



Drivers of forest loss in Papua and West Papua

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Indonesian Papua extends across 41.1 million hectares (Mha) and constitutes the western half of the island of New Guinea. It is divided administratively into two provinces: Papua (31.3 Mha) and West Papua (9.8 Mha) and comprises 42 districts (or regencies). This region harbors one of the Pacific's last remaining expanses of old-growth tropical forest. The recent expansion of industrial plantations and road developments indicate that change is on the horizon.

Overview of two decades of change: 2001-2018

Forest area in 2018

In 2018, 83.4% (34.3 Mha) of Indonesian Papua was covered with old-growth forest, including 2.8 Mha of peat-swamp forest, 1.2 Mha of mangroves and 30.3 Mha of forest on mineral soils. Old-growth forests (abbreviated to “forests”) are closed-canopy (>90% cover) and high carbon stock (Above Ground carbon: 150-310 Mg C/ Ha) evergreen forests growing on dry mineral soils or on peat swamps. On peat domes, forests are thinner, low carbon stock pole forests. In coastal regions, forests include mangroves. In the drier regions of southern

Papua province, in Merauke district, forests include tall mixed seasonally inundated savanna, with trees reaching up to 40 m in height and usually dominated by *Melaleuca Cajeputi* and *Tristania suaveolens* tree species. “Forests” includes intact and selectively-logged forests. Intact forests are pristine old-growth forests, i.e. forests that have never been disturbed by humans, or for which disturbances were too localized to be detected by the satellites. Selectively-logged forests are old-growth forests that have been impacted by industrial-scale mechanized selective logging at some point since logging activities began. Intact and selectively logged forests are similar to “Primary” and “Secondary” forests on the Indonesian Ministry of Forestry and Environment’s maps.

Indonesia’s Ministry of Environment and Forestry inventory report states that in 2017 there were 33.8 Mha of forest (including Primary and Secondary forests). This difference in estimated forest area (about 0.5 Mha) is partly explained by the fact that we report tall dense savanna in Pulau Dolok, Merauke District as “Forest”, whereas the ministry’s inventory reports it as being non-forest cover.





Aerial view of tall mixed seasonally inundated dense savanna, with trees reaching up to 40 m in height in Pulau Dolok Protected Area, Merauke District, Papua Province. Photo by Ulet Ifansasti/Greenpeace.

Forest loss during 2001–2018

Two percent (713,766 ha) of old-growth forest was cleared

1.9% (487,895 ha) and 2.6% (225,871 ha) cleared in Papua and West Papua provinces, respectively.

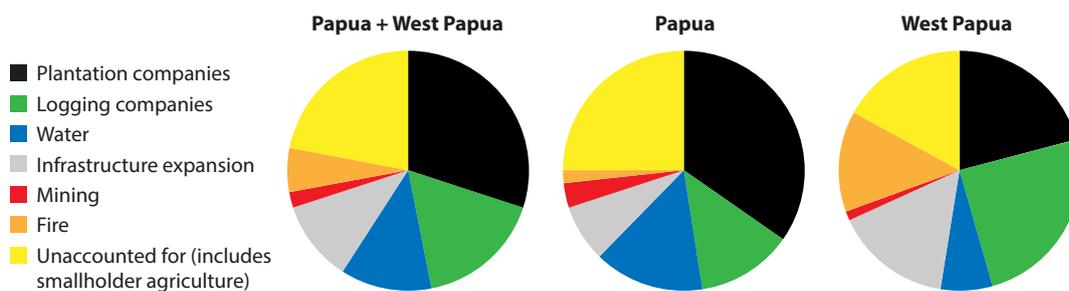
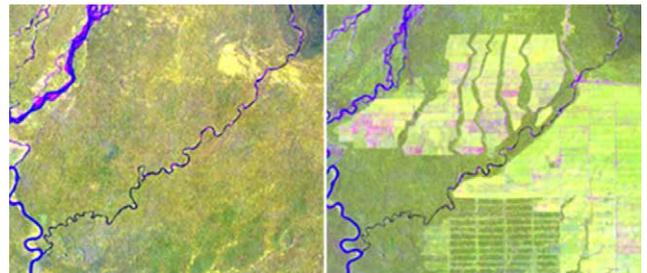


Figure 1. Drivers of 2001–2018 forest loss by province.

An area of 215,289 ha (30%) was cleared by oil palm and pulpwood companies

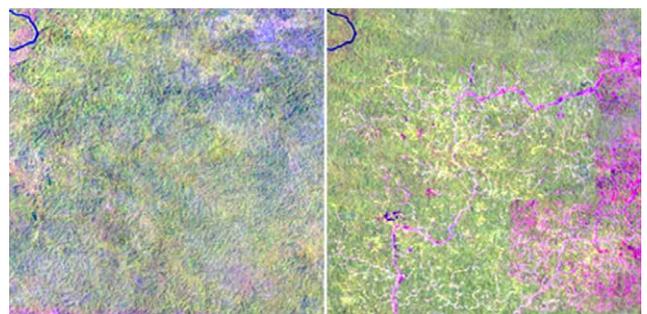
(96% oil palm; 4% pulpwood): 167,681 ha (34%) in Papua and 47,608 ha (21%) in West Papua. This company-driven deforestation caused 200,000 ha to be permanently converted to plantations, comprising 196,500 ha cleared and converted to plantations within the same year and 14,000 ha cleared but not planted (or cleared for company infrastructure developments such as roads connecting estates or bulking stations).



An area of forest (left) converted to an oil palm plantation (right) in Mimika regency.

Selective logging activities led to 120,500 ha (17%) being cleared

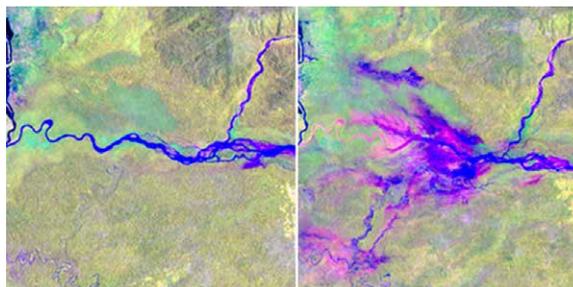
63,800 ha (13%) in Papua and 56,700 ha (25%) in West Papua. This logging-driven forest loss was caused by timber extraction that made way for logging roads and small clearings near roads. This loss is usually temporary, as disused logging roads and forest clearings in the forest interior regenerate quickly after logging. In total, we detected that 14,488 km of primary logging roads have been built in the forest interior.



An area of forest (left) impacted by logging (right) in Boven Digoel regency.

An area of 83,800 ha (12%) was cleared by the movement of surface water:

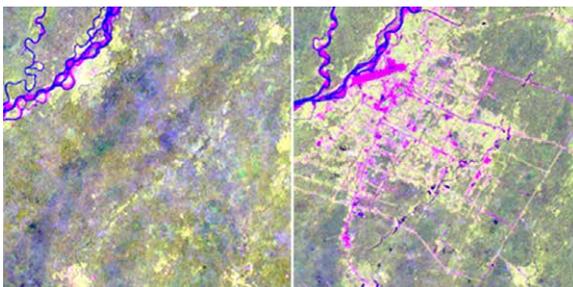
68,900 ha (14%) in Papua and 14,900 ha (7%) in West Papua. This water-driven forest loss is caused by lakes and rivers expanding or changing course, by river overflow and by surface run-off. This is a natural process and is usually temporary.



An area of forest (left) impacted by river overflow (right) in Mimika regency.

An area of 76,800 ha (11%) was permanently cleared for urban and infrastructure expansion:

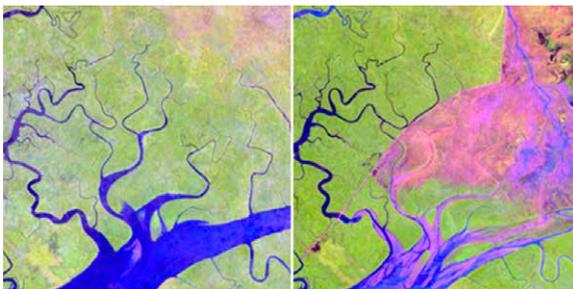
39,800 ha (8%) in Papua and 37,000 ha (16%) in West Papua. This includes forest loss caused by the expansion of built-up areas, transmigration sites and public roads.



An area of forest (left) converted to an urban center (right) in Yahukimo regency.

Mining activities caused 13,542 ha (2%) of forest to be permanently cleared:

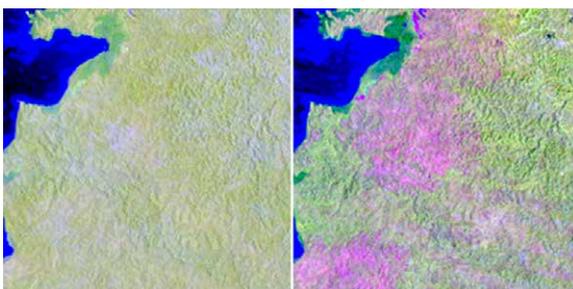
12,685 ha (3%) in Papua and 857 ha (0.4%) in West Papua. In addition, 11,227 ha were cleared after toxic waste (tailings) was dumped in the Aikwa delta system by the world's biggest gold mine in Mimika District.¹



An area of forest (left) impacted by mine tailings (right) in Mimika regency.

An area of 39,347 ha (6%) was impacted by forest fires:

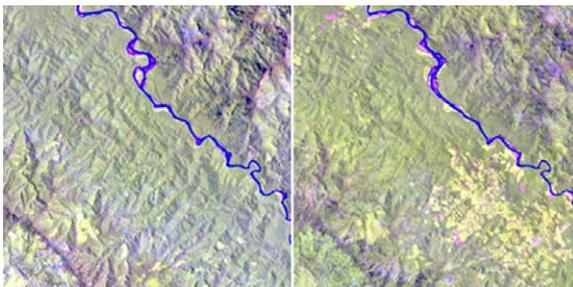
8,395 ha (2%) in Papua and 30,952 ha (14%) in West Papua. The most impacted districts are Fakfak, Kaimana, Sorong Selatan and Merauke. This fire-driven forest loss is usually temporary.



An area of forest (left) impacted by fire in 2015 (right) in Fakfak regency.

An area of 164,423 ha (23%) is unaccounted for:

126,594 ha (26%) in Papua and 37,829 ha (17%) in West Papua. This forest loss can be attributed to smallholder agriculture and other processes such as forest degradation by tornadoes.



An area of forest (left) converted to small-scale agriculture (right) in Pegunungan Bintang regency.

¹ Freeport's mine tailings have obliterated 22,000 ha of forest along the Aikwa delta since 1979, including 4,200 ha of mangrove forests.

Industrial plantations expanded during 2001–2018

In 2018, 0.8% (272,000 ha) of Indonesian Papua was covered with industrial oil palm (*Elaeis guineensis* Jacq.) and pulpwood (mainly *Acacia*) plantations (97% oil palm; 3% pulpwood).

The region gained 221,000 ha of plantations (212,000 ha of oil palm; 9,000 ha of pulpwood) between 2001 and 2018. Thus, the area planted with large monoculture plantations increased by 439%. Much of this expansion occurred in Papua Province, where 196,000 ha of plantations are located.



Aerial view of an oil palm plantation bordering a forest in Papua Province. Photo by Ulet Ifansasti/Greenpeace.

Roads expansion during 2001–2018

In 2018, there were 29,162 km of public roads (paved or unpaved): 8,195 km of main roads and 20,967 km of local roads. Main roads are defined as national roads, provincial roads and strategic roads by the Indonesian Government, and include the Trans-Papua Highway (3,795 km).

The public roads network increased by 44% (12,856 km), with main roads increasing by 40% (3,246 km) and local roads by 46% (9,610 km). Notably, the Trans-Papua Highway (4,330 km) is now almost 90% complete (3,795 km).

An area of 86,416 ha of forest has been cleared near (within 1 km of) main roads since 2000, representing 12% of total losses in forest area during the 2001–2018 period.



Local villagers in traditional canoes on the Digul river, Papua Province. Photo by Ulet Ifansasti/Greenpeace.

Annual trends: 2001–2018

Forest loss and plantations expansion

Forest loss was moderate between 2001 and 2010, with an average of 26,000 ha cleared each year (Figure 2, panel a). Since 2011, forest loss has trended upward sharply, reaching a maximum in 2015 (103,000 ha lost). This acceleration is most evident in Papua Province, where forest loss peaked in 2016 (59,000 ha). In West Papua, forest loss has been more constant, except for a sharp peak in 2015 (44,000 ha) caused by El-Niño-driven forest fires in Fakfak, Kaimana, and Sorong Selatan regencies.

The variation in annual forest loss is strongly positively correlated with the annual expansion of industrial plantations ($r^2=0.81$, $p<0.0001$; Figure 2, panels a,d), although the correlation is noisier in West Papua ($r^2=0.28$, $p=0.02$; panels c,f) than in Papua ($r^2=0.89$, $p<0.0001$; panels b,e). Since 2011, oil palm expansion has trended upward and peaked in 2015 (38,000 ha

added; black-and-white bars in panel d). Much of this expansion occurred in Papua Province (panel e), where 74% (162,000 ha) of the total plantation area added between 2001 and 2018 is found.

Forests cleared and converted to plantations within the same year (company-driven deforestation; black bars in panels d,e,f) exhibit a similar rise-and-fall pattern to that shown by industrial plantation expansion.

The construction of main roads, which includes the Trans-Papua Highway, has trended up from 2001 to 2016 (Figure 3), from 110 km of roads added in 2001 to 266 km in 2016, with two peaks in 2012 (341 km added) and 2015 (347 km added). On the Papua Province side (panel b), there appears to be two distinct periods for road developments. During the period 2001 to 2010, road construction was moderate, with an average of 43 km added each year. Since 2011, road construction has trended upward sharply, reaching a maximum in 2015 of 231 km. In West Papua (panel c), road construction appears to have developed more constantly throughout the years.



Forest loss and plantations expansion in Papua.

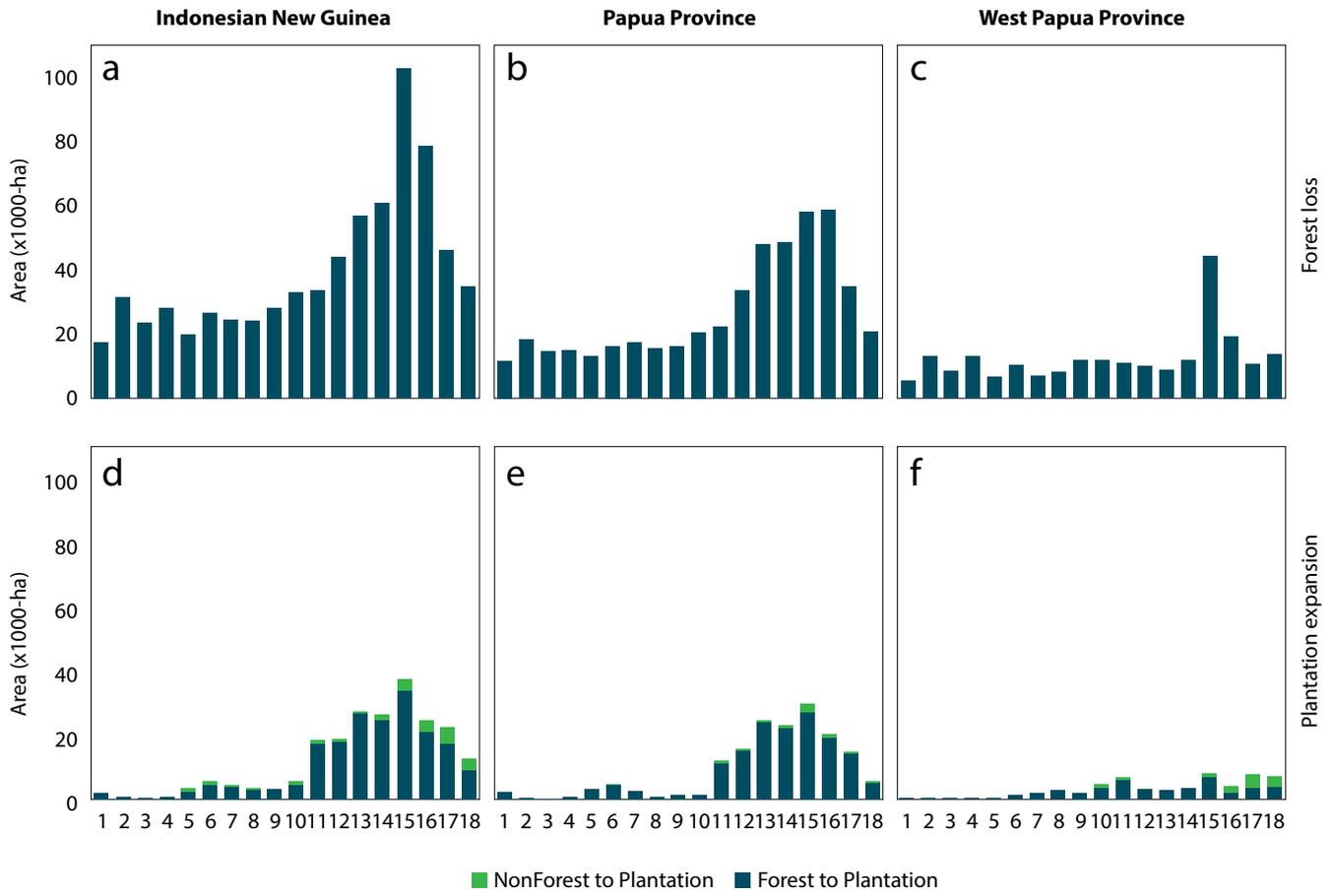


Figure 2. Time series (2001–2018) data for Papua's and West Papua's land cover change indicating the annual loss of forest area (a,b,c) and the concomitant annual expansion (d,e,f) of industrial plantations of oil palm and pulpwood (mainly fast-growing *Acacia*). The black bars in (d,e,f) represent the forested areas cleared and converted to industrial plantations in the same year (or company-driven deforestation).

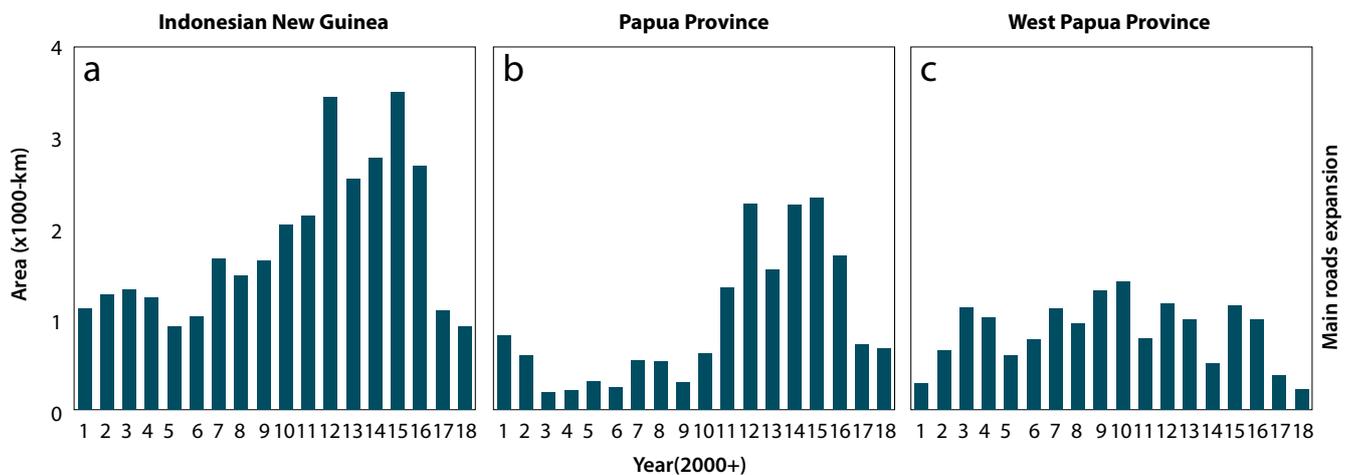


Figure 3. Time series (2001–2018) data for main public roads expansion in Papua and West Papua provinces. We define main roads as: national roads, provincial roads, Trans-Papua Highway.

Focus on the last two years: 2017 and 2018

Forest loss declined markedly in 2017 and in 2018 but remained above pre-2010 levels (35,000 ha cleared in 2018). This decline is most apparent in Papua Province, and less so in West Papua Province.

Plantations expansion also declined markedly in 2018 (13,000 ha added), but remained higher than pre-2010 levels.

Main roads expansion dropped dramatically in 2017 (109 km added) and in 2018 (90 km added). In 2018, roads expansion was the lowest in 18 years. This drop is evident in both provinces.



Oil palm plantation landscape in Papua, Indonesia. Photo by Agus Andrianto/CIFOR

Spatial planning as of 2018

- *Oil palm concessions extend 1.81 Mha, with 1.4 Mha remaining forest in concessions.*
- *Pulpwood concessions extend 813,000 ha, with 577,000 ha remaining forest in pulpwood concessions.*
- *The network of conservation areas (nature reserves and national parks) extends 8.6 Mha, or 21% of Indonesian Papua.*

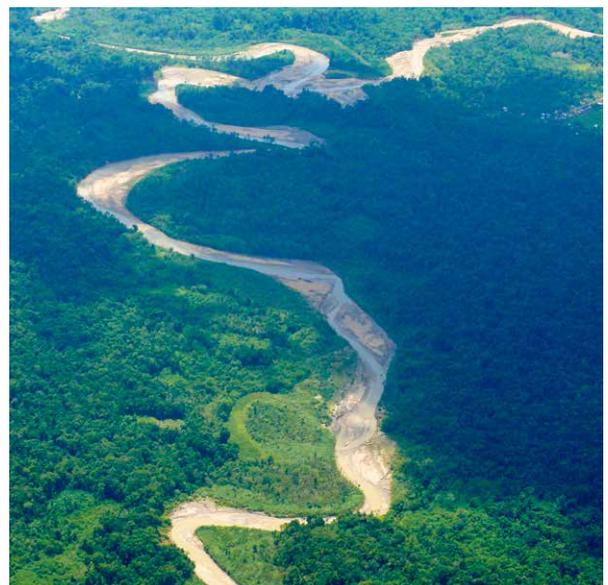


Photo by Manuel Boissière for CIRAD and CIFOR



Aerial view of an old-growth forest growing on mineral soils in Papua Province. Photo by Ulet Ifansasti/Greenpeace.



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