



PENGENDALIAN EMISI [103-1][103-2][103-3]

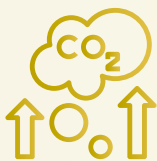
Seiring dengan penggunaan energi untuk kegiatan operasional, ANTAM juga menghasilkan emisi Gas Rumah Kaca (GRK), NO₂, SO₂, dan partikulat lain dari kegiatan penambangan, pengolahan limbah, proses kimia, serta penggunaan dan pemanfaatan lahan. ANTAM berkomitmen untuk mengambil langkah dalam melawan perubahan iklim salah satunya dengan mengurangi emisi GRK melalui berbagai inisiatif.

Dalam konteks keberlanjutan, pengendalian emisi menjadi salah satu aspek penting bagi ANTAM. Perusahaan memiliki kebijakan penurunan emisi GRK dan konvensional, identifikasi sumber emisi, beban emisi, data aktivitas faktor emisi, faktor oksidasi dan konversi di setiap unit bisnis. Seluruh kegiatan pengendalian emisi ANTAM dilakukan selaras dengan aturan pemerintah, yaitu Peraturan Presiden Nomor 61/2011 tentang rencana aksi penurunan Gas Rumah Kaca (GRK) dan Peraturan Presiden Nomor 71/2011 tentang Pencatatan Inventarisasi GRK Nasional.

EMISSION CONTROL [103-1][103-2][103-3]

Along with energy usage for operational activities, ANTAM also produces greenhouse gas (GHG) emissions, NO₂, SO₂, and other particulates from mining activities, waste processing, chemical processes, land use, and utilization. ANTAM is committed to performing to meet climate change, one of which is by reducing GHG emissions through various initiatives.

In the context of sustainability, emission control is an essential aspect of ANTAM. The Company has GHG and conventional emission reduction policies, identifying emission sources, emission load, emission factor activity data, oxidation factors and conversions in each business unit. All ANTAM's emission management activities have been conducted that meet with government regulations, namely Presidential Decree No. 61/2011 concerning the Action Plan for Reducing Greenhouse Gases (GHG) and Presidential Decree No. 71/2011 concerning Recording of the National GHG Inventory.

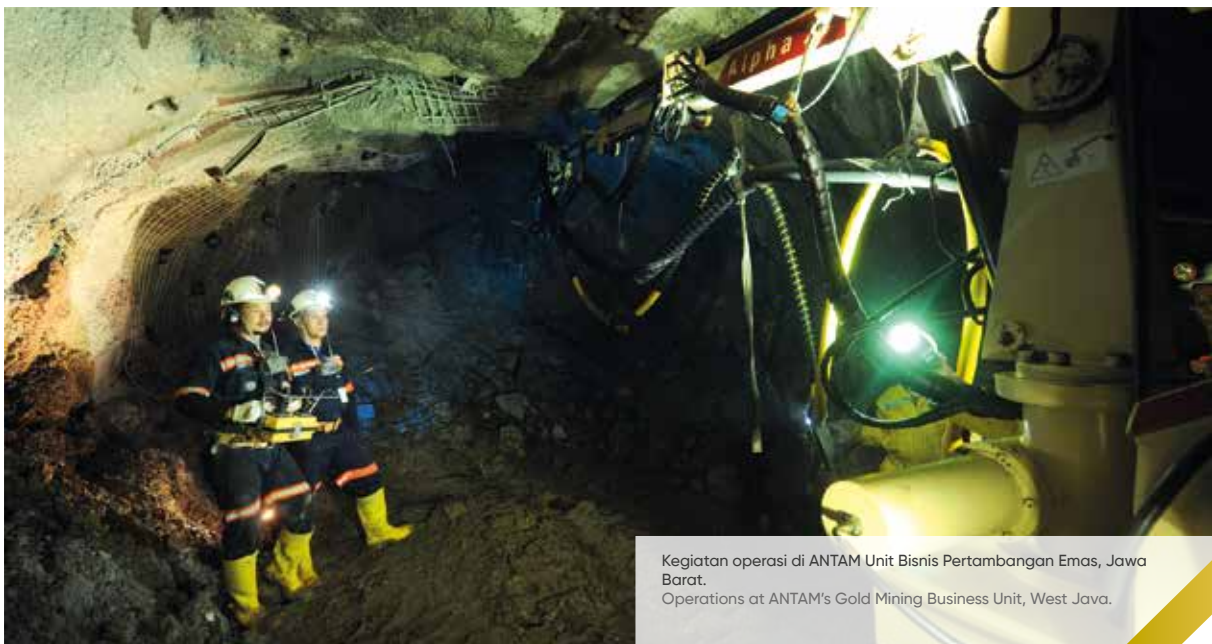


Total emisi ANTAM pada 2020 atau lebih tinggi dibandingkan tahun 2019. Secara umum peningkatan total emisi Perusahaan disebabkan oleh meningkatnya konsumsi energi.

ANTAM's total emissions in 2020 were higher than in 2019. In general, the increase was due to a rise in energy consumption.

1,32

juta ton CO₂eq
million tons of CO₂eq



Kegiatan operasi di ANTAM Unit Bisnis Pertambangan Emas, Jawa Barat.
Operations at ANTAM's Gold Mining Business Unit, West Java.

Total Emisi Berdasarkan Unit Bisnis & Cakupan Sumber Energi yang Digunakan [305-1][305-2]
Total Emission Based on Business Unit & Coverage of Energy Sources [305-1][305-2]

Unit Bisnis Business Unit	2018 ton CO ₂ eq		2019 ton CO ₂ eq		2020 ton CO ₂ eq	
	Cakupan-1 Scope - 1	Cakupan-2 Scope - 2	Cakupan-1 Scope - 1	Cakupan-2 Scope - 2	Cakupan-1 Scope - 1	Cakupan-2 Scope - 2
UBP Nikel Sulawesi Tenggara Southeast Sulawesi Nickel Mining Business Unit	1.140.738	-	1.096.188	-	1.173.534	-
UBP Nikel Maluku Utara North Maluku Nickel Mining Business Unit	151,04	-	344,68	-	427,1	-
UBP Emas Gold Mining Business Unit	5.253	55.599	5.139	50.397	4.849	49.488
UBPP Logam Mulia Precious Metals Processing and Refinery Business Unit	-	2.696	-	2.820	-	2.957
UBP Bauxit Kalimantan Barat West Kalimantan Bauxite Mining Business Unit	-	88.113	-	119.904	-	88.766
TOTAL	1.146.142,04	146.408	1.101.671,68	172.721	1.178.810	141.211
TOTAL CAKUPAN-1 & CAKUPAN-2 TOTAL SCOPE-1 & SCOPE-2	1.292.550,04		1.274.392,68		1.320.022	

Intensitas Emisi GRK ANTAM berdasarkan Unit Bisnis [305-4]
ANTAM's GHG Emission Intensity based on Business Unit [305-4]

Unit Bisnis Business Unit	Satuan Unit	2018	2019	2020	
UBP Nikel Sulawesi Tenggara Southeast Sulawesi Nickel Mining Business Unit	Total Emisi Total Emission	TonCO ₂ eq	1.140.738	1.096.188	1.173.534
	Total Produksi Total Production	TNi	24.868	25.713	25.970
	Intensitas Emisi Emissions Intensity	TonCO ₂ eq/TNi	45,87	42,63	45,19
UBP Nikel Maluku Utara North Maluku Nickel Mining Business Unit	Total Emisi Total Emission	TonCO ₂ eq	151,04	344,69	427,14
	Total Produksi Total Production	WMT	4.827.762	3.890.171	2.429.203
	Intensitas Emisi Emissions Intensity	TonCO ₂ eq/ WMT	0,000031	0,00008861	0,0000176
UBP Emas Gold Mining Business Unit	Total Emisi Total Emission	TonCO ₂ eq	63.198	54.602	54.337
	Total Produksi Total Production	Dore Kg	12.169	12.805	9.808
	Intensitas Emisi Emissions Intensity	TonCO ₂ eq/ Dore Kg	5,19	4,26	5,54
UBPP Logam Mulia Precious Metals Processing and Refinery Business Unit	Total Emisi Total Emission	TonCO ₂ eq	2.696	2.820	2.957
	Total Produksi Total Production	Kg	227.834	257.712	217.005
	Intensitas Emisi Emissions Intensity	TonCO ₂ eq/Kg	0,011	0,011	0,0136



Intensitas Emisi GRK ANTAM berdasarkan Unit Bisnis [305-4] ANTAM's GHG Emission Intensity based on Business Unit [305-4]

Unit Bisnis Business Unit		Satuan Unit	2018	2019	2020
UBP Bauksit Kalimantan Barat West Kalimantan Bauxite Mining Business Unit	Total Emisi Total Emission	TonCO ₂ eq	88.113	119.904	88.766
	Total Produksi Total Production	WMT	1.102.385	1.770.120	1.553.457
	Intensitas Emisi Emissions Intensity	TonCO ₂ eq/ WMT	0,080	0,068	0,057

Catatan | Notes:

Emisi GRK dihitung berdasarkan metode perhitungan yang dikembangkan ANTAM berdasarkan studi yang dilakukan di masing-masing unit. Perhitungan emisi GRK menggunakan metode *Intergovernmental Panel on Climate Change (IPCC) Guidelines* yang dikeluarkan oleh United Nations Environment Programme (UNEP) 2006, GHG Protocol for Corporate Accounting (WBCSD/WRI) dan ISO 14064.

GHG emissions are calculated based on the calculation method developed by ANTAM based on the studies conducted in each unit. The calculation of GHG emissions uses the Intergovernmental Panel on Climate Change (IPCC) Guidelines issued by the United Nations Environment Program (UNEP) 2006, GHG Protocol for Corporate Accounting (WBCSD/WRI) and ISO 14064.

Cakupan-1: emisi bruto GRK langsung dari operasional yang dimiliki atau dikendalikan oleh organisasi (termasuk penambangan, pemakaian energi, pengolahan limbah, dan proses kimia) dari Unit Bisnis ANTAM yang termasuk dalam batasan laporan ini.

Cakupan-2: emisi GRK tidak langsung dari pemakaian energi yang dibeli dari luar (PLN) Unit Bisnis ANTAM yang termasuk dalam batasan laporan ini.

Scope-1: gross GHG emissions directly from operations owned or controlled by the organization (including mining, energy use, waste treatment, and chemical processes) of ANTAM's Business Units included in the boundaries of this report.

Scope-2: indirect GHG emissions from energy usage purchased from state electricity company (PLN), which are included in this report's boundaries.

Selain emisi GRK, Kami juga melakukan pemantauan terhadap emisi non-GRK yang terdiri dari Nitrogen Dioksida (NO₂), Sulfur Dioksida (SO₂), dan partikulat lain yang dihasilkan. Berikut ini adalah volume emisi non-GRK berdasarkan unit bisnis.

Apart from GHG emissions, we also monitor non-GHG emissions, consisting of Nitrogen Dioxide (NO₂), Sulfur Dioxide (SO₂), and other particulates produced. Following is the volume of non-GHG emissions by business unit.

Hasil Pengukuran Emisi NO₂ dan SO₂ Serta Partikulat Lain [305-7] NO₂, SO₂ and Other Particulate Emission Monitoring Results [305-7]

Unit Bisnis Business Unit	Satuan Unit	Nitrogen Dioksida Nitrogen Dioxide				Sulfur Dioksida Sulfur Dioxide				Partikulat Total Total Particulate			
		NO ₂				SO ₂							
		Baku Mutu Standard	2018	2019	2020	Baku Mutu Standard	2018	2019	2020	Baku Mutu Standard	2018	2019	2020
UBP Nikel Sulawesi Tenggara Southeast Sulawesi Nickel Mining Business Unit	mg/m ³	1.000	861,5	994,6	867,3	800	626	743,8	728,5	250	225,5	207,7	209,3
UBP Nikel Maluku Utara North Maluku Nickel Mining Business Unit	mg/m ³	1.000	20	460	690	800	20	1	17	350	33	45	45,28
UBP Emas Gold Mining Business Unit	mg/m ³	1.000	776,4	150,3	82,6	800	123,7	154,5	32	350	35,95	194	37
UBPP Logam Mulia Precious Metals Processing and Refinery Business Unit	mg/m ³	1.000	94	2	794	800	20	3	66	350	12	2	112
UBP Bauksit Kalimantan Barat West Kalimantan Bauxite Mining Business Unit	mg/m ³	1.000	124	186	92	800	18,7	18,8	92,3	350	53,1	58,3	44,8

• Spesifik sesuai dengan Peraturan Menteri Lingkungan Hidup No. 4 Tahun 2014 tentang Baku Mutu Emisi Sumber Tidak Bergerak Kegiatan Pertambangan. Specific in accordance with Regulation of the Minister of Environment No. 4 of 2014 concerning Standard Quality of Emission of Immobile Resources Mining Activities.

• Hasil uji tertinggi didapat dari hasil pengukuran emisi cakupan I & II. Cakupan III tidak termasuk dalam perhitungan. The highest test results are obtained from the measurement results of emissions coverage I & II. Coverage III is not included in the calculation.

Beragam Inovasi Mengurangi Emisi [305-5] Various Innovations to Reduce Emissions [305-5]

ANTAM memiliki komitmen besar dalam berkontribusi mengurangi emisi GRK. Beragam inovasi dan *monitoring* terus dilakukan di seluruh unit bisnis ANTAM untuk mencapai dan menjaga emisi GRK yang optimal sebagai berikut:

ANTAM has a significant commitment to reducing GHG emissions. Various innovations and monitoring are continuously carried out in all ANTAM's business units to achieve and maintain optimal GHG emissions as follows:

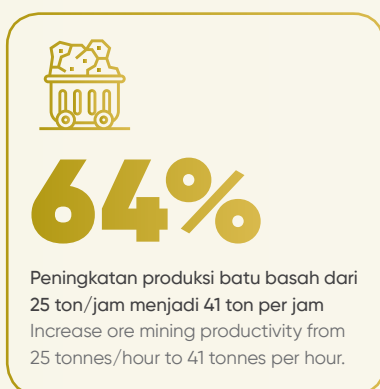
Inovasi Penurunan Emisi di UBP Emas Emission Reduction Innovation at Gold Mining Business Unit

Di UBP Emas, Perusahaan melakukan program Inovasi Penurunan Emisi dengan mengubah metode penambangan bawah tanah dari *Fishbone* dan *Upperhole* secara seri menjadi *Fishbone* dan *Upperhole* secara paralel di salah satu area penambangan. Perusahaan juga melakukan perubahan mekanisme salah satu proses tambang yakni *drilling* untuk mengoptimalkan produktivitas. Program ini dapat meningkatkan produktivitas tambang dari sebelumnya 25 ton/jam menjadi 41 ton/jam atau meningkat sebanyak 64%.

Program ini dapat menurunkan pencemaran udara dari emisi sebanyak 571 tonCO₂eq per tahun dan memiliki nilai penghematan sebanyak Rp674 juta per tahun. Dengan program ini, UBP Emas telah menjadi pionir dalam rekayasa metode pertambangan bawah tanah yang sesuai dengan kondisi batuan, *front* produksi dan lingkungan dengan tetap berlandaskan standar-standar kesehatan, keselamatan, keamanan dan lingkungan.

At Gold Mining Business Unit, the Company conducts the Emission Reduction Innovation program by switching the underground mining method from Serial Fishbone and Upperhole to Pararel Fishbone and Upperhole in one of the mining areas. The Company is also improving the mining processes mechanism, namely drilling, to optimize productivity. This program can increase mining productivity from the previous 25 tonnes/hour to 41 tonnes/hour or 64%.

This program can reduce air pollution by 571 tonnes CO₂eq per year and has a saving value of Rp674 million per year. With this program, Gold Mining Business Unit has become a pioneer in engineering underground mining methods based on rock conditions, production fronts, and the environment while keeping health, safety, security, and environmental application standards.





Serapan Karbon dari Reklamasi di UBP Nikel Sulawesi Tenggara Carbon Conversion from Reclamation in Southeast Sulawesi Nickel Mining Business Unit

Di UBP Nikel Sulawesi Tenggara, Perusahaan melaksanakan reklamasi dan melakukan pengukuran serapan karbon atas dampak efek GRK yang ditimbulkan dari bukaan lahan karena aktivitas penambangan. ANTAM melakukan pengukuran serapan karbon sejak tahun 2013 hingga saat ini.

At the Southeast Sulawesi Nickel Mining Business Unit, the Company perform reclamation and measures carbon absorption on the impact of GHG effects arising from land clearing due to mining activities. ANTAM has measured carbon absorption from 2013 to the present.

	2013	2014	2015	2016	2017	2018	2019	2020
Titik Sampel Sample Points	56	34	84	73	55	71	111	45
Rata-rata Serapan (ton CO ₂ /Ha) Average Absorption (tonne CO ₂ /Ha)	47,81	17,95	147,32	119,78	41,25	126,47	405,386	221,472
Total Serapan Karbon (ton CO ₂) Total Carbon Absorption (tonne CO ₂)	1077,7	241,41	685,46	682,6	915,365	1.784,3	2.813,61	2.098,33



Aktivitas reklamasi di ANTAM Unit Bisnis Pertambangan Nikel Sulawesi Tenggara.
Reclamation activities at ANTAM's Southeast Sulawesi Nickel Mining Business Unit.

Instalasi Sistem Pengendalian Emisi di Pabrik Feronikel Emission Control System Instalation at the Ferronickel Plant

Pada tahun 2019, ANTAM memulai inisiasi pengendalian emisi di UBP Nikel Sulawesi Tenggara melalui instalasi sistem pengendalian emisi di pabrik feronikel. Proyek ini bertujuan untuk mengurangi timbulan debu yang terlepas ke lingkungan mengingat produksi feronikel menggunakan proses pirometalurgi sehingga menghasilkan debu yang cukup signifikan.

Pada tahun ini, instalasi *exhaust ducting* di area Pemurnian 3 dan Impeller Breaker Rotary Dryer 4 telah selesai dan sudah dilakukan uji coba, namun tetap dilakukan pemantauan dan perbaikan berkelanjutan sehingga sistem lebih optimal dalam mengendalikan emisi. Berdasarkan hasil pemantauan hingga saat ini, dengan adanya instalasi peralatan ini mampu mengubah arah debu dan gas serta dapat mengurangi debu yang terlepas ke udara sehingga debu dan gas tersebut tidak mengganggu aktivitas pekerja di wilayah operasional.

Guna mewujudkan lingkungan pabrik yang lebih sehat dan ramah lingkungan, UBP Nikel Sulawesi Tenggara terus melanjutkan proses instalasi sistem pengendalian emisi lainnya yaitu instalasi mesin briket atau *new dust handling system* di line 4, *gas cleaning technology* di Furnace 2, dan *refinery dust collector*.

Instalasi mesin briket bertujuan untuk mengolah kembali debu dari *Rotary Dryer* dan *Rotary Kiln* menjadi briket yang akan diumpan kembali ke *Rotary Kiln* 4. Instalasi *gas cleaning technology* pada Furnace 2, bertujuan untuk menangani *off-gas furnace*, di antaranya: menurunkan temperatur gas, menangkap debu, dan mengurangi CO yang terlepas ke udara. Sedangkan instalasi *refinery dust collector* bertujuan untuk mengendalikan emisi dari proses pemurnian sehingga kondisi lingkungan kerja dan udara di sekitar pabrik menjadi lebih aman dan nyaman.

In 2019, ANTAM started initiating emission control at the Southeast Sulawesi Nickel Mining Business Unit by installing an emission control system at the ferronickel plant. This project aims to reduce dust, considering that ferronickel production uses a pyrometallurgical process that produces significant dust.

This year, the exhaust ducting installation in Refining 3 area and Impeller Breaker Rotary Dryer 4 has been completed. It has been tested, but monitoring and continuous improvement are still ongoing. Based on the monitoring result, the system was able to change the direction of dust and gas. It can reduce dust released into the air so that the dust and gas do not affect workers' activities in operational areas.

To create a healthier and more environmentally friendly factory environment, Southeast Sulawesi Nickel Mining Business Unit continues installing other emission control systems, namely the installation of a briquette machine or new dust handling system on line 4, gas cleaning technology in Furnace 2, and refinery dust collectors.

The briquette machine's installation aims to reprocess dust from the Rotary Dryer and Rotary Kiln into briquettes fed back to the Rotary Kiln 4. Installation of gas cleaning technology in Furnace 2 aims to handle off-gas furnaces, including lowering gas temperatures, catching dust, and reduce CO released into the air. Meanwhile, the dust collector refinery installation aims to control emissions from the refining process so that the working environment and air conditions around the factory become safer and more comfortable.