Kementerian Pertanian
Republik Indonesia

LAPAN

BADAN INFORMASI GEOSPASIAL

KPK
Komisi Pemberantasan Korupsi

Oil Palm Cover in Indonesia

An Analysis of Satellite Imagery from 2014-2016

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Digitization by the Auriga team working as part of the GN-PSDA team and program implementation

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2019

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Cover:
Oil palm plantation in PIR ADB village, Langkat district, North Sumatra. Photo taken on 9 April 2018 using a quadcopter drone .

Photo: Yudi Nofiandi/Auriga Nusantara

Oil palm seedlings ready for planting in Sukabumi district, West Java .

Photo: Yudi Nofiandi/Auriga Nusantara

Chapter 1
Updating Oil Palm Data

BACKGROUND

The Government of Indonesia issues periodic announcements on oil palm plantation data through its Oil Palm Plantation Statistics released by the Ministry of Agriculture's Directorate General of Estate Crops. These statistics record the extent of private, government and smallholder oil palm estate plantings in Indonesia.

The statistics provide figures on private and state-owned plantations based on secondary data from company reports, while data on smallholder plantations is obtained through various interview methods.

Advances in technology and knowledge have opened up opportunities for spatial determination of oil palm cover.

Though this may give rise to the emergence of figures that differ from the aforementioned statistics, spatial data can provide comparisons that enable the government to determine relevant policies relating to state revenue, the development of upstream and downstream industries, and the advancement of smallholder plantations.

It is with these considerations in mind that a spatial approach to mapping oil palm cover was undertaken. This data can elicit the updating of oil palm estate data in Indonesia.

We should emphasize that data presented in this book is data on oil palm cover, meaning areas on the ground already planted with oil palm. These maps will of course differ from concession area maps, as they do not include areas of concessions that have either not been, or have yet to be planted with oil palm.

Chapter 2

Utilizing Satellite Imagery

2.1 2.1 MAPPING REGIONS

Mapping was conducted by combining provincial Indonesian Estate Crop Statistics or *Statistik Perkebunan Indonesia* 2015-2017 (Directorate General of Estate Crops, 2018) and available SPOT-6 satellite imagery for provinces with oil palm cover. The absence of SPOT-6 satellite imagery for Riau Archipelago and North Sulawesi meant no mapping was conducted for either of the two provinces even though statistics indicated 19,013 ha of oil palm cover in Riau Archipelago province in 2015.

The absence of SPOT-6 satellite imagery for **Riau Archipelago** and **North Sulawesi** meant no mapping was conducted for either of the two provinces.

With this filtering, mapping was conducted for 25 provinces across six regions: Sumatra, Java, Kalimantan, Sulawesi, the Moluccas, and Papua.

FIGURE 1 . DISTRIBUTION OF OIL PALM MAPPING LOCATIONS IN 25 PROVINCES

◀ Oil palm estate in PIR ADB village, Langkat district, North Sumatra

Photo: Yudi Nofiandi/Auriga Nusantara

2.2 MAIN DATA

SPOT – 6 satellite imagery
The SPOT-6 satellite, built by Airbus Defence & Space, was launched on 9 September 2012. SPOT-6 is an optical remote sensing satellite capable of providing panchromatic and multispectral imagery with resolutions of 1.5 meters and 6 meters respectively.

The SPOT-6 satellite imagery for this mapping was sourced from the LAPAN Remote Sensing Technology and Data Center, and had already undergone pansharpening and mosaic processes in GeoTIFF format. These SPOT-6 image mosaics had a resolution of 1.5 meters and acquisition times from 2014-2016.

Landsat – 8 satellite imagery
The Landsat-8 Earth observation satellite, which was launched on 11 February 2013 and has a temporal resolution of 16 days, possesses two sensors: Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS).These sensors provide 30-meter spatial resolution (visible, NIR, SWIR), 100-meter thermal and 15-meter panchromatic imagery. The Landsat-8 imagery used for this mapping was downloaded from the US Geological Survey portal provided at https://glovis.usgs.gov/.

Unmanned aerial vehicle/drone aerial photographs
Unmanned aerial vehicles (UAVs), commonly called drones, are aerodynamic flying machines that can be controlled by either remote or automatic piloting. Drones used for this mapping were fixed-wing drones with ranges of 50 – 100 km, coverage of 1,500 – 2,000 hectares, and flight durations of 60 – 120 minutes per flight.

Depending on weather conditions, the fixed-wing drones were capable of 4 – 5 flights, or covering 6,000 – 10,000 hectares per day (SIAR-Auriga, 2018).

Fixed-wing drone aerial photos were acquired in 2018 for several locations, including Aceh, North Sumatra, Bengkulu, Central Kalimantan, and East Kalimantan. These photos were used to form mosaics as supplements to main data and as material for reinterpreting the results of analyses.

2.3 SUPPORTING DATA

Land cover maps
Land cover maps constitute lines that depict boundaries of cover areas on the Earth's surface comprising natural and/or manmade landscapes (Law No. 4/2011 on Geospatial Information). Land coverage can also be defined as observable biophysical cover on the Earth's surface that constitutes the result of manmade arrangements, activities and treatments conducted on particular types of land cover in order to undertake production, change or maintenance activities on those areas (SNI 7645, 2010).

The land cover map used for this mapping was produced through manual interpretation of satellite imagery (on-screen digitization) by the Ministry of Environment and Forestry's Directorate General of Forestry Planology and Environmental Arrangement. This national-scale map differentiates between 22 land cover classes; 7 of which are forest cover classes, while the remaining 15 are non-forest cover classes.

Oil Palm Estate Permit Maps
Oil palm estate permit maps constituted compilations of regional government location permit maps and plantation concession permit maps, as well as business use rights permit maps sourced from regional offices of the National Land Agency.

The compilation process was one of the activities undertaken in the framework of coordinating and supervising estate crop themed implementation of the National Movement for the Rescue of Natural Resources (*Gerakan Nasional Penyelamatan Sumberdaya Alam* (Korsup GN-PSDA) from 2016-2017, and took place in 12 provinces: Riau, Jambi, South Sumatra, Bengkulu, West Kalimantan, Central Kalimantan, East Kalimantan, North Kalimantan, West Sulawesi, Central Sulawesi, West Papua, and Papua.

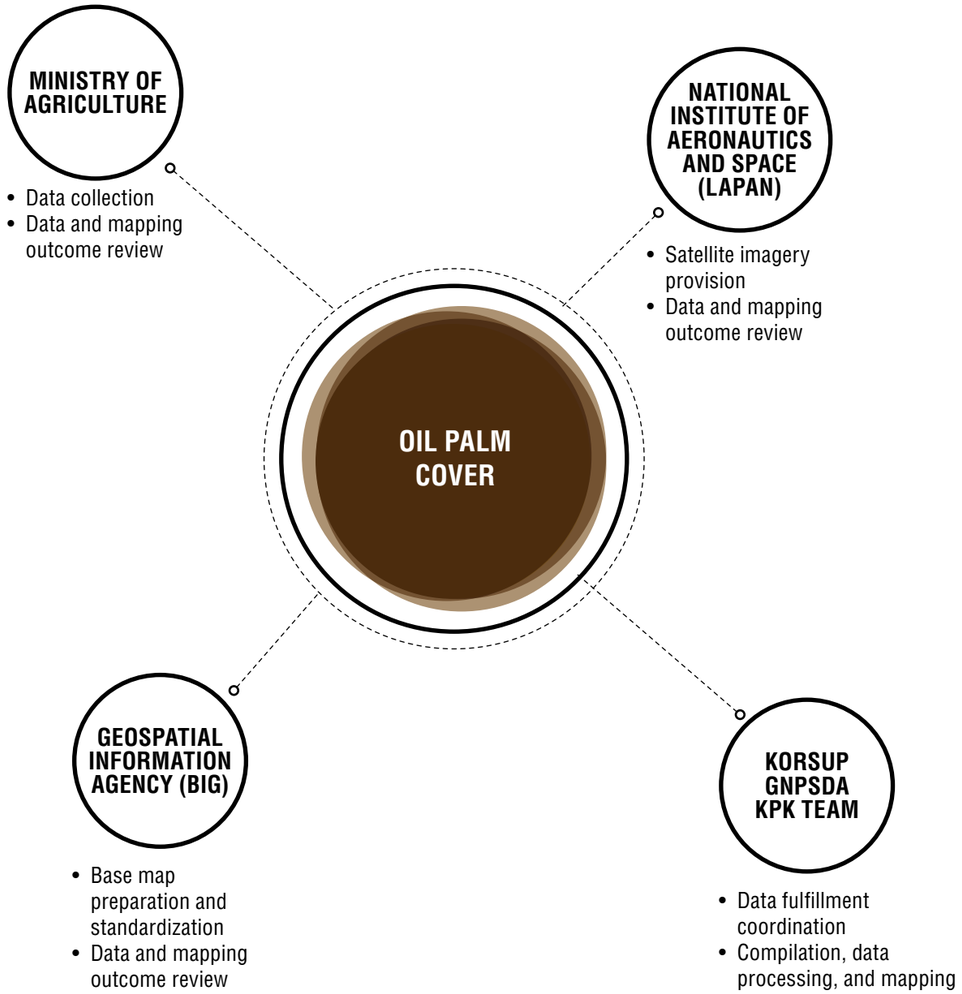
2.4 STAGES IN OIL PALM COVER MAPPING

2.4.1 Data Preparation
Oil palm cover mapping was conducted under estate crop themed implementation of the National Movement for the Rescue of Natural Resources (GN-PSDA). It involved relevant state ministries and agencies, such as the Ministry of Agriculture's Directorate General of Estate Crops (*Ditjenbun*), the Geospatial Information Agency (BIG), and the National Space and Aeronautics Agency (LAPAN), and was coordinated and supervised by the Corruption Eradication Commission (KPK).

TABLE 1. NATIONAL OIL PALM MAPPING DATA SOURCES

DATA CATEGORY	DATA TYPE		YEAR	SOURCE
MAIN DATA	SPOT 6	Panchromatic 1.5 m and multispectral 6 m resolution satellite imagery	Data mosaics 2014-2016	LAPAN – GNPSDA KPK
	UAV Orthophoto	0.2-0.5 m resolution aerial photographs	2018	Korsup GN-PSDA KPK Team
	Landsat 8	Panchromatic 15 m and multispectral 30 m resolution satellite imagery	Data mosaics 2017	LAPAN – GNPSDA KPK
SUPPORTING DATA	Regional administrative boundaries	1:50,000 scale digital maps	Seamless year 2016	BIG-GNPSDA KPK
	Land cover	1:50,000 scale digital maps	2016	BIG dan KLHK – GNPSDA KPK
	Oil palm plantation concession permits	Digital maps and legal documents	Compilation of IUP and HGU concession data up to 2016	Provincial government agriculture offices – GN-PSDA KPK

FIGURE 2. DATA PREPARATION MECHANISM AND STAKEHOLDER INVOLVEMENT IN OIL PALM COVER MAPPING



2.4.2. Sample Design

Two types of samples were used in this mapping: samples for preparing reinterpretations, and samples for final outcome accuracy testing. Sample distribution was determined with stratified random sampling. Sample size and distribution followed Slovin's formula:

$$n = N / (1 + N \times e^2)$$

Where:

n = sample size / polygon class sampled

N= population size / delineated polygon

e = margin of error

With mapping regions comprising a variety of provinces, Slovin's formula was applied to each provincial region with additional samples numbering 10% of the total numbers of samples required.

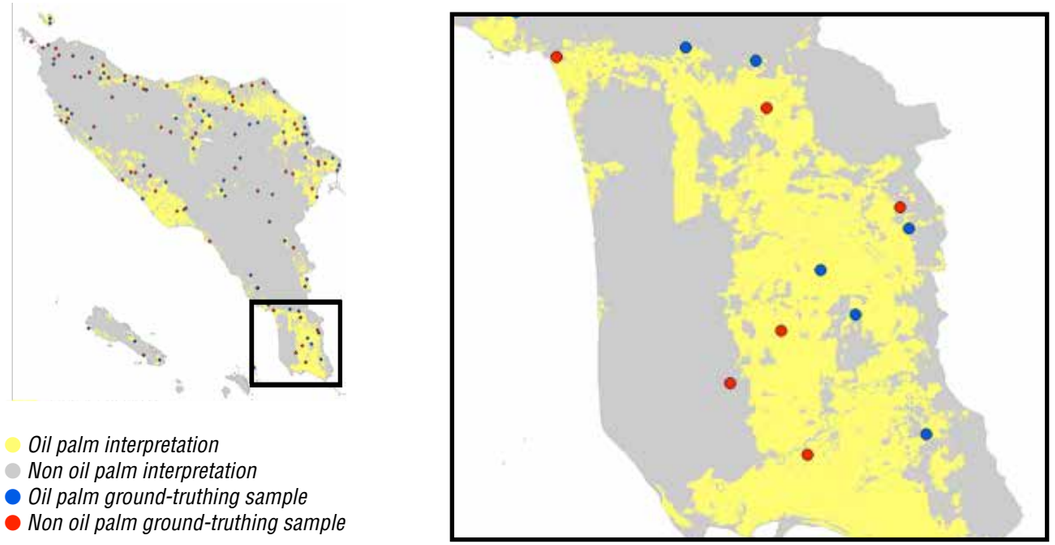
2.4.3 Oil Palm Cover Visual Interpretation

Approaches Used in Visual Interpretation

On-screen or heads-up digitization was always carried out directly on monitor screens. Visual interpretation involved satellite imagery interpretation processes, covering detection, identification, delineation and classification of land cover appearance, together with manually drawing boundary lines. This was done on images of land with both large-scale and small-scale sporadic oil palm plantings. In addition to appearing massive in imagery, large-scale plantations were frequently identifiable through plantation permit maps.

Visual interpretation was undertaken using 2 approaches: a photomorphic approach and a landscape ecology approach. The photomorphic approach relied

FIGURE 3. EXAMPLE OF OIL PALM AND NON OIL PALM SAMPLE DETERMINATION



on information from satellite imagery, and was applied in cases where objects or land cover were recognizable merely from their photomorphic appearance alone.

The landscape ecology approach, meanwhile, was undertaken through an ecological context with the help of information other than imagery.

FIGURE 4. OIL PALM LAND

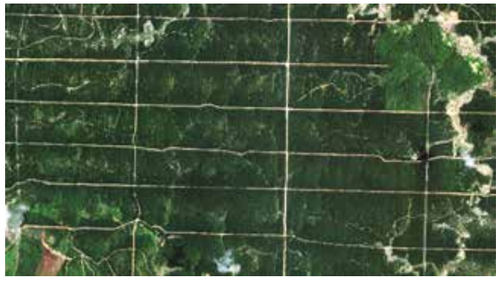
Land currently being developed or prepared for oil palm planting was usually marked with land clearing activities in planting blocks inside company oil palm plantation concessions.

Determination of Minimum Mapping Units, Imagery Views and Their Enlargement on Monitor Screens for Digitization

Minimum mapping unit (MMU) size determination was always applied in visual interpretation-based mapping. MMU size was scaleless, but linked to the capacity of the eye and imaging or digitization tool in identifying the smallest mapping feature that could still be depicted manually. The MMU on a print scale of 1:25,000 (spatial resolution 1.5 m) was 62.5 m x 62.5 m.

The use of an imagery input scale the same as that of the output map risked imprecise or unrefined delineation lines at the time of on-screen digitization due to vertex deviation being too infrequent. To reduce this risk, imagery was displayed at a larger scale on the monitor so digitization was more meticulous with a higher vertex frequency.

FIGURE 5. OIL PALM ESTATE



Land planted with oil palm in the form of extensive, homogenous and neatly planted expanses of land was usually marked with road networks between organized planting blocks. Oil palm crops like these are usually managed by companies

FIGURE 6. SMALLHOLDER OIL PALM

Land planted with oil palm the formation of which tends to be irregular, with crops of varying ages in one area. Oil palm plantations like these are commonly managed by smallholders rather than companies.

The standard display scale for imagery used as the basis for on-screen visual interpretation was three times larger than the scale of the map output. As an example, for maps generated at a scale of 1:25,000, composite imagery display and digitization were done at a scale of at least 1:8,500, in reference to the scale displayed on the monitor screen.

Oil Palm Cover Delineation

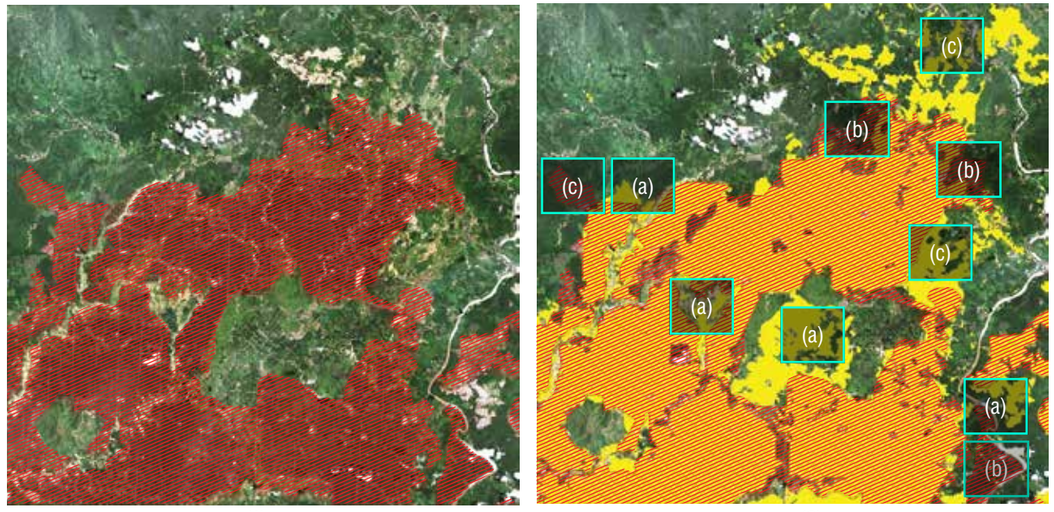
Technically, in generating oil palm cover maps in the preliminary interpretation process, the steps involved were: firstly, merging layers of land cover maps, plantation maps and oil palm concession permit maps to form a base layer of land cover and plantation land use. Secondly, the merged layer was divided into 1:25,000 grid indices. Thirdly, each grid index was verified and edited based on the appearance of oil palm cover on the SPOT-6 imagery (Figure 7).

Editing was carried out to: (a) delete and repair polygons that were inappropriate or did not constitute oil palm cover based on interpretations of SPOT-6 imagery; (b) add polygons that had not been detected as oil palm cover but were still in a plantation; and (c) delineate new polygons detected as oil palm cover.

2.5. DATA ANALYSIS AND REINTERPRETATION

After preliminary identification of oil palm cover from SPOT-6 imagery had been secured on screen, validation was carried out through a reinterpretation process in accordance with samples that had already been determined beforehand. This process of reinterpretation was vital, particularly for regions with high, but sporadic oil palm coverage, such as those in Sumatra. For

FIGURE 7. (1) LAND COVER AND PLANTATION MAP BEFORE EDITING AND DELINEATION
(2) RESULT OF EDITING AND DELINEATION OF OIL PALM COVER BASED ON SPOT-6 IMAGERY



(1) *(2)*

regions with such characteristics reinterpretation was often extended from the sample region.

2.6. ACCURACY ASSESSMENT

Accuracy assessment was done by overlaying the results of oil palm cover reinterpretation with test sample polygons taken from higher resolution satellite imagery like Digital Globe, Quickbird, etc. These high resolution images were selected in accordance with their availability on Google Earth for the 2016 acquisition time.

Accuracy assessment on interpretation results used the precision testing matrix developed by Short (1982) as shown in the table below.

The accuracy values obtained were for user's accuracy, producer's accuracy and overall (total) accuracy. The minimum accepted overall (total) accuracy value was 95%, with producer's accuracy and user's accuracy values no lower than 90%.

TABLE 2. ACCURACY ASSESSMENT MATRIX

	Field Reference Data				
Data Interpretation	X	Y	Total Rows	Commission	User's accuracy
X	6	4	10	0.40	0.60
Y	2	8	10	0.20	0.80
Total Columns	8	12	14		
Omission	0.25	0.33			
Producer's accuracy	0.75	0.67			Over all accuracy
					0.70

$$\text{Over all accuracy} = \frac{\text{Total number of correct interpretations}}{\text{Total number of samples}} \times 100\%$$

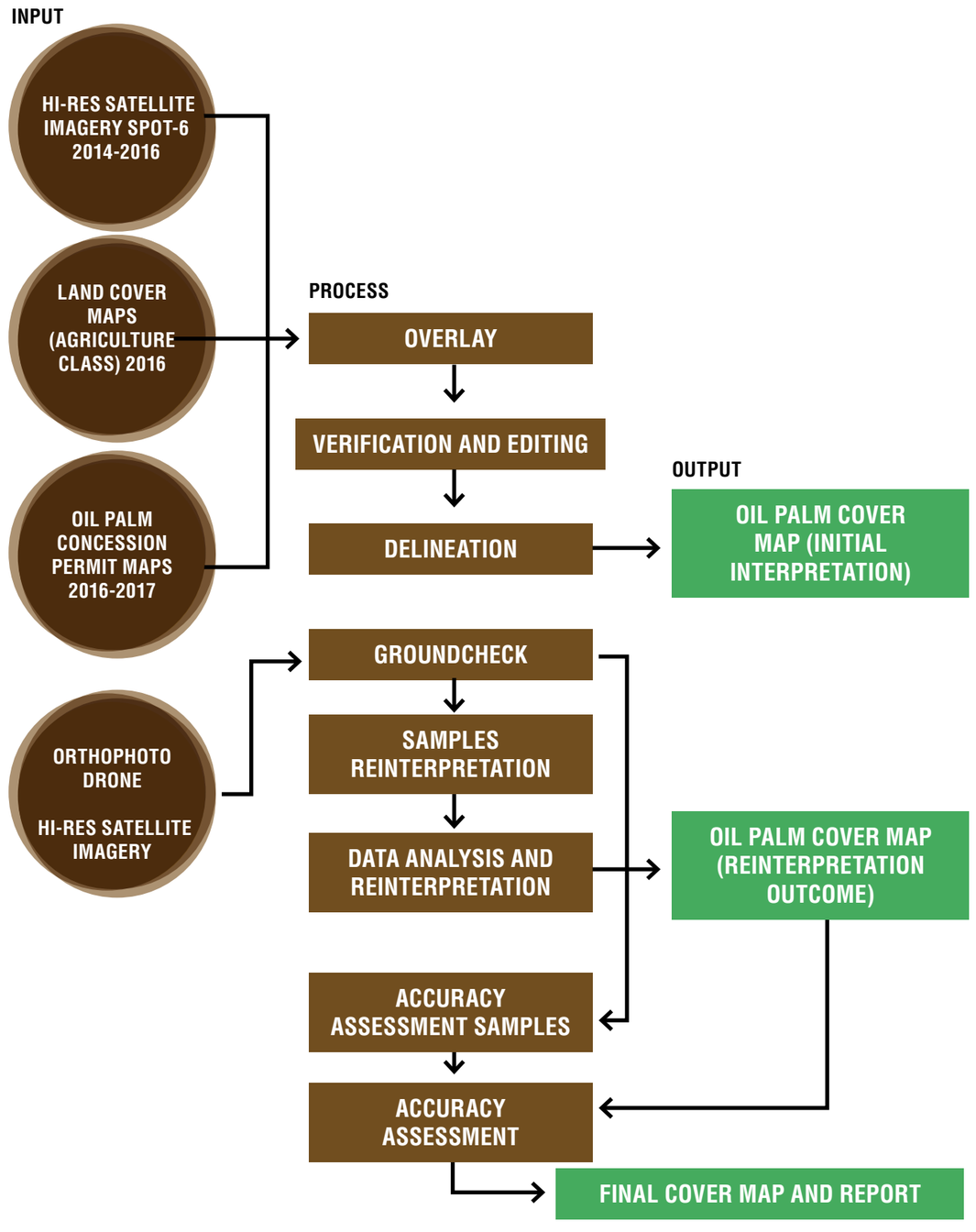
$$\text{Producer's Accuracy} = \frac{\text{Total number of correct interpretations}}{\text{Number of field data samples with the same class}} \times 100\%$$

$$\text{User's Accuracy} = \frac{\text{Total number of correct interpretations}}{\text{Number of interpretation outcome samples with the same class}} \times 100\%$$

$$\text{Omission} = \frac{\text{Number of samples in field data classified incorrectly}}{\text{Total number of columns}} \times 100\%$$

$$\text{Commission} = \frac{\text{Number of samples in interpretation outcome data classified incorrectl}}{\text{Total number of rows}} \times 100\%$$

2.7. OIL PALM COVER MAPPING PROCESS FLOW DIAGRAM



Oil palm plantation in PIR ADB village, Langkat district, North Sumatra.

Photo: Yudi Nofiandi/Auriga Nusantara

Chapter 3

Indonesia's Oil Palm Cover

DISTRIBUTION OF PROVINCES AND DISTRICTS/MUNICIPALITIES WITH OIL PALM COVER*

* Data does not cover Riau Archipelago and North Sulawesi provinces

SUMATRA

130 districts/ municipalities

Aceh, North Sumatra, West Sumatra, Riau, Jambi, South Sumatra, Bengkulu, Lampung, Bangka Belitung

9 PROVINCES

KALIMANTAN

7 municipalities
47 districts

West Kalimantan, Central Kalimantan, South Kalimantan, East Kalimantan, North Kalimantan

5 PROVINCES

SULAWESI

41 districts

Central Sulawesi, South Sulawesi, Southeast Sulawesi, Gorontalo, West Sulawesi

5 PROVINCES

JAVA

7 districts

Jawa Barat, Banten

2 PROVINCES

BALI & NUSA TENGGARA

—

MOLUCCAS & PAPUA

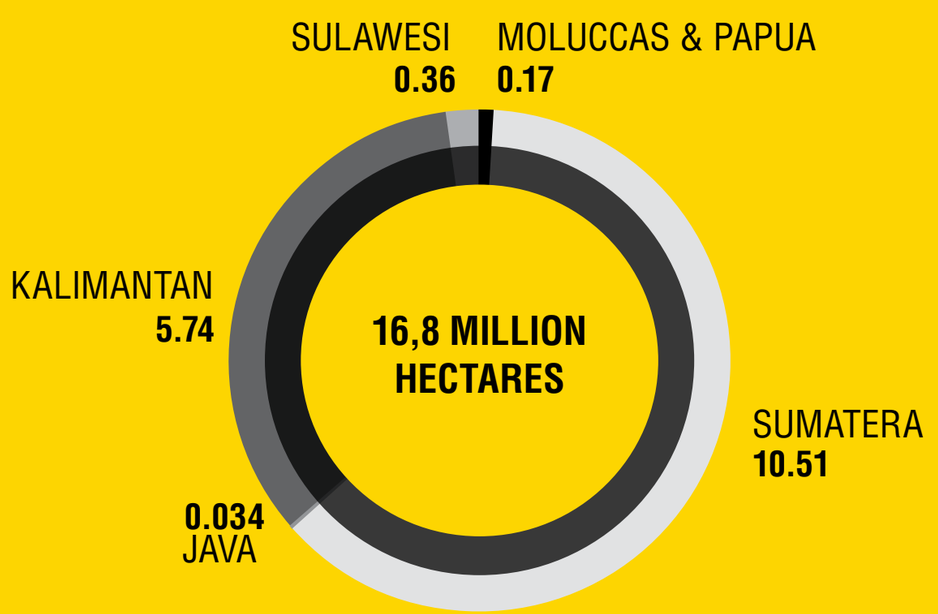
15 districts

The Moluccas, North Moluccas, West Papua, Papua

4 PROVINCES

THERE ARE 25 PROVINCES AND 247 DISTRICTS/ MUNICIPALITIES WITH OIL PALM COVER

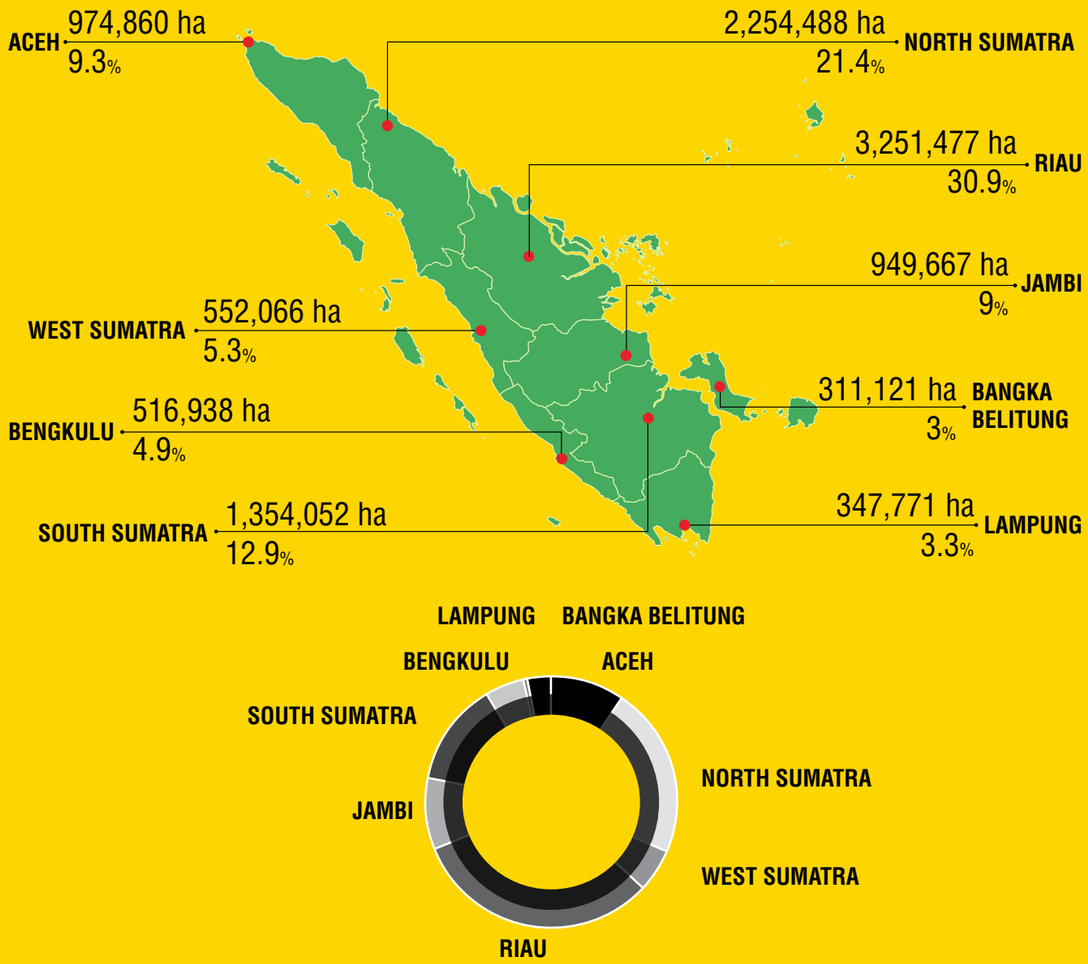
INDONESIA'S OIL PALM COVER CENTERS



13.8 million hectares or 82% of Indonesia's oil palm cover is located in 8 provinces: Riau, North Sumatra, Central Kalimantan, West Kalimantan, South Kalimantan, East Kalimantan, Aceh, and Jambi

One third of Indonesia's oil palm cover (6.1 million hectares) is found in 15 districts: East Kotawaringin, Rokan Hilir, East Kutai, Ketapang, Rokan Hulu, Kampar, Musi Banyuasin, Banyuasin, Indragiri Hilir, Seruyan, Pelalawan, Siak, South Labuhan Batu, Asahan, and Sanggau

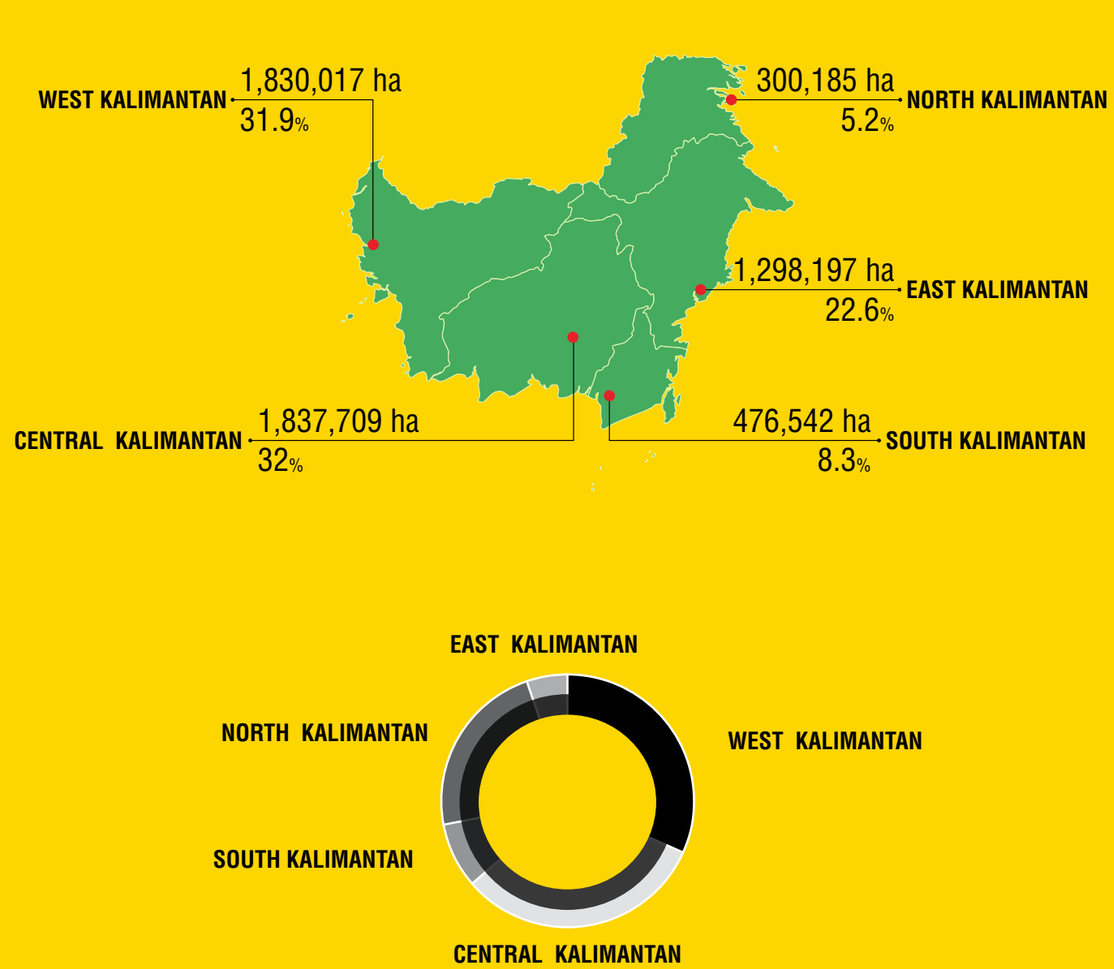
OIL PALM COVER IN SUMATRA*



SUMATRA'S OIL PALM COVER AREA IS **10.5 MILLION HECTARES** OR **62.5%** OF INDONESIA'S TOTAL OIL PALM COVER

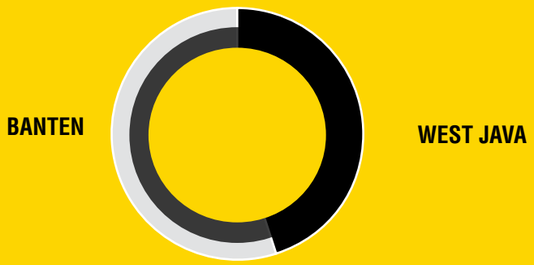
* Data does not include Riau Archipelago Province

OIL PALM COVER IN KALIMANTAN



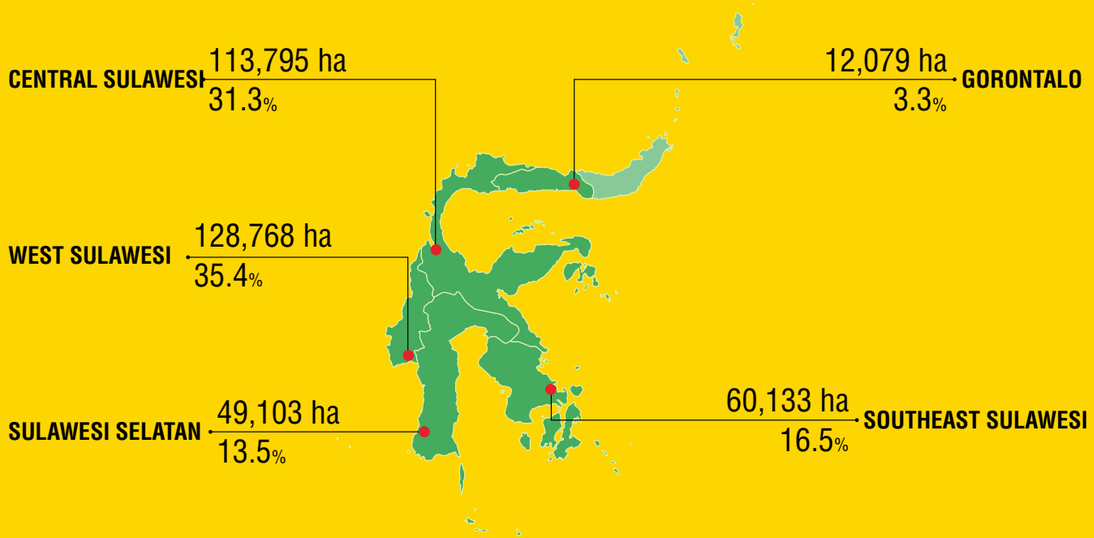
KALIMANTAN'S OIL PALM COVER AREA IS **5.7 MILLION HECTARES** OR **34.1%** OF INDONESIA'S TOTAL OIL PALM COVER

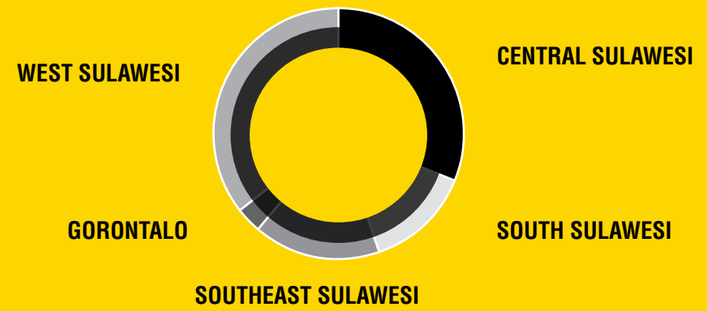
OIL PALM COVER IN JAVA



OIL PALM COVER AREA IN JAVA IS **0.034 MILLION HECTARES** OR **0.2%** OF INDONESIA'S TOTAL OIL PALM COVER

OIL PALM COVER IN SULAWESI*

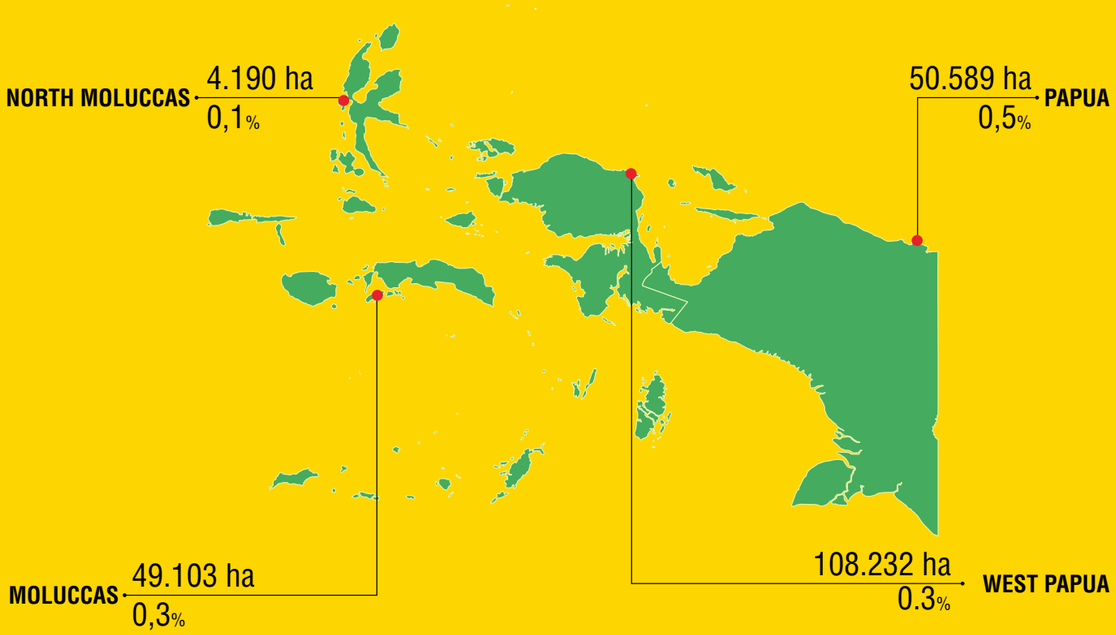


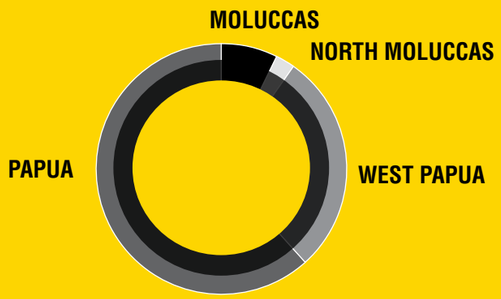


SULAWESI'S OIL PALM COVER AREA IS **0.36 MILLION HECTARES** OR **2.2%** OF INDONESIA'S TOTAL OIL PALM COVER

* Data does not include North Sulawesi Province

OIL PALM COVER IN THE MOLUCCAS AND PAPUA





PAPUA AND THE MOLUCCAS'S OIL PALM COVER AREA IS **0.17 MILLION HECTARES** OR **1%** OF INDONESIA'S TOTAL OIL PALM COVER

Map of Oil Palm Cover in Indonesia Based on Administrative Areas*

ACEH | OIL PALM COVER AREA 974.860 HA	
1101 Kab. Simeulue	15.265 Hektar
1102 Kab. Aceh Singkil	89.865
1103 Kab. Aceh Selatan	34.110
1104 Kab. Aceh Tenggara	24.386
1105 Kab. Aceh Timur	143.812
1106 Kab. Aceh Tengah	26.968
1107 Kab. Aceh Barat	46.932
1108 Kab. Aceh Besar	2.499
1109 Kab. Pidie	22.681
1110 Kab. Bireun	46.018
1111 Kab. Aceh Utara	118.462
1112 Kab. Aceh Barat Daya	32.356
1113 Kab. Gayo Lues	13.794
1114 Kab. Aceh Tamiang	85.113
1115 Kab. Nagan Raya	122.413
1116 Kab. Aceh Jaya	35.181
1117 Kab. Bener Meriah	30.168
1118 Kab. Pidie Jaya	11.445
1172 Kota Sabang	6.628
1173 Kota Langsa	5.937
1174 Kota Lhokseumawe	3.083
1175 Kota Subulussalam	57.744

NORTH SUMATERA | 2.254.488	
1201 Kab. Nias	48
1202 Kab. Mandailing Natal	105.189
1203 Kab. Tapanuli Selatan	39.811
1204 Kab. Tapanuli Tengah	31.696
1205 Kab. Tapanuli Utara	128
1206 Kab. Toba Samosir	1.916
1207 Kab. Labuan Batu	200.169
1208 Kab. Asahan	272.888
1209 Kab. Simalungun	217.535
1210 Kab. Dairi	1.785
1211 Kab. Karo	3.726
1212 Kab. Deli Serdang	61.758
1213 Kab. Langkat	268.162
1214 Kab. Nias Selatan	158
1215 Kab. Humbang Hasundutan	273
1216 Kab. Pakpak Bharat	621
1218 Kab. Serdang Bedagai	133.098
1219 Kab. Batu Bara	64.685
1220 Kab. Padang Lawas Utara	151.296
1221 Kab. Padang Lawas	170.449
1222 Kab. Labuhan Batu Selatan	280.107
1223 Kab. Labuhan Batu Utara	240.890
1272 Kota Tanjung Balai	3.550
1273 Kota Pematang Siantar	314
1274 Kota Tebing Tinggi	918
1275 Kota Medan	213
1276 Kota Binjai	3.106

WEST SUMATERA | 552.066	
1302 Kab. Pesisir Selatan	86.766
1304 Kab. Sijunjung	29.606
1305 Kab. Tanah Datar	58
1306 Kab. Padang Pariaman	2.181
1307 Kab. Agam	50.408
1308 Kab. Lima Puluh Kota	12.102
1309 Kab. Pasaman	8.247
1310 Kab. Solok Selatan	47.735
1311 Kab. Dharmasraya	104.920
1312 Kab. Pasaman Barat	209.699
1373 Kota Sawahlunto	185
1376 Kota Payakumbuh	63
1377 Kota Pariaman	96

BENGKULU | 516.938	
1701 Kab. Bengkulu Selatan	56.847
1702 Kab. Rejang Lebong	113
1703 Kab. Bengkulu Utara	161.222
1704 Kab. Kaur	20.177
1705 Kab. Seluma	67.951
1706 Kab. Muko Muko	173.277
1707 Kab. Lebong	466
1708 Kab. Kepahiang	629
1709 Kab. Bengkulu Tengah	31.284
1771 Kota Bengkulu	4.972

RIAU | 3.251.477	
1401 Kab. Kuantan Singingi	159.415
1402 Kab. Indragiri Hulu	212.037
1403 Kab. Indrigiri Hilir	377.965
1404 Kab. Pelalawan	335.551
1405 Kab. Siak	309.904
1406 Kab. Kampar	454.019
1407 Kab. Rokan Hulu	494.871
1408 Kab. Bengkalis	250.076
1409 Kab. Rokan Hilir	547.746
1410 Kab. Kepulauan Meranti	18.822
1471 Kota Pekan Baru	23.305
1473 Kota Dumai	67.966

JAMBI | 949.667	
1501 Kab. Kerinci	133
1502 Kab. Merangin	91.523
1503 Kab. Sarolangun	68.048
1504 Kab. Batang Hari	92.079
1505 Kab. Muaro Jambi	177.940
1506 Kab. Tanjung Jabung Timur	184.053
1507 Kab. Tanjung Jabung Barat	182.966
1508 Kab. Tebo	78.649
1509 Kab. Bungo	74.099
1571 Kota Jambi	177

BANGKA BELITUNG | 311.121	
1901 Kab. Bangka	61.792
1902 Kab. Belitung	39.056
1903 Kab. Bangka Barat	79.803
1904 Kab. Bangka Tengah	39.479
1905 Kab. Bangka Selatan	40.025
1906 Kab. Belitung Timur	50.878
1971 Kota Pangkal Pinang	87

SOUTH SUMATERA | 1.354.052	
1601 Kab. Ogan Komering Ulu	44.350
1602 Kab. Ogan Komering Ilir	174.285
1603 Kab. Muara Enim	66.425
1604 Kab. Lahat	48.505
1605 Kab. Musi Rawas	97.265
1606 Kab. Musi Banyuasin	404.340
1607 Kab. Banyuasin	390.130
1608 Kab. Ogan Komering Ulu Selatan	1.264
1609 Kab. Ogan Komering Ulu Timur	21.356
1610 Kab. Ogan Ilir	32.880
1611 Kab. Empat Lawang	3.161
1612 Kab. Penukal Abab Lematang Ilir	5.216
1613 Kab. Musi Rawas Utara	59.912
1671 Kota Palembang	3.301
1672 Kota Prabumulih	1.515
1674 Kota Lubuk Linggau	148

LAMPUNG | 347.771	
1801 Kab. Lampung Barat	78
1802 Kab. Tanggamus	294
1803 Kab. Lampung Selatan	11.967
1804 Kab. Lampung Timur	14.930
1805 Kab. Lampung Tengah	56.184
1806 Kab. Lampung Utara	18.798
1807 Kab. Way Kanan	34.943
1808 Kab. Tulang Bawang	49.292
1809 Kab. Pesawaran	3.974
1810 Kab. Pringsewu	1.691
1811 Kab. Mesuji	130.062
1812 Kab. Tulang Bawang Barat	16.375
1813 Kab. Pesisir Barat	9.184

BANTEN | 18.869	
3601 Kab. Pandeglang	7.357
3602 Kab. Lebak	11.511

WEST KALIMANTAN | 1.830.017	
6101 Kab. Sambas	133.152
6102 Kab. Bengkayang	113.946
6103 Kab. Landak	168.171
6104 Kab. Pontianak	16.228
6105 Kab. Sanggau	268.329
6106 Kab. Ketapang	534.169
6107 Kab. Sintang	192.957
6108 Kab. Kapuas Hulu	87.432
6109 Kab. Sekadau	91.594
6110 Kab. Melawi	46.440
6111 Kab. Kayong Utara	45.809
6112 Kab. Kubu Raya	129.562
6171 Kota Pontianak	334
6172 Kota Singkawang	1.903

CENTRAL KALIMANTAN | 1.837.709	
6201 Kab. Kotawaringin Barat	259.645
6202 Kab. Kotawaringin Timur	551.659
6203 Kab. Kapuas	182.975
6204 Kab. Barito Selatan	13.407
6205 Kab. Barito Utara	32.981
6206 Kab. Sukamara	72.205
6207 Kab. Lamandau	114.903
6208 Kab. Seruyan	348.122
6209 Kab. Katingan	69.598
6210 Kab. Pulang Pisau	106.448
6211 Kab. Gunung Mas	53.473
6212 Kab. Barito Timur	28.621
6213 Kab. Murung raya	5.076
6271 Kota Palangka Raya	6.595

SOUTH KALIMANTAN | 476.542	
6301 Kab. Tanah Laut	46.032
6302 Kab. Kota Baru	178.815
6303 Kab. Banjar	19.269
6304 Kab. Barito Kuala	35.717
6305 Kab. Tapin	63.679
6306 Kab. Hulu Sungai Selatan	10.360
6307 Kab. Hulu Sungai Tengah	403
6308 Kab. Hulu Sungai Utara	4.405
6309 Kab. Tabalong	6.447
6310 Kab. Tanah Bumbu	108.551
6311 Kab. Balangan	1.765
6371 Kota Banjar Baru	99

EAST KALIMANTAN | 1.298.197	
6401 Kab. Paser	231.254
6402 Kab. Kutai Barat	182.870
6403 Kab. Kutai Kertanegara	226.604
6404 Kab. Kutai Timur	541.102
6405 Kab. Berau	104.226
6409 Kab. Penajam Paser Utara	66.989
6411 Kab. Mahakam Hulu	13.491
6471 Kota Balikpapan	10.828
6472 Kota Samarinda	520
6474 Kota Bontang	312

NORTH KALIMANTAN | 300.185	
6501 Kab. Malinau	235
6502 Kab. Bulungan	56.757
6503 Kab. Tana Tidung	90.773
6504 Kab. Nunukan	152.420

WEST JAVA | 15.485	
3201 Kab. Bogor	3.317
3202 Kab. Sukabumi	7.724
3203 Kab. Cianjur	124
3205 Kab. Garut	3.365
3213 Kab. Subang	955

SOUTH SULAWESI | 49.103	
7302 Kab. Bulukumba	1.808
7303 Kab. Bantaeng	57
7304 Kab. Jeneponto	167
7305 Kab. Takalar	237
7306 Kab. Gowa	119
7307 Kab. Sinjai	204
7313 Kab. Wajo	2.291
7315 Kab. Pinrang	7.526
7316 Kab. Enrekang	10
7317 Kab. Luwu	27
7318 Kab. Tana Toraja	2.647
7322 Kab. Luwu Utara	18.981
7325 Kab. Luwu Timur	15.029

SOUTHEAST SULAWESI | 60.133	
7401 Kab. Buton	43
7403 Kab. Konawe	13.561
7404 Kab. Kolaka	12.097
7405 Kab. Konawe Selatan	2.447
7406 Kab. Bombana	21
7408 Kab. Kolaka Utara	385
7410 Kab. Konawe Utara	29.854
7411 Kab. Kolaka Timur	1.698
7471 Kota Kendari	27

WEST SULAWESI | 128.768	
7601 Kab. Majene	381
7602 Kab. Polewali Mandar	223
7603 Kab. Mamasa	461
7604 Kab. Mamuju	44.012
7605 Kab. Mamuju Utara	83.691

CENTRAL SULAWESI | 113.795	
7202 Kab. Banggai	19.530
7203 Kab. Morowali	12.523
7204 Kab. Poso	4.646
7205 Kab. Donggala	8.740
7206 Kab. Toli-Toli	3.958
7207 Kab. Buol	26.894
7208 Kab. Parigi Moutong	604
7209 Kab. Toju Una-Una	332
7212 Kab. Morowali Utara	36.569

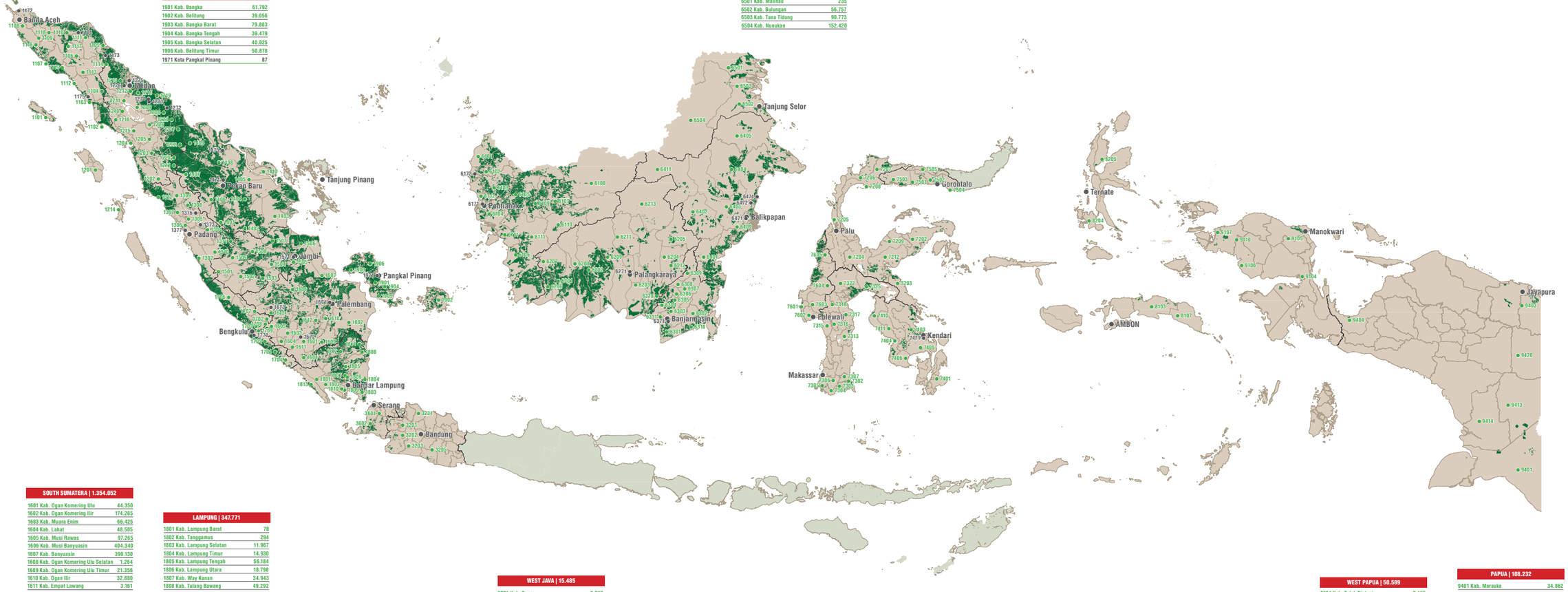
GORONTALO | 12.079	
7501 Kab. Boalemo	1.714
7502 Kab. Gorontalo	1.166
7503 Kab. Pohuwato	8.344
7504 Kab. Bone Bolango	26
7505 Kab. Gorontalo Utara	828

MOLUCCAS | 12.949	
8103 Kab. Maluku Tengah	12.667
8107 Kab. Seram Bagian Timur	282

NORTH MOLUCCAS | 4.190	
8204 Kab. Halmahera Selatan	3.851
8205 Kab. Halmahera Utara	339

WEST PAPUA | 50.589	
9104 Kab. Teluk Bintuni	7.465
9105 Kab. Manokwari	22.555
9106 Kab. Sorong Selatan	2.033
9107 Kab. Sorong	18.251
9110 Kab. Maybrat	285

PAPUA | 108.232	
9401 Kab. Marauke	34.862
9403 Kab. Jayapura	20.972
9404 Kab. Nabire	2.343
9413 Kab. Boven Digoel	23.594
9414 Kab. Mappi	3.300
9420 Kab. Keerom	23.160



* Data does not include Riau Archipelago and North Sulawesi provinces ● Kabupaten/District ● Kota/Municipal

Digitization by the Auriga team working as part of the GN-PSDA team and program implementation, Jakarta 2019.