Prospects of Energy Transition in Indonesia

Budy P. Resosudarmo
Arndt-Corden Department of Economics
Crawford School of Public Policy

Australian National University

Routledge
Taylor & Francis Group

Bulletin of Indonesian Economic Studies, Vol. 59, No. 2, 2023: 149–177

Survey of Recent Developments

PROSPECTS OF ENERGY TRANSITION IN INDONESIA

Budy P. Resosudarmo*
Australian National University

Jahen F. Rezki
Universitas Indonesia

Yuventus Effendi
Indonesian Ministry of Finance

The Indonesian government has submitted its plan for nationally determined contributions (NDCs) to the United Nations and has committed to achieving net-zero emissions (NZEs) by 2060. While looking to reduce emissions from forestry, the government has prioritised a transition to renewable energy in the energy sector. However, Indonesia faces challenges owing to its lower-middle-income status, limited budgets and constraints in attracting international finance. This paper aims to assess Indonesia's potential for realising its energy transition goals. It evaluates the country's economic strength, past experiences in energy transition and the current status of ongoing initiatives. It concludes that significant progress is possible, but achieving NZEs by 2060 remains a major challenge.

Commitments: Nationally Determined Contribution (NDC)

	BAU GHG Emission (Mt CO_2-eq)		2022 Updated NDC (lower than BAU)	
	2010	2030	2030	
			CM1	CM2
Energy	453	1,669	358	446
			12.5%	15.5%
Waste	88	296	40	43.5
			1.4%	1.5%
Industry processes & product uses	36	70	7	9
			0.2%	0.3%
Agriculture	111	120	10	12
			0.3%	0.4%
Forestry & other land uses	647	714	500	729
			17.4%	25.4%
TOTAL	1,334	2,869	915	1,240
			31.9%	43.2%

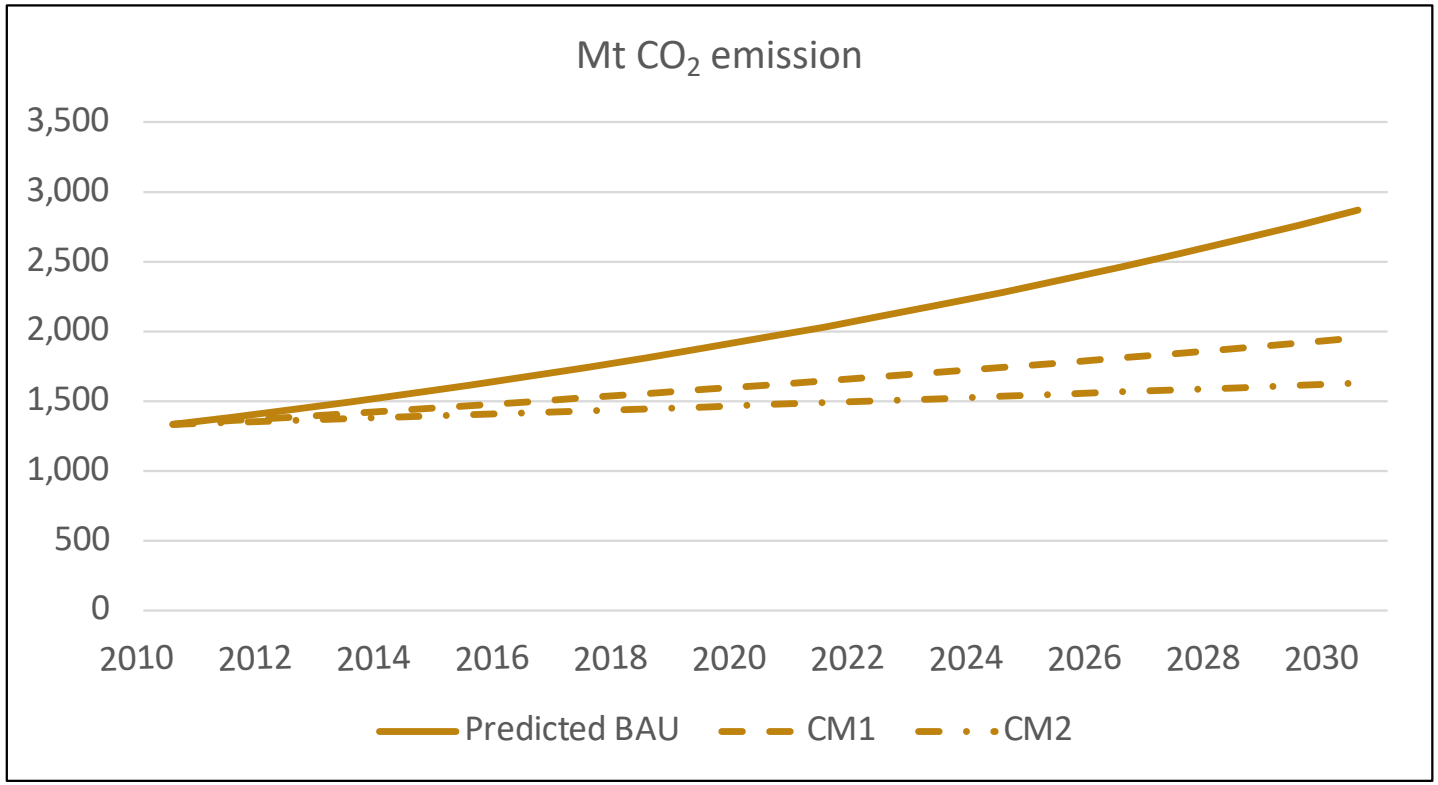
First NDC was in 2009.

Note:
CM1 = counter measure 1 (without international supports) & CM2 = counter measure 2 (with international supports).

2021: Net Zero Emission (NZE) by 2060

Nationally Determined Contribution (NDC)

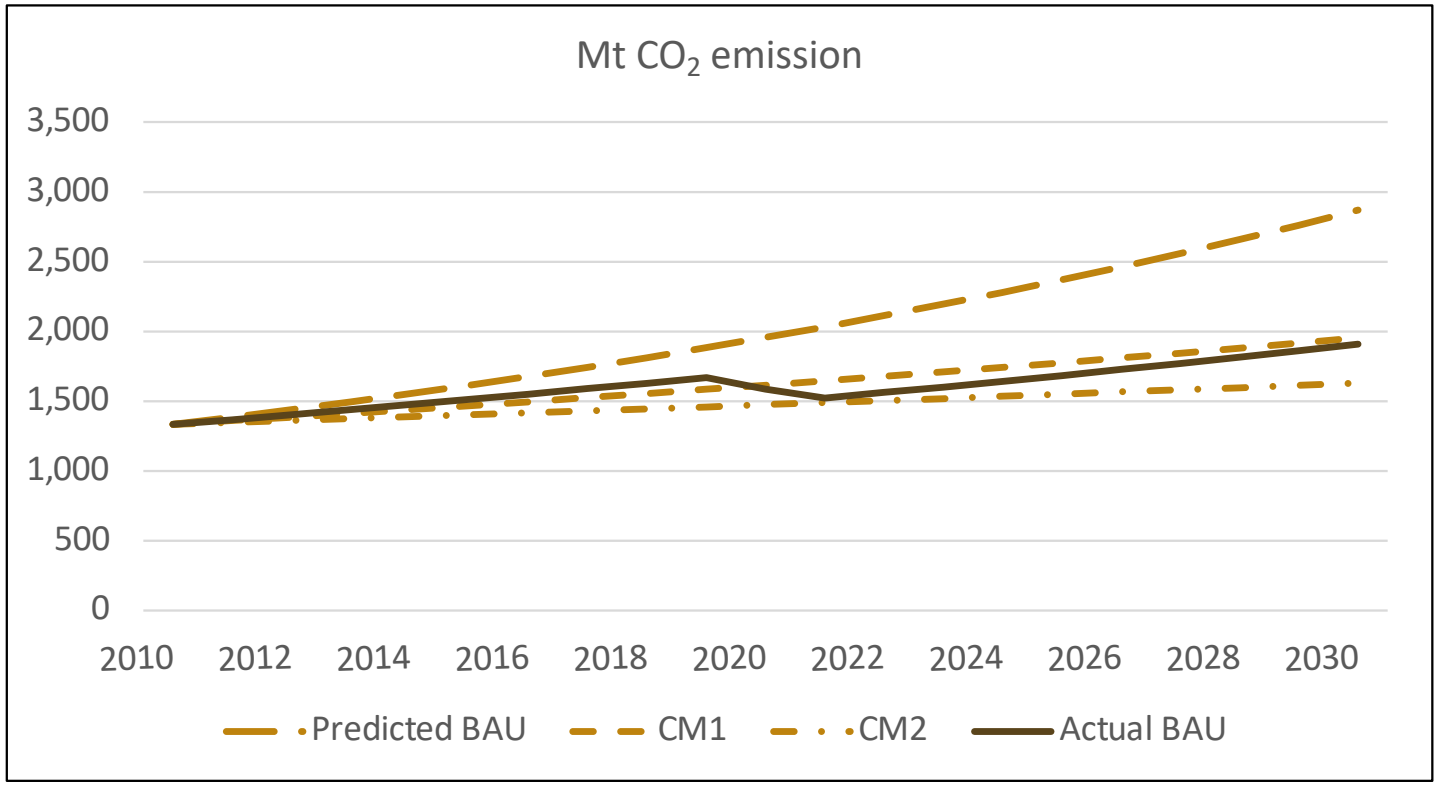
With a certain assumption on GDP growth rate



Nationally Determined Contribution (NDC)

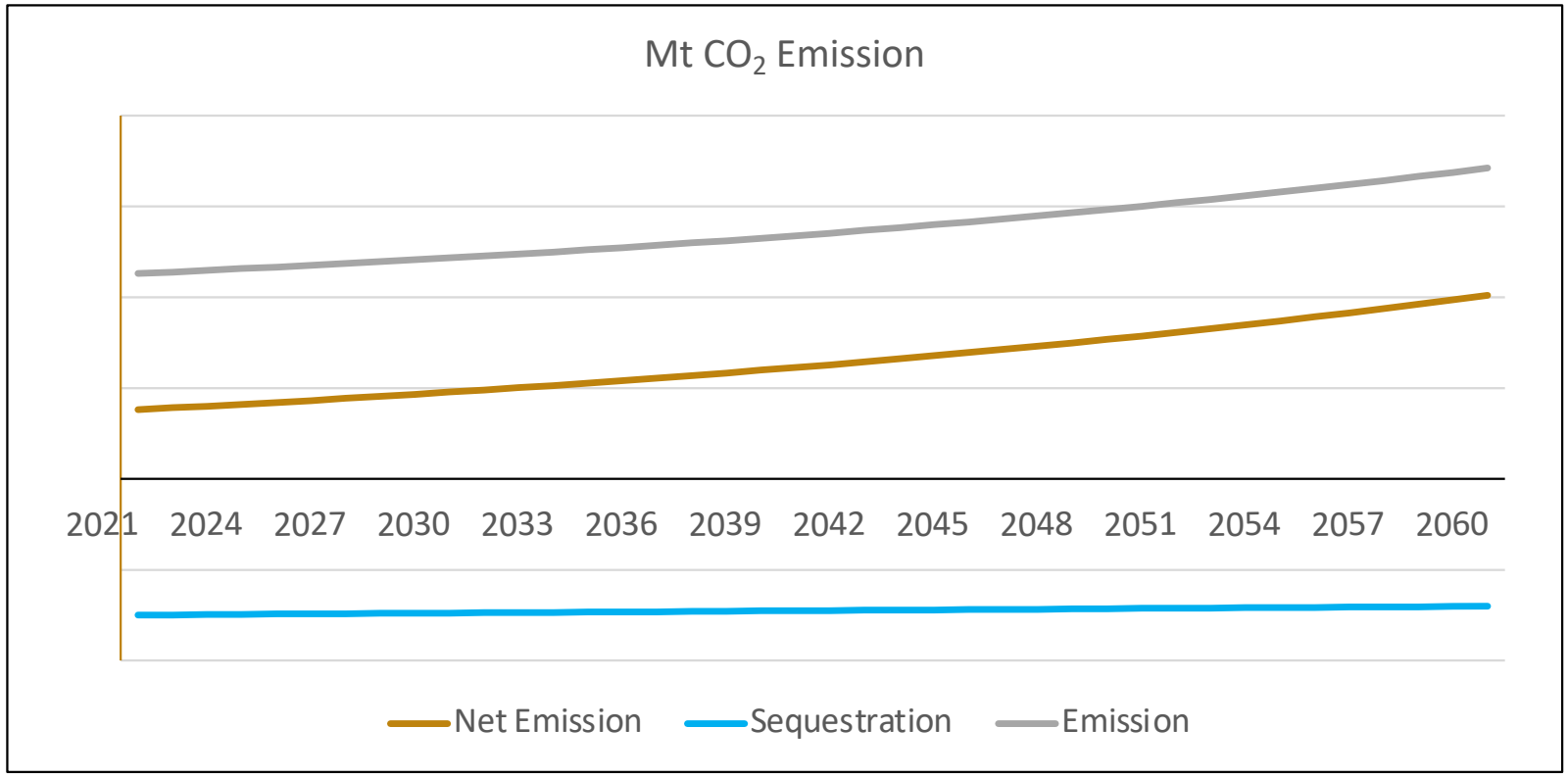
If the actual GDP growth rate < the assumed GDP growth rate

→ actual-assumed growth rate dependent



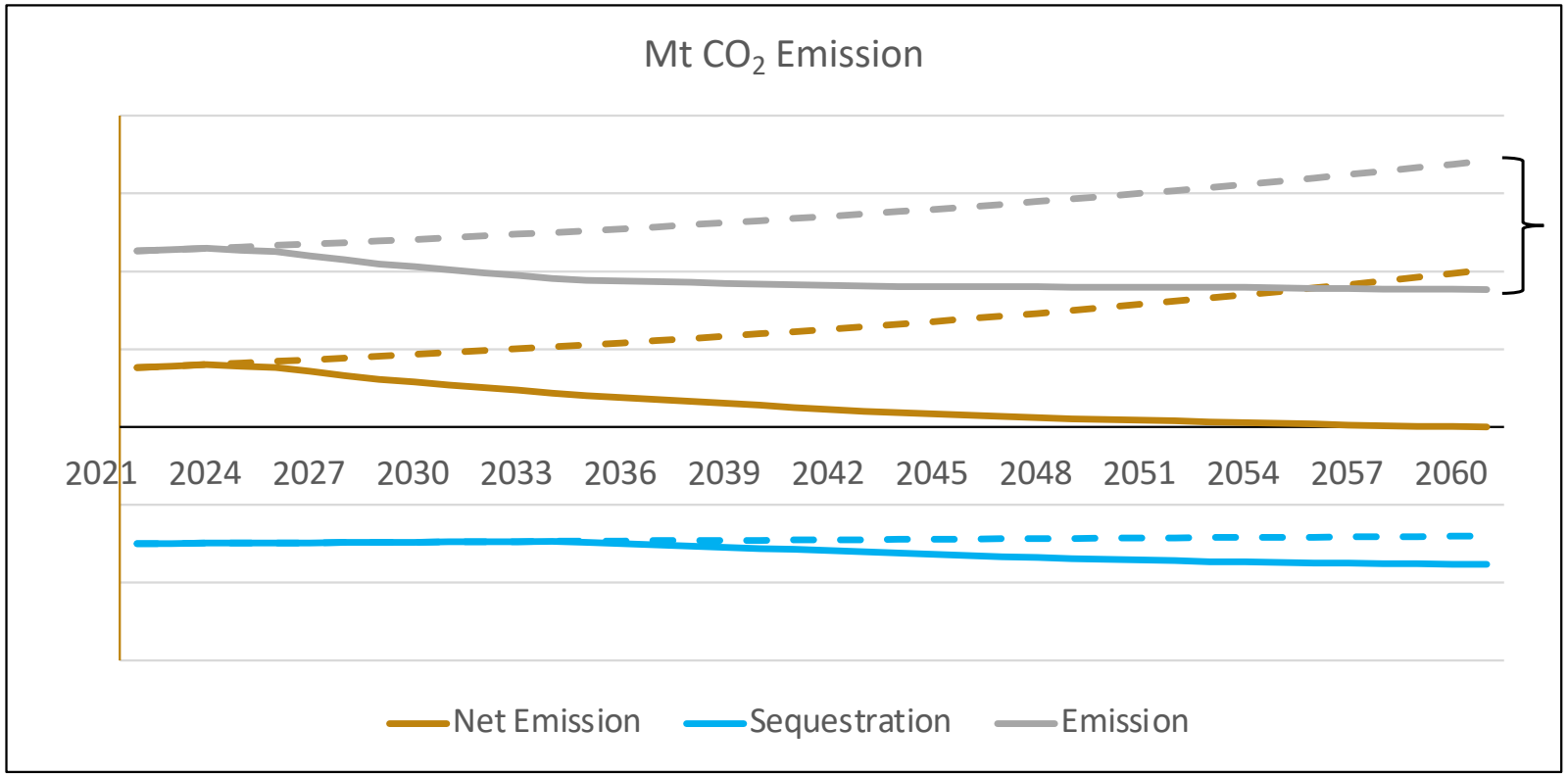
Net Zero Emission (NZE) by 2060

For what ever actual GDP



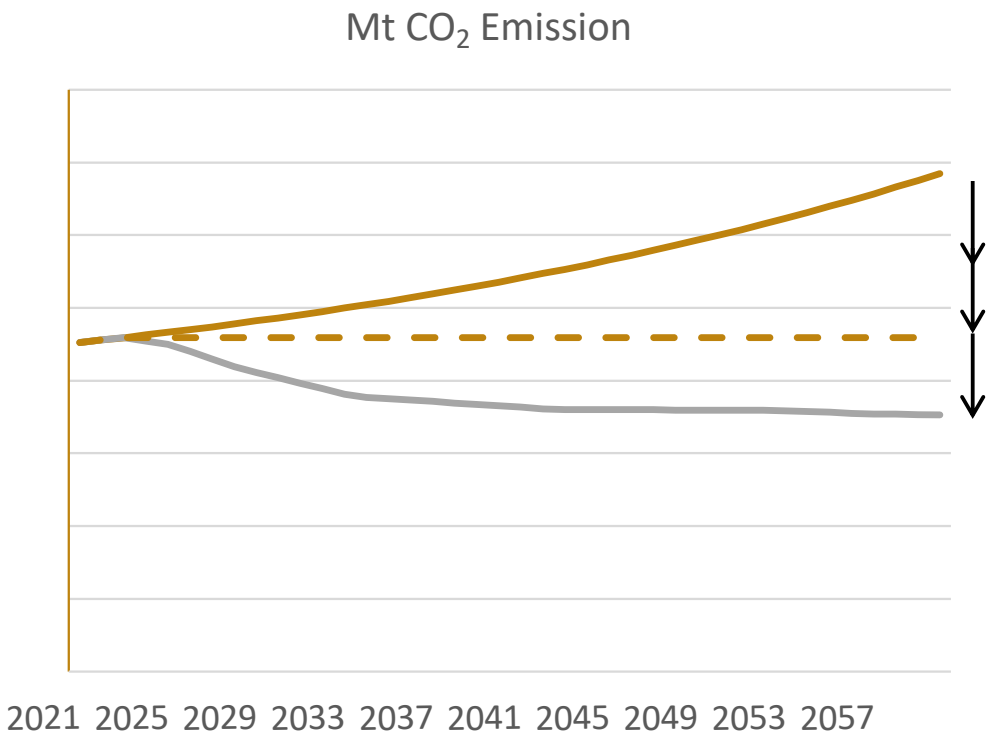
Net Zero Emission (NZE) by 2060

For what ever actual GDP → Actual force for reforms



A lot needs to be done for the energy transition.

This Presentation



Possible Energy Transition Scenarios

What are the prospects for Indonesia achieving its energy transition?

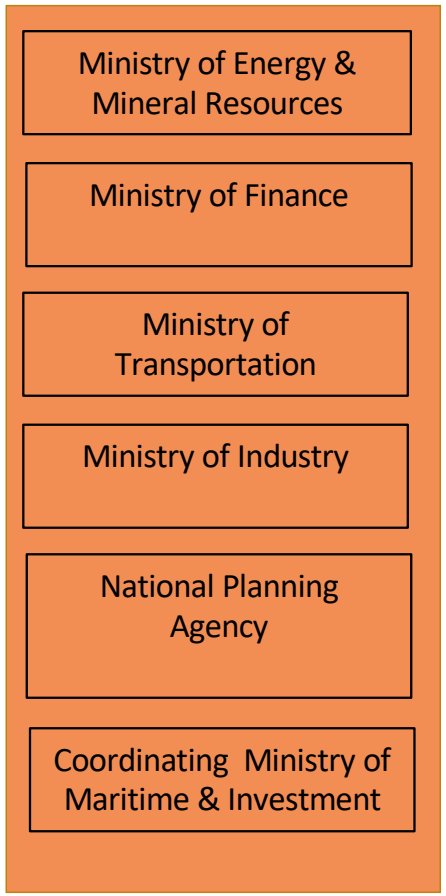
- Transformation on future energy demand?
- Transformation that includes existing energy demand? → replacement of current non-renewable energy use.

Require large financial investments ($0.23–3.5 trillion) and favorable policies.

Observing:

- Current economic
- Starting point on the energy mix
- Current initiatives for energy transition.

Targets of Energy Transition



- Government Regulation (PP) No. 79/2014 on National Energy Policy:
  - Increase the contribution of renewable energy to the total energy consumption mix to reach 23% by 2025 and at least 31% by 2050.
  - Reduce the contribution of oil to the total energy consumption mix to be less than 25% by 2025 and less than 20% by 2050.
  - Control the use of coal for the total energy consumption mix to a minimum of 30% by 2050 and a minimum of 25% by 2050.
  - Control the use of gas for the total energy consumption mix to a minimum of 22% by 2050 and a minimum of 24% by 2050.
- After the COP26 in Glasgow in 2021, the Indonesian government developed a comprehensive roadmap on energy transition that extends beyond the targets specified in PP No. 79/2014.
- National Energy Council (Dewan Energi Nasional or DEN) released its Roadmap on Energy Transition in January 2023.
- Presidential Regulation (Perpres) No. 112/2022 to incentivize the PLN prioritizing the development of renewable power plants while halting the construction of new coal plants.

DEN Road Map on Energy Transition

2025	2030	2035
Supply side:	**Supply side:**	**Supply side:**
Renewable energy is 23% of total energy mix	Renewable energy is 25% of total energy mix	Renewable energy is 30-31% of total energy mix
	Replacing 50% of diesel power plants with gas and renewable energy	No more diesel power plants anymore
		Retirement of coal power plant phase I
		Nuclear power plants up to 2 GW
Demand side:	**Demand side:**	**Demand side:**
Piped gas: 5 million HH	Piped gas: 5.8 million HH	Piped gas: 10.8 million HH
Induction cooker: 2 million HH	Induction cooker: 5 million HH	Induction cooker: 10 million HH
	Use of Dimethyl Ether (DME) at HH	
Electric cars: 1 million	Electric cars: 5.5 million	Electric cars: 6.7-7.3 million
Electric motorcycles: 6 million	Electric motorcycles: 8.5 million	Electric motorcycles: 28.5-30.2 million
		Electric buses: 219 thousand
		Electric trucks: 595 thousand
Gas fuel: 200 thousand cars & 100 ships	Gas fuel: 440 thousand cars & 257 ships	Gas fuel: 500 thousand cars & 300 ships
Mandatory used of B30 gasoline		Hidrogen trucks: 245 thousand

DEN Road Map on Energy Transition

2040	2050	2060
Supply side:	**Supply side:**	**Supply side:**
Renewable energy is 36-38% of total energy mix	Renewable energy is 53-54% of total energy mix	Renewable energy is 62-63% of total energy mix
		Installing carbon capture, utilization and storage (CCUS) on non-renewable power plants
Retirement of coal power plant phase II		
Nuclear power plants up to 8 GW	More nuclear power plants	
Demand side:	**Demand side:**	**Demand side:**
Piped gas: 15.5 million HH	Piped gas: 20.5 million HH	Piped gas: 23 million HH
Induction cooker: 15 million HH	Induction cooker: 46.6 million HH	Induction cooker: 52 million HH
Electric cars: 12-13 million	Electric cars: 25-27.7 million	Electric cars: 44-47 million
Electric motorcycles: 48.5-52 million	Electric motorcycles: 88.5-95 million	Electric motorcycles: 128.4-138 million
Electric buses: 388 thousand	Electric buses: 777 thousand	Electric buses: 1.3 million
Electric trucks: 1.3 million	Electric trucks: 2.7 million	Electric trucks: 4.1 million
Gas fuel: 550 thousand cars & 310 ships	Gas fuel: 600 thousand cars & 320 ships	Gas fuel: 650 thousand cars & 330 ships
Hidrogen trucks: 558 thousand	Hidrogen trucks: 1.1 million	Hidrogen trucks: 1.7 million

The Economy

(y-o-y)	Quart. Avg.	2022				2023	
	2017-2019	Q1	Q2	Q3	Q4	Q1	Q2
GDP	5.1	5.0	5.5	5.7	5.0	5.0	5.2
By Expenditure							
Consumption	4.9	3.3	4.2	4.3	3.0	4.5	5.9
Private	5.0	4.3	5.5	5.4	4.5	4.5	5.2
Government consumption	3.5	-6.6	-4.6	-2.6	-4.8	4.0	10.6
Gross fixed capital formation	5.8	4.1	3.1	5.0	3.3	2.1	4.6
Building & structures	5.7	2.6	0.9	0.1	0.1	0.1	3.3
Machine & equipment	11.5	19.2	16.3	36.5	18.4	4.6	7.7
Vehicles	4.8	0.3	7.0	17.1	17.1	24.1	15.5
Other equipment	5.0	6.0	-4.3	0.1	-2.7	-5.3	-5.3
Export	5.0	14.2	16.4	19.4	14.9	11.7	-2.7
Import	4.4	16.0	12.7	25.4	6.3	2.8	-3.1

- In general: back to pre-pandemic growth rates.
- Mostly driven by consumption → both private and government (even with a 3% gov. deficit target).
- Investment growth has been relatively steady, but yet to be at pre-pandemic levels.
- Net export has been fluctuated.

Market observations (Q1 2023):

- Varies a lot

The Economy

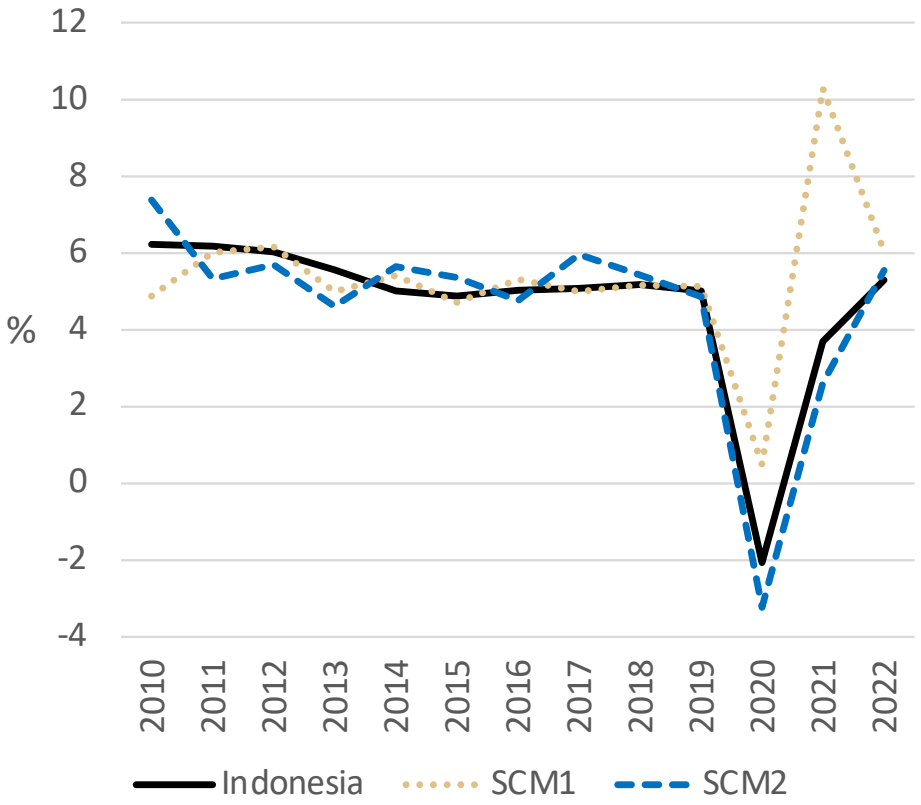
	Quart. Avg.	2022				2023	
	2017-2019	Q1	Q2	Q3	Q4	Q1	Q2
By Sector							
Agriculture	3.8	1.2	1.7	2.0	4.5	0.4	0.2
Mining & quarrying	1.4	3.8	4.0	3.2	6.5	4.9	5.0
Manufacturing	4.1	5.1	4.0	4.8	5.6	4.4	4.9
Electricity, water & gas	9.3	12.4	13.7	8.1	3.6	2.9	3.3
Construction	6.2	4.8	1.0	0.6	1.6	0.3	5.2
Trade, hotel & restaurant	4.9	5.9	5.4	7.4	7.9	6.1	6.1
Transportation & communication	8.1	10.3	12.9	13.7	11.9	10.5	10.9
Finance, real estate & company	5.8	3.2	3.0	2.7	4.0	3.5	3.6
Services	6.0	1.3	1.7	6.9	3.1	3.5	8.0
By Region							
Sumatera	4.5	4.1	5.0	4.7	5.0	4.8	4.9
Jawa	5.6	5.0	5.6	5.8	4.8	5.0	5.2
Kalimantan	4.4	3.5	4.5	5.7	6.0	5.8	5.6
Sulawesi	7.6	5.5	6.5	8.2	7.8	7.0	6.6
Eastern Indonesia	1.7	8.5	9.9	6.8	4.7	2.6	5.6

- Almost all sectors have been back to pre-pandemic growth rates.
- Agriculture, utilities and financial sectors have not been back.
- Mining, trade, hotel & restaurant as well as transportation seem to well perform.
- All regions seem to recover.

Regional market observations (Q1 2023):

- A lot have been back to pre-pandemic.

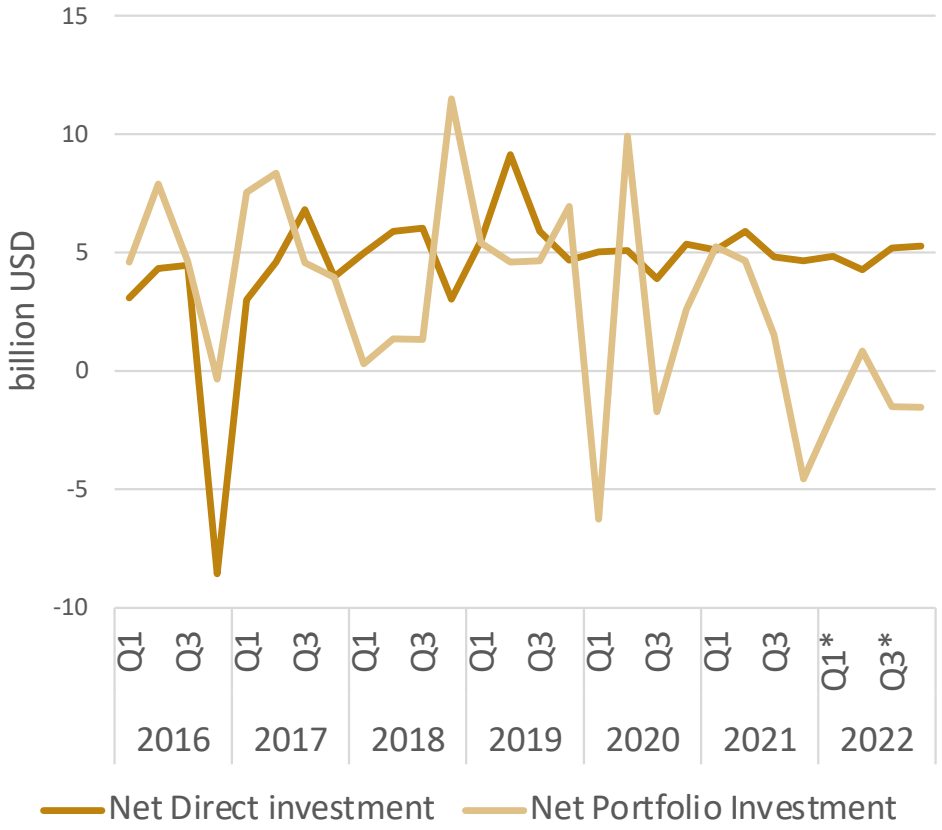
Growth in Comparison



- SCM1, includes Indonesia's Southeast Asian neighbours along with China and India, namely Malaysia, the Philippines, Thailand, Vietnam, China, and India.
- SCM2, includes only Indonesia's Southeast neighbours, namely Malaysia, the Philippines, Thailand, and Vietnam.

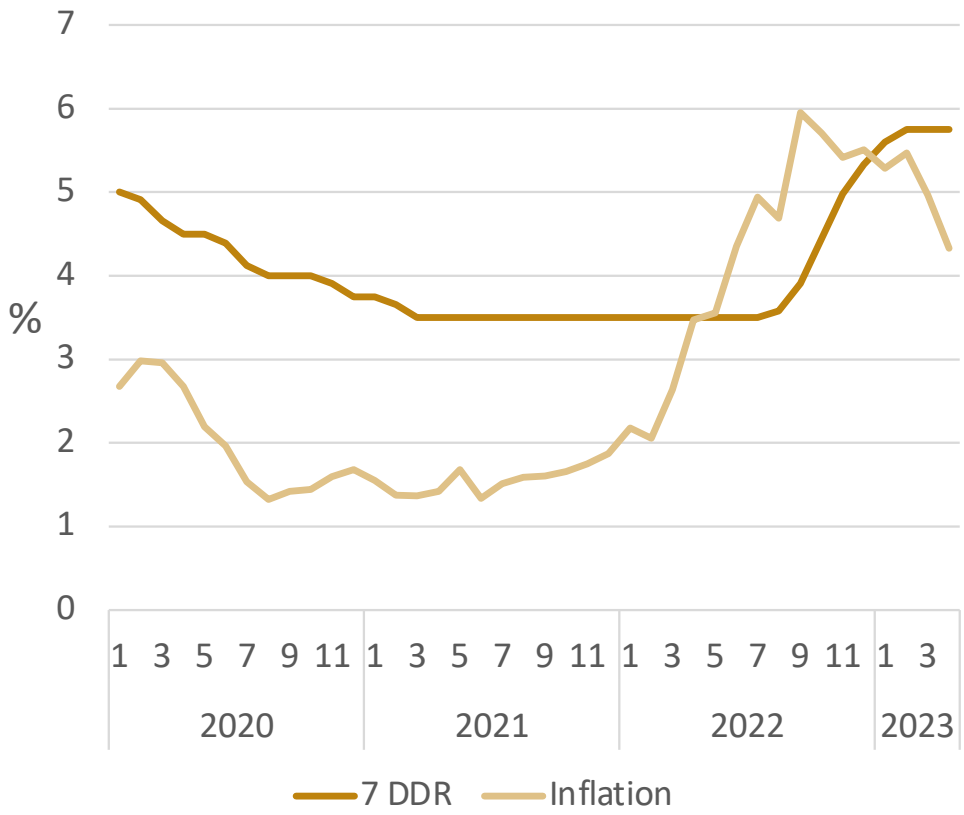
Hint uncertainty in securing investments needed.

External Condition



- Potential trade slowdown due to declining commodity prices, US-China geoeconomic fragmentation, and a weakened global trade outlook.
- Recent years have shown relatively stable levels of direct investment, while portfolio investment has experienced significant fluctuations, especially after the onset of the COVID-19 pandemic.
- In 2022, capital outflow indications were further exacerbated by tightening monetary policies in the United States and Europe. Not much improvement in 2023.

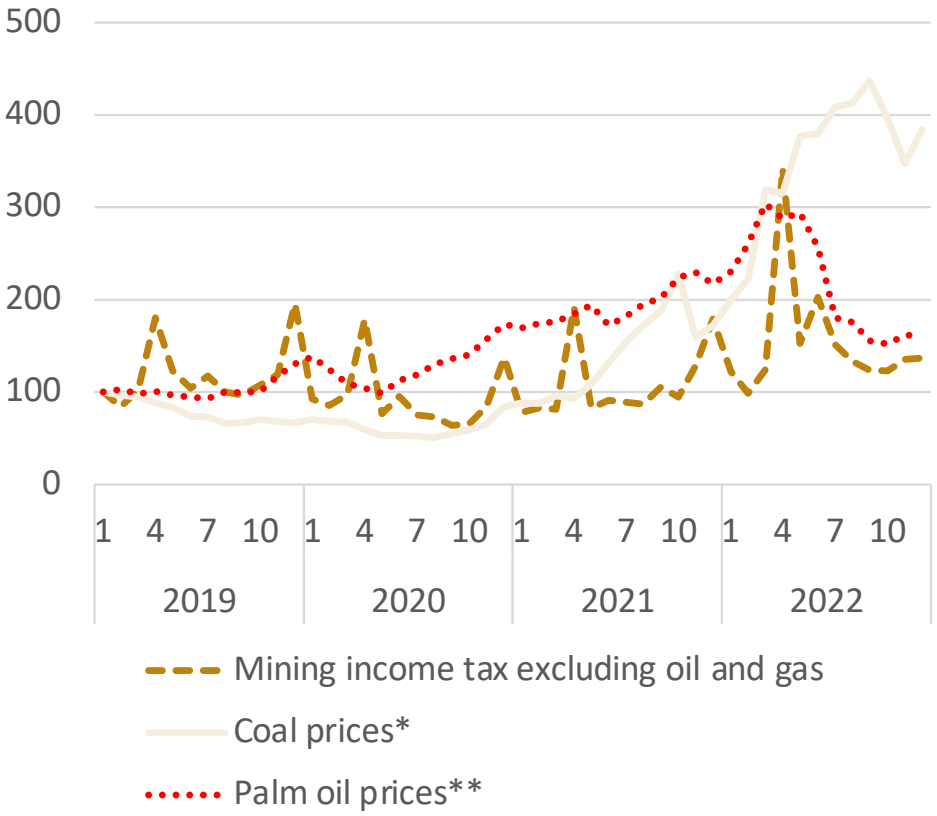
Internal Condition



Private activities:

- The relatively low inflation levels experienced in 2021 and mid-2022 allowed Bank Indonesia, the Central Bank of Indonesia, to maintain a low policy central bank interest rate.
- Potential of growth acceleration is there.

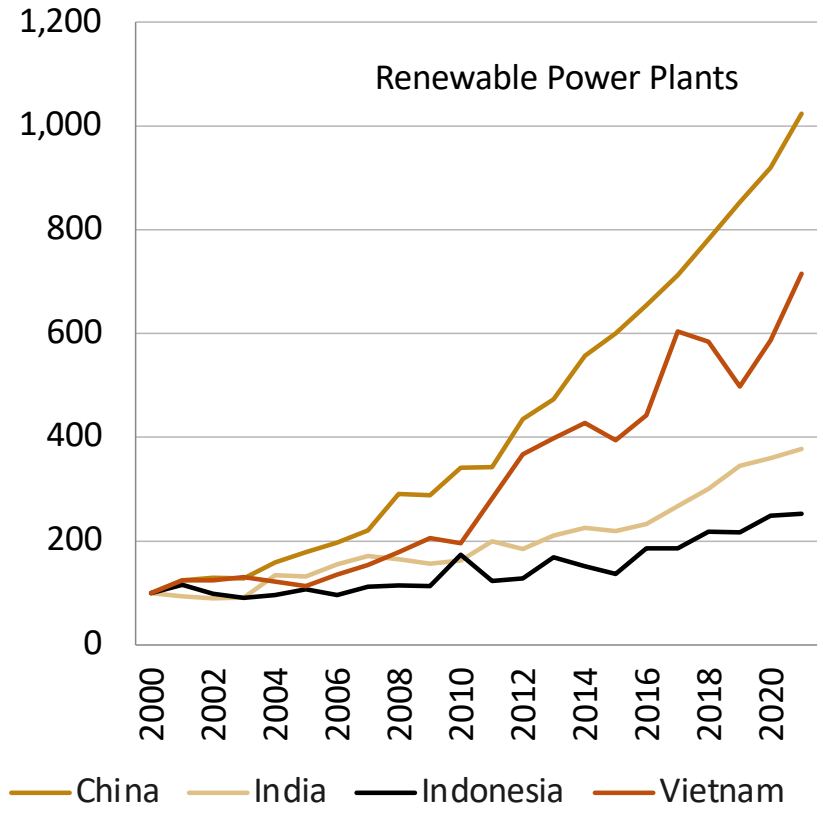
Internal Condition



Government revenues:

- In 2021 and 2022, the government managed to recover its revenue collection and narrow the budget deficit to 4.5 per cent of GDP and 2.2 per cent of GDP respectively.
- The improvement in revenue collection in late 2021 and mid-2022 can be attributed to the economic reopening and the commodity boom.
- Effects of policies on downstream operations in the mining sector are yet to be observed.
- Although the expenditure priority has been focused on improving human capital, evidence of increased productivity remains elusive.

Renewable Energy

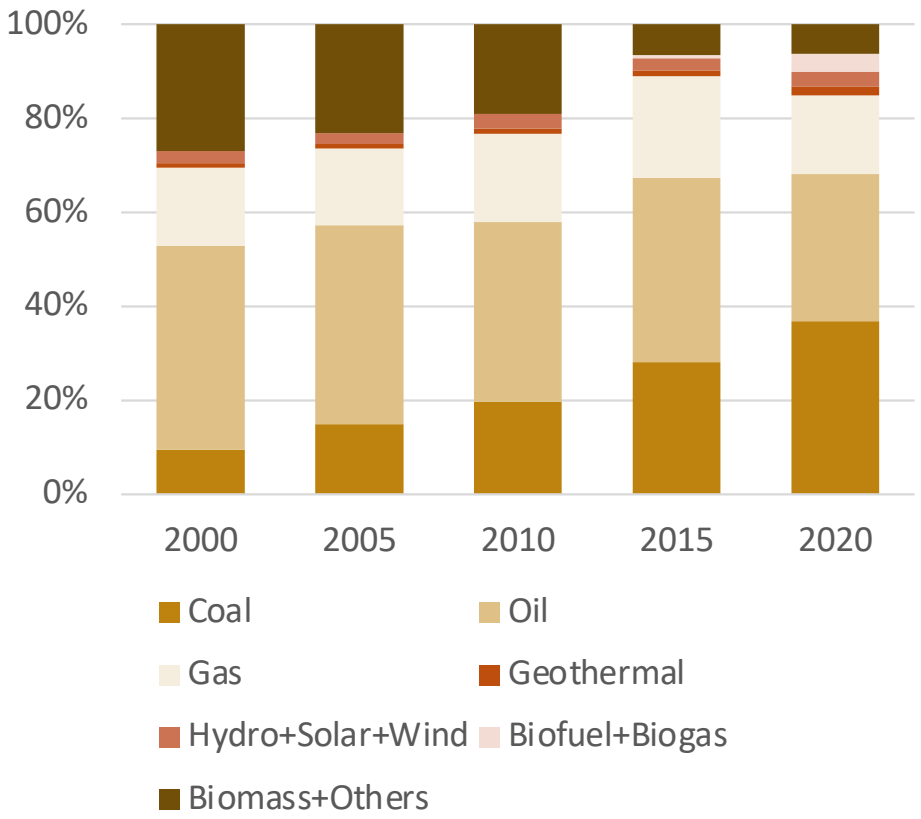


- Prices of renewable technologies have been rapidly declining.
- Adoptions have been increasing.
- Also occurs in Indonesia, but at a much slower pace compared to several neighboring countries.

Some issues include:

- market position of fossil fuel energy holds significance in the Indonesian economy.
- “persistent“ resistance from the utility sector.
- energy subsidy.

Energy Consumption



- Renewable (hidro+solar+wind+biofuel+biogas) made less than 10% of energy consumption.
- Coal has been increasing from 9% in 2000 to 37% in 2020.

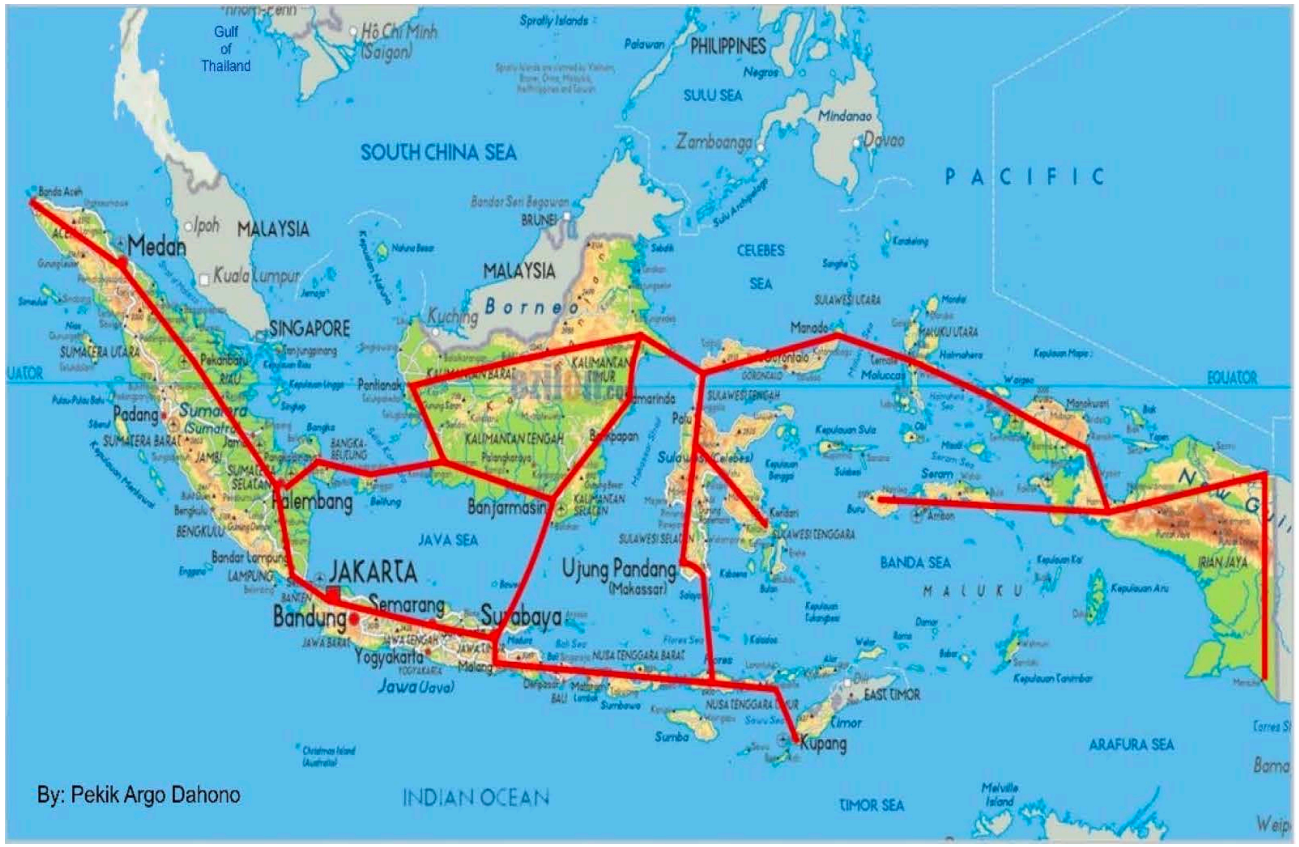
In the electric power plant sector, in 2021:

- Renewable made approximately 9% of total energy inputs
- Coal contributed 61% of total energy inputs.

(Potentially) a lot to catch up. Might require, among others,

- Strong commitments from the president
- Strong knowledge base and connection to international agents
- Strong & stable economic growth.

Nusantara Super Grid



Super grid is an important part of energy transition as location of renewable power plants, in general, are not flexible.

Connecting islands of the country with AC and DC transmissions: AC within island and DC between islands.

Development in power electronic, besides renewable electricity, is a key important issue.

Prices have gone down and continue to decline

Source: Dahono, 2018 & 2021

ETM Country Platform

- Ministry of Energy & Mineral Resources
- Ministry of Finance
- Ministry of Transportation
- Ministry of Industry
- National Planning Agency
- Coordinating Ministry of Maritime & Investment

Energy Transition Mechanism (ETM) Country Platform

a collaborative partnership program aimed at enhancing energy infrastructure and accelerating the transition towards achieving Net Zero Emissions (NZE) by 2060 or earlier.

- the early retirement of coal coal-fired power plants (CFPPs)
- the facilitation of investments in renewable power plants.

- Steering Committee and the country platform manager will be responsible for setting objectives, establishing targets, and approving financial instruments at the project level.
- Minister of Finance Decision No. 275/KMK.010/22: assigned PT SMI to develop blended finance and provide financial de-risking instruments for projects.
- Initial challenges:
  - Lack of significant grant funding from donors or philanthropic organizations for this program
  - Early retirement initiative for coal-fired power plants (CFPP) is challenging for the blended finance institutions to ensure some profit, unless affirmative policies, and has not yet generated any income through the international carbon market
  - Diminished interest in investing in sunset industries compared to renewable energy and EV.
  - PLN, while has the monopoly right on electric distribution, has an excess supply of electricity, primarily due to existing purchasing contracts with coal-based IPPs, compared to the current electricity demand, particularly in Java.

JETP-Indonesia

- Ministry of Energy & Mineral Resources
- Ministry of Finance
- Ministry of Transportation
- Ministry of Industry
- National Planning Agency
- Coordinating Ministry of Maritime & Investment

Just Energy Transition (JETP)-Indonesia

mobilization of $20 billion international fund over the next 3-5 years by the IPG co-led by the United States of America (US) and Japan to support Indonesia's transition from fossil fuels to renewable resources as its main energy supply.

- offering policy support and bolstering the enabling environment for renewable energy
- energy efficiency industry development
- sustainable finance market expansion.

- Aims to achieve a net-zero power sector by 2050 and a 34% renewable energy share in the power sector by 2030.
- JETP is certainly beyond the ETM Country Platform.
- On 16 February 2023, the Indonesian government, along with the co-leads of the IPG, officially established the Secretariat for the JETP-Indonesia.
- Initial challenges:
  - Similar as those challenges of ETM Country Program
  - Lack of clear announcements regarding financial contributions from the other IPG members, except for the UK's $1 billion financing through the World Bank's loan programs
  - To effectively implement the JETP-Indonesia programs and accomplish their objectives, the Indonesian government needs to undertake regulatory and policy reforms., including energy subsidy and local content requirement policies .. (as well as PLN monopoly in power distribution system).

Carbon Market & Tax

- Ministry of Energy & Mineral Resources
- Ministry of Finance
- Ministry of Transportation
- Ministry of Industry
- National Planning Agency
- Coordinating Ministry of Maritime & Investment

- Carbon Market and Pricing.
  - **employ an Emissions Trading System (ETS) to reduce emissions using a "baseline-and-credit" mechanism**
  - **Impose carbon tax to entities that surpass the current baseline. Law No. 7/2021 on the Harmonization of Tax Regulations: tax > carbon market price.**
- Presidential Regulation (PerPress) No. 98/2021 on Carbon Economic Value to establish a national framework for carbon pricing instruments, including the implementation of an ETS in Indonesia → Pilot ETS in 2021 ($2/tCO2, 18 participants)
- PerMen ESDM No. 16/2022 outlines the procedures for implementing the Carbon Economic Value in the Power Generation Sub-Sector. Subsequently
  - This initial phase of the ETS covers 99 coal-fired power plants, which represent 81.4% of the country's national power generation capacity
  - 55 CFPPS belong to the state-owned utility PLN, while the rest are owned by IPPs.
- Initial challenges:
  - OJK has not yet developed the necessary regulations to initiate the carbon market in Indonesia
  - Determining the appropriate size of the carbon cap for the carbon market and carbon tax has traditionally posed challenges
  - The issue of carbon washing must be effectively addressed.

EV Program

- Ministry of Energy & Mineral Resources
- Ministry of Finance
- Ministry of Transportation
- Ministry of Industry
- National Planning Agency
- Coordinating Ministry of Maritime & Investment

- Electric Vehicle Program.
  seeking international FDI to develop a robust EV supply chain, covering various aspects from mining and processing battery metals to manufacturing EVs and recycling batteries
  - having 2 million electric cars and 13 million electric motorbikes on the roads by 2030**.**
- PerPres No. 55/2019 specifically focuses on Battery Electric Vehicles (EVs) and together with PerMen KemenPerin No. 6/2022 outlines specific targets for local production of low-carbon vehicles, including battery EVs, plug-in hybrid vehicles, flex-fuel engines, and low-cost green cars.
- Ministry of Finance Regulation No. 38/2023: Starting from April 1, 2023, EVs with a local content of 40% or higher will receive a reduction in value-added tax (VAT) on EV sales from 11% to 1%.
- Observations regarding the electric motorcycle initiative in Bali (early 2023): subsidy (Rp7 million, LCR 20%); battery swapping and charging system through mini markets (besides PLN stations).
- Initial challenges:
  - If a significant portion of the electricity is produced by fossil fuel-based power plants, such as coal-fired power plants (CFPPs), the increased adoption of EVs may result in higher emissions
  - Significant interest, uncertainty on the sources of larger investments needed.

Final Notes

- Transitioning to a greener energy system poses significant challenges for Indonesia, particularly due to its well-established non-renewable energy industries.
- Most of international financial resources to support the transition come in the form of loans, which require positive returns on investment.
  - The heavily regulated electricity sector, characterized by a monopoly in power distribution, presents challenges in finding additional returns on investments
  - Weak institutional quality and regulatory uncertainty in the country may discourage international finance institutions from investing their resources
- Emissions Trading System (ETS), combined with a carbon tax, although is promising, Indonesia has never had experience in organizing this activity.
- Local content requirement might keep providing hurtle for FDI in renewable power plant and EV development.
- Lack of sufficient infrastructure remains a significant challenge in achieving the country's targets for EV adoption.
- Although the Indonesian economy has shown signs of recovery from the shock of the COVID-19 pandemic, there are still threats (geoeconomics fragmentation and declining prices of commodities) that need to be addressed.
- It is likely that Indonesia could make significant strides in its energy transition, but maintaining consistency, monitoring progress, and considering flexibility in target implementation may be necessary.