADHANA ARIFNUSA	WEST NUSA TENGGARA	3.812,80	No data	No data	3.812,80
PT SELARAS INTI SEMESTA	PAPUA	70.178,90	17.995,60	78.570,50	166.745,00
PT USAHA TANI LESTARI (EAST NUSA TENGGARA)	EAST NUSA TENGGARA	41.447,71	No data	No data	41.447,71
PT BARA INDOCO	EAST NUSA TENGGARA, WEST SULAWESI	6.695,09	2.708,24	17.068,70	26.472,03
PT BIO ENERGI INDOCO	WEST SULAWESI	2.853,54	246,65	6.531,92	9.632,11

Deforestation projections are estimated using the accessibility approach. Accessibility is defined as the length of time it takes from the journey of HPH, HTI and Social Forestry (PS) concessions to the nearest PLTU point. The method used is the cost distance method using the parameters of the presence of roads, topography and land cover. Cost distance analysis, also known as Accumulated Cost Surface Analysis, is an analytical GIS tool used to calculate the least accumulative cost distance for each cell to the closest source through the cost surface (Chen, Liu & Liu, 2020)[3].

In this research, we use the least-cost path to measure the accessibility of HPH, HTI, PS permits to PLTU in Indonesia. In other words, we are trying to change the calculation of spatial accessibility into an analysis of the shortest travel time (or the smallest cumulative cost) from each permit location to the nearest PLTU. The higher the accessibility value generated, the greater the travel time to that location to a predetermined point, which indicates lower accessibility.

Figure 2. Photo of Appearance of the HTI Plantation

3. Wei Chen, Weidong Liu & Zhigao Liu (2020) Integrating land surface conditions and transport networks to quantify the spatial accessibility of cities in China, Journal of Maps, 16:1, 6-12, DOI: 10.1080/17445647.2019.1692081 To link to this article: https://doi.org/10.1080/17445647.2019.1692081

The analyzed PLTUs are 52 PLTUs appointed by PLN to carry out cofiring of biomass. The accessibility variable is derived based on several factors that affect access, such as the road network, land cover, river network, and topography (slope). Accessibility between HPH and HTI locations, and PS and PLTU can be identified by dividing them into three categories. Low category, namely the distance from the location reference point of 3 permits (HPH, HTI, PS) to the PLTU can be reached in more than 3 days. Medium category, namely the distance from the location reference point of 3 permits (HPH, HTI, PS) to the PLTU can be reached in one to three days. While the high category, namely the distance from the location reference point of 3 permits (HPH, HTI, PS) to the PLTU can be reached in one day or less. The number of analyzed licenses for HPH, HTI, and PS are 259, 294, and 2,546 permit units, respectively.

Based on the analysis of HPH, HTI, and PS accessibility to PLTU, a total of 3,287 HPH, HTI, and PS permits were observed to have high accessibility to PLTU, *i.e* these locations can be reached in less than one day. Based on the number of permits that have high accessibility to PLTU, the numbers of HPH, HTI, PS permits are 43, 147 and 1124 respectively. The details are as follows:

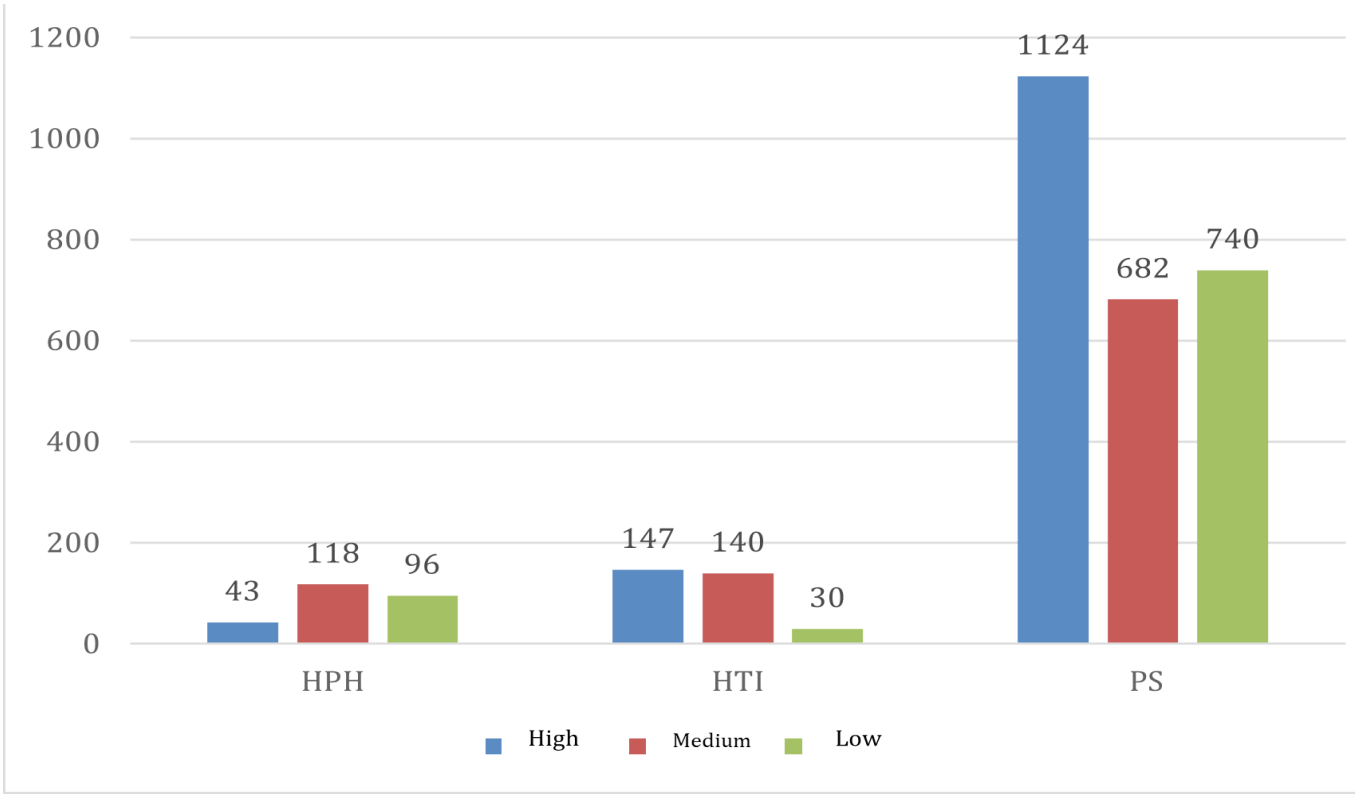
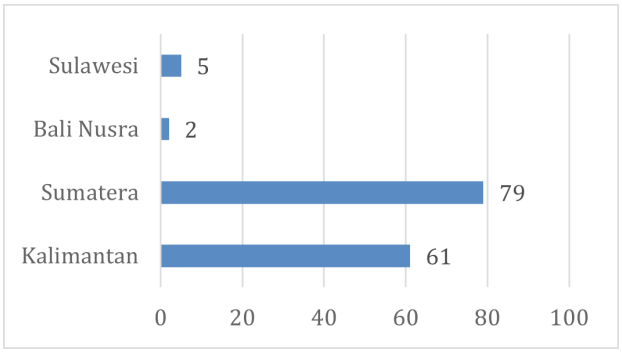


Figure 3. Graph of the accessibility levels of 52 cofiring steam power



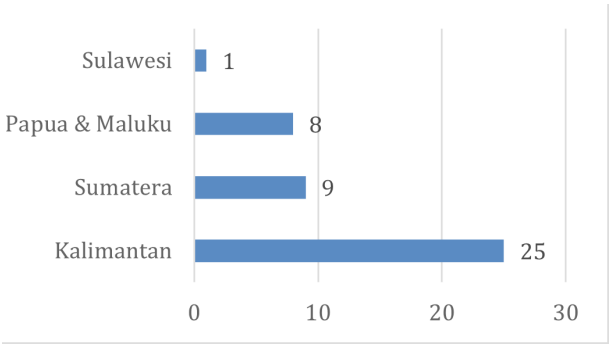


Figure 4. High accessibility to the number of HTI permits by region (left). High accessibility on the number of HPH licenses by region (right)

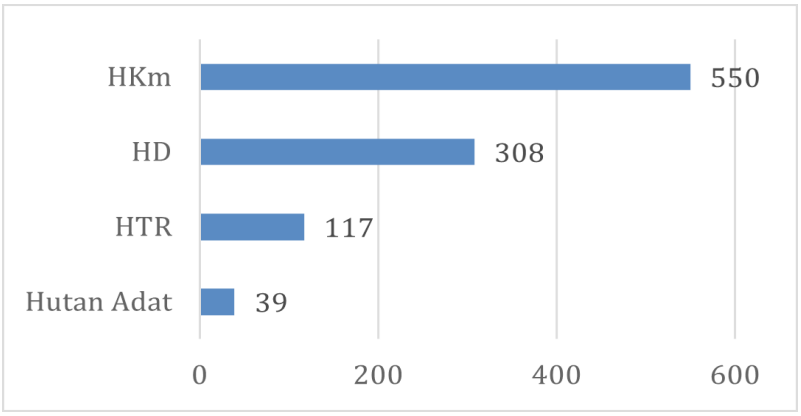


Figure 5. High accessibility on PS permission scheme

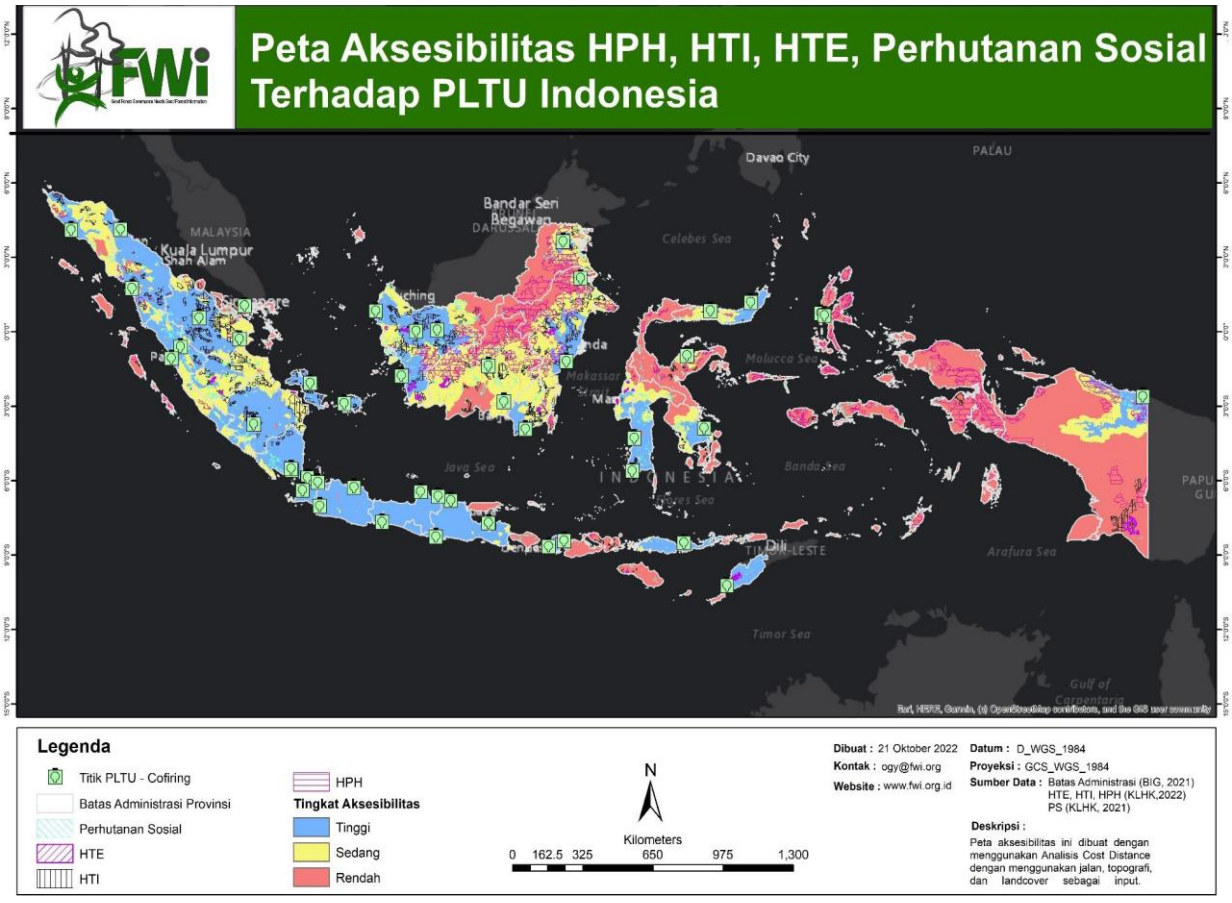


Figure 6. Map of HPH, HTI, HTE, and PS permits accessibility to cofiring power plant locations in Indonesia

Regionally, HPHs with high accessibility to PLTUs are Kalimantan, Sumatra, Papua, Maluku, and Sulawesi with 25, 9, 8, and 1 permit(s), respectively. As for HTI with high accessibility are in Kalimantan, Sumatra, Bali Nusra, and Sulawesi regions with 61, 79, 2, and 5 permits, respectively. As for PS, we differentiate based on the permit scheme, namely Customary Forest, HTR, HD, and HKm with 39, 117, 308, and 550 permits, respectively.

We also analyzed the presence of remaining natural forest in each permit; HPH, HTI and PS. Natural forest area is estimated from each type of permit that has high accessibility. The values for HPH, HTI and PS were 2.76 million Ha, 1.38 million Ha and 510 thousand Ha, respectively. Overall, natural forests located in HPH, HTI and PS permit concessions with high accessibility to PLTU and have a total value of 4.65 million Ha are in a threatened status due to the potential for business expansion, one of which is the development of Energy Plantation Forests.

Furthermore,we also analyze the accessibility of 30 HTI permits, those that have planted energy crops and are still in the form of commitments in each regency in 14 provinces in Indonesia. The average accessibility value is obtained by calculating the average accessibility value for all pixels located in every 30 HTI permits for the PLTU. Out of these permits, there are 15 regencies with high accessibility, 25 regencies with medium accessibility and 3 districts with low accessibility. Regencies with high accessibility to PLTUs are Aceh Besar, Bangka, South Bangka, Central Bangka, Bengkayang, Landak, Central Lombok, East Lombok, North Lombok, Melawi, Pidie, Sambas, Sanggau, Sintang, and Tanah Laut, with average accessibility of less than 1 day. (Figure. Accessibility of HTE per Regency to PLTU)

Regencies with medium accessibility to PLTU are Banyuasin, North Barito, Bone Bolango, Bungo, Gorontalo, North Gorontalo, North Kayong, Ketapang, Kotabaru, West Kotawaringin, Kubu Raya, Kupang, West Kutai, West Kutai, Kutai Kartanegara, East Kutai, Lamandau, Majene, Mamuju, Merangin, Ogan Komering Ilir, Paser, Pontianak, Sarolangun, West Sumba, and Tanah Bumbu with an average accessibility value of 1 day. There are 3 regencies with low accessibility; Berau, East Halmahera, and Merauke with an average accessibility of 8 days.

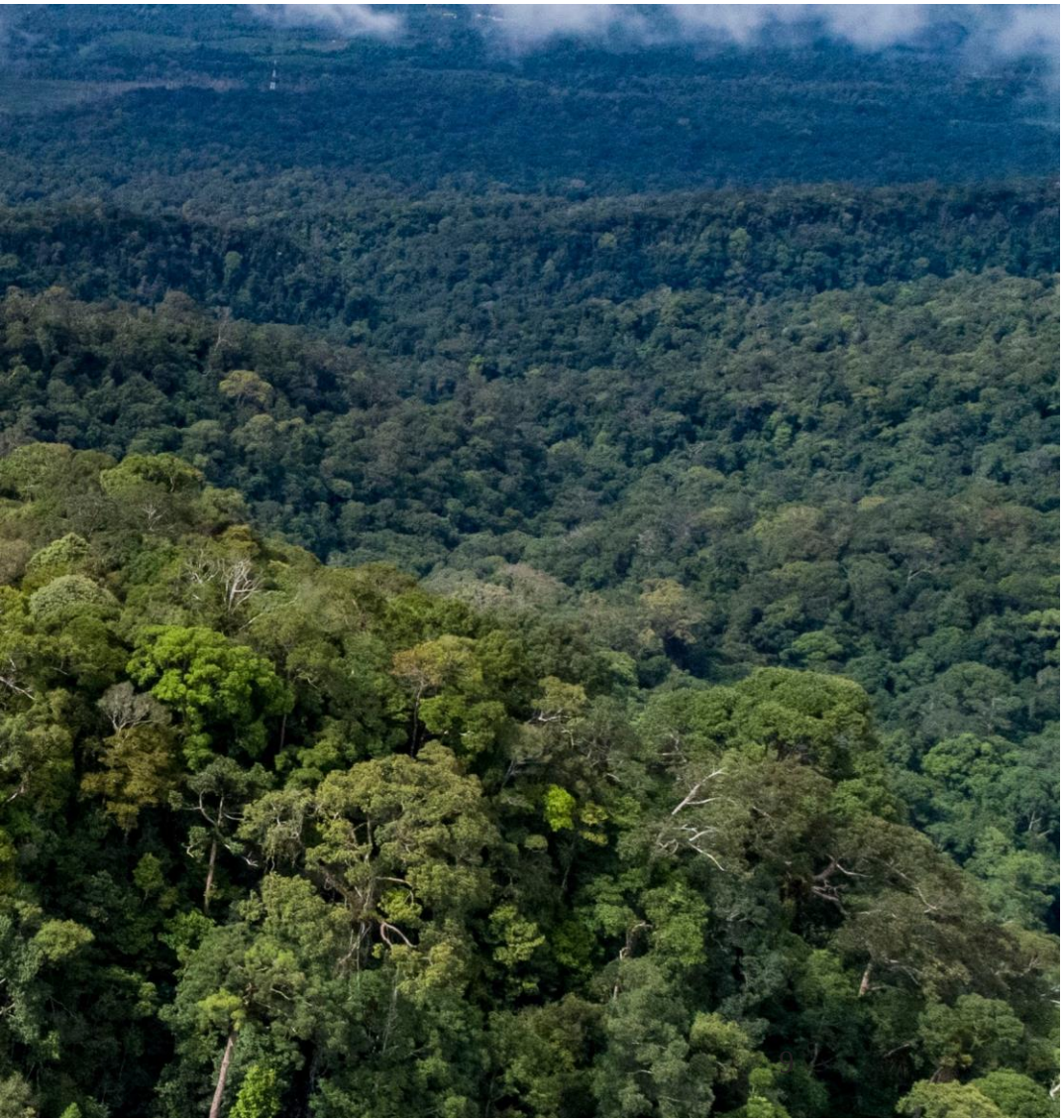


Figure 7. Natural Forest Mahakam Hulu

For instance, Bangka Regency in Bangka Belitung Province, the average accessibility value is 461.82 minutes, which indicates that the average travel time to the PLTU in Bangka Regency is 461.82 minutes (< 1 day) and is included in the High accessibility category, whereas in Berau regency, East Kalimantan Province, the average accessibility value is 3,312.63 minutes. This indicates that the average travel time to the PLTU in Berau district is 3,312.63 minutes (2 days) and is included in the low accessibility category. The closer to the PLTU, the higher the accessibility value are.

Regencies that have an average score of high accessibility to PLTU such as Aceh Besar, Bangka, South Bangka, Central Bangka, Bengkayang, Landak, Central Lombok, East Lombok, North Lombok, Melawi, Pidie, Sambas, Sanggau, Sintang, and Tanah Laut is the current and future locations for energy transition projects from biomass. These locations are exposed to a higher risk of destructed natural forest due to the construction of HTE in the regency.

The research concludes that deforestation alarm has gone off in Indonesia, as a result of HTE development through HPH, HTI, and PS permits. Destruction of natural forests, both that has occurred and will soon occur (in planned deforestation status) which include the projected deforestation, is the adverse effects if (or when) the energy transition policy in Indonesia is actually implemented. Another policy that makes timber biomass a renewable energy source, which is then co-fired with coal (cofiring) at the PLTU is an erroneous decision and must be reviewed.

APPENDIX.

Appendix 1. List of companies committed to developing Energy Plantation Forests/Energy Plantations

	Company Name	Permit Number	Province	Regency	Concession Area (Ha)
1	PT. Hijau Arta Nusa	SK.183/Men-hut-II/2013	Jambi	Merangin, Sarolangun, Bungo	32.189,10
2	PT. Usaha Tani Lestari*	SK.216/Men-hut-II/2013	East Nusa Tenggara	Kupang, Sumba Barat	41.447,71
3	PT. Bara Indoco**	SK.110/Men-hut-II/2014	West Sulawesi	Majene, Mamuju	26.472,03
4	PT. Bio Energy Indoco**	SK.931/Men-hut-II/2013	West Sulawesi	Mamuju	9.632,11
5	PT. Sadhana Arifnusa	SK.256/Menhut II/2011	West Nusa Tenggara	Central Lombok, East Lombok	3.812,80
6	PT. Dharma Hutani Makmur	SK. 632/Men-hut-II/2013	East Kalimantan	KuKar, Kubar	41.094,97
7	PT. Hutan Ketapang Industri	SK.59/Men-hut-II/2007	West Kalimantan	Ketapang	97.963,43
8	PT. Figureu Selaras Alam**	SK.739/Men-hut-II/2014	West Kalimantan	Sanggau, Landak	20.368,91
9	PT. Muara Sungai Landak	SK.389/Men-lhk/Setjen/ HPL.0/10/2020	West Kalimantan	Pontianak, Kubu Raya	11.847,20
	PT. Selaras Inti Semesta	SK.18/MEN-HUT-II/2009	Papua	Merauke	166.745,00
	PT. Jhonlin Agro Mandiri	SK.482/Men-hut-II/2014	South Kalimantan	Tanah Bumbu, Kotabaru	17.481,69
	PT. Korintiga Hutani	SK.201/Men-hut-II/2011	Central Kalimantan	Kotawaringin Barat and Lamandau	94.375,55
	PT. Ciptamas Bumi Subur*	70/Menhut-II/2005	South Sumatra	Banyuasin, OKI	7.545,11
	PT. Aceh Nusa Indrapuri**	SK.261/MEN-LHK/SETJEN/ HPL.0/4/2019	Aceh	Aceh Besar, Pidie	97.769
	PT. Bangkanesia**	SK.639/Men-hut-II/2009	babel	Central Bangka, South-Bangka	51.269
	PT. Istana Kawi Kencana	SK.20/Kpts-II/1998	babel	Bangka	14.116
	PT. Inhutani II Senakin	SK.505/Men-hut-II/2009	South Kalimantan	Kota Baru	30.300
	PT. Inhutani I Tanah Grogot	SK.815/Men-lhk/Setjen/ HPL.0/10/2019	East Kalimantan	Paser	30.611
	PT. Inhutani III nanga pinoh	SK.523/Men-hut-II/2011	West Kalimantan	melawi, sintang	124.608
	PT. Bhatara Alam Lestari**	SK.631/Men-hut-II/2013	West Kalimantan	Pontianak	7.100
	PT. Hutan Mahligai	SK.47/Menhut II/2006	East Kalimantan	West Kutai	11.358
	PT. Belantara Pusaka	SK.20/Kpts-II/1998	East Kalimantan	Berau	15.642
	PT. Oecanias Timber Product	SK.298/Men-hut-II/2012	East Kalimantan	Berau	16.000
	PT. Nityasa Idola**	SK.329/Kpts-II/1998	West Kalimantan	Sanggau, Sintang	98.797
	PT. Daya Tani Kalbar	SK.33/Menlhk/Set-jen/HPL.0/1/2019	West Kalimantan	Pontianak and Ketapang	44.989
	PT. E Greendo*	SK.747/Men-hut-II/2012	Central Kalimantan	West Kotawaringin	14.613

4. Luas areal yang dikomitmenkan untuk proyek energi

	PT. Gema Nusantara Jaya	1/1/IUPHHK-HTI/ PMDN/2017	Gorontalo	North Gorontalo	27.999
	PT. Kirana Cakrawala	184/Kpts-II/1997	Malut	North Halmahera	22.680
	PT. Wono Indo Niaga**	SK.740/Men-hut-II/2014	East Nusa Tenggara	Southwest Sumba and Central Sumba	12.682
	PT. Wanamulia Sukses Sejati Unit I dan II	3/1/IUPHHK-HTI/ PMDN/2015	Papua	Merauke	112.561
	PT. Inhutani III Unit Pelaihari	SK.358/MENHUT II2005	South Kalimantan	Tanah Laut	28.572
	Perum Perhutani		West Java, Central Java, East Java	-	120.000[1]

*Evaluated

**Revoked

Appendix 2. Accessibility of HTE per District/Regency

Regency	*Average Accessibility (minute)*	*Average Accessibility (day)*	*Class/Level*	*Province*
Aceh Besar	*611.44*	*0.42*	*High*	*Aceh*
Bangka	*461.82*	*0.32*	*High*	*Bangka Belitung*
Bangka Selatan	*387.83*	*0.27*	*High*	*Bangka Belitung*
Bangka Tengah	*387.83*	*0.27*	*High*	*Bangka Belitung*
Banyuasin	*2,396.89*	*1.66*	*Medium*	*South Sumatra*
Barito Utara	*2,323.24*	*1.61*	*Medium*	*Central Kalimantan*
Bengkayang	*782.00*	*0.54*	*High*	*West Kalimantan*
Berau	*3,312.63*	*2.30*	*Low*	*East Kalimantan*
Bone Bolango	*1,890.88*	*1.31*	*Medium*	*Gorontalo*
Bungo	*1,249.51*	*0.87*	*Medium*	*Jambi*
Gorontalo	*1,890.88*	*1.31*	*Medium*	*Gorontalo*
Gorontalo Utara	*1,890.88*	*1.31*	*Medium*	*Gorontalo*
Halmahera Timur	*18,237.40*	*12.66*	*Low*	*North Maluku*
Kayong Utara	*1,447.15*	*1.00*	*Medium*	*West Kalimantan*
Ketapang	*1,304.21*	*0.91*	*Medium*	*West Kalimantan*
Kotabaru	*1,904.05*	*1.32*	*Medium*	*South Kalimantan*
Kotawaringin Barat	*1,965.20*	*1.36*	*Medium*	*Central Kalimantan*
Kubu Raya	*1,460.34*	*01.01*	*Medium*	*West Kalimantan*
Kupang	*2,496.85*	*1.73*	*Medium*	*East Nusa Tenggara*
Kutai Barat	*1,747.19*	*1.21*	*Medium*	*East Kalimantan*
Kutai Kartanegara	*1,171.14*	*0.81*	*Medium*	*East Kalimantan*
Kutai Timur	*1,429.07*	*0.99*	*Medium*	*East Kalimantan*
Lamandau	*1,837.45*	*1.28*	*Medium*	*Central Kalimantan*
Landak	*707.20*	*0.49*	*High*	*West Kalimantan*
Lombok Tengah	*254.47*	*0.18*	*High*	*West Nusa Tenggara*
Lombok Timur	*254.47*	*0.18*	*High*	*West Nusa Tenggara*
Lombok Utara	*254.47*	*0.18*	*High*	*West Nusa Tenggara*
Majene	*1,637.40*	*1.14*	*Medium*	*West Sulawesi*
Mamuju	*1,843.92*	*1.28*	*Medium*	*West Sulawesi*
Melawi	*469.99*	*0.33*	*High*	*West Kalimantan*
Merangin	*1,249.51*	*0.87*	*Medium*	*Jambi*
Merauke	*12,093.21*	*8.40*	*Low*	*Papua*
Ogan Komering Ilir	*2,396.89*	*1.66*	*Medium*	*South Sumatra*
Paser	*2,348.21*	*1.63*	*Medium*	*East Kalimantan*
Pidie	*611.44*	*0.42*	*High*	*Aceh*
Pontianak	*1,050.82*	*0.73*	*Medium*	*West Kalimantan*
Sambas	*731.12*	*0.51*	*High*	*West Kalimantan*
Sanggau	*659.35*	*0.46*	*High*	*West Kalimantan*
Sarolangun	*1,249.51*	*0.87*	*Medium*	*Jambi*
Sintang	*469.99*	*0.33*	*High*	*West Kalimantan*
Sumba Barat	*2,496.85*	*1.73*	*Medium*	*East Nusa Tenggara*
Tanah Bumbu	*1,231.12*	*0.85*	*Medium*	*South Kalimantan*
Tanah Laut	*759.82*	*0.53*	*High*	*South Kalimantan*

2023