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Analysis of Indonesia's Economic Potential in World Carbon Credit Trade

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ABSTRACT: Indonesia has economic potential through increasingly interconnected carbon credit transactions. Through its abundant natural resources, including vast forests, Indonesia controls nearly 80 percent of the world's carbon reserves. This opportunity offers hope for the development of a sustainable carbon market. This study aims to calculate and analyze Indonesia's economic potential in carbon credit trading on the global market based on the amount of forest it owns.

This study employed two methodologies: analysis of data from the Ministry of Forestry, which included land area and the carbon dioxide absorption capacity of each Indonesian forest type. Calculation of economic potential financially using simulations based on commodity trading concepts. The calculation of potential revenue was carried out in stages, using an economic model to calculate the amount of revenue from trade transactions and elaborating on the EUR currency in actual carbon trading transactions.

The study concluded that Indonesia's potential to earn revenue from the Indonesian forestry carbon trade in the international market reached IDR 97-258 trillion per year by 2030 if fully optimized. Meanwhile, gross deforestation occurred in secondary forests covering 200.6 thousand hectares (92.8%), of which 69.3% occurred within forest areas and the remainder outside forest areas. Indonesia is predicted to be able to surpass the carbon trading potential of Peru, Kenya, and Brazil as fellow countries with the largest tropical forest areas in the world. The formation of carbon prices by country in Indonesia with several REDD+ pilot projects with the Result-Based Payment (RBP) scheme, such as the Green Climate Fund (GCF), Forest Carbon Partnership Facility (FCPF) and Bio Carbon Fund (BCF) with a total commitment value of around USD 273.8 million.

KEYWORDS: Carbon credit transactions, carbon credit trading, carbon by country.

I. INTRODUCTION

The opening of the door to cross-border carbon trading will be a key narrative ahead of COP30 in Belem, Brazil, next November. The meeting is expected to produce the most detailed rules to facilitate global carbon trading, thus attracting wider investor interest. The European Union, too, is not absent from its carbon market. The region will begin trading under the Emissions Trading System (ETS2) scheme two years before its official launch and implement a cross-border carbon tax mechanism (Carbon Border Adjustment Mechanism/CBAM). China and Europe will expand cap-and-trade rules to new industries, while new carbon markets will emerge in countries from Brazil to Vietnam and New York. Bloomberg NEF believes that reforms to existing programs will accelerate de carbonization and potentially raise carbon prices. All these developments further strengthen carbon trading's position as a crucial tool in the energy transition.

Global carbon credit trading opportunities for Indonesia are driven by the doubling of carbon removal contracts. The trend among companies to purchase carbon credits is shifting to contracts to remove carbon from the atmosphere to reduce emissions. This trend is driven by growing attention to the risks of climate change, such as damage from forest fires and the increasing intensity of extreme weather. Bloomberg NEF noted that the volume of new contracts for carbon removal credits increased 74% in 2024. Contract volume is expected to double in 2025, driven by decreasing costs and innovations in contract mechanisms. In 2024, the volume of carbon removal credit contracts will reach 7.8 million tons, up from 4.5 million tons in 2023. Microsoft is the largest buyer, with nearly two-thirds of the total new contracts, that is 5.1 million carbon removal credits.

Since its launch, domestic carbon trading in Indonesia has faced challenges in terms of market liquidity. Throughout 2024, the total value of traded carbon reached IDR 19.72 billion, lower than IDR 30.90 billion in 2023. The volume of carbon transactions in 2024 also decreased to 412,186 tons of CO_2 equivalent, compared to 494,254 tons of CO_2 equivalent in the previous year. One factor that could increase carbon trading activity is the implementation of a carbon tax. If a carbon tax is implemented and its value is higher than the carbon market price, carbon trading will be more active. Several industrialized countries with high carbon emissions are predicted to become major buyers of carbon credits from Indonesia. Countries such as the United States, the European Union, Japan, and China are expected to be major customers of IDX Carbon. IDX Carbon has shown rapid growth since its launch in 2023, and this international trade demonstrates Indonesia's readiness to lead the global carbon market. From just 16 initial users, registered participants have now reached 100 by the end of 2024. On January 20, 2025, the Indonesian Carbon Exchange officially launched Indonesia's monumental step in international carbon trading. In the history of carbon trading in Indonesia, this moment marked a culmination, marking Indonesia's readiness to compete in the global carbon market. This significant step was inseparable from Indonesia's commitment following the COP 29 meeting, where the country affirmed its support for the implementation of Article 6 of the Paris Agreement. This international carbon trading also serves as an effort to accelerate the achievement of the second Nationally Determined Contribution (NDC) target, submitted in February 2025.

The Indonesian Carbon Exchange has seen significant growth since its launch on September 26, 2023. As of January 31, 2025, 107 service users had obtained permits, with a total carbon trading volume of 1,181,255 tCO2e and an accumulated value of IDR 62.93 billion. Transaction details show that 12.22 percent of the trading volume occurred in the Regular Market, 62.14 percent in the Negotiated Market, 25.40 percent in the Auction Market, and 0.24 percent through the marketplace. Going forward, the exchange's potential remains substantial, given the 4,154 registrants in the National Climate Change Control Registry System (SRN PPI) and the high potential for carbon units to be offered. The Indonesian Carbon Exchange has seen significant growth since its launch on September 26, 2023. As of January 31, 2025, 107 service users had obtained permits, with a total carbon trading volume of 1,181,255 tCO2e and an accumulated value of IDR 62.93 billion. Transaction details show that 12.22 percent of the trading volume occurred in the Regular Market, 62.14 percent in the Negotiated Market, 25.40 percent in the Auction Market, and 0.24 percent through the marketplace. Going forward, the exchange's potential remains substantial given the 4,154 registrants in the National Climate Change Control Registry System (SRN PPI) and the high potential for carbon units to be offered.

Indonesia, which is committed to implementing carbon mitigation, has economic potential through its abundant natural resources, including vast forests, which can generate carbon credits. Indonesia is said to control almost 80 percent of the world's carbon reserves. Indonesia has 3.3 million hectares of mangrove land with the potential to store around 20 percent and peat lands that are estimated to be able to absorb around 37 percent of global carbon stores. Indonesia also has 125 million hectares of tropical rainforests which are a significant source of carbon absorption. This potential can be utilized by the Indonesian government in mitigating global climate change. Utilizing the carbon market will help the government achieve the carbon emission reduction targets set out in the nationally determined contributions (NDC) commitment in the 2015 Paris Agreement.

This research focuses on analyzing data from agencies implementing forest management in Indonesia, specifically tropical rainforests, mangrove forests, and mountain forests. Data obtained from the Ministry of Forestry includes land area and carbon dioxide absorption capacity of each forest type studied. This data is then processed to calculate the potential economic and financial benefits to the Indonesian government.

II. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

A) Theoretical Foundations

Definition of forest

A forest is a land area dominated by trees. Hundreds of definitions of forest are used worldwide, incorporating factors such as tree density, tree height, land use, legal status, and ecological function. The Food and Agriculture Organization of the United Nations defines a forest as an area of land greater than 0.5 hectares with trees exceeding 5 meters in height and a canopy cover of more than 10%, or trees capable of achieving these thresholds locally.

In Indonesia, according to Forestry Law No. 41 of 1999, a forest is an ecosystem unit in the form of a stretch of land containing natural biological resources because trees dominate the natural environment and cannot be separated altogether.

Types of Forests in Indonesia, Their Benefits and Functions

a. Tropical rainforests

Tropical rainforests typically exist in areas with an average temperature of 20-30 degrees Celsius. Tropical rainforests are unique because they are divided by the equator. Tropical rainforests are found on large islands in Indonesia, such as Sumatra, Kalimantan, Sulawesi, and Papua. Tropical rainforests store millions of tons of carbon due to the diverse vegetation they grow within.

b. Mangrove forests

Mangrove forests in Indonesia are distributed between the western and eastern sides of Sumatra, covering an area of 417,000 hectares. Some areas on Java cover 34,400 hectares, while on Kalimantan they cover 165,000 hectares, and many more.

c. Mountain forests

Mountain forests, also known as Montana forests, are a type of tropical rainforest that forms in mountainous regions. Key factors in their formation are low temperatures and the formation of clouds or fog that frequently blanket the canopy.

Measuring the annual carbon dioxide absorption capacity based on Forest Type.

a. Calculation Method

1). Direct measurement method measures the amount of carbon dioxide absorbed by forests through photosynthesis

2). Biomass calculation method estimates the amount of carbon dioxide absorbed based on that biomass

3). Emission factor calculation method measures the amount of carbon absorbed by forests based on predetermined emission factors.

b. Calculation Formula

1. Biomass Calculation Formula:

- Biomass (tons/ha) = Wood Volume (m3/ha) x Wood Density (tons/m3)

- Carbon Dioxide Absorbed (tons CO2/ha) = Biomass (tons/ha) x Carbon Conversion Factor

2. Calculation Formula Based on Emission Factors:

(Ton CO2/ha/year) = Forest area (ha) x Emission factor (tons)

- Carbon Dioxide Emissions Absorbed:

Factors Affecting the Calculation:

Forest Type, Forest Age, Vegetation Density, Rainfall, and Temperature.

c. The Importance of Calculating Carbon Dioxide Absorption Capacity

Calculating the carbon dioxide absorption capacity of each forest type can help in:

- Estimating the forest's potential to reduce carbon dioxide emissions

- Developing effective forest conservation strategies

- Increasing public awareness of the importance of forests in mitigating the impacts of climate change.

Theory for Calculating Carbon Dioxide Absorption Capacity of Each Forest Type in Indonesia

1). Basic Theory

Photosynthesis is a process that occurs in green plants, including forest trees, which uses energy from sunlight to convert carbon dioxide and water into glucose and oxygen.

Calculation Formula

Carbon dioxide absorption capacity can be calculated using the following formula:

CO2 absorption capacity = (Photosynthesis - Respiration) x Forest area

- Photosynthesis is the rate of photosynthesis of plants in a forest (tons of CO2/ha/year)

- Respiration is the rate of respiration of plants in a forest (tons of CO2/ha/year)

- Forest area is the calculated forest area (ha)

2). Photosynthesis Theory

The rate of photosynthesis can be influenced by factors such as sunlight intensity, temperature, and humidity.

3). Biomass Theory

Biomass is the total amount of organic matter contained in plants and animals. Forest biomass can be used to calculate carbon dioxide absorption by using a biomass-to-carbon conversion factor.

4). Algometric Theory

Used to calculate plant biomass based on plant size and shape. This theory can be used to calculate forest biomass and carbon dioxide absorption capacity.

5). Dynamic Model Theory

This model can be used to calculate the long-term carbon dioxide absorption capacity of forests. The theories used to calculate carbon dioxide absorption capacity of forests can help in

Estimating the potential of forests to reduce carbon dioxide emissions

- *Developing effective forest conservation strategies*
- *Raising public awareness of the importance of forests in mitigating the impacts of climate change.*

Several theoretical guidelines that can be used to calculate carbon dioxide absorption capacity based on forest types in Indonesia:

(1). Intergovernmental Panel on Climate Change (IPCC):

The IPCC provides guidelines for calculating greenhouse gas emissions and absorption, including carbon dioxide, by forests.

(2). Food and Agriculture Organization (FAO):

The FAO provides guidelines for calculating forest biomass and carbon.

(3). Scientific research:

Many scientific studies have been conducted to calculate carbon dioxide absorption capacity by forests in Indonesia, such as research conducted by the Bogor Agricultural Institute (IPB) and the Forestry Research and Development Agency (BP2K).

Guidelines for calculating carbon dioxide absorption capacity according to the IPCC:

Method 1: Used if the partial pressures of CO2 and CO2 and flue gas concentrations are unknown. CO2 emissions are calculated using the equation ECO2 = CCAVG x CF x

$$\boxed{ECO2 = CCAVG \times CF}$$

- *ECO2 = CO2 Emission in mass unit per year*
- *CCAVG = Average daily coke burn rate in units of mass/year*
- *CF = Carbon fraction in coke*

Method 2: Used if data on air blower capacity and flue gas concentration is available. CO2 Emission are calculated using the formula:

$$\boxed{ECO2 = (AR + SOR) \times (FCO2 + FCO)}$$

- *AR = Air flow rate*
- *SOR = Supplemental oxygen flow rate*
- *FCO2 = CO2 fraction in flue gas*

Method 3: Used when there is data on the volumetric flow rate of the sour gas, the composition of CO2 in the sour gas, and the volume-molecular conversion factor and mole weight of CO2. CO2 emissions are calculated based on the volume of hydrocarbon burned and the composition of hydrocarbons in the sour gas.

Emission Factor

The CO2 emission factor can be calculated using the formula:

$$\boxed{Wt\ \%Cmixture = 1\ \#components \times \sum (Wt\ \%i \times Wt\ \%Ci)\ 100\ i}$$

The CH4 and N2O emission factors can also be calculated using the same formula. Calculation of the emission load from the external combustion unit for the CO2, CH4, and N2O parameters can be done using the basic formula:

$$\boxed{E = FC \times EF}$$

- E = Emissions

- FC = Fuel Consumption

- EF = Emission Factor

Emission factors for biomass and carbon dioxide can vary depending on the type of biomass and the combustion process. Some examples of commonly used emission factors are:

- Natural Gas: 2.75 tons CO_2/ton of fuel
- Petroleum: 3.06 tons CO_2/ton of fuel
- Coal: 3.67 tons CO_2/ton of fuel

It is important to remember that biomass and carbon dioxide calculations can vary depending on the context and purpose of the calculation. Therefore, it is important to understand the methods and assumptions used in the calculations.

Calculating Biomass

a. Direct Measurement Method:

Biomass can be measured directly by weighing or counting the amount of biomass produced.

b. Estimation Method:

Biomass can be estimated using models or formulas based on parameters such as plant species, plant age, and environmental conditions.

Calculating Carbon Dioxide

a. Stoichiometric Method:

CO_2 emissions can be calculated based on the chemical reaction of biomass combustion using the stoichiometric formula.

b. Emission Factor Method:

CO_2 emissions can be calculated using a predetermined emission factor based on the type of biomass and the combustion process.

The formula for calculating CO_2 emissions is:

- *ECO2* = *CO_2 Emission*

$$\boxed{ECO2 = FC \times EF}$$

- *FC* = *Fuel Consumption*
- *EF* = *Emission Factor*

The Forest Type with the Largest Carbon Storage

Distribution of Mangrove Forests in Indonesia

Mangrove forests, or mangroves, are forests that grow in coastal areas of Indonesia, covering an area of approximately 3.31 million hectares, equivalent to 23% of all mangrove ecosystems worldwide. According to the Ministry of Environment and Forestry's (KLHK) social media page on Thursday (December 2, 2021), they are spread across seven provinces. The first province in question is Sumatra, with a mangrove area of 666,438.94 hectares. Second, Kalimantan, with an area of 735,886.45 hectares. Third, Sulawesi, with a mangrove area of 118,891.88 hectares. Fourth, Java, with an area of 35,910.56 hectares. Fifth, Bali, Nusa Tenggara, with a total mangrove area of 34,834.58 hectares. Sixth, Papua, with an area of 1,497,723 hectares, and finally Maluku, with an area of 221,560.31 hectares.

Estimation of Mangrove Carbon Absorption through Photosynthesis Process.

Estimation of carbon that can be absorbed by mangroves through the process of photosynthesis using the Leaf Area Index (LAI) method (Kathiresan, 2011). This method measures the intensity of sunlight absorbed by the mangrove canopy. To find out how much canopy absorption of sunlight intensity must be measured the value of sunlight intensity under or inside the canopy. Light intensity above or outside the canopy (I0¬). Light intensity in the canopy below and outside the canopy is measured using a lux meter. The calculation of the Leaf Area Index is a comparison of the area of tree canopy cover to the area (Sahu and Kathiresan, 2019).

$$\boxed{LAI = \frac{Log\ e\ \left(\frac{I}{I_0}\right)}{-k}}$$

LAI = *Leaf Area (Leaf area(m2))/(Leaf area(m2))*
I = *Light intensity outside the canopy*
Io = *Light intensity inside the canopy*

III. METHODOLOGY

The methodology used in this study is: data analysis from agencies that carry out forest environmental management in Indonesia. That is from the Ministry of Forestry consisting of the land area of each type of forest to be studied, the carbon dioxide absorption capacity of each type of forest studied. Furthermore, data is processed from agencies related to carbon trading in Indonesia and simulations of calculating the financial economic potential that can be obtained by the Indonesian Government. The analysis is carried out through qualitative and quantitative approaches, especially in the simulation of calculating the financial benefits of carbon trading.

Data collection

Data collection for this study was conducted through the websites of relevant agencies and research journals conducted by other researchers related to the topic. To calculate the financial economic potential of carbon trading, a simulation was conducted based on the concept of commodity trading, as carbon emissions are classified as a commodity. The calculation of potential revenue from carbon trading was carried out in stages, starting with the use of an economic model to calculate the amount of revenue from trade transactions, followed by the elaboration of foreign exchange rates. The EUR was the foreign currency used in this study because both currencies are used in actual carbon trading transactions.

Referring to Pindyck and Rubinfeld (2013), the basic model for the simulation used in this study is:

$$\boxed{R1 = P * Q1}$$

R1 = Product sales revenue

P = Product price

Q1 = Product quantity = Forest carbon dioxide absorption capacity x Forest land area

The purpose of using this carbon price is to assess the extent of the global carbon market that could potentially be formed in Indonesia. This is important considering that Indonesia is currently a primary destination for investors or countries committed to reducing their carbon emissions. The use of the EUR/IDR exchange rate facilitates the interpretation of the simulation results.

Sample and population

The population used in this study was all forests in Indonesia. The sample consisted of forest types based on climate: tropical rainforests, mangrove forests, peat forests, and urban forests. Simple random sampling was used.

Operational Variable

The operational variables in this study can be seen in the following table:

Variable	Indicator	Measurement
Government Policy	Kyoto Protocol	Carbon Emission Mitigation
Forest Land Area	Spacious	Hectare Are
carbon dioxide absorption capacity	photosynthesis	CO2 absorption capacity = (Photosynthesis - Respiration) x Forest area
	Biomass	- Biomass (ton/ha) = Wood volume (m3/ha) x Wood density (ton/m3)
		- Carbon dioxide absorbed (tons CO2/ha) = Biomass (tons/ha) x Carbon conversion factor
EUR Carbon Sales	EUR Carbon Prices	Carb = PEURCarbEmRed * QCarbEm* CurrEUR.

IV. RESULT

Sectorial Participation in IDX Carbon.

Indonesia's forestry sector holds significant carbon reserves and thus significant credit potential, yet its participation in the IDX Carbon is only just beginning to take shape. Recognizing the importance of forests for domestic emissions targets and international financing, the Ministry of Environment and Forestry (KLHK) issued Ministerial Regulation No. 7 of 2023 concerning carbon trading mechanisms in the forestry sector. This regulation provides a framework for projects such as avoided deforestation (REDD+), reforestation, and sustainable forest management to generate tradable carbon credits.

Analysis of Indonesia's Economic Potential in World Carbon Credit Trade

The Ministry of Forestry released the results of its annual monitoring of forest conditions and deforestation rates in Indonesia. This monitoring was conducted comprehensively across Indonesia's landmass, covering 187 million hectares, both inside and outside forest areas, using Landsat satellite imagery provided by the National Research and Innovation Agency (BRIN). The monitoring results show that forested land in Indonesia in 2024 reached 95.5 million hectares, or 51.1% of the total land area. Of this figure, approximately 91.9% (87.8 million hectares) were located within forest areas. Meanwhile, the net deforestation rate in 2024 was recorded at 175.4 thousand hectares. This figure was obtained from gross deforestation of 216.2 thousand hectares minus reforestation results of 40.8 thousand hectares. The majority of gross deforestation occurred in secondary forests with an area of 200.6 thousand hectares (92.8%), of which 69.3% occurred within forest areas and the remainder outside forest areas. To reduce deforestation, the Ministry of Forestry has implemented reforestation efforts through Forest and Land Rehabilitation covering an area of 217.9 thousand hectares by 2024. This figure represents Forest and Land Rehabilitation within the area of 71.3 thousand hectares and outside the area of 146.6 thousand hectares, both from the State Budget (APBN) and non-APBN funding sources. Meanwhile, over the past decade, the average figure for Forest and Land Rehabilitation is 230 thousand hectares per year, which can be used as a reference for reducing deforestation rates.

Types of Forests in Indonesia and Their Carbon Dioxide Absorption Capacity

a. Tropical Rainforests: The estimated carbon dioxide absorption capacity of tropical rainforests is approximately 200-300 tons of CO2 per hectare per year.
b. Mangrove Forests: The estimated carbon dioxide absorption capacity of mangrove forests is approximately 1.5-3.7 tons of CO2 per hectare per year for soil and 0.4-1.2 tons of CO2 per hectare per year for biomass.
c. Swamp Forests: The estimated carbon dioxide absorption capacity of swamp forests is approximately 1.1-2.5 tons of CO2 per hectare per year.
d. Mountain Forests: The estimated carbon dioxide absorption capacity of mountain forests is approximately 50-150 tons of CO2 per hectare per year.

Forest Types and Carbon Storage Capacity in Biomass and Soil

1. Tropical Rainforest:
   - Biomass: 150-300 tons C/ha
   - Soil: 100-200 tons C/ha
   - Total: 250-500 tons C/ha
2. Mangrove Forest:
   - Biomass: 100-200 tons C/ha
   - Soil: 500-1,000 tons C/ha
   - Total: 600-1,200 tons C/ha
3. Swamp Forest:
   - Biomass: 50-150 tons C/ha
   - Soil: 200-500 tons C/ha
   - Total: 250-650 tons C/ha
4. Mountain Forest:
   - Biomass: 50-150 tons C/ha
   - Soil: 100-200 tons C/ha
   - Total: 150-350 tons C/ha

The carbon dioxide absorption capacity through photosynthesis of each forest type in Indonesia is as follows:

1. Tropical Rainforest: 200-300 tons of CO2/ha/year
2. Mangrove Forest: 150-250 tons of CO2/ha/year
3. Swamp Forest: 100-200 tons of CO2/ha/year
4. Mountain Forest: 50-150 tons of CO2/ha/year
5. Seasonal Forest: 100-200 tons of CO2/ha/year

1. Analysis of research result

Analysis of Indonesia's potential based on the type of forest owned based on the international carbon credit market price.

Analysis of Indonesia's Economic Potential in World Carbon Credit Trade

Table 4.1. Calculating Indonesia's Economic Potential Based on Forest Types Using the Photosynthesis Method In Carbon Trading on the European Union Carbon Credit Market

Forest Type	Carbon absorption capacity per hectare per year	Area of each Forest Type (Hectares)	Total COe absorption capacity (Ton COe)	Carbon Credit Prices in the European Market	Total Income (EUR)
Tropical forest	200-300 ton CO2	86,9 million	26.070.000.000	EUR 73	1.903.110.000.000
Swamp forest	100-200ton CO2	33,4 million	840.000.000	EUR 73	487.640..000.000
Mangrove forest	150-250ton CO2	3,36 million	124.320.000	EUR 73	61.320.000.000
Seasonal forest	100-200ton CO2	34.400 Hectare	86.000	EUR 73	6.278.000
Mountain forest	50-150 ton CO2	No data	Not processed	EUR 73	Not processed
Total Economic Potential of Forest Carbon Credits in Indonesia					2.452.076.278.000

Source: KLHK and Green Business.com Data processed

Based on Table 4.1, the economic potential of Indonesia's forests is estimated at €2,452,076,278,000, equivalent to IDR 4.563 trillion. This value represents only a portion of Indonesia's existing forests. Combined with government activities to rehabilitate damaged forests, Indonesia's forests will have even greater economic potential.

Forests absorb carbon dioxide not only through photosynthesis but also through biomass and forest soil. The forest's carbon absorption capacity, based on biomass, is shown in the following table:

Table 4.2. Calculation of Indonesia's Economic Potential Based on Forest Types Using the Biomass Method In Carbon Trading on the European Union Carbon Credit Market

Forest Type	Absorption capacity per hectare	Area of each forest type	Total Coe absorption capacity(Ton Coe)	bon credit prices in the European market (€)	Total income
Tropical forest	250-500 ton C/ha	86,9 million	43.450.000.000	73	3.171.850.000.000
Swamp forest	0-650 ton C/ha	33,4 million	21.710.000.000	73	1.584.830.000.000
Mangrove forest	)-1.200 ton C/ha	3,36 million	4.032.000.000	73	294.336.000.000
Tropical forest	250-500 ton C/ha	86,9 million	43.450.000.000	73	3.171.850.000.000
Seasonal forest	100-200 ton CO2/ha/year	400 Hectare	6.880.000	73	502.240.000
Mountain forest	150-350 ton C/ha	no data	no data	73	no data
onesia's Total Income Potential					5.051.518.240.000

Source: KLHK and Green Business.com Data processed

Analysis of Indonesia's Economic Potential in World Carbon Credit Trade

Based on Table 4.2 above, the economic potential of Indonesia's forests is €5,051,518,240,000, or the equivalent of IDR 9.5 trillion. This is derived from the absorption capacity of Indonesia's forest biomass and soil. This represents significant potential for Indonesia to generate revenue from carbon trading on the international market, especially if all deforested forests are rehabilitated and returned to their previous function.

2. Government Policy in Responding to the Economic Potential of Indonesian Forests in the International Market

a. Indonesia's Green Economy Strategy

The hope is that this green economy will encourage new job opportunities (green jobs) and also new investment opportunities (green investment). The strategies for realizing a green economy are as follows: first, through low-carbon development as outlined in the 2020-2024 National Medium-Term Development Plan (RPJMN). Second, a net-zero emissions policy. A roadmap has been issued to achieve net-zero emissions by 2060, including a net sink in the forestry and land sector by 2030. Third, the provision of a number of green incentives to encourage increased realization of the green economy. Environmental conservation and restoration efforts have been quite successful in recent years.

The government has initiated a green economy strategy by establishing a Green Industrial Park in North Kalimantan, powered by green energy from the Kayan River. The Kayan River's hydropower potential is estimated to produce 11,000-13,000 megawatts. The Mamberamo River can generate around 24,000 megawatts.

b. Inauguration of Forestry Sector Carbon Trading

The strategic step being pushed is the completion of the Mutual Recognition Agreement (MRA) with international standards such as Verra, Gold Standard, and Plan Vivo, which is targeted for completion in May 2025. Furthermore, the government is also revising Presidential Regulation Number 98 of 2021 concerning the Implementation of the Economic Value of Carbon (NEK) to increase the effectiveness and transparency of carbon trading. In the initial stage, this carbon trading includes private forest management schemes, namely Forest Utilization Business Permit Holders (PBPH) and Social Forestry schemes. These two forest management schemes have different carbon absorption potentials. PBPH has the potential to absorb 20-58 tons of carbon dioxide per hectare at a price of US$5-10 per ton of carbon dioxide. Meanwhile, Social Forestry can absorb up to 100 tons of carbon dioxide per hectare at a price of up to 30 euros per ton of carbon dioxide. By 2025, the potential for carbon trading in this sector is estimated to reach 26.5 million tons of carbon dioxide, with transaction values ranging from Rp 1.6 trillion to Rp 3.2 trillion per year. If optimized until 2034, the potential for carbon trading from the forestry sector could reach Rp 97.9 trillion to Rp 258.7 trillion per year. Of this figure, tax contributions would be around Rp 23 trillion to Rp 60 trillion, and non-tax state revenue (PNBP) would be between Rp 9.7 trillion and Rp 25.8 trillion per year. Furthermore, this program is expected to create 170,000 jobs at various carbon project locations.

c. FOLUSINK Implementation Plan for 2030

The 2030 FOLU Net Sink is stipulated in Presidential Regulation Number 98 of 2021 concerning the Implementation of Carbon Economic Values for the Achievement of Nationally Determined Contribution Targets and Greenhouse Gas Emission Control in National Development. The Main Strategy of the 2030 FOLU Net Sink to achieve this target, the government is implementing four main strategies: Avoiding deforestation, Conservation and sustainable forest management, Protection and restoration of peat lands, Increasing carbon absorption. With this strategy, the FOLU sector is expected to be able to reduce up to 60 percent of the total national emission target and become the foundation for achieving net-zero emissions by 2060.

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