



The 48th

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**GAINING MOMENTUM TO ADVANCE
SUSTAINABLE ENERGY SECURITY
IN INDONESIA AND THE REGION**

IPAINFOGRAPHIC BOOKLET

Infographic Regarding "IPIP&P for Indonesia's Sustainable Energy Security and Stronger Economy" By Global IPI Institute

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GLOBAL CCS
INSTITUTE

Indonesia is well positioned to be a regional leader in Carbon Capture and Storage (CCS), helping the Asia region decarbonise while boosting its domestic industries and economy to achieve Indonesia's net-zero and a net-zero emissions (NZE) future.

To achieve Indonesia's net-zero, growth in heavy-duty industries such as steel and cement is necessary to meet the rising demand for National Strategic Projects. CCS technology is crucial to balancing industry growth with the emission reduction needed to meet NZE targets. Ignoring CCS could cost Indonesia an additional US\$ 1.1 trillion. CCS will also enable the development of new low-emissions industries such as blue hydrogen and bio-ammonia.

With its vast geological storage potential and wealth of oil and gas industry expertise, Indonesia can take advantage of its strategic location to develop CCS hubs and become a regional hub leader. These hubs would attract the growing regional CO₂ market, with neighbours prepared to pay a fee for CO₂ storage.

As the CO₂ market in the region gains momentum, Indonesia must act swiftly and decisively. By accelerating the development of CCS, Indonesia can secure its leadership position and ensure a sustainable future. Indonesia's GDP is projected to increase by approximately US\$ 270 billion, with more than 15,000 jobs per annum created up to 2050 by CCS hubs, benefiting the entire country.

This IEA infographic outlines the Indonesian government's role in developing CCS hubs in Indonesia, based on recommendations from the IEA's IPSEA White Paper. It calls for a collaborative approach between the government and industry to improve the ease of doing business, investor confidence, and stakeholder trust.

With strategic interventions and concerted efforts, Indonesia can navigate the energy transition landscape, achieve net-zero, secure its economic future, and significantly contribute to global emissions reduction goals.



CO₂ emissions are causing global warming

Global temperatures are rising

Temperature is rising most severely in the tropics and the Arctic region



Source: NASA satellite



Global temperatures are rising



Source: NASA

Sea level rise is increasing

Sea level rise is increasing

49% of IPCC AR4 projections



3.2 m by 2100

23% of IPCC AR4 projections



7.6 m by 2100

25% of IPCC AR4 projections



5.2 m by 2100

Source: IPCC Working Group III Contribution to the Fourth Assessment Report (AR4)

Business as usual is not enough.

Action needed now to limit warming to 1.5C



Source: IPCC Working Group III Contribution to the Fourth Assessment Report (AR4)

Carbon capture utilization and storage (CCUS) helps industry reduce CO₂ emissions



National Strategic Projects (PNS)
driving demand for industry



Indonesia's Energy needs lead to -to- create industries to grow.
CCU(x) is crucial to success



Indonesia has abundant CO₂ storage potential to meet domestic requirements and CO₂ flows elsewhere



Indonesia has abundant CO₂ storage potential to meet domestic requirements and CO₂ flows elsewhere

INDONESIA

28.8 Gtppa storage capacity up to 2050

EUROPE

20.0 Gtppa storage capacity up to 2050

USA

10.0 Gtppa storage capacity up to 2050

INDONESIA

28.8 Gtppa storage capacity up to 2050

EUROPE

20.0 Gtppa storage capacity up to 2050

Potential CO₂ storage market to reach up to 2050



Wellness plan to reduce carbon emissions already underway in various agricultural sectors



Developing CO₂ projects creates Indonesian jobs and multiplier effect



CO₂ facilities construction jobs



CO₂ facilities service jobs



1 trillion USD investment in CO₂ capturing and storage (CCS) technology

This is the high value capturing carbon dioxide from industrial processes and power generation plants

Investment in CO₂ capturing and storage (CCS) technology

- Construction: 100,000 jobs
- Operation: 100,000 jobs
- Service: 100,000 jobs

Global CCS deployment expanding rapidly

2022-2023
Global CCS capacity increasing rapidly



Top countries with CCS projects (2023)



Expected global CCS capacity (2028)



USA

Clear economic benefits from CCS forecast



Source: Global CCS Institute

	2020	2028
US CCS capacity (Gt)	0	2.5
US GDP (trillion USD)	18.5	22.5
US GDP per capita (USD)	68,000	72,000

Source: Global CCS Institute

*Percentage of US GDP attributable to CCS is calculated using the US CCS capacity forecast.



China

Value and opportunity through CCS predicted



2025
7.6 million
US dollars worth of
investment value



2027
7.2 million tons
of CO₂ capture
in manufacturing value



2028
Manufacturing investment
contributing to
3.7 Gtpe by 2028
(China CCS Institute)



United Kingdom

East Coast Cluster (ECC) creates long term benefits



2025
28,000+
jobs created
(through investment)



2025-2027
2.8 billion USD+
through direct and
indirect investment



2028
23 Mtpa
average capacity of CO₂
capture from existing gas
plants by 2028

CCU hubs can boost Indonesia's economy and regional status



CCU hubs can increase Indonesia's local and regional advantage



Indonesia has what it takes



CCU will create multiple impacts for Indonesia



26T CO₂ needs to be removed from atmosphere for Indonesia to reach Net Zero by 2060*

26T CO₂ needs to be removed from atmosphere for Indonesia to reach Net Zero by 2060*



International Assessment



CCl offers cost-effective solutions to industries with limited decarbonization options

CCl offers cost-effective power and industrial gases



Cost-effective solution for plants with 20 years left to get ready for climate

Enables them to continue operating



CCl is economic compared to other decarbonization technologies



Increased uptake and advancements will further lower cost of CCl

More expected to reduce cost, competitive cost level versus fossil alternatives

Investment in first early-stage projects also paving the future growth and reduction

Global competitive landscape



CCS technology has been safely used for over 50 years



~1.3 million tonnes
of CO₂ stored in natural geological storage systems



~1.8 million tonnes
of CO₂ stored in enhanced oil recovery systems



US study finds strong CO₂ storage security

< 1% CO₂ leakage to atmosphere

"This study is the most rigorous assessment to date of potential CO₂ storage leakage. It supports the conclusion that CO₂ storage is a viable CO₂ storage option."

Monitoring and detection of expansion can add to security



Monitoring is essential to ensure the gas storage system is operating as designed and to detect any expansion of gas storage capacity

- Monitor subsidence
- Monitor seismicity
- Monitor CO₂ concentrations in the storage reservoir
- Monitor CO₂ concentrations in the storage reservoir

Monitoring is essential to ensure the gas storage system is operating as designed and to detect any expansion of gas storage capacity



CCS

Monitoring and detection of expansion can add to security

"This study is the most rigorous assessment to date of potential CO₂ storage leakage. It supports the conclusion that CO₂ storage is a viable CO₂ storage option."

In unlikely event of storage leakage...

CO₂ returns to the atmosphere through natural processes in a concentrated form



CO₂ returns to the atmosphere



CO₂ returns to the atmosphere



Natural processes



Global race to scale up CCS is intensifying



Indonesia's global location is ideal for CCS
 Indonesia's strategic location in Southeast Asia, positioned between major industrial hubs in Asia and North America, makes it an ideal region for CCS.

Indonesia's path to regional CCS leadership



Indonesia's strategic location is ideal for CCS
 Indonesia's strategic location in Southeast Asia, positioned between major industrial hubs in Asia and North America, makes it an ideal region for CCS.



Indonesia's strategic location is ideal for CCS
 Indonesia's strategic location in Southeast Asia, positioned between major industrial hubs in Asia and North America, makes it an ideal region for CCS.

Take advantage of strategic location of Indonesia's strategic location in Southeast Asia, positioned between major industrial hubs in Asia and North America, makes it an ideal region for CCS.



Indonesia's strategic location is ideal for CCS
 Indonesia's strategic location in Southeast Asia, positioned between major industrial hubs in Asia and North America, makes it an ideal region for CCS.

Government and industrial sector together to support areas of transportation, energy storage, industrial and power generation.

Don't delay

Indonesia's strategic location is ideal for CCS. Government and industrial sector together to support areas of transportation, energy storage, industrial and power generation.

Project developer key findings

Government, industry, and academia are working together to support CCS development.

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Well established CCS policy and regulations spur growth in CCS globally

The International Energy Agency (IEA) ranks countries on the basis of their CCS policy



Source: IEA (2024)

Investor certainty in USA and Europe is underpinned by proactive government policy support



Investor certainty is gained by these governments in both policies and regulations

<p>IRA (Inflation Reduction Act)</p> <p>2022</p> <p>20% tax credit for CCS</p>	<p>BIL (Bipartisan Infrastructure Law)</p> <p>2021</p> <p>30% tax credit for CCS</p>	<p>EU ETS (European Union Emissions Trading System)</p> <p>2005</p> <p>Carbon price for CCS</p>	<p>EU Emissions Trading System</p> <p>2005</p> <p>Carbon price for CCS</p>
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Leading Asia is scaling-up CCS in new paths to achieving net-zero in 2050

<p>China</p> <p>2023</p> <p>1.2 GW CCS</p> <p>2023-2025</p> <p>1.2 GW CCS</p>	<p>India</p> <p>2023</p> <p>1.2 GW CCS</p> <p>2023-2025</p> <p>1.2 GW CCS</p>	<p>Japan</p> <p>2023</p> <p>1.2 GW CCS</p> <p>2023-2025</p> <p>1.2 GW CCS</p>	<p>South Korea</p> <p>2023</p> <p>1.2 GW CCS</p> <p>2023-2025</p> <p>1.2 GW CCS</p>
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Strong case for CCB hubs development in Indonesia



Indonesia
Needs
strategic potential

Strong case for CCB hubs

- Large population (275 million)
- Rapid economic growth (5.0%)
- High employment (52.5%)
- Government for job creation
- Good infrastructure



Indonesia can play a key role in helping regions worldwide

	Australia 12 CCBs	2022-2023
	Japan 12 CCBs	2022-2023
	South Korea 12 CCBs	2022-2023
	Singapore 2 CCBs	2022-2023

Government should build on significant progress already made to further accelerate Indonesia's CCB hubs development

Top 4 priorities

- #1 Develop Indonesia's CCBs implementing programmes**

 - High government involvement
 - High private sector interest
 - High industry productivity
- #2 Policies for the agreements (implementation)**

 - Government involvement: strong
 - Government priority: high and strategic
 - High private sector interest: strong
 - High industry productivity: high

- #3 Sustainability**

 - Government involvement: strong
 - Government priority: high and strategic
 - High private sector interest: strong
 - High industry productivity: high
- #4 Resilience**

 - Government involvement: strong
 - Government priority: high and strategic
 - High private sector interest: strong
 - High industry productivity: high



CCB hubs will benefit all Indonesians, and contribute to the global effort to combat global warming



**INDONESIA'S
JOB CREATION**

12,000 FTEs in 2023
12 CCBs (100 employees each)
2023 - 2024



12,000 FTEs in 2024
12 CCBs (100 employees each)
2024 - 2025



**INDONESIA'S
SECURITY**

- Increased economic activities
- Increased employment
- Increased income
- Increased trust in government



**INDONESIA'S
SECURITY**

- Increased economic activities
- Increased employment



**INDONESIA'S
CONTRIBUTION
TO THE
GLOBAL**

**PATH TO
ACHIEVING
INDONESIA'S
SDG**





coal fuels play a fundamental role in fueling faster development and strong economic growth but anticipated use has elevated atmospheric concentrations of greenhouse gases well beyond historical levels, resulting in anthropogenic climate change. Indonesia's energy demand is forecast to increase significantly in line with the country's economic development, urbanisation and population growth. To address this growth, Indonesia must focus on increasing domestic energy supply through fueling production, reducing greenhouse gas emissions, and ensure investment that drives development in efficient domestic supply. These interdependencies are shown in the energy triangle.

Indonesia will be increasingly fuel by low-carbon renewable sources; however, the full potential of renewable energy is constrained by advancements in technology. Not as long as coal consumption increases much more slowly than gas, Indonesia will transition to fuel low-carbon domestic energy.

Despite increasing demand, production of oil and gas in Indonesia has not increased. Increasing the share of domestic supply is estimated by IEA to require a doubling of current levels of investment by 2035. In fact, changes are required to make investing in Indonesia oil and gas opportunities more attractive compared to other opportunities in other countries around the world. This can be achieved through enhanced fiscal terms, greater legal certainty, more ease of doing business and incentives that drive R&D investments aligned with a net-zero world.

Gas in particular has a crucial role in many parts of Indonesia's economy. It is the backbone for all industrial furnace production. It takes under half per day's output industry gas also generates nearly percent of Indonesia's electricity needs. Almost a million households are heated by gas, and government revenue (not including taxes) from oil and gas exports covers a fifth of GDP.

Gas as a transition fuel source of coal is crucial to reducing greenhouse gas emissions. Current projections suggest a modest increase in produced energy supply from coal than gas, but this still results in coal generating a greater proportion of total energy consumed by IEA. Natural gas produces half the carbon dioxide of coal, much less nitrogen dioxide and far less sulphur. Reducing this gas than coal is a climate and more desirable outcome.

Coal supplies a security demand around Indonesia's world-class gas potential, with the discovery of the two largest deepwater gas discoveries in the world in 2011 – the Tangguh and Sakti gas fields.

However, unless the Indonesia R&D sector continues to thrive unobstructed, today's discovery of domestic oil & gas production is the face of increasing domestic energy demand will suppress the country's ability to import dependency and will be Indonesia that is not superior to a net exporter of natural gas unless a drastic investment. It is crucial to R&D investment that produces the value being forecasted discoveries. The multi-billion Indonesia's current position as a net gas exporter into the future. This would ensure a transition to the energy security, sustainability and affordability needed to power the future Indonesia.



Achieve and sustain energy transition

Energy Indonesia balance between energy security, energy efficiency, and energy sustainability

The energy transition



Fuel Supply Resilience

IPM demand will increase domestic production of production. However, the increase from oil national will not offset the production reduction in domestic. This is because of increasing cost.



IPM 2022

Energy Investment

Indonesia's energy needs will grow by 70% over the next 20 years. Increasing energy supply will grow by only 30% but satisfying 40% of energy.

Investment needed to meet the energy requirements is estimated at:



Indonesia must remain globally competitive to attract investment

To attract production, the government is competing for investment from other jurisdictions. Indonesia still by 2030



Source: Citigroup

Improving Indonesia's E&P attractiveness

Enhanced fiscal terms

- Stability and support for fiscal and non-fiscal incentives
- Attracting investment
- Regulatory and development objectives



Logistics

- Improve infrastructure and safety
- Reduce cost of doing business
- Increase efficiency
- Increase safety and security of investment
- Increase investment

Cost of doing business

- Reduce the cost of doing business
- Increase efficiency
- Increase safety and security of investment
- Increase investment



Non-governmental

- Non-governmental investment
- Increase investment
- Increase safety and security of investment
- Increase investment



Many years and ongoing risks loomed for Indonesia's economy

- High dependence on fossil fuels**
- High energy demand**
- High volatility of fossil fuel commodity prices**
- High volatility of global economic conditions**
- High fiscal deficit**

Indonesia relies on coal as its main source of energy. Indonesia's energy related activities will continue to rise beyond 2025.



Indonesia holds significant potential for gas. The country's gas reserves are estimated to be the largest amongst the global states.

Top 10 natural gas reserves (trillion m³)

- 650** Indonesia (natural)
- 580** Indonesia (contract)
- 572** Indonesia (contract) (Ongoing)
- 540** Indonesia (contract)
- 298** Indonesia (contract) (Ongoing)

Indonesia's gas reserves required to meet its energy demand (trillion m³)

2025: 150,000,000 toe

Gas holds out renewable's promise, energy security, the gas price will rise over 2025. Gas offers a lower alternative to coal.





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