BADAN PUSAT STATISTIK

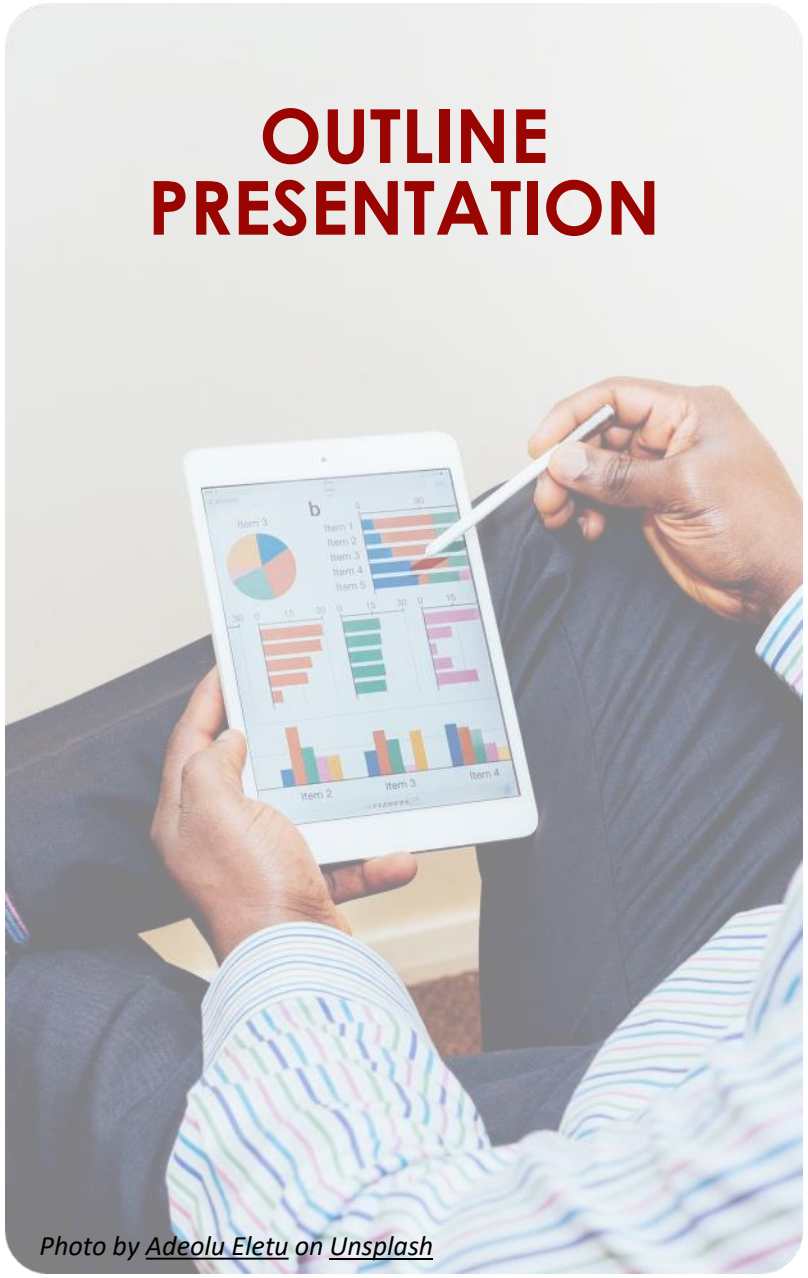
Environment Asset Accounts in Indonesia

delivered on Training Workshop on SEEA Asset Accounts for Sustainable Development

BPS- Statistics Indonesia

Chiba, 16-19 June 2025

OUTLINE PRESENTATION



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1. Implementation SEEA in Indonesia
2. Land Accounts
3. Timber Asset Accounts
4. Mineral and Energy Asset Accounts
5. Lessons Learned, The Way Forward, and How The Accounts Used

01 Implementation SEEA in Indonesia

Publication of Integrated System of Environmental and Economic Accounting of Indonesia

SISNERLING – Sistem Terintegrasi Neraca Ekonomi dan Lingkungan is one of BPS-Statistics Indonesia's publications which is compiled to provide an overview of the impact of development on the availability and role of natural resources in economic activities.

THE LATEST SISNERLING PUBLICATION CAN BE DOWNLOADED FROM BPS WEBSITE (www.bps.go.id)

SEEA Implementation Achievements in SISNERLING

Sisnerling publication provide information on Indonesia's natural resource asset accounts

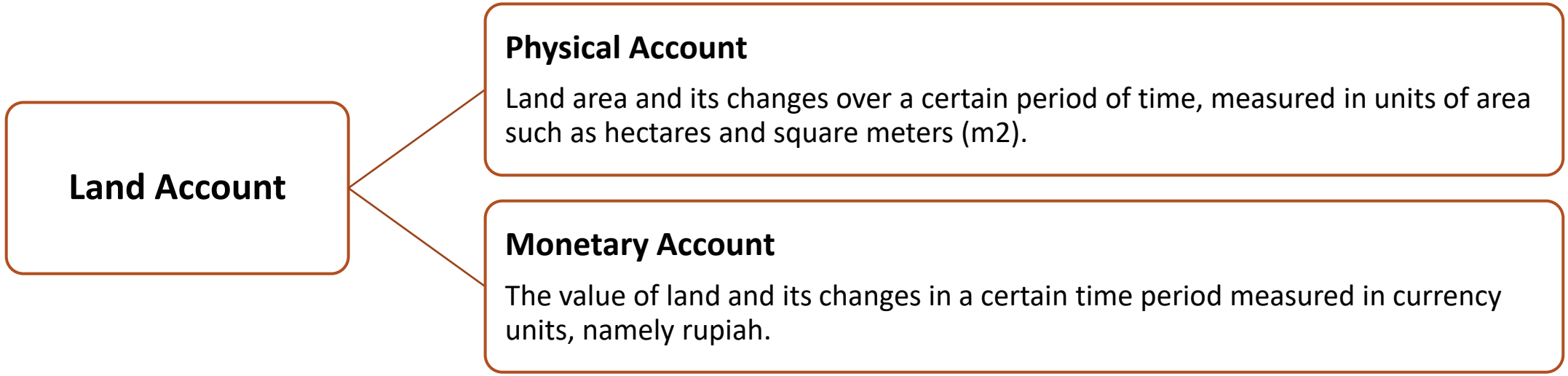
√ **Already implemented** X **Not yet implemented**

Environmental Assets in SEEA	Coverage in Physical Asset Accounts	Coverage in Monetary Asset Accounts
 Mineral & Energy resources	√	√
 Land	√	X
 Soil resources	X	X
 Timber resources	√	√
 Aquatic resources	X	X
 Other Biological resources	X	X
 Water resources	X	X

02 Land Account

Land Account

- **Land account** is an account that records the area or land area that is the territory of a region and its changes over a certain period of time.
- The area covered in the land account is not only limited to land, but also includes areas covered by water, such as rivers and lakes.
- In certain applications, the land account can also be extended to include a country's coastal areas and Exclusive Economic Zone (EEZ).



Land Account Data Source

Ministry of Environment and Forestry (KLHK)

- Land cover map

Geospatial Information Agency (BIG)

- Land use map

Land Account Coverage

No.	Classification Code	Land Cover (KLHK)
1.	2001	Primary Dryland Forest
2.	2002	Secondary Dryland Forest
3.	2004	Primary Mangrove Forest
4.	2005	Primary Swamp Forest
5.	2006	Plantation Forest
6.	2007	Shrubs
7.	2010	Plantation
8.	2012	Settlement
9.	2014	Open Land
10.	2500	Cloud
11.	3000	Savanna/Grassland
12.	5001	Lake
13.	20041	Secondary Mangrove Forest
14.	20051	Secondary Swamp Forest
15.	20071	Swamp Thicket
16.	20091	Dry Land Farming
17.	20092	Dry Land Farming Mixed with Bushes
18.	20093	Ricefield
19.	20094	Pond
20.	20121	Airport/Port
21.	20122	Transmigration/Village
22.	20141	Mining
23.	50011	Swamp

No.	Land Cover (SEEA-CF)
1.	Artificial surfaces (including related urban areas)
2.	Herbaceous crops
3.	Woody plants
4.	Multiple or layered crops
5.	Grassland
6.	Tree covered area
7.	Mangrove
8.	Shurb-covered areas
9.	Shrubs and/or herbaceous vegetation, aquatic or regularly flooded
10.	Sparsely natural vegetated areas
11.	Terrestrial barren land
12.	Permanent snow and glacier
13.	Inland waters bodies
14.	Coastal water bodies and intertidal areas

There is differences between the SEEA CF-2012 classification and the land cover classification from KLHK.
The SEEA CF-2012 classification consists of 14 classes while the KLHK classification consists of 23 classes.

Land Account Coverage (2)

No.	Land Use Classification (SEEA-CF)
1.	**Land**
1.1	Agriculture
1.2	Forestry
1.3	Land used for aquaculture
1.4	Use of built-up and related areas
1.5	Land used for maintenance and restoration of environmental function
1.6	Other uses of land n.e.c
1.7	Land not in use
2.	**Inland waters**
2.1	Inland waters used for aquaculture or holding facilities
2.2	Inland waters used for maintenance and restoration of environmental functions
2.3	Other uses of inland waters n.e.c
2.4	Inland waters not in use

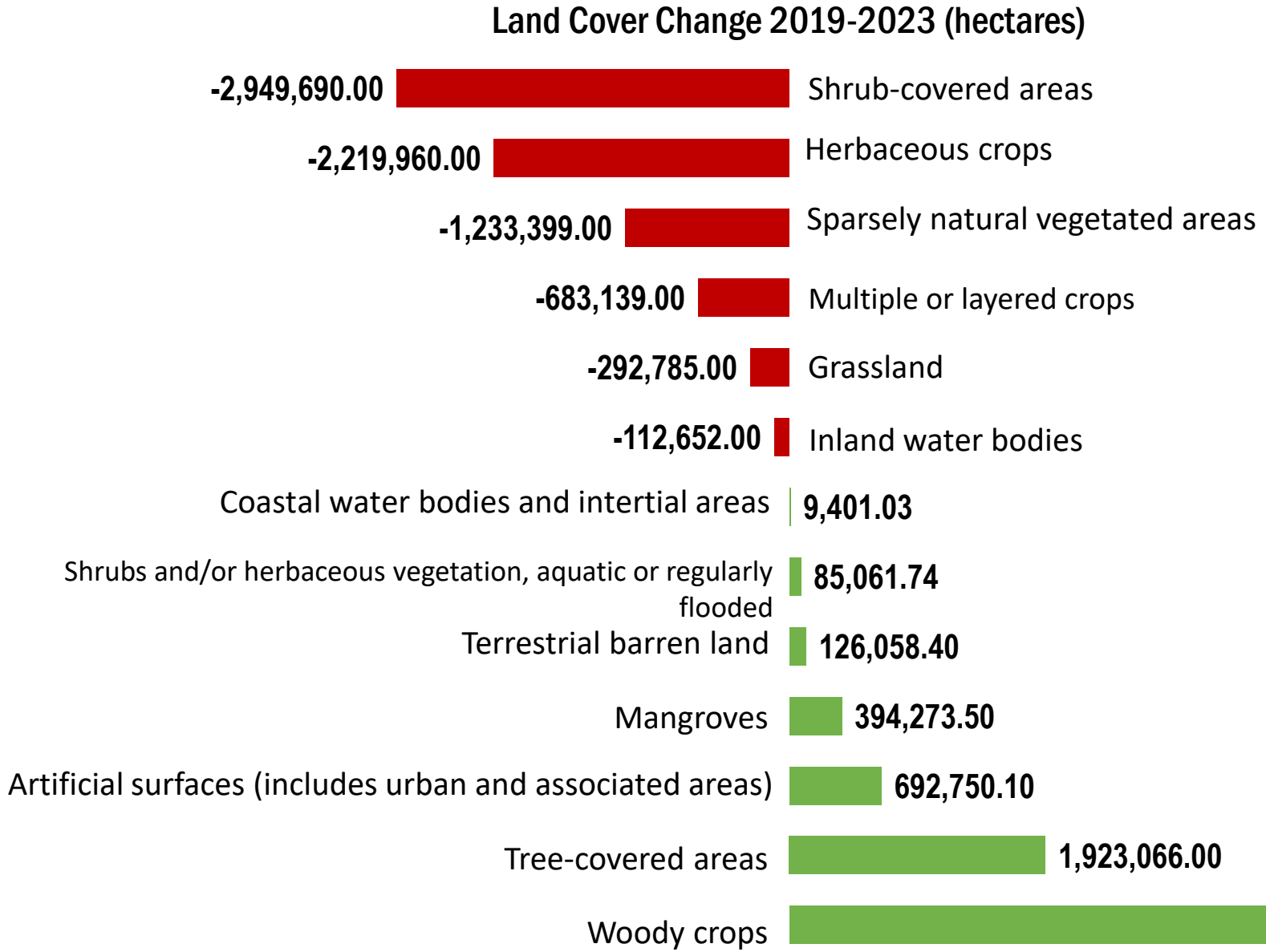
- Land use reflects the activities carried out and institutional arrangements placed in a particular area for the purpose of economic production, or maintenance and restoration of environmental functions.
- These categories are not defined based on economic activity but rather on consideration of the general purpose and role of the area's users.

Compilation of Land Account in Indonesia

Land account in physical units describes land area and changes in land area over a period of time.
Land account can be presented in various forms, such as land use account, land cover account, or land ownership account.
The unit of land measurement used is the unit of area, such as hectares or square meters.

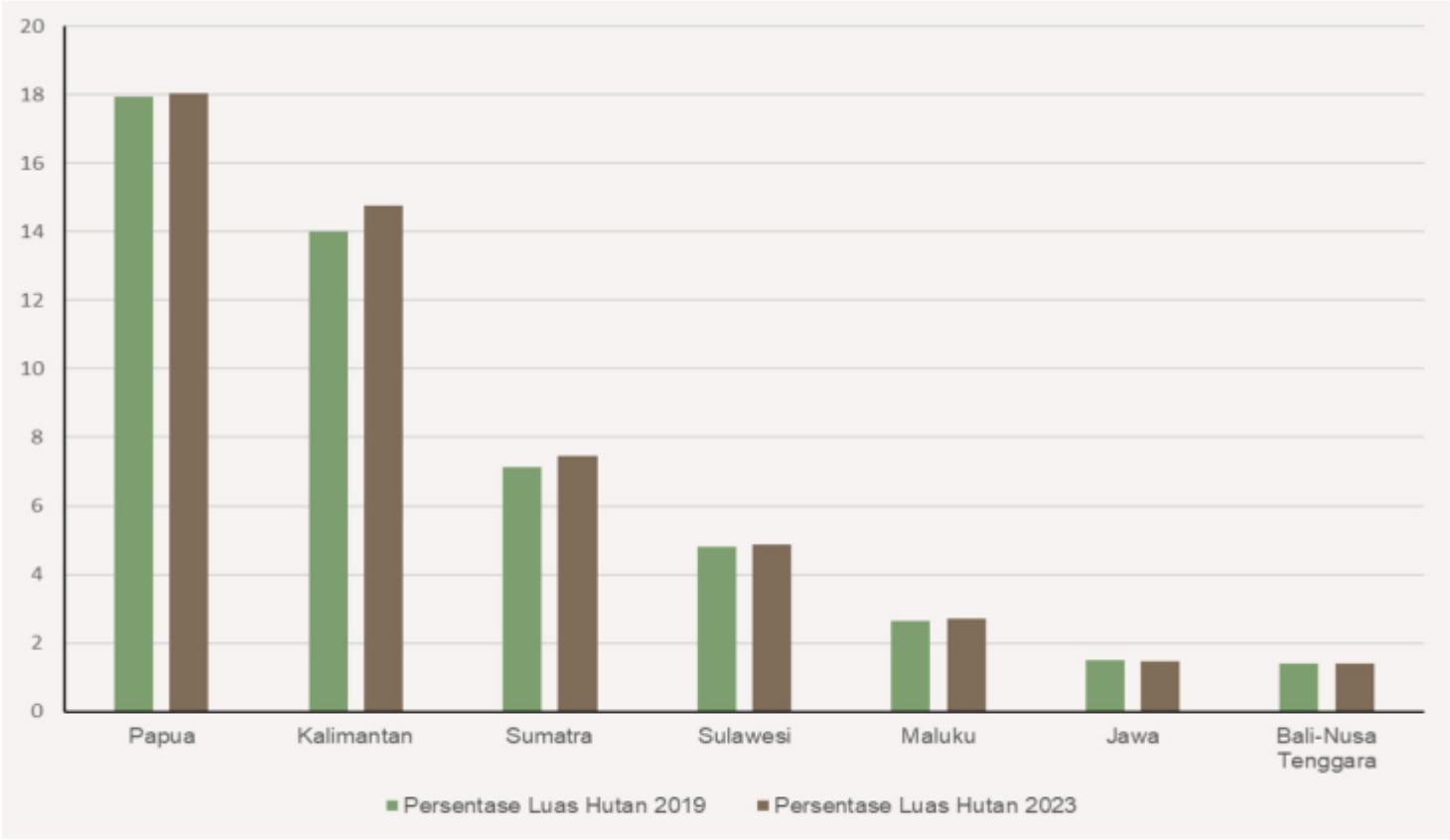
1. Spatial data collected from KLHK & BIG in the form of shape files.
2. Data processing using GIS (Geographic Information System) software such as ArcGIS and ArcMap.
3. Tabular analysis and land account dissemination.

Land Account Result



In 2019-2023, the land cover that experienced a decrease were areas covered by ***shrubs, herbaceous crop, sparsely natural vegetated area, multiple or layered crops, grasslands, and inland water bodies.*** *On the other hand, the land cover that experienced an increase in 2019-2023 included* ***Coastal water bodies and intertial areas, Shrubs and/or herbaceous vegetation, aquatic or regularly flooded, Terrestrial barren land, mangrove, artificial surfaces, tree-covered areas, and woody crops****.*

Land Account Result (2)



Gambar 3.9 Persentase Luas Hutan Indonesia (persen), 2019–2023/
Figure *Percentage of Indonesia Forest Area (percent), 2019–2023*

Source: Publication of Integrated System of Environmental and Economic Accounting of Indonesia 2019-2023

Land Account Result (3)

Tabel 3.7 *Table* Perbandingan Luas Pulau, Luas Tutupan Hutan, danPersentase Luas Tutupan Hutan, 2019 dan 2023/ *Comparison of Island Area, Forest Cover Area, and Percentage of Forest Cover Area, 2019 and 2023*

Kelompok Pulau/ Island Groups	Luas/*Area (ha)*	Luas Tutupan Hutan/*Land Cover Area (ha)*		Persentase Luas Tutupan Hutan terhadap Luas Indonesia/ *Percentage of Forest Cover Area towards Total Area of Indonesia (%)*		Persentase Luas Tutupan Hutan terhadap Luas Per Pulau/ *Percentage of Forest Cover Area towards Total Area Per Islands (%)*	
		2019	2023	2019	2023	2019	2023
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sumatera	47.580.763	13.464.246	14.133.229	7,11	7,47	28,30	29,70
Jawa	13.260.358	2.839.783	2.738.954	1,50	1,45	21,42	20,66
Kalimantan	53.469.846	26.538.133	27.906.088	14,02	14,75	49,63	52,19
Sulawesi	18.621.615	9.117.605	9.235.519	4,82	4,88	48,96	49,60
Bali-Nusa Tenggara	7.171.268	2.669.710	2.627.533	1,41	1,39	37,23	36,64
Maluku	7.915.697	5.017.823	5.140.863	2,65	2,72	63,39	64,95
Papua	41.221.462	33.950.910	34.133.363	17,94	18,04	82,36	82,80
Indonesia	189.241.009	93.598.210	95.915.549	49,46	50,68	49,46	50,68

Tabel 3.8 *Table* Luas Lahan dan Perubahan Luas Tutupan Hutan di Indonesia, 2019 dan 2023/ *Land Area and Forest Cover Changes in Indonesia, 2019 and 2023*

Kelompok Pulau/ *Island Groups*	Luas/*Area (ha)*	Pengurangan dan Penambahan Luas Tutupan Hutan di Indonesia/ *Forest Cover Loss and Additions in Indonesia*	
		Hektar/ *Hectares*	Persentase/ *Percentages*
(1)	(2)	(3)	(4)
Sumatra	47.580.763	668.983	1,41
Jawa	13.260.358	-100.829	-0,76
Kalimantan	53.469.846	1.367.955	2,56
Sulawesi	18.621.615	117.915	0,63
Bali-Nusa Tenggara	7.171.268	-42.177	-0,59
Maluku	7.915.697	123.040	1,55
Papua	41.221.462	182.453	0,44
Indonesia	189.241.009	2.317.339	1,22

Source: Publication of Integrated System of Environmental and Economic Accounting of Indonesia 2019-2023

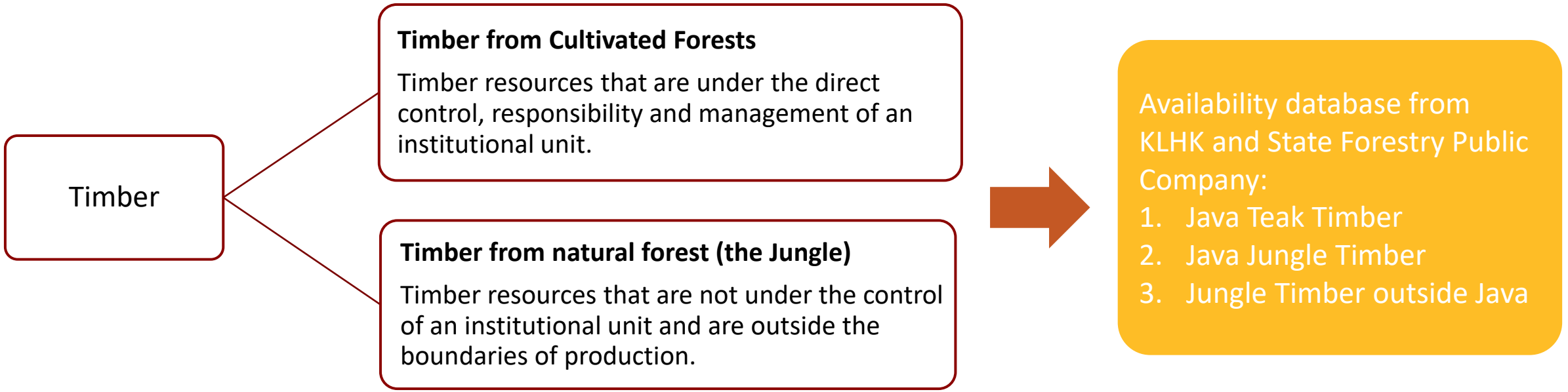
The Challenges of Compiling Indonesia's Land Account

- Concordance land cover/land use classifications between KLHK and SEEA-CF.
- Spatial data processing can take a long time due to shapefiles size and computer capacity/capability.
- Valuation (Land price) data according to land classifications are unavalaible due to restricted/limited access.

03 Timber Asset Accounts

Timber Asset Account Coverage

Timber resources recorded in the timber resource asset account in physical units include all timber, whether available to produce logs or firewood products or timber that cannot be used for various reasons, such as being in areas where logging activities are prohibited, being in remote areas that are inaccessible and therefore not economically viable for logging activities, or being classified as a plant species that has no economic value from a biological perspective.



Physical Asset Account

Basic Structure of Physical Asset Account for Timber Resources (m^3)

Details	Origin/Source of Timber Resources		
	Timber from Cultivated Forests	Timber from the Jungle	
		Available for supply (Production Forest)	Not available for supply (Conservation Forest)
(1)	(2)	(3)	(4)
Beginning of year stock			
Stock addition:			
Natural growth			
Reclassification			
Total addition to stock			
Stock reduction:			
Logging			
Logging waste			
Catastrophic Losses			
Reclassifications			
Total reduction			
End of year stock			

Re-Structure of Physical Asset Account for Timber Resources (m^3)

	Details	2019	2020	2021	2022	2023
	(1)	(2)	(3)	(4)	(5)	(6)
1	**Beginning of year stock**					
2	**Stock addition:**					
	Growth					
	Reclassification					
	Total addition					
3	**Stock reduction:**					
	Logging					
	Damage and Reclassification					
	Total reduction					
4	**End of year stock**					

Monetary Asset Account

Basic Structure of Monetary Asset Account for Timber Resources (rupiah)

Details	Origin/source of timber resources		
	Timber from Cultivated Forests	Wood from the Jungle	
		Available for supply (Production Forest)	Not available for supply (Conservation Forest)
(1)	(2)	(3)	(4)
Opening stock			
Additions to stock:			
Natural growth			
Reclassification			
Total addition			
Reductions in stock:			
Logging			
Logging waste			
Catastrophic losses			
Reclassification			
Total reduction			
Revaluation			
Closing stock			

Re- Structure of Monetary Asset Account for Timber Resources (rupiah)

	Details	2019	2020	2021	2022	2023
	(1)	(2)	(3)	(4)	(5)	(6)
1	**Opening stock**					
2	**Additions to stock:**					
	Growth					
	Reclassification					
	Total addition					
3	**Reductions in stock:**					
	Logging					
	Damage and Reclassification					
	Total reduction					
4	**Revaluation**					
5	**Closing stock**					

Timber Asset Account Data Sources

Ministry of Environment and Forestry (KLHK)

- Timber production & resources

State Forestry Public Company (Perhutani)

- Timber production & resources
- Comodity Price

Ministry of Finance

- Government Bond Rate

BPS-Statistics Indonesia

- Gross Operating Surplus

Timber Asset Account Data Source

Details	Methodology and Data source		
	Teak Timber of Java	Jungle Timber of Java	Other Timber Outside of Java
Stock Addition:			
Growth	Estimation of Teak Production Forest Area (Perhutani)	Estimates of the Area of Rimba Production Forest (Perhutani)	Estimation with t-1 growth
Reclassification	Estimates of Routine Reforestation Area+ReforestationDevelopment Teak (Forestry)	Estimates of Routine Forest (Forestry)	Estimation of Area Reforestation + Community Forest Planting (NSDH, KLHK)
Stock Reduction:			
Logging	Carpentry Wood/Roundwood Production Teak (Forestry)	Carpentry Wood/Roundwood Production Jungle (Forestry)	Roundwood Production Outside Java (Forestry and Perhutani GDP)
Damage and Reclassification	Estimates of Total Losses from Forest Security Disturbances (Perhutani)	Estimates of Total Losses from Forest Security Disturbances (Perhutani)	Estimation of potential forest stands from Fire Area and ConversionForest (NSDH, KLHK)

Compilation of Timber Physical Asset Account

Java Teak Timber

a. Opening stock

The opening stock of Java teak timber resources in the current year has the same value as the ending stock of Java teak timber resources in the previous year.

$$Opening\ stock_{(t)} = Closing\ stock_{(t-1)}$$

b. Additions to stock

Natural growth

The natural growth of Java teak timber resources was calculated based on data of Teak Production Forest Area obtained from Perhutani.

It is assumed that changes in the area of teak production forest will also change the quantity of available timber volume linearly.

In Sisnerling, the growth of Java teak timber resources is estimated from the comparison between the Java teak production forest area (TPFA) in the current year and the Java teak production forest area in the previous year.

$$Growth_{(t)} = TPFA_{(t)} \,/\, TPFA_{(t-1)} \times Growth_{(t-1)} \times (1 + NGC)$$

The **natural growth coefficient (NGC)** indicates the proportion of timber volume that grows over the course of a year or accounting period.

Currently, the volume of Java Teak timber is assumed to experience a natural growth of **0.5 percent** each year.

Compilation of Timber Physical Asset Account (2)

Java Teak Timber

b. Additions to stock

Reclassification ≈ Reforestation

The addition of java teak timber resources is also caused by replanting Java Teak wood that has been cut down, or also known as reforestation.

The volume of timber increased *by this planting is assumed to be* ***directly proportional*** *to the area of* ***reforestation****.*

The volume of timber planted was estimated using data on teak forest reforestation area (TFRA) from Perhutani.

$$Planting_{(t)} = TFRA_{(t)}/TFRA_{(t-1)} \times Planting_{(t-1)}$$

Total addition

Total stock addition of Java Teak Timber resources is the sum of Java Teak Timber volume growth and Java Teak Timber volume planting.

c. Reductions in stock

Logging ≈ Logs production

The reduction in stock of Java Teak Timber resources caused by the extraction of timber cut outside the Java Teak timber production forest area is approached from the production data of woodworking Teak timber (logs) obtained from Perhutani (m^3).

Log production data: ***national account team → agriculture account (forestry)***

Compilation of Timber Physical Asset Account (3)

Java Teak Timber

c. Reductions in Stock

Conversion and Damage (CD)

Estimated using Forest Security Disturbance Loss (FSDL) data from Perhutani. This data is presented in rupiah.

The things that are included in the forest security disturbance loss: tree thieves, forest destruction, grazing, fires, and natural disasters.

The volume of Java teak timber resources reduced by **conversion and damage** is assumed to be directly proportional to the loss of **forest security disturbances**.

$$CD_{(t)} = CD_{(t-1)} \times FSDL_{(t)}/FSDL_{(t-1)}$$

Total reductions in stock

The total stock reduction of Java teak timber resources is the sum of the felling of Java teak timber volume as well as the conversion and destruction of Java teak timber volume.

d. Closing stock

The ending stock of Java teak timber resources is calculated by summing the initial stock with the total stock additions and then subtracting the total stock reductions.

$$Closing\ Stock_{(t)} = Opening\ Stock_{(t)} + Growth_{(t)} + Planting_{(t)} - Logging_{(t)} - CD_{(t)}$$

Valuation

NPV Method generate expected return value by using projections of future asset prices and extraction rates which are then discounted on the assumption that return earned in the current period is more valuable than return obtained in the future.

$$V_t = \sum_{\tau=1}^{N_t} \frac{RR_{t+\tau}}{(1+r_t)^{\tau}}$$

Information:	
V	Present value
RR	Resource Rent
r	Discount rate
N	Asset Life

Monetary Asset Valuation of Natural Resources at Sisnerling Indonesia

- **Resource rent** approached from the value **gross operating surplus** (GOS)-estimated based on outputand the GOS ratio of the IO Table 2010.
- In the case of unavailability of data on the social discount rate, the **discount rate** that can be used is the **government bond rate**, which can be obtained from the Ministry of Finance.

Compilation of Timber Monetary Asset Account

1. Input Discount Rate data

TAHUN	Sumber: DJPPR Government Bond Rate	
	Rate	Convert
2019	8.02	8.02%
2020	7.49	7.49%
2021	7.05	7.05%
2022	7.21	7.21%
2023	6.85	6.85%

2. Calculating GOS per unit

Jati Jawa

	Harga	Output (juta Rp)	Produksi (000 m3)	GOS per Unit (Rp/m3)
2019	3,881,085.70	1,433,975.73	369.48	2,005,737.68
2020	3,933,314.11	1,385,215.39	352.18	2,032,729.22
2021*	3,961,315.89	1,363,003.24	344.08	2,047,200.48
2022**	4,055,822.68	1,471,345.79	362.77	2,096,041.41
2023***	4,226,858.30	1,528,704.90	361.66	2,184,432.29
		Rasio GOS/Output (SUT 2010)	0.651705457	
		Rasio GOS/Output (IO 2016)	0.516798089	

**Data from Agricultural Accounts (forestry) and National Accounts (IO)*

GOS per unit (t) = GOS Ratio (t) * Output (t) / Production (t) * 1000

3. Calculating NPV

Year	Discount Rate	GOS per unit (Rp/m3)	Resource rent (billion Rp)	Asset Life	Discount Factor	NPV (billiom Rp)	Unit Rent (Rp/m3)
2019	0,080	2.005.737,68	814,48	313,42	0,0398	10.153,12	79.774,24
2020	0,075	2.032.729,22	879,80	302,30	0,0442	11.753,01	89.827,46
2021	0,070	2.047.200,48	1.012,87	272,36	0,0521	14.369,06	106.632,45
2022	0,072	2.096.041,41	1.049,02	276,94	0,0501	14.543,75	104.931,15
2023	0,068	2.184.432,29	1.011,29	307,48	0,0475	14.763,51	103.711,47

Resource Rent (t) = GOS per unit (t) / Logging (t)

Reserve Life (t) = Closing Stock(t) / Logging (t)

Discount factor (t) = (PV(Discount Rate(t), Asset Life(t), -1/Asset Life (t))

NPV (t) = Resource Rent (t) * Asset Life (t) * Discount factor (t)

Unit rent (t) = NPV (t) / Closing stock (t) * 1.000.000

Compilation of Timber Monetary Asset Account (2)

4. Calculating Timber Monetary Assets

Year	Opening stock	Growth	Planting	Conversion & Damage	Logging	Revaluation	Closing Stock	Unit Rent (thousand Rp/m3)
2019	9.263,85	385,77	1,43	85,51	32,39	619,99	10.153,12	79,77
2020	10.153,12	438,63	1,51	80,88	38,88	1.279,51	11.753,01	89,83
2021	11.753,01	522,78	2,33	55,06	52,76	2.198,76	14.369,06	106,63
2022	14.369,06	522,40	1,37	67,30	52,52	(229,25)	14.543,75	104,93
2023	14.543,75	525,96	1,75	90,89	48,01	(169,05)	14.763,51	103,71

Opening stock (t) = NPV (t-1)

Growth (t) = Growth (t) * Unit Rent (t) / 1.000.000

Planting (t) = Planting (t) * Unit Rent (t) / 1.000.000

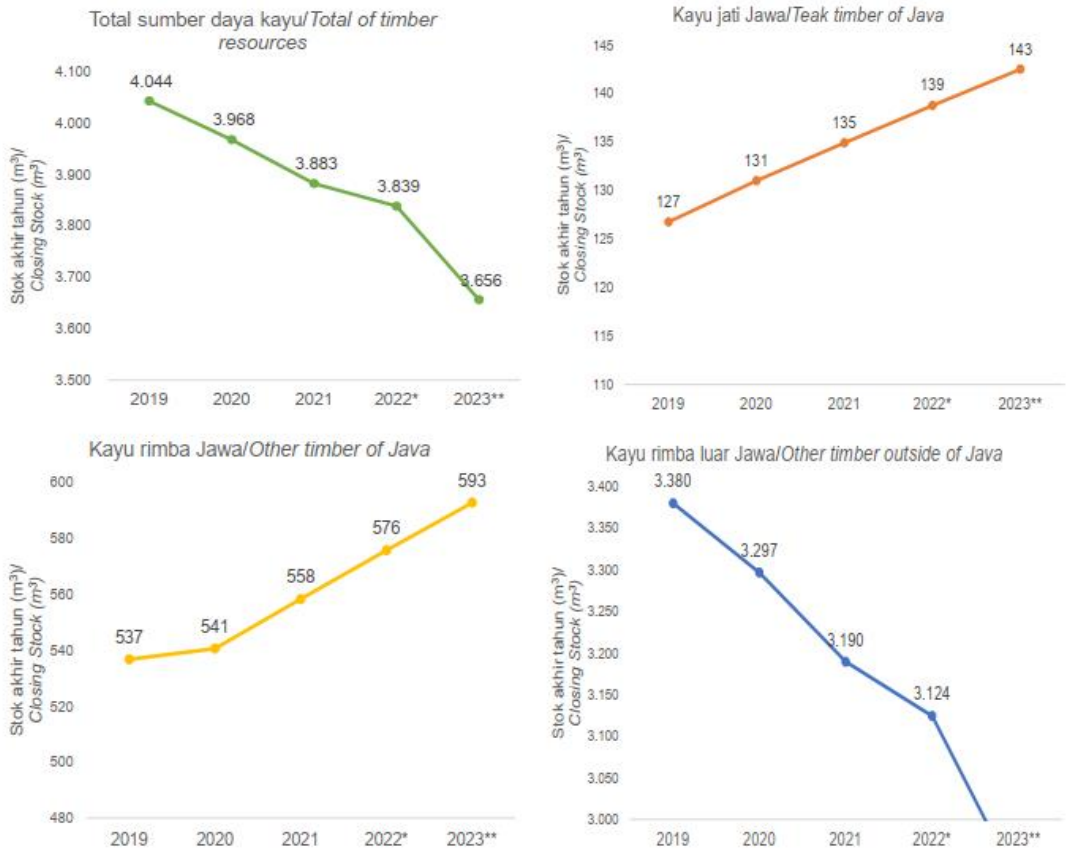
Conversion & Damage(t) = Conversion & Damage (t) * Unit Rent (t) / 1.000.000

Logging (t) = Logging (t) * Unit Rent (t) / 1.000.000

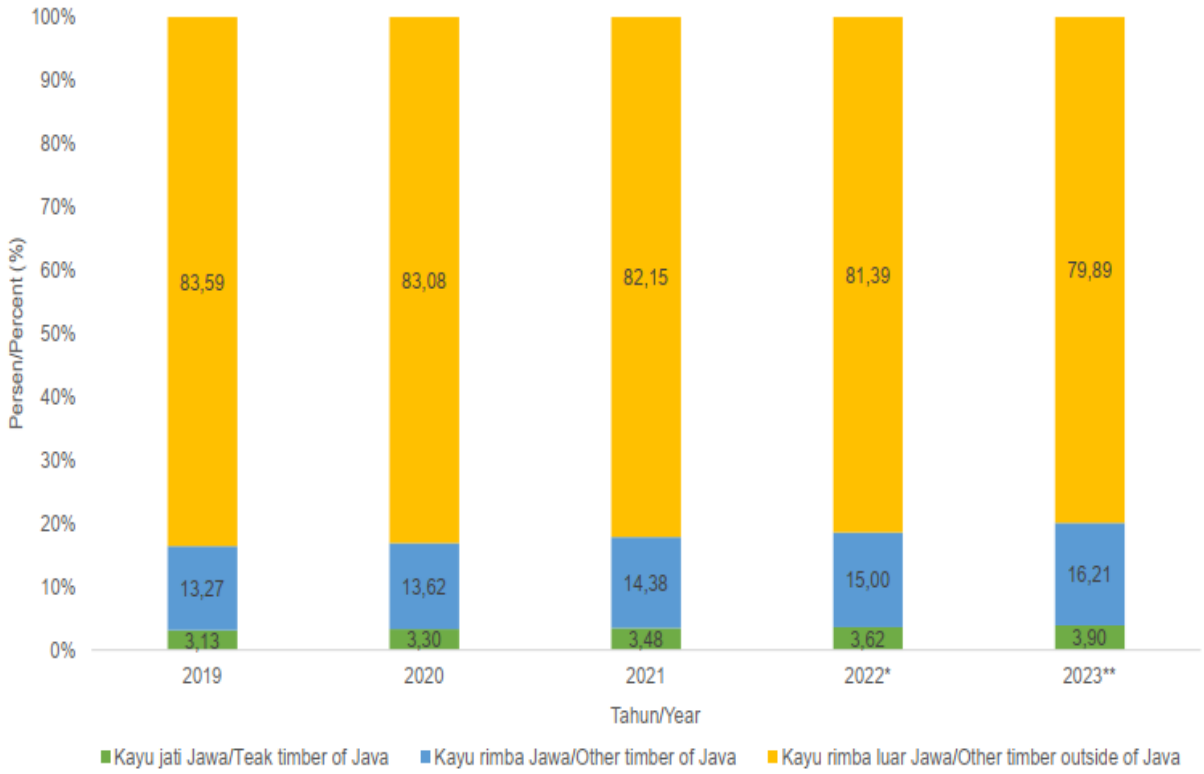
Revaluation (t) = Unit Rent (t) - Unit Rent (t-1) * Opening stock (t) / 1.000.000

Closing stock (t) = NPV (t)

Timber Asset Account Results



Gambar 4.1 Stok Akhir Neraca Fisik Sumber Daya Kayu indonesia (juta m³), 2019–2023/
Figures *Closing Stock of Physical Asset Account for Timber Resources of Indonesia (million m³), 2019–2023*



Gambar 4.2 Kontribusi Neraca Fisik Komoditi Kayu terhadap Neraca Fisik Sumber Daya Kayu Indonesia (persen), 2019–2023/
Figures *Contribution of Physical Asset Account for Timber to Physical Account for Timber Resources of Indonesia (percent), 2019–2023*

Source: Publication of Integrated System of Environmental and Economic Accounting of Indonesia 2019-2023

Timber Asset Account Results (2)

Indonesian Timber Resources Monetary Account Table (billion Rupiah), 2019-2023

Rincian/Detail	2019	2020	2021	2022*	2023**
(1)	(2)	(3)	(4)	(5)	(6)
Stok awal tahun/Opening stock	**740,284.00**	**818,198.38**	**952,915.52**	**1,100,095.71**	**1,175,510.08**
Penambahan stok/*Additions to stock*					
Pertumbuhan alami/*Natural growth*	6,109.57	7,281.45	7,365.46	7,902.89	9,911.55
Reklasifikasi/*Reclassifications*	3,075.19	3,032.54	1,343.84	2,044.68	3,502.10
Total penambahan/Total additions to stock	**9,184.76**	**10,314.00**	**8,709.31**	**9,947.57**	**13,413.65**
Pengurangan stok/*Reductions in stock*					
Penebangan/*Removals*	11,560.74	14,524.24	15,185.37	16,619.61	22,281.85
Kerusakan dan Reklasifikasi/*Losses and Reclassifiations*	76,926.66	19,002.63	22,902.56	12,615.63	69,388.30
Total pengurangan/Total reductions in stock	**88,487.39**	**33,526.87**	**38,087.93**	**29,235.24**	**91,670.15**
Revaluasi/Revaluations	**157,217.01**	**157,930.02**	**176,558.81**	**94,702.05**	**313,730.25**
Stok akhir tahun/Closing stock	**818,198.38**	**952,915.52**	**1,100,095.71**	**1,175,510.08**	**1,410,983.83**

Source: Publication of Integrated System of Environmental and Economic Accounting of Indonesia 2019-2023

The Challenges of Compiling Indonesia's Timber Asset Accounts

- The available data does not distinguish between types of timber resources, especially between timber resources from cultivated forests and timber resources from forests.
- Discontinuous sectoral data from the ministry.
- Availability of discount rate by commodity.

04 Mineral and Energy Asset Accounts

Mineral and Energy Asset Accounts

Mineral and energy asset accounts organize relevant information,including the quantities and values of stocks of the resources and the changes in these over accounting periods.

Indonesia **Energy** Asset Accounts comprises:

1. Crude Oil
2. Natural Gas
3. Coal

Indonesia **Mineral** Asset Accounts comprises:

1. Gold
2. Silver
3. Copper
4. Tin
5. Nickel
6. Bauxite

Classification of Mineral and Energy Resources

1

RESERVE

Known to be economically, legally, and technically feasible for extraction

Coverage of Indonesia Mineral & Energy Asset Accounts

2

RESOURCE

Potentially valuable, and for which reasonable prospects exist for eventual economic extraction

Account Structure

Physical Energy Asset Accounts

Description	Type of Resources			
	Crude	Coal	....	Bauxite
(1)	(2)	(3)	....	(9)
Opening Stock				
Extraction				
Other Changes in Stock				
Closing Stock				

Monetary Energy Asset Accounts

Description	Type of Resources			
	Coal	Crude Oil	....	Bauxite
(1)	(2)	(3)	....	(9)
Opening Stock				
Extraction				
Other Changes in Stock				
Revaluation				
Closing Stock				

Mineral and Energy Asset Account Data Sources

Ministry of Energy and Mineral Resources (ESDM)

- Stock of Reserves
- Production

Ministry of Finance

- Government Bond Rate

BPS-Statistics Indonesia

- Commodity Price
- Gross Operating Surplus

Compilation of Mineral and Energy Physical Asset Account

1) Recording the stock of each type of mineral and energy resource. Stock data for each type of mineral and energy resources obtained from ESDM in a certain year is considered as the final stock for that period.

$$\boldsymbol{Opening\ stock_{(t)} = Closing\ stock_{(t-1)}}$$

2) The recording of mineral resource stocks, which also comprises reserves and resources, is done in two forms, gross ore and metal content.
3) Estimating extraction data for each type of mineral resource starts with converting production data, which comes in various forms, into metal content. Then, the extraction estimation results in metal content can be converted into gross ore (common conversion factors from Eurostat).
4) The type of change in the stock of mineral and energy resources that can be recorded in the physical asset account for mineral and energy resources is extraction. Other stock changes besides extraction, used as a balancing item in the physical assets account for mineral and energy resources.

$$\boldsymbol{Other\ changes\ in\ stock_{(t)} = Closing\ stock_{(t)} - Opening\ stock_{(t)} + Extraction_{(t)}}$$

Valuation

NPV Method generate expected return value by using projections of future asset prices and extraction rates which are then discounted on the assumption that return earned in the current period is more valuable than return obtained in the future.

$$V_t = \sum_{\tau=1}^{N_t} \frac{RR_{t+\tau}}{(1+r_t)^{\tau}}$$

Information:	
V	Present value
RR	Resource Rent
r	Discount rate
N	Asset Life

Monetary Asset Valuation of Natural Resources at Sisnerling Indonesia

- **Resource rent** approached from the value **gross operating surplus** (GOS)-estimated based on output and the GOS ratio of the IO Table 2010.
- In the case of unavailability of data on the **social discount rate**, the **discount rate** that can be used is the **government bond rate**, which can be obtained from the Ministry of Finance.

Compilation of Mineral and Energy Monetary Asset Account

1. Input Discount Rate data

Tahun		2019	2020	2021	2022	2023
Tanggal		31-Dec-2019	30-Dec-2020	30-Dec-2021	30-Dec-2022	29-Dec-2023
5 Y	FR	FR0077	FR0081	FR0086	FR0090	FR0095
	FR %	8,13%	6,50%	5,50%	5,13%	6,38%
	End Date	15-May-2024	15-Jun-2025	15-Apr-2026	15-Apr-2027	15-Aug-2028
	Harga / Price	106,61	105,41	101,63	96,5	99,83
	Yield	6,37%	5,13%	5,07%	6,07%	6,42%
10 Y	FR	FR0078	FR0082	FR0087	FR0091	FR0096
	FR %	8,25%	7,00%	6,50%	6,38%	7,00%
	End Date	15-May-2029	15-Sep-2030	15-Feb-2031	15-Apr-2032	15-Feb-2033
	Harga / Price	108,32	108,34	101,08	96,63	103,71
	Yield	7,03%	5,86%	6,35%	6,87%	6,46%
15 Y	FR	FR0068	FR0080	FR0088	FR0093	FR0098
	FR %	8,38%	7,50%	6,25%	6,38%	7,13%
	End Date	15-Mar-2034	15-Jun-2035	15-Jun-2036	15-Jul-2037	15-Jun-2038
	Harga / Price	107,15	111,1	100,27	96,62	104,72
	Yield	7,55%	6,32%	6,23%	6,75%	6,62%
20 Y	FR	FR0079	FR0083	FR0083	FR0092	FR0097
	FR %	8,38%	7,50%	7,50%	7,13%	7,13%
	End Date	15-Apr-2039	15-Apr-2040	15-Apr-2040	15-Jun-2042	15-Jun-2043
	Harga / Price	107,3	111,13	104,64	100,39	103,86
	Yield	7,65%	6,48%	7,05%	7,09%	6,77%

Source: Directorate General of Budget Financing and Risk Management, Ministry of Finance

2. Estimation of Resource Rent

No.	Description	Unit	2019	2020	2021	2022	2023
(1)	(2)	(3)	(15)	(16)	(17)	(18)	(19)
1	Output	million IDR	255.933.666	179.866.855	278.070.589	364.796.336	312.350.575
2	Intermediate consumption	million IDR	61.927.256	43.521.671	67.283.639	88.268.325	75.578.232
3	Compensation of employees	million IDR	38.413.680	26.996.635	41.736.262	54.753.132	46.881.425
4	Other taxes and subsidies on production	million IDR	1.256.545	883.083	1.365.230	1.791.023	1.533.532
5	**Gross operating surplus**	**million IDR**	**154.336.185**	**108.465.465**	**167.685.457**	**219.983.856**	**188.357.385**
6	Specific taxes and subsidies on extraction	million IDR					
7	Consumption of fixed capital	million IDR					
8	Return to produced assets	million IDR					
9	**Resource Rent**	**million IDR**	**154.336.185**	**108.465.465**	**167.685.457**	**219.983.856**	**188.357.385**
10	Quantity of resource extracted	million barrel	272	259	240	224	221
11	**Per unit resource rent**	**IDR/barrel**	**567.359**	**418.387**	**697.639**	**984.000**	**852.213**

Source: Directorate of Production Account, BPS-Statistics Indonesia

3. Estimation of NPV

No.	Description	Unit	2019	2020	2021	2022	2023
(1)	(2)	(3)	(15)	(16)	(17)	(18)	(19)
1	Price per unit of resource extracted (PS)	IDR/barrel	567.359	418.387	697.639	984.000	852.213
2	Quantity of resource extracted (S)	million barrel	272	259	240	224	221
3	Resource Rent (RR)	billion IDR	154.336	108.465	167.685	219.984	188.357
4	Number of remaining periods of extraction (N)	year	23	21	20	18	17
5	**Discount Rate (r)**		**0,0765**	**0,0648**	**0,0705**	**0,0675**	**0,0662**
6	Discount factor		0,46	0,54	0,53	0,56	0,59
7	**Present value of stock at the end of period (V**	**billion IDR**	**1.650.482,15**	**1.232.797,10**	**1.759.477,45**	**2.275.538,67**	**1.904.383,56**
8	Quantity of resource in the ground (X)	million barrel	3.775	4.169	3.947	4.174	4.700
9	Price per unit of resource in the ground (P)	IDR/barrel	437.261	295.726	445.753	545.133	405.164

$$RR_{(t)} = PS_{(t)} \times S_{(t)} \div 1000$$

$$N_{(t)} = Closing\ stock_{(t)} \div S_{(t)}$$

$$Discount\ factor_{(t)} = PV(Discount\ rate_{(t)}, N_{(t)}, -1/N_{(t)})$$

$$NPV_{(t)} = RR_{(t)}, \times N_{(t)} \times Discount\ factor_{(t)})$$

$$X_{(t)} = Closing\ stock_{(t)}$$

$$P_{(t)} = NPV_{(t)} \div X_{(t)}$$

Compilation of Mineral and Energy Monetary Asset Account (2)

4. Calculating Timber Monetary Assets

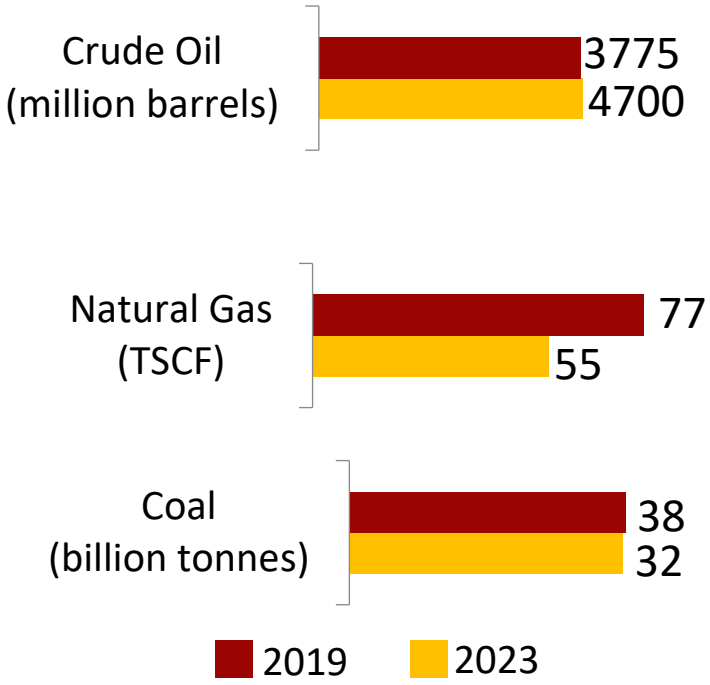
No.	Description	Unit	2019	2020	2021	2022	2023
(1)	(2)	(3)	(15)	(16)	(17)	(18)	(19)
1	**Opening Stock**	**billion IDR**	**1.827.895**	**1.650.482**	**1.232.797**	**1.759.477**	**2.275.539**
2	**Addition to stock**	**billion IDR**	**0**	**0**	**0**	**0**	**0**
2,1	- Discoveries	billion IDR	0	0	0	0	0
2,2	- Upward Reappraisals	billion IDR	0	0	0	0	0
2,3	- Reclassifications	billion IDR	0	0	0	0	0
3	**Reduction in stock**	**billion IDR**	**92.568**	**95.012**	**89.111**	**110.762**	**105.018**
3,1	- Depletion	billion IDR	92.568	95.012	89.111	110.762	105.018
3,2	- Catastrophic Losses	billion IDR	0	0	0	0	0
3,3	- Downward Reappraisals	billion IDR	0	0	0	0	0
3,4	- Reclassifications	billion IDR	0	0	0	0	0
4	**Other changes in stock**	**billion IDR**	**-1.179.312**	**239.455**	**6.990**	**223.266**	**354.946**
5	**Revaluation**	**billion IDR**	**1.094.467**	**-562.128**	**608.802**	**403.557**	**-621.083**
6	**Closing Stock**	**billion IDR**	**1.650.482**	**1.232.797**	**1.759.477**	**2.275.539**	**1.904.384**

$$Opening\ stock_{(t)} = NPV_{(t-1)}$$

$$Closing\ stock_{(t)} = NPV_{(t)}$$

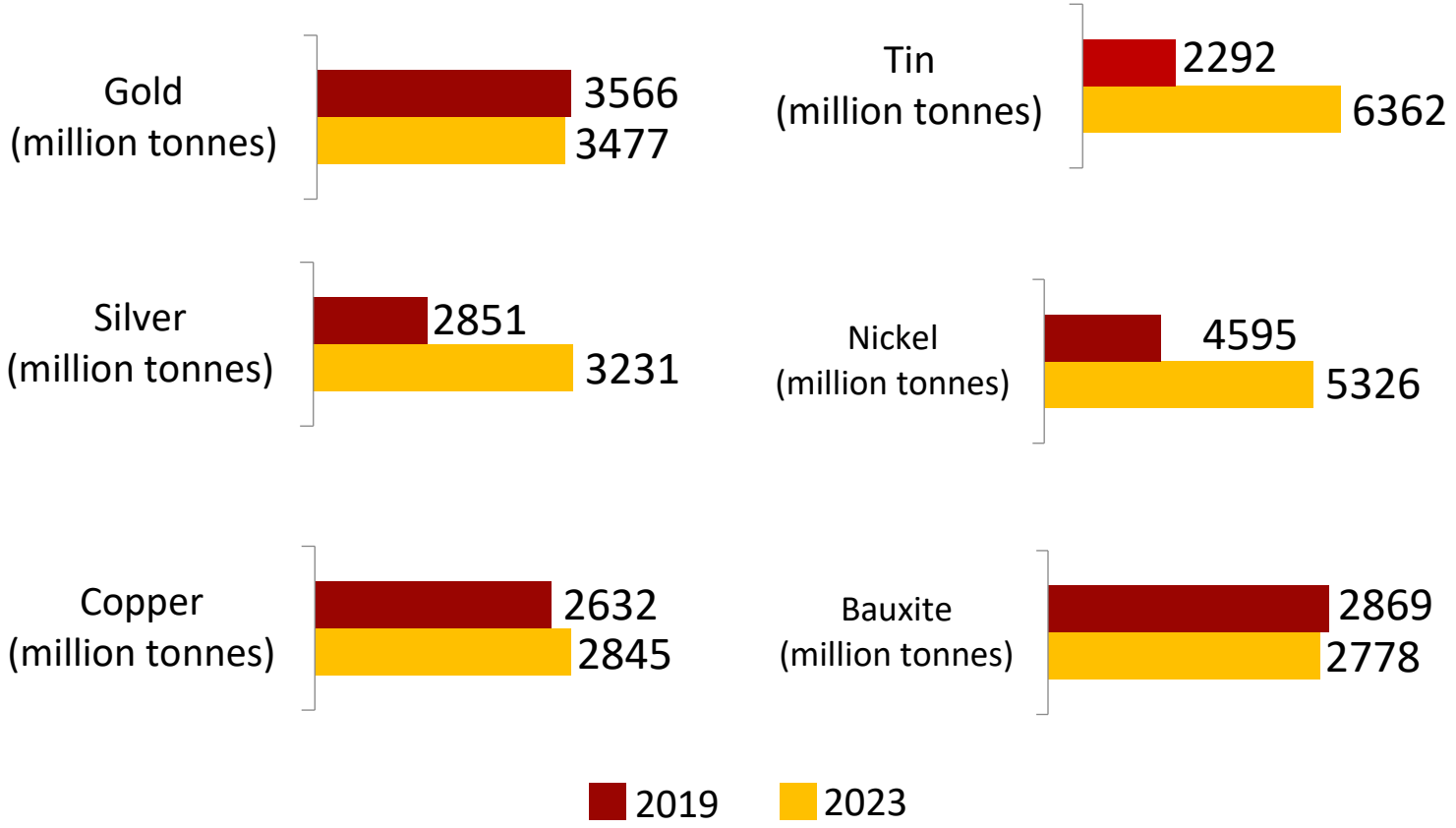
Mineral and Energy Asset Account Results

Stock of Energy Resources



In the 2019-2023, the environmental carrying capacity to provide energy resource stocks in Indonesia has decreased in Natural Gas and Coal resources.

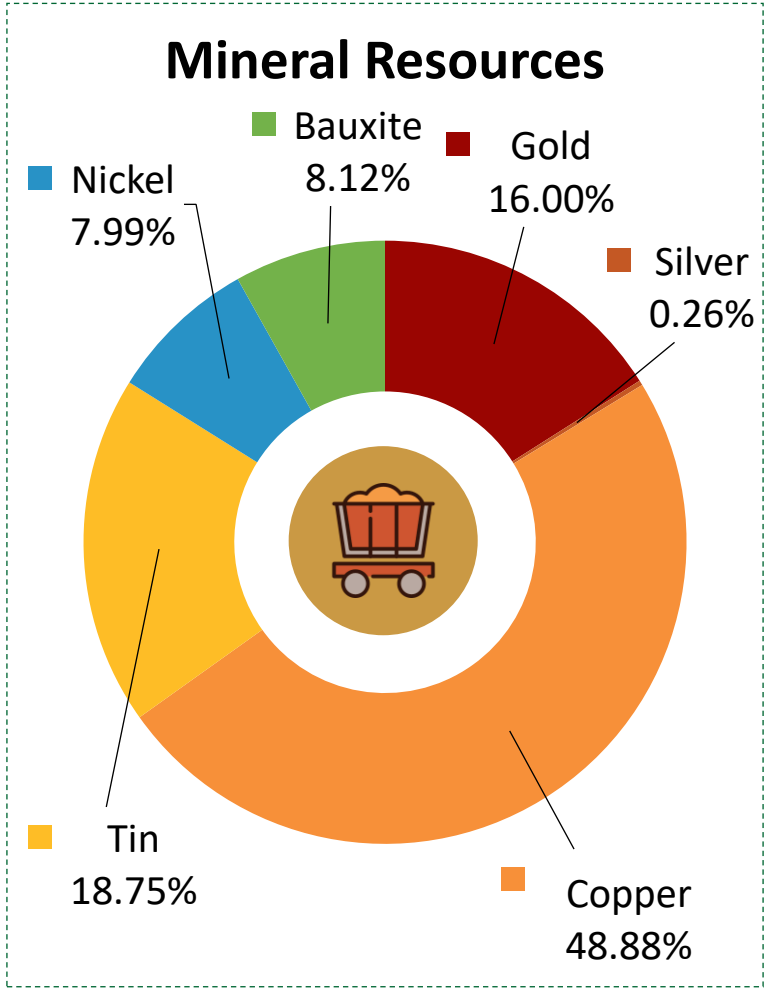
Stock of Mineral Resources

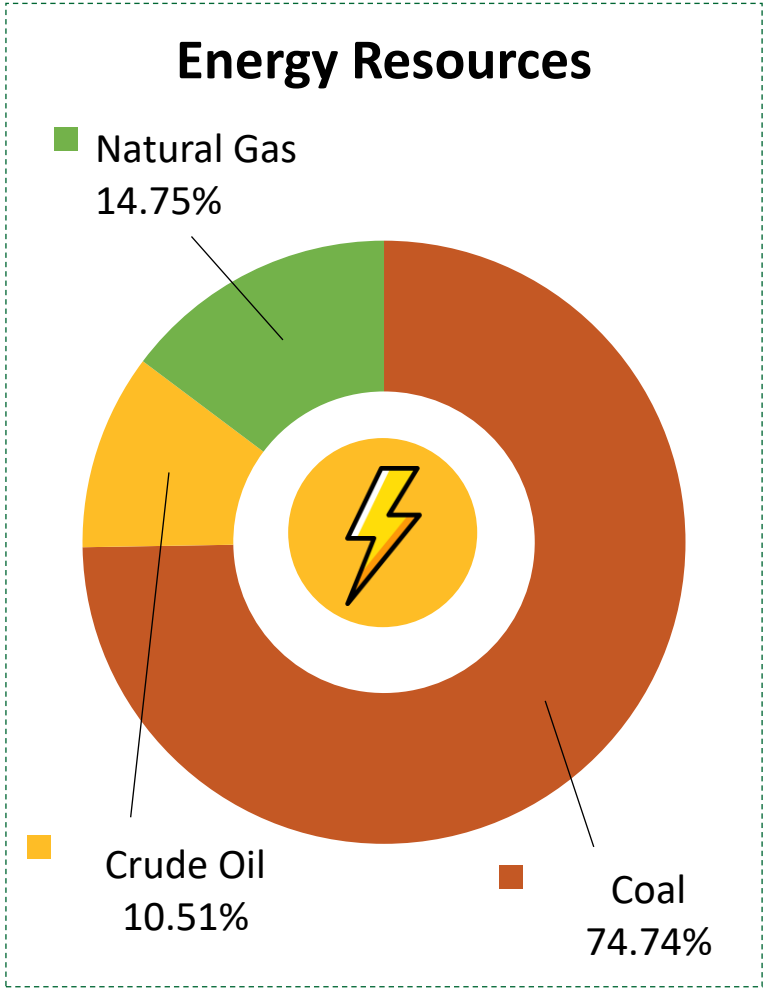


In the 2019-2023, the environmental carrying capacity to provide mineral resource stocks in Indonesia increases in Silver, Copper, Tin and Nickel resources.

Mineral and Energy Asset Account Results

Percentage of Monetary Value of Indonesia's Natural Resources in 2023

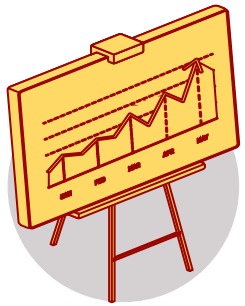




The Challenges of Compiling Mineral & Energy Asset Accounts

- Data Consistency on minerals and energy production from the ministry.
- Availability of discount rate by commodity of minerals and energy.
- Coordination and communication to other stakeholders making them engage more in the process of work.

05 Lessons Learned, The Way Forward, and How The Accounts Used

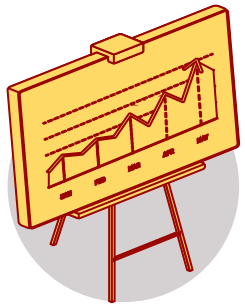


Lessons Learned and The Way Forward

1. Improve the scope of asset accounts by further coordination with related ministries who produce the source data.

2. Build an integrated data system to facilitate the data exchange between NSO and other stakeholders.

3. Understand the use of environment accounts produced to support decision makers formulate related polices.



How The Accounts are Used

1. Preparation of publication on the value of state assets from natural resources conducted by the Ministry of Finance (not yet released).

2. Preparation of natural resources fiscal potential report by the Ministry of Finance.

3. IndoTERM modeling for sustainable development planning conducted by the Ministry of Development

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Thank You

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