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INDONESIA'S 2025 MINERAL AND COAL RESERVES AND RESOURCES

Status as of December 2024



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GEOLOGICAL AGENCY
CENTER OF MINERAL COAL AND GEOTHERMAL RESOURCES

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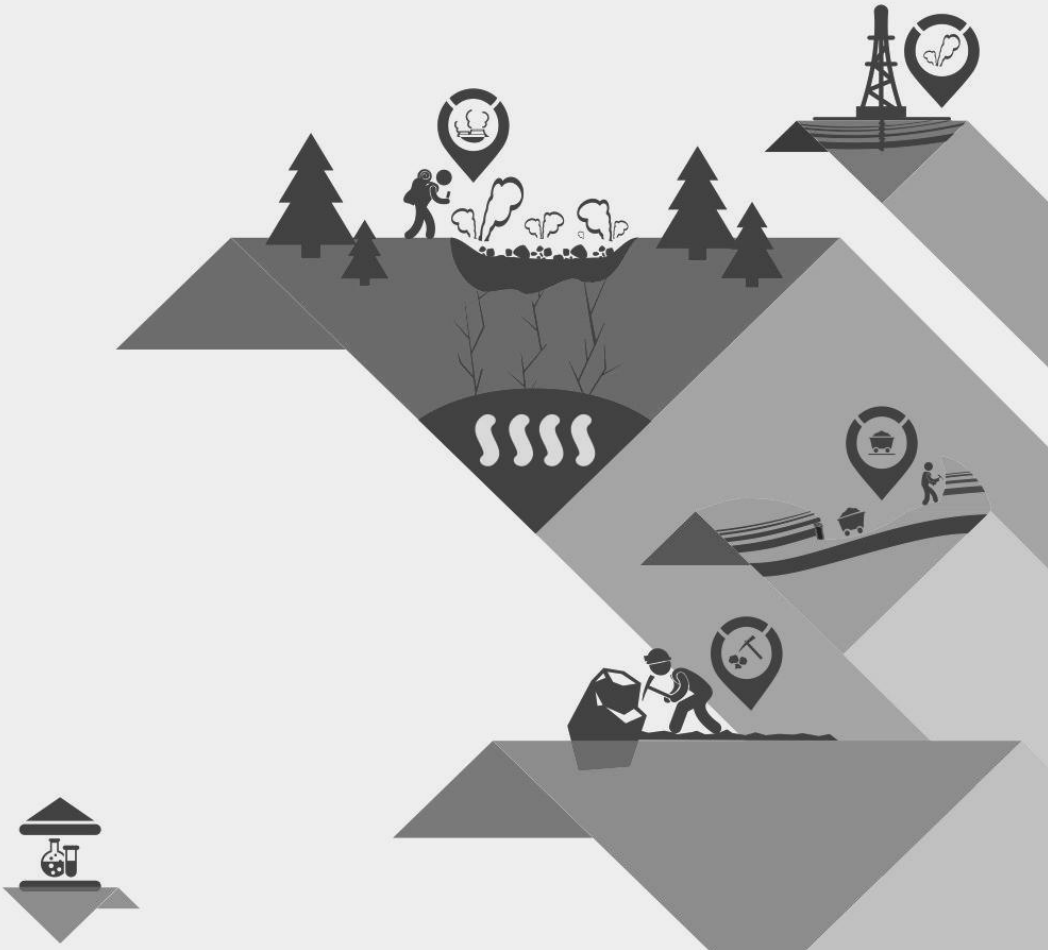
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REMARKS
MINISTER OF ENERGY AND MINERAL RESOURCES

With sincere gratitude to the Almighty, we proudly acknowledge the release of the 2025 Edition of the Indonesian Mineral and Coal Resources and Reserves Book. This publication is a key instrument in advancing national energy resilience through the development of downstream industries in the mineral and coal sectors, in line with the strategic direction set forth by President Prabowo Subianto in the field of energy and natural resources.

As outlined in "Asta Cita 5," President Prabowo has expressed a strong commitment to continuing the industrialization of natural resources and fostering value-added domestic industries. This publication reflects Indonesia's dedication to supporting the global shift toward clean energy, targeting net zero emissions by 2060. It serves as a foundational document for shaping energy and mining policies that contribute to economic growth and public prosperity.

We trust that this book will serve as a valuable reference for local governments, industry stakeholders, researchers, and the wider community. Through enhanced synergy and cooperation, we can collectively work toward energy security, resources autonomy, and sustainable mineral development to secure a brighter future for Indonesia.

Bahlil Lahadalia
Minister of Energy and Mineral Resources

FOREWORD
HEAD OF THE GEOLOGICAL AGENCY

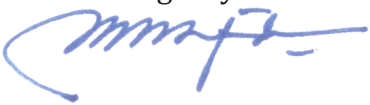
With gratitude to the Almighty God, we are proud to release the *Indonesia's 2025 Mineral and Coal Resources and Reserves*. This publication follows the enactment of Ministerial Regulation of Energy and Mineral Resources No. 14 of 2022 regarding the National Data of Mineral and Coal Resources and Reserves, and represents the Geological Agency's continued role in fulfilling its duty to compile these national resources and reserves statistics.

The document adheres to Indonesian National Standards (SNI) and applicable regulatory frameworks to ensure data reliability and precision. Presenting data as of December 31, 2024, it covers national mineral and coal resource, reserve, and production figures. This information serves as a key reference for developing strategic policies and plans concerning the management, utilization, and development of mineral and coal resources, as well as for providing recommendations on regional planning, mining environmental management, and both national and local land-use strategies.

The Geological Agency remains dedicated to enhancing the quality and comprehensiveness of resources and reserves data, aiming to make this information a dependable source for policymakers, industry professionals, researchers, and all stakeholders involved in the energy and mineral resources sector.

We extend our sincere appreciation to everyone who contributed to the development of this publication and hope the insights offered will support the advancement of a sustainable energy and mineral sector.

Bandung, Juni 2025
Head of the Geological Agency



Muhammad Wafid A.N..

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GLOSSARY

MINERAL AND COAL

The National Mineral and Coal Resources and Reserves comprise data on the quantity of national mineral and coal resources, reserves, and production. This information is presented in tabular form and through maps illustrating the distribution of mineral and coal resources, reserves, and production.

Hypothetical Resources refer to resources whose quantity and quality are derived from investigations at the reconnaissance survey stage. These estimates possess a low level of confidence are required for the national natural resources inventory by the government.

Inferred resources refer to resources whose quantity and quality can only be estimated with a low level of confidence. Observation points, possibly supported by ancillary data, are insufficient to prove continuity, density, shape, dimensions, grade, or mineral/coal content. Estimates within this confidence category are subject to significant change with further exploration.

Indicated resources are resources whose quantity and quality are estimated based on observation points with continuity, density, shape, dimensions, grade, and mineral/coal content, with a moderate level of confidence.

Estimates in this category may change significantly with detailed exploration.

Measured resources are resources whose quantity and quality are estimated based on observation points with continuity, density, shape, dimensions, grade, and mineral/coal content, with a high level of confidence.

Probable reserves are portions of indicated resources that can be mined economically after applying modifying factors; may also be parts of measured resources, albeit with some uncertainties regarding one or more modifying factors.

Proven reserves are measured resources that, based on feasibility studies, have fulfilled all necessary criteria to be mined economically.

Preliminary Survey refers to an initial mining activity phase aimed at identifying regional/general geological conditions, mineralization indicators, potential, and target areas for exploration and mineral and/or coal resources estimation.

Prospecting is a stage within exploration to narrow down areas containing potential mineral deposits through geological mapping, possibly supplemented with geochemical methods, geophysical surveys, trenching, test pits, drilling, and sampling to acquire the general shape and dimensions of the mineral deposit and estimate inferred resources.

General exploration is the initial delineation phase of an identified deposit. Methods include geological mapping, widely spaced sampling, trenching, and drilling for preliminary evaluation of quantity and quality. Limited interpolation is possible based on indirect survey methods.

The aim is to understand the geological profile, estimate the size, shape, distribution, quantity, and quality, and determine the indicated resources, including social and environmental information.

Detailed exploration is a phase for three-dimensional delineation of previously identified mineral deposits using exposures, trenches, drill holes, shafts, and tunnels. The sampling density must be close enough to determine the size, shape, distribution, quantity, quality, and characteristics of the deposit with high accuracy, enabling estimation of measured resources and assessment of socio-environmental impacts.

Total coal resources comprise the sum of inferred, indicated, and measured resources to facilitate public communication.

Total mineral resources comprise the sum of inferred, indicated, and measured resources to facilitate public communication.

Total reserves comprise the sum of probable and proven reserves to facilitate public communication.

Inclusive resources refer to statements of resources that include reserve values.

Exclusive resources refer to resources statements that exclude reserve values.

Data refers to all facts, indications, and information in the form of text (characters), numbers (digital), images (analog), magnetic media, documents, rock samples, fluids, and other forms obtained from geological investigations and studies,

preliminary surveys, exploration, feasibility studies, and mining activities.

New data refers to location and value information of resources or reserves not recorded in the previous year's database and added in the current year.

Updated data refers to location and value information of resources or reserves previously recorded in the database and revised based on the latest reports in the current year.

Minerals are naturally occurring inorganic compounds with specific chemical and physical properties and regular crystal structures or aggregates forming rocks, whether loose or solid.

Ore refers to single or combined minerals found in a mass or deposit with economic value, expressed in tonnage (wmt).

Wet metric ton (wmt) represents ore tonnage in wet condition.

Dry metric ton (dmt) represents ore tonnage in dry condition.

Tonnage is an expression of material quantity, represented in weight (wmt/dmt) or volume (m3).

Mineral concentrate is a processed ore containing higher metal grade after separation processes.

Grade is a physical or chemical measurement of desired material characteristics in a sample, expressed in weight/weight (gr/ton, %) for primary deposits or weight/volume (kg/m3) for secondary deposits.

Metal content is calculated as the product of dry ore/concentrate and grade.

Primary metallic minerals are target metal commodities within ore that can be extracted for utilization.

By-product metallic minerals are other metallic commodities associated with the primary metal minerals in ore, also extractable.

Crude/Unwashed Bauxite refers to the condition of natural bauxite ore before washing.

Washed Bauxite refers to bauxite ore after undergoing washing.

Concretion Factor (CF) is the percentage ratio between the weight of Washed Bauxite and the original weight of Crude Bauxite.

Alumina metal refers to aluminum oxide (Al_2O_3), chemically derived from bauxite ore using the Bayer process, and extractable through electrolytic processes into pure aluminum. Alumina contains approximately 52.9% aluminum by weight (Robert H. McCune, 1962).

Tin ore is metallic ore containing primary tin and naturally occurring alluvial secondary tin deposits with 20–30% Sn content, concentrate-able into cassiterite. Most tin ore mined in Indonesia is alluvial, known as secondary or placer tin deposits. Its primary mineral is cassiterite, with associated minerals such as pyrite, quartz, zircon, ilmenite, galena, bismuth, arsenic, stibnite, chalcopyrite, xenotime, and monazite.

Cassiterite concentrate is the result of tin ore concentration using gravity, magnetic, and electrostatic separation to yield tin concentrate with 72% Sn oxide content, with minor impurities like monazite, xenotime, ilmenite, zircon, galena, stibnite, chalcopyrite, bismuth, and arsenic.

Tin metal (Sn) is pure tin (Sn 100%) derived from primary tin ore and cassiterite concentrate via pyrometallurgical smelting at 1,000°C. Impurities are separated as slag.

Coal is an accumulation of organic material derived from plant remains that have undergone peatification, coalification, and lithification, involving compaction, chemical transformation, and metamorphism over geological time.

Coal basin is a low-lying area in the Earth's crust formed by tectonic activity, serving as an accumulation zone for coal.

Calorific value refers to the energy content of fuel, measured by the heat produced from complete combustion of a given amount. Expressed in cal/g or kcal/kg.

Air Dried Basis (adb) expresses data with moisture removed, i.e., after coal sample drying.

Gross as Received (gar) expresses data in the as-received condition, including moisture naturally attached to the coal.

Competent Person (CP) is an individual with the knowledge, skills, and experience to report on exploration results, resource estimates, and reserve estimations of minerals and coal, validated by a competency certificate from a recognized professional organization under relevant regulations.

MBP (Mining Business Permit) refers to a mining permit free from overlapping claims, compliant with non-tax state revenue obligations and technical and environmental requirements per applicable laws.

Former MBP location refers to ex-**MBP** areas that still contain coal potential.

PEAT

Peat is a soil layer rich in organic matter (C-organic >18%) with thickness of 50 cm or more. Peat is a precursor to coal and contains calorific value usable as an energy source.

Peat resources refer to the estimated quantity of peat deposits based on occurrence location, thickness, and specific gravity, expressed in tons.

1. INTRODUCTION

Geologically, Indonesia possesses a wide array of geological resource potentials, including mineral and coal resources. Various types of minerals can be found across Indonesia, encompassing metallic minerals such as gold, silver, copper, nickel, tin, zinc, iron, aluminum, and rare earth elements, as well as radioactive minerals and non-metallic minerals and rocks such as limestone, kaolin, zircon sand, phosphate, gypsum, and potassium-bearing rocks. Nearly all objects used in modern life contain minerals as their essential raw materials.

Based on the Decree of the Minister of Energy and Mineral Resources (MoEMR) No. 69.K/MB.01/MEM.B/2024 regarding the designation of strategic mineral commodity classifications, 22 commodities have been designated as strategic minerals. These are defined as minerals that serve as key raw materials for strategic industries, have the potential to control global markets, and contribute to national revenue and foreign exchange. Additionally, MoEMR Decree No. 296.K/MB.01/MEM.B/2023 defines 47 commodities as part of the critical mineral classification.

One of Indonesia's long-standing energy resources utilized for national development is coal. Coal is relatively easy to mine and provides a low-cost source of electricity. To this day, the majority of power plants in Indonesia continue to rely on coal as their primary energy source. Geologically, peat is the precursor material to coal. Peat has a lower calorific value and higher moisture content compared to coal. In several countries,

peat has long been used as an energy source. Although peat has not yet been utilized for energy production in Indonesia, it is essential for the Government to assess its potential—particularly to support other strategic uses beyond energy.

As a country with a population exceeding 284 million (Statistics Indonesia, 2025), Indonesia requires reliable energy security and policies that ensure the continuity of supply, improved accessibility, and energy diversification. Simultaneously, sustainable national development depends heavily on the supply of various minerals, whether for domestic consumption, value addition, or export to increase state revenue. Therefore, accurate data on the quantity of mineral and coal resources, reserves, and productions are crucial in supporting national policy formulation regarding energy utilization and mineral development.

The legal foundation for the government's preparation of the mineral, coal, and geothermal resources is primarily derived from Article 33 of the 1945 Constitution of the Republic of Indonesia, which mandates that the nation's natural wealth shall be controlleld by the state and utilized to the greatest benefit of its people. Further legal basis is provided by Law No. 3 of 2020, amending Law No. 4 of 2009 on Mineral and Coal Mining, specificaly Article 6 paragraph (1) point r, which states that the Central Government has the authority to prepare the national mineral and coal resources. This is reinforced by Law No. 23 of 2014 on Regional Government, particularly Appendix CC, which allocates the responsibility of formulating the national mineral and energy resources to the Ministry of Energy and Mineral Resources through the Geological Agency

under the sub-field of geology.

Furthermore, Ministerial Regulation No. 14 of 2022 on the National Mineral and Coal Resources and Reserves underscores the strategic importance of this sheet as a basis for recommending national policies regarding resources management, value addition, utilization, and exploitation of mineral and coal resources. It also serves as a reference for regional and environmental mining planning, as well as national, provincial, and local spatial planning.

According to Government Regulation No. 96 of 2021 on the Implementation of Mineral and Coal Mining Business Activities, Article 2 paragraph 1 categorizes mining commodities into five groups: radioactive minerals, metallic minerals, non-metallic minerals, rocks, and coal. Paragraph 2 further specifies a category for certain types of non-metallic minerals. This categorization is also referenced in MoEMR Decree No. 147.K/MB.01/MEM.B/2022, which updates the classification of mining commodities to include dolomite, feldspar, phosphate, graphite, quartzite, and zircon sand.

To implement these regulatory mandates, the Geological Agency—through the Center for Geological Resources for Minerals, Coal, and Geothermal (CMCGR)—is tasked under Ministerial Regulation No. 9 of 2024 concerning the Organization and Work Procedures of the Ministry of Energy and Mineral Resources (KESDM) to prepare the national resources and reserves for minerals and coal. The compilation and updating of this resources and reserves data serve as a critical effort to inventory and update national data on the potential wealth of energy and mineral resources.

2. METHODOLOGY OF DATA COMPILATION AND UPDATING

2.1. DATA SOURCES

The data sources used in compiling the National Mineral and Coal Resources and Reserves originate from investigation activities conducted by the government (specifically CMCGR - Geological Agency, BATAN, and regional governments), as well as data from exploration and exploitation activities carried out by business entities. These include Mineral Contracts of Work (COW), Coal Mining Concession Work Agreements (CCOW), Mining Business Permite (MBP) for minerals and coal, and Special Mining Business Permite (SMBP) for minerals and coal (Figure 1).

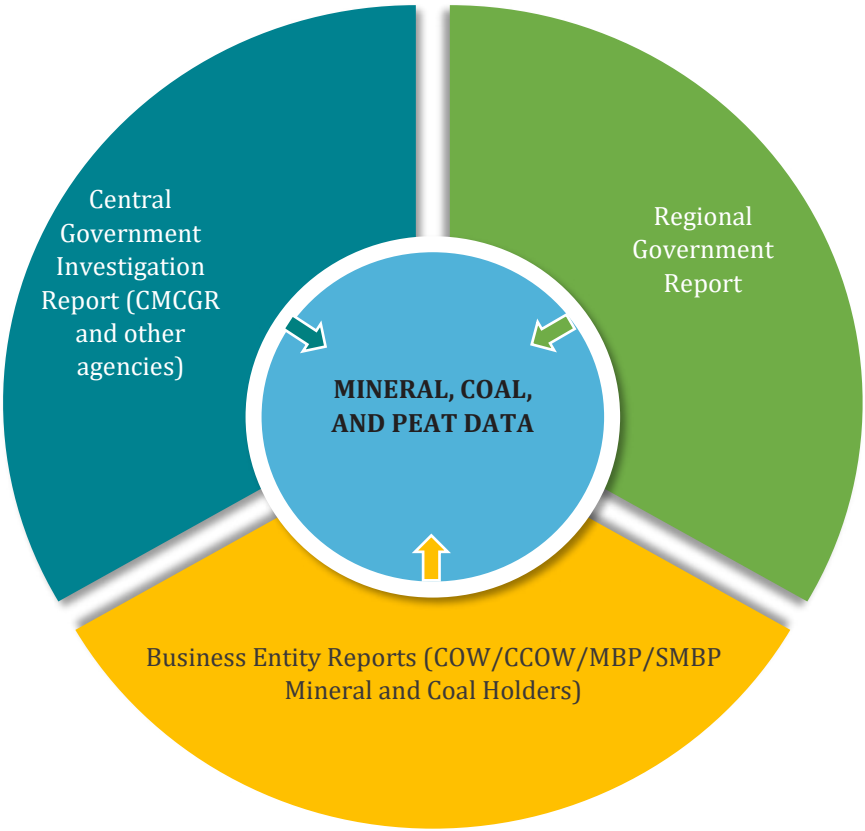


Figure 1. Data Source of Mineral and Coal Resources and Reserves

2.2. DATA COMPILATION AND UPDATING WORKFLOW

To compile the Mineral and Coal Resources and Reserves Data, the following steps are carried out (Figure 2):

1. The Geological Agency, through the Center for Mineral, Coal, and Geothermal Resources (CMCGR), collects data

and information on mineral and coal resources and reserves. This information is sourced from investigative reports prepared by both government institutions and Business Entities operating under Mineral Contracts of Work (COW), Coal Mining Concession Work Agreements (PKP2B), Mining Business Permite (MBP), and Special Mining Business Permite (SMBP). In the case of peat, since it is not yet commercially exploited in Indonesia, the data is entirely derived from CMCGR's own investigations.

2. To improve data quality, CMCGR conducts reconciliation efforts in collaboration with the Directorate General of Minerals and Coal (Ditjen Minerba). These efforts focus on harmonizing data submitted by Business Entities on various mineral and coal commodities. This process is intended to result in more accurate and complete records of Indonesia's mineral and coal resources, reserves, and production figures.
3. The inventoried data is then processed and entered into CMCGR's mineral and coal resources database. This step includes not only the addition of new data, but also the revision and updating of existing entries based on the most recent information provided by Business Entities with COW, CCOW, MBP, and SMBP licenses.
4. After the update process is finalized, the consolidated mineral and coal resources data is formatted into a comprehensive database and visualized through a web-based Geographic Information System (webGIS) that maps out the distribution of resources potential data.

This information is also made available through GeoRIMA, an application managed by CMCGR that provides public access to data on Indonesia's mineral, coal, and geothermal resources potential.

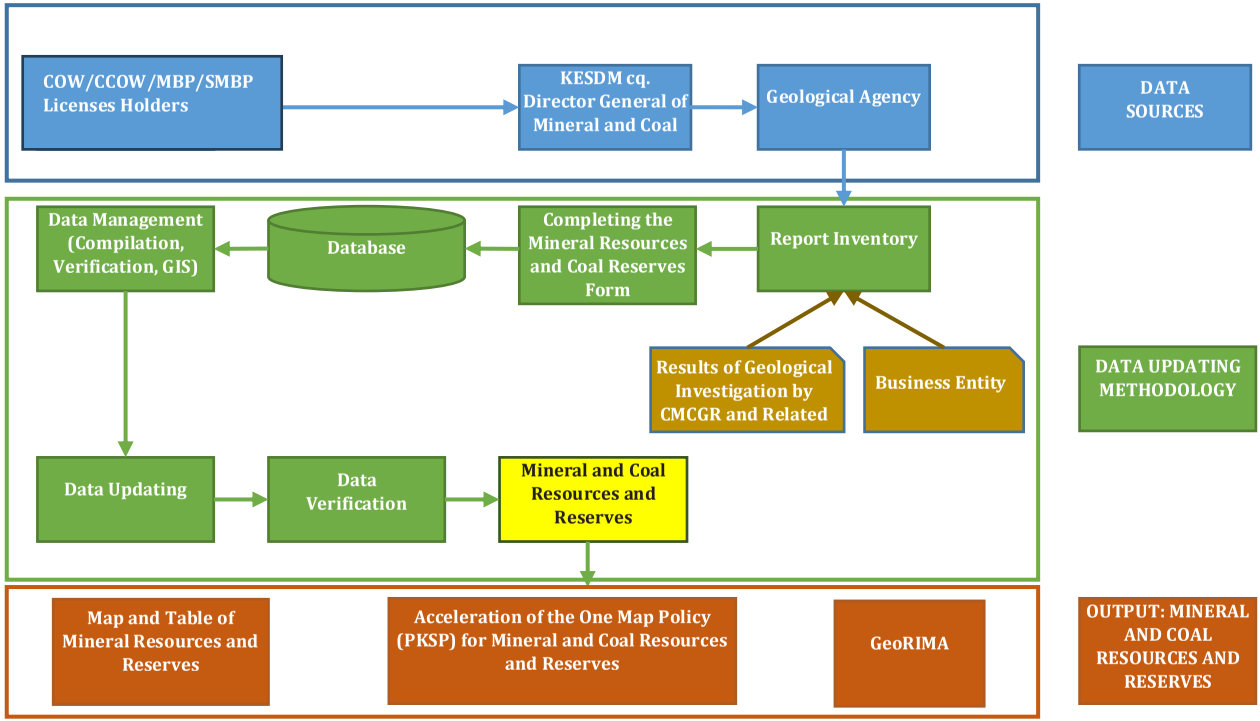


Figure 2. Data Flow Diagram and Methodology for Updating the Mineral and Coal Resources and Reserves

3. MINERAL AND COAL RESOURCES AND RESERVES

3.1. MINERAL RESOURCES

In the activities of compiling and updating mineral resources and reserves data refers to Government Regulation Number 96 of 2021 (PP No.96 Tahun 2021) and the Minister of Energy and Mineral Resources Decree Number 147.K/MB.01/MEM.B/2022. The classification of mineral resources and reserves refers to SNI 6728.4:2015 on the Compilation of Spatial Natural Resource – Part 4: Mineral and Coal Resources and Reserves, and SNI 4726:2019 on Guidelines for Reporting Exploration Results of Mineral Resources and Reserves.

The tabulation of metallic mineral tonnage consists of several columns, including ore/concentrate, grade, and metal content. For certain commodities, ore tonnage is further divided into wet ore and dry ore. This classification reflects the natural wet condition of the ore, which is subsequently analyzed in its dry state to determine the metal grade.

Based on the results of data inventory, not all companies report moisture content or dry ore tonnage. Therefore, assumptions are required to complete the data. Based on agreements with several stakeholders in 2020, the average moisture values derived from selected prospective areas. As a result, the following standard moisture contents are applied: 30% for nickel ore, and 15% for both primary gold ore and bauxite ore.

Bauxite ore is initially measured in its raw (crude) form, which is then washed to produce washed bauxite. The ratio between washed and crude bauxite is known as the concretion factor. While some companies include the concretion factor in their reports, many do not; therefore, a general assumption of 50% is used. Washed bauxite that has been dried is analyzed for Al_2O_3 content and the presence of other minerals/elements. The alumina (Al_2O_3) content in the bauxite ore is therefore calculated by multiplying the grade by the tonnage of dry washed bauxite.

Tin ore is a metallic ore containing primary tin and naturally formed alluvial deposits that contain secondary tin with Sn content ranging from 20–30%, which can be concentrated into cassiterite concentrate. Tin ore mined in Indonesia generally originates from alluvial tin deposits, commonly referred to as secondary or placer tin deposits. The primary mineral in tin ore is cassiterite, while associated minerals include pyrite, quartz, zircon, ilmenite, galena, bismuth, arsenic, stibnite, chalcopyrite, xenotime, and monazite.

Cassiterite concentrate (SnO_2) is obtained through concentration techniques such as gravity, resulting in a product with approximately 72% Sn in oxide form. This concentrate may still contain minor impurities including monazite, xenotime, ilmenite, zircon, galena, stibnite, chalcopyrite, bismuth, and arsenic.

Metallic tin (Sn) is then produced by smelting the cassiterite concentrate at around 1,000°C, reducing the oxide to obtain nearly pure tin.

The updated 2024 national metallic mineral resources and reserves consists of 29 strategic and critical metallic mineral commodities, including: Mercury, Antimony, Bauxite, Lateritic Iron, Primary Iron, Sedimentary Iron, Alluvial Gold, Primary Gold, Cobalt, Chromite, Placer Chromite, Rare Earth Elements, Manganese, Molybdenum, Monazite, Nickel, Iron Sand, Silver, Platinum, Zinc, Copper, Tin, Lead, Lateritic Titanium, Placer Titanium, Vanadium, Xenotime, Thorium, and Uranium.

3.1.1. METALLIC MINERAL RESOURCES

Based on the updated data as of December 31, 2024, the national number of metallic mineral resources and reserves comprises 29 metallic mineral commodities. The update process recorded revisions for 148 existing locations and the addition of 120 new locations (Figure 3), bringing the total number of metallic mineral resources and reserves data points to 2,809. The primary data sources for this update were the 2023 and 2024 Work Plan and Budget (RKAB) reports submitted by business entities.

As of January 2025, there are a total of 934 Mining Business Permits (MBP), Special Mining Business Permits (SMBP), Contracts of Work (COW), and People's Mining Permits (PMP). Out of these, 635 MBPs/ SMBPs/ COWs (67.99%) have reported resources and/or reserves data that are recorded in the metallic mineral resources and reserves database. The percentage of mining business permits that have

reported resource and reserve data from 2021 to 2024 is presented in Figure 3. While the number of mining business permits / special mining business permits with resource and reserve data in 2024 has declined compared to 2023, the overall percentage has increased due to several permits becoming inactive during 2024.

The number and percentage of mining business permits for various commodities that have reported their resource and reserve data are presented in Table 1. This data was derived from overlaying the spatial map of metallic mineral resource and reserve locations with the current valid permit data for Contract of Work (COW)/Mining Business Permit (MBP)/ Special Mining Business Permit (SMBP)/ People's Mining Permit (PMP) (as of January 2025).

Table 1. Percentage of Mining Business Permit (MBP)/ Special Mining Business Permit (SMBP) and COW Holders Accompanied by Resource and Reserve Data

No	Commodity	Number of MBP/SMBP/COW/ PMP	Number with Resources and Reserves Data	Percentage (%)
1	Antimony	2	2	100.00
2	Bauxite	78	55	70.51
3	Iron	81	69	85.19
4	Gold	112	80	71.43
5	Chromite	1	1	100.00
6	Manganese	31	21	67.74
7	Nickel	390	227	58.21
8	Iron Sand	12	11	91.67
9	Copper	11	8	72.73
10	Tin	200	149	74.50
11	Lead/Galena and Zinc	13	11	84.62
12	Other Metals	3	1	33.33
Total		**934**	**635**	**67.99**

No	Type of License	Total	With Resource and Reserve Data	Percentage (%)
1	Mining Business Permits	892	602	67.49
2	Special Mining Business Permits	7	6	85.71
3	Contract of Work	29	27	93.10
4	People's Mining Permit	6	0	0.00
Total		**934**	**635**	**67.99**

Mining Business Permit Area data source: Directorate General of Mineral and Coal, January 2025

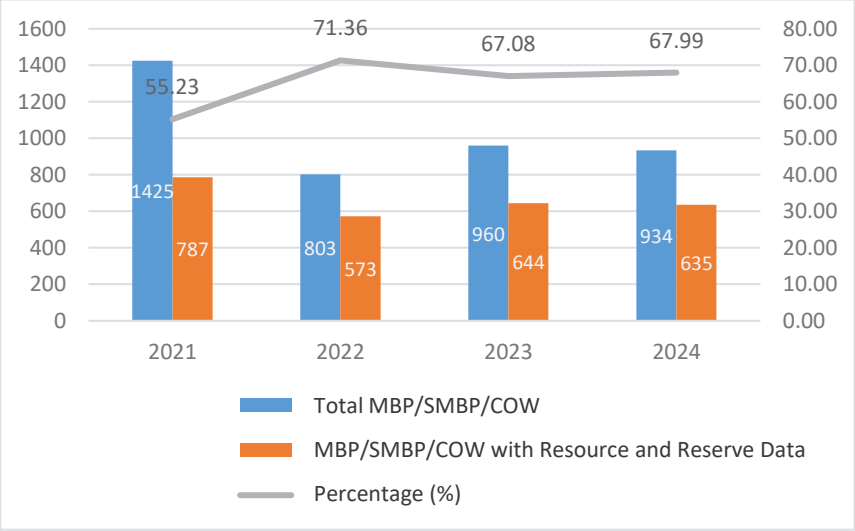


Figure 3. Comparison of the Number of MBP/SMBP/COW and Corresponding Data for the Years 2021–2024

Bauxite, lateritic iron, primary iron, alluvial and primary gold, cobalt, manganese, nickel, iron sand, silver, zinc, copper, tin, and lead are among the 14 commodities for which updates were noted in the December 2024 report of metallic mineral

resources and reserves. In addition, 120 new locations were added for 8 commodities: lateritic iron, primary iron, primary gold, cobalt, manganese, nickel, zinc, and tin.

Significant updates in the resources and reserves of a number of metallic mineral commodities, including lateritic iron, primary gold, silver, copper, nickel, tin, and bauxite, are reflected in the 2024 data on metallic mineral resources and reserves (Figure 4).

Furthermore, several commodities did not undergo any updates in 2024. The number of data records that remained intact was as follows: mercury (5), antimony (3), platinum (4), sedimentary iron (6), chromite (11), placer chromite (10), molybdenum (7), lateritic titanium (19), vanadium (1), monazite (48), xenotime (5), rare earth elements (4), thorium (4), and uranium (18) (Figure 4).

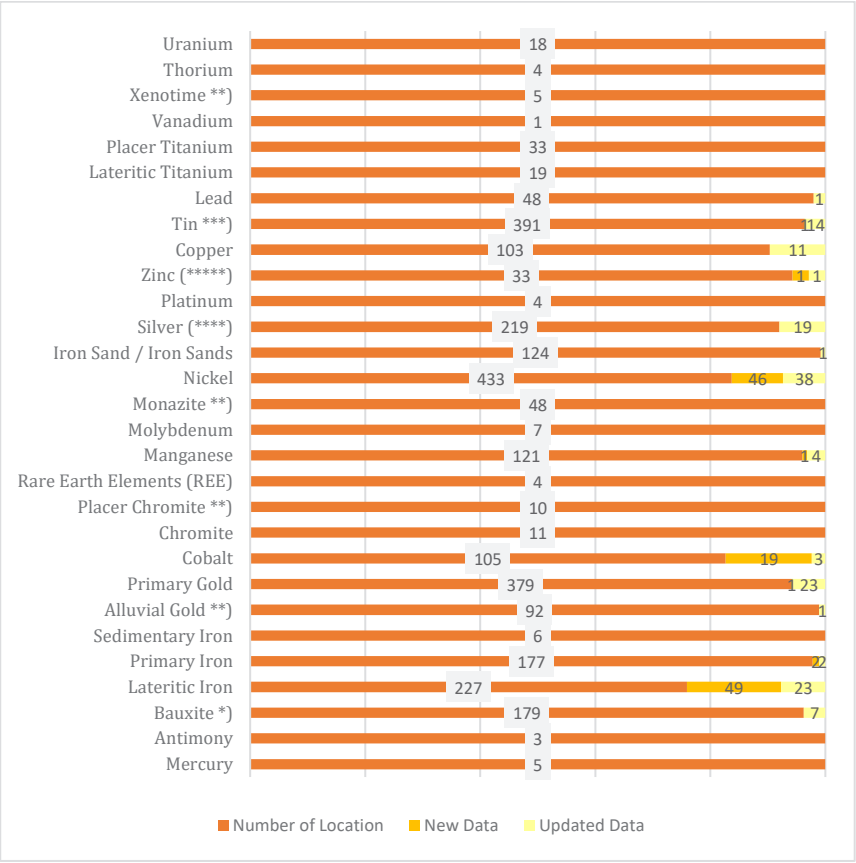


Figure 4. Updating on the Number of Metallic Mineral Resources and Reserves Locations in 2024

Tables 2 and 3 provide a summary of the most recent information on metallic mineral resources and reserves as of December 2024. Table 3 shows a recapitulation of total resources, total reserves, and total production, especially for the commodities: Bauxite ore, iron concentrate, primary gold (concentrate and metal), silver (concentrate and

metal), copper ore, nickel ore, tin metal, zinc (concentration), and lead (concentrate) (Source: January 2025, Directorate General of Minerals and Coal).

Figure 5 shows available resources, reserves, and productions data for major metallic mineral commodities in 2024 (excluding rare earth elements).

Table 2. Recapitulation of Metallic Mineral Resources and Reserves as of December 2024

No	Comodity	Category	Number of Location		Data Information 2024, 2nd Semester (December)		RESOURCES (Ton)						RESERVES (Ton)				Number of Resources (Ton)		Number of Reserves (Ton)	
							Inferred		Indicated		Measured		Probable		Proven					
			2023	2024.2	New Data	Updated Data	Ore	Metal	Ore	Metal	Ore	Metal	Ore	Metal	Ore	Metal	Ore	Metal	Ore	Metal
1	Mercury	Base Metals	5	5	0	0	-	-	32,250,169	43	4,713	33	-	-	-	-	32,254,882	76	-	-
2	Antimony	Base Metals	3	3	0	0	-	-	11,778,633	375,555	111,788	-	3,958,633	15,835	-	-	11,890,421	375,555	3,958,633	15,835
3	Bauxite *)	Light and Rare Metals	179	179	0	7	2,553,309,067	405,443,556	3,094,594,212	519,590,999	2,140,849,083	400,037,874	1,855,075,945	358,692,210	1,010,098,898	193,617,318	7,788,752,362	1,325,072,429	2,865,174,843	552,309,528
4	Lateritic Iron	Ferrous and Ferroalloy Metals	185	227	49	23	3,362,901,200	532,599,449	2,574,401,331	355,106,917	2,458,570,073	435,092,853	1,284,650,976	294,545,065	682,452,025	142,566,193	8,395,872,604	1,322,799,219	1,967,103,001	437,111,258
5	Primary Iron	Ferrous and Ferroalloy Metals	175	177	2	2	1,886,726,998	533,753,484	3,481,711,546	1,077,227,394	2,464,345,614	240,019,059	969,067,574	118,527,202	239,655,857	89,683,563	7,832,784,158	1,850,999,937	1,208,723,431	208,210,765
6	Sedimentary Iron	Ferrous and Ferroalloy Metals	6	6	0	0	5,202,186	3,601,615	623,437	78,553	-	-	-	-	-	-	5,825,623	3,680,168	-	-
7	Alluvial Gold **)	Precious Metals	92	92	0	1	815,316,095	34	254,842,115	205	553,810,205	107	51,770,419	116	9,172,858	34	1,623,968,415	346	60,943,277	150
8	Primary Gold	Precious Metals	378	379	1	23	6,615,954,147	4,765	7,541,885,227	5,108	3,090,602,739	2,491	2,403,542,184	2,587	1,057,309,880	857	17,248,442,113	12,364	3,460,852,064	3,444
9	Cobalt	Ferrous and Ferroalloy Metals	93	105	19	3	1,386,690,585	3,307,507	931,770,614	3,567,251	1,189,744,325	1,826,009	687,912,532	4,22,381	361,371,522	333,073	3,508,211,525	8,700,767	1,049,284,054	755,453
10	Chromite	Ferrous and Ferroalloy Metals	11	11	0	0	424,000	177,869	234,000	111,150	17,021,700	6,806,963	12,643,200	5,057,280	10,203,599	4,080,781	17,679,700	7,095,982	22,846,799	9,138,061
11	Placer Chromite **)	Ferrous and Ferroalloy Metals	10	10	0	0	265,795	104,711	3,638,236	576,895	891,813	371,716	3,552,165	137,971	-	-	4,795,844	1,053,322	3,552,165	137,971
12	Rare Earth Elements (REE)	Light and Rare Metals	4	4	0	0	128,884,684	114,236	5,498,750	3,317	1,821,875	1,097	-	-	-	-	136,205,309	118,650	-	-
13	Manganese	Ferrous and Ferroalloy Metals	120	121	1	4	106,276,982	46,473,349	51,692,284	21,466,994	55,022,170	22,049,841	114,579,384	51,808,255	21,897,989	6,943,136	212,991,435	89,990,185	136,477,373	58,751,391
14	Molybdenum	Ferrous and Ferroalloy Metals	7	7	0	0	2,744,124,333	270,490	37,000,000	3,955	28,000,000	2,576	-	-	-	-	2,809,124,333	277,021	-	-
15	Monazite **)	Light and Rare Metals	48	48	0	0	6,925,308,651	182,138	203,501	4,493	432,442	32	-	-	-	-	6,925,944,594	186,663	-	-
16	Nickel	Ferrous and Ferroalloy Metals	394	433	46	38	8,843,032,123	95,951,231	6,373,498,214	58,794,622	3,940,973,890	38,797,626	3,818,745,880	39,919,952	2,095,119,934	22,109,904	19,157,504,227	193,543,479	5,913,865,814	62,029,856
17	Iron Sand / Iron Sands	Ferrous and Ferroalloy Metals	124	124	0	1	2,208,208,994	291,304,292	1,163,448,775	372,655,730	919,215,944	242,384,260	454,831,132	145,279,766	192,849,666	78,866,151	4,290,873,713	906,344,282	647,680,798	224,145,917
18	Silver (****)	Precious Metals	219	219	0	19	4,374,217,307	121,539	5,841,974,775	176,833	2,591,075,848	28,739	2,197,189,183	39,039	1,017,673,789	3,554	12,807,267,931	327,111	3,214,862,972	42,592
19	Platinum	Precious Metals	4	4	0	0	30,000,000	1.20	32,250,000	6.32	52,500,000	0.35	-	-	-	-	114,750,000	7.87	-	-
20	Zinc (*****)	Base Metals	32	33	1	1	1,382,182,190	17,286,100	2,369,786,679	43,720,521	53,081,927	2,241,904	79,617,895	1,316,823	34,532,820	1,494,429	3,805,050,796	63,248,525	114,150,715	2,813,252
21	Copper	Base Metals	103	103	0	11	9,340,960,585	28,036,667	6,182,546,059	36,256,649	2,812,835,192	11,920,247	1,781,945,811	13,699,044	1,075,915,152	7,626,600	18,336,341,836	76,213,563	2,857,860,963	21,325,644
22	Tin ***)	Base Metals	393	391	1	14	2,545,995,458	656,756	2,024,364,687	665,055	3,705,044,879	1,212,104	5,138,164,824	820,620	1,292,496,834	618,043	8,275,405,054	2,533,915	6,430,661,657	1,438,663
23	Lead	Base Metals	48	48	0	1	1,489,014,468	36,271,632	2,364,534,991	53,169,467	144,348,902	3,566,345	38,112,471	1,057,470	37,419,377	952,763	3,997,898,382	93,007,445	75,531,848	2,010,233
24	Lateritic Titanium	Ferrous and Ferroalloy Metals	19	19	0	0	342,150,000	1,756,074	831,381,457	3,419,242	176,205,888	1,336,981	79,995,556	571,326	33,930,000	260,721	1,349,737,345	6,512,296	113,925,556	832,046
25	Placer Titanium	Ferrous and Ferroalloy Metals	33	33	0	0	225,563,703	15,351,992	200,304,431	12,536,663	172,588,958	9,760,630	194,039,743	10,697,528	12,926,309	483,990	598,457,092	37,649,286	206,966,052	11,181,518
26	Vanadium	Ferrous and Ferroalloy Metals	1	1	0	0	-	-	183,793,000	1,249,792	47,008,000	324,355	133,447,186	907,441	28,182,330	194,458	230,801,000	1,574,148	161,629,516	1,101,899
27	Xenotime **)	Light and Rare Metals	5	5	0	0	6,466,257,914	20,734	-	-	-	-	-	-	0.09	0.06	6,466,257,914	20,734	0.09	0.06
28	Thorium	Radioactive Minerals	4	4	0	0	9,897,431	3,424	-	-	652,979	4,729	-	-	-	-	10,550,410	8,153	-	-
29	Uranium	Radioactive Minerals	18	18	0	0	24,282,197	4,065	7,720,724	5,003	2,942,850	4,436	-	-	-	-	34,945,771	13,503	-	-
Total			2,713	2,809	120	146														

There is additional/updated data

*) Ore in the form of Crude (Tons) and Metal in the form of Al_2O_3 (Tons)

**) Ore/concentrate units in m^3

***) Ore in the form of concentrate in (m^3) and Sn metal (ton)

Table 3. Recapitulation of Total Metallic Mineral Resources and Total Reserves in 2024, with Production data from January to December 2024

No	Comodity	Number of Resources (Ton)		Number of Reserves (Ton)		PRODUKSI (TON)		
		Ore	Metal	Ore	Metal	BIJIH	KONSENTRAT	LOGAM
1	Mercury	32,254,882	76	-	-			
2	Antimony	11,890,421	375,555	3,958,633	15,835			
3	Bauxite *)	7,788,752,362	1,325,072,429	2,865,174,843	552,309,528	**8,362,444**		
4	Lateritic Iron	8,395,872,604	1,322,799,219	1,967,103,001	437,111,258			
5	Primary Iron	7,832,784,158	1,850,999,937	1,208,723,431	208,210,765		**1,193,762**	
6	Sedimentary Iron	5,825,623	3,680,168	-	-			
7	Alluvial Gold **)	1,623,968,415	346	60,943,277	150			
8	Primary Gold	17,248,442,113	12,364	3,460,852,064	3,444		**1,402,671**	**17**
9	Cobalt	3,508,211,525	8,700,767	1,049,284,054	755,453			
10	Chromite	17,679,700	7,095,982	22,846,799	9,138,061			
11	Placer Chromite **)	4,795,844	1,053,322	3,552,165	137,971			
12	Rare Earth Elements (REE)	136,205,309	118,650	-	-			
13	Manganese	212,991,435	89,990,185	136,477,373	58,751,391			
14	Molybdenum	2,809,124,333	277,021	-	-			
15	Monazite **)	6,925,944,594	186,663	-	-			
16	Nickel	19,157,504,227	193,543,479	5,913,865,814	62,029,856	**173,635,642**		
17	Iron Sand / Iron Sands	4,290,873,713	906,344,282	647,680,798	224,145,917		**16,266**	
18	Silver (****)	12,807,267,931	327,111	3,214,862,972	42,592		**14,265,745**	**105**
19	Platinum	114,750,000	7.87	-	-			
20	Zinc (*****)	3,805,050,796	63,248,525	114,150,715	2,813,252		**22,254**	
21	Copper	18,336,341,836	76,213,563	2,857,860,963	21,325,644	**1,215,951**	**2,019,939**	
22	Tin ***)	8,275,405,054	2,533,915	6,430,661,657	1,438,663			**39,814.29 (#)**
23	Lead	3,997,898,382	93,007,445	75,531,848	2,010,233		**12,348**	
24	Lateritic Titanium	1,349,737,345	6,512,296	113,925,556	832,046			
25	Placer Titanium	598,457,092	37,649,286	206,966,052	11,181,518			
26	Vanadium	230,801,000	1,574,148	161,629,516	1,101,899			
27	Xenotime **)	6,466,257,914	20,734	0.09	0.06			
28	Thorium	10,550,410	8,153	-	-			
29	Uranium	34,945,771	13,503	-	-			

There is updated data

*) Ore reported as Crude (Ton) dan Metal reported as Al_2O_3 (Ton)

**) Ore/concentrate volume in m^3

***) Ore reported as concentrate (m^3) dan metal Sn (ton)

****) Silver production associated with gold Zinc concentrate production

*****) Associated with iron and galena Tin metal production

#) PB type 50 to 300

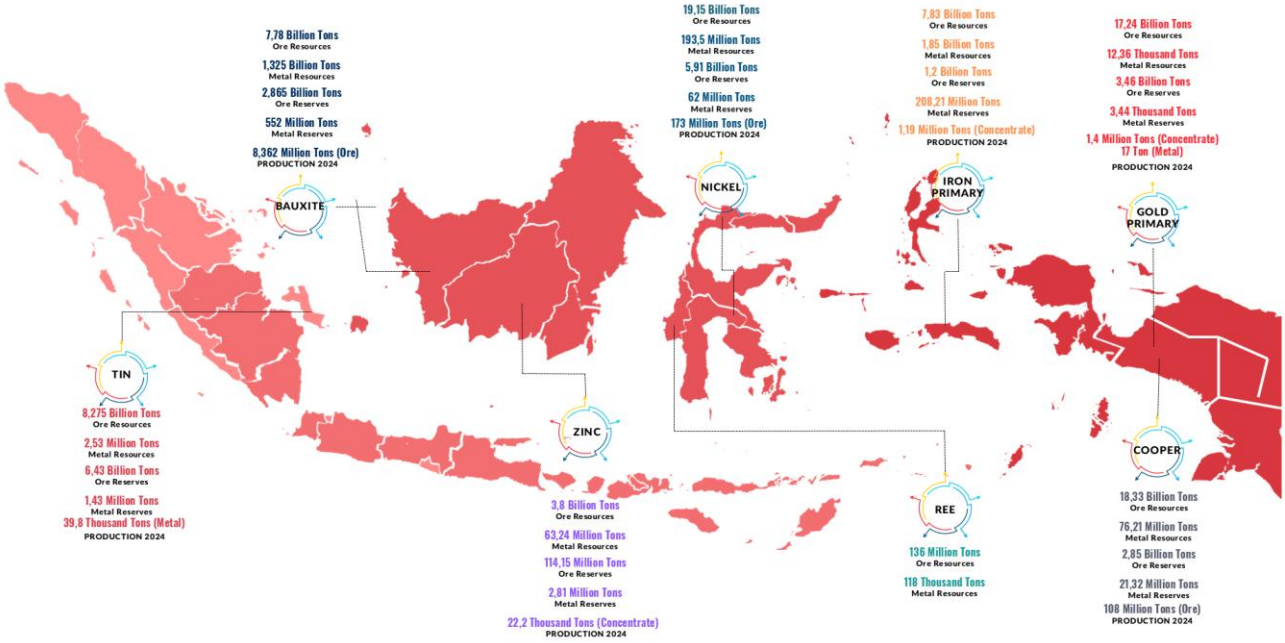


Figure 5. Mineral Resources and Reserves number for Major Metal Commodities in 2024

The 2024 update of the metallic mineral resource and reserve data comprises the verified data by Competent Persons (CP), particularly for six critical mineral commodities: primary gold, silver, copper, nickel, bauxite, and tin (Figure 6).

There are 143 (38.5%) CP-verified resource locations for primary gold, while 98 (24.9%) CP-verified reserve locations made up the total. Based primarily on information from PT Freeport Indonesia and PT Amman Mineral Nusa Tenggara, the CP-verified resource and reserve volumes of primary gold ore are 12.9 billion tons (74.8%) and 3.07 billion tons (88.7%), respectively (Figures 6 and 7).

For silver ore, there are 97 (44.3%) CP-verified resource locations, and 69 (32.9%) of those locations have CP-verified reserve data. Of the overall volumes of silver ore resources and reserves, the CP-verified resources total 11.08 billion tons (86.5%), while the reserves total 2.86 billion tons (88.9%) (Figures 6 and 7).

Based mostly on information from PT Freeport Indonesia and PT Amman Mineral Nusa Tenggara, the CP-verified metal reserves consist of 31,483 tons of silver (74% of the total silver reserves) and 2,550 tons of primary gold (74% of the total primary gold reserves) (Figure 8).

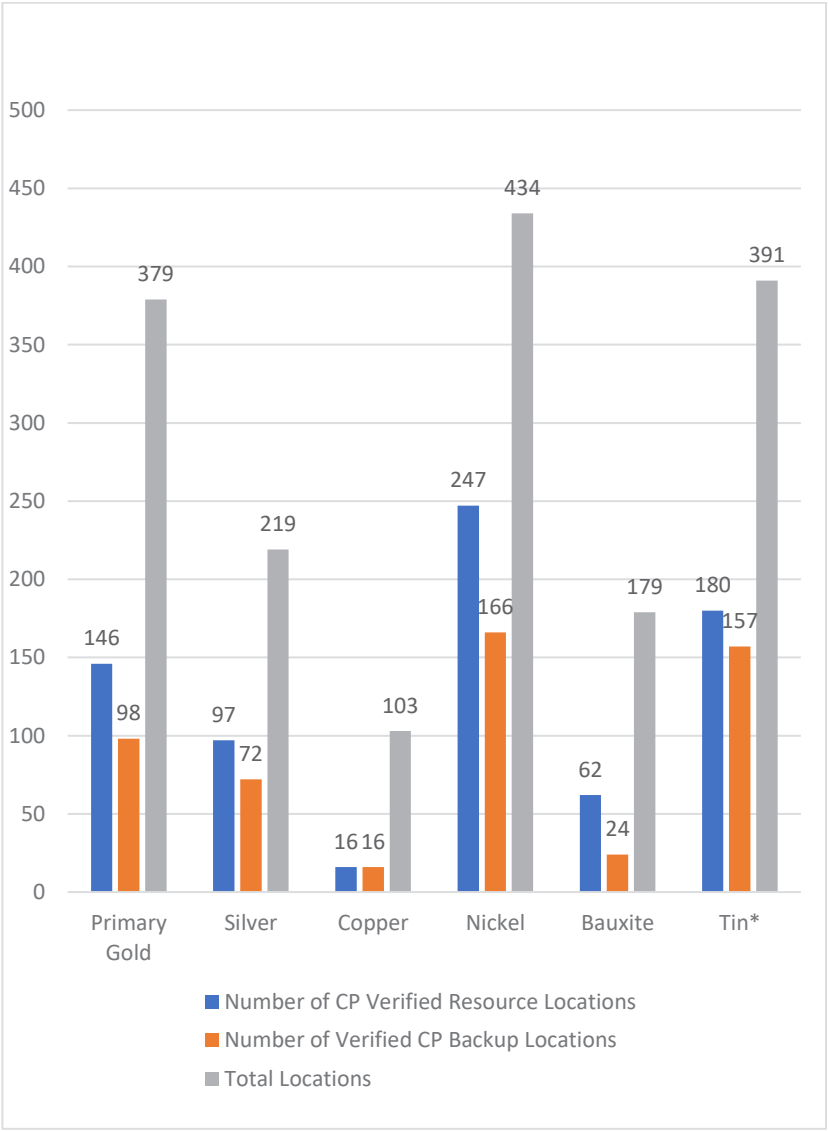


Figure 6. Number of Resource Locations and Reserves Verified by Competent Persons for Primary Gold, Silver, Copper, Nickel, Bauxite, and Tin Commodities in 2024

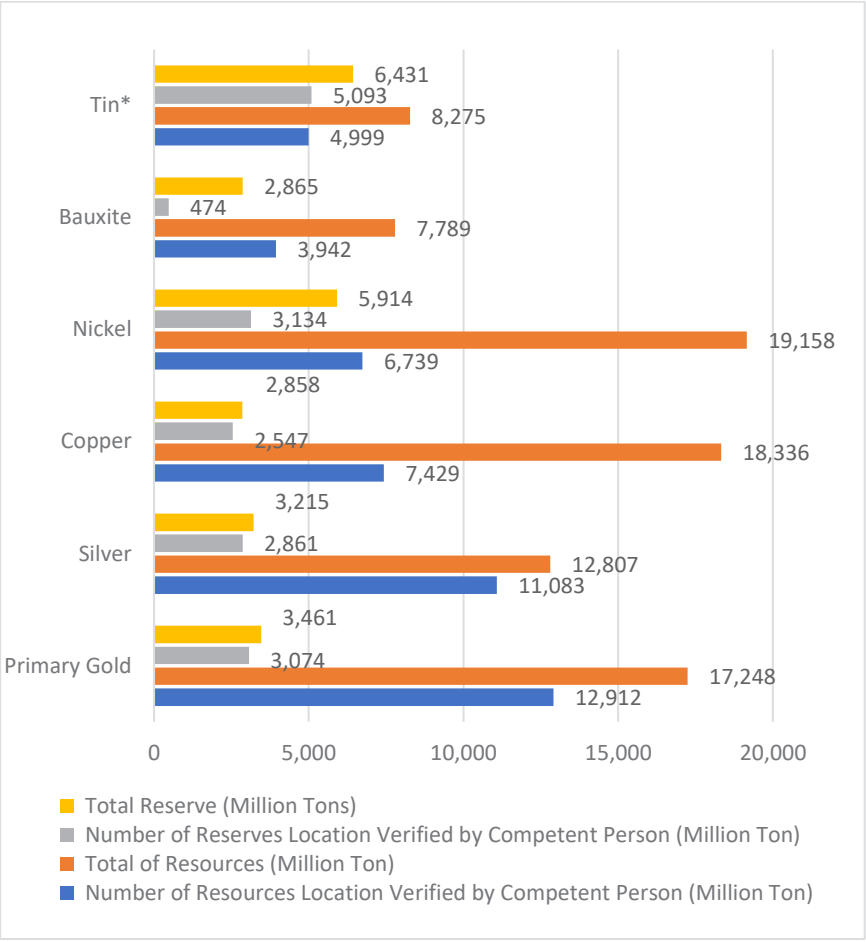


Figure 7. Total Resources and Reserves Verified by Competent Person for Primary Gold, Silver, Copper, Nickel, Bauxite and Tin Ore Commodities in 2024

The number of verified resource location data for copper ore by Competent Persons (CP), is 16 (15,5%) and the verified reserves location are also 16 (15,5%), from total data.

The volume of copper ore resources confirmed by CPs is 7.43 billion tons, which constitutes 40% of the total, while the verified reserves amount to 2.54 million tons, or 88.9% (Figure 7).

For tin ore, 180 resource locations (46%) and 157 reserves (40%) have undergone CP verification. Verified resources stand at 4.99 billion cubic meters (60%), and reserves at 5.09 billion cubic meters (79.2%) of the overall total (Figure 7).

Regarding metal reserves, 97% of copper metal reserves, equating to 20.68 million tons, are CP-verified. Tin (Sn) metal reserves verified by CPs account for 709 thousand tons or 49% (Figure 9).

Nickel ore has 247 CP-verified resource locations (57%) and 166 CP-verified reserves (38%). Verified nickel resources reach 6.74 billion tons (35%), and reserves total 3.13 billion tons (53%) (Figures 5 and 7).

Bauxite ore has 35 CP-verified resource sites (20%) and 25 verified reserves (14%). The total verified bauxite resources are 3.5 billion tons (31%), with reserves amounting to 745.6 million tons (27%) (Figure 7).

As for metal content, 50% of primary nickel reserves, totaling 31.49 million tons, are CP-verified, along with 96 million tons of alumina reserves, representing 17.4% (Figure 10).

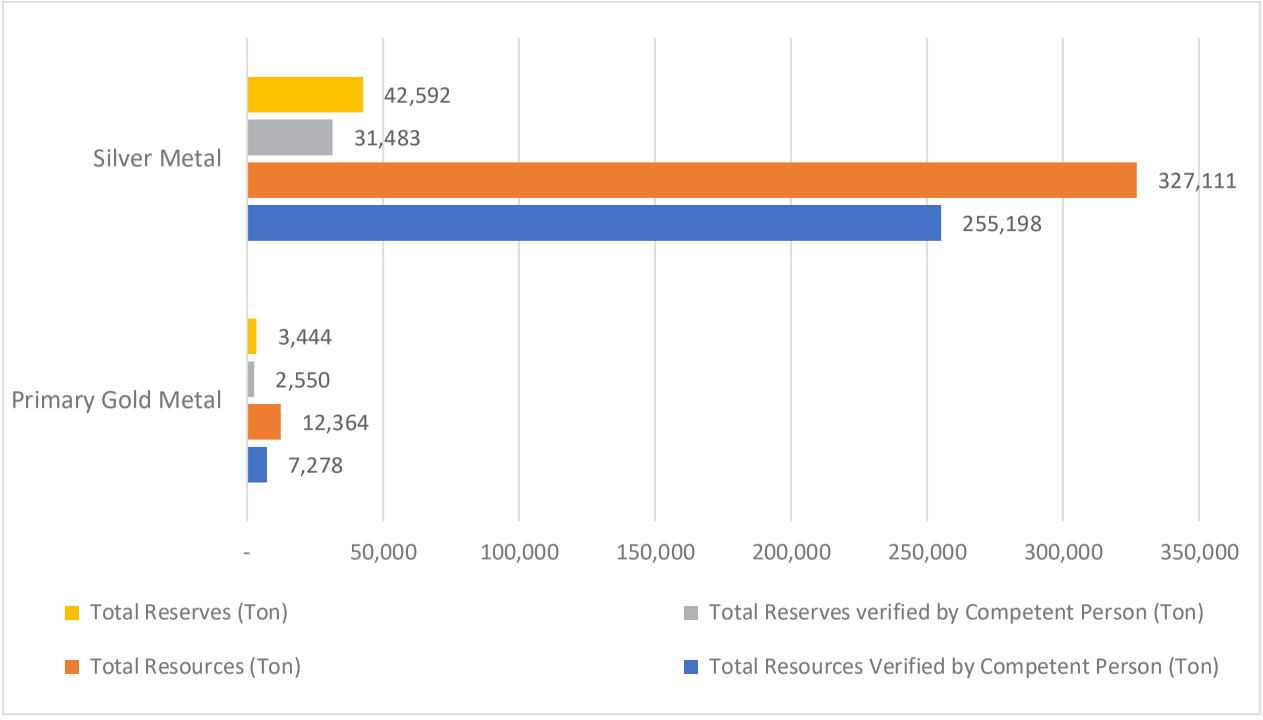


Figure 8. Total Resources and Reserves Verified by Competent Persons for Primary Gold and Silver Commodities in 2024

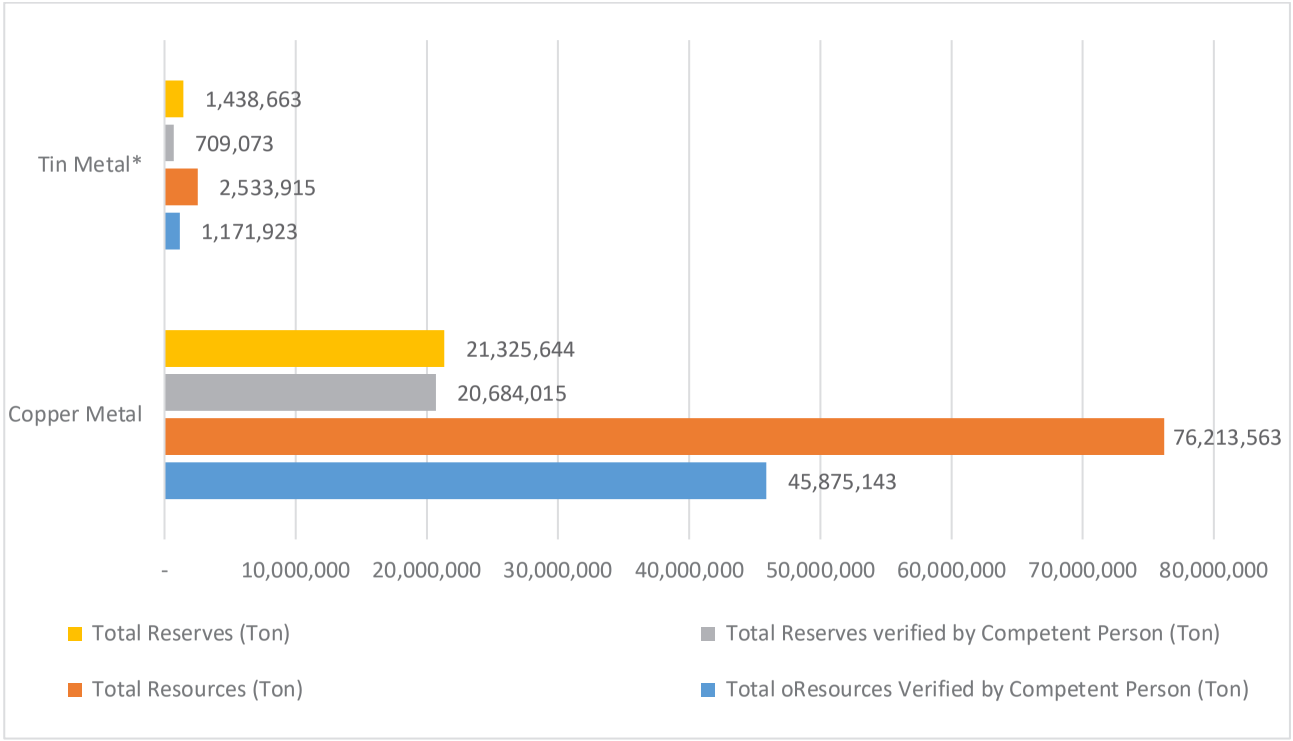


Figure 9. Resources and Reserves of Copper and Tin Metal Minerals Verified by Competent Person

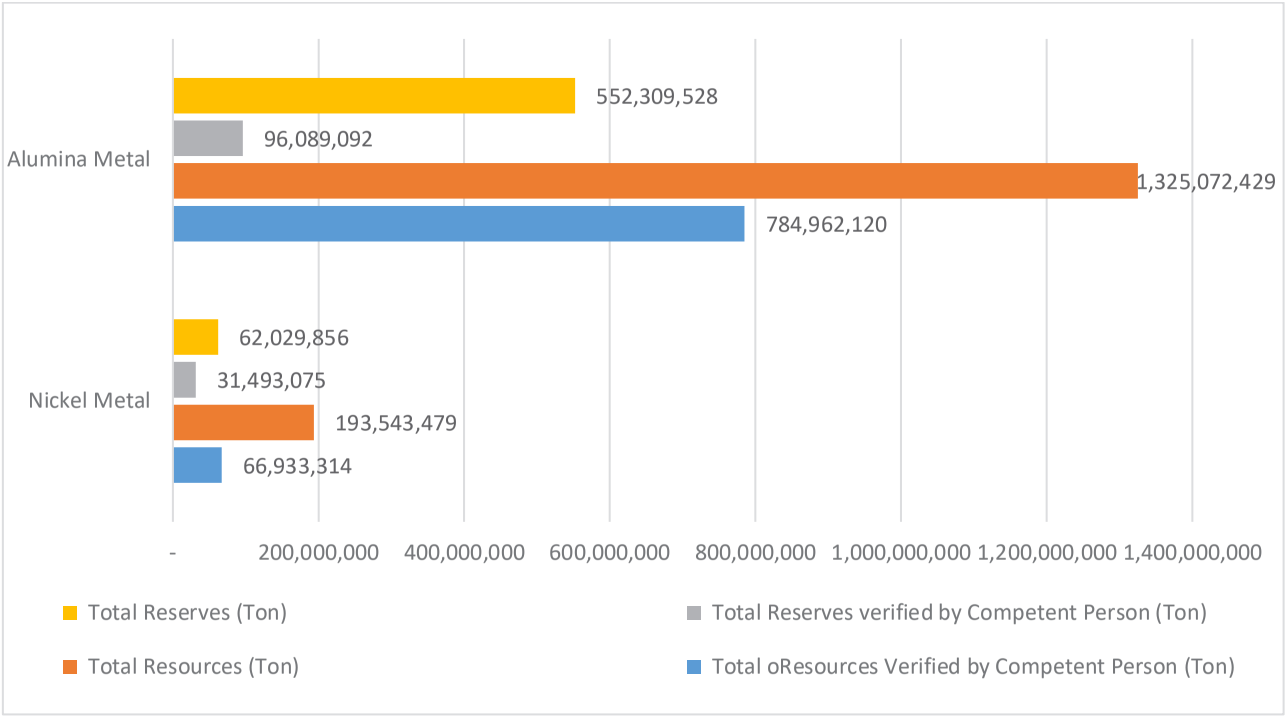


Figure 10. Resources and Reserves of Nickel and Alumina Metal Minerals Verified by Competent Person

The discussion on the resources and reserves of several metallic mineral commodities that experienced significant updates in 2024 includes the following commodities: copper, gold, silver, nickel, cobalt, bauxite, tin, and primary iron—is discussed alongside supporting visuals. These include charts showing the current status for 2024, a five-year comparison from 2020 to 2024, and provincial-level distribution maps of mineral resources and reserves.

Some graphs are displayed with two x-axes due to the large differences in numerical values—such as cases where ore and metal tonnages differ by factors as high as 1:100 or even 1:1,000,000.

Overall, the graphs illustrating the link between resource/reserve volumes and the number of data entries suggest that increases in reported data correspond to higher resource/reserve estimates. Meanwhile, the update graphs highlight how many companies actively submit annual reports on their exploration or mining results.

Copper, Gold and Silver

Copper, gold, and silver ores occur in various locations, though silver is usually associated with gold. However, not every gold deposit contains silver. In several reports, gold ore tonnage is listed as either wet or dry metric tons, and metal content is sometimes expressed in ounces instead of the tons used in the the table resource. Since wet ore typically contains around 15% moisture, this proportion is used to convert wmt to dmt when needed.

As of 2024, the majority of copper ore and metal resources are classified as inferred, while gold and silver resources are mainly indicated. With more detailed exploration, inferred copper and gold resources can be upgraded to indicated or measured status (Figures 11 and 14).

Over the past five years, between 2020 and 2024, copper ore resources and reserves have significant increase—especially in the inferred and indicated categories. Although probable reserves slightly declined, proven reserves saw an increase compared to 2023. This resulted in a 1.81 billion-ton rise in total copper ore resources and a 12.39 million-ton gain in reserves, totaling 18.336 billion tons and 2.86 billion tons, respectively (Figure 13). Copper grades at PT Freeport's sites range from 0.45% to 2.5%, and at Batu Hijau (PT Amman) from 0.25% to 0.43%. By December 2024, copper ore production reached 108.13 million tons.

The 2024 update for primary gold ore shows a total resource increase of 1.7 billion tons, though reserves dropped by 16.4 million tons. Despite this, gold metal reserves rose by about 26 tons compared to the previous year. In total, gold ore resources amounted to 17.2 billion tons and reserves to 3.46 billion tons, while gold metal resources and reserves were 12,364 tons and 3,444 tons, respectively (Figures 15 and 16). Gold grades at major deposits vary: PT Freeport's sites have 0.32–0.98 g/ton, Batu Hijau 0.1–0.48 g/ton, Hu'u 0.4–0.58 g/ton, and Tumpangpitu up to 1.45 g/ton. As of December 2024, gold concentrate production totaled 1.4 million tons, with 17 tons of metal produced.

Silver ore resources experienced a sharp increase of 1.4 billion tons in 2024, while reserves declined by 16.5 million tons. This brought total silver ore resources to 12.807 billion

tons and reserves to 3.214 billion tons (Figures 19 and 20). Silver grades vary widely: PT Freeport's deposits range from 1.63–15.18 g/ton, Batu Hijau 0.6–1.34 g/ton, Hu'u 3–5 g/ton, and Tumpangpitu 8.19–65.64 g/ton. Silver concentrate output by December 2024 stood at 14.286 million tons, with 106 tons of silver metal produced.

The provincial-level values of copper and gold resources and reserves show a dominant concentration in West Nusa Tenggara and Papua (Tables 4–5, Figures 14 and 18), and the same regional trend applies to silver (Table 6, Figure 22).

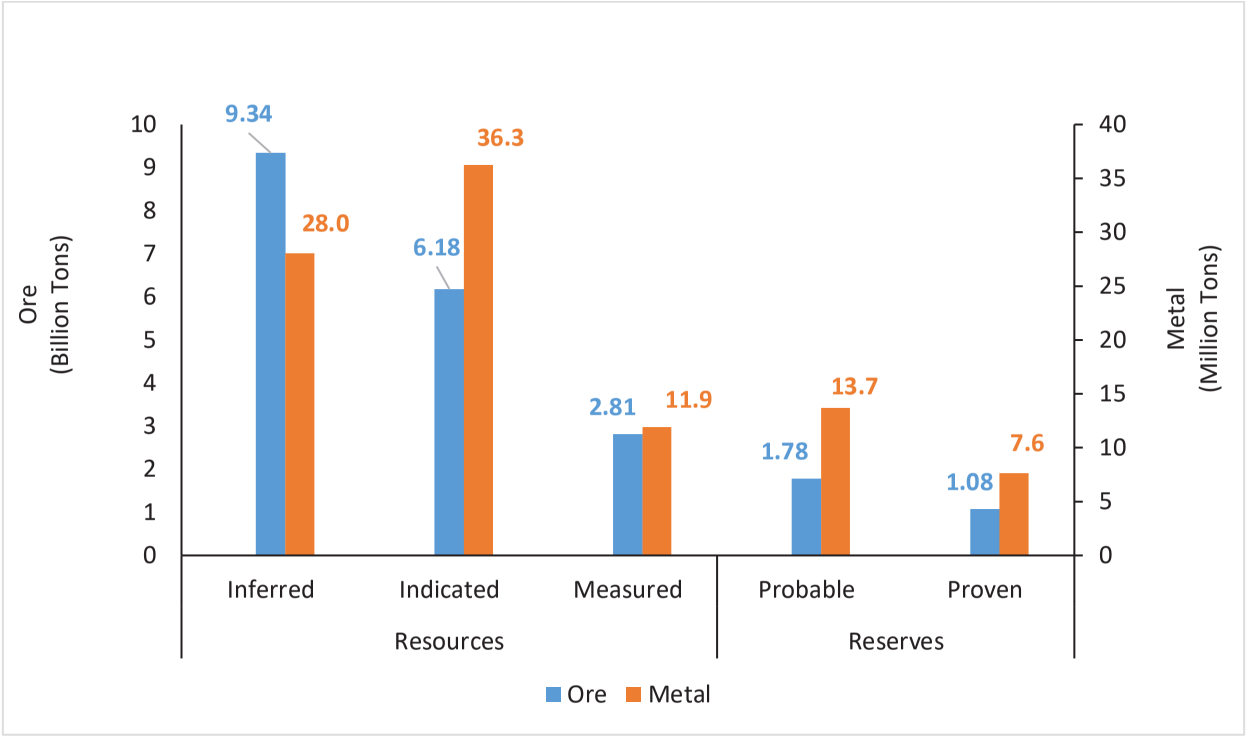


Figure 11. Status of Copper Ore/Metal Resources and Reserves as of December 2024

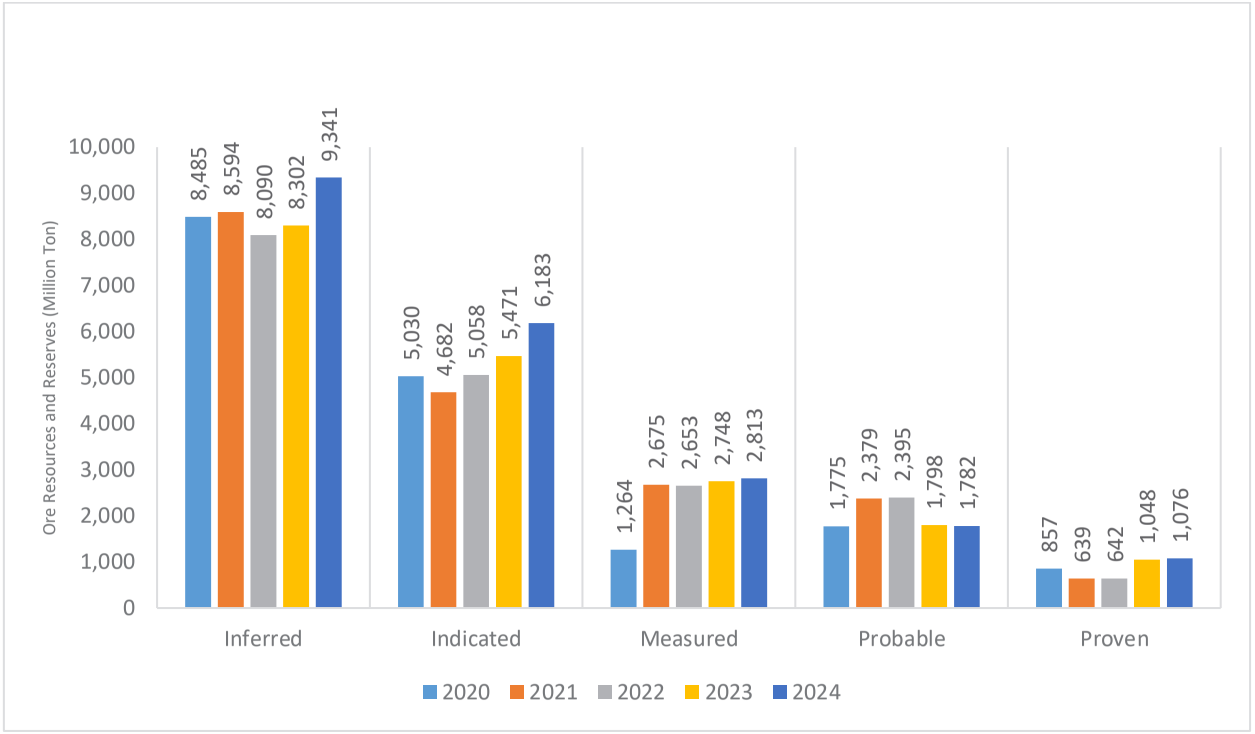


Figure 12. Trend of Copper Ore Resources and Reserves for the Years 2020–2024

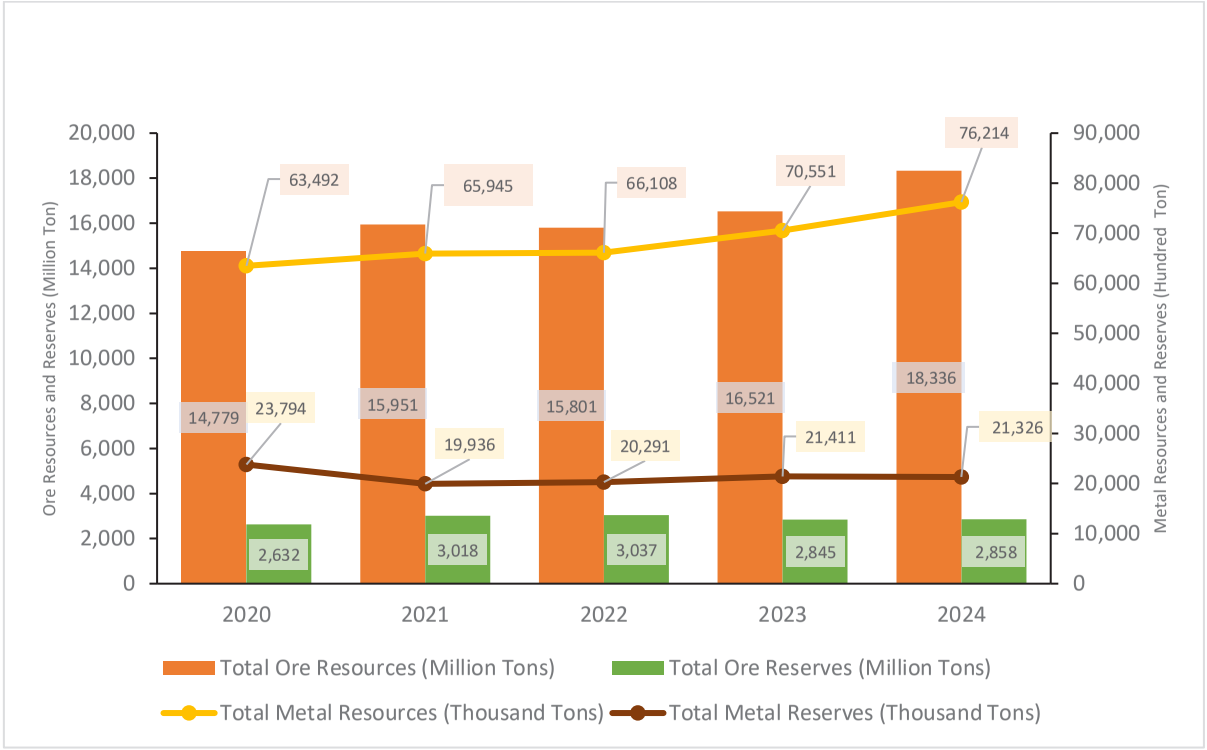


Figure 13. Trend of Copper Ore/Metal Resources and Reserves for the Years 2020–2024

Table 4. Total Resources and Total Reserves of Copper Ore/Metal by Province in 2024

NO	PROVINCE	NUMBER OF LOCATIONS	RESOURCES (TONS)							
			INFERRED		INDICATED		MEASURED		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL	ORE	METAL
1	Aceh	5	958,400,000	2,907,600	37,000,000	244,800	28,000,000	201,600	1,023,400,000	3,354,000
2	Banten	1	-	-	-	-	90,712,000	482	90,712,000	482
3	Bengkulu	2	-	-	-	-	778,000	3,039	778,000	3,039
4	Gorontalo	13	218,530,661	911,786	32,824,385	148,333	334,825,954	1,259,463	586,181,000	2,319,582
5	West Java	7	8,741,039	29,182	11,250,000	41,625	-	-	19,991,039	70,807
6	Central Java	2	61,915,000	86,527	3,080,000	2,772	21,590,000	32,385	86,585,000	121,684
7	East Java	4	1,417,200,000	5,940,800	372,100,000	2,269,810	4,915,015	66,360	1,794,215,015	8,276,970
8	West Kalimantan	1	-	-	8,731,198	-	-	-	8,731,198	-
9	Central Kalimantan	11	2,841,803,837	3,527,147	35,837,305	173,005	21,642,000	162,230	2,899,283,142	3,862,381
10	Maluku	4	47,480,000	70,817	46,308,000	150,998	6,930,000	168,200	100,718,000	390,015
11	North Maluku	6	115,656,250	312,272	2,080,444	3,233	71,632,090	117,514	189,368,784	433,019
12	West Nusa Tenggara	5	2,658,750,000	11,216,325	2,718,000,000	14,943,400	1,528,000,000	6,634,000	6,904,750,000	32,793,725
13	East Nusa Tenggara	2	-	-	1,248,000	28,656	-	-	1,248,000	28,656
14	Central Papua	16	862,742,000	2,634,153	2,575,077,000	17,901,108	479,057,000	3,228,066	3,916,876,000	23,763,327
15	West Sulawesi	1	47,366,000	-	281,254,000	-	214,714,000	-	543,334,000	-
16	South Sulawesi	6	6,050,400	192,621	48,320,284	300,607	8,279,133	32,828	62,649,817	526,056
17	Central Sulawesi	3	14,400,250	87,890	8,000,000	40,000	-	-	22,400,250	127,890
18	West Sumatera	9	81,647,148	118,968	635,443	4,702	-	-	82,282,591	123,670
19	South Sumatera	2	100,000	29	-	-	1,760,000	14,080	1,860,000	14,109
20	North Sumatera	3	178,000	551	800,000	3,600	-	-	978,000	4,151
Total		**103**	**9,340,960,585**	**28,036,667**	**6,182,546,059**	**36,256,649**	**2,812,835,192**	**11,920,247**	**18,336,341,836**	**76,213,563**

NO	PROVINCE	NUMBER OF LOCATIONS	RESERVES (TONS)					
			PROBABLE		PROVEN		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL
1	Aceh	5	24,700,000	87,738	28,600,000	151,650	53,300,000	239,388
2	Banten	1	-	-	-	-	-	-
3	Bengkulu	2	-	-	-	-	-	-
4	Gorontalo	13	105,400,000	737,800	-	-	105,400,000	737,800
5	West Java	7	-	-	-	-	-	-
6	Central Java	2	-	-	-	-	-	-
7	East Java	4	11,797,000	90,095	662,000	15,491	12,459,000	105,586
8	West Kalimantan	1	-	-	-	-	-	-
9	Central Kalimantan	11	27,767,000	202,699	-	-	27,767,000	202,699
10	Maluku	4	6,060,000	68,044	970,000	19,497	7,030,000	87,541
11	North Maluku	6	1,456,311	-	-	-	1,456,311	-
12	West Nusa Tenggara	5	433,000,000	1,428,900	327,000,000	1,406,100	760,000,000	2,835,000
13	East Nusa Tenggara	2	-	-	-	-	-	-
14	Central Papua	16	1,125,515,000	10,791,367	495,754,000	5,992,918	1,621,269,000	16,784,286
15	West Sulawesi	1	-	-	214,714,000	-	214,714,000	-
16	South Sulawesi	6	46,250,500	292,400	8,215,152	40,944	54,465,652	333,344
17	Central Sulawesi	3	-	-	-	-	-	-
18	West Sumatera	9	-	-	-	-	-	-
19	South Sumatera	2	-	-	-	-	-	-
20	North Sumatera	3	-	-	-	-	-	-
Total		**103**	**1,781,945,811**	**13,699,044**	**1,075,915,152**	**7,626,600**	**2,857,860,963**	**21,325,644**

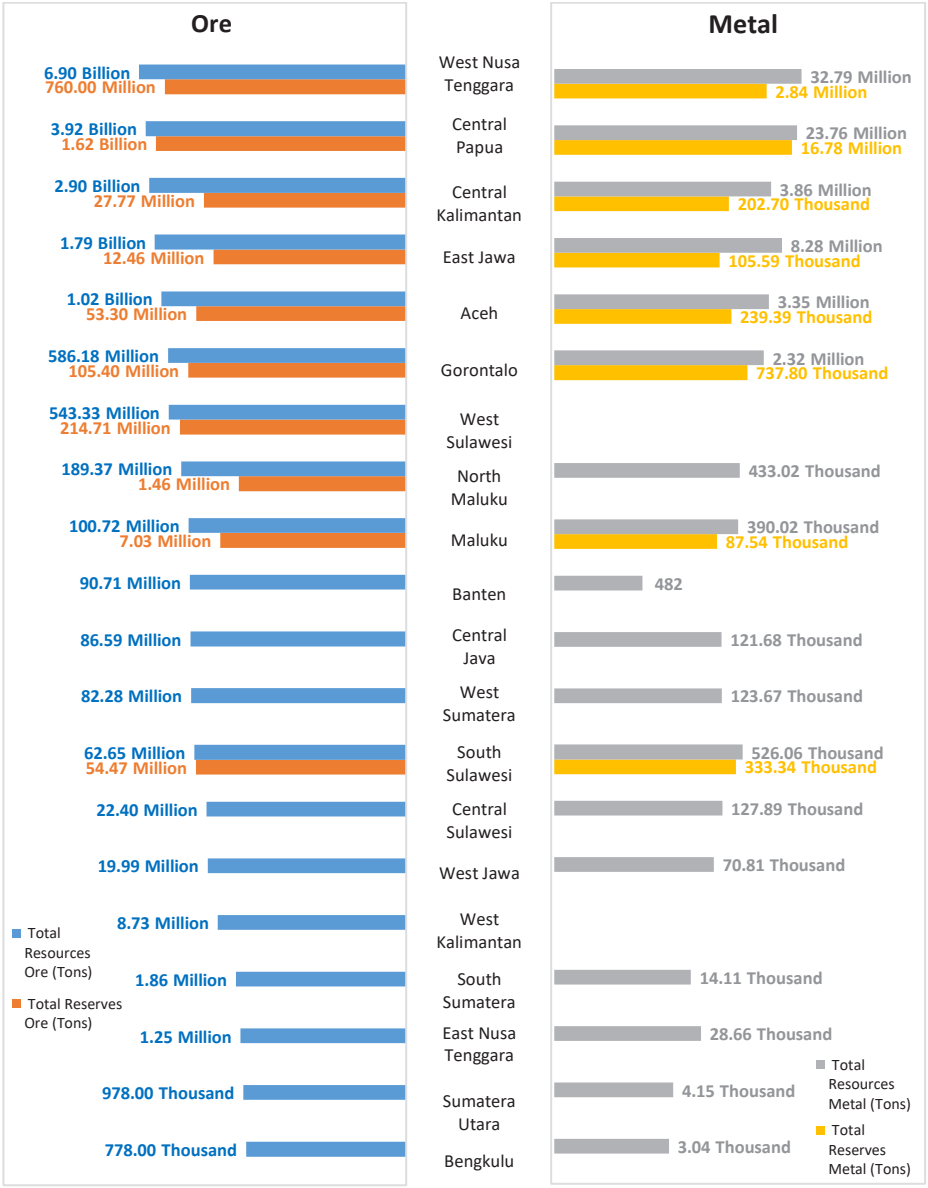


Figure 14. Total Copper Ore/Metal Resources and Reserves by Province for 2024

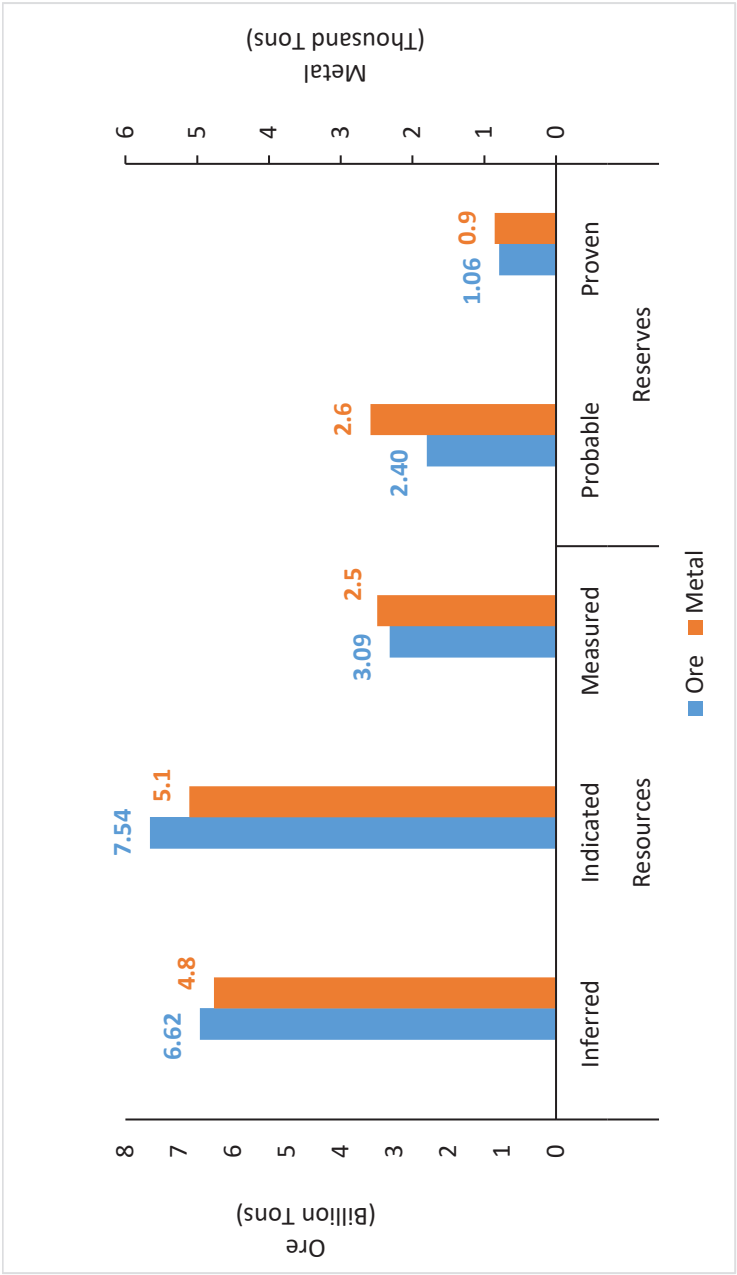


Figure 15. Gold Ore and Metal Resources and Reserves for 2024

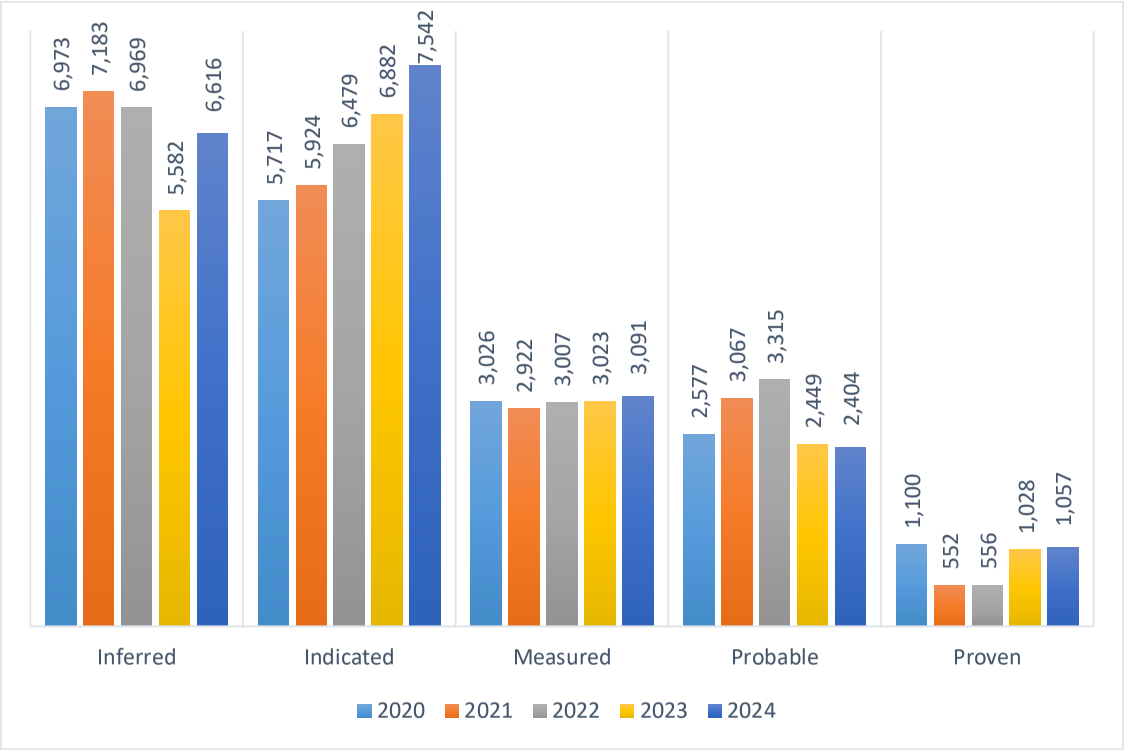


Figure 16. Trend of Gold Ore Resources and Reserves for the Years 2020–2024

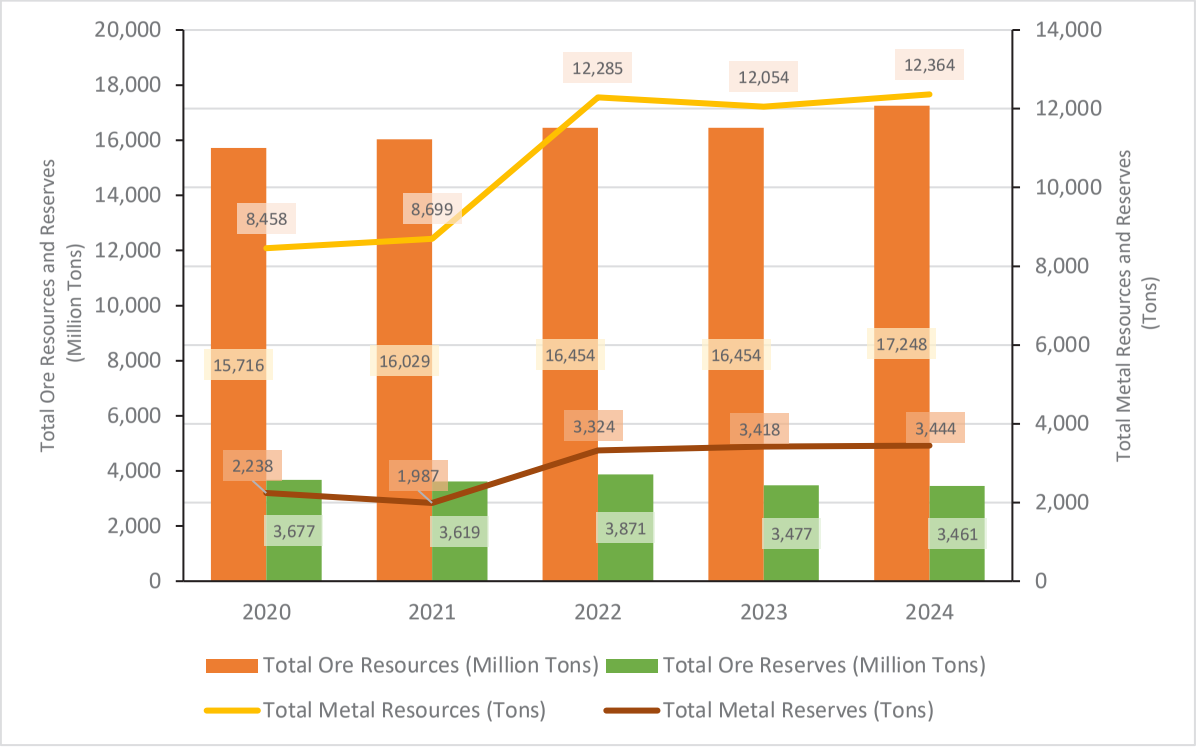


Figure 17. Trend of Gold Ore/Metal Resources and Reserves for the Years 2020 – 2024

Table 5. Gold Ore and Metal Resources and Reserves by Province, 2024.

NO	PROVINCE	NUMBER OF LOCATIONS	RESOURCES (TONS)							
			INFERRED		INDICATED		MEASURED		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL	ORE	METAL
1	Aceh	10	493,110,000	286	74,133,414	66	39,957,791	52	607,201,205	405
2	Banten	13	656,634,823	102	460,799,000	27	1,238,000	9	1,118,671,823	137
3	Bengkulu	10	18,115,539	12	48,887,048	54	3,813,900	74	70,816,487	140
4	Gorontalo	28	478,795,106	240	218,065,072	165	228,968,577	83	925,828,755	488
5	Jambi	4	24,453,643	24	-	-	-	-	24,453,643	24
6	West Java	25	11,091,549	40	22,737,394	64	7,065,991	22	40,894,934	125
7	Central Java	3	8,025,000	6	10,600,000	9	13,500,000	10	32,125,000	24
8	East Java	13	201,856,174	740	144,674,266	49	25,506,733	14	372,037,173	803
9	West Kalimantan	16	661,898	3	4,361,606	4	24,088,597	42	29,112,100	48
10	South Kalimantan	3	7,486,755	13	2,156,129	4	4,581,164	10	14,224,048	27
11	Central Kalimantan	55	95,613,754	168	244,844,747	178	26,983,037	38	367,441,538	384
12	East Kalimantan	5	4,544,308	10	4,760,688	10	304,327,898	596	313,632,893	616
13	North Kalimantan	6	16,058,216	7	19,019,604	9	41,573,686	54	76,651,506	69
14	Lampung	16	8,220,309	8	9,779,530	21	1,595,793	8	19,595,632	38
15	Maluku	8	85,516,174	23	66,050,117	27	10,800,000	5	162,366,291	54
16	North Maluku	20	240,247,293	61	67,442,588	257	72,968,310	6	380,658,191	324
17	West Nusa Tenggara	23	3,144,845,743	743	2,993,538,162	1,061	1,553,481,549	491	7,691,865,454	2,296
18	East Nusa Tenggara	5	2,650,835	2	2,670,280	4	1,200,000	1	6,521,115	7
19	Papua	1	1,000,000	4	-	-	-	-	1,000,000	4
20	Central Papua	19	671,928,357	301	2,575,077,000	1,269	482,526,000	387	3,729,531,357	1,957
21	West Sulawesi	2	-	-	3,278,429	-	-	-	3,278,429	-
22	South Sulawesi	5	331,874,726	1,776	283,247,623	1,432	85,328,463	395	700,450,812	3,603
23	Central Sulawesi	3	5,500,000	18	33,500,000	69	3,500,000	14	42,500,000	101
24	Southeast Sulawesi	4	2,103,484	12	491,614	1	491,614	1	3,086,712	14
25	North Sulawesi	45	77,450,335	111	145,485,967	129	45,808,468	60	268,744,770	299
26	West Sumatera	8	5,429,750	12	6,679,250	15	860,170	4	12,969,170	32
27	South Sumatera	17	4,857,000	8	3,386,000	6	1,817,000	0	10,060,000	14
28	North Sumatera	12	17,883,375	38	96,219,700	177	108,620,000	115	222,723,075	331
Total		**379**	**6,615,954,147**	**4,765**	**7,541,885,227**	**5,108**	**3,090,602,739**	**2,491**	**17,248,442,113**	**12,364**

NO	PROVINCE	NUMBER OF LOCATIONS	RESERVES (TONS)					
			PROBABLE		PROVEN		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL
1	Aceh	10	26,885,585	4	29,258,308	3	56,143,893	8
2	Banten	13	73,397,081	18	96,800	1	73,493,881	19
3	Bengkulu	10	1,314,440	2	-	-	1,314,440	2
4	Gorontalo	28	156,790,000	64	48,045,969	104	204,835,969	168
5	Jambi	4	-	-	-	-	-	-
6	West Java	25	6,801,440	33	91,094	1	6,892,534	34
7	Central Java	3	8,600,000	6	-	-	8,600,000	6
8	East Java	13	45,868,521	24	16,994,429	10	62,862,950	34
9	West Kalimantan	16	2,725,116	3	4,191,038	4	6,916,154	7
10	South Kalimantan	3	1,106,000	3	3,814,000	8	4,920,000	11
11	Central Kalimantan	55	8,488,753	11	5,538,371	5	14,027,124	15
12	East Kalimantan	5	1,125,972	2	2,732,066	6	3,858,037	8
13	North Kalimantan	6	49,074,594	56	1,816,034	1	50,890,628	57
14	Lampung	16	5,386,278	5	76,000	1	5,462,278	5
15	Maluku	8	13,030,000	10	-	-	13,030,000	10
16	North Maluku	20	13,014,368	27	1,076,771	3	14,091,139	30
17	West Nusa Tenggara	23	439,746,327	85	339,048,356	156	778,794,683	241
18	East Nusa Tenggara	5	-	-	-	-	-	-
19	Papua	1	-	-	-	-	-	-
20	Central Papua	19	1,125,515,000	660	495,754,000	381	1,621,269,000	1,040
21	West Sulawesi	2	-	-	-	-	-	-
22	South Sulawesi	5	274,813,445	1,369	3,100,000	4	277,913,445	1,374
23	Central Sulawesi	3	28,000,000	55	3,600,000	14	31,600,000	69
24	Southeast Sulawesi	4	491,123	1	491,123	1	982,246	2
25	North Sulawesi	45	81,842,012	80	38,909,322	56	120,751,334	136
26	West Sumatera	8	203,400	0	-	-	203,400	0,4
27	South Sumatera	17	9,339,000	10	33,000	0,2	9,372,000	11
28	North Sumatera	12	29983730	58	62,643,200	98	92,626,930	156
Total		**379**	**2,403,542,184**	**2,587**	**1,057,309,880**	**857**	**3,460,852,064**	**3,444**

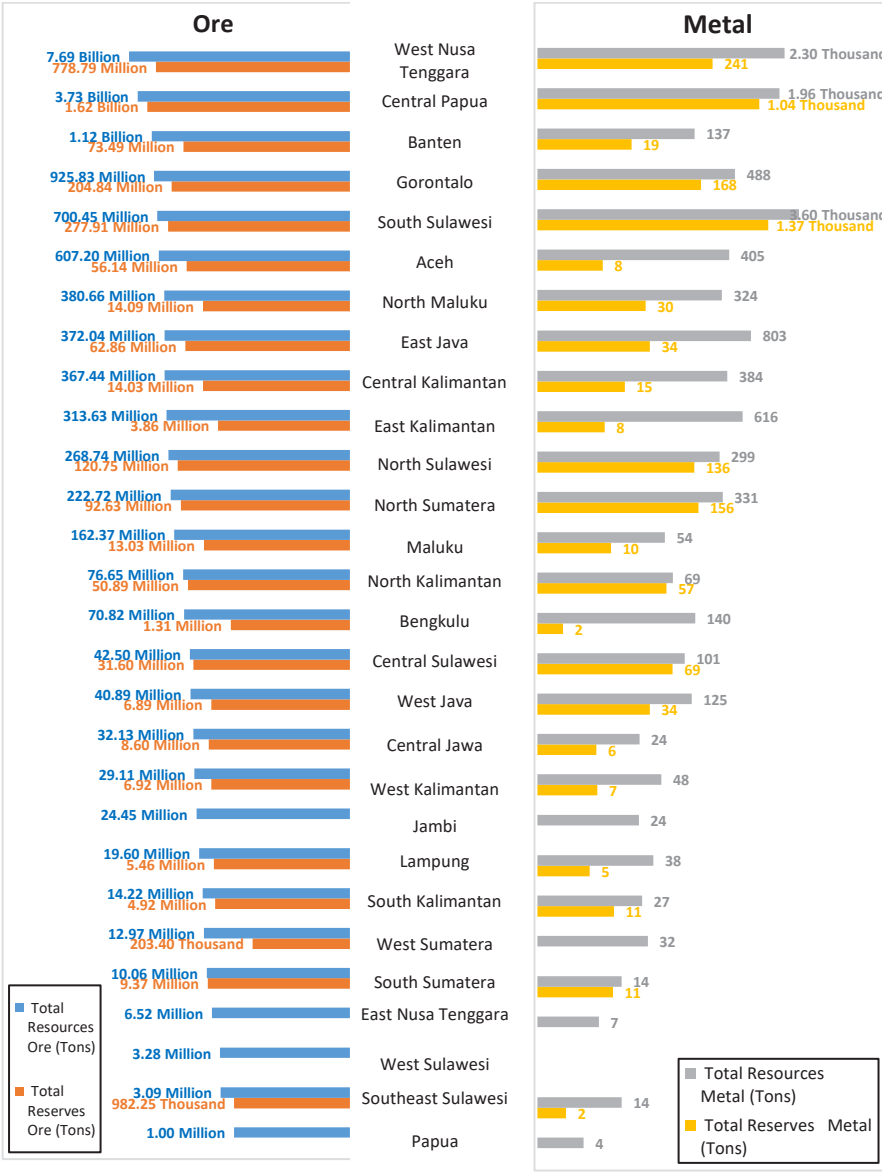


Figure 18. Total Gold Ore/Metal Resources and Reserves by Province for 2024

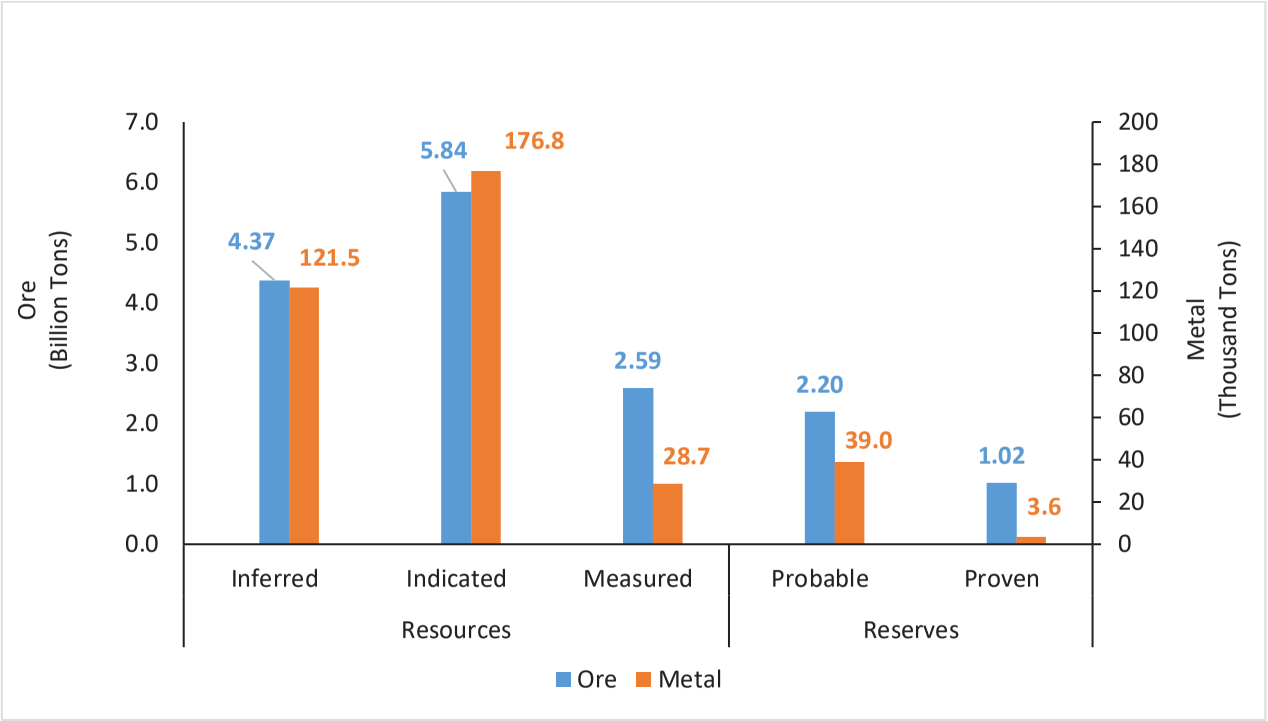


Figure 19. Total Silver Ore/Metal Resources and Reserves by Province for 2024

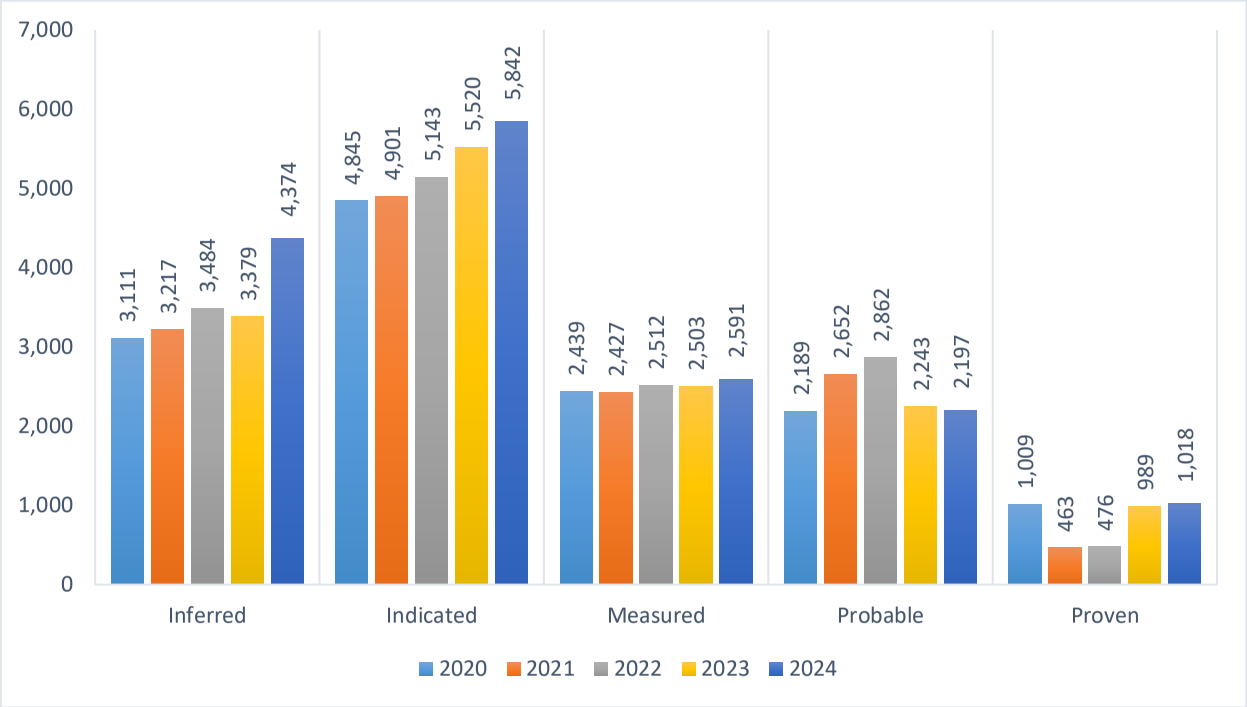


Figure 20. Total Silver Ore Resources and Reserves for the Years 2020–2024

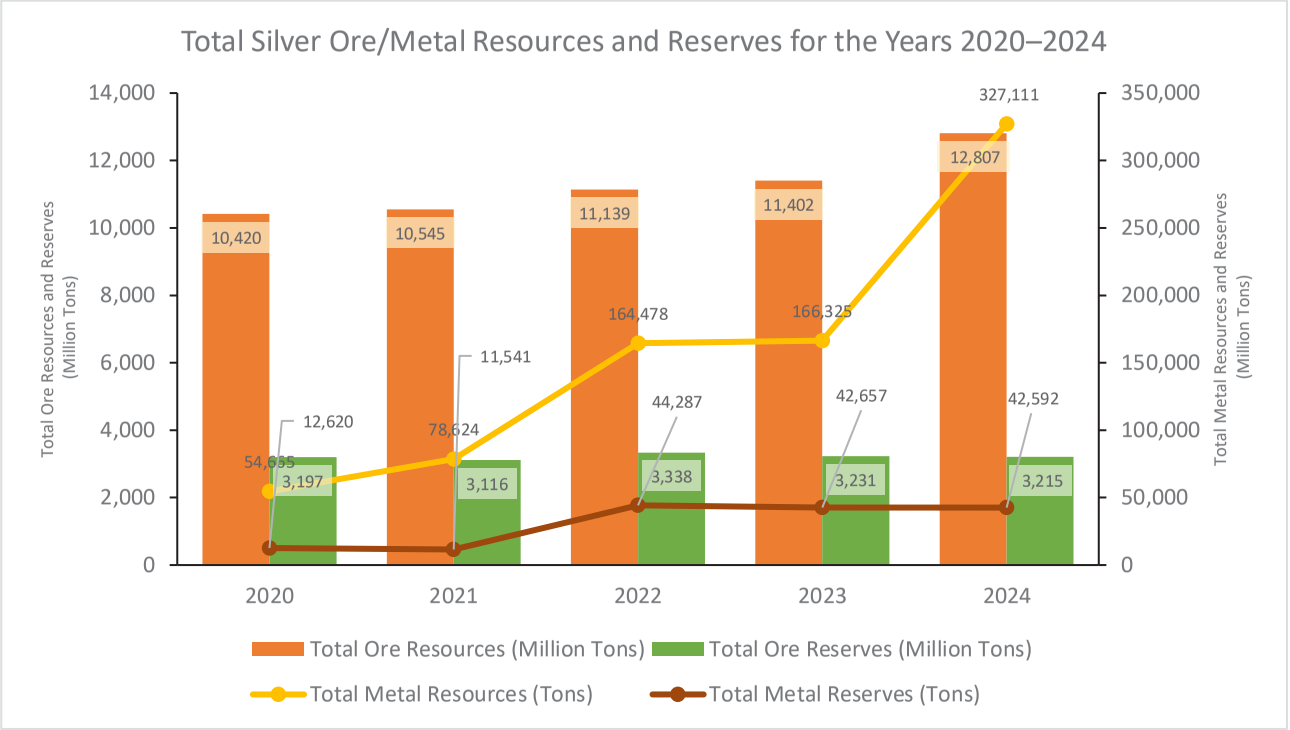


Figure 21. Trend Total Silver Ore/Metal Resources and Reserves for the Years 2020–2024

Table 6. Silver Ore and Metal Resources and Reserves by Province, 2024

NO	PROVINCE	NUMBER OF LOCATIONS	RESOURCES (TONS)							
			INFERRED		INDICATED		MEASURED		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL	ORE	METAL
1	Aceh	5	197,020,000	389	44,350,000	99	28,840,000	47	270,210,000	534
2	Banten	10	197,052,000	14,567	30,104,000	391	40,807,000	308	267,963,000	15,266
3	Bengkulu	7	1,444,088	25	3,105,563	40	4,414,900	398	8,964,551	464
4	Gorontalo	17	194,925,106	369	91,814,385	360	161,529,195	196	448,268,686	925
5	Jambi	2	21,271,538	274	-	-	-	-	21,271,538	274
6	West Java	11	4,956,806	24,230	6,650,945	122,727	3,003,634	13,417	14,611,385	160,373
7	Central Java	1	5,025,000	871	-	-	-	-	5,025,000	871
8	East Java	8	35,902,139	158	75,574,266	1,173	23,496,733	574	134,973,138	1,905
9	West Kalimantan	2	-	-	7,604,113	65	-	5	7,604,113	70
10	South Kalimantan	2	686,756	2	2,156,129	7	4,581,164	21	7,424,049	30
11	Central Kalimantan	39	268,073,374	24,288	24,456,180	611	2,554,250	30	295,083,804	24,929
12	North Kalimantan	4	980,000	2	1,360,000	4	1,220,000	5	3,560,000	10
13	Bangka Belitung Islands	1	13,380,000	680	12,230,000	622	-	-	25,610,000	1,302
14	Lampung	11	5,114,958	41	8,657,326	78	1,113,799	10	14,886,083	129
15	Maluku	4	75,926,164	7,113	38,430,117	835	-	-	114,356,281	7,948
16	North Maluku	12	1,158,496	10	8,886,275	254	71,632,090	3	81,676,861	267
17	West Nusa Tenggara	5	2,565,125,021	3,191	2,392,513,126	4,692	1,538,059,406	1,522	6,495,697,553	9,405
18	East Nusa Tenggara	3	2,650,835	136	2,670,280	81	1,200,000	52	6,521,115	269
19	Central Papua	14	353,102,000	808	2,575,077,000	8,555	482,526,000	1,459	3,410,705,000	10,822
20	South Sulawesi	1	325,174,726	43,709	242,647,623	34,705	82,527,103	9,004	650,349,452	87,418
21	Central Sulawesi	1	5,500,000	34	33,990,000	56	3,500,000	24	42,990,000	114
22	North Sulawesi	29	78,839,300	322	153,198,600	629	41,094,000	162	273,131,900	1,113
23	West Sumatera	8	1,629,000	117	1,094,590	112	1,759,574	182	4,483,164	410
24	South Sumatera	9	4,757,000	61	3,204,257	76	1,817,000	214	9,778,257	350
25	North Sumatera	13	14,523,000	143	82,200,000	664	95,400,000	1,108	192,123,000	1,915
Total		**219**	**4,374,217,307**	**121,539**	**5,841,974,775**	**176,833**	**2,591,075,848**	**28,739**	**12,807,267,931**	**327,111**

NO	PROVINCE	NUMBER OF LOCATIONS	RESERVES (TONS)					
			PROBABLE		PROVEN		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL
1	Aceh	5	26,362,177	53	29,258,308	31	55,620,485	83
2	Banten	10	48,878,081	239	96,800	8	48,974,881	248
3	Bengkulu	7	3,105,563	40	-	-	3,105,563	40
4	Gorontalo	17	130,190,000	160	44,661,572	106	174,851,572	267
5	Jambi	2	-	-	-	-	-	-
6	West Java	11	2,744,912	119	1,021,094	26	3,766,006	145
7	Central Java	1	-	-	-	-	-	-
8	East Java	8	14,337,521	258	13,494,429	378	27,831,950	636
9	West Kalimantan	2	7,604,113	65	-	-	7,604,113	65
10	South Kalimantan	2	-	-	-	-	-	-
11	Central Kalimantan	39	5,585,374	124	960,172	5	6,545,546	128
12	North Kalimantan	4	370,000	3	-	-	370,000	3
13	Bangka Belitung Islands	1	-	-	-	-	-	-
14	Lampung	11	755,701	7	5,922,671	33	6,678,372	41
15	Maluku	4	5,330,000	178	-	-	5,330,000	178
16	North Maluku	12	7,038,170	41	-	-	7,038,170	41
17	West Nusa Tenggara	5	435,677,193	332	330,703,735	461	766,380,928	793
18	East Nusa Tenggara	3	-	-	-	-	-	-
19	Central Papua	14	1,125,515,000	3,945	495,754,000	1,737	1,621,269,000	5,682
20	South Sulawesi	1	244,913,445	32,921	-	-	244,913,445	32,921
21	Central Sulawesi	1	28,440,000	19	3,600,000	24	32,040,000	43
22	North Sulawesi	29	83,754,164	323	33,036,121	104	116,790,285	427
23	West Sumatera	8	207,300	19	-	-	207,300	19
24	South Sumatera	9	1,380,469	32	14,887	1	1,395,356	33
25	North Sumatera	13	25,000,000	163	59,150,000	639	84,150,000	802
Total		**219**	**2,197,189,183**	**39,039**	**1,017,673,789**	**3,554**	**3,214,862,972**	**42,592**

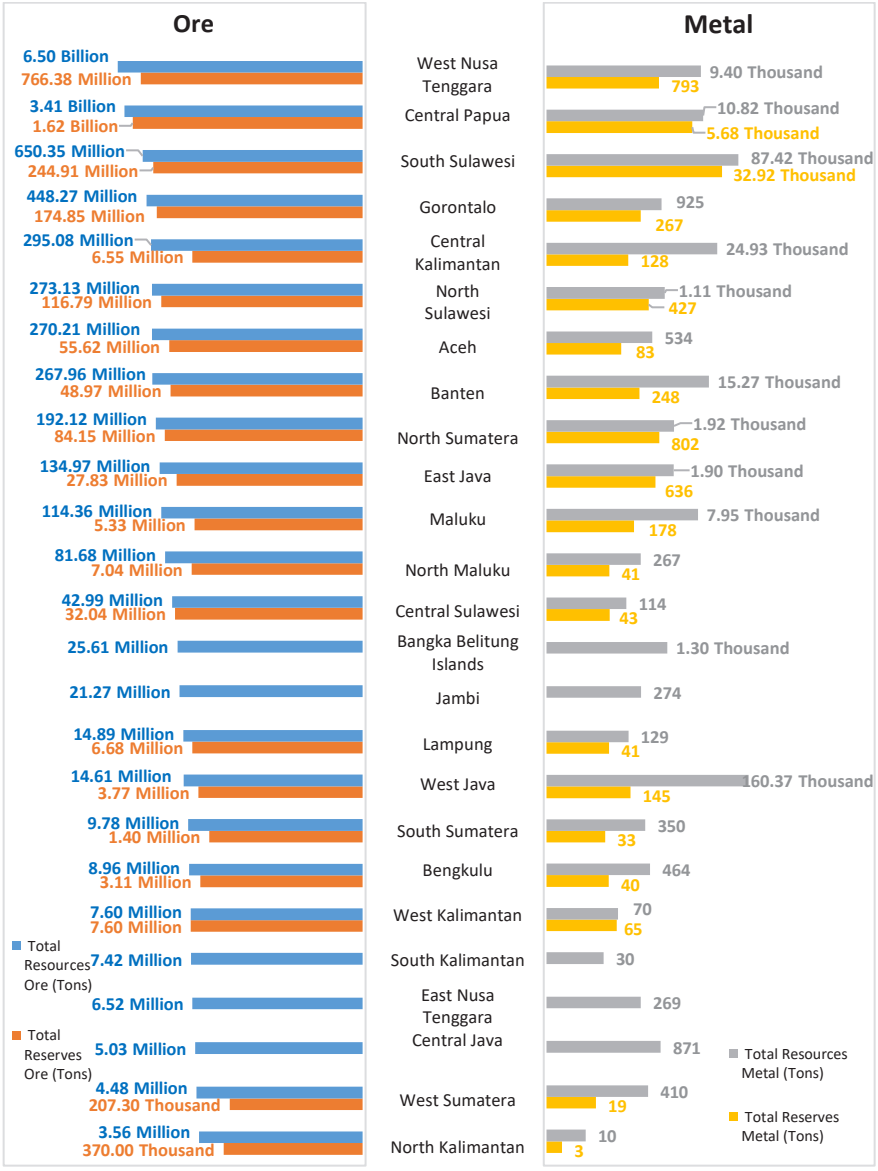


Figure 22. Total Silver Ore/Metal Resources and Reserves by Province for 2024

Nickel, Laterite Iron and Cobalt

Nickel ores typically contain secondary metals such as lateritic iron and cobalt, but only a quarter of reporting companies include these associated metals in their data. In certain areas, lateritic iron is actually the main product, as seen on Sebuku Island.

Based on the reporting of nickel ore resources and reserves from several companies, to convert wet metric tons (wmt) to dry metric tons (dmt), several mining companies agreed to use a 30% moisture content as a standard reference, based on industry practices. The classification of nickel ore resources in 2024 shows that inferred and indicated resources dominate the total, while reserves are primarily listed as probable. This is reflected in the growth of various categories of resources and reserves the five-year period between 2020 and 2024 (Figures 23 and 24).

In 2024, nickel ore resources expanded by 607 million tons, and reserves rose by 588.9 million tons compared to 2023. Nickel metal resources grew by 8.9 million tons, and reserves by 5.9 million tons. As a result, the total nickel ore resources in 2024 reached 19.6 billion tons, 5.9 billion tons in reserves, and 62 million tons in nickel metal reserves (Figure 25). As of December 2024, nickel ore production stood at 173.6 million tons.

A provincial breakdown for 2024 shows that Southeast Sulawesi, North Maluku, and Central Sulawesi held the largest shares of national nickel resources and reserves (Table 7 and Figure 26).

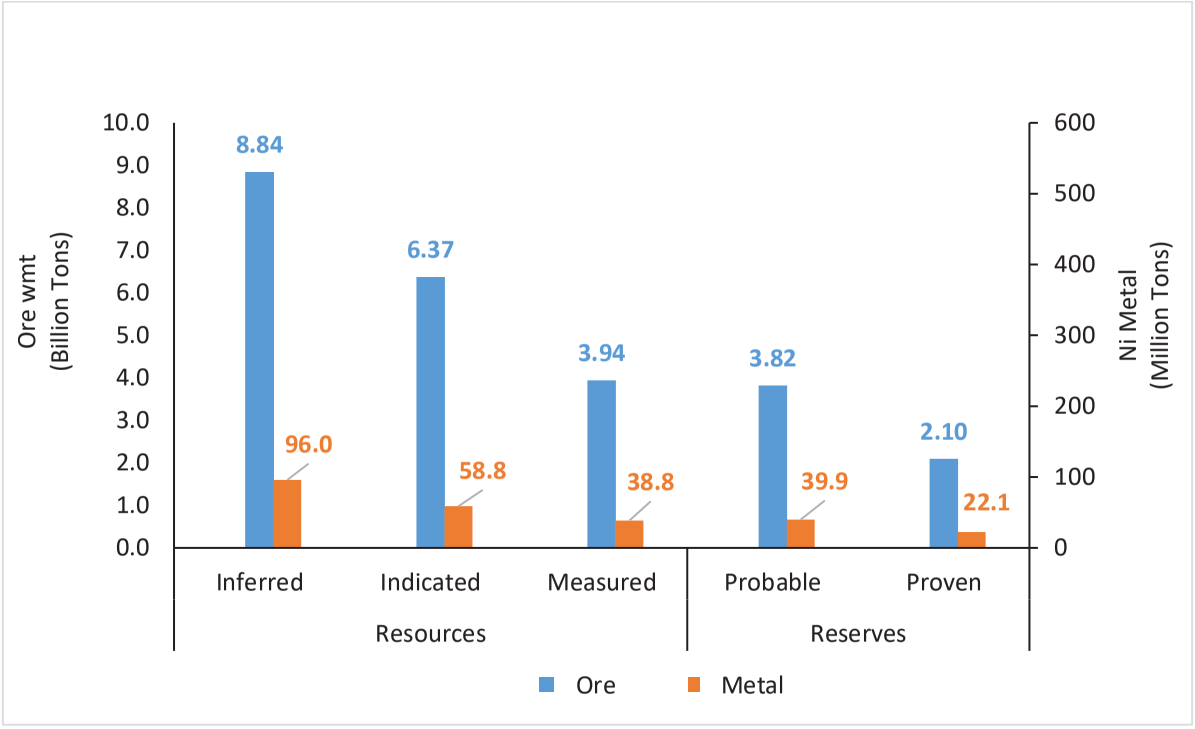


Figure 23. Nickel Ore/Metal Resources and Reserves for 2024

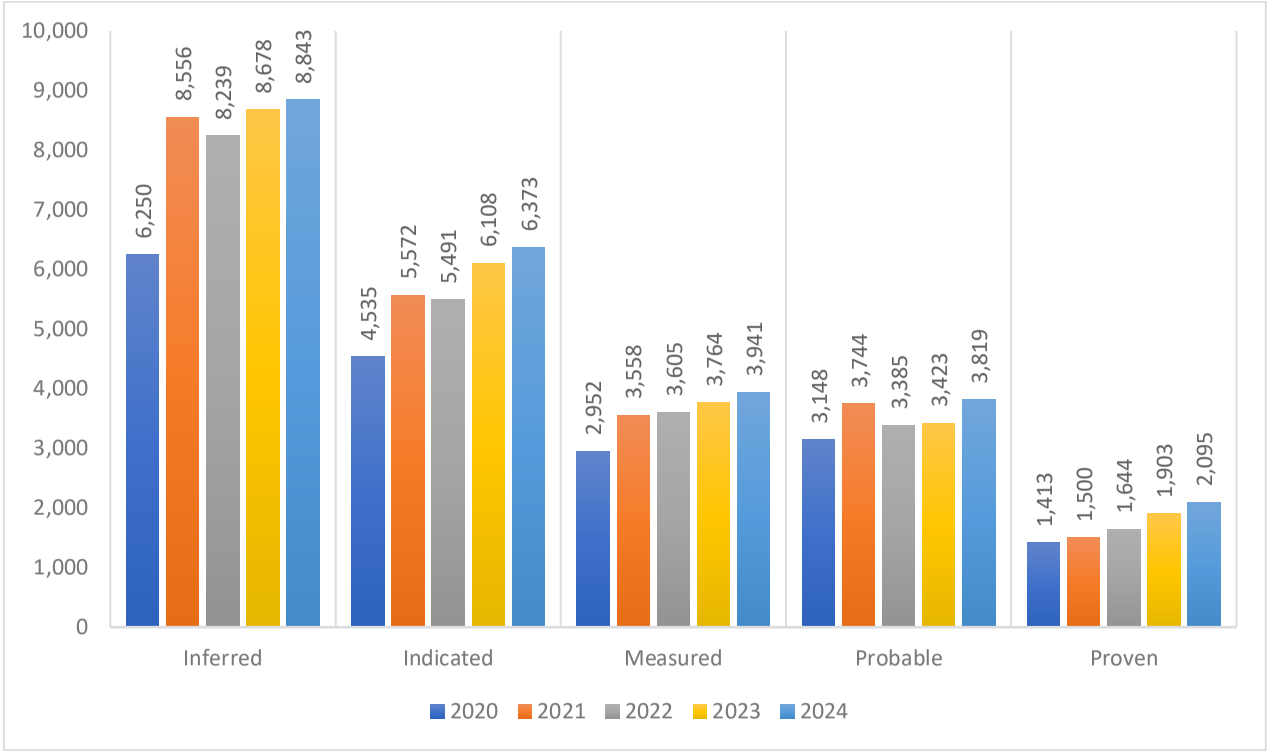


Figure 24. Trend of Nickel Ore Resources and Reserves for the Years 2020–2024

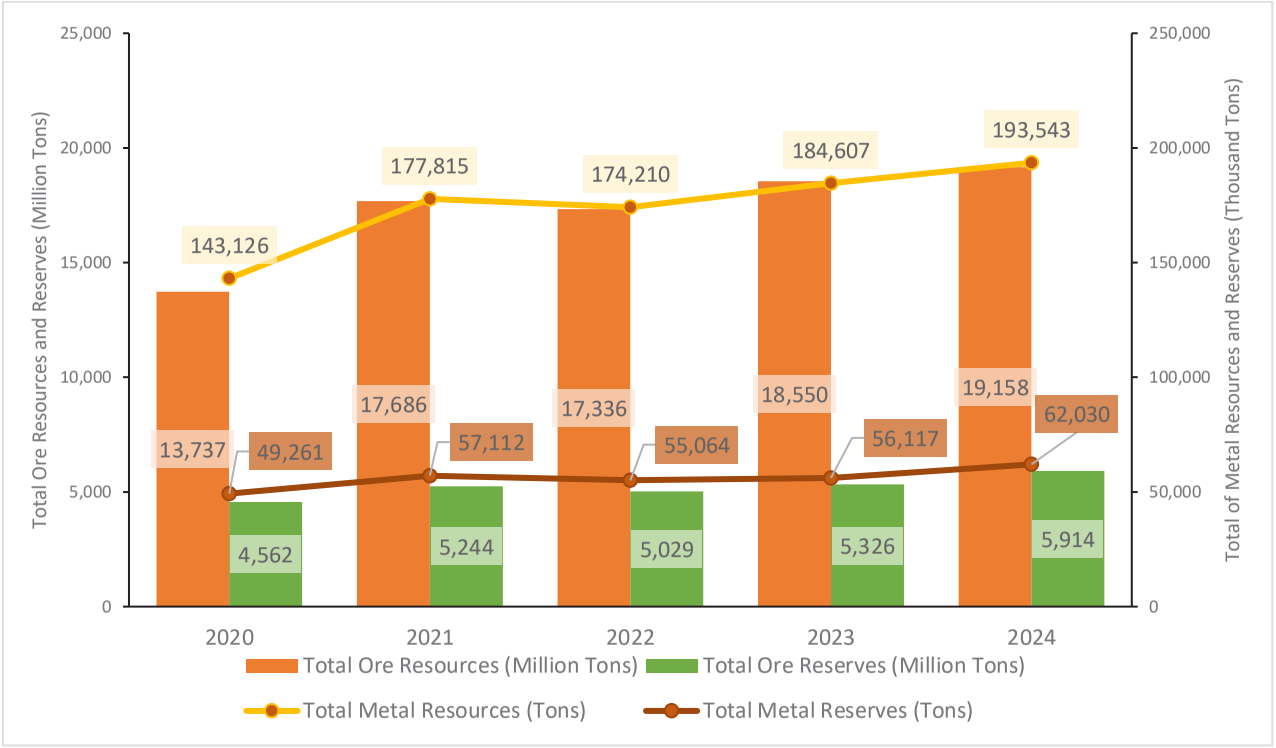


Figure 25. Trend of Nickel Ore/Metal Resources and Reserves for the Years 2020–2024.

Table 7. Total Resources and Reserves of Nickel Ore and Metal by Province, 2024

NO	PROVINCE	NUMBER OF LOCATIONS	RESOURCES (TONS)							
			INFERRED		INDICATED		MEASURED		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL	ORE	METAL
1	Aceh	1	8,295,040	59,738	-	-	-	-	8,295,040	59,738
2	South Kalimantan	3	24,128,000	186,625	46,305,000	331,566	-	-	70,433,000	518,190
3	Central Kalimantan	1	-	-	21,730,643	275,327	-	-	21,730,643	275,327
4	East Kalimantan	1	-	-	1,202,428	11,784	-	-	1,202,428	11,784
5	Maluku	1	833,703,503	-	694,752,919	-	365,659,431	-	1,894,115,853	-
6	North Maluku	82	2,516,558,873	39,481,306	1,726,510,694	16,973,804	1,415,820,536	14,823,355	5,658,890,103	71,278,464
7	Papua	6	216,000,000	1,941,030	93,000,000	950,460	49,240,000	450,513	358,240,000	3,342,003
8	Southwest Papua	13	272,720,000	3,807,305	113,565,600	1,088,303	98,489,600	946,920	484,775,200	5,842,527
9	Central Papua	1	-	-	-	-	-	-	-	-
10	South Sulawesi	14	329,018,955	3,598,760	202,707,215	1,177,821	202,752,647	1,872,444	734,478,817	6,649,026
11	Central Sulawesi	101	1,608,455,659	16,326,819	1,585,023,115	17,410,986	497,875,978	6,047,580	3,691,354,753	39,785,385
12	Southeast Sulawesi	209	3,034,152,093	30,549,648	1,888,700,600	20,574,572	1,311,135,698	14,656,814	6,233,988,391	65,781,034
Total		**433**	**8,843,032,123**	**95,951,231**	**6,373,498,214**	**58,794,622**	**3,940,973,890**	**38,797,626**	**19,157,504,227**	**193,543,479**

NO	PROVINCE	NUMBER OF LOCATIONS	RESERVES (TONS)					
			PROBABLE		PROVEN		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL
1	Aceh	1	-	-	-	-	-	-
2	South Kalimantan	3	121,655,000	760,179	-	-	121,655,000	760,179
3	Central Kalimantan	1	9,780,719	117,075	-	-	9,780,719	117,075
4	East Kalimantan	1	-	-	-	-	-	-
5	Maluku	1	123,694,640	2,300,974	24,125,130	379,348	147,819,770	2,680,322
6	North Maluku	82	1,099,548,501	11,201,302	749,584,214	7,756,203	1,849,132,715	18,957,505
7	Papua	6	-	-	-	-	-	-
8	Southwest Papua	13	54,470,000	665,631	17,780,000	183,684	72,250,000	849,315
9	Central Papua	1	-	-	-	-	-	-
10	South Sulawesi	14	246,578,658	2,689,029	488,774,504	4,146,038	735,353,162	6,835,067
11	Central Sulawesi	101	670,123,170	7,126,298	310,820,122	3,742,391	980,943,293	10,868,692
12	Southeast Sulawesi	209	1,492,895,192	15,059,461	504,035,964	5,902,239	1,996,931,156	20,961,701
Total		**433**	**3,818,745,880**	**39,919,952**	**2,095,119,934**	**22,109,904**	**5,913,865,814**	**62,029,856**

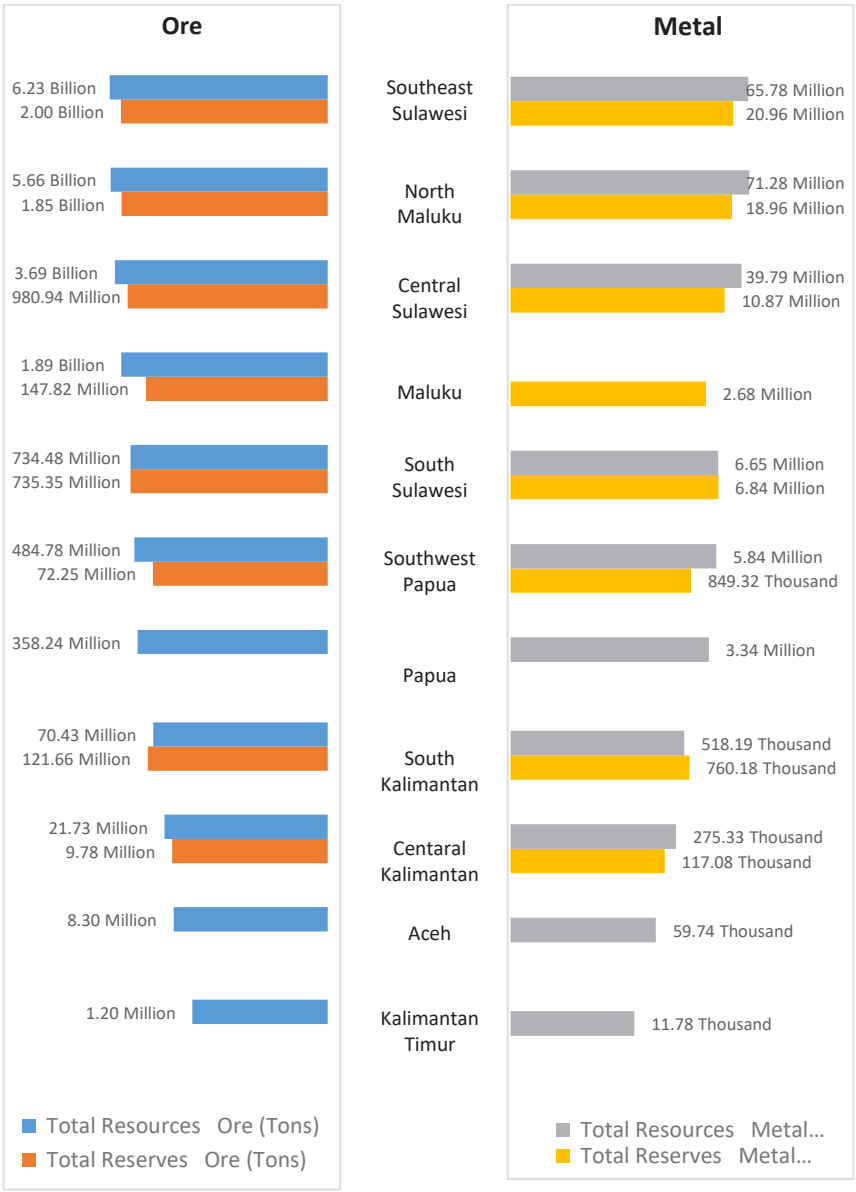


Figure 26. Total Nickel Ore/Metal Resources and Reserves by Province for 2024.

According to the updated compilation of nickel ore and metal resource and reserve data as of December 2024, the nickel content reported by companies shows considerable variation, from as low as 0.5% to as high as 2.73% Ni. Based on processing technologies, nickel characteristics in Indonesia are divided into two main categories: pyrometallurgy and hydrometallurgy. High-grade saprolite ores (Ni > 1.5%) are processed using pyrometallurgical smelters, while low-grade limonite ores (Ni < 1.5%) are processed with hydrometallurgical methods (source: Nickel Booklet, Ministry of Energy and Mineral Resources, 2020). Accordingly, the classification of nickel resources and reserves as of December 2024 is divided into two groups: above and below 1.5% Ni content (Table 8).

The total amount of nickel ore resources in 2024 with Ni content below 1.5% was 58%—equivalent to 11.15 billion tons, while 42%—8 billion tons—contained more than 1.5% Ni. The reserve figures show a similar breakdown, with 39% (2.33 billion tons) for Ni < 1.5%, and 61% (3.58 billion tons) for Ni > 1.5%. In terms of metal content, nickel resources with less than 1.5% Ni amounted to 79.7 million tons (41%), and those above 1.5% totaled 113.8 million tons (59%). For metal reserves, 18.66 million tons (30%) came from Ni < 1.5% deposits, while 43.36 million tons (70%) came from Ni > 1.5% deposits (Figure 30).

Moreover, lateritic nickel types are further classified as limonite (Ni < 1.5%) and saprolite (Ni > 1.5%), following the lateritic nickel profiles defined by Waheed (2008) and Kyle (2010) (Figure 27).

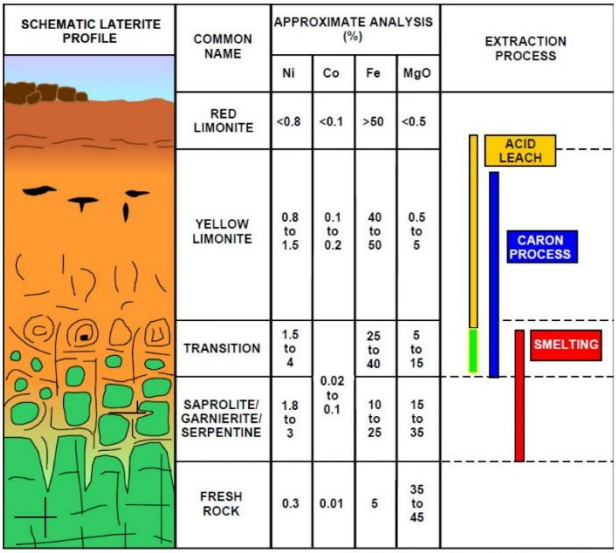


Figure 27. Profile of Lateritic Nickel
(Source: Waheed, 2008, as cited in Kyle, 2010)

The classification of ore types into limonite and saprolite indicates that, in 2024, the total resources and reserves of saprolite exceeded those of limonite. Saprolite resources represented 58% of the total, amounting to 11.2 billion tons, while limonite comprised for 42% or 8 billion tons. For reserves, saprolite comprised 61% or 3.58 billion tons, and limonite 39% or 2.3 billion tons (Table 9). A comparison of the total saprolite and limonite ore resources and reserves between 2023 and 2024 shows a significant increase in both saprolite and limonite resources and reserves (Figure 31).

The provincial distribution of nickel resources and reserves based on grade—less than 1.5% Ni and greater than 1.5% Ni—is generally depicted in Figures 28 and 29.

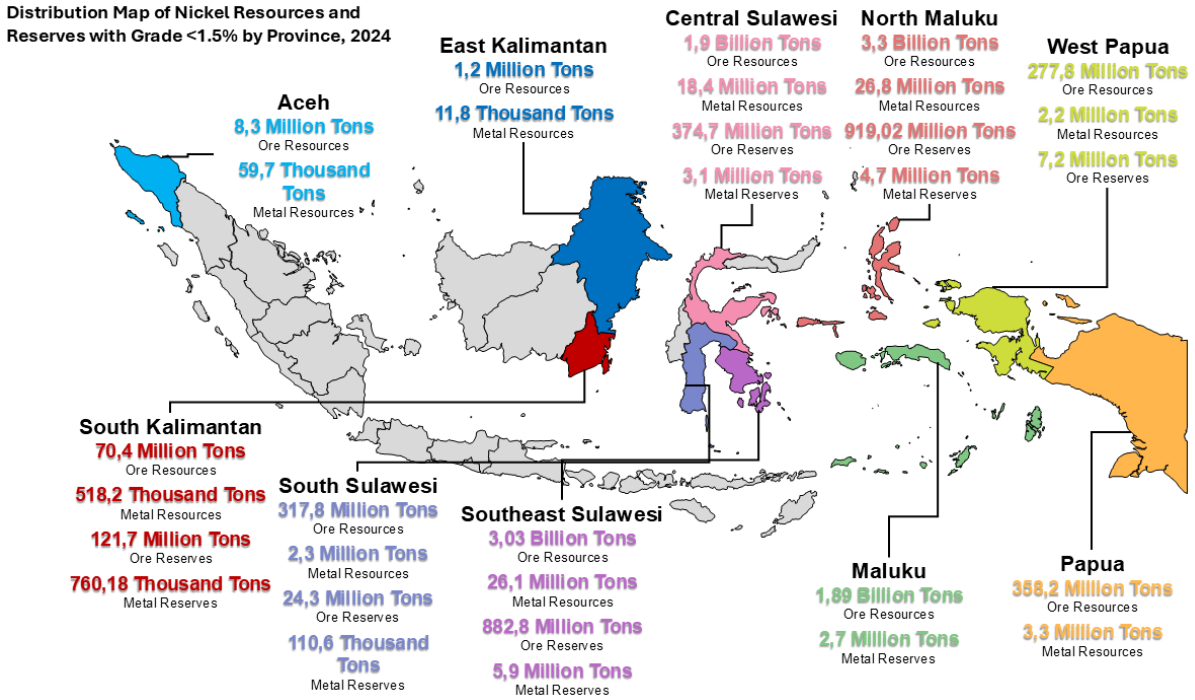


Figure 28. Distribution of Nickel Ore/Metal Resources and Reserves with Grades Below 1.5% by Province for 2024

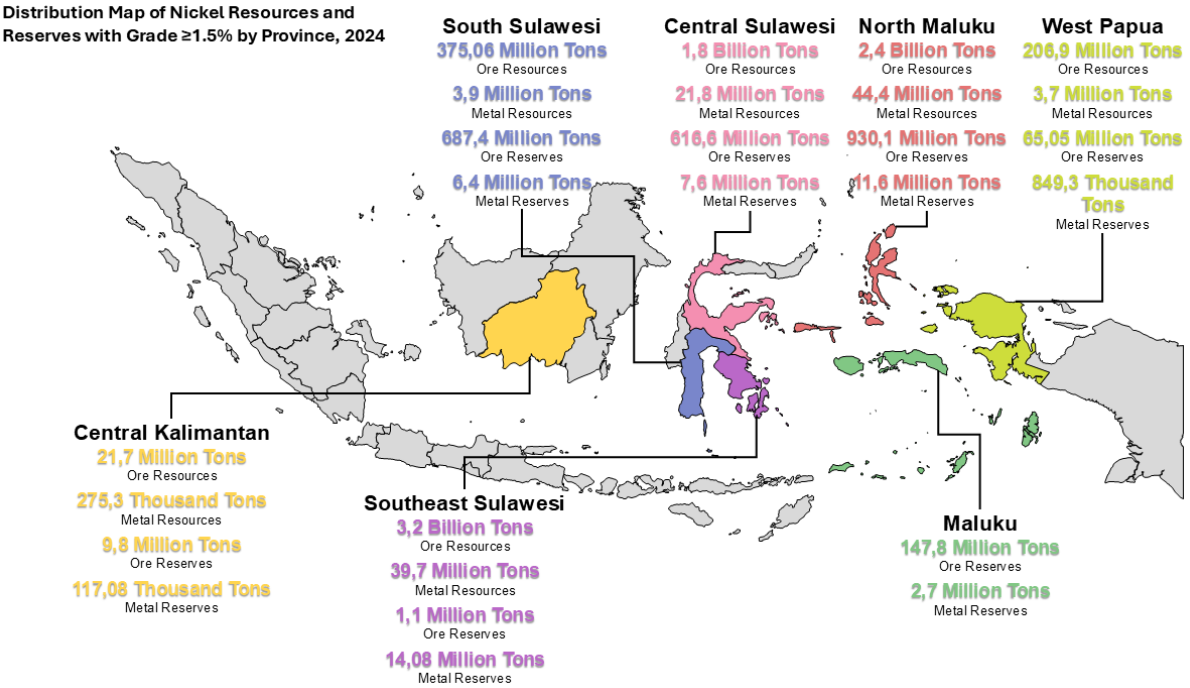
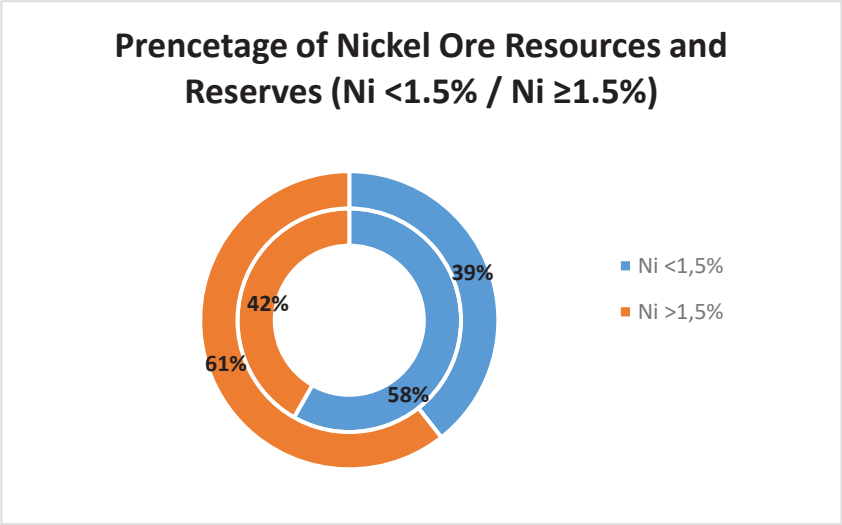


Figure 29. Distribution of Nickel Ore/Metal Resources and Reserves with Grade ≥1.5% by Province for 2024

Table 8. Classification of Nickel Resources and Reserves Status as of December 2024 Based on Ni Grade (<1.5% and >1.5%)

Grade Ni	Resources (Ton)						Reserves (Ton)			
	Inferred		Indicated		Measured		Probable		Proven	
	Ore	Metal	Ore	Metal	Ore	Metal	Ore	Metal	Ore	Metal
Ni <1.5%	5,116,703,629	35,736,692	4,032,770,943	29,725,847	2,006,676,596	14,274,876	1,816,891,074	14,523,143	512,805,219	4,142,598
Ni ≥1.5%	3,726,328,494	60,214,538	2,340,727,270	29,068,776	1,934,297,294	24,521,473	2,001,854,807	25,396,809	1,582,314,715	17,967,306
Total	8,843,032,123	95,951,231	6,373,498,214	58,794,622	3,940,973,890	38,796,349	3,818,745,880	39,919,952	2,095,119,934	22,109,904

Grade Ni	Total Resources		Total Reserves	
	Ore (Million Tons)	Metal (Thousand Tons)	Ore (Million Tons)	Metal (Thousand Tons)
Ni <1.5%	11,156	79,737	2,330	18,666
Ni ≥1.5%	8,001	113,805	3,584	43,364
Total	19,158	193,542	5,914	62,030



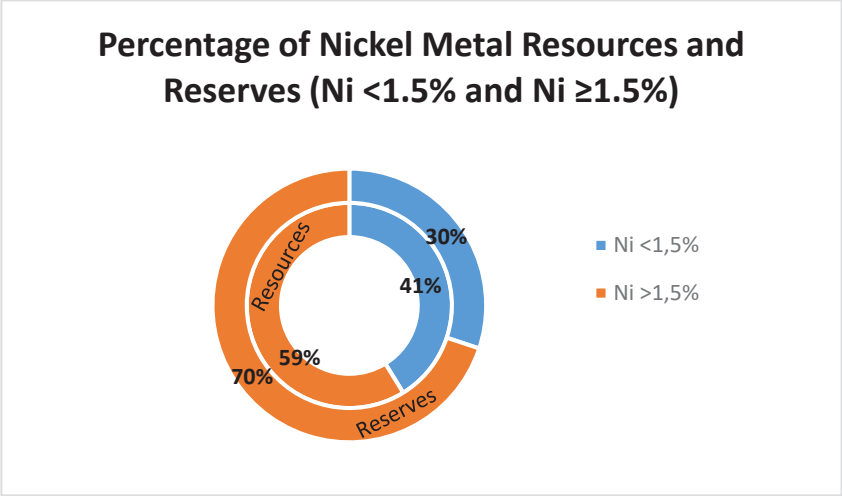
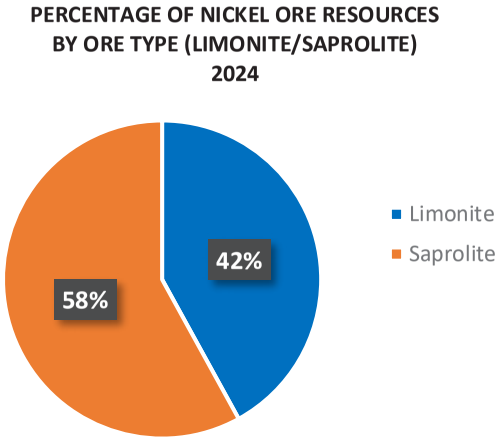


Figure 30. Percentage of Nickel Ore/Metal Resources and Reserves by Ni Grade (< 1.5% and > 1.5%)

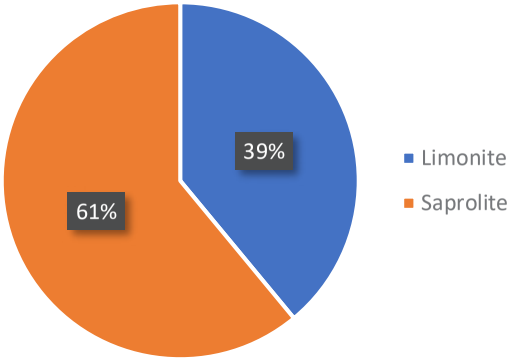
Table 9. Classification of Nickel Resources and Reserves as of December 2024 Based on Ore Type Characteristics (Limonite/Saprolite)

NICKEL ORE TYPES	Resource						Total Resources	
	Inferred		Indicated		Measured			
	WMT Ore (Billion Tons)	Metals (Million Tons)	WMT Ore (Billion Tons)	Metals (Million Tons)	WMT Ore (Billion Tons)	Metals (Million Tons)	WMT Ore (Billion Tons)	Metals (Million Tons)
Limonite	3.66	30.69	2.93	27.08	1.45	13.10	8.04	70.86
Saprolite	5.18	65.27	3.45	31.72	2.49	25.70	11.12	122.68
Total	**8.84**	**95.95**	**6.37**	**58.79**	**3.94**	**38.80**	**19.16**	**193.54**



NICKEL ORE TYPES	Reserves				Total Reserves	
	Probable		Proven			
	WMT Ore (Billion Tons)	Metals (Million Tons)	WMT Ore (Billion Tons)	Metals (Million Tons)	WMT Ore (Billion Tons)	Metals (Million Tons)
Limonite	1.79	15.10	0.54	4.80	2.33	19.90
Saprolite	2.03	24.82	1.55	17.31	3.58	42.13
Total	**3.82**	**39.92**	**2.10**	**22.11**	**5.91**	**62.03**

PERCENTAGE OF NICKEL ORE RESERVES BY ORE TYPE (LIMONITE/SAPROLITE) 2024



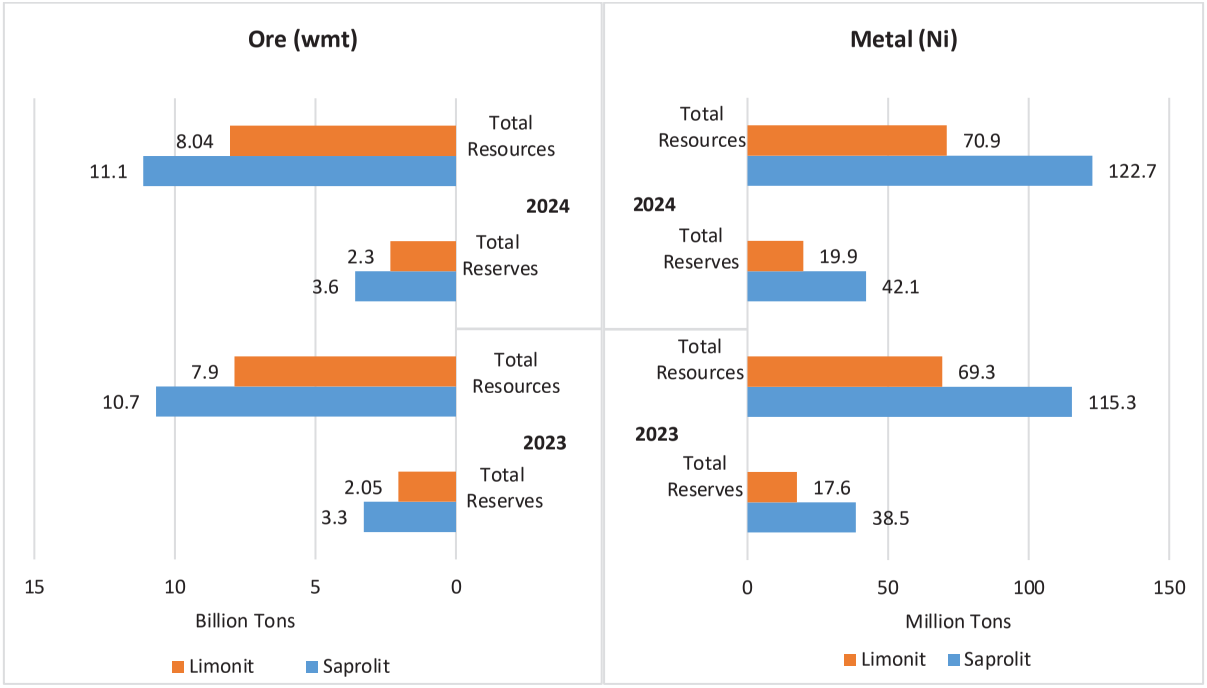


Figure 31. Diagram of Total Nickel Resources and Reserves (Limonite, Saprolite) for the Years 2023–2024

Most of the lateritic iron resources are classified as inferred, while the majority of the reserves fall into the probable category (Figure 32). These resources and reserves are primarily located in South Kalimantan, Southeast Sulawesi, Central Sulawesi, North Maluku, Maluku, and West Papua (Table 10, Figure 34).

Lateritic iron resources and reserves from 2020 to 2024 generally increased in line with the addition of new and updated data. Most of the lateritic iron resources remain in the inferred category. To upgrade these resources to the indicated and measured categories, further exploration is required. Overall, the total lateritic iron resources have shown a significant increase from 2020 to 2024 (Figure 33).

For cobalt as a metal commodity, the development of resources and reserves between 2020 and 2024 has also shown a significant upward trend, particularly starting in 2021 (Figure 36). The distribution of cobalt resources and reserves is primarily concentrated in Southeast Sulawesi, North Maluku, West Papua, and Central Sulawesi (Table 11, Figure 37).

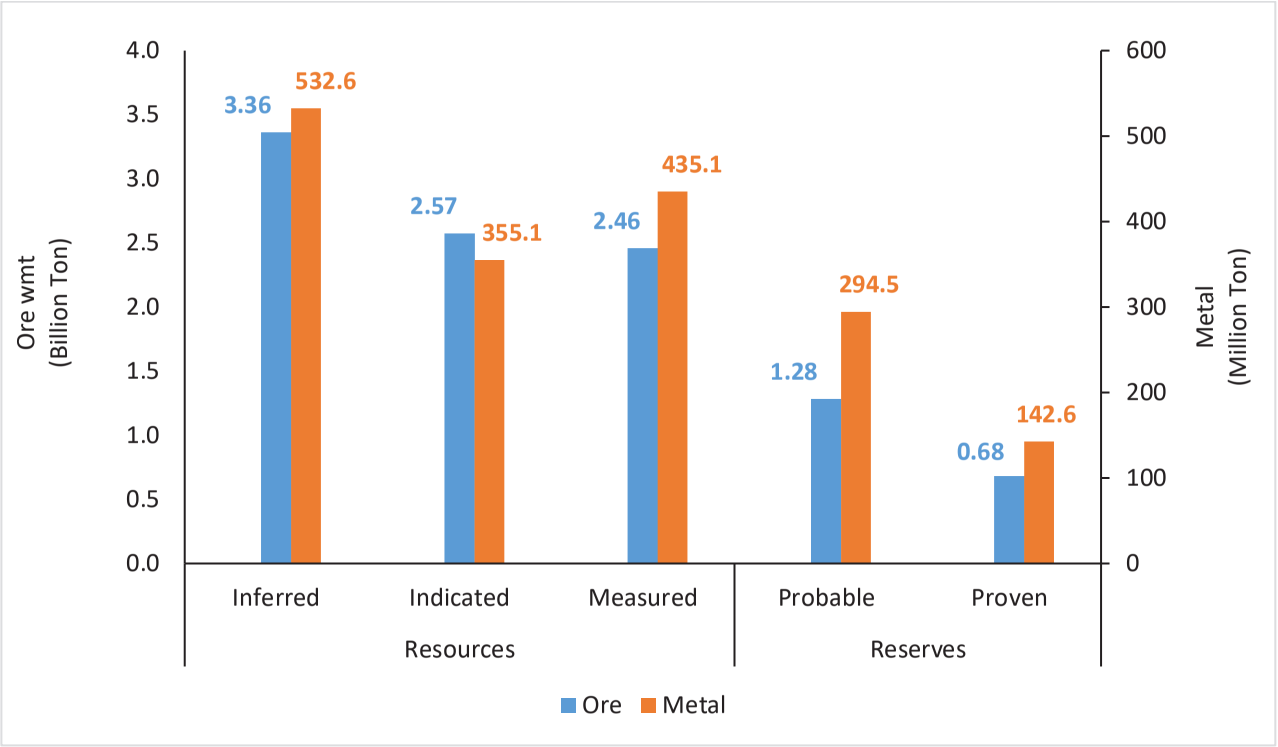


Figure 32. Lateritic Iron Ore Resources and Reserves for 2024

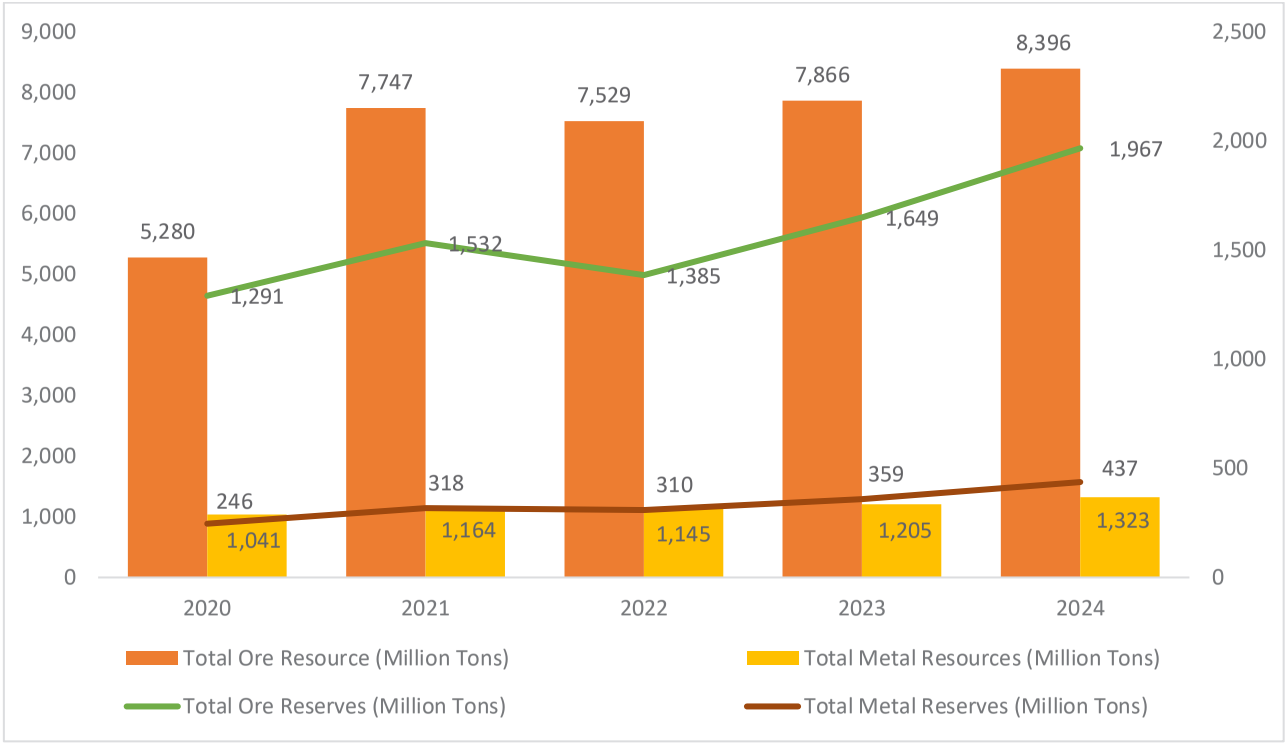


Figure 33. Trend of Lateritic Iron Ore/Metal Resources and Reserves for the Years 2020–2024

Table 10. Lateritic Iron Resources and Reserves by Province, 2024.

NO	PROVINCE	NUMBER OF LOCATIONS	RESOURCES (TONS)							
			INFERRED		INDICATED		MEASURED		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL	ORE	METAL
1	Aceh	1	8,295,040	2,058,299	-	-	-	-	8,295,040	2.058.299
2	West Java	1	500,000	225,000	-	-	-	-	500,000	225.000
3	West Kalimantan	1	6,897,375	598,692	16,804,938	1,939,794	69,351,889	6,874,159	93,054,202	9.412.645
4	South Kalimantan	13	66,651,157	18,006,141	160,291,686	51,844,819	185,925,533	69,724,502	412,868,376	139.575.462
5	Central Kalimantan	7	-	-	82,860,000	6,884,410	-	-	82,860,000	6.884.410
6	Lampung	3	8,000	5,819	-	-	-	-	8,000	5.819
7	Maluku	1	833,703,503	-	694,752,919	-	365,659,431	-	1,894,115,853	-
8	North Maluku	28	806,007,050	131,905,874	584,150,401	104,170,106	683,693,880	123,264,213	2,073,851,331	359.340.194
9	Papua	5	-	-	-	-	40,733,000	10,757,770	40,733,000	10.757.770
10	Southwest Papua	13	352,130,000	33,368,941	91,680,000	1,344,151	71,388,000	12,618,763	515,198,000	47.331.855
11	South Sulawesi	6	388,586,697	186,650,864	20,765,977	3,079,046	9,470,000	1,530,190	418,822,674	191.260.099
12	Central Sulawesi	47	300,726,453	50,375,461	318,569,967	57,809,495	217,188,361	32,301,167	836,484,782	140.486.122
13	Southeast Sulawesi	101	599,395,924	109,404,358	604,525,443	128,035,100	815,159,979	178,022,089	2,019,081,346	415.461.547
Amount		**227**	**3.362.901.200**	**532,599,450**	**2,574,401,331**	**355,106,920**	**2,458,570,073**	**435,092,854**	**8,395,872,604**	**1,322,799,223**

NO	PROVINCE	NUMBER OF LOCATIONS	RESOURCES (TONS)					
			PROBABLE		PROVEN		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL
1	Aceh	1	-	-	-	-	-	-
2	West Java	1	-	-	-	-	-	-
3	West Kalimantan	1	69,351,889	6,874,159	-	-	69,351,889	6.874.159
4	South Kalimantan	13	235,999,211	88,538,645	153,841,144	51,174,724	389,840,355	139.713.368
5	Central Kalimantan	7	36,050,000	2,798,177	-	-	36,050,000	2.798.177
6	Lampung	3	-	-	-	-	-	-
7	Maluku	1	123,694,640	51,989,180	24,125,130	7,674,428	147,819,770	59.663.607
8	North Maluku	28	200,789,260	25,302,371	202,371,234	27,051,047	403,160,494	52.353.418
9	Papua	5	-	-	-	-	-	-
10	Southwest Papua	13	58,930,000	786,024	10,740,000	138,325	69,670,000	924.349
11	South Sulawesi	6	4,079,401	702,422	9,702,375	1,334,238	13,781,776	2.036.661
12	Central Sulawesi	47	188,791,363	38,600,797	144,429,310	23,015,119	333,220,673	61.615.916
13	Southeast Sulawesi	101	366,965,212	78,953,291	137,242,832	32,178,314	504,208,044	111.131.605
Amount		**227**	**1.284.650.976**	**294,545,066**	**682,452,025**	**142,566,195**	**1,967,103,001**	**437,111,261**

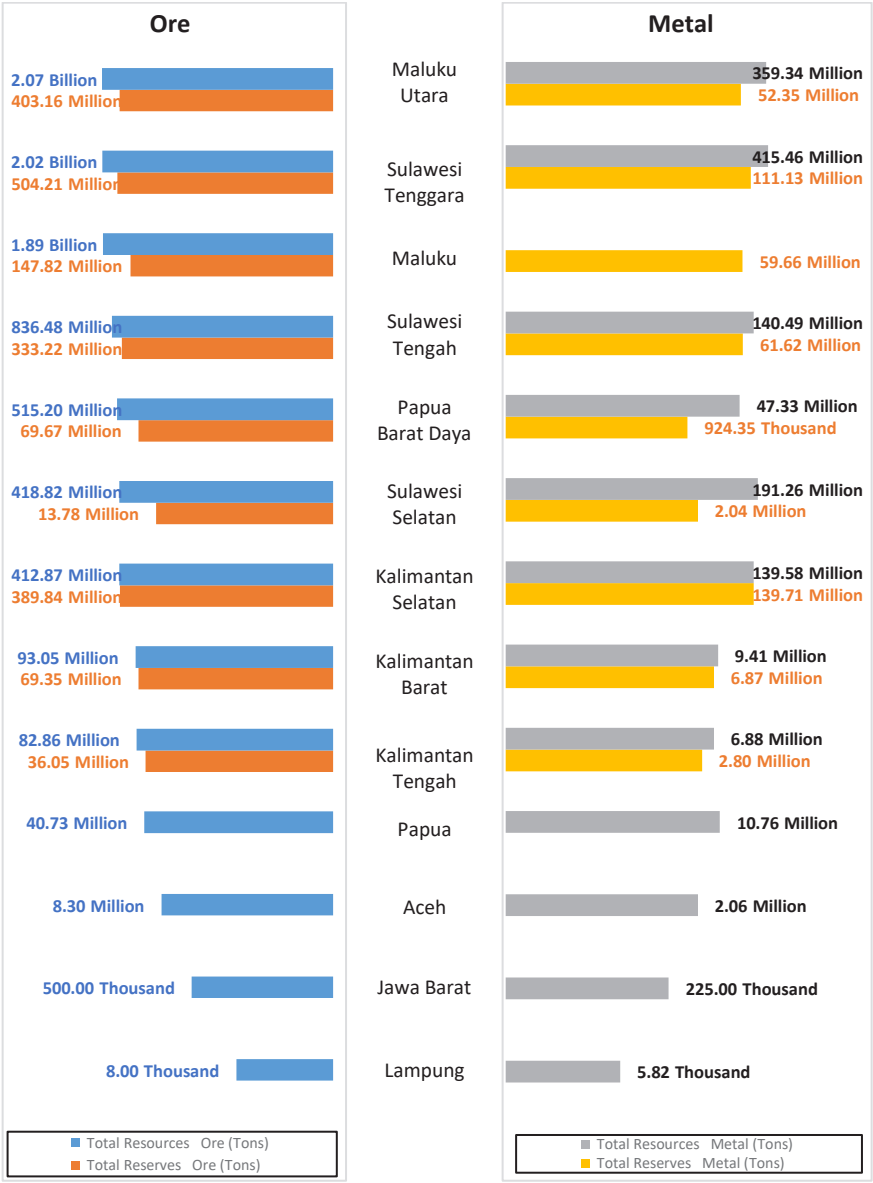


Figure 34. Lateritic Iron Resources and Reserves by Province for 2024

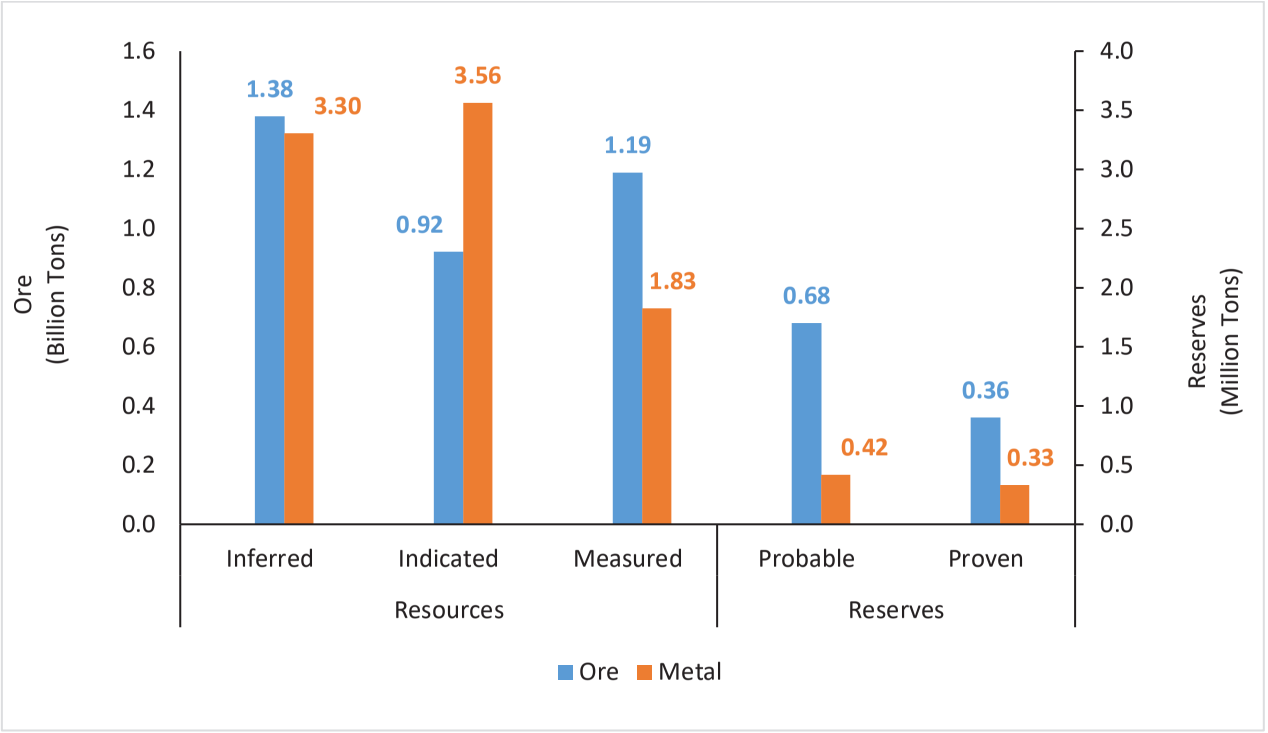


Figure 35. Cobalt Ore/Metal Resources and Reserves for 2024

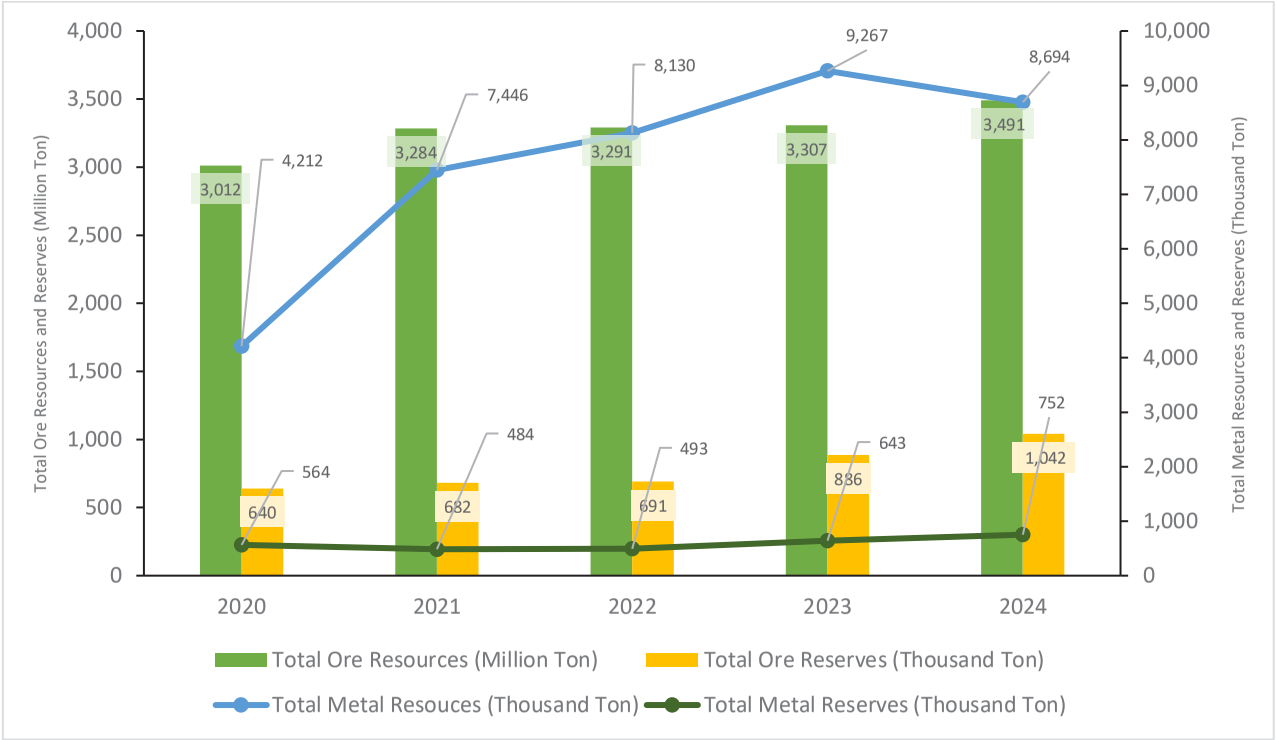


Figure 36. Trend of Cobalt Ore/Metal Resources and Reserves for the Years 2020–2024

Table 11. Cobalt Resources and Reserves by Province, 2024

NO	PROVINCE	NUMBER OF LOCATIONS	RESOURCES (TONS)							
			INFERRED		INDICATED		MEASURED		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL	ORE	METAL
1	Aceh	1	8,295,040	8,311	-	-	-	-	8,295,040	8,311
2	South Kalimantan	3	24,128,000	11,265	46,305,000	28,943	-	-	70,433,000	40,207
3	North Maluku	27	333,685,400	262,578	309,246,000	717,096	377,769,000	872,136	1,020,700,400	1,851,809
4	Papua	7	81,000,000	39,690	-	-	43,613,000	33,569	124,613,000	73,259
5	Southwest Papua	15	313,170,000	2,500,558	90,800,000	1,112,686	78,728,000	343,080	482,698,000	3,956,323
6	Central Sulawesi	11	118,935,900	93,265	55,788,141	31,482	25,020,459	97,832	199,744,501	222,579
7	Southeast Sulawesi	41	507,482,245	391,841	429,631,473	1,677,044	664,613,866	479,392	1,601,727,584	2,548,278
Jumlah		**105**	**1,386,696,585**	**3,307,507**	**931,770,614**	**3,567,251**	**1,189,744,325**	**1,826,009**	**3,508,211,525**	**8,700,767**

NO	PROVINCE	NUMBER OF LOCATIONS	RESOURCES (TONS)					
			PROBABLE		PROVEN		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL
1	Aceh	1	-	-	-	-	-	-
2	South Kalimantan	3	121,655,000	101,623	-	-	121,655,000	101,623
3	North Maluku	27	289,953,610	119,385	262,840,000	130,374	552,793,610	249,759
4	Papua	7	-	-	-	-	-	-
5	Southwest Papua	15	58,930,000	25,908	10,740,000	138,325	69,670,000	164,233
6	Central Sulawesi	11	19,087,072	7,359	17,576,544	24,943	36,663,616	32,302
7	Southeast Sulawesi	41	198,286,850	168,105	70,214,978	39,431	268,501,828	207,536
Jumlah		**105**	**687,912,532**	**422,381**	**361,371,522**	**333,073**	**1,049,284,054**	**755,453**

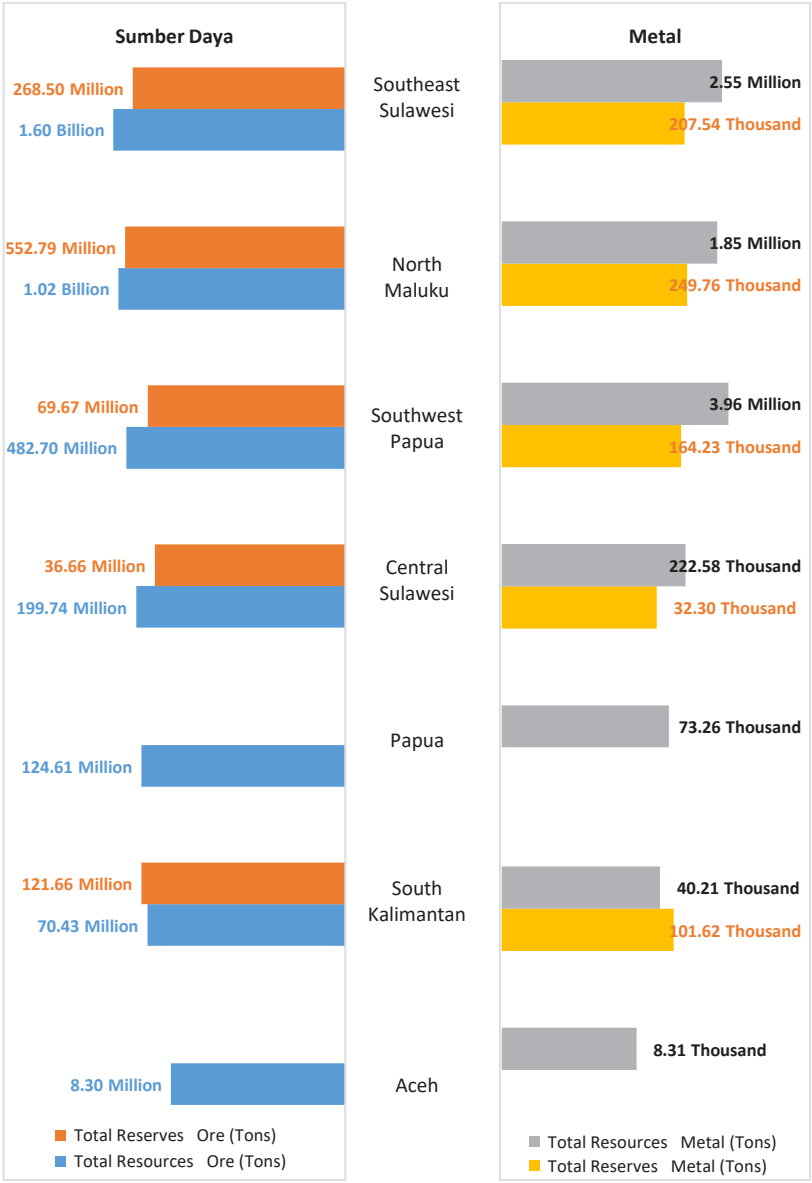


Figure 37. Cobalt Ore/Metal Resources and Reserves by Province

BAUXITE

Bauxite ore assessments start with crude bauxite (wmt cbx), which undergoes washing to yield washed bauxite (wmt wbx). The ratio of washed to crude ore is known as the concretion factor. While some companies report this factor, many do not, so a default value of 50% is typically assumed. After drying, the washed bauxite is analyzed for its Al_2O_3 (alumina) content and other minerals, with the alumina content calculated by multiplying the Al_2O_3 grade by the quantity of dry washed bauxite. Reports that include both wet and dry measurements suggest that the average moisture content in wet bauxite ore is about 15%. For companies that do not report data in dry form, alumina content is derived by converting wmt to dmt first.

In 2024, the majority of crude bauxite and alumina resources were in the indicated category, while reserves were mostly probable. Advancing these resource categories to measured status will require further detailed exploration (Figures 38 and 39).

The total crude bauxite resource stood at 7.79 billion tons, with 3.93 billion tons of washed bauxite and 1.32 billion tons of alumina. Reserves included 2.86 billion tons of crude bauxite, 1.45 billion tons of washed bauxite, and 552 million tons of alumina.

Resource values for bauxite and alumina have been increasing since 2022, while reserves saw increased beginning in 2023. In 2024, crude bauxite resources rose by 313 million tons, and reserves grew by 88 million tons compared to the previous year. Alumina resources increased by 77 million tons,

and reserves expanded by 21 million tons (Figures 39 and 40). Total bauxite ore production reached 8.362 million tons.

Based on the development of bauxite/alumina resources and reserves from 2020 to 2024, there is a need to enhance feasibility studies to convert resources into reserves, thereby improving the sustainability of bauxite/alumina reserves.

The 2024 classification of bauxite resources and reserves based on Al_2O_3 grade includes four levels: low grade, low–medium grade, medium–high grade, and high grade (source: Antam, 2020). Table 14 and Figure 42 show the distribution by province. According to Tables 12 and 13, there was a notable decrease in medium–high grade alumina resources and reserves in 2024 compared to 2023. Most of the bauxite reserves and resources are found in West Kalimantan, the Riau Islands, and Central Kalimantan (Figure 42).

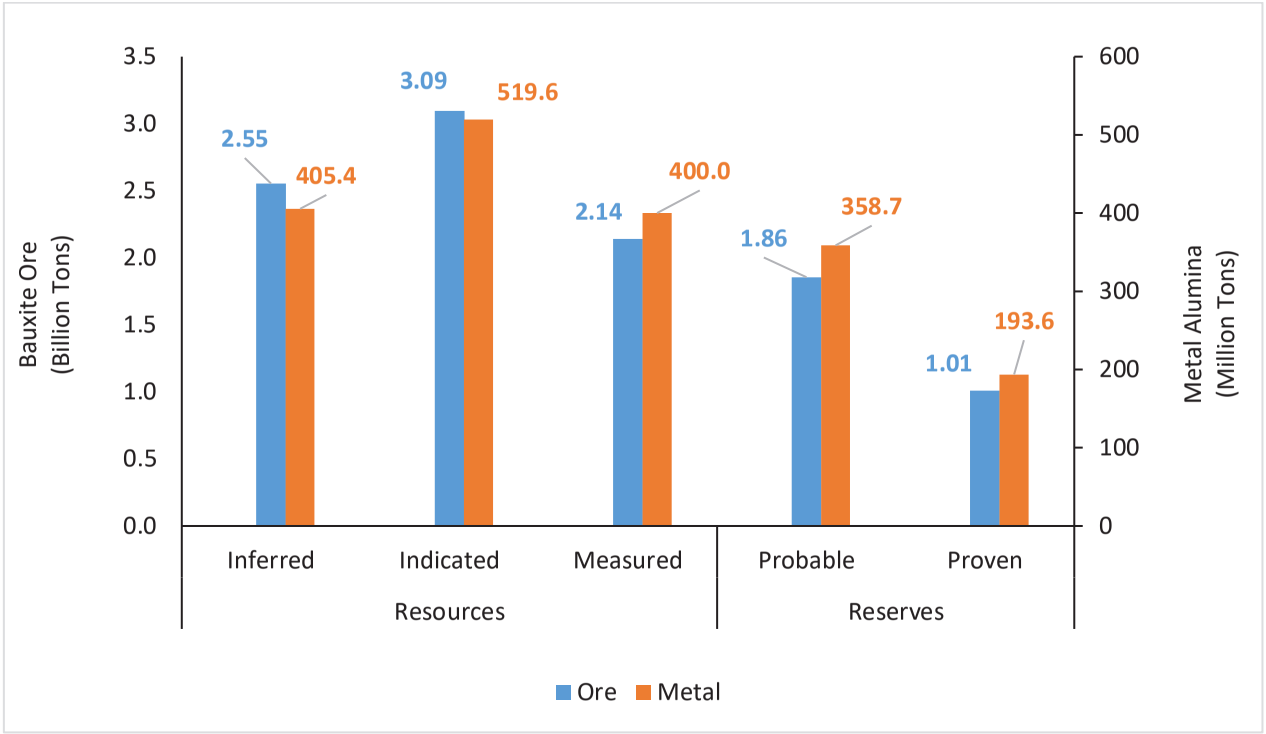


Figure 38. Bauxite Ore and Alumina Metal Resources and Reserves for 2024

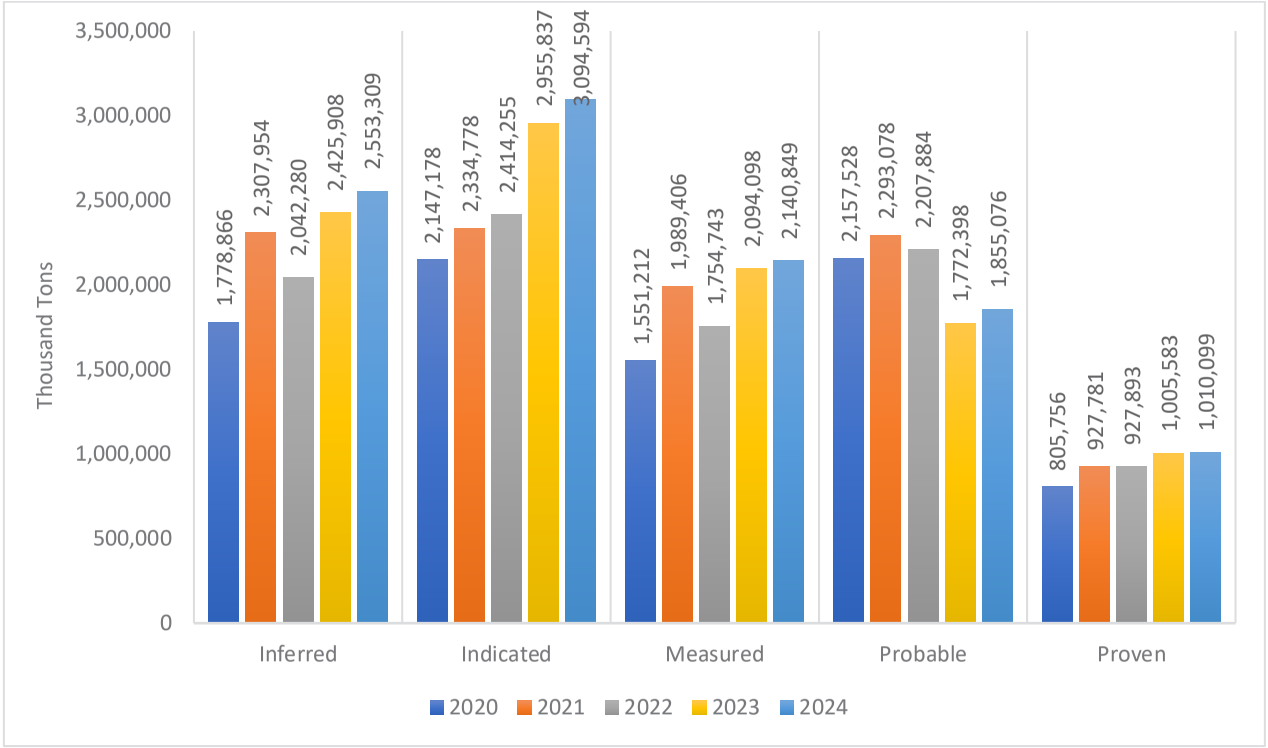


Figure 39. Trend of Crude Bauxite Resources and Reserves for the Years 2020–2024

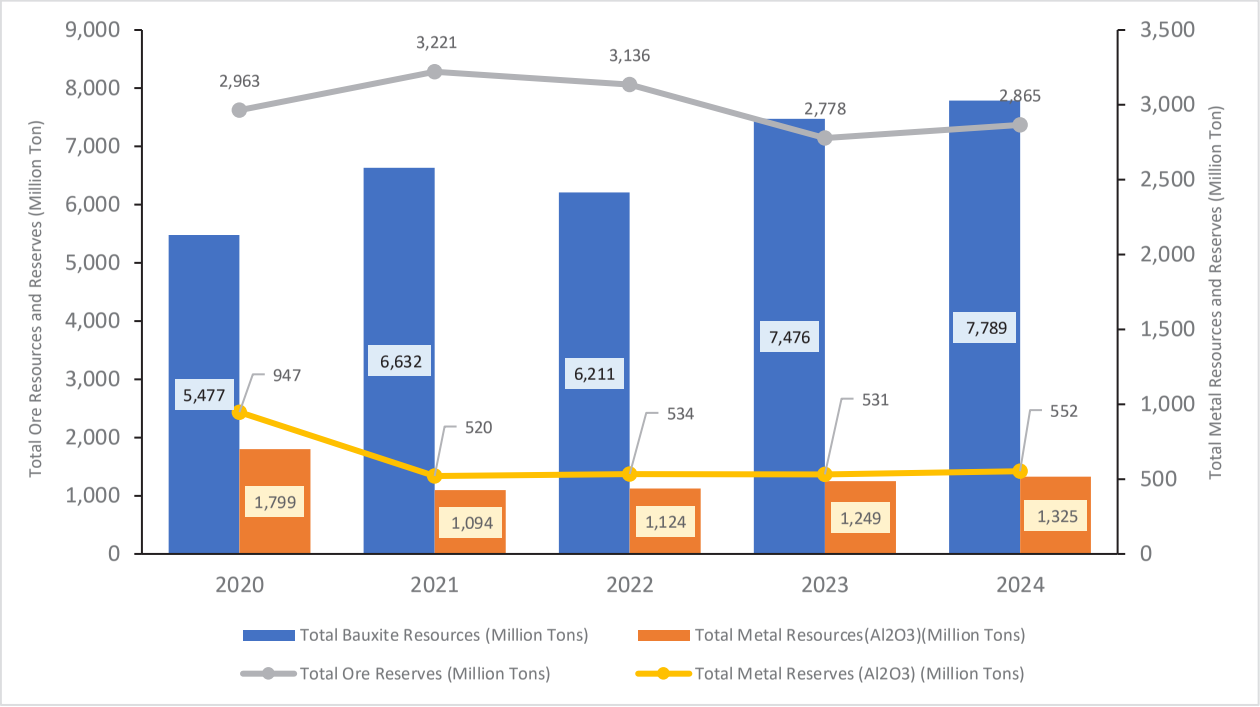


Figure 40. Trend of Bauxite Ore and Alumina (Al_2O_3) Resources and Reserves for the Years 2020–2024

Table 12. Classification of Bauxite Ore and Alumina Metal Resources and Reserves for 2024 Based on Al_2O_3 Grade (Source: Antam, 2020)

Classification of Bauxite Content (Al_2O_3)		Resources (Million Tons)						Reserves (Million Tons)				Total (Million Tons)			
		Inferred		Indicated		Measurable		Probable		Proven		Resources		Reserves	
		Ore	Metal	Ore	Metal	Ore	Metal	Ore	Metal	Ore	Metal	Ore	Metal	Ore	Metal
No Concentration Al_2O_3	No Concentration Al_2O_3	294.5	0.0	264.5	0.0	30.8	0.0	39.3	0.0	3.4	0.0	589.9	0.0	42.7	0,0
Al_2O_3 < 38.5%	Low Grade	11.1	4.5	39.6	12.7	0.38	0.11	19.8	6.4	0.14	0.04	51.1	17.3	20.0	6,4
38.5 %< Al_2O_3 < 42%	Low Grade - Medium Grade	5.4	1.8	28.8	9.9	229.2	76.4	10.5	3.8	139.2	47.2	263.5	88.0	149.7	51,0
42 % < Al_2O_3 < 46%	Medium Grade - High Grade	420.9	160.6	264.9	101.5	259.8	98.2	201.0	78.1	95.8	36.4	945.7	360.3	296.7	114,5
Al_2O_3 > 46%	High Grade	580.5	238.5	954.5	395.6	541.9	225.4	669.1	270.4	268.02	110.0	2,077.0	859.5	937.08	380,4
Total		**1,312.5**	**405.4**	**1,552.4**	**519.6**	**1,062.2**	**400.04**	**939.6**	**358.7**	**506.5**	**193.6**	**3,927.1**	**1,325.1**	**1,446.1**	**552.3**

Table 13. Classification of Bauxite Ore and Alumina Metal Resources and Reserves, 2023

Classification of Bauxite Content (Al_2O_3)		Resources (Million Tons)						Reserves (Million Tons)				Total (Million Tons)			
		Inferred		Indicated		Measurable		Probable		Proven		Resources		Reserves	
		Ore	Metal	Ore	Metal	Ore	Metal	Ore	Metal	Ore	Metal	Ore	Metal	Ore	Metal
No Concentration Al_2O_3	No Concentration Al_2O_3	589.06	0.0	532.2	0.0	65.7	0.0	83.7	1.08	8.01	0.0	1,186.9	0.0	91.7	1,08
Al_2O_3 < 38.5%	Low Grade	0.59	0.09	187.8	15.7	91.4	14.8	39.6	6.4	0.74	0.07	279.7	30.6	40.4	6,5
38.5 %< Al_2O_3 < 42%	Low Grade - Medium Grade	83.2	14.7	57.7	9.9	376.2	63.1	5.3	0.91	253.6	42.7	517.1	87.6	258.8	43,6
42 % < Al_2O_3 < 46%	Medium Grade - High Grade	550.08	123.6	413.5	79.01	467.06	88.7	232.06	45.1	173.4	32.2	1,430.7	291.3	405.5	77,3
Al_2O_3 > 46%	High Grade	1,203.01	244.5	1,764.7	366.1	1,093.8	228.3	1,411.7	285.7	569.8	117.3	4,061.4	838.9	1,981.6	403,01
Total		**2,425.9**	**382.9**	**2,955.8**	**470.7**	**2,094.1**	**395.0**	**1,772.4**	**339.2**	**1,005.6**	**192.2**	**7,475.8**	**1,248.5**	**2,778.0**	**531.4**

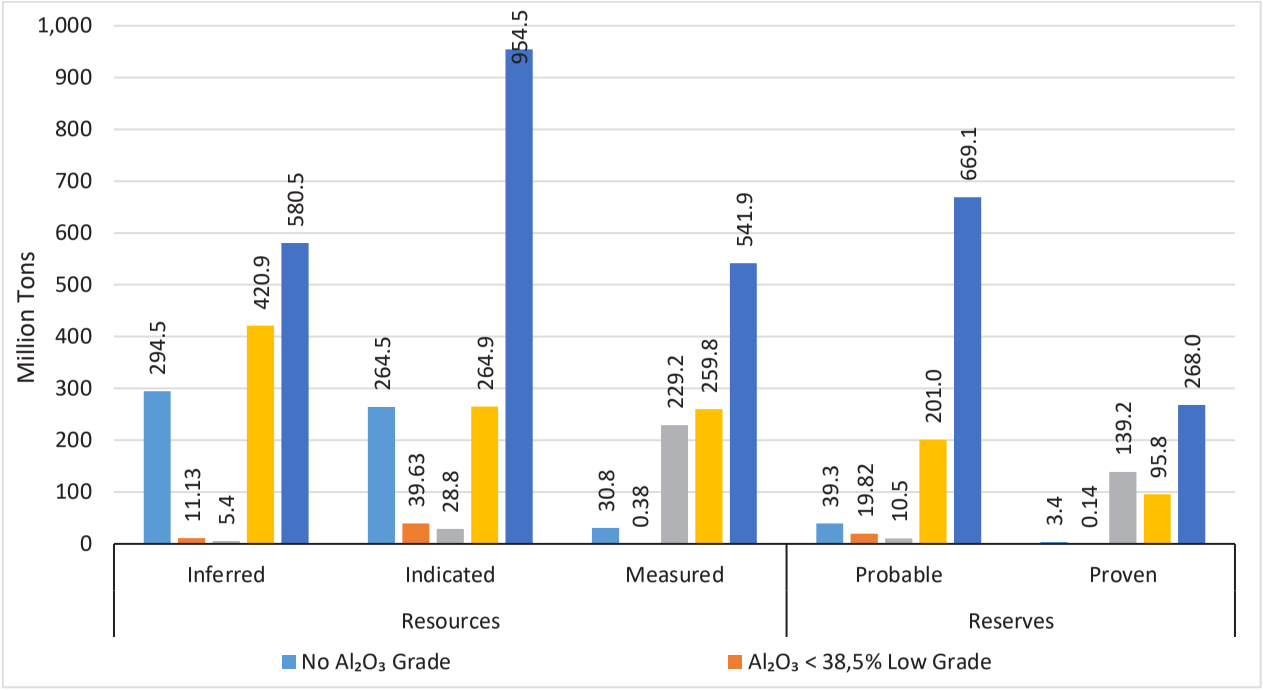


Figure 41. Diagram of Bauxite Ore Resources and Reserves Grouped by Al_2O_3 Grade for 2024 (Source: Antam, 2020)

Table 14. Bauxite Resources and Reserves by Province, 2024

NO	PROVINCE	NUMBER OF LOCATIONS	RESOURCES (TONS)							
			INFERRED		INDICATED		MEASURED		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL	ORE	METAL
1	Riau Islands	44	592,103,300	60,589,085	458,109,976	52,292,046	313,376,274	60,551,880	1,363,589,550	173,433,011
2	Bangka Belitung Islands	1	-	-	3,100,000	368,900	-	-	3,100,000	368,900
3	West Kalimantan	123	1,822,027,980	324,775,711	2,436,029,227	424,254,071	1,729,061,075	321,873,914	5,987,118,282	1,070,903,697
4	Central Kalimantan	11	139,177,787	20,078,760	197,355,009	42,675,981	98,411,734	17,612,080	434,944,530	80,366,822
Total		**179**	**2,553,309,067**	**405,443,556**	**3,094,594,212**	**519,590,999**	**2,140,849,083**	**400,037,874**	**7,788,752,362**	**1,325,072,429**

NO	PROVINCE	NUMBER OF LOCATIONS	RESERVES (TONS)					
			PROBABLE		PROVEN		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL
1	Riau Islands	44	191,185,024	34,380,350	128,143,243	25,633,020	319,328,267	60,013,370
2	Bangka Belitung Islands	1	-	-	-	-	-	-
3	West Kalimantan	123	1,556,758,909	300,261,747	835,399,607	159,377,666	2,392,158,516	459,639,413
4	Central Kalimantan	11	107,132,012	24,050,114	46,556,048	8,606,632	153,688,060	32,656,745
Amount		**179**	**1,855,075,945**	**358,692,210**	**1,010,098,898**	**193,617,318**	**2,865,174,843**	**552,309,528**

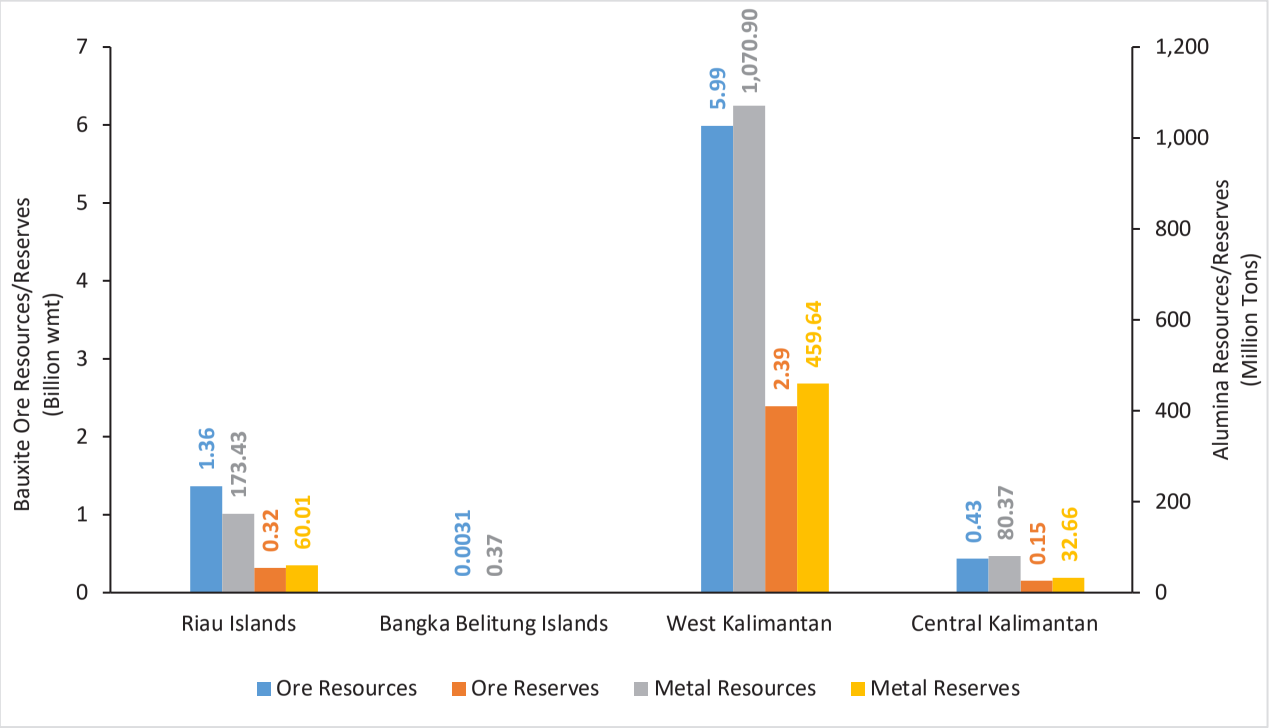


Figure 42. Bauxite Ore and Alumina Resources and Reserves by Province for 2024

TIN

The 2024 update reveals that most tin ore is classified as probable reserves and measured resources. The total of tin ore resources is 8.27 billion cubic meters, while reserves account for 6.43 billion cubic meters. Cassiterite (SnO_2) concentrate resources total 3.517 million tons, with reserves at 1.99 million tons. In terms of metal content, tin (Sn) resources are recorded at 2.53 million tons, and reserves at 1.44 million tons (Figures 43 and 44).

Between 2020 and 2024, tin ore resources increased by 195 million cubic meters, and ore reserves increased by 69 million cubic meters compared to 2023. Cassiterite concentrate and tin metal resources and reserves also experienced moderate increased over this period.

Production of tin metal, covering grades P50 to P300, reached 39.8 thousand tons.

Based on the trends of resources and reserves over the past five years, from 2020 to 2024, more detailed feasibility studies are needed to upgrade measured resources into probable or proven reserves. Provincial-level data on tin ore resources and reserves is available in Table 15 and Figure 46. Moreover, further exploration efforts are needed to upgrade inferred resources to indicated or measured categories (Figures 43, 44, and 45).

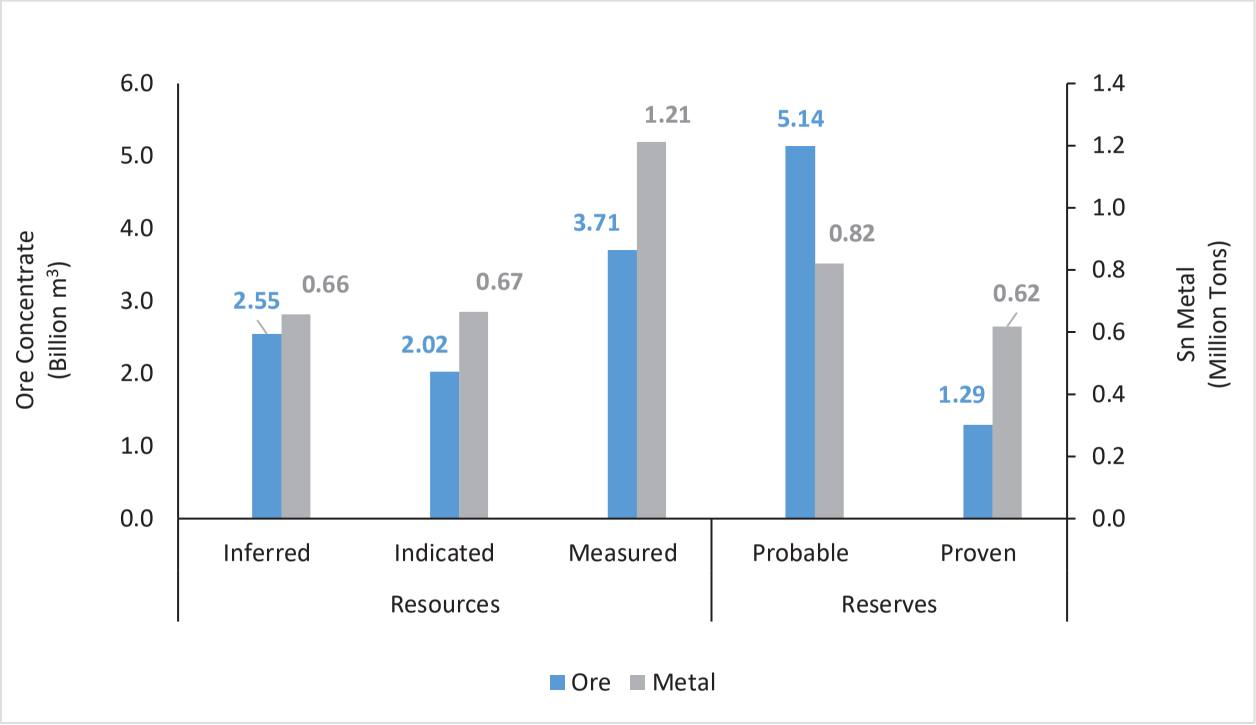


Figure 43. Tin Concentrate/Metal Resources and Reserves for 2024

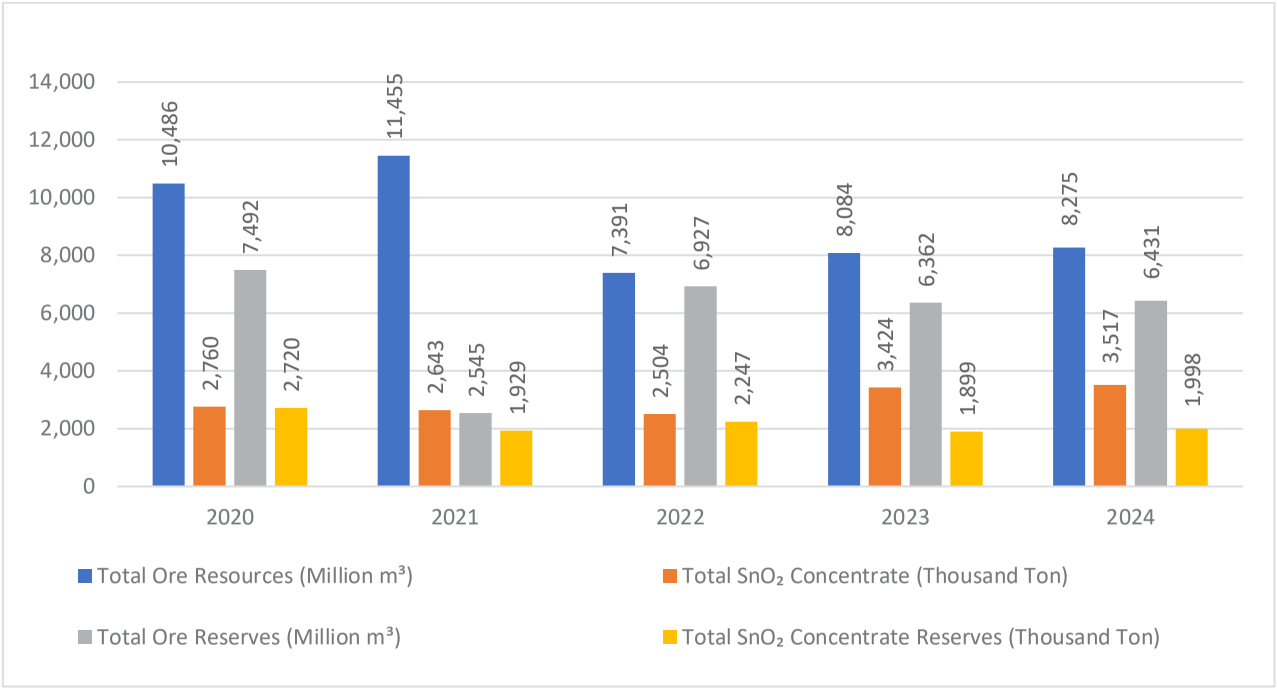


Figure 44. Trend of Total Tin Ore/Concentrate (SnO_2) Resources and Reserves for the Years 2020–2024

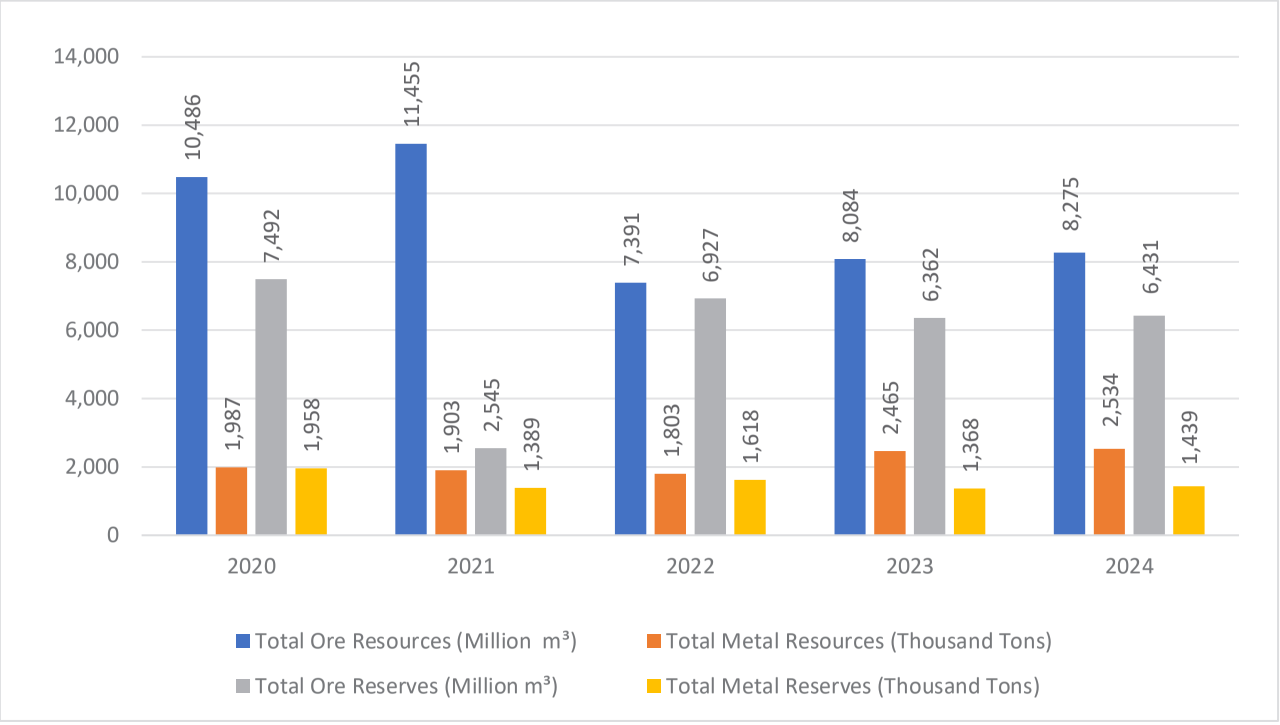


Figure 45. Trends of Tin Ore/Metal (Sn) Resources and Reserves, 2020–2024

Table 15. Total Resources and Total Reserves of Tin Sand, SnO_2 Concentrate, and Tin Metal by Province, 2024

NO	PROVINCE	NUMBER OF LOCATIONS	RESOURCES (TONS)*							
			INFERRED		INDICATED		MEASURED		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL	ORE	METAL
1	West Kalimantan	5	28,261,997	6,521	981,262	6,124	-	8,028	29,243,258	20,673
2	Bangka Belitung Islands	353	2,027,964,636	597,601	1,830,688,544	596,905	3,153,957,069	1,071,249	7,012,610,249	2,265,755
3	Riau Islands	28	485,415,855	52,465	192,486,612	56,819	551,077,810	132,577	1,228,980,278	241,861
4	Riau	5	4,353,000	169	208,269	5,207	10,000	250	4,571,269	5,626
Total		**391**	**2,545,995,488**	**656,756**	**2,024,364,687**	**665,055**	**3,705,044,879**	**1,212,104**	**8,275,405,054**	**2,533,915**

NO	PROVINCE	NUMBER OF LOCATIONS	RESERVES (TONS)*					
			PROBABLE		PROVEN		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL
1	West Kalimantan	5	-	-	-	-	-	-
2	Bangka Belitung Islands	353	4,586,997,159	740,841	1,069,928,708	555,365	5,656,925,867	1,296,206
3	Riau Islands	28	551,167,664	79,779	222,568,126	62,678	773,735,790	142,457
4	Riau	5	-	-	-	-	-	-
Total		**391**	**5,138,164,824**	**820,620**	**1,292,496,834**	**618,043**	**6,430,661,657**	**1,438,663**

*Ore/concentrate units in m^3

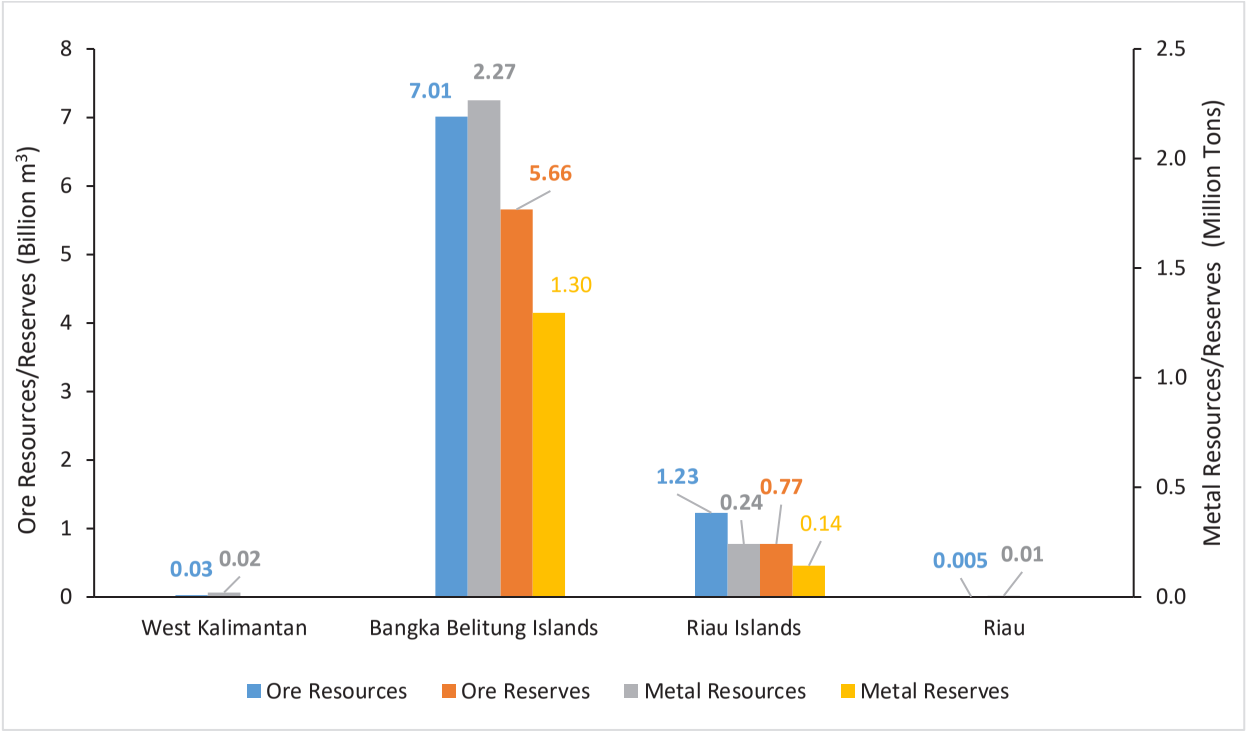


Figure 46. Trend of Total Tin Ore/Metal Resources and Reserves by Province for 2024.

PRIMARY IRON

As of 2024, the majority of iron ore resources are classified as indicated, and have the potential to be upgraded to probable reserves through detailed feasibility studies that apply relevant modifying factors. (Figure 47).

Between 2020 and 2024, iron ore resources experienced only a slight increase, and the reserve for 2024 were slightly lower than those recorded in 2023. The total iron ore resources reached 7.83 billion tons, while reserves stood at 1.2 billion tons (Figure 48). Iron ore production for the year amounted to 1.19 million tons in the form of concentrate.

Distribution the majority of iron ore resources and reserves are concentrated in several regions: Aceh, North Maluku, South and North Sulawesi, West and South Sumatra, West Java, West, Central, and East Kalimantan, as well as East Nusa Tenggara (Table 16 and Figure 49).

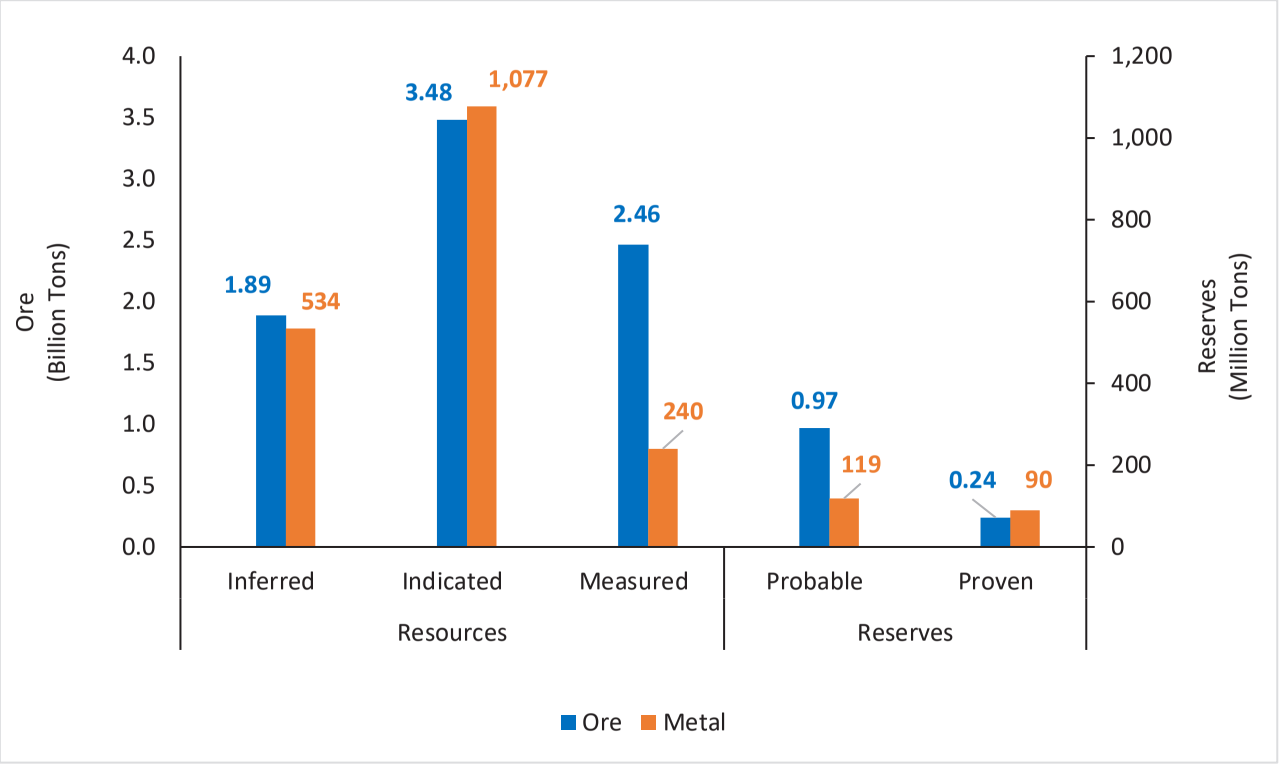


Figure 47. Primary Iron Ore/Metal Resources and Reserves for 2024

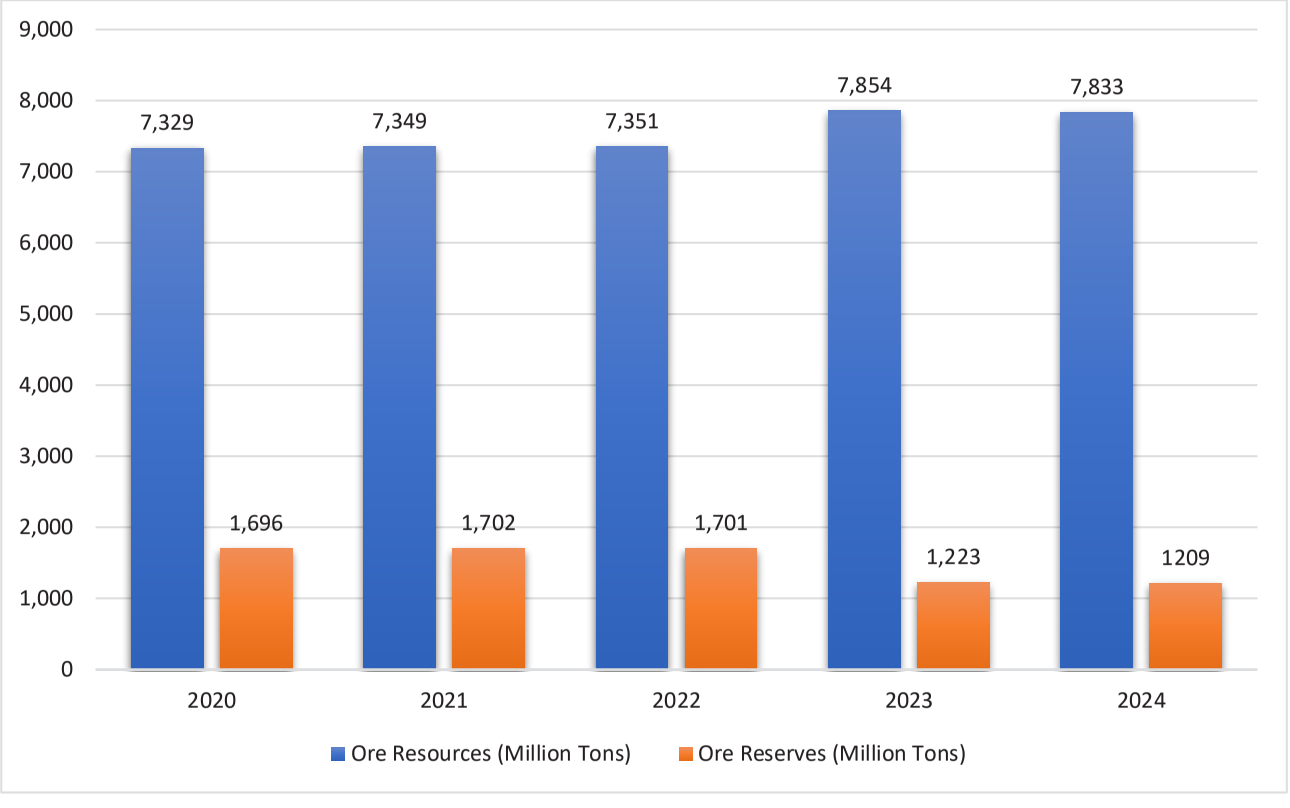


Figure 48. Trend of Primary Iron Ore Resources and Reserves for the Years 2020–2024.

Table 16. Primary Iron Ore and Metal Resources and Reserves by Province, 2024.

NO	PROVINCE	NUMBER OF LOCATIONS	RESOURCES (TONS)							
			INFERRED		INDICATED		MEASURED		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL	ORE	METAL
1	Aceh	13	992,122,678	385,597,653	2,442,825,644	912,072,679	86,184,280	21,301,120	3,521,132,602	1,318,971,452
2	Jambi	9	2,347,363	1,455,365	20,580,054	10,940,978	6,025,598	5,194,902	28,953,015	17,591,245
3	West Java	2	18,000,000	-	37,427,111	-	-	-	55,427,111	-
4	West Kalimantan	12	377,700	35,970	44,381,728	13,617,188	72,908	43,016	44,832,336	13,696,173
5	South Kalimantan	21	23,962,458	13,137,711	23,949,581	14,036,820	33,908,174	17,624,668	81,820,213	44,799,198
6	Central Kalimantan	18	29,691,241	12,106,942	56,040,902	13,455,075	49,871,114	26,225,289	135,603,257	51,787,305
7	East Kalimantan	2	-	-	409,659	-	18,000,000	9,900,000	18,409,659	9,900,000
8	Bangka Belitung Islands	4	-	-	35,916,306	18,524,953	58,317	10	35,974,623	18,524,963
9	Riau Islands	5	10,422,920	30,250	24,114,934	-	-	-	34,537,854	30,250
10	Lampung	7	891,185	468,942	788,612	473,533	1,261,509	638,753	2,941,306	1,581,228
11	North Maluku	42	657,751,099	58,448,186	66,314,600	23,120,869	262,765,129	10,701,926	986,830,828	92,270,981
12	West Nusa Tenggara	3	93,506	-	1,271,204	9,554	523,450	-	1,888,160	9,554
13	East Nusa Tenggara	2	34,965,280	20,979,168	26,223,960	15,734,376	18,208,640	10,947,109	79,397,880	47,660,653
14	West Sulawesi	4	6,372	190	-	-	-	-	6,372	190
15	South Sulawesi	6	50,000,000	27,590,000	161,510,060	21,898,425	1,648,578,223	670,559	1,860,088,283	50,158,984
16	Central Sulawesi	2	3,900,000	2,145,000	368,487,933	-	-	-	372,387,933	2,145,000
17	North Sulawesi	1	-	-	61,936,951	25,394,150	328,092,049	134,517,740	390,029,000	159,911,890
18	West Sumatera	21	59,795,197	10,626,268	103,768,033	7,948,794	9,896,223	2,253,968	173,459,453	20,829,030
19	South Sumatera	3	2,400,000	1,131,840	5,764,275	-	900,000	-	9,064,275	1,131,840
Total		**177**	**1,886,726,998**	**533,753,484**	**3,481,711,546**	**1,077,227,394**	**2,464,345,614**	**240,019,059**	**7,832,784,158**	**1,850,999,937**

NO	PROVINCE	NUMBER OF LOCATIONS	CADANGAN (TON)					
			PROBABLE		PROVEN		TOTAL	
			ORE	METAL	ORE	METAL	ORE	METAL
1	Aceh	13	47,394,481	22,241,751	87,188,147	34,424,786	134,582,628	56,666,536
2	Jambi	9	10,991,083	2,158,001	5,735,001	1,373,055	16,726,084	3,531,057
3	West Java	2	-	-	-	-	-	-
4	West Kalimantan	12	-	-	49,391,366	27,964,689	49,391,366	27,964,689
5	South Kalimantan	21	1,903,904	1,086,549	1,848,300	1,054,825	3,752,204	2,141,374
6	Central Kalimantan	18	94,895,101	49,304,427	37,229,381	13,248,605	132,124,482	62,553,032
7	East Kalimantan	2	-	-	-	-	-	-
8	Bangka Belitung Islands	4	-	-	50,161	10	50,161	10
9	Riau Islands	5	-	-	-	-	-	-
10	Lampung	7	479,869	240,824	228,509	112,433	708,378	353,257
11	North Maluku	42	341,256,923	22,707,081	14,751,239	6,822,448	356,008,162	29,529,530
12	West Nusa Tenggara	3	-	-	658,250	-	658,250	-
13	East Nusa Tenggara	2	3,496,528	2,097,917	1,748,264	1,048,958	5,244,792	3,146,875
14	West Sulawesi	4	-	-	-	-	-	-
15	South Sulawesi	6	3,467,912	2,046,068	4,732,000	-	8,199,912	2,046,068
16	Central Sulawesi	2	368,487,933	-	-	-	368,487,933	-
17	North Sulawesi	1	40,245,890	16,500,815	6,594,520	2,703,753	46,840,410	19,204,568
18	West Sumatera	21	54,655,950	143,770	28,761,519	930,000	83,417,469	1,073,770
19	South Sumatera	3	1,792,000	-	739,200	-	2,531,200	-
Total		**177**	**969,067,574**	**118,527,202**	**239,655,857**	**89,683,563**	**1,208,723,431**	**208,210,765**

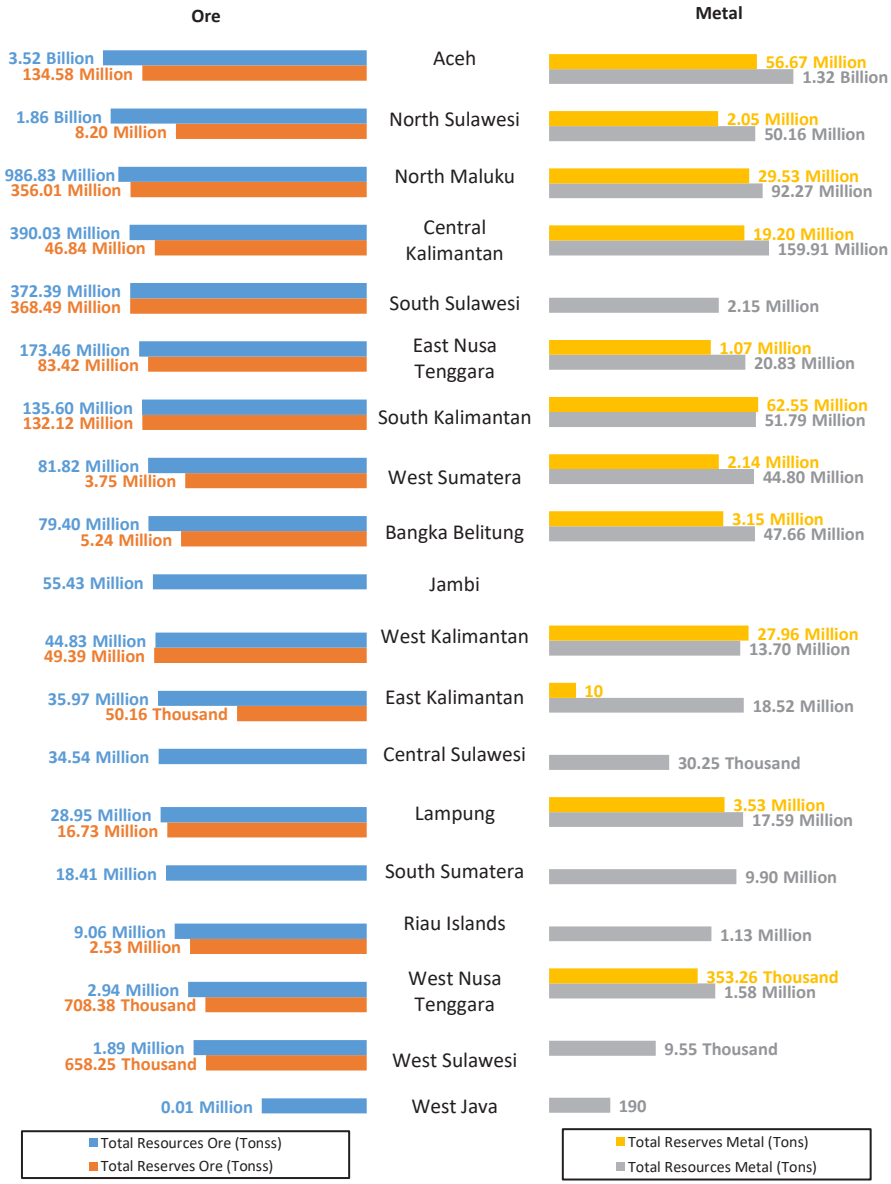


Figure 49. Primary Iron Ore Resources and Reserves by Province for 2024

3.1.2. NON-METALLIC MINERALS AND ROCK RESOURCES

By 2024, 1,779 records had been compiled, consisting of 1,695 from the Mineral and Coal Resource and Reserve Data Reconciliation project with government support, and 84 from CMCGR – Geological Agency surveys in 2023.

Table 17. Data Sources for the Indonesian Non-Metallic Minerals and Rocks Resources and Reserves, 2024.

No	Province	Data Reconciliation (Directorate General of Mineral and Coal)	CMCGR Investigation	TOTAL
1	Aceh	117	5	122
2	Banten	133	-	133
3	D I Yogyakarta	33	-	33
4	Gorontalo	17	-	17
5	West Java	103	-	103
6	Central Java	203	-	203
7	East Java	57	-	57
8	South Kalimantan	89	-	89
9	Central Kalimantan	77	27	104
10	North Kalimantan	29	-	29
11	Bangka Belitung Islands	97	-	97
12	Riau Islands	62	19	81
13	Lampung	44	-	44
14	North Maluku	13	-	13
15	West Nusa Tenggara	94	-	94
16	East Nusa Tenggara	36	-	36
17	West Papua	10	-	10
18	Southwest Papua	4	-	4
19	Riau	85	9	94
20	West Sulawesi	64	-	64
21	South Sulawesi	71	12	83
22	Central Sulawesi	25	-	25
23	Southeast Sulawesi	36	-	36
24	North Sulawesi	11	-	11
25	West Sumatera	121	12	133
26	South Sumatera	14	-	14
27	North Sumatera	50	-	50
TOTAL		**1.695**	**84**	**1.779**

The 2024 update activities for the non-metallic mineral and rock resources and reserves demonstrated growth compared to the previous year. This year, 1,139 new site locations for non-metallic minerals were recorded across Indonesia, representing 31 different commodities. Moreover, 640 existing locations were updated, covering 22 commodities in various provinces. Consequently, the 2024 resources and reserves includes a total of 6,587 location points representing 57 types of non-metallic mineral commodities distributed nationwide.

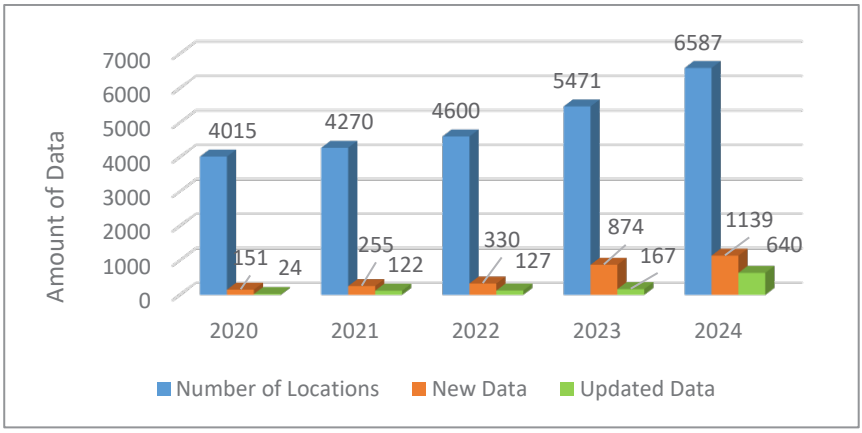


Figure 50. Statistics of the Number of Data Locations, New Data, and Data Updates for Non-Metallic Mineral and Rock Resources and Reserves, 2020–2024

Compared to 2023, the 2024 data revealed several significant changes in the volumes of resources and reserves for non-metallic minerals and rocks. Notable fluctuations were observed in commodities such as andesite, limestone, potassium-bearing rocks, bentonite, dolomite, feldspar, kaolin,

quartzite, clay, silica sand, marine sand, zircon sand, natural sand-gravel mixtures (sirtu), trass, and ultrabasic rocks.

The classification of non-metallic minerals and rocks follows Government Regulation No. 96 of 2021 on mining operations, and Ministerial Decree No. 147.K/MB.01/MEM.B/2022, which redefines the classification of minerals such as dolomite, feldspar, phosphate, graphite, quartzite, and zircon. These commodities are grouped into three main categories.

Tables 18 to 20 summarize the resources and reserves for each group, showing not only national totals by commodity but also comparisons between the 2023 and 2024 datasets, including updated records and new data entries.

1. **General Non-Metallic Minerals**, including materials such as asbestos, barite, sulfur, bentonite, fluorite, gypsum, halite, calcite, kaolin, and zeolite;
2. **Specific Non-Metallic Mineral Types**, comprising gemstones and industrial minerals like diamond, ruby, dolomite, feldspar, phosphate, quartzite, zircon, limestone, clay, and silica sand used in the cement and non-cement industries;
3. **Rocks**, which cover a wide range of materials including andesite, basalt, limestone, granite, trass, marble, and various natural gravels and sands, provided they lack economically valuable metal or non-metal content.

Tables 18 to 20 summarize the resources and reserves for each group, showing not only national totals by commodity but also comparisons between the 2023 and 2024 datasets, including updated records and new data entries.

Table 18. Recapitulation of Non-Metallic Minerals Resources and Reserves, 2024

No	Comodity	Total Data		New Data 2024	Updated Data 2024	Hypothetical (Tons)	Resources (Tons)			Reserves (Tons)	
		2023	2024				Inferred	Indicated	Measured	Probable	Proven
1	Barite	5	5	-	-	377,000	300,000	37,078,000	-	-	-
2	Sulfur	17	17	-	-	1,697,000	254,400	2,610,192	357,100	2,610,192	-
3	Bentonite	113	118	5	4	501,190,800	304,030,462	85,033,678	26,903,569	16,548,667	20,263,987
4	Gypsum	13	13	-	-	7,268,422	-	9,890	161,000	-	-
5	Calcite	7	9	1	1	60,025,000	62,092,200	10,152,050	8,472,050	385,666,603	6,354,038
6	Kaolin	132	136	6	15	1,252,280,424	270,294,552	155,789,747	135,727,642	132,557,418	68,856,957
7	Magnesite	3	3	-	2	780	-	-	-	408,802	-
8	Ochre	11	11	-	-	123,085,840	-	45,000	-	-	-
9	Pyrophyllite	9	10	1	1	104,762,000	38,599,214	15,632,008	12,477,572	15,065,135	4,627,407
10	Chert	8	9	1	-	381,651,334	24,083,210	-	190,292	-	190,292
11	Serpentinite	15	15	-	-	1,290,635,000	19,028,417	14,751,955	10,436,394	8,979,723	12,698,523
12	Talc	5	5	-	-	185,000	1,945,000	1,200	-	-	-
13	Travertine	1	1	-	-	-	7,500	-	-	-	-
14	Iodine	4	4	-	-	-	-	-	138,192	9,020	1,638
15	Zeolite	41	41	-	-	236,081,163	117,132,625	141,247,006	38,820,791	3,886,070	1,992,016

Table 19. Recapitulation of Non-Metallic Minerals Total Resources and Reserves, 2024

No	Comodity	Group	Hypothetical (Tons)	Total Resources (Tons)	Total Reserves (Tons)
1	Barite	Industrial Minerals	377,000	37,378,000	-
2	Sulfur	Industrial Minerals	1,697,000	3,221,692	2,610,192
3	Bentonite	Industrial Minerals	501,190,800	415,967,709	36,812,654
4	Gypsum	Industrial Minerals	7,268,422	170,890	-
5	Calcite	Industrial Minerals	60,025,000	80,716,300	392,020,641
6	Kaolin	Ceramic Materials Mineral	1,252,280,424	561,811,941	201,414,375
7	Magnesite	Ceramic Materials Mineral	780	-	408,802
8	Ochre	Industrial Minerals	123,085,840	45,000	-
9	Pyrophyllite	Ceramic Materials Mineral	104,762,000	66,708,795	19,692,542
10	Chert	Precious Stones	381,651,334	24,273,502	190,292
11	Serpentinite	Industrial Minerals	1,290,635,000	44,216,766	21,678,246
12	Talc	Industrial Minerals	185,000	1,946,200	-
13	Travertine	Industrial Minerals	-	7,500	-
14	Iodine	Industrial Minerals	-	138,192	10,658
15	Zeolite	Industrial Minerals	236,081,163	297,200,422	5,878,086

Note: *=sum of inferred, indicated and measured resources; **=sum of probable and proven reserves

Based on the summary data of non-metallic mineral resources and reserves groups (Tables 20 and 21), certain commodities are still dominated by hypothetical resource estimates. These are expected to be upgraded to inferred, indicated, or even measured categories, which will require intensified exploration in the relevant regions.

While some minerals show large overall resource quantities, their confirmed reserves are still minimal. For example, bentonite has 415.9 million tons of resources but only 36.8 million tons in reserves, and zeolite has 297.2 million tons in resources compared to just 5.8 million tons in reserves. This reflects a significant untapped potential that has not yet been fully explored or commercially developed.

Moreover, commodities such as barite, gypsum, ochre, talc, and travertine currently have no documented reserves at all.

The volume of recorded data for non-metallic minerals also remains limited. To improve this, enhanced coordination is necessary between central and regional authorities responsible for mining data to effectively track and document the latest developments in resource and reserve inventories for non-metallic minerals throughout the country.

Table 20. Recapitulation of Resources and Reserves of Specific Types of Non-Metallic Mineral, 2024

No	Comodity	Total Data		New Data 2024	Updated Data 2024	Hypothetical (Tons)	Resources (Tons)			Reserves (Tons)	
		2023	2024				Inferred	Indicated	Measured	Probable	Proven
1	Amethyst	1	1	-	-	-	8,668	-	-	-	-
2	Limestone	1000	1106	111	57	608,085,100,467	193,821,514,506	27,705,582,852	28,686,484,501	12,366,935,671	14,991,926,824
3	Dolomite	74	79	5	3	2,450,643,480	2,809,045,502	1,870,659,733	473,351,101	369,602,583	455,321,096
4	Feldspar	175	186	11	8	6,435,680,286	4,444,877,091	656,521,931	187,566,114	90,936,290	89,926,859
5	Phosphate	72	73	1	-	19,114,414	4,453,853	5,477,079	1,353,588	-	187,561
6	Graphite	3	3	-	-	23,457,457	17,000,000	14,300,000	-	-	-
7	Diamond*	3	3	-	-	100,640	33,522,908	10,067,293	-	10,073,201	-
8	Quartzite	16	28	12	1	350,962,700	1,418,291,910	237,154,899	-	-	-
9	Clay	566	602	31	17	91,002,625,845	9,643,964,781	1,907,256,952	1,551,875,515	744,843,140	639,507,296
10	Zircon Sand	68	82	16	15	5,026,850	205,535,345	190,180,527	135,069,502	112,077,476	38,520,582
11	Quartz Sand	478	611	139	91	23,278,271,100	10,576,146,133	9,000,104,268	6,826,704,002	4,359,638,300	3,451,983,400

*resource and reserve tonnage units : diamonds in carats;

Table 21. Recapitulation of Total Resources and Total Reserves of Certain Non-Metallic Mineral Groups, 2024.

No	Comodity	Group	Hypothetical (Tons)	Total Resources (Tons) **	Total Rserves (Tons) ***
1	Amethyst	Precious Stones	-	8,668	-
2	Limestone	Industrial Minerals	608,085,100,467	250,213,581,859	27,358,862,495
3	Dolomite	Industrial Minerals	2,450,643,480	5,153,056,336	824,923,679
4	Feldspar	Ceramic Materials Mineral	6,435,680,286	5,288,965,136	180,863,149
5	Phosphate	Industrial Minerals	19,114,414	11,284,520	187,561
6	Graphite	Industrial Minerals	23,457,457	31,300,000	-
7	Diamond*	Precious Stones	100,640	43,590,201	10,073,201
8	Quartzite	Industrial Minerals	350,962,700	1,655,446,809	-
9	Clay	Ceramic Materials Mineral	91,002,625,845	13,103,097,248	1,384,350,436
10	Zircon Sand	Industrial Minerals	5,026,850	530,785,374	150,598,058
11	Quartz Sand	Industrial Minerals	23,278,271,100	26,402,954,403	7,811,621,700

Note : **Resource and Reserve tonnage units: diamonds in carats;
**Sum of inferred, indicated, and measured resources;
***Sum of probable and proven reserves

Based on the summarized data in Tables 22 and 23, hypothetical resources still dominate several specific non-metallic minerals. These deposits are expected to be upgraded to inferred, indicated, or measured categories, which will require more intensive exploration in their respective locations.

Some minerals, although rich in resource volume, have very limited or even no confirmed reserves. For instance, feldspar holds a total of 5.2 billion tons in resources but only 180.8 million tons in reserves. Quartzite shows a significant resource increase from the previous year, reaching 1.6 billion tons, yet no reserves have been recorded. This points to untapped potential that has not yet been effectively developed or utilized.

In several cases, the absence of reserve data may reflect the challenging nature of the deposits, either due to difficult access or limited geological data, with most of their classification still at the inferred or indicated resource level.

This poses a challenge for companies looking to develop these commodities. Graphite and quartzite are among the materials that currently lack any documented reserves.

Table 22. Recapitulation of Resources and Reserves of Rock Groups, 2024

No	Comodity	Total Data		New Data 2024	Updated Data 2024	Hypothetical (Tons)	Resources (Tons)			Reserves (Tons)	
		2023	2024				Inferred	Indicated	Measured	Probable	Proven
1	Andesite	804	1031	232	158	57,679,160,000	18,370,609,692	10,872,573,385	9,442,712,355	5,000,794,633	4,051,815,488
2	Ball / Bond Clay	22	23	1	-	99,620,000	80,019,131	31,365,071	154,112,007	63,663,509	69,211,300
3	Basalt	43	50	7	4	1,282,370,631	5,092,658,266	146,359,248	107,389,041	45,252,730	64,342,915
4	Ornament Stone	25	25	-	3	2,940,750,748	95,447	49,800	123,294	51,971	140,354
5	Quartz Stone	4	6	2	-	390,000	6,699,574	7,232,987	33,734,108	6,217,518	18,608,040
6	Potassium Bearing Rock	31	43	12	-	1,086,652,000	60,927,956,291	13,229,435,793	1,439,436,948	-	-
7	Pumice	30	31	1	-	601,552,780	96,811,000	65,283,000	747,484	711,484	-
8	Slate	6	6	-	-	39,145,830	-	-	-	-	-
9	Dacite	23	24	1	-	1,189,258,627	2,026,125,000	1,499,118	-	1,499,118	345,722
10	Diabase	1	1	-	-	625,000,000	-	-	-	-	-
11	Diatomite	12	12	-	-	107,105,800	52,000	31,004,700	-	-	-
12	Diorite	30	30	-	2	8,773,845,000	520,000,000	32,312,459	-	31,276,870	-
13	Jade	8	8	-	-	271,530	2,509,575	-	-	-	-
14	Granite	176	176	2	22	60,407,990,863	18,132,718,680	2,324,694,772	4,008,390,690	774,045,598	524,750,816
15	Granodiorite	9	10	1	-	2,126,000,000	-	872,589	-	892,981	-
16	Jasper	2	2	-	-	600	-	650,000	-	-	-
17	Chalcedony	9	10	1	-	109,852	3,130,332	838,240	111,816	117,936	75,816
18	Petrified Wood	1	1	-	-	-	13,750	-	-	-	-
19	Marble	123	136	13	2	106,220,384,000	5,098,271,881	1,373,173,142	666,250,184	1,151,316,620	392,859,740
20	Obsidian	7	10	3	-	4,150,000	62,720,000	16,385,336	8,713,851	1,856,384	7,337,834
21	Onyx	3	3	-	-	527,500	-	-	-	-	-
22	Opal	2	2	-	-	-	-	-	1,67	-	-
23	Sea Sand*	42	52	10	5	-	2,720,698,118	4,293,936,194	2,473,327,472	3,097,945,695	1,706,511,597
24	Gabbro/Peridotite	20	26	7	1	8,289,422,000	109,563,520	108,475,642	39,227,557	70,816,845	27,477,685
25	Perlite	20	22	2	-	1,287,190,100	193,004,000	19,766,336	15,249,240	-	12,841,211
26	Prehnite	1	1	-	-	-	-	4,200	-	-	-
27	Sand and Gravel	931	1405	479	222	5,137,269,319	8,640,757,460	3,988,334,931	5,154,012,494	3,987,456,038	2,560,608,272
28	Toseki	36	36	-	-	221,651,000	48,816,000	5,080,000	-	-	-
29	Trachyte	23	23	-	-	4,124,316,000	-	1,286,927,500	-	-	-
30	Trass	122	138	17	6	4,307,815,880	481,308,665	252,011,612	220,673,935	359,514,066	1,162,039,696
31	Ultabasic	65	73	8	-	49,821,210,517	51,247,054,241	15,186,770,661	16,217,291	9,457,406	6,675,405

*resources and reserves tonnage units: sea sand in m^3

Table 23. Recapitulation of Total Resources and Total Reserves of Rock Groups, 2024

No	Comodity	Group	Hypothetical (Tons)	Total Resources (Tons) **	Total Reserves (Tons) ***
1	Andesite	Building Materials Mineral	57,679,160,000	38,685,895,433	9,052,610,120
2	Ball / Bond Clay	Ceramic Materials Mineral	99,620,000	265,496,209	132,874,809
3	Basalt	Building Materials Mineral	1,282,370,631	5,346,406,555	109,595,645
4	Ornament Stone	Precious Stones	2,940,750,748	268,541	192,325
5	Quartz Stone	Industrial Minerals	390,000	47,666,669	24,825,558
6	Potassium Bearing Rock	Industrial Minerals	1,086,652,000	75,596,829,031	-
7	Pumice	Industrial Minerals	601,552,780	162,841,484	711,484
8	Slate	Building Materials Mineral	39,145,830	-	-
9	Dacite	Building Materials Mineral	1,189,258,627	2,027,624,118	1,844,840
10	Diabase	Building Materials Mineral	625,000,000	-	-
11	Diatomite	Industrial Minerals	107,105,800	31,056,700	-
12	Diorite	Building Materials Mineral	8,773,845,000	552,312,459	31,276,870
13	Jade	Precious Stones	271,530	2,509,575	-
14	Granite	Building Materials Mineral	60,407,990,863	24,465,804,142	1,298,796,414
15	Granodiorite	Building Materials Mineral	2,126,000,000	872,589	892,981
16	Jasper	Precious Stones	600	650,000	-
17	Chalcedony	Precious Stones	109,852	4,080,388	193,752
18	Petrified Wood	Precious Stones	-	13,750	-
19	Marble	Building Materials Mineral	106,220,384,000	7,137,695,207	1,544,176,360
20	Obsidian	Ceramic Materials Mineral	4,150,000	87,819,187	9,194,218
21	Onyx	Precious Stones	527,500	-	-
22	Opal	Precious Stones	-	1,67	-
23	Sea Sand*	Building Materials Mineral	-	9,487,961,784	4,804,457,292
24	Gabbro/Peridotite	Building Materials Mineral	8,289,422,000	257,266,719	98,294,530
25	Perlite	Ceramic Materials Mineral	1,287,190,100	228,019,576	12,841,211
26	Prehnite	Precious Stones	-	4,200	-
27	Sand and Gravel	Building Materials Mineral	5,137,269,319	17,783,104,885	6,548,064,310
28	Toseki	Ceramic Materials Mineral	221,651,000	53,896,000	-
29	Trachyte	Ceramic Materials Mineral	4,124,316,000	1,286,927,500	-
30	Trass	Building Materials Mineral	4,307,815,880	953,994,212	1,521,553,761
31	Ultabasic	Industrial Minerals	49,821,210,517	66,450,042,193	16,132,811

Notes : *resource and reserve tonnage units: sea sand in m3
**sum of inferred, indicated, and measured resources
***sum of probable and proven reserves

According to the consolidated data in Tables 24 and 25, many rock-based commodities still possess large volumes of hypothetical resources. These deposits hold the potential to be upgraded into inferred, indicated, or even measured resource categories, provided exploration activities are intensified in the relevant areas. Some commodities still lack recorded reserves, which suggests that few businesses are currently investing in or utilizing these materials. Notable among them are potassium-bearing rocks, slate, diabase, diatomite, jade, jasper,

chalcedony, petrified wood, obsidian, onyx, opal, perlite, prehnite, toseki, and trachyte.

Despite the absence of reserves, several of these commodities show significant resource potential. For instance, potassium-bearing rocks have a total estimated resource of 75.5 billion tons. These could serve as an alternative source of potassium fertilizer, which is essential for supporting agricultural productivity and national food security. At present, the farming sector depends heavily on industrially produced potassium fertilizers. With raw materials for fertilizers becoming increasingly scarce, utilizing this local resource could help reduce fertilizer import dependency.

Another commodity with untapped potential is trachyte, which has a resource base of 1.2 billion tons but no identified reserves. This emphasizes the large, yet underutilized, opportunities that remain in the rock commodity sector.

The quantity of recorded data for rock-based resources remains limited, underlining the need for closer collaboration between central and local mining authorities to update and track the latest status of non-metallic mineral resources and reserves nationwide.

Furthermore, in accordance with the Ministerial Decree No. 296.K/MB.01/MEM.B/2023 concerning the classification of Critical Minerals, several non-metallic minerals and rocks have been designated as critical. These include silica (in the form of quartz sand, quartzite, and quartz crystal), barite, limestone, potassium-bearing rocks, sulfur, dolomite, feldspar, phosphate, graphite, and zircon sand.

The following section outlines the resource and reserve conditions for key commodities under the critical mineral classification, particularly those that have shown notable changes in volume. This includes accompanying tables and charts that summarize total resources, reserves, and data entries by province over the five-year period from 2020 to 2024.

LIMESTONE

Limestone is a non-metallic mineral commodity with deposits spread across almost all provinces in Indonesia. It is critically important for supplying raw materials to several strategic industries—such as cement manufacturing, metal smelting, and others—and is also used as an alternative construction material in certain regions.

Geologically, limestone is a sedimentary rock primarily composed of calcite (CaCO3), dolomite (CaMg(CO3)2), and aragonite (CaCO3), and can form through organic, mechanical, or chemical processes. Most natural limestone in Indonesia is of organic origin, derived from the accumulation of shells, snails, foraminifera, algae, or skeletal remains of marine organisms. Limestone, also known as "batu kapur," typically contains around 90% calcite, 3% dolomite, and the remainder clay minerals. Aragonite, which is associated with limestone, is a less stable mineral that eventually transforms into calcite over time (Jasruddin et al., 2015). The color of limestone varies widely—from milky white, gray, and brown to red and black—depending on impurities. Reddish hues are due to manganese and iron oxides, while black tones are caused by organic matter

Limestone deposits have been identified in numerous provinces, including Aceh, Banten, Bali, Bengkulu, Yogyakarta, Gorontalo, Jambi, West Java, Central Java, East Java, South Kalimantan, Central Kalimantan, East Kalimantan, North Kalimantan, Lampung, Maluku, North Maluku, West Nusa Tenggara, East Nusa Tenggara, Papua, West Papua, Southwest Papua, Riau, West Sulawesi, South Sulawesi, Central Sulawesi,

Southeast Sulawesi, North Sulawesi, West Sumatra, South Sumatra, and North Sumatra. A detailed breakdown of provincial resource and reserve figures is provided in Table 24.

Over the past five years, limestone resources and reserves have increased, supported by new and updated data from CMCGR investigations as well as reports from mining bussines permit (MBP) holders. CMCGR activities included limestone prospecting in Aceh (2020), investigations in East Java and North Sumatra, West Sumatra (2021), and further studies Riau and West Sumatra (2023). Data reconciliation carried out in 2024 by the Directorate General of Mineral and Coal together with CMCGR and provincial governments recorded 166 new limestone potential sites into the national inventory.

By 2024, limestone was identified at 1,106 sites in 199 regencies in 31 provinces, with total resources amounting to 249,961,106,200 tons and total reserves reaching 27,358,862,495 tons. These developments over the past five years are illustrated in Figure 51.

For industrial applications, processed limestone must meet specific requirements, including high CaO content (degree of purity), low levels of chemical impurities (Mg, Al, Fe, P, S, Na, K, and F), low levels of mineral impurities (quartz, pyrite, and marcasite), and certain physical properties (brightness, grain size, surface area, and moisture). When these conditions are met, limestone can be used for a wide range of purposes, including quicklime and hydrated lime production, cement, carbide, steel smelting and refining, abrasives, ceramics, glass, silica bricks, paper, rubber, soda ash production, water

treatment, non-ferrous ore precipitation, sugar production, and agriculture.

Table 24. Limestone Resources and Reserves by Province, 2024

NO	PROVINCE	NUMBER OF LOCATIONS	HYPOTHETICAL (TONS)	RESOURCES (TONS)			RESERVES (TONS)	
				INFERRED	INDICATED	MEASURED	PROBABLE	PROVEN
1	Aceh	65	10,477,864,000	6,099,010,932	127,255,579	1,158,331,583	589,535,122	1,034,771,509
2	Bali	9	4,982,737,000	-	879,551,000	1,329,500,000	-	-
3	Banten	14	60,000,000	3,149,707,866	815,761,104	1,145,333,726	2,502,272,127	396,087,549
4	Bengkulu	5	837,088,000	-	-	-	-	-
5	D,I, Yogyakarta	13	365,602,000	15,901,754	2,660,328	9,526,772	8,624,513	3,746,008
6	Gorontalo	14	-	25,533,350,000	-	-	-	-
7	Jambi	4	8,100,000	646,380,000	307,800,000	288,025,200	328,792,225	328,792,225
8	West Java	46	431,195,000	670,633,729	1,517,874,983	2,594,791,421	169,343,521	2,017,177,112
9	Central Java	55	625,302,000	4,898,262,304	2,192,779,167	1,785,370,715	458,487,434	698,047,677
10	East Java	127	1,226,548,700	1,918,363,978	1,997,964,412	3,581,488,369	108,789,433	870,721,908
11	South Kalimantan	59	24,815,810,000	2,165,060,482	2,363,222,287	869,172,921	659,090,472	684,448,683
12	Central Kalimantan	10	448,775,000	-	-	-	-	-
13	East Kalimantan	32	5,494,901,000	12,963,682,642	2,548,038,632	261,951,243	189,737,544	188,893,794
14	North Kalimantan	6	1,109,500,000	-	-	239,424,768	-	63,673,986
15	Lampung	10	15,141,000	228,933,845	8,835,323	23,226,210	10,100,874	11,810,154
16	Maluku	1	65,250,000,000	-	-	-	-	-
17	North Maluku	30	11,273,072,800	19,480,239,074	2,037,287,120	1,540,688,524	1,496,953,198	13,373,674
18	West Nusa Tenggara	30	1,116,263,000	62,110,015	81,918,000	66,034,648	32,514,499	29,117,246
19	East Nusa Tenggara	106	32,504,948,000	30,462,126,000	1,519,388,750	613,861	-	604,560
20	Papua	38	19,668,100,000	168,832,034	-	147,142,000	-	-
21	West Papua	60	271,599,830,000	5,559,083,000	-	-	-	-
22	Southwest Papua	1	-	-	-	698,210,190	-	230,440,190
23	Riau	3	42,986,000	18,706,756	-	-	-	-
24	West Sulawesi	12	616,375,000	-	119,700,000	-	581,558	-
25	South Sulawesi	56	11,917,414,000	5,164,733,688	620,887,176	379,210,704	524,282,814	98,132,306
26	Central Sulawesi	79	20,790,088,300	7,300,836,599	6,007,962,079	8,729,070,690	3,649,374,379	5,550,975,591
27	Southeast Sulawesi	55	34,275,884,000	37,508,148,448	3,318,514,363	2,649,091,319	1,153,347,917	829,734,756
28	North Sulawesi	14	2,728,715,000	-	-	-	-	-
29	West Sumatera	102	83,038,747,000	23,364,857,569	271,069,926	357,100,325	452,315,931	1,694,337,786
30	South Sumatera	16	425,707,000	863,963,815	687,802,529	803,088,657	-	234,313,076
31	North Sumatera	34	1,938,406,667	5,559,206,977	46,217,436	30,090,655	32,792,111	12,613,965
TOTAL		1,106	608,085,100,467	193,802,131,507	27,472,490,194	28,686,484,501	12,366,935,672	14,991,813,755

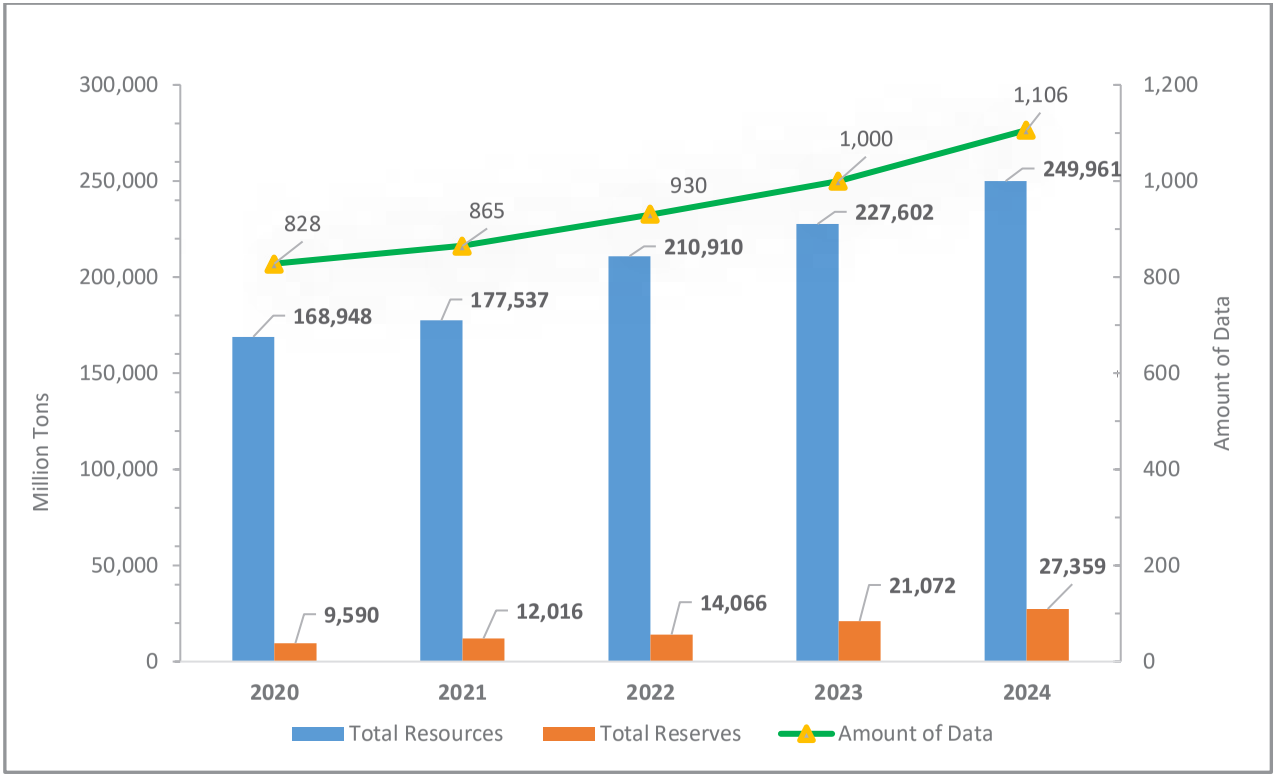


Figure 51. Statistics of Total Limestone Resources and Reserves for the Years 2020–2024

POTASSIUM-BEARING ROCKS

Potassium is a critical nutrient for plant development, alongside nitrogen and phosphorus. The primary sources of potassium for fertilizer are sedimentary deposits containing minerals such as sylvite, kainite, or langbeinite (potassium–magnesium salts. These are typically water-soluble, making them highly effective in delivering nutrients to crops.

While plants naturally obtain potassium from decomposing organic matter and the weathering of potassium-rich minerals, the most accessible and fast-releasing sources come from rocks containing minerals such as K-feldspar, leucite, biotite, and glauconite. Among them, volcanic rocks rich in leucite are particularly known for their rapid weathering.

Although commercial fertilizers like muriate of potash (KCl) are widely used, they can pose risks for salt-sensitive crops. Therefore, potassium bearing silicate minerals offer a more sustainable alternative, releasing nutrients gradually over time. Silicate minerals such as phlogopite, biotite, and leucite provide a sustainable, slow-release source of potassium and magnesium.

In Indonesia, leucite-rich potassium-bearing rocks have been identified in regions such as Jepara, Pati, and Kudus (Central Java), Situbondo (East Java), Mamuju (West Sulawesi), and Barru and Bone (South Sulawesi). Table 25 outlines the resource distribution across these provinces.

From 2019 to 2024, resource data for potassium-bearing rocks has steadily increased, driven by exploration efforts—particularly by CMCGR, which conducted field studies

in Bone, South Sulawesi, in 2023. As of 2024, 43 potential sites were recorded across 7 regencies in 4 provinces, with an estimated total resource of approximately 75.6 billion tons. However, no reserves have yet been established due to the lack of commercial exploitation. These trends are reflected in Figure 52.

These potassium-rich rocks could serve as a domestic alternative to imported fertilizers such as potassium chloride, potassium sulfate, potassium-magnesium sulfate, and potassium nitrate. Utilizing these local natural resources may significantly reduce Indonesia's reliance on imported fertilizer raw materials.

Table 25. Potassium-Bearing Rock Resources and Reserves by Province, 2024

No	Province	Number of Location	Hypothetical (Tons)	Resources (Tons)			Reserves (Tons)	
				Inferred	Indicated	Measured	Probable	Proven
1	Central Java	24	-	11,580,024,064	12,923,185,793	1,407,982,985	-	-
2	East Java	1	-	117,500,000	-	31,453,963	-	-
3	West Sulawesi	4	-	44,324,799,193	-	-	-	-
4	South Sulawesi	14	1,086,652,000	4,905,633,034	306,250,000	-	-	-
	Total	43	1,086,652,000	60,927,956,291	13,229,435,793	1,439,436,948	-	-

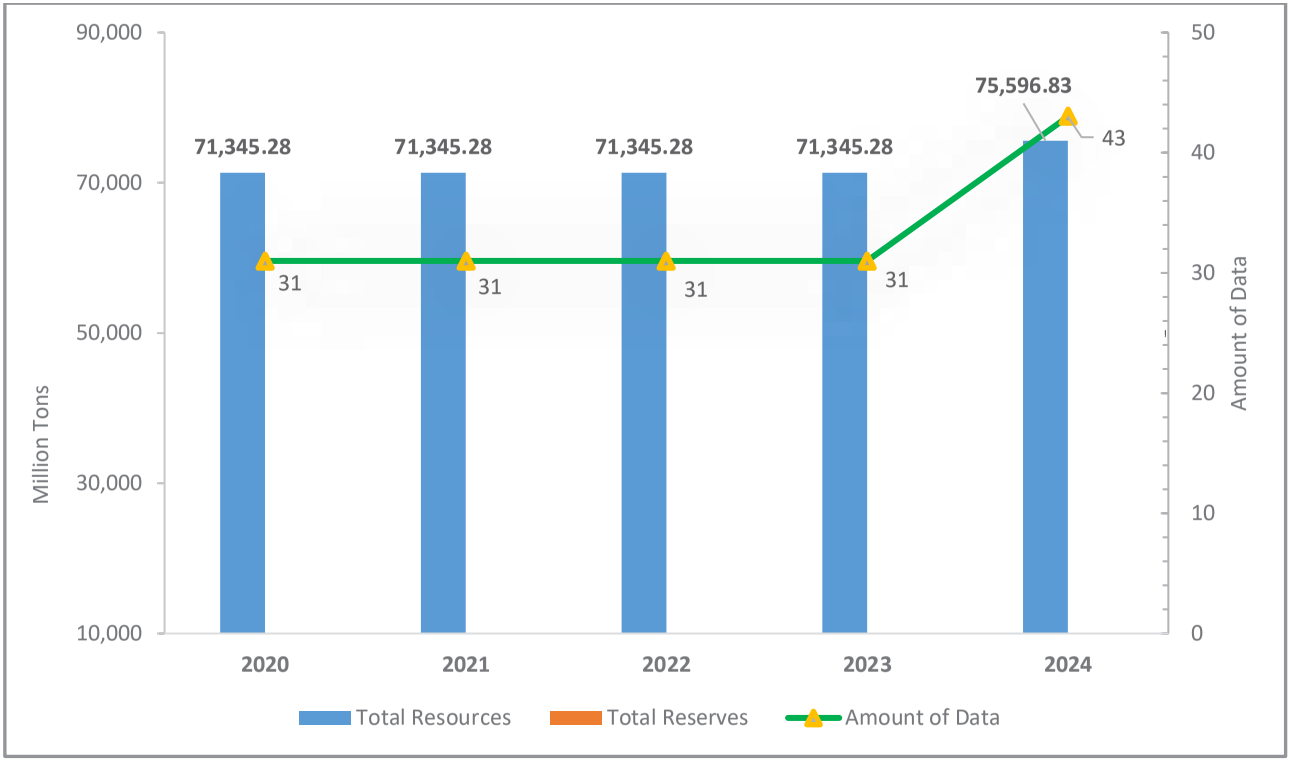


Figure 52. Statistics of Total Potassium-Bearing Rock Resources and Reserves for the Years 2020–2024

DOLOMITE

Dolomite is a naturally occurring sedimentary rock classified under the carbonate mineral group. Pure dolomite theoretically contains 45.6% $MgCO_3$ (21.9% MgO) and 54.3% $CaCO_3$ (30.4% CaO). Its chemical formula can be written as $CaMg(CO_3)_2$ or $Ca_xMg_{1-x}CO_3$, with variants such as manganodolomite ($MgFe(CO_3)_2$) and ferrodolomite. However, in nature, dolomite rarely exists in pure form and is usually found alongside other materials such as limestone, quartz, chert, pyrite, and clay impurities.

Dolomite forms either through **primary geological processes** (as mineral veins associated with ore deposits) or through **secondary transformation**—where magnesium-rich water alters limestone in a process known as **dolomitization**. This transformation can take place over long geological periods, often resulting in older limestone deposits becoming dolomite. Secondary dolomite may also form as independent evaporite deposits. The process is influenced by factors such as water pressure with high magnesium content and the long-term geological age of the limestone.

Physically, dolomite is usually white to gray or bluish, softer than regular limestone (with a Mohs hardness of about 3.5–4), and has a specific gravity between 2.8 and 2.9. It has a rhombohedral crystal structure fine- to coarse-grained texture, absorbs water easily, and can be easily crushed due to its porous nature.

In Indonesia, dolomite deposits have been confirmed in multiple provinces and regencies, including: **Aceh** (Central

Aceh, Southeast Aceh, Gayo Lues, Tamiang); **Banten** (Lebak); **Central Java** (Rembang); **East Java** (Bangkalan, Gresik, Lamongan, Pacitan, Tuban); **North Maluku** (Sula Islands); **East Nusa Tenggara** (Lembata, East Manggarai, North Central Timor, South Central Timor); **Central Sulawesi** (Banggai, Poso); **Southeast Sulawesi** (Muna); **West Sumatra** (Lima Puluh Kota, Sijunjung, South Solok); **North Sumatra** (Karo, Dairi)

A total of **79 dolomite sites** were identified in 2024, spread across **24 regencies**, with an **estimated resource of 5,153,056,336 tons** and **reserves totaling 824,923,679 tons**. Dolomite resource and reserve data have expanded over the past five years, notably increasing in 2022 due to updated reports from mining companies and field investigations by CMCGR. Surveys in 2021 focused on East Java, North Sumatra, and West Sumatra.

Dolomite plays a vital role across multiple sectors. In **agriculture**, it serves as a natural fertilizer, enriching soil with calcium and magnesium while improving pH balance. In **construction and manufacturing**, dolomite is used as a refractory material, in furnace linings, and as a filler in glass, paper, plastic, and cement production. It is also used in the production of sorel cement, seawater magnesium, and the alkali industry. Additionally, dolomite is applied in water treatment, cosmetics, and pharmaceuticals making it an essential industrial mineral with growing importance.

Table 26. Dolomite Resources and Reserves by Province, 2024

NO	Province	Number of Locations	Hypothetical (Tons)	Resources (Tons)			Resrves (Tons)	
				Inferred	Indicated	Measured	Probable	Proven
1	Aceh	13	187,500,000	659,160,000	57,327,000	-	607,595	-
2	Banten	2	-	350,195,826	-	-	44,878,150	-
3	Central Java	2	10,000,000	-	156,000	-	-	-
4	East Java	29	551,531,000	532,056,942	806,244,347	469,951,801	313,900,452	451,921,796
5	North Maluku	3	114,520,000	-	-	-	-	-
6	East Nusa Tenggara	8	825,750,000	-	691,350,000	-	-	-
7	Central Sulawesi	3	262,818,000	-	-	-	-	-
8	Southeast Sulawesi	1	324,000,000	-	-	-	-	-
9	North Sumatera	11	114,724,480	894,759,207	312,183,086	-	6,817,086	-
10	West Sumatera	7	59,800,000	372,873,527	3,399,300	3,399,300	3,399,300	3,399,300
TOTAL		**79**	2,450,643,480	2,809,045,502	1,870,659,733	473,351,101	369,602,583	455,321,096

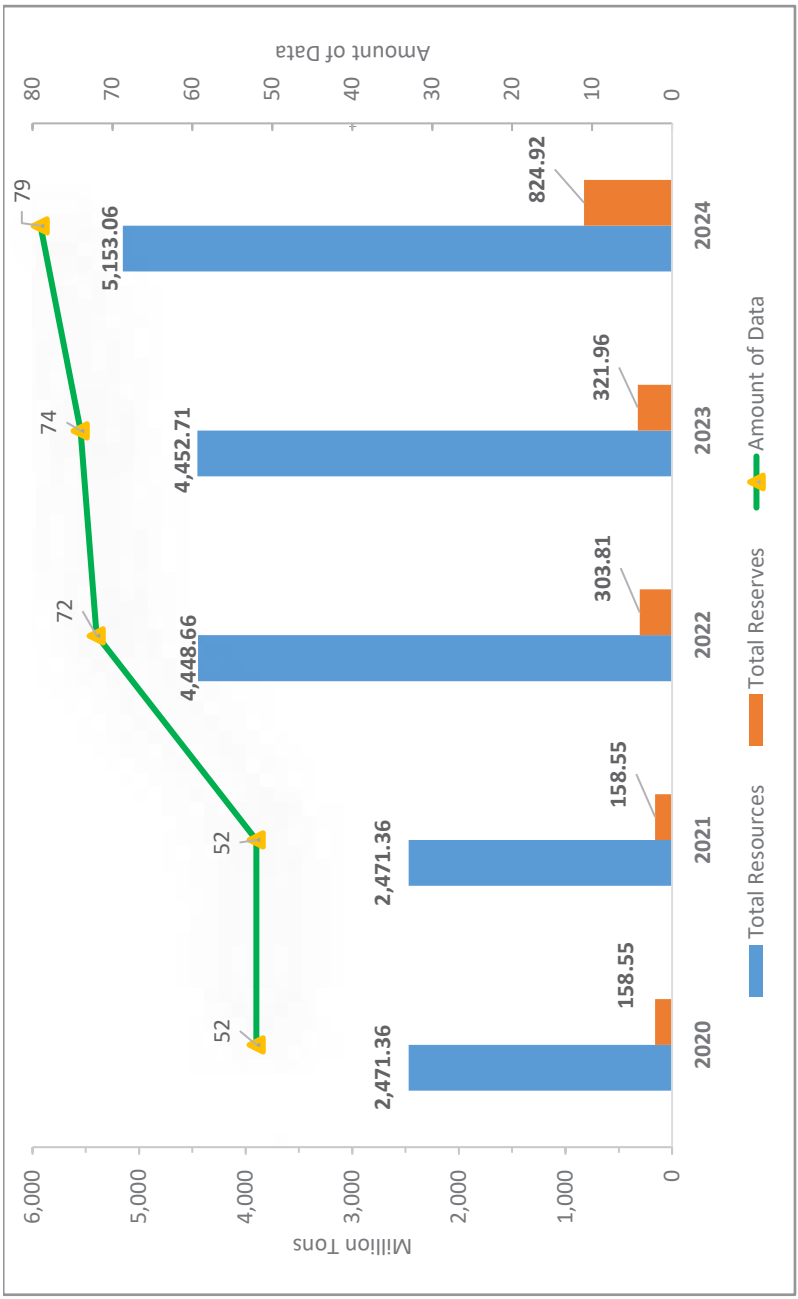


Figure 53. Statistics of Total Dolomite Resources and Reserves for the Years 2020–2024.

FELDSPAR

Feldspar is a group of minerals that serves as a primary constituent of igneous rocks and an important component of many metamorphic and even sedimentary rocks. It is the most prevalent mineral group on Earth, accounting for about 60% of the Earth's crust. Chemically, feldspar is a silicate composed of aluminum, potassium, sodium, and calcium.

In industrial applications, feldspar is categorized as **potash feldspar (K-spar)**, like orthoclase and microcline, or **soda feldspar**, such as anorthite. Potash feldspar contains more than 8% K_2O, while soda feldspar contains over 7% Na_2O.

There are three types of feldspar deposits found in Indonesia: **primary**, **diagenetic**, and **alluvial**. Primary feldspar deposits are usually associated with aplitic, pegmatitic-granitic rocks, and syenite-monzonite. These types of feldspar-bearing rocks are widely distributed in Indonesia, especially in Aceh, North Sumatra, Bangka Belitung, West Kalimantan, and West Sulawesi—including granite, aplite, pegmatite, monzonite, syenite, and others. Although these deposits are yet to be fully exploited, the resource potential is extensive. Igneous rocks containing floating feldspar can yield potassium or sodium feldspar, along with valuable by-products like mica and silica.

Diagenetic feldspar is formed by altering acidic pyroclastic rocks, including rhyolitic, dacitic, and other volcanic glass-rich materials, during the diagenesis process. This feldspar type is considered highly promising for future ceramic raw materials due to its ease of mining and processing. Such

deposits are predicted to occur abundantly in Tertiary volcanic tuff-rich formations, particularly within older andesite formations or equivalent layers.

Diagenetic feldspar occurs in Lampung, West Java, Central Java, Yogyakarta, East Java, and other regions, with total alkali contents (K_2O + Na_2O) ranging from 4.5% to 8%, making them suitable for structural ceramic production. **Alluvial feldspar**, on the other hand, results from the redeposition of sanidine or feldspathic-bearing rocks—igneous or sedimentary in origin. Alluvial feldspar commonly occurs in the form of beach sand or alluvial sand, composed largely of sanidine and quartz grains, such as those found in Jambi and Central Sulawesi.

Feldspar has been identified in the provinces of Aceh, Bali, Banten, Yogyakarta, Gorontalo, Jambi, West Java, Central Java, East Java, West Kalimantan, Lampung, North Maluku, West Nusa Tenggara, East Nusa Tenggara, West Sulawesi, South Sulawesi, Central Sulawesi, West Sumatra, South Sumatra, and North Sumatra. A recapitulation of feldspar resources and reserves for each province is provided in Table 27.

Over the past five years, feldspar resource and reserve data have undergone updates and expansions. In both 2023 and 2024, there were significant increases in the reported figures, likely due to new and updated data submitted by mining business permit (MBP) holders. As of 2024, feldspar potential has been recorded at **186 sites** across **57 regencies** in **20 provinces**, with a **total resources volume of 5,288,965,136 tons** and **reserves totaling 180,863,149**

tons. Figure 54 presents the five-year feldspar resource and reserve statistics.

Feldspar plays a vital role in several industrial sectors. It is especially valued for its use in **ceramics**—as a melting and binding agent in the production of tableware, sanitary fixtures, and electrical insulators—and in the **glass manufacturing industry**.

Table 27. Feldspar Resources and Reserves by Province, 2024

NO	PROVINCE	NUMBER OF LOCATIONS	HYPOTHETICAL (TONS)	RESOURCES (TONS)			RESERVES (TONS)	
				INFERRED	INDICATED	MEASURED	PROBABLE	PROVEN
1	Aceh	15	552,010,000	1,376,524,500	-	-	-	-
2	Bali	1	25,000,000	-	-	-	-	-
3	Banten	6	80,000	-	2,800,000	-	-	-
4	D.I. Yogyakarta	1	500,000	-	-	-	-	-
5	Gorontalo	1	-	2,500,000	-	-	-	-
6	Jambi	9	-	481,100,000	-	-	-	-
7	West Java	5	-	13,000,000	-	3,829,241	-	515,186
8	Central Java	27	450,000	128,423,089	169,535,876	138,211,428	51,021,571	65,037,980
9	East Java	21	866,542,000	29,673,503	20,453,493	12,625,904	3,700,446	5,995,010
10	West Kalimantan	4	1,011,600,000	-	1,692,000	-	-	-
11	Lampung	9	4,200,000	20,390,000	54,221,679	30,100,341	24,051,924	17,079,483
12	North Maluku	8	1,362,862,286	-	-	-	-	-
13	West Nusa Tenggara	1	-	-	24,675,300	-	-	-
14	East Nusa Tenggara	12	264,975,000	22,932,800	155,625,000	-	-	-
15	West Sulawesi	13	727,540,000	-	-	-	-	-
16	South Sulawesi	5	105,964,000	6,667,199	-	1,500,000	-	-
17	Central Sulawesi	3	40,822,000	-	215,000,000	-	-	-
18	West Sumatera	8	1,144,530,000	-	-	-	-	-
19	South Sumatera	19	36,268,000	2,216,000	1,484,800	1,299,200	1,484,800	1,299,200
20	North Sumatera	18	292,337,000	2,361,450,000	11,033,783	-	10,677,548	-
TOTAL		**186**	6,435,680,286	4,444,877,091	656,521,931	187,566,114	90,936,290	89,926,859

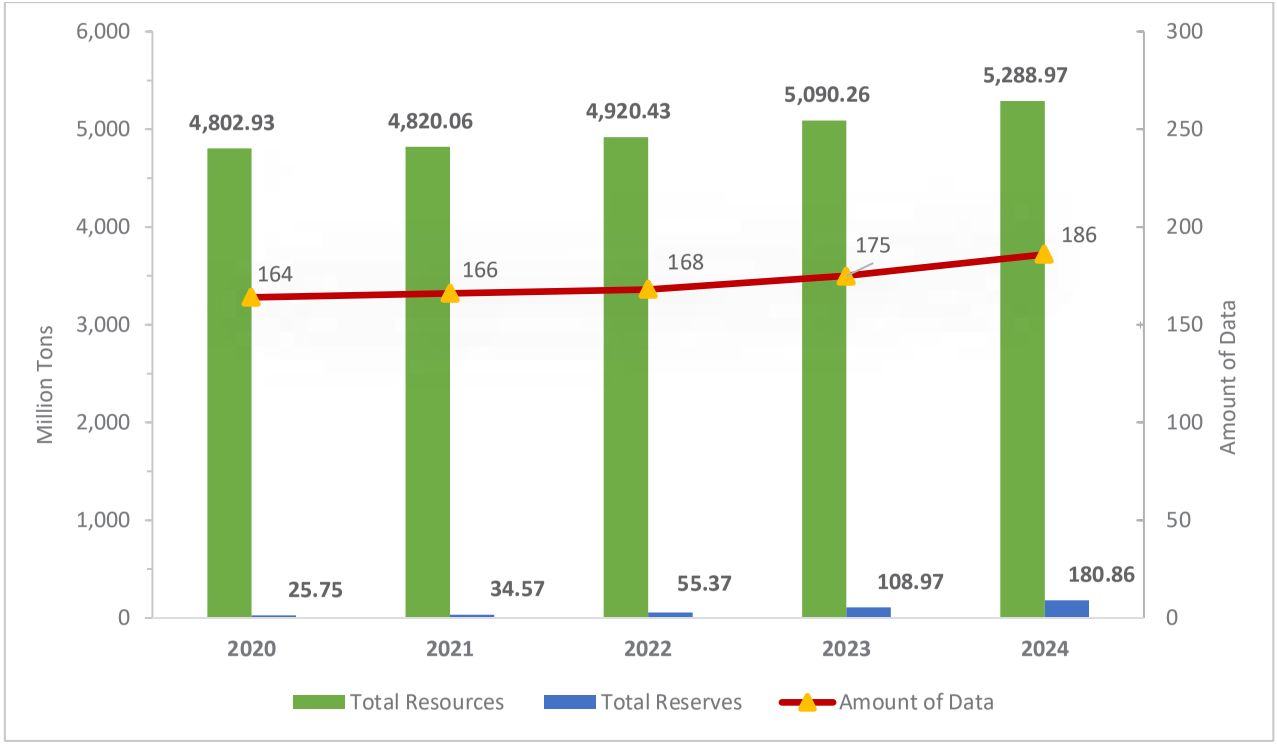


Figure 54. Statistics of Total Feldspar Resources and Reserves for the Years 2020–2024.

QUARTZ SAND

Quartz sand is a mineral material composed of silica (SiO_2) crystals and contains impurities that are carried along during the sedimentation process. These impurities commonly include iron oxides, calcium oxides, alkali oxides, magnesium oxides, clay, and organic matter derived from the decomposition of animal and plant remains. Quartz sand, also known as white sand, is the result of weathering of rocks that contain essential minerals such as quartz and feldspar. The weathered materials are subsequently washed and transported by water or wind, and deposited along riverbanks, lakes, or coastal areas. In nature, quartz sand is found with varying degrees of purity depending on its formation process and the presence of other materials during deposition. These impurities contribute to the coloration of quartz sand, and the color can serve as an indicator of its level of purity (Prayogo, T. and Budiman, B., 2009).

The genesis of quartz sand refers to the processes of formation and natural deposition. Quartz sand is a type of sand primarily composed of quartz grains, a mineral consisting of silicon dioxide (SiO_2). Its formation involves several natural processes that influence the distribution and characteristics of quartz sand across various environments. The key factors affecting its genesis include:

1. **Weathering of Parent Rock**
   Quartz sand originates from the breakdown of quartz-bearing parent rocks, such as granite, sandstone, or metamorphic rocks. This process can be driven by

erosion, glacial movement, wind, river water, and other natural agents.

2. **Transportation and Deposition**
   The quartz sand particles derived from parent rocks are transported by agents such as rivers, ocean currents, wind, or glaciers. During this transportation, particle sorting may occur, where coarser particles settle faster than finer ones.
3. **Deposition and Precipitation**
   Quartz sand settles when the energy of the transporting agent (e.g., river flow or wind speed) decreases, preventing further movement. This results in deposition in riverbeds, lakes, or marine environments. Quartz can also form through chemical precipitation when silica-saturated solutions cool down or experience reduced pressure, leading to crystallization.
4. **Special Classification Processes**
   Some quartz sand deposits may undergo specific classification processes. For instance, beach deposits may be influenced by wave and shoreline dynamics, while desert deposits are shaped by environmental changes in arid regions.
5. **Geological Time**
   The genesis of quartz sand occurs over thousands to millions of years, with deposits gradually accumulating over geological time.

Quartz sand deposits have been discovered in the provinces of Aceh, Banten, West Java, Central Java, East Java,

West Kalimantan, South Kalimantan, Central Kalimantan, Bangka Belitung Islands, Riau Islands, Lampung, West Nusa Tenggara, East Nusa Tenggara, West Papua, Riau, South Sulawesi, Southeast Sulawesi, Central Sulawesi, West Sumatra, South Sumatra, and North Sumatra. Quartz sand resources and reserves in each Province can be seen in the Table 28.

Over the past five years, the development of quartz sand resources and reserves has shown a general upward trend due to increased data availability (Figure 55). However, the total reserve value in 2021 declined compared to 2020, likely due to data updates from MBP (Mining Business Permite) holders. In 2022, 2023, and 2024, there was a significant increase in quartz sand resource and reserve data. This growth is attributed to the significant addition and updating of data from MBP holders and investigations conducted by CMCGR. In 2024, a reconciliation of non-metallic mineral and rock resource and reserve data was conducted with the Directorate General of Mineral and Coal, involving provincial governments, resulting in an increased volume of inputted data. Data from MBP holders for quartz sand that could be input amounted to 191 locations. In 2022, CMCGR conducted quartz sand prospecting in South Kalimantan and West Kalimantan provinces. In 2023, prospecting activities were carried out in Central Kalimantan and Riau Islands provinces.

By 2024, Indonesia had identified 611 quartz sand locations across 23 provinces, with total resources amounting to 26.399.028.002 tons and reserves 7.811.621.700 tons.

Industrially, quartz sand is processed into silica sand, silica flour, and resin-coated sand. Its applications span various

sectors including glass manufacturing, cement production, electronics, ceramics, metal casting, construction, oil and gas, coatings, and water treatment systems.

Table 28. Quartz Sand Resources and Reserves by Province, 2024

NO	PROVINCE	NUMBER OF LOCATIONS	HYPOTHETICAL (TONS)	RESOURCES (TONS)			RESERVES (TONS)	
				INFERRED	INDICATED	MEASURED	PROBABLE	PROVEN
1	Aceh	16	57,350,000	1,248,000	-	-	-	-
2	Banten	29	50,000,000	318,625,871	328,523,220	321,478,736	333,990,506	157,637,000
3	West Java	13	4,184,000	66,520,098	55,180,074	54,850,342	39,535,815	39,915,921
4	Central Java	12	20,000,000	19,006,962	67,071,726	3,272,790	17,995,608	2,047,595
5	East Java	13	3,725,000	18,695,007	18,830,446	18,849,417	8,464,969	5,147,257
6	South Kalimantan	37	134,128,000	316,042,982	571,465,946	365,379,553	86,638,343	676,002,605
7	Central Kalimantan	105	193,549,000	8,378,265,328	6,481,969,118	4,813,996,854	3,251,503,826	2,079,700,136
8	West Kalimantan	47	1,722,587,500	-	284,250,000	56,600,000	-	-
9	East Kalimantan	56	896,857,000	64,050,000	-	-	-	-
10	North Kalimantan	14	61,160,000	-	-	-	-	-
11	Bangka Belitung Islands	78	569,310,100	44,863,620	125,024,025	296,068,442	200,975,228	201,319,370
12	Riau Islands	60	231,700,000	762,013,956	548,255,371	125,360,579	183,438,666	23,019,970
13	Lampung	18	98,950,000	5,737,153	935,510	9,499,250	479,870	8,889,054
14	West Nusa Tenggara	1	83,000	-	-	-	-	-
15	East Nusa Tenggara	3	447,500,000	-	-	-	-	-
16	West Papua	2	1,100,000	-	-	-	-	-
17	Riau	25	221,235,500	65,450,000	58,850,000	5,405,000	-	-
18	South Sulawesi	16	101,030,000	76,045,430	124,935,813	73,199,826	49,034,590	3,139,966
19	Central Sulawesi	5	34,370,000	-	-	-	-	-
20	Southeast Sulawesi	26	4,950,812,000	435,645,048	334,033,018	629,411,978	140,756,853	208,573,767
21	West Sumatera	14	11,903,500,000	1,300,000	780,000	53,331,235	-	46,590,760
22	South Sumatera	10	100,200,000	1,650,000	-	-	45,300,937	-
23	North Sumatera	11	1,474,940,000	986,677	-	-	1,523,088	-
TOTAL		**611**	23,278,271,100	10,576,146,133	9,000,104,268	6,826,704,002	4,359,638,300	3,451,983,400

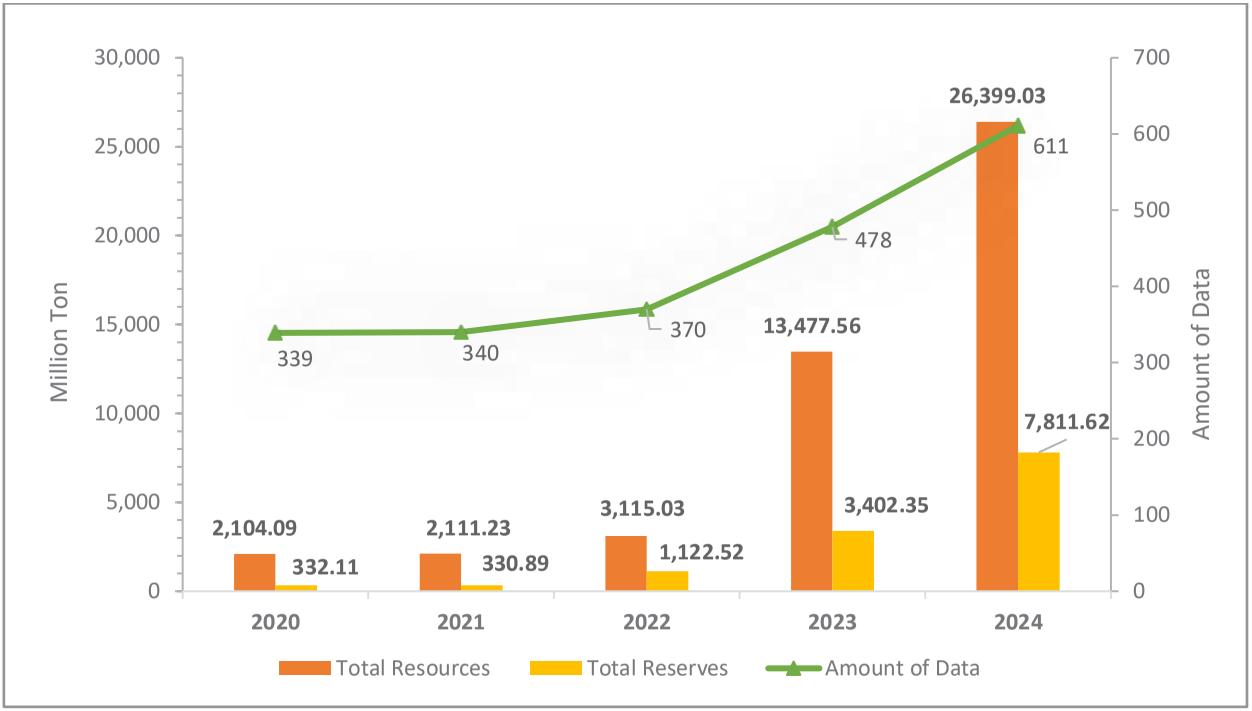


Figure 55. Statistics of Total Quartz Sand Resources and Reserves for the Years 2020–2024

QUARTZITE

Quartzite is a **non-foliated metamorphic rock**, predominantly made up of quartz minerals, often exceeding 90% and sometimes reaching 99% purity. It originates from **quartz-rich sandstones** that have undergone **metamorphic transformation** involving elevated temperature, pressure, and chemical processes. This leads to the **recrystallization of quartz grains**, forming an extremely strong and interlocked structure, which accounts for its **hardness and durability**, distinguishing it clearly from sandstone.

In terms of appearance, quartzite is generally **white to light gray**, but **iron oxide impurities** can give it **pink, red, or purple** hues. Other trace elements may result in colors like **yellow, orange, brown, green, or blue**. Its high quartz composition gives quartzite a **Mohs hardness rating of approximately 7**.

The genesis of quartzite is the formation process of quartzite through metamorphism. Quartzite is formed from protolith containing quartz that undergo physical and chemical changes due to high pressure and temperature. The following is a summarize process of **quartzite formation**, or genesis:

1. **Initial Rock Composition** – Quartzite originates from quartz-bearing rocks, such as sandstones quartz arenite, or other sedimentary rocks containing significant amounts of quartz
2. **Metamorphic Condition**s – Quartzite is formed through metamorphism, which means that the protolith undergoes high pressure and temperature conditions beneath the

Earth's surface. This process may occur in specific geological settings, such as the subduction of tectonic plates into deeper parts of the crust.

3. **Mineral Transformation** – The metamorphic process induces changes in the minerals of the protolith. Other minerals that may be present in the protolith, such as feldspar or clay minerals, can undergo chemical and physical transformations, and eventually may recrystallize into pure quartz.
4. **Compaction and Crystallization** - The high pressure during metamorphism causes compaction of quartz particles, while pure quartz crystallization takes place under elevated temperature conditions. This process results in the formation of a very dense and homogeneous quartzite structure.
5. **Visual Properties** – Quartzite often exhibits a **homogeneous texture** and generally appears **white or gray**, due to the absence of significant other minerals. Its high quartz content contributes to its distinctive appearance.

Occurrences of quartzite have been mapped in **six Indonesian provinces**, including Aceh, West Sumatra, Riau, Lampung, East Nusa Tenggara, and West Papua. Resource and reserve data are consolidated in **Table 29**.

Over the last five years, the volume of quartzite resources and reserves has varied (Figure 56). A decline occurred in 2022, attributed to data updates from CMCGR, while 2024 saw a substantial increase due to expanded

exploration. In 2023, investigations were specifically carried out in **Riau and West Sumatra**.

By 2024, **28 quartzite deposits** were identified across **10 regencies**, totaling 1.655.446.809 tons in resources, though no reserves have been officially recorded—indicating no active mining operations for quartzite at present.

Quartzite serves as a critical input for **construction materials**, **advanced ceramics**, **refractory goods**, **solar energy technologies**, and **semiconductors**. Notably, the extraction of **high-purity silicon from quartzite** supports the efficient and cost-effective production of solar panels, outperforming other silicon-bearing minerals in economic value and energy yield (Syafrizal, 2022).

Table 29. Quartzite Resources and Reserves by Province, 2024

NO	PROVINCE	NUMBER OF LOCATIONS	HYPOTHETICAL (TONS)	RESOURCES (TONS)			RESERVES (TONS)	
				INFERRED	INDICATED	MEASURED	PROBABLE	PROVEN
1	Aceh	6	50,000,000	4,610,700	237,154,899	-	-	-
2	Lampung	2	-	54,244	-	-	-	-
3	East Nusa Tenggara	2	-	515,000	-	-	-	-
4	Papua Barat	1	-	2,650,000	-	-	-	-
5	Riau	2	9,695,700	-	-	-	-	-
6	West Sumatera	15	291,267,000	1,410,461,967	-	-	-	-
TOTAL		**28**	350,962,700	1,418,291,910	237,154,899	-	-	-



Figure 56. Statistics of Total Quartzite Resources and Reserves for the Years 2020–2024

3.2 COAL RESOURCES

3.2.1. COAL

Indonesia's coal resources and reserves data is compiled and updated in accordance with **SNI 5015-2019**, a national standard issued by the **National Standardization Agency (BSN)**, which provides detailed guidelines for reporting the results of coal exploration, resources, and reserves. This standard defines five categories for classification: **inferred**, **indicated**, and **measured resources**, as well as **probable** and **proven reserves**.

Data is derived from two main sources: **primary data** from geological investigations by **Center Of Mineral Coal and Geothermal Resources (CMCGR)**, and **secondary data** from corporate reports, specifically the **Work Plan and Budget (RKAB)** of mining companies that hold **CCOW**, **SMBP**, or **MBP** permits, with the latter data obtained from the **Directorate General of Mineral and Coal**.

Coal is classified based on **its energy content (calorific value)**, as stipulated in **Government Regulation Number 26/2022** concerning Non-Tax State Revenue, adapted from international systems such as the **ASTM D388-99 (U.S.)** and **UN-ECE**. The classifications include:

- **Low- calorific coal**, which is soft to hard, easily crushed, highly moist (up to 70%), often with a visible woody structure, and has a calorific value less **4,200 kcal/kg or less (gar)**.

- **Medium-calorific coal**, harder and drier than low-grade, with a calorific value ranging from **more 4,200 to 5,200 kcal/kg (gar)**, still occasionally showing wood texture.
- **High-calorific coal**, which is the hardest and driest type, typically lacking any wood structure, and has a calorific value **more 5,200 kcal/kg or higher (gar)**.

This data plays a **strategic role in shaping energy policies** and, therefore, must be based on precise and up-to-date geological information. The integrity of the **investigation data flow** ensures the reliability of resources and reserves estimates. The scope of the data includes **coal potential exposed up to 100 meters below the surface**, deemed suitable for **surface mining (open pit)**.

As of 2024, the coal database managed by CMCGR includes **1,656 sites** distributed across **23 provinces** in Indonesia. These originate from:

- **59 CCOW contracts**;
- **6 SMBP permits**;
- **873 MBP licenses**;
- **562 former MBP areas**; and
- **160 CMCGR-surveyed sites**.

This comprehensive data collection forms the backbone of Indonesia's national coal resource and reserve accounting.

Table 30. Data Sources for the Indonesian Coal Resources and Reserves, 2024

No	Province	COW	SMBP	MBP	Location of former MBP	CMCGR Investigation	TOTAL
1	East Kalimantan	18	4	285	187	25	519
2	South Kalimantan	14	2	117	127	6	266
3	Central Kalimantan	13	0	170	96	5	284
4	West Kalimantan	0	0	1	3	10	14
5	North Kalimantan	3	0	24	12	9	48
6	Jambi	3	0	98	35	19	155
7	West Sumatera	0	0	24	26	2	52
8	South Sumatera	8	0	109	33	32	182
9	Riau	0	0	11	12	7	30
10	North Sumatera	0	0	0	1	1	2
11	Aceh	0	0	8	1	3	12
12	Bengkulu	0	0	23	17	3	43
13	Lampung	0	0	1	0	2	3
14	Central Sulawesi	0	0	0	0	2	2
15	South Sulawesi	0	0	0	3	6	9
16	West Sulawesi	0	0	1	2	4	7
17	Southeast Sulawesi	0	0	0		1	1
18	Papua	0	0	0	1	6	7
19	West Papua	0	0	1	2	6	9
20	North Maluku	0	0	0	0	4	4
21	Banten	0	0	0	4	4	8
22	Central Java	0	0	0	0	2	2
23	West Java	0	0	0	0	1	1
TOTAL		**59**	**6**	**873**	**562**	**160**	**1660**

As of **December 2024**, data compiled from both internal and external sources indicate that **Indonesia's total coal resources** have reached **97.960,76 tons**, while its **coal reserves** stand at around **31.955,50 tons** (refer to Table 31). Based on calorific value using the **gar (gross as received)** basis, Indonesia's coal resources are categorized as follows:

- **Low-calorific coal (≤ 4,200 kcal/kg gar)**: 67,333.07 million tons
- **Medium-calorific coal (> 4,200 to 5,200 kcal/kg gar)**: 15,526.30 million tons
- **High-calorific coal (≥ 5,200 kcal/kg gar)**: 15,101.39 million tons

In terms of classification, Indonesia's coal resources are divided into three categories with the following details:

- **Inferred resources**: 25,952.90 million tons
- **Indicated resources**: 32,232.44 million tons
- **Measured resources**: 39,775.43 million tons

The **coal reserves figures** are derived from reports submitted by companies holding **Coal Contract of Work (CCOW)**, **Special Mining Business Permite (SMBP)**, and **Mining Business Permite (MBP)**. As of the end of December 2024, **probable reserves** amount to **14,418.87 million tons**, while **proven reserves** total **17,536.63 million tons**.

Table 31. Quality of Coal Resources and Reserves of Indonesia, 2024.

COMMODITY	QUALITY	RESOURCES (MILLION TONS)				RESERVES (MILLION TONS)			PRODUCTION (MILLION TONS)
		INFERRED	INDICATED	MEASURED	TOTAL	PROBABLE	PROVEN	TOTAL	
Coal	Low Calories	17,862.37	23,534.43	25,936.27	67,333.07	11,144.25	12,914.67	24,058.91	
	Medium Calories	3,338.69	4,215.56	7,972.05	15,526.30	1,638.34	2,901.97	4,540.31	
	High Calories	4,751.84	4,482.45	5,867.10	15,101.39	1,636.28	1,719.99	3,356.28	
JUMLAH		**25,952.90**	**32,232.44**	**39,775.43**	**97,960.76**	**14,418.87**	**17,536.63**	**31,955.50**	**836.12**

- **Sheet Notes for 2024**
- Resources and Reserves submitted by business entities have been reduced by production realization.
- Coal Resources are inclusive (reserves are part of resources)
- Production data for December 2023 is taken from the Ministry of Energy and Mineral Resources' Pocket Book (Pusdatin ESDM).

Coal quality based on calorific value ~~class~~ classification on a gross air received basis (Government Regulation Number 26/2022)
a. Low-Calorific ≤ 4.200 kcal/kg (gar)
b. Medium-Calorific > 4.200 s.d. 5.200 kcal/kg
c. High-Calorific ≥ 5.200 kcal/kg

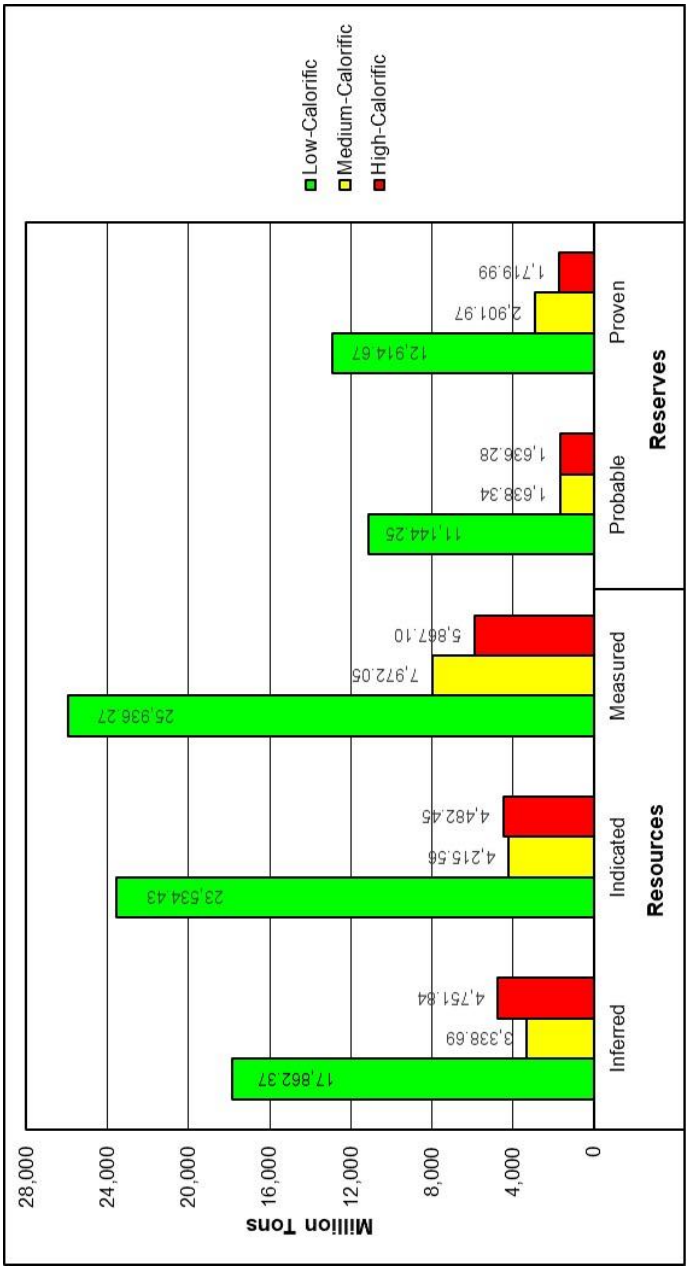


Figure 57. Quality of Indonesia's Coal Resources and Reserves for 2024

3.2.2. PEAT

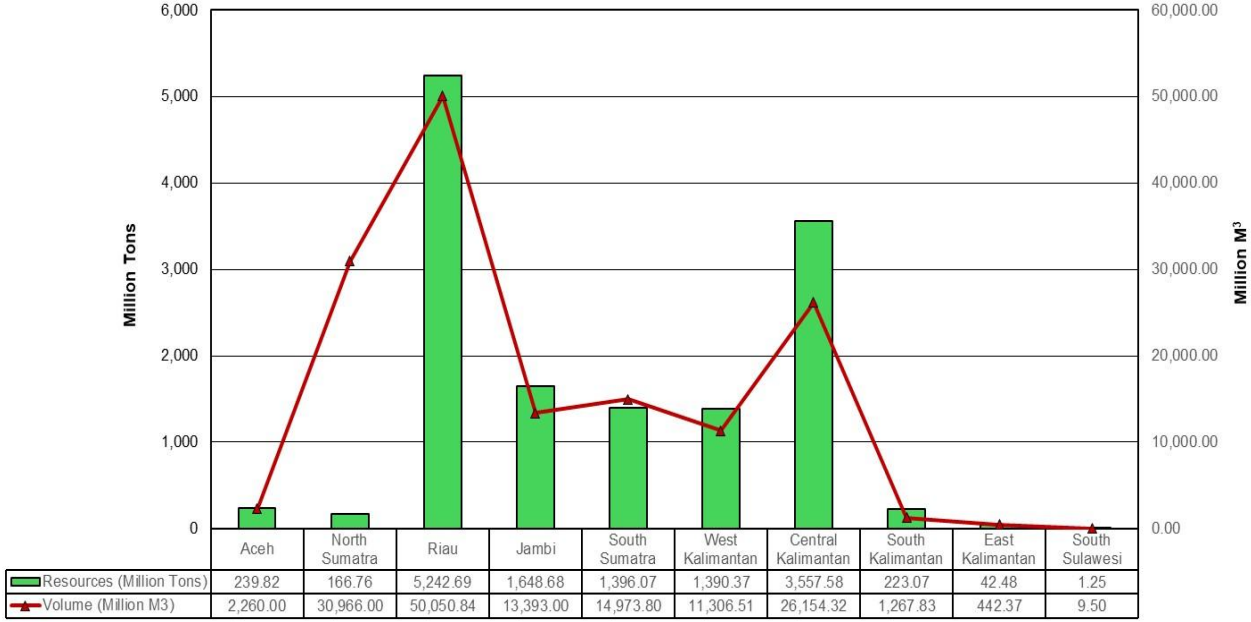
At present, the **exploration of peat as a potential energy source in Indonesia** is carried out solely by the **CMCGR**. Consequently, the peat resource database relies entirely on **CMCGR's investigation results**. The compiled data covers the **geographical distribution (by province)**, **calorific value on an adb basis**, **area (in hectares)**, **peat volume (in million cubic meters)**, and **total peat resources (in million tons)**.

Indonesia's **dry peat resources** are estimated to total approximately **13,90 billion tons** (Table 32), with **calorific values reaching 5.950 kcal/kg adb**, placing them in the same energy class as **lignite and sub-bituminous coal**. According to Table 32, these resources are distributed over **71 locations**, including **31 in Sumatra**, **39 in Kalimantan**, and **1 in Sulawesi** (Figure 58).

Although peat has not yet been **commercially utilized as an energy sources in Indonesia**, largely due to the **greater economic feasibility of alternative energy sources**, its **relatively high energy content** makes it a **viable candidate for future energy use**. However, a challenge to its development is the fact that **much of Indonesia's peatland lies within conservation zones**, often overlaid by **protected forests essential to local ecosystems**.

Table 32. Peat Resources of Indonesia, 2024

No	Province	Area (ha)	Volume (million m3)	Resources (million tons)	Caloric Value (cal/g)
1	Aceh	57,700.00	2,260.00	239.82	1,545 – 5,035
2	North Sumatera	27,040.63	30,966.00	166.76	4,455 – 5,540
3	Riau	1,311,155.50	50,050.84	5,242.69	4,395 – 5,950
4	Jambi	260,407.00	13,393.00	1,648.68	1,405 – 5,220
5	South Sumatera	447,615.94	14,973.80	1,396.07	3,018 – 5,540
Sumatera		**2,103,919.07**	**111,643.64**	**8,694.02**	
6	West Kalimantan	1,090,750.39	11,306.51	1,390.37	3210 - 5670
7	Central Kalimantan	654,519.62	26,154.32	3,557.58	3395 - 5330
8	South Kalimantan	250,963.00	1,267.83	223.07	2362 - 5320
9	East Kalimantan	16,579.00	442.37	42.48	3400 - 5480
Kalimantan		**2,012,812.01**	**39,171.03**	**5,213.49**	
10	South Sulawesi	1,250.00	9.50	1.25	4680 - 5220
Sulawesi		**1,250.00**	**9.50**	**1.25**	
Indonesian Peat Resources		**4,117,981.08**	**150,824.17**	**13,908.76**	



	Aceh	North Sumatra	Riau	Jambi	South Sumatra	West Kalimantan	Central Kalimantan	South Kalimantan	East Kalimantan	South Sulawesi
Resources (Million Tons)	239.82	166.76	5,242.69	1,648.68	1,396.07	1,390.37	3,557.58	223.07	42.48	1.25
Volume (Million M3)	2,260.00	30,966.00	50,050.84	13,393.00	14,973.80	11,306.51	26,154.32	1,267.83	442.37	9.50

Figure 58. Peatland Resources of Indonesia for 2024

4. CONCLUSION

The Government, through the CMCGR of the Geological Agency, remains committed to enhancing the management of Indonesia's mineral and energy resources. One such initiative is the regular compilation and updating of the national mineral and coal resources and reserves, which provides vital, current information to support policy-making on energy utilization and mineral exploitation.

To ensure the accuracy and integrity of this data, CMCGR actively collaborates with various stakeholders to perform comprehensive evaluations and reconciliations. Going forward, the goal is to expand the database quantitatively through improved governance of resource and reserve data flow, while also enhancing its quality through data standardization and verification processes.

This data forms a strategic foundation for understanding the country's mineral and energy potential, serving as a basis for national policies in the energy and mineral sectors—such as mineral downstreaming, reserve sustainability, energy transition strategies, spatial planning, and development planning at both national and regional levels.

In today's context, managing mineral and energy resources responsibly demands a paradigm shift—moving beyond siloed, sector-specific strategies toward integrated and inclusive planning. This approach ensures that the full value of these resources can be realized while carefully weighing their broader social, economic, and environmental impacts.

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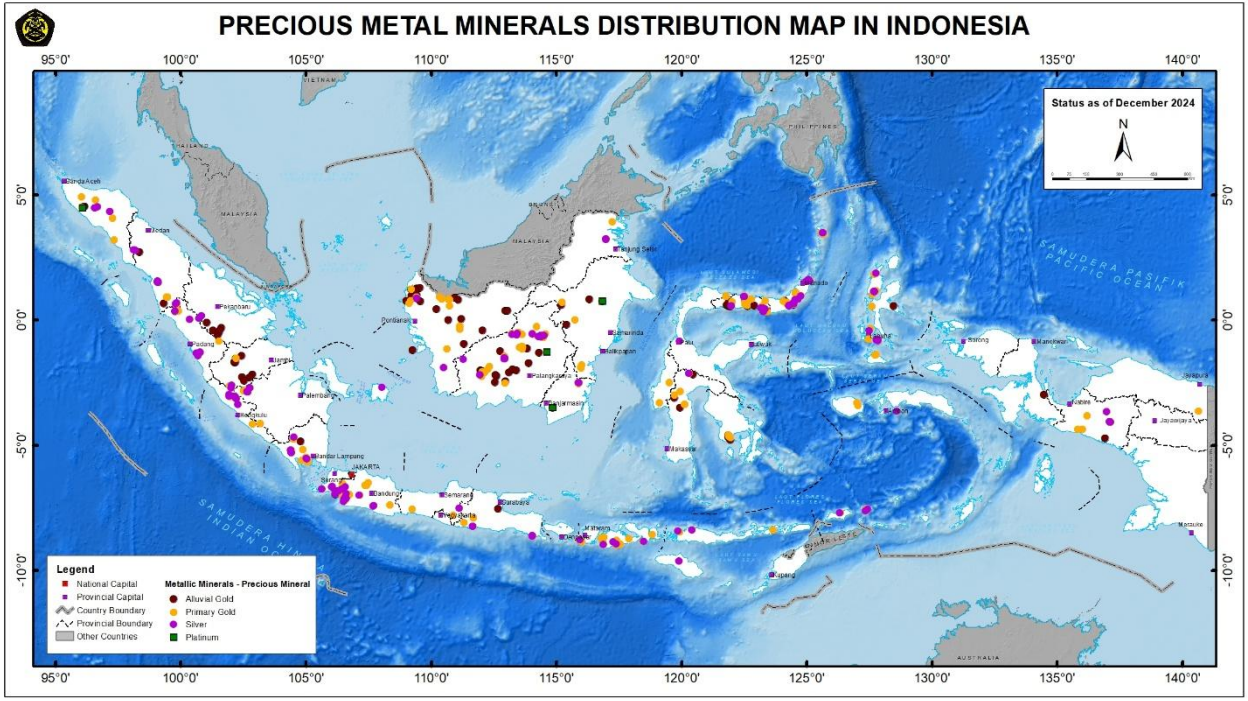
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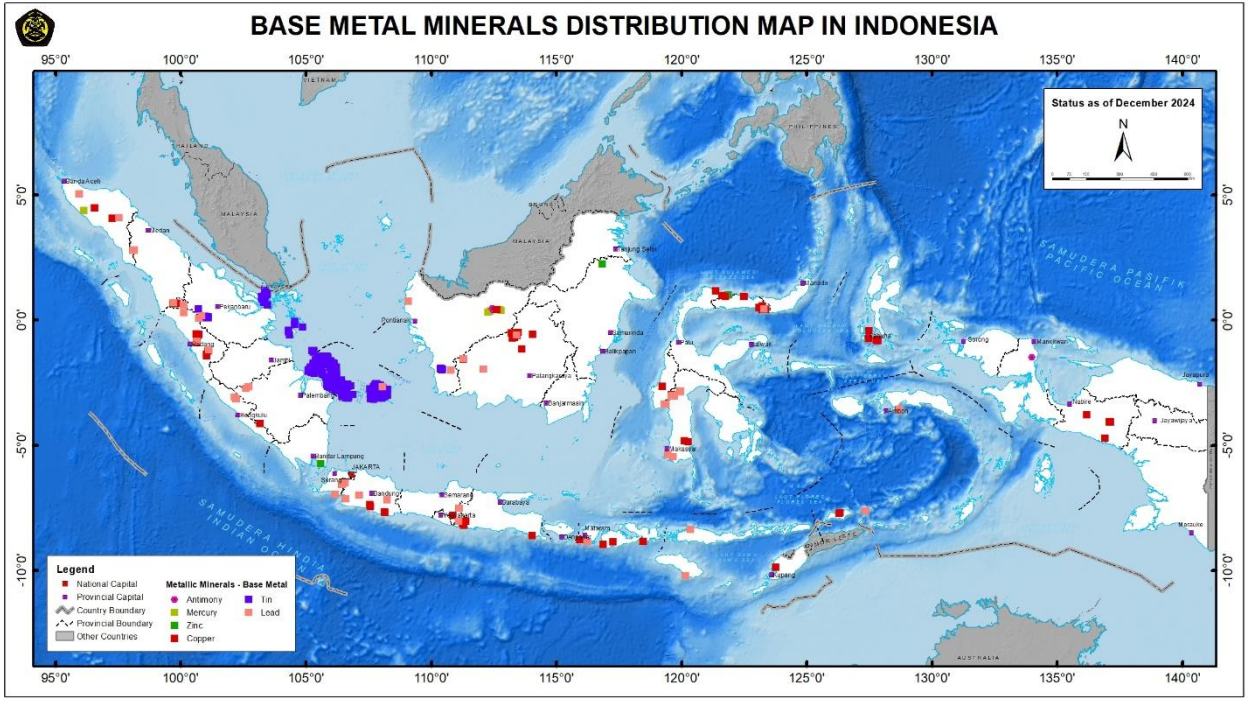
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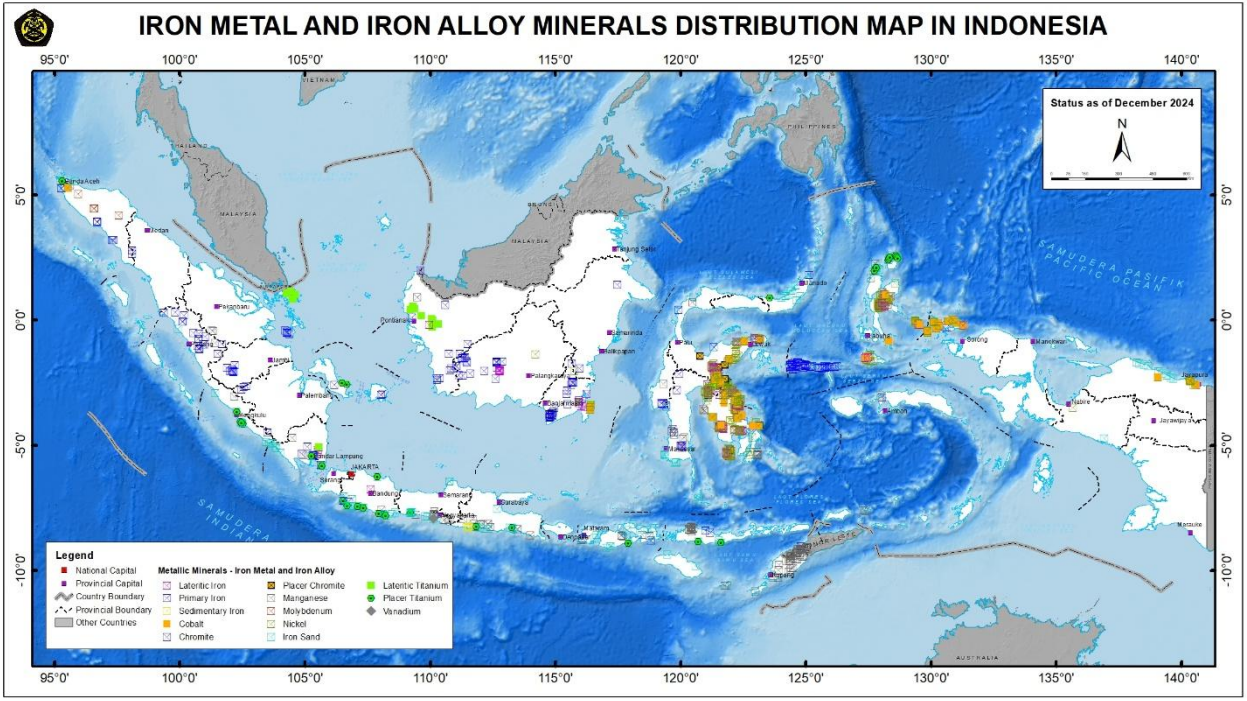
PRECIOUS METAL MINERALS DISTRIBUTION MAP IN INDONESIA



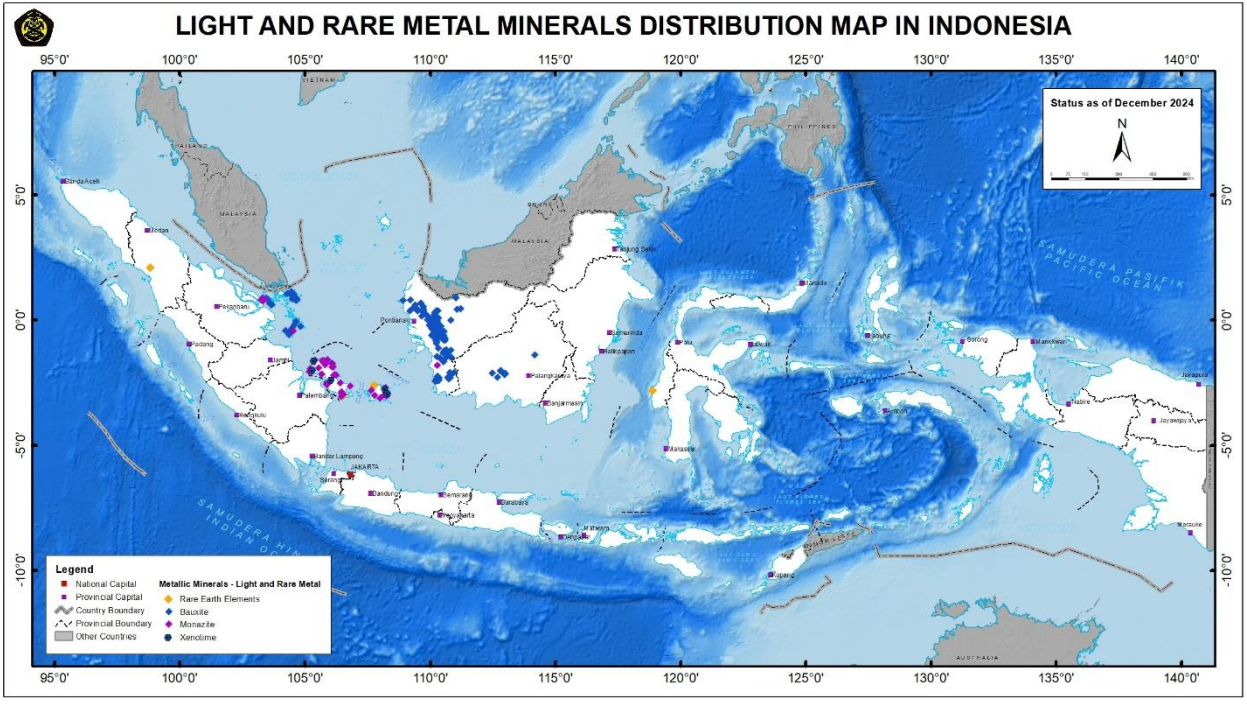
BASE METAL MINERALS DISTRIBUTION MAP IN INDONESIA



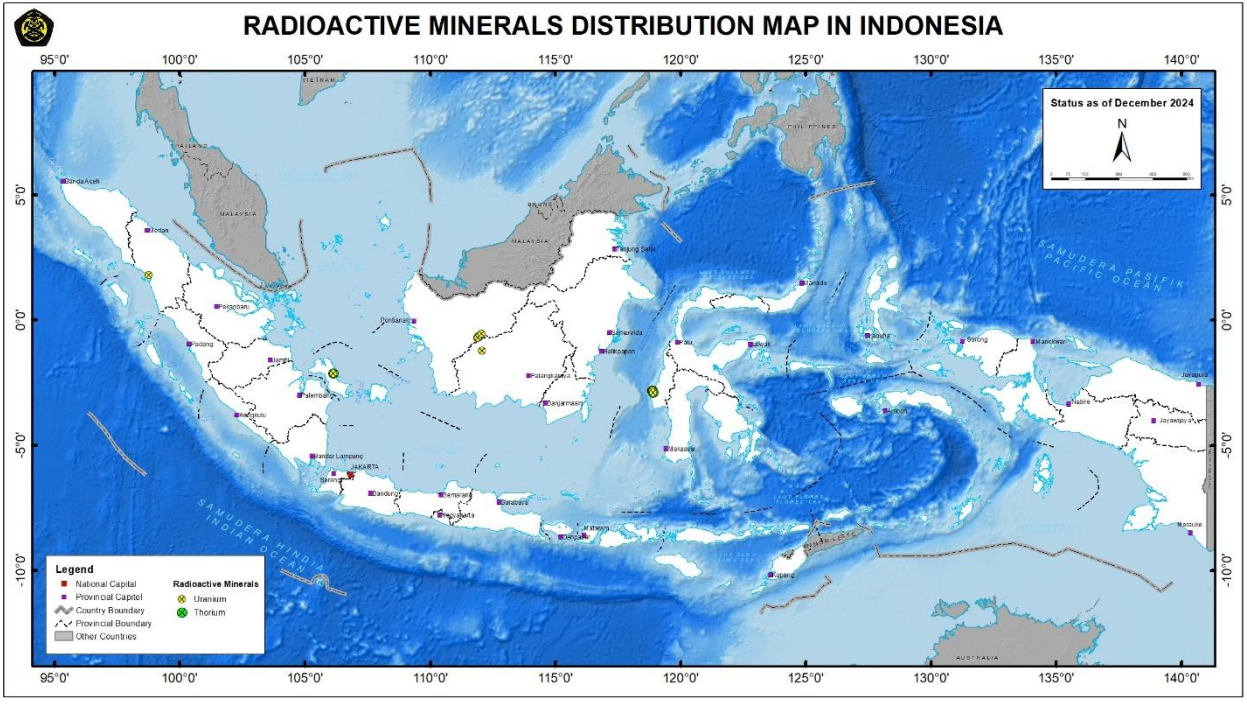
IRON METAL AND IRON ALLOY MINERALS DISTRIBUTION MAP IN INDONESIA

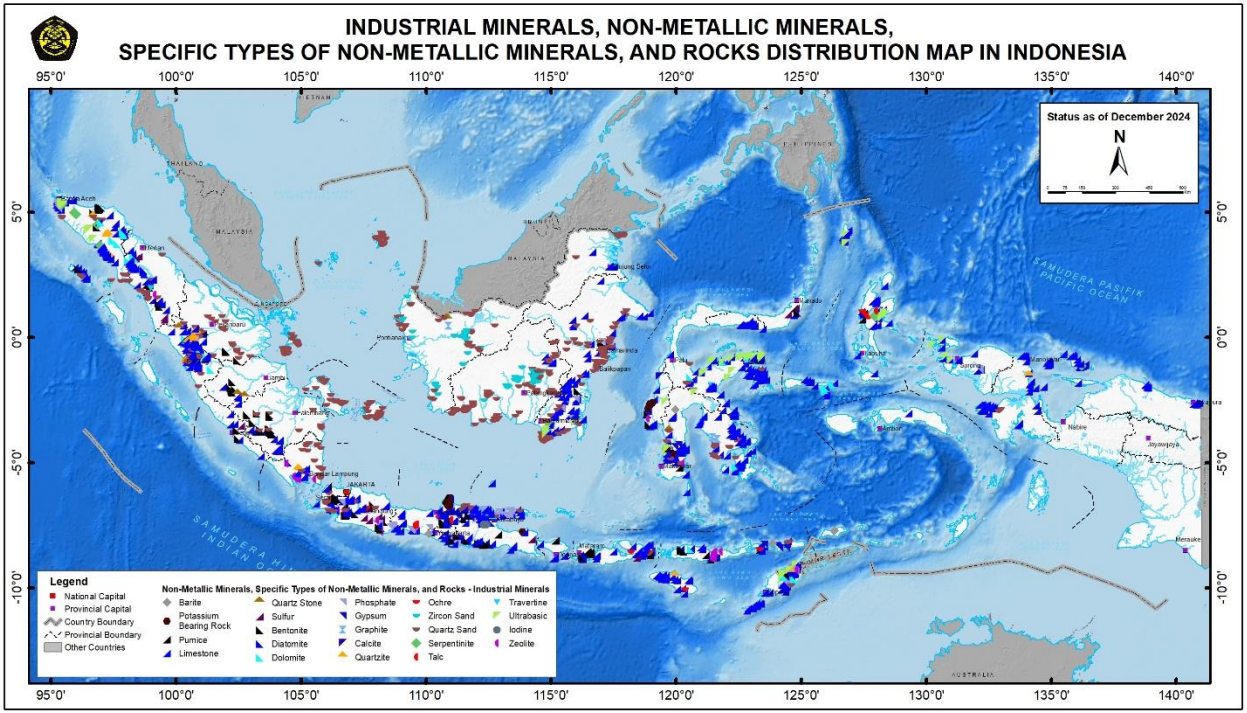


LIGHT AND RARE METAL MINERALS DISTRIBUTION MAP IN INDONESIA

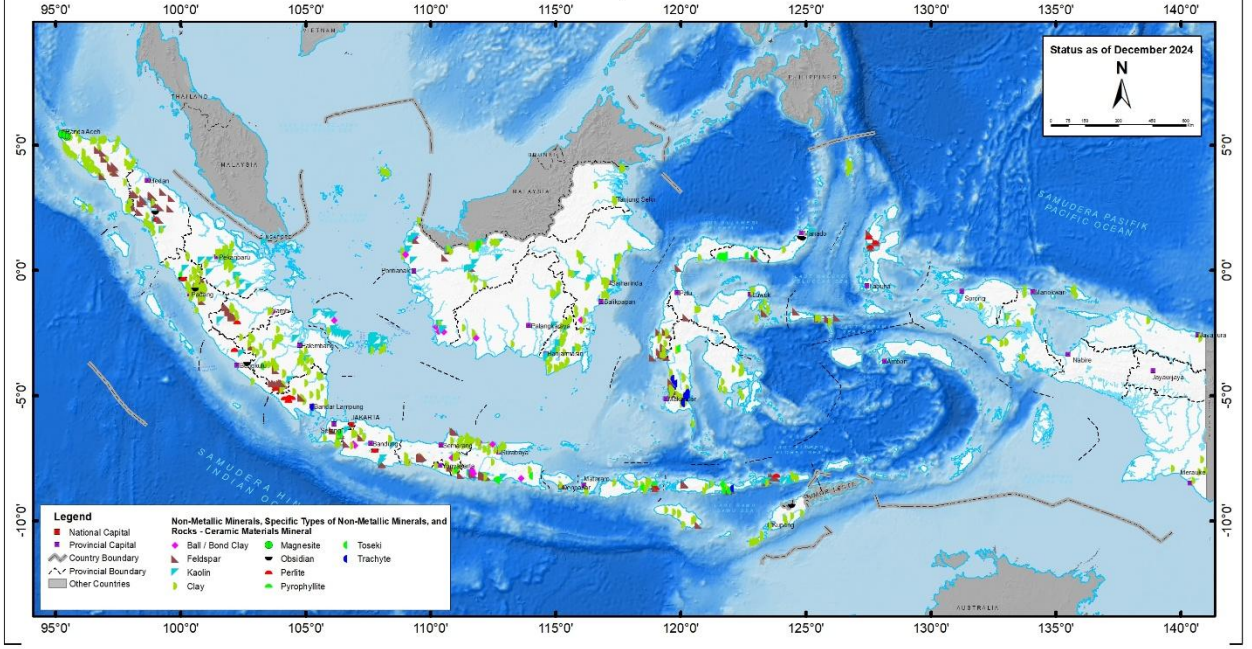


RADIOACTIVE MINERALS DISTRIBUTION MAP IN INDONESIA

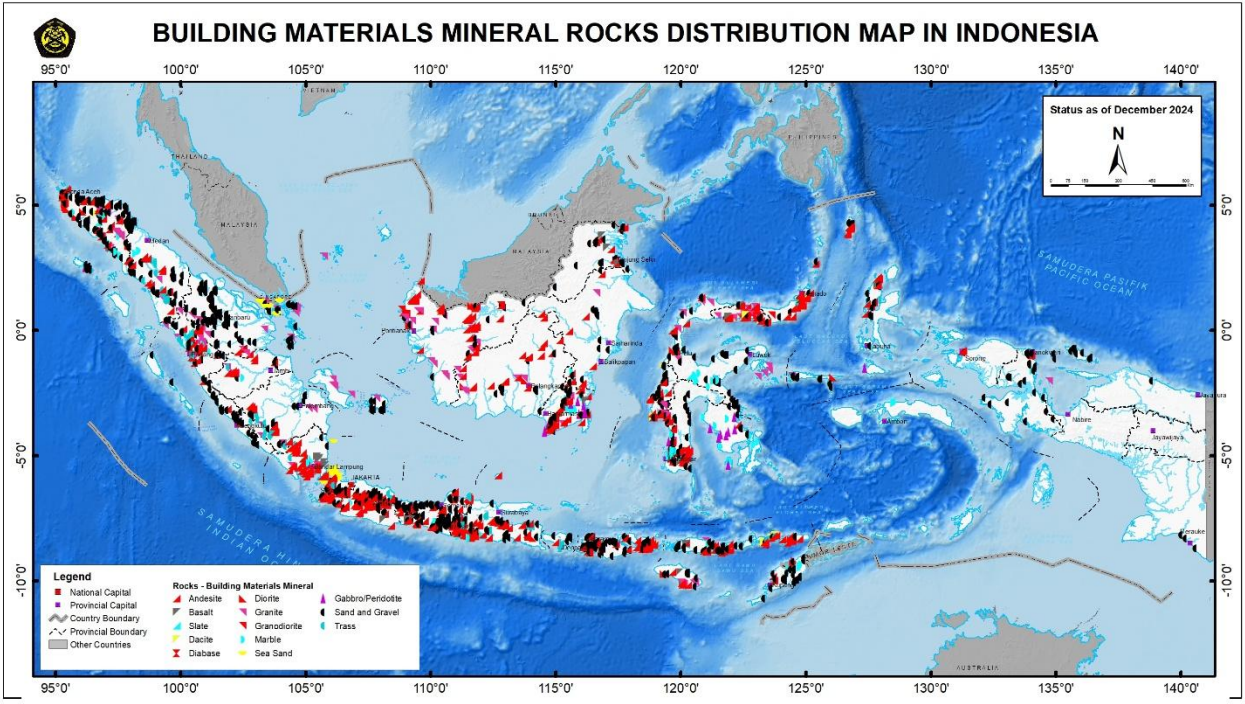



INDUSTRIAL MINERALS, NON-METALLIC MINERALS,
SPECIFIC TYPES OF NON-METALLIC MINERALS, AND ROCKS DISTRIBUTION MAP IN INDONESIA
95°0'
100°0'
105°0'
110°0'
115°0'
120°0'
125°0'
130°0'
135°0'
140°0'
5°0'
0°0'
-5°0'
-10°0'
Status as of December 2024
N
SAMUDERA PASIFIK
PACIFIC OCEAN
SAMUDERA HINDIA
INDIAN OCEAN
Legend
National Capital
Provincial Capital
Country Boundary
Provincial Boundary
Other Countries
Non-Metallic Minerals, Specific Types of Non-Metallic Minerals, and Rocks - Industrial Minerals
Barite
Potassium Bearing Rock
Pumice
Limestone
Quartz Stone
Sulfur
Bentonite
Diatomite
Dolomite
Phosphate
Gypsum
Graphite
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Ochre
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Talc
Travertine
Ultrabasic
Iodine
Zeolite

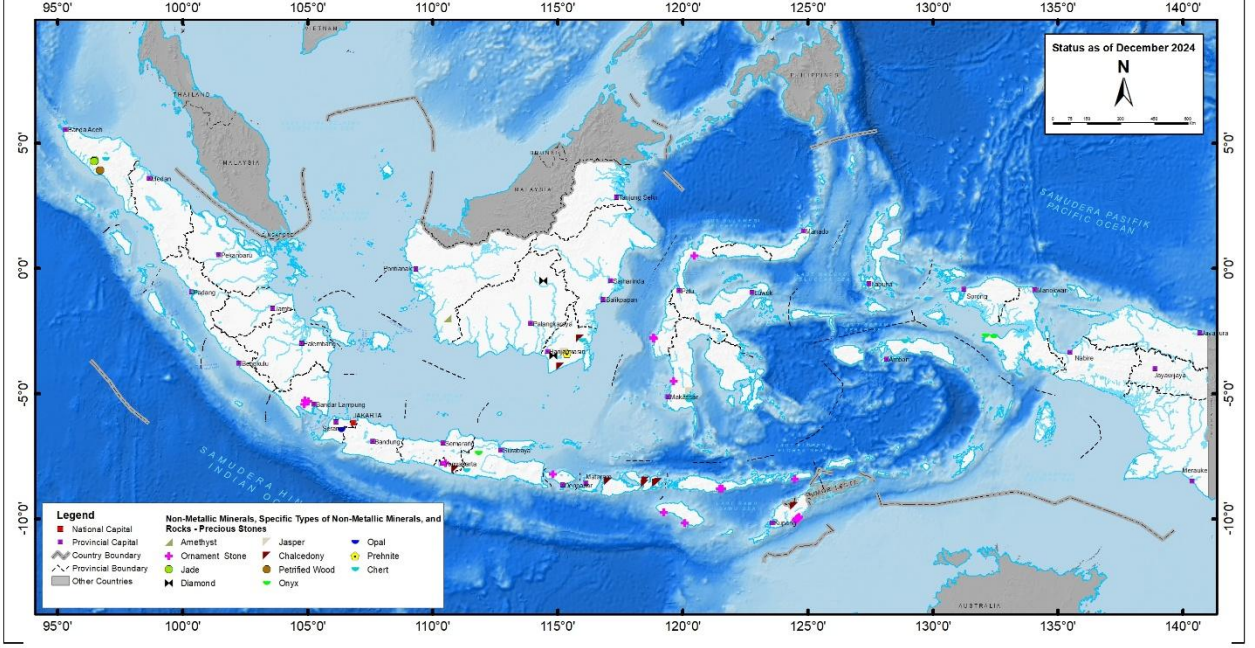
CERAMIC MATERIALS MINERAL, NON-METALLIC MINERALS, SPECIFIC TYPES OF NON-METALLIC MINERALS, AND ROCKS DISTRIBUTION MAP IN INDONESIA



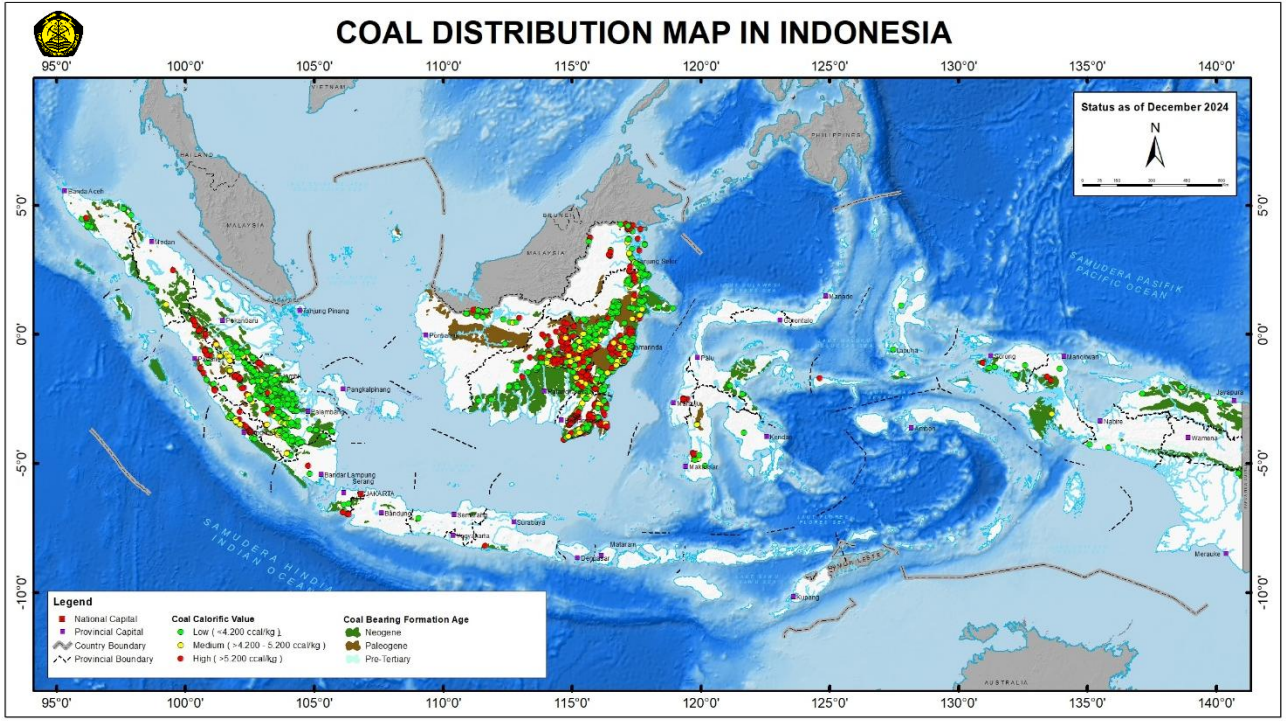
BUILDING MATERIALS MINERAL ROCKS DISTRIBUTION MAP IN INDONESIA



PRECIOUS STONES, NON-METALLIC MINERALS, SPECIFIC TYPES OF NON-METALLIC MINERALS, AND ROCKS DISTRIBUTION MAP IN INDONESIA

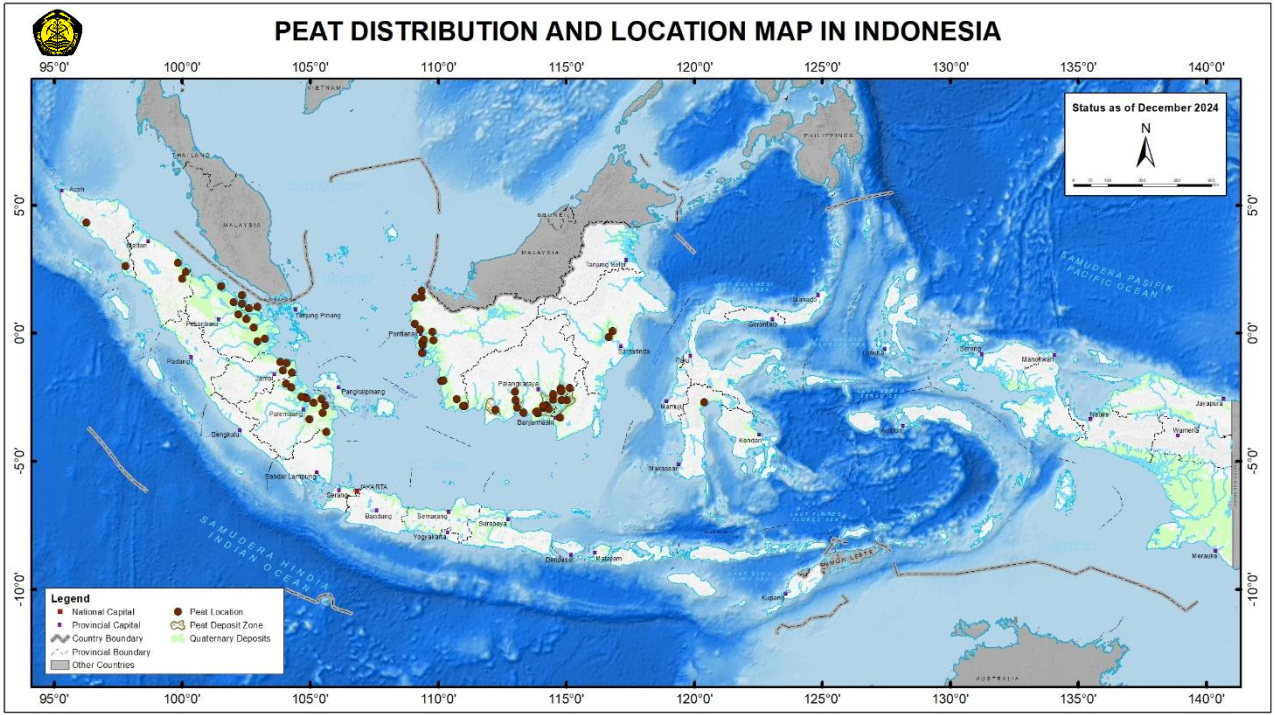


COAL DISTRIBUTION MAP IN INDONESIA



Coal quality based on calorific value classes on a Gross As Received (GAR) basis in accordance with Government Regulation No. 26 of 2022

PEAT DISTRIBUTION AND LOCATION MAP IN INDONESIA





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