

BAB VI

PENUTUP

6.1 Kesimpulan

Berdasarkan hasil estimasi regresi linier berganda, seluruh variabel dalam penelitian ini yaitu Emisi Karbon Dioksida dari Karhutla, PDRB, dan Jumlah Penduduk berpengaruh signifikan terhadap Indeks Kualitas Lingkungan Hidup (IKLH) di Indonesia.

1. Emisi Karbon Dioksida dari Karhutla memiliki pengaruh negatif dan signifikan terhadap IKLH. Secara ilmiah, peningkatan emisi dari Karhutla mencemari udara, merusak ekosistem, dan menurunkan kualitas lingkungan hidup.
2. PDRB berpengaruh positif dan signifikan terhadap IKLH. Meskipun pertumbuhan ekonomi dapat menyebabkan tekanan terhadap lingkungan, peningkatan PDRB juga menyediakan sumber daya bagi pemerintah untuk membiayai upaya pelestarian dan pemulihan lingkungan, seperti pengolahan limbah dan perlindungan ekosistem (Putri, 2020; Karimi et al., 2025).
3. Jumlah Penduduk juga menunjukkan pengaruh positif dan signifikan terhadap IKLH. Meskipun secara teori jumlah penduduk besar dapat menekan daya dukung lingkungan, hasil ini menunjukkan bahwa pertumbuhan penduduk yang diiringi dengan peningkatan kesadaran lingkungan dan pengelolaan yang baik justru dapat mendukung peningkatan kualitas lingkungan (Aulia et al., 2024; Budi Darma, 2021).

6.2 Saran

Berdasarkan penelitian yang telah dilakukan, maka penulis mengemukakan beberapa saran berikut ini:

1. Penanggulangan Karhutla harus menjadi prioritas nasional, dengan memperkuat penegakan hukum dan memperluas strategi pencegahan berbasis masyarakat serta penggunaan teknologi deteksi dini. Pemerintah juga perlu memperketat pengawasan terhadap praktik pembakaran lahan.
2. PDRB harus diarahkan pada pembangunan berkelanjutan, yakni dengan mendorong investasi ramah lingkungan, efisiensi energi, dan insentif terhadap industri hijau, sehingga peningkatan ekonomi tidak merusak lingkungan.
3. Pengelolaan kependudukan harus diiringi dengan pembangunan infrastruktur lingkungan, seperti sanitasi, pengelolaan limbah, dan ruang terbuka hijau, agar pertambahan jumlah penduduk tidak menurunkan daya dukung lingkungan.
4. Edukasi dan kesadaran masyarakat terhadap pentingnya lingkungan hidup perlu terus ditingkatkan melalui kampanye, kurikulum pendidikan, dan pelibatan masyarakat dalam kegiatan pelestarian lingkungan.

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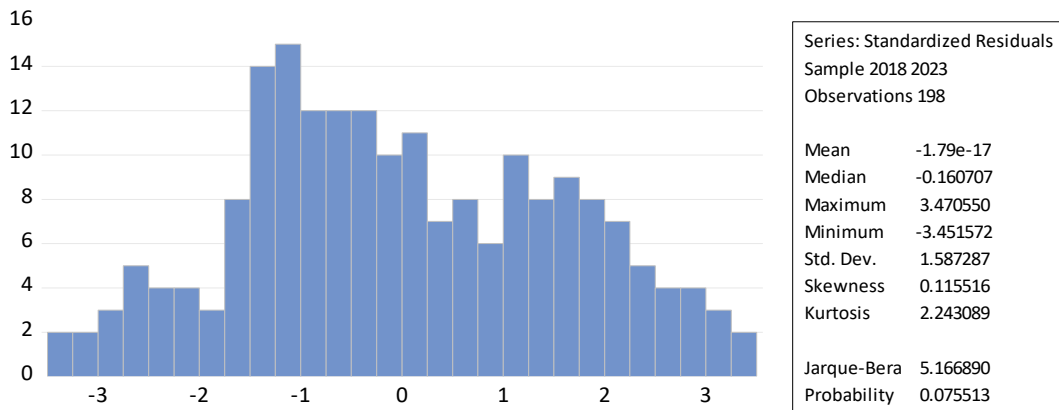
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LAMPIRAN

Uji Asumsi Klasik

a. Uji Normalitas



b. Uji Heteroskedastisitas

Unrestricted Test Equation:
Dependent Variable: ABSRESID
Method: Panel EGLS (Cross-section weights)
Date: 08/18/25 Time: 23:21
Sample: 2018 2023
Periods included: 6
Cross-sections included: 33
Total panel (unbalanced) observations: 198
Iterate weights to convergence
Convergence achieved after 20 weight iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.672701	0.053227	12.63846	0.0000
X1	7.51E-09	4.50E-09	1.668501	0.0968
X2	-2.20E-08	1.29E-07	-0.170545	0.8648
X3	3.85E-07	1.79E-05	0.021486	0.9829

Weighted Statistics

Root MSE	1.317862	R-squared	0.015408
Mean dependent var	1.699292	Adjusted R-squared	0.000103
S.D. dependent var	1.196713	S.E. of regression	1.331448
Akaike info criterion	2.654467	Sum squared resid	342.1416
Schwarz criterion	2.721131	Log likelihood	-257.4650
Hannan-Quinn criter.	2.681453	F-statistic	1.006758
Durbin-Watson stat	1.535849	Prob(F-statistic)	0.390913

Unweighted Statistics

R-squared	-0.275411	Mean dependent var	1.304321
Sum squared resid	342.1508	Durbin-Watson stat	1.206756

c. Uji Multikolinearitas

	X1	X2	X3
X1	1	-0.03537445184739123	-0.1011069845104028
X2	-0.03537445184739123	1	0.4918430194880975
X3	-0.1011069845104028	0.4918430194880975	1

Uji Data Panel

Model Panel

Uji Cem

Dependent Variable: Y
Method: Panel Least Squares
Date: 08/18/25 Time: 23:31
Sample: 2018 2023
Periods included: 6
Cross-sections included: 33
Total panel (balanced) observations: 198

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	73.42417	0.476042	154.2389	0.0000
X1	-3.30E-08	1.78E-08	-1.849103	0.0660
X2	-3.63E-06	1.04E-06	-3.505090	0.0006
X3	-0.001040	0.000151	-6.862780	0.0000
Root MSE	5.188570	R-squared	0.362324	
Mean dependent var	70.39551	Adjusted R-squared	0.352463	
S.D. dependent var	6.513990	S.E. of regression	5.241788	
Akaike info criterion	6.171197	Sum squared resid	5330.409	
Schwarz criterion	6.237627	Log likelihood	-606.9485	
Hannan-Quinn criter.	6.198086	F-statistic	36.74323	
Durbin-Watson stat	0.670301	Prob(F-statistic)	0.000000	

Uji Fem

Dependent Variable: Y
Method: Panel EGLS (Cross-section weights)
Date: 08/18/25 Time: 23:28
Sample: 2018 2023
Periods included: 6
Cross-sections included: 33
Total panel (balanced) observations: 198
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	38.43206	5.765224	6.666187	0.0000
X1	-2.56E-08	1.06E-08	-2.410440	0.0171
X2	6.02E-05	1.05E-05	5.754177	0.0000
X3	0.009470	0.002638	3.589226	0.0004
Effects Specification				
Cross-section fixed (dummy variables)				
Weighted Statistics				

Root MSE	3.516328	R-squared	0.836883
Mean dependent var	101.3126	Adjusted R-squared	0.801641
S.D. dependent var	61.15457	S.E. of regression	3.887447
Sum squared resid	2448.183	F-statistic	23.74713
Durbin-Watson stat	1.429834	Prob(F-statistic)	0.000000

Uji Rem

Dependent Variable: Y
Method: Panel EGLS (Cross-section random effects)
Date: 08/18/25 Time: 23:31
Sample: 2018 2023
Periods included: 6
Cross-sections included: 33
Total panel (balanced) observations: 198
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	73.22716	0.776093	94.35362	0.0000
X1	-3.14E-08	1.49E-08	-2.110776	0.0361
X2	-2.67E-06	1.71E-06	-1.561401	0.1201
X3	-0.001053	0.000250	-4.207422	0.0000

Effects Specification		S.D.	Rho
Cross-section random		3.199829	0.4020
Idiosyncratic random		3.902908	0.5980

Weighted Statistics			
Root MSE	4.228845	R-squared	0.140642
Mean dependent var	31.37845	Adjusted R-squared	0.127353
S.D. dependent var	4.573348	S.E. of regression	4.272219
Sum squared resid	3540.860	F-statistic	10.58334
Durbin-Watson stat	1.005990	Prob(F-statistic)	0.000002

Unweighted Statistics			
R-squared	0.358898	Mean dependent var	70.39551
Sum squared resid	5359.050	Durbin-Watson stat	0.664683

Uji Chow

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	5.872880	(32,162)	0.0000
Cross-section Chi-square	152.488301	32	0.0000

Cross-section fixed effects test equation:

Dependent Variable: Y

Method: Panel Least Squares

Date: 08/18/25 Time: 23:36

Sample: 2018 2023

Periods included: 6

Cross-sections included: 33

Total panel (balanced) observations: 198

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	73.42417	0.476042	154.2389	0.0000
X1	-3.30E-08	1.78E-08	-1.849103	0.0660
X2	-3.63E-06	1.04E-06	-3.505090	0.0006
X3	-0.001040	0.000151	-6.862780	0.0000
Root MSE	5.188570	R-squared		0.362324
Mean dependent var	70.39551	Adjusted R-squared		0.352463
S.D. dependent var	6.513990	S.E. of regression		5.241788
Akaike info criterion	6.171197	Sum squared resid		5330.409
Schwarz criterion	6.237627	Log likelihood		-606.9485
Hannan-Quinn criter.	6.198086	F-statistic		36.74323
Durbin-Watson stat	0.670301	Prob(F-statistic)		0.000000

Uji Housmen

Correlated Random Effects - Hausman Test

Equation: HUSMENTEST

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	41.451306	3	0.0000

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
X1	-0.000000	-0.000000	0.000000	0.3279
X2	0.000057	-0.000003	0.000000	0.0000
X3	0.006575	-0.001053	0.000005	0.0007

Cross-section random effects test equation:

Dependent Variable: Y

Method: Panel Least Squares

Date: 08/18/25 Time: 23:37

Sample: 2018 2023

Periods included: 6

Cross-sections included: 33

Total panel (balanced) observations: 198

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	44.80268	5.141722	8.713555	0.0000
X1	-2.76E-08	1.54E-08	-1.792299	0.0750
X2	5.72E-05	1.08E-05	5.293765	0.0000

X3	0.006575	0.002258	2.912339	0.0041
Effects Specification				
Cross-section fixed (dummy variables)				
Root MSE	3.530314	R-squared	0.704790	
Mean dependent var	70.39551	Adjusted R-squared	0.641010	
S.D. dependent var	6.513990	S.E. of regression	3.902908	
Akaike info criterion	5.724287	Sum squared resid	2467.697	
Schwarz criterion	6.322154	Log likelihood	-530.7044	
Hannan-Quinn criter.	5.966283	F-statistic	11.05033	
Durbin-Watson stat	1.422488	Prob(F-statistic)	0.000000	

Uji LM

Lagrange Multiplier Tests for Random Effects

Null hypotheses: No effects

Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided (all others) alternatives

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	44.87830 (0.0000)	227.9234 (0.0000)	272.8017 (0.0000)
Honda	6.699127 (0.0000)	15.09713 (0.0000)	15.41228 (0.0000)
King-Wu	6.699127 (0.0000)	15.09713 (0.0000)	16.50269 (0.0000)
Standardized Honda	7.287306 (0.0000)	16.86374 (0.0000)	12.63391 (0.0000)
Standardized King-Wu	7.287306 (0.0000)	16.86374 (0.0000)	15.18277 (0.0000)
Gourieroux, et al.	--	--	272.8017 (0.0000)

Dari Hasil Uji Diatas Adalah Model yang terbaik adalah FEM

Dependent Variable: Y
Method: Panel EGLS (Cross-section weights)
Date: 08/18/25 Time: 23:28
Sample: 2018 2023
Periods included: 6
Cross-sections included: 33
Total panel (balanced) observations: 198
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	38.43206	5.765224	6.666187	0.0000
X1	-2.56E-08	1.06E-08	-2.410440	0.0171
X2	6.02E-05	1.05E-05	5.754177	0.0000
X3	0.009470	0.002638	3.589226	0.0004

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics			
Root MSE	3.516328	R-squared	0.836883
Mean dependent var	101.3126	Adjusted R-squared	0.801641
S.D. dependent var	61.15457	S.E. of regression	3.887447
Sum squared resid	2448.183	F-statistic	23.74713
Durbin-Watson stat	1.429834	Prob(F-statistic)	0.000000

LAMPIRAN DATA PENELITIAN

No	Cross Saction	Time Series	IKLH (Persen)	X1 Emisi Karbon	X2 PDRB	X3 Jumlah Penduduk
1	ACEH	2018	75.34	572104	126824,4	5243.4
		2019	76.01	281520	132069,6	5316.3
		2020	75.61	361241	131581,0	5554.8
		2021	75.54	550931	135274,0	5274.9
		2022	78.29	1013561	140971,7	5334.9
		2023	78.53	385417	146932,4	5409.2
2	SUMATERA UTARA	2018	62.49	2397182	512762,6	14476
		2019	62.49	885018	539513,9	14639.4
		2020	69.9	1425416	533746,4	15588.5
		2021	71.15	841901	547651,8	14799.4
		2022	74.11	1087514	573528,8	14970.5
		2023	72.8	1013561	602236,0	15180.5
3	SUMATERA BARAT	2018	69.67	1701825	163996,2	5411.8
		2019	69.66	1029562	172205,6	5479.5
		2020	72.79	660876	169426,6	5836.2
		2021	73.68	1028498	174999,9	5534.5
		2022	74.98	3790938	182628,3	5597.3
		2023	75.85	1013561	191070,6	5677.6
4	RIAU	2018	63.57	37236912	482064,6	6717.6
		2019	62.39	72081698	495607,1	6835.1
		2020	69.41	12422996	489995,8	6728.1
		2021	70.72	8986804	506471,9	6394.1
		2022	72.1	2496402	529533,0	6466.8
		2023	70.42	1013561	551828,5	6555.8
5	JAMBI	2018	66.91	1038931	142902,0	2174.8
		2019	68.08	29884752	149111,1	2241.6
		2020	70.87	138961	148354,3	2183.3
		2021	69.04	126338	153850,6	2064.6
		2022	70.32	200838	161732,0	2089.9
		2023	68.15	1082497	169277,6	2121.5
6	SUMATERA SELATAN	2018	61.78	3699638	298484,1	3527.1
		2019	61.41	158329629	315464,8	3566.2
		2020	69.71	612278	315129,2	3724.3
		2021	69.7	869492	326405,2	3548.2
		2022	72.12	365957	343503,6	3586.4
		2023	70.2	1013561	360967,5	3633.2
7	BENGKULU	2018	64.16	889	44164,11	8391.5
		2019	64.41	3912	46345,45	8497.2
		2020	69.92	28985	46338,43	8837.3
		2021	71.46	10952	47853,78	8467.4
		2022	70.82	283511	49916,06	8548.6

No	Cross Saction	Time Series	IKLH (Persen)	X1 Emisi Karbon	X2 PDRB	X3 Jumlah Penduduk
		2023	72.1	13372	52051,56	8647.3
8	LAMPUNG	2018	54.79	2557810	232166.0	1432.1
		2019	57.37	6642737	244378,3	1451.1
		2020	67.46	159258	240319,6	1531.5
		2021	68.56	556105	246966,5	1455.7
		2022	69.1	807457	257534,2	1471.8
		2023	69.91	1013561	269240,5	1492
9	KEPULAUAN BANGKA BELITUNG	2018	62.63	345632	52208,04	1948.6
		2019	64.85	839454	53941,9	1971.8
		2020	73.5	253108	52705,94	2112.2
		2021	72.05	132470	55369,65	2010.7
		2022	71.67	49912	57804,21	2032.4
		2023	71.62	727226	60336,51	2059.4
10	KEPULAUAN RIAU	2018	64.98	36752	173498,8	8377.7
		2019	67.01	651434	181877,7	8457.6
		2020	70.51	602348	174959,2	9419.6
		2021	73.19	162770	180952,4	9007.8
		2022	74.17	2535	190111,1	4438.6
		2023	74.26	1013561	199912,8	4496.6
11	JAWA BARAT	2018	48.86	244995	1419624.0	48475.5
		2019	51.69	743929	1490960.0	49023.2
		2020	59.4	348260	1453381.0	50345.2
		2021	62.68	128017	1507746.0	48274.2
		2022	64.66	71637	1589985.0	48738.8
		2023	64.77	626097	1669421.0	49306.8
12	JAWA TENGAH	2018	61.06	5160	941091,1	12530.8
		2019	60.97	491617	991516,5	12714.3
		2020	67.62	85750	965227,3	12431.4
		2021	66.27	90504	997321,1	11904.6
		2022	66.85	19537	1050278.0	12023
		2023	68.59	1193013	1102474.0	12167
13	DI YOGYAKARTA	2018	53.68	347	98024,01	34358.5
		2019	49.24	5297	104485,5	34552.5
		2020	66.65	246	101698,5	37892.3
		2021	65.66	23847	107372,6	36516
		2022	65.96	34658	112901,3	36811.1
		2023	66.29	1013561	118625,5	37180.4
14	JAWA TIMUR	2018	59.75	1059894	1563442.0	3818.3
		2019	60.25	3872134	1649896.0	3868.6
		2020	67.07	2212151	1611393.0	3759.5
		2021	68.29	2042032	1668754.0	3668.7
		2022	69.92	280367	1757875.0	3687.8
		2023	69.59	7489228	1844809.0	3712.6
15	BANTEN	2018	49.18	334	433782,7	39521.9

No	Cross Saction	Time Series	IKLH (Persen)	X1 Emisi Karbon	X2 PDRB	X3 Jumlah Penduduk
		2019	51.09	2134	456620.0	39744.8
		2020	59.37	423	441148,6	41814.5
		2021	64.14	657	460952,8	40665.7
		2022	63.41	456	484129,4	40921.1
		2023	62.52	228	507425,7	41230
16	BALI	2018	57.87	51165	154072,7	4985.1
		2019	63.09	41410	162693,4	5045.7
		2020	71.99	2408	147498,9	5695.5
		2021	70.7	316	143871,7	5414.4
		2022	70.89	234	150830,8	5474.7
		2023	71.38	95214	159447,7	5549.7
17	NUSA TENGGARA BARAT	2018	63.4	1220500	2612,6	2612.6
		2019	64.59	3544094	2649,8	2649.8
		2020	70.83	1623911	2809,7	2809.7
		2021	69.89	4975536	2670.0	2670
		2022	70.56	1155451	2700,1	2700.1
		2023	71.92	1013561	2737,2	2737.2
18	NUSA TENGGARA TIMUR	2018	66.34	3486993	4162,4	4162.4
		2019	69.67	8810217	4216,3	4216.3
		2020	73.28	6546923	4273,4	4273.4
		2021	74.97	5342001	4073,6	4073.6
		2022	73.49	1904876	4116,9	4116.9
		2023	74.18	1013561	4170,2	4170.2
19	KALIMANTAN BARAT	2018	67.68	43554165	3573,8	3573.8
		2019	65.91	71642105	3619,7	3619.7
		2020	70.07	2159837	4045,9	4045.9
		2021	72.9	14652006	3766.0	3766
		2022	71.9	6936347	3803,5	3803.5
		2023	73.73	27649104	3856,8	3856.8
20	KALIMANTAN TENGAH	2018	72.55	34182439	682,8	682.8
		2019	74.19	216133847	695,6	695.6
		2020	72.74	2313223	739,8	739.8
		2021	75.11	909031	701,8	701.8
		2022	76.62	160507	710.0	710
		2023	75.17	44938470	720,1	720.1
21	KALIMANTAN SELATAN	2018	77.36	15447181	2474,4	2474.4
		2019	61.94	19994430	2494,1	2494.1
		2020	68.43	241705	2701,8	2701.8
		2021	71.03	1277416	2621,9	2621.9
		2022	71.97	55191	2639,5	2639.5
		2023	73.5	19398495	2660,8	2660.8
22	KALIMANTAN TIMUR	2018	61.47	7029802	1166,1	1166.1
		2019	80.79	12852068	1176,4	1176.4
		2020	76.46	779825	1227,8	1227.8

No	Cross Saction	Time Series	IKLH (Persen)	X1 Emisi Karbon	X2 PDRB	X3 Jumlah Penduduk
		2021	75.06	436334	1171,7	1171.7
		2022	74.46	65065	1183,5	1183.5
		2023	75.47	7498935	1198,4	1198.4
23	KALIMANTAN UTARA	2018	77.59	198190	3001,9	3001.9
		2019	78.98	1112651	3042,1	3042.1
		2020	78.49	269849	3121,8	3121.8
		2021	80.85	268889	2985,7	2985.7
		2022	80.67	41129	3015.0	3015
		2023	80.77	122148	3051,2	3051.2
24	SULAWESI UTARA	2018	67.63	4008	8748,1	8748.1
		2019	65.15	340325	8819,5	8819.5
		2020	70.69	6645	9463,4	9463.4
		2021	72.38	7845	9073,5	9073.5
		2022	72.37	12362	9156,9	9156.9
		2023	73.87	1013561	9260,1	9260.1
25	SULAWESI TENGAH	2018	72.55	340958	1340,1	1340.1
		2019	74.19	871489	1359,2	1359.2
		2020	72.74	239088	1503,2	1503.2
		2021	75.11	189930	1419,2	1419.2
		2022	76.62	227631	1436,7	1436.7
		2023	75.17	1013561	1458,9	1458.9
26	SULAWESI SELATAN	2018	77.36	120671	2623,6	2623.6
		2019	61.94	818516	2663,7	2663.7
		2020	68.43	116939	2793,1	2793.1
		2021	71.03	24297	2624,9	2624.9
		2022	71.97	43587	2659,9	2659.9
		2023	73.5	1013561	2704,6	2704.6
27	SULAWESI TENGGARA	2018	61.47	788725	4309,2	4309.2
		2019	80.79	1620921	4362.0	4362
		2020	76.46	216246	4433,3	4433.3
		2021	75.06	68205	4317,4	4317.4
		2022	74.46	97592	4343,4	4343.4
		2023	75.47	1013561	4374,3	4374.3
28	GORONTALO	2018	77.59	16930	5077,7	5077.7
		2019	78.98	189475	5152,4	5152.4
		2020	78.49	5612	5646.0	5646
		2021	80.85	6519	5320,1	5320.1
		2022	80.67	5393	5387,2	5387.2
		2023	80.77	46344	5474.0	5474
29	SULAWESI BARAT	2018	67.63	55088	5360,3	5360.3
		2019	65.15	153410	5437,2	5437.2
		2020	70.69	30576	5656.0	5656
		2021	72.38	62055	5325,6	5325.6
		2022	72.37	40314	5394,4	5394.4

No	Cross Saction	Time Series	IKLH (Persen)	X1 Emisi Karbon	X2 PDRB	X3 Jumlah Penduduk
		2023	73.87	1013561	5481,8	5481.8
30	MALUKU	2018	75.57	506543	1749,5	1749.5
		2019	80.23	2511141	1768,5	1768.5
		2020	77.53	1824612	1945,6	1945.6
		2021	77.78	1105080	1848,9	1848.9
		2022	78.66	1073419	1869,5	1869.5
		2023	79.93	1013561	1895,1	1895.1
31	MALUKU UTARA	2018	66.01	7548	1218,8	1218.8
		2019	67.63	238113	1235,7	1235.7
		2020	70.7	9770	1355,6	1355.6
		2021	73.23	8317	1282,9	1282.9
		2022	74.17	15412	1299,6	1299.6
		2023	74.3	1013561	1318,5	1318.5
32	PAPUA BARAT	2018	75.32	192028	941,4	941.4
		2019	72.03	898894	963,6	963.6
		2020	72.82	2701410	1205,8	1205.8
		2021	74.97	4542	1134,1	1134.1
		2022	76.88	368979	1149,4	1149.4
		2023	78.41	1013561	1168,4	1168.4
33	PAPUA	2018	74.71	4652415	3300,2	3300.2
		2019	74.97	6646052	3347,1	3347.1
		2020	75.31	1803978	4542,6	4542.6
		2021	77.32	1600134	4303,7	4303.7
		2022	79.79	858424	4356,8	4356.8
		2023	79.52	1013561	4429,7	4429.7