IBC
Indonesian Business Council

White Paper

Preparing an Innovative and Globally Competitive Carbon Market in Indonesia:

Strategic Actions Towards an Impactful Carbon Market

December 2023

This White Paper titled “Preparing an Innovative and Globally Competitive Carbon Market in Indonesia: Strategic Actions towards an Impactful Carbon Market” is the result of a collaborative effort involving multiple partners. We extend our sincere appreciation to each contributor for their expertise and shared commitment to this document.

Contents

Glossary

Carbon Credit *Kredit Karbon*	A measurable, verifiable GHG emissions reduced from a certified reduction activity.
Carbon Credit Issuance *Penerbitan Kredit Karbon*	A process of registering and verifying GHG emissions reduction projects according to standards and requirements set to prove the projects' eligibility to be issued as a representation of a tonne of CO2e that has been eliminated from the atmosphere.
Carbon Exchange *Bursa Karbon*	A system regulating the carbon stocks registry, carbon trading, and the carbon units.
Carbon Levy *Retribusi Karbon*	State levies imposed on businesses that potentially and/or have validated to generate carbon emissions applied in both central and local governments, carried in the form of tax, customs, and excise.
Carbon Market *Pasar Karbon*	A trading system where carbon credits are sold and bought.
Carbon Offset *Pengimbangan GRK*	A GHG emissions reduction and/or an increase in carbon storage used to compensate for the generated GHG emissions.
Carbon Pricing *Nilai Ekonomi Karbon*	The value of each unit of GHG emissions produced.
Carbon Securities *Efek Karbon*	Securities (surat berharga) or investment contracts given to a right owner to directly/indirectly obtain economic benefits, which can be transferred and/or traded within the carbon market.
Carbon Tax *Pajak Karbon*	A tax imposed on goods or activities that produce GHG emissions in a certain period.
Carbon Trading *Perdagangan Karbon*	A market-based mechanism to reduce GHG Emissions through Carbon Units trading.
Carbon Unit *Unit Karbon*	A proof of carbon ownership is the form of a certificate/allowance verified, which values one (1) ton of GHG emission per slip.
Certified Emission Reduction (CER) *Pengurangan Emisi Bersertifikat*	A digital certificate issued for GHG emission reductions generated from Clean Development Mechanism (CDM) projects in accordance with the rules and requirements; One CER is equivalent with one mtCO2e removed.
Clean Development Mechanism (CDM) *Mekanisme Pembangunan Bersih*	A mechanism allowing a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol to implement an emission-reduction project in developing countries, such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one tonne of CO2.
Compliance Carbon Market (CCM) *Pasar Karbon Wajib*	A carbon market driven by government policy, using carbon emission permits as their carbon credits to be traded. The government determines the maximum emission limits/allowances for business sectors, and the usual form of CM is the Emission Trading System (ETS).

Emission Cap Allowance *Persetujuan Teknis Batas Atas Emisi (PTBAE)*	Limitations and/or caps for GHG emissions can be produced by business actors within a certain compliance period for each business actor.
Emission Trading System (ETS) *Sistem Perdagangan Emisi*	A market mechanism that allows those bodies (such as countries, companies, or manufacturing plants) that emit (release) greenhouse gasses into the atmosphere, to buy and sell these emissions (as permits or allowances) amongst themselves.
GHG Emission Reduction Certificate *Sertifikat Pengurangan Emisi GRK (SPE-GRK)*	A letter of emission reduction proof by a business actor and/ or activity that has gone through the measurement, reporting, and verification processes, and is recorded within the SRN-PPI database in the form of a registry number and/or code.
Joint Crediting Mechanism *Mekanisme Pemberian Kredit Bersama*	A mechanism rooted from bilateral collaboration between countries (pioneered by the Government of Japan) in forging concerted decarbonization and mitigation actions for accelerating both countries' environment ambitions.
Offset Credit *Kredit Prengimbangan*	The transferable form of GHG emissions reduced, verified by governments and/or third-party verifiers; usually represented on one metric tonne of CO2.
National Registry System for Climate Change *Sistem Registri Nasional Pengendalian Perubahan Iklim (SRN-PPI)*	The web-based management system that tracks the national actions and resources for mitigation, adaptation, and carbon pricing/Nilai Ekonomi Karbon (NEK).
Renewable Energy *Certificate (REC) Sertifikat Energi Terbarukan*	A digital certificate containing information on the standard and size of energy generated attributing to one-megawatt hour (MWh) produced by renewable sources.
Result-Based Payment (RBP) *Pembayaran Berbasis Kerja*	The incentives given to stakeholders once the GHG emission reduction is verified and/or validated.
Voluntary Carbon Market (VCM) *Pasar Karbon Sukarela*	A carbon market that functions based on the voluntary intention (with no legal requirement) of businesses/individuals to reduce their carbon emissions by purchasing carbon offsets/offset credits1 as their carbon credit to offset their emissions from a Project Developer (initiated projects or businesses that deliberately reduce GHG emissions as part of their operations, such as reforestation, wetland management, carbon capture and storage, renewable energy projects, etc.).

1 VCM's Carbon credit, the offset credits, refer to units of carbon removed from the atmosphere as part of the company's normal business activities. The carbon offsets can be sold to other companies that need to reduce their carbon footprint.

1. Introduction

1.1 Definition

Carbon Market/Pasar Karbon is a trading system where carbon credits are sold and bought.[2] The Carbon Market facilitates an ecosystem of carbon exchange and greenhouse gas emissions as principal trading commodities where it can be traded among various stakeholders, ranging from countries, governments, and business actors, down to individuals that emit greenhouse gasses/*Gas Rumah Kaca* (GHG) into the atmosphere.[3]

In Indonesia, a carbon Unit/*Unit Karbon* represents proof of carbon ownership in the form of a certificate or allowance verified to produce GHG emission, which values one (1) ton of GHG emission per slip registered in the National Registry System for Climate Change/*Sistem Registri Nasional Pengendalian Perubahan Iklim* (SRN-PPI).[4] Additionally, the reduced GHG emissions/or an increase in carbon storage used to compensate for the generated GHG emissions is referred to as a carbon offsetting process,[5] represented by an offset credit that can be traded among entities.

The SRN-PPI refers to a web-based management system that tracks national actions/*aksi nasional* and resources for mitigation, adaptation, and carbon pricing/*Nilai Ekonomi Karbon* (NEK).[6] Carbon Pricing/*Nilai Ekonomi Karbon* is identified as the value of each unit of GHG emissions produced.[7] Once the carbon unit is processed and verified by SRN PPI, a certificate will be generated, known as the GHG Emission Reduction Certificate/*Sertifikat Pengurangan Emisi GRK* (SPE-GRK). SPE-GRK will be acquired in the form of a registry number and/or code.[8]

Once the SPE-GRK is obtained, the carbon trading activity can be carried out to fulfill the Emission Cap Allowance settled. The Emission Cap Allowance/*Persetujuan Teknis Batas Atas Emisi bagi Pelaku Usaha* (PTBAE-PU) is determined for pertaining stakeholders, specifically to business actors, to set a limited cap of GHG emissions that can be produced within a certain period for each actor.[9] There are two (2) available instruments in meeting the emissions caps/PTBAE-PU determined for business stakeholders which can be done through

- Carbon Trading/*Perdagangan Karbon*: a market-based mechanism to reduce GHG Emissions through Carbon Units tradings.[10]
- Carbon Exchange/*Bursa Karbon:* a system regulating the carbon stocks registry, carbon trading, and the carbon units.[11]

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2 https://climatepromise.undp.org/news-and-stories/what-are-carbon-markets-and-why-are-they-important

3 Ibid.

4 *Peraturan Otoritas Jasa Keuangan No. 14 Tahun 2023 Tentang Perdagangan Karbon Melalui Bursa Karbon/* Regulation of the Indonesian Financial Services Authority No. 14 of 2023 on Carbon Trade through Carbon Exchange

5 https://www.offsetguide.org/understanding-carbon-offsets/what-is-a-carbon-offset/

6 The mechanism of NEK can be discovered further on the Regulation of the Minister of Environment and Forestry Number 21 of 2022 on the Procedures for the Imple mentation of NEK.

7 Presidential Regulation No. 98 of 2021

8 *Peraturan Otoritas Jasa Keuangan No. 14 Tahun 2023 Tentang Perdagangan Karbon Melalui Bursa Karbon/* Regulation of the Indonesian Financial Services Authority No. 14 of 2023 on Carbon Trade through Carbon Exchange

9 Ibid.

10 https://unfccc.int/process/the-kyoto-protocol/mechanisms/emissions-trading

11 Article 54 Presidential Regulation No. 98 of 2021

1.2 History of the Carbon Market

Developments regarding the Carbon Market or the procedure of Emissions Trading have been a point of discussion for nearly three decades. Initially brought forward within the United Nations Framework Convention on Climate Change (UNFCCC), the adoption of the first global commitment to the environment in 1997 known as the Kyoto Protocol.[12] The Kyoto Protocol stands as the cardinal binding of values and principles weighing the environmental responsibilities of States and economies in reducing GHG emissions through individual targets and emission trading. Article 17 of the Kyoto Protocol initially introduced the emission trading mechanism, which allows for States with sparred permitted emission units to sell the excess capacity to other States that are over their targets.[13] The emission trading scheme is intended to be an applicable climate policy instrument on global, regional, and national levels. In the early implementation phase, the European Union (EU) is the first entity to set a national cap on the GHG emission allowances through its National Allocation Plans (NAPs) among its member states.[14] [15] NAP was the initial milestone for the creation of the EU Emission Trading System (EU ETS).

The international commitment to reducing GHG emissions in the Kyoto Protocol was further bolstered by the creation of the Paris Agreement, a legally binding international treaty on climate change at the UNFCCC Conference of the Parties (COP) 21 in 2015.[16] The Paris Agreement has been adopted by 196 member states of the UNFCCC and established NDCs as a global instrument to measure respective progress towards limiting global temperature by 1.5°C by 2100.[17] Article 6 of the Paris Agreement stipulates further on a way states can escalate their efforts in achieving the emission reduction targets, which are set out in the NDCs, through a voluntary collaboration through emission trading mechanism.[18]

12 https://unfccc.int/kyoto_protocol

13 https://unfccc.int/process/the-kyoto-protocol/mechanisms/emissions-trading#:~:text=Emissions%20trading%2C%20as%20set%20out, that%20 are%20over%20 t heir%20targets

14 https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/development-eu-ets-2005-2020_en

15 The National Allocation Plans (NAPs) allows each EU country to decide on their own allocation of their emission allowances.

16 https://unfccc.int/process-and-meetings/the-paris-agreement

17 https://www.npr.org/2021/11/08/1052198840/1-5-degrees-warming-climate-change#:~:text=That%27s%20the%20global%20climate% 20change ,hunger%2C%20con flict%20and%20drought%20worldwide

18 https://www.worldbank.org/en/news/feature/2022/05/17/what-you-need-to-know-about-article-6-of-the-paris-agreement

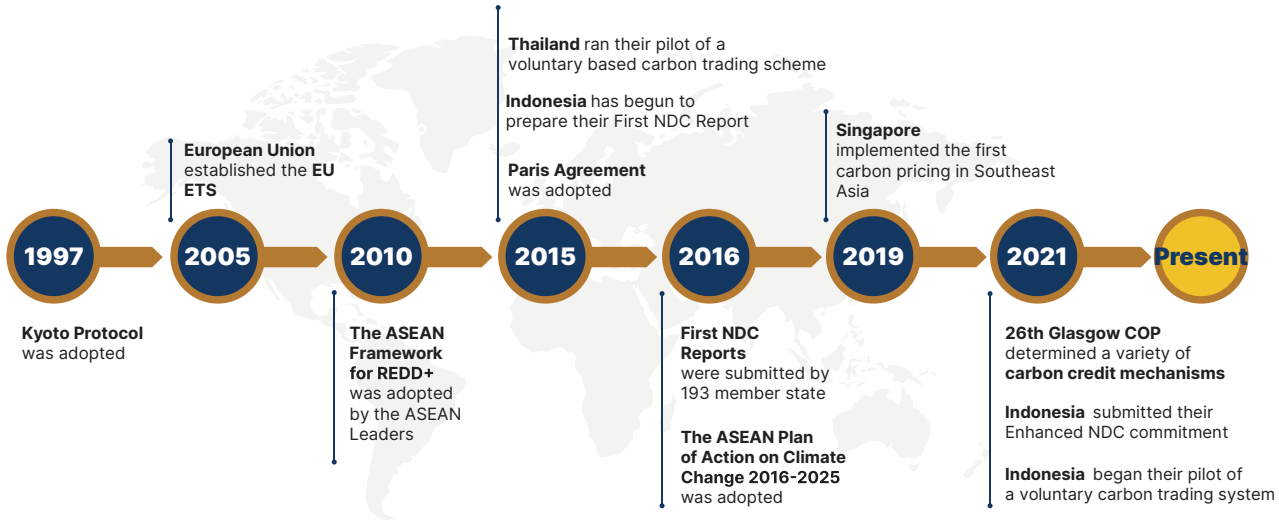


Figure 1.1 Selected Milestones of the Global Development of Carbon Market

Since the Kyoto Protocol, commitments to reduce GHG emissions have been embedded and adopted in regional efforts. The EU was the first region to implement a carbon market mechanism in 2005, known as the EU ETS. This was followed by ASEAN Leaders introducing the ASEAN Framework for REDD+ in 2010. The ASEAN Framework for REDD+ pertains to Southeast Asia's commitment to reducing regional GHG emissions through the Reduced Emissions from Deforestation and Forest Degradation (REDD)-Plus mechanism, as outlined in the ASEAN Leaders' Statement on Joint Response to Climate Change.[19]

In 2015, at the Paris COP21, the UNFCCC member states further reinforced their commitment to the Kyoto Protocol by establishing the Paris Agreement, which integrates economic, social, and environmental considerations.[20] The Paris Agreement requires member states to submit NDC reports on a five-year cycle, with each NDC expected to make incremental progress towards higher and more measurable ambitions compared to the previous cycle.[21] Article 6 of the Paris Agreement introduces extended schemes for carbon markets, including the Clean Development Mechanism (CDM).[22] Three specific agendas discussed in the Paris Agreement are located in Articles 6.2, 6.4, and 6.8. Article 6.2 emphasizes the voluntary intention in establishing cooperative approaches to mitigate outcomes towards NDCs with robust accounting systems, avoiding carbon credits double-counting.[23] Secondly, Article 6.4 provides a model of collaborative GHG emissions through voluntary efforts under the guidance of COP, aiming for incentivization and facilitation of GHG emission mitigation, GHG emission voluntary trading in fulfilling NDCs, and global mitigation efforts.[24] On the third agenda, Article 6.8 underlines the importance of establishing integrated, holistic, and balanced non-market approaches in enabling the capacities of the private sector.[25] The Article promotes mitigation and enhancing participation from public and private sectors in supporting the NDCs fulfillment through incentivization and participation facilitation in supporting the State's efforts for the fulfillment of NDCs.

19 https://www.iwgia.org/images/publications/0560_ASEAN_CC_REDD_AND_IPs.pdf
20 https://unfccc.int/process-and-meetings/the-paris-agreement
21 ibid.
22 https://unfccc.int/process/the-paris-agreement/cooperative-implementation#:~:text=Article%206%20of%20the%20Paris,sustainable%20 development%20and%20environmental%20integrity
23 https://unfccc.int/sites/default/files/english_paris_agreement.pdf
24 Ibid.
25 Ibid.

In the subsequent year, 2016, the COP recorded that 193 member states had submitted their first NDC commitments for the period spanning 2015 to 2020.[26] During the first commitment period, Southeast Asian countries actively contributed to shaping their national efforts in achieving the predetermined NDC targets. The initial carbon market implementation was undertaken by Singapore in 2019 when the country established a carbon pricing scheme through carbon taxation. This was followed by various additional initiatives, including the establishment of independent carbon exchange platforms in the subsequent years.[27] In recent developments, the UNFCCC reached an agreement that permits member states to employ a variety of carbon credit mechanisms to achieve their respective NDCs. The accord achieved at Glasgow COP26 has paved a way for countries to explore additional measures at the national level in supporting their NDCs achievement, which includes the empowerment of a carbon market.[28]

26 https://www.un.org/en/climatechange/all-about-ndcs#:~:text=So%20far%2C%20all%20193%20Parties,some%20cases%2C%20insuffici ent% 20political%20commit ment

27 https://www.nccs.gov.sg/singapores-climate-action/mitigation-efforts/carbontax/#:~:text=Singapore%20implemented%20a%20carbon% 20tax, period%20for%20 emitters%20to%20adjust

28 https://dentons.rodyk.com/en/insights/alerts/2022/september/27/carbon-projects-and-asean-opportunities-and-challenges

2. Situational Overview of the Carbon Market in Indonesia

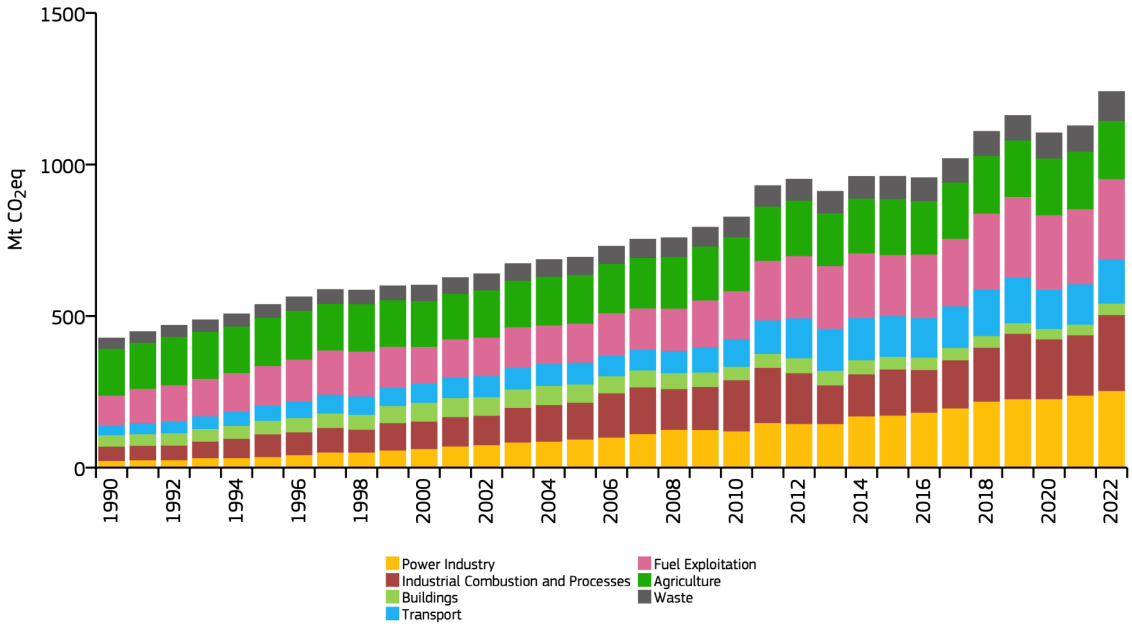
Understanding the role and implications of the carbon market requires us to, first and foremost, explore the current situation and conditions that trigger the establishment of carbon markets in Indonesia. This chapter provides an overview on Indonesia's strategic efforts towards achieving its NDCs, with the pivotal roles and involvement from government agencies such as Financial Services Authority (OJK), Ministry of Energy and Mineral Resources (KESDM) through its ETS trials, Badan Pengelola Dana Lingkungan Hidup (BPDLH), the national registry known as SRN-PPI developed by KLHK, and the newly-established IDXCarbon. Through this situational exploration, this chapter aims to provide insights and understanding of the country's efforts to decarbonization in compliance with the Paris Agreement and NDC.

2.1 Emission Trends and the Path to NDC Implementation in Indonesia

The COVID-19 pandemic led to a 3.7% drop in global emissions in 2020 compared to 2019, halting over a decade of consistent growth. However, the decline was short-lived as global greenhouse gas (GHG) emissions began to rise again after the peak of the pandemic. By 2022, emissions had reached 53.8 Gt CO2eq, a figure 2.3% higher than that of 2019 and 1.4% more than 2021.[29]

Similar to the global situation, Indonesia's emissions also experienced an uptick in the wake of the COVID-19 recovery period. Indonesia's GHG rose to 1.2 Gt CO2eq in 2022, a noticeable increase from the 1.1 Gt CO2eq recorded during the pandemic.[30] Integral to this, in 2022, Indonesia is among the top 6 countries with the highest GHG-emitting country with a total share of 2.31% of the global emissions. This is in comparison to China with a total share of 29.16%, the United States 11.19%, India 7.33%, Russia 4.80%, and Brazil 2.44%.[31]

Figure 2.1 Indonesia Historical GHG Emissions



Source: Emissions Database for Global Atmospheric Research, 2023

29 https://edgar.jrc.ec.europa.eu/report_2023
30 ibid.
31 ibid.

In the face of the looming threats, Indonesia has sought to strengthen its climate ambitions through its latest NDCs, committing to reduce GHG emissions by 31.89% unconditionally (self-effort) or 43.2% conditionally (with international support) by 2030. The enhanced NDC is outlined with an aim to integrate both adaptation and mitigation measures in the development of various sectors, focusing on forestry, energy, and transportation.[32] These ambitions are further projected under Indonesia's vision of deep decarbonization, as outlined in the Long-Term Strategy for Low Carbon and Climate Resilience 2050 (LTS-LCCR 2050), aiming to peak its emissions by 2030 and achieve net-zero emissions by 2060 or even earlier.[33]

In addition, The Government of Indonesia has promulgated Presidential Regulation 98/2021 concerning the Implementation of Carbon Pricing to Achieve the Nationally Determined Contribution Target and Control Over Greenhouse Gas Emissions in the National Development. The Regulation serves as a legal framework to implement NDC towards low carbon and climate resilience. It also prescribes carbon pricing, including arrangements for carbon trading, carbon levies and result based payments.[34]

2.2 Indonesia's Carbon Market: A Developing Landscape

A pivotal aspect of Indonesia's pledges to fulfill their NDCs revolves around the implementation of carbon pricing mechanisms. This initiative was advanced by the Indonesian government in 2021, with key instruments being the Emissions Trading System (ETS) and the Carbon Tax. However, as of October 2023, regulations concerning Carbon Tax have not been implemented, set to be applicable in 2025.

Indonesia has two carbon trading mechanisms, namely compliance-based and a voluntary-based carbon market. The compliance-based carbon market in Indonesia is still in its early stages of development, but has made significant progress in recent months. Launched in February 2023, the power generation sector is the first sector to be covered by the compliance-based carbon market in Indonesia. Whilst, in September 2023, the Financial Services Authority (OJK) officially launched IDXCarbon, a compliance-based carbon market under Indonesian Stock Exchange (PT. Bursa Efek Indonesia).

2.2.1 Compliance Carbon Market in Indonesia

2.2.1.1 Emissions Trading within the Power Sub Sector

Earlier this year, power generation was chosen as the first subsector to implement mandatory carbon trading due to its easily identifiable emissions calculations, based on and strengthened by the Ministry of Energy and Mineral Resources Regulation 16/2022 on Procedures for Implementing Carbon Economic Value in the Power Generation Subsector. The legal foundation supporting the ETS is rooted in a series of regulatory enactments, including the Presidential Regulation No. 98 of 2021 on the Implementation of Carbon Pricing (NEK), two pivotal regulations from KLHK, namely the Regulation No. 21/2022 on the Guidelines for Implementation on Carbon Pricing and Regulation No. 16/2022 on Guidelines for Carbon Pricing Implementation for the Power Generation Sub-sector, and the Law 7/2021 on the Harmonization of Tax Regulations.

The mandatory ETS is implemented in phases in Indonesia. The first phase runs from 2023 to 2024 and only covers coal-fired power plants; whilst, the second phase (runs from 2025 to 2027) and third phase (runs from 2028 to 2030) are expected to include oil and gas-fired power plants and other coal-fired power plants not connected to Perusahaan Listrik Negara (PLN). The first phase of the ETS, as a trial, involved 80 coal power plants (PLTU Batu Bara) with at least 100 MW of generation capacity, in which 59 of these power plants produced more than 75% of CO2 emissions.[35] The trial implemented a 'Cap and Trade' mechanism

32 https://unfccc.int/sites/default/files/NDC/2022-09/23.09.2022_Enhanced%20NDC%20Indonesia.pdf
33 https://unfccc.int/sites/default/files/NDC/2022-09/23.09.2022_Enhanced%20NDC%20Indonesia.pdf
34 Indonesia's Enhanced NDC.
35 https://gatrik.esdm.go.id/assets/uploads/download_index/files/b334f-bahan-ditjen-ketenagalistrikan.pdf

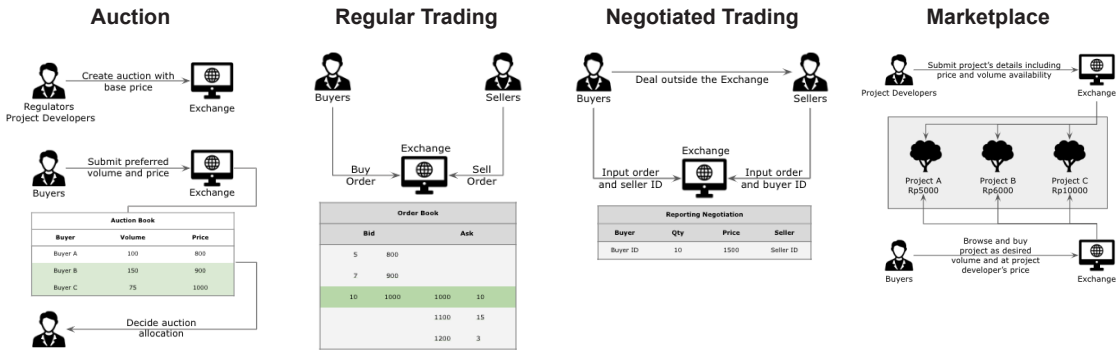
and succeeded in prompting 28 carbon transactions with 42,455.42 tonnes of CO2 emissions, at an average carbon price of US$ 2/ton CO2. The carbon offset trading succeeded in gathering 4,500 tonnes of CO2 emissions from international offsets credit, equivalent to €3/ton CO2, and 22,248.1 tonnes of CO2 from the Emission Reduction Certificate/*Sertifikat Penurunan Emisi,* equivalent to Rp 4,000/ton CO2.[36]

2.2.1.2 Carbon Exchange through IDXCarbon

Carbon trading in Indonesia has so far been implemented in private manner and/or between coal-fired power generation companies. It was not until recently, in September 2023, that the Indonesian Stock Exchange (PT. Bursa Efek Indonesia), IDXCarbon, was launched. During the launch, 16 companies participated in IDXCarbon with half of the buyers being banking institutions, and as of October 12, 2023, IDXCarbon has recorded transactions of 459.970 ton CO2 equivalent, which is significantly higher than Malaysia's Carbon Exchange performance of 166.500 ton CO2 equivalent transaction from its establishment in March 2023 until October 2023.[37]

Grounded in a robust legal framework, IDXCarbon derives its mandate from the Law No 4 of 2023 on Financial Sector Development and Reinforcement, OJK Regulation No.14/2023 on Carbon Trading through Carbon Exchange, and Circular Letter OJK No 12/04/2023 on Procedures for Carbon Exchange, which in accordance to that, IDXCarbon provides 4 (four) trading mechanisms, namely Auction, Regular Trading, Negotiated Trading, and Marketplace.

Figure 2.2.1.2 Four Available Trading Mechanism on IDXCarbon



Source: IDX Carbon

Through the platform, IDXCarbon offers a comprehensive mechanism to carbon trading. The first mechanism is auction. Similar to the general mechanism of auction, prospective buyers engage in this auction by submitting purchase requests, detailing both the volume they seek and the price they are willing to offer. Through Regulators/Project Developers, the bidded carbon units are then offered to the highest bidders. The second mechanism, regular trading, operates via a continuous auction framework where all parties, at any given time, can submit their buy-and-sell offers. The third mechanism, negotiated trading, is offered by the IDXCarbon for trades that have been pre-negotiated outside the system. The fourth mechanism, marketplace, is a dedicated space where Emission Mitigation Project Owners can offer their carbon units at a predetermined price, granting them greater control over their sales strategy.

The existence of a carbon market provides an opportunity for companies to raise finance through carbon trading within the market. To support this, IDXCarbon has developed their own requirements for company participation into the market.

36 Ibid.

37 Sosialisasi Perdagangan Karbon Melalui IDXCarbon (October 13,2023)

Table 2.2.1.2 Requirements & Procedures to Become a User of IDXCarbon

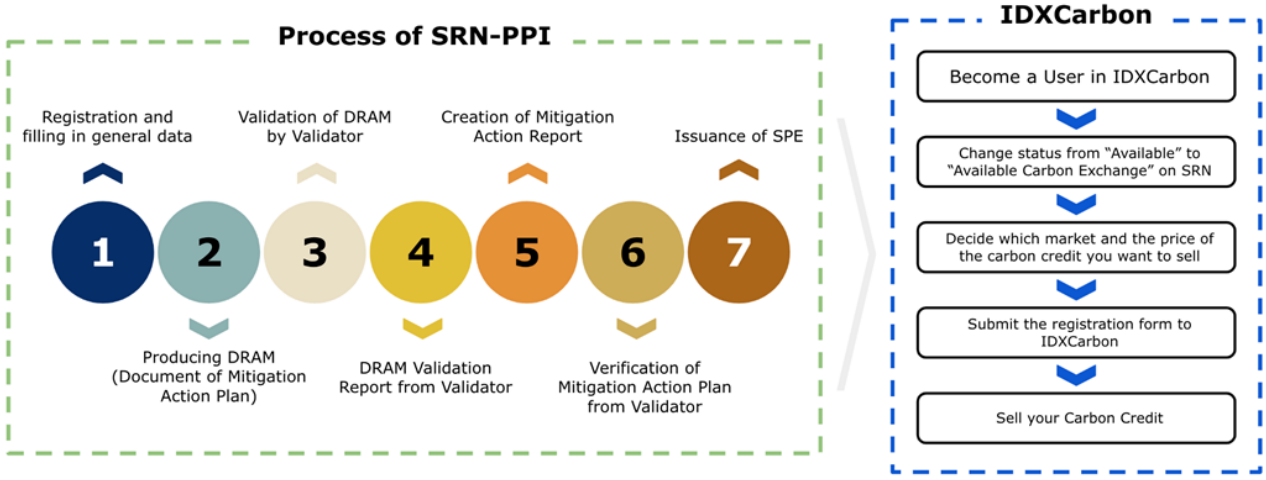
Elements	Details
Requirement	Company registration: The company must be legally registered in Indonesia and have a valid business license. The company must have a Taxpayer Identification Number (NPWP) and a Business Registration Number (NIB). The company must provide a copy of its Articles of Association and/or Bylaws. The company must provide a copy of its Company Establishment Deed and any Company Name Change Deed (if applicable).
	Financial requirements: The company must submit its Financial Reports for the Last 1 Year of the Latest Accounting Books. The company must have a bank account in Indonesia (connected to BI-FAST and BI-RTGS systems) that will be used for transactions on IDX Carbon.
	User Registration: The company must appoint two user users of the Carbon Market Service who will represent the company on the platform. The appointed user users must complete training related to the Carbon Market organized by PBK (training schedule will be provided after the applicant fills out the registration request through the link https://bit.ly/DaftarIDXCarbon). The appointed user users must have an email address using the Company's domain name. Pay the registration fee as a Carbon Exchange Service User (Free until September 2024)
	Supporting documents: The company must provide a duly stamped and signed Statement Letter from the Prospective IDXCarbon Service User. The appointed user must provide a copy of a valid identification card, a color passport photo, and an Employee Certification of the Carbon Market Service User. The company must submit a completed User Registration Form for the Carbon Market Service.
	Supporting documents for foreigners (to be implemented in the future): The appointed users must provide a Legal Entity Identifier (LEI).
Procedure	Submit applications by filling in the form and another attachment needed. IDXCarbon may request additional documents IDXCarbon may ask prospective Users to open a securities account at the Securities Exchange Member No later than the 5th trading day after the entire review process is completed, IDXCarbon will give confirmation (approval or rejection) to prospective Carbon Exchange Service Users.

Source: IDXCarbon

Following the table presented, it is evident that the registration process for companies intending to participate in the IDXCarbon market is comprehensive and detailed, aimed to ensure that only legitimate entities with serious commitments are given access to the platform. The requirements, ranging from company registration to financial prerequisites and user representatives registration, emphasize both the transparency and professionalism expected from participating businesses. Nevertheless, it is also crucial to note that, as of present, only **Indonesian Legal Entities are eligible** to become users of the Carbon Market Service (IDXCarbon). Provisions for foreign companies may be introduced in the future, but the current prerequisites underscore IDXCarbon's current focus on enhancing the domestic market.

Consequent to the requirements of joining IDXCarbon market, IDXCarbon also requires prospective projects to be registered under SRN-PPI.

Source: IDXCarbon



To sell carbon units on the Indonesian carbon exchange, it is mandatory to be registered with SRN-PPI, where sellers are awarded a certificate known as SPE-GRK. To achieve this, potential sellers must commence with registration at the SRN-PPI, which is overseen by the MoEF. Following registration, a document termed DRAM needs to be created. This document subsequently undergoes validation by an appointed validator. Once validated, the DRAM serves as a directive for reporting to the SRN-PPI, where further validation is undertaken. Additionally, sellers are required to compile and submit a report detailing mitigation actions executed, based on all the projects registered with SRN-PPI. This report is subject to another verification process, after which a SPE-GRK is issued, only then can the units be traded on the IDXCarbon. It is crucial to note that both the validation and verification procedures are conducted external to the Carbon Exchange and are managed by the MoEF via the SRN-PPI.

2.2.2 Voluntary Carbon Market in Indonesia

Prior to the ETS and carbon tax, Indonesia has been familiar with the Voluntary Carbon Market (VCM). In essence, VCMs is a type of carbon market in which organizations voluntarily purchase credits from projects that (i) prevent CO2 emissions, (ii) help reduce emissions, or (iii) permanently remove emissions from the atmosphere to offset some or all of their own carbon emissions. Standard setters verify these projects using different methods before issuing carbon offset credits as the issued products.[38] There are already multiple active and registered Nature-Based Solutions (NBS) and Renewable Energy (RE) projects that function under the Voluntary Carbon Market (VCM) model's offsetting mechanism. The following serve as examples of the realization of the Voluntary Carbon Market.

38 https://www.iosco.org/library/pubdocs/pdf/IOSCOPD740.pdf

1. Katingan Mentaya Project

Katingan Mentaya Project by PT Rimba Makmur Utama comprises a restoration and acacia plantation project spanning 157,875 hectares in Central Kalimantan and is one of the VCM pioneers, established since 2010.[39] The project has succeeded in producing 7.5 million certified carbon credits each year[40] by providing carbon conversion and GHG emission reduction reserves for more than 447 million tonnes of CO2 over 60 years, benefiting companies across Indonesia.[41]

2. Pertamina Geothermal

PT. Pertamina Geothermal Energy (PGE) Tbk, a subsidiary of Indonesian state-owned oil and gas company Pertamina, is actively participating in the carbon trading market. PGE currently oversees 15 work areas with a combined geothermal capacity of 1,877 MW (including Joint Operation Contract - JOC), potentially reducing carbon emissions by approximately 9.7 mtCO2e/year.[42] Under the 15 work areas, 7 of them are PGE Carbon Credit Projects, which encompasses not only CDM but also VCS and the Gold Standard.[43]

The company has successfully earned a substantial sum of revenue through carbon credits, amounting to US $747,000 or approximately IDR 11.18 billion.[44] The income derived from carbon credits can be attributed to two geothermal power plants, namely PLTP Ulubelu Units 3 and 4, as well as PLTP Karaha Unit 1. These power plants have collectively contributed to the reduction of approximately 1.7 million tons of carbon emissions.[45] This substantial reduction spans from the moment these power plants commenced commercial operations up until the early months of 2020.

3. ICDX Indonesian Carbon Market Platform[46]

The ICDX Group, a commodity exchange center, has launched a trading platform for carbon that participates on the Indonesian carbon market which uses MetaTrader5, the most used platform used by global traders, and the Cerebro ECN Matching Engine that incorporates over 100 instruments in the Matching Engine with the market depth of up to 10 levels to create an equitable market.[47] In translating the emissions to a certificate, ICDX utilizes the Electronic Warehouse Receipt Trading,[48] a web-based software system that will dematerialize physical commodities into an electronic proof of ownership and integrate the commodity on the Exchange.

4. Other notable efforts:

The Clean Development Mechanism (CDM) in Indonesia has completed 215 projects, of which 37 of the projects have acquired a Certified Emission Reduction (CER) that have reduced 10.1 million tonnes CO2 emissions. In addition, the Joint Credit Mechanism (JCM) has reduced 329.5 thousand tonnes of CO2 through 106 projects in Indonesia.[49]

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39 https://mediaindonesia.com/nusantara/493553/rmu-kelola-katingan-mentaya-project-untuk-turunkan-emisi-karbon
40 https://katinganmentaya.com
41 https://katinganmentaya.com/impacts/1/climate
42 https://www.pge.pertamina.com/id/siaran-pers/kantongi-sertifikat-carbon-credit-pge-dukung-net-zero-emission-hingga-2-6-juta-ton-co2-e-tahun
43 ibid.
44 https://www.kompas.id/baca/ekonomi/2023/04/01/pertamina-geothermal-dapatkan-rp-11-miliar-dari-karbon-kredit#:~:text=JAKARTA%2C%20KOMPAS%20%E2%80%94%20PT%20Pertamina%20Geothermal,30%2F3%2F2023).
45 ibid.
46 https://www.icdx.co.id/our-market/carbon
47 https://www.icdx.co.id/our-technology/our-trading-platform
48 Ibid.
49 https://cdn1.katadata.co.id/media/filespdf/2022/Indonesia_Carbon_Trading_Handbook.pdf

2.2.3 Carbon Market Registration

***1. Sistem Registri Nasional Pengendalian Perubahan Iklim* (SRN-PPI)**

SRN-PPI emerged as there is a need for integrated data to monitor and strengthen Indonesia's effort in achieving its NDC. The Directorate General of Climate Change Control (DJPPI) emphasized that Indonesia's NDC can only be realized through comprehensive and integrated planning, execution, and management by all stakeholders.[50] The National Registry System will streamline data management for climate change adaptation and mitigation actions and resources in Indonesia, addressing issues of data accuracy, redundancy, and inconsistency. The Presidential Regulation 98/2021 provided an avenue for the establishment of the National Registry System for Climate Change/Sistem Registry Nasional Pengendalian Perubahan Iklim (SRN-PPI). The system also represents government recognition for contributions to climate change control in Indonesia. Therefore, all business actors must record and report Climate Change Mitigation Actions, Climate Change Adaptation Actions, NEK Implementation, and Climate Change Resources on the SRN-PPI to fulfill the NDC targets.[51]

The Ministry of Environment and Forestry, business actors, and verification institutions are the stakeholders in SRN-PPI. The government representative responsible for the system's operation is the Ministry of Environment and Forestry through its designated national vocal point, the DJPPI. On the other hand, business actors are the stakeholder on the participant side. Businesses with a climate change control plan or projects have to register in SRN-PPI. It is also a way for them to gain government recognition. Lastly, verification institutions is an independent party responsible for verifying the registered plan or projects in SRN-PPI. Verification institutions recognized as verificator are listed in the system which is open for the public.[52]

The SRN-PPI's current activities are serving as the gatekeeper for data collection, registration, and a list of climate mitigation efforts and projects. First, the system functions as a database for data collection and reporting. It manages and measures data on climate mitigation actions, supports and facilitates climate mitigation efforts, as well as monitors and tracks Indonesia's emission reduction commitments. Second, SRN-PPI acts as a registration platform for climate mitigation efforts and activities. Third, the system serves as a recordkeeper of local, sub-national & national climate mitigation efforts. It allows users to independently monitor progress in achieving emission reduction targets in accordance with intended NDC commitments and enables local initiatives to be recognized as part of the national climate action. Fourth, it is a recordkeeper for both BAU players and green project developers. Therefore, it can bridge the supply and demand side in the carbon market.To be registered in the system, participants have to undergo 4 main processes: account registration, activity registration, technical registration, and verification. Having the verification number serves as proof of activities recognized by the government which lead to some incentives. The most recent development is registration to the system becoming a requirement for participation in the Indonesian Carbon Exchange. Hence, already registered projects have an advantage of early and smooth participation in the current-existing Carbon Exchange in Indonesia.[53]

***2. Aplikasi Penghitungan dan Pelaporan Emisi Ketenagalistrikan* (APPLE Gatrik)**

APPLE-GATRIK is an application (Aplikasi Penghitungan dan Pelaporan Emisi Ketenagalistrikan) that allows power generation companies to independently calculate and report their Greenhouse Gas Emissions (GRK) online. It is introduced by the Ministry of Energy and Mineral Resources (Kementerian Energi dan Sumber Daya Mineral or ESDM) in Indonesia, specifically by the Directorate General of Electricity, to streamline the process of measuring and reporting emissions. This application is intended to help power generation companies report their GRK emissions based on established standards and methodologies, aligning with the government's commitment to reduce GRK emissions, as outlined in Indonesia's Enhanced Nationally

50 https://ppid.menlhk.go.id/berita/siaran-pers/4554/indonesia-luncurkan-pedoman-verifikasi-aksi-mitigasi-perubahan-iklim
51 https://srn.menlhk.go.id/index.php?r=tentang%2Fabout-us
52 https://srn.menlhk.go.id/static/srn/PDF/fin_manual_srn_proponent.pdf
53 https://katadata.co.id/rezzaaji/ekonomi-hijau/64e5fc3273553/peserta-bursa-karbon-wajib-daftar-srn-ppi-ini-caranya

Determined Contribution (NDC) under the Paris Agreement, APPLE-GATRIK is expected to facilitate data collection, standardize the inventory methodology, and contribute to achieving emission reduction targets in the power generation sector. It is accessible online through the laporan-emisigatrik.id website.[54]

In February 2023, the Ministry of Energy and Mineral Resources (ESDM) in Indonesia officially launched a carbon trading feature for the energy sector, specifically the subsector of steam power plants (PLTU). This carbon trading initiative involves direct trading mechanisms for 99 PLTU facilities from 42 different companies. According to calculations by the Ministry of ESDM, these 99 power plants have the potential to emit around 20 million tons of CO2e, of which 500,000 tons of CO2e can be traded. The APPLE-Gatrik platform will assist these power plants in reporting their emissions, facilitating carbon trading transactions. Additionally, the ministry is coordinating with the Indonesia Stock Exchange (BEI) to enable carbon trading under the BEI's auspices, and the pricing range for traded emissions is determined by the Ministry of Finance.[55]

The APPLE-Gatrik platform serves as an essential tool for the carbon trading initiative in the energy sector, enabling power plants to report their emissions accurately. The carbon trading process will include the purchase of emissions from plants exceeding their allocated emission limits, known as Persetujuan Teknis Batas Atas Emisi Pelaku Usaha (PTBAE-PU), or the purchase of Greenhouse Gas Emission Reduction Offset Certificates (SPE-GRK). This initiative is part of a phased approach, with three phases for PTBAE implementation, starting in 2023 and extending beyond 2030. The pricing for emissions will be set within a specific range, influenced by international benchmarks.[56]

2.3 Value at Stake

Indonesia, an archipelagic nation located in Southeast Asia, is a nation characterized by its remarkable population and economic growth. As of 2023, the country is home to approximately 279.17 million inhabitants and has an estimated GDP of US$ 1.30 trillion.[57] Indonesia's economy is significantly influenced by its diverse array of natural resources which include oil, gas, coal, minerals, forests, and fisheries. The country has gained international recognition as the world's most prolific exporter of thermal coal and palm oil, in addition to being the second-largest exporter of nickel ore. Moreover, Indonesia possesses the world's largest estimated geothermal resources, indicating a substantial capacity for the development of renewable energy.[58]

Guiding the nation's growth trajectory is the Medium-Term Development Plan (RPJMN) 2020-2024, underscoring several key development priorities consisting of economic, social, infrastructures, and environment pillar. Central to the government's commitment to environmental sustainability, which manifested in its objectives to reduce GHG emissions, safeguarding forests and other natural resources, and endorse sustainable development practices.[59] These strategic measures are intended to ensure the optimal and sustainable utilization of Indonesia's abundant natural resources for the benefit of future generations.

In addition, Indonesia's unique biodiversity, which holds between 75% and 80% of the world's carbon sinks[60] also highlights its significant potential as a prominent player in the global carbon market. In particular, the country is rich with 3.31 million hectares of mangrove forests, which store 20% of the global carbon credits (equivalent to 33 Gt of carbon), the largest peatlands that contain 37% of the global carbon credits (equivalent to 55 Gt), and 125.9 million hectares of rainforests that store 25.18 Gt of carbon.[61] With this astonishing topography, the archipelago country has a concrete foundation for establishing a firm and expansive carbon

54 https://ekonomi.bisnis.com/read/20180828/44/832265/lewat-apple-gatrik-perusahaan-pembangkit-bisa-laporkan-emisi-grk-mandiri
55 https://industri.kontan.co.id/news/kementerian-esdm-resmikan-perdagangan-karbon-pltu-dengan-potensi-500-ribu-ton-co2e
56 https://industri.kontan.co.id/news/kementerian-esdm-resmikan-perdagangan-karbon-pltu-dengan-potensi-500-ribu-ton-co2e
57 World Bank. (2023). Indonesia Data.
58 US Energy Information Administration. (2023). Indonesia Country Analysis Brief.
59 Ministry of National Development Planning of the Republic of Indonesia. (2020). Medium-Term Development Plan (RPJMN) 2020-2024.
60 https://www.cnbcindonesia.com/news/20210505111302-4-243311/luhut-ri-kuasai-hingga-80-cadangan-karbon-dunia
61 ibid.

market, leveraging the green resources owned by Indonesia, which is predicted to contribute up to US$ 150 billion to the national economy.[62] According to the Coordinating Minister for the Economy, carbon credits could be valued at US$5 per tonne of CO2, suggesting that Indonesia stands to generate approximately IDR 8,000 trillion in revenue.[63] Meanwhile, a differing projection from the Coordinating Ministry for Maritime and Investment Affairs estimates the potential revenue to be closer to IDR 3,000 trillion,[64] indicating some variance in these economic forecasts. Regardless of these varying projections, the potential revenue from the carbon market is undeniably substantial, making it a significant sector for Indonesia's economic development goals.

2.4 Problem Identification and Challenges

The Indonesian government has set its sights on ambitious targets: reducing greenhouse gas emissions by over 30% by 2030 and achieving net-zero emissions by 2060.[65] A key aspect of their plan is the establishment of a carbon market in Indonesia. However, there are several obstacles that must be overcome for the Indonesian carbon market to go into full gear. Thus, the government is taking proactive measures to tackle these challenges head-on. In 2021, the government issued a presidential regulation that sets out the framework for the Indonesian carbon market. Currently, the government remains to work continuously to develop a carbon trading system and to provide more support mechanisms for businesses.

A thriving carbon market is important for Indonesia's vision to reduce greenhouse gas emissions and reach their climate objectives. To galvanize businesses and effectively reach these goals, the government must tackle the challenges outlined below, which could hinder the development of the carbon market as an attractive new frontier for businesses and serve as speed bumps for Indonesia in achieving its climate goals.

2.4.1. Systemic Challenges

- **Missing Carbon Trading Roadmap**

  Carbon trading in Indonesia is based on the Carbon Trading Road Map as regulated in Article 4 of the Minister of Environment and Forestry Regulation No. 21 of 2022 concerning the Implementation of the Implementation of Carbon Economic Value (NEK). Article 6 of the regulation specifies The Carbon Trading Road Map as a guide for sectors/sub sectors that consider the Annual Sector or Subsector GHG Emission Baseline, GHG Inventory, GHG Emission Inventory results in the form of actual emissions in the sub sector or sub sectors, as well as plans and strategies for achieving NDC in the sector or subsectors and strategies Domestic and foreign emission trading. However, as of October 2023, the Carbon Trading Roadmap is still not available to the public.

- **The Initial Concept of the Carbon Exchange Roadmap Provides Minimum Details of The Industrial Point of View**

  The initial concept of the Road Map for the Development of Carbon Exchanges focuses on facilitating coordination across Ministries/Institutions, compiling and issuing RPOJK Carbon Trading through Carbon Exchanges, granting permits, registering and trading in primary and secondary markets, as well as conducting socialization and education for market players and stakeholders. However, it falls short in providing opportunities for stakeholders to voice their aspirations, hopes, and knowledge. Furthermore, the benchmarking process has not yielded final results or lessons learned, and there is a noticeable absence of academic papers or white papers related to the development or implementation of carbon markets in Indonesia.

62 https://www.icdx.co.id/news-detail/corporate-news/perdagangan-multilateral-naik-1-991-dalam-dua-tahun-berikut-rencana-icdx-tahun-ini

63 Press Release of the Coordinating Minister for the Economy, 14 March 2022, https://www.kompas.id/baca/opini/2023/07/21/menanti-kehadiran- bursa-karbon

64 https://www.cnbcindonesia.com/news/20230926181855-4-475759/anak-buah-luhut-ungkap-potensi-dagang-karbon-lebih-rp3000-t

65 https://www.worldbank.org/en/country/indonesia/publication/indonesia-country-climate-and-development-report

While the initial draft Roadmap to Carbon Markets offers a broad direction for the development of Indonesia's carbon markets, it lacks the specific details necessary for successful implementation. The absence of concrete actionable steps in this preliminary concept renders the roadmap overly normative and not particularly useful for stakeholders seeking practical guidance on how to translate goals into tangible actions. This lack of detailed guidance, key achievement indicators, clear accountabilities, and resource allocation mechanisms diminishes the effectiveness of the roadmap and creates uncertainty among stakeholders regarding the timing and nature of their next steps.

- **Ministries/Institutions Collaboration to Improve Carbon Exchange Trial Efforts, especially KESDM and KBUMN**

  In 2023, OJK signed a Memorandum of Understanding (MoU) with the Ministry of Environment and Forestry to collaborate on the establishment of a Carbon Exchange. The MoU encompasses capacity building, policy harmonization, and data provision and exchange. However, there is currently a lack of synergy between key Ministries and Institutions responsible for shaping energy and State-Owned Enterprises (BUMN) policies, leading to a siloed approach.

  For instance, in 2021, the Ministry of Energy and Mineral Resources (KESDM) successfully conducted trials for a carbon power plant market, achieving measurable transaction results. On another front, the Ministry of State-Owned Enterprises (KBUMN) initiated a voluntary carbon market (VCM) and fostered discussions among SOEs regarding the carbon market's future in Indonesia. Despite progress, BUMN participation remains a challenge. To address this, OJK should expand cooperation among relevant ministries and agencies, including ESDM and BUMN, to enhance the trial efforts.

- **Insufficient Collaboration between the Public and Private Sectors**

  Another significant challenge revolves around the insufficiency of collaboration between the public and private sectors within the Indonesian carbon market. While the government has assumed a prominent role in shaping the market's development, businesses and other stakeholders would also need to be more involved in the development of carbon trading in Indonesia, as effective collaboration stands as a vital requirement to ensure that the carbon market's design aligns with the expectations and necessities of all involved parties. Currently, there remains a gap between government and non-government stakeholders in the carbon market, as there has been minimal involvement of non-government stakeholders shaping the market. This has resulted in businesses to be in a state of confusion regarding the mechanisms of the carbon market. An inclusive approach that actively engages both the public and private sectors has the potential to result in a carbon market better equipped to fulfill its environmental and economic objectives, all while addressing the distinctive needs of each stakeholder within an Indonesian context.

2.4.2. Infrastructure Challenges

- **Innovation gap**

  OJK has presented the POJK Draft Framework which contains General Provisions, Requirements for Carbon Trading Through Carbon Exchanges, Shareholders, Members of the Board of Directors and Members of the Board of Commissioners, Supervision of Carbon Exchanges, Requirements and Procedures for Licensing of Carbon Exchange Operators, Amendments to Regulations and Articles of Association of Carbon Exchange Organizers, Carbon Exchange Organizer Report and Sanctions Provisions.

  However, we identified several innovation gaps in the composition of the RPOJK Components. First, there is no explanation regarding the Monitoring, Reporting and Verification (MRV) process. The absence of

a well-defined MRV mechanism raises concerns about the effectiveness of the protocol in maintaining market security and credibility and increasing international investment. Second, there is no explanation regarding the involvement of the International Expert Panel/ Advisory Panel which can strengthen the competitiveness and credibility of the Indonesian Carbon Exchange. Third, there are no clauses that cover disclosure towards compliance with international standards (eg Verra and The Gold Standard)

- **Industry recognition through carbon exchange and green taxonomy**
  According to IBC analysis, there are 15 companies that are registered through Verra. Verra is positioned as one of the world's leading standard and certification organizations for green projects. Public backlash based on different levels of understanding of what is considered "greenwashing" may discourage companies from pursuing meaningful forms of accountability or green projects. These differing viewpoints can lead to public backlash and raise concerns about the authenticity of companies' commitment to green projects in the carbon market. Moreover, Indonesia's rich tradition of acknowledging contributions and achievements does not currently encompass an established framework for recognizing and awarding entities actively engaged in the Carbon Market. This absence of formal recognition can deter companies from pursuing genuine accountability or participating as champions of the Carbon Market, thus limiting its growth and impact.

- **Access to knowledge and education regarding the carbon market**
  President Joko Widodo, during the launch of the first Indonesian carbon exchange in September of this year, stated that Indonesia has approximately 1 gigaton of potential carbon credits. This potential could result in the recently-launched Indonesia Carbon Exchange (IDX) Carbon reaching 3,000 trillion Rupiah ($194 billion).[66] However, the Indonesian Ministry of Environment and Forestry has released their estimation, suggesting that the carbon trading potential will only reach 350 trillion Rupiah ($25 billion) between 2022 and 2026.[67] This poses a striking difference of up to 88% between the two sets of data. The data inconsistency can also be found not only on the domestic level, but is further exacerbated from the transboundary capacity. The World Bank's Country, Climate, and Development Report on Indonesia 2023 depicts the hypothetical net gain can be achieved by the country from emission reduction efforts through tax can hit $16.19 billion in 2018-2030.[68]

  The discrepancy in government-released data has a significant impact on public perception, particularly among those with limited knowledge of the carbon market. This underscores the critical need for synchronized government communication to help the public better understand the carbon market ecosystem. Presently, a substantial awareness gap exists, with limited understanding of carbon trading mechanisms, potential benefits, and environmental significance among individuals and businesses. This knowledge gap presents a major hurdle when it comes to effectively involving a large range of stakeholders. Moreover, the lack of a universally accepted industry model or standardized framework only adds to the complexity and uncertainty of how the carbon market operates. Last but not least, restricted access to a complete, regularly updated, and transparent information further obstructs stakeholders from properly evaluating potential risks and opportunities, ultimately hindering the advancement and efficiency of Indonesia's carbon market.

66 https://jakartaglobe.id/business/indonesias-carbon-exchange-holds-rp-3000t-potential-jokowi

67 https://www.thejakartapost.com/academia/2021/08/14/maximizing-our-massive-carbon-trading-potential.html#:~:text=In%20the%20calculation%20of%20the, area%20of%20forests%20in%20Indonesia.

68 World Bank's Country, Climate, and Development Report 2023: Indonesia

- **Lack of facilitation for industry participation within the market**
  The current regulation requires that the international selling of carbon credits requires approval from the government. Interestingly, some companies choose to employ intermediaries to facilitate these deals on a global scale. However, this creates obstacles for industries attempting to navigate the complex process, as there is limited access and a shortage of experts in corporate carbon accounting and verification, and an underdeveloped carbon marketplace that hinders connections between sellers and buyers. Overall, this highlights the urgent need for a more efficient and accessible means of conducting international carbon credit transactions, ultimately bridging the gap between sellers and potential buyers. If these challenges are left unaddressed, Indonesia may struggle to fully capitalize on carbon trading, thus limiting its ability to leverage the advantageous environmental and economic rewards tied to carbon credit markets.

- **Inadequacy of the SRN-PPI as the primary integrated national registry for carbon**
  There are several challenges associated with the SRN-PPI registration process, notably its complexity and the resulting administrative burden placed on potential participants. The SRN-PPI website currently doesn't have a user-friendly interface, resulting in a less than satisfactory user-friendly platform that hinders effective navigation and access to important information and features. These challenges not only impact the website, but also have a significant impact on other crucial aspects of the carbon market, making it even more difficult for stakeholders to seamlessly participate. Additionally, the lack of dedicated customer services only adds to these difficulties, leaving stakeholders without the necessary support and guidance. These collective obstacles within the SRN-PPI framework lead to inefficiencies and hinder accessibility, impeding the development and effectiveness of the carbon market in Indonesia. Addressing these issues is crucial to foster a more accommodating environment for carbon trading while acknowledging the need for improvement.

- **Insufficient Incentives for Industry**
  Another notable challenge facing the Indonesian carbon market is the insufficient incentives for businesses to draw their participation. While the current carbon pricing system and results-based payment system may inform the public of good practices, they fail to offer adequate financial incentives for companies to actively reduce emissions. The current incentives lack holistic support, such as guidance, additional resources, or direct financial aid. The limited support available for businesses to reduce their emissions presents a major obstacle to their full participation in environmental efforts. The inadequacy of incentives can discourage businesses from adopting emission reduction strategies, as they may face financial obstacles and find the lack of necessary resources being accommodated to facilitate this important shift unmotivating for them to push through with more sustainable and environmentally-friendly practices.

3. Selected Benchmarks and Best Practices

Since the first NDCs, Indonesia has displayed its commitment to bolstering a carbon-neutral ecosystem through extensive climate mitigation and adaptation strategies, including the establishment of a carbon market. The commitment is exemplified by the creation of SRN PPI, a carbon registry powered by the Ministry of Environment and Forestry (MOEF), and the launch of IDX Carbon. These two evidences highlight the national commitment to foster a robust synergy of carbon market that is competitive, adept, and sustainable. This chapter aims to provide a benchmark analysis through the selected best practices delved, serving key takeaways and adaptable lessons for Indonesia. By benchmarking countries with renowned Compliance carbon markets and two Voluntary carbon markets, this White Paper aims to provide valuable insights and best practices. In this section, the European Union is selected because of the longstanding history of the European Union Emission Trading System (EU ETS) that began in 1997. In the Southeast Asian region, Singapore is ahead in establishing its carbon market ecosystem through tax schemes and incentivization. India is selected as a benchmark with a similar capacity to Indonesia, especially in terms of its current progress of carbon market planning and composition. Other carbon market instruments can be found in the Regional Greenhouse Gas Initiative (RGGI) of several northeastern states in the United States. The RGGI's state-to-state coordination system could help Indonesia to accelerate its market development among its provinces.

Furthermore, this section serves as a valuable resource, offering insights into four prominent global carbon credit certification standards. This information is instrumental in strengthening the SRN PPI within its aspects of national accreditation and certification framework. In addition, the best practices learned can serve as insights for the current standard to curate its own long-term strategy and playbook that can facilitate the relevant industries comprehension on the indicators making the carbon market successful in the benchmarked countries.

Compliance Carbon Market (CCM)

Functioning according to emission cap allowances, the selected CCMs pose distinctive market models and features. These encompass industry-centric incentivization schemes and complementary tools designed to foster and perpetuate active industry involvement. The overarching objective is to provide valuable evident-driven insights and embrace the best practices in the context of improving the existing carbon market framework.

3.1 European Union (EU)

3.1.1 History and Landscape

In 1996, the European Community introduced the European's first long-term goal of limiting global temperatures to be below 2°C compared to pre-industrial levels. This coined idea advanced the environmental determination of the EU Ministers to form a "burden sharing" agreement in early 1997, proposing for the (then) 15 EU member states to form National Allocation Plans (NAPs) in deciding their GHG emission allocation respectively.[69] Dated from the initiative begun, several challenges emerged due to the lack of policy instruments that would later cause incompatible system managing states with different capacities. Responding to this matter, the European Commission launched the EU Emission trading System (EU ETS) as a solution with capability to coordinate and integrate policies and measures in key economic sectors EU-wide.[70]

69 http://climatepolicyinfohub.eu/overview-climate-targets-europe

70 https://climatepolicyinfohub.eu/eu-emissions-trading-system-introduction.html

Aside from a sizable group of participants, this urgency also serves as a way to accelerate the EU's ambition in establishing the largest carbon market system in the world. As the European Commission formed a gradual timeline, the first three years of implementation (2005 to 2007) was treated as a "trial" period with the goal of introducing and developing the infrastructure's blueprint for the next period.[71] During this trial period, the EU ETS was not designed with the goal of achieving emission reduction targets. Instead, it was established as a preparatory phase and a forerunner for both the system itself and the participating member states.

3.1.2 European Union Emission Trading System

EU *Emissions Trading System* (EU ETS) serves as the main 'tool' to drive the commitment to reduce pan-European GHG emissions,[72] covering 45% of EU-wide GHG emissions in energy extensive sectors,[73] as pursuant to its overarching NDC commitment of achieving 55% reduction below 1990 levels by 2030.[74] It aims to achieve this through the gradual implementation of phases, ensuring an incremental decrease in overall GHG emissions per phase.[75] The current phase that is currently up and running which extends from the trading period of 2021 until 2030 aims to build an ecosystem of climate neutrality by 2050, envisioning this through an overall and compounded learning of its previous phases; namely resulting in the new implementation of market stability reserves, funding low carbon innovation and energy sector modernization.[76] The EU ETS establishes a ceiling on the total volume of greenhouse gasses that controlled enterprises can emit. This limit is separated into European Union Emission Allowances, which confer upon holders the authorization to emit greenhouse gasses equivalent to a metric ton of CO2-eq. Within the framework of the EU ETS, facilities and airlines must yearly relinquish allowances to offset their emissions. The EU Registry, responsible for recording EU Allowance proprietors, efficiently upholds the rules by identifying and penalizing entities that do not adhere to the regulations.[77]

3.1.3 Incentivization Schemes

1. **Social Climate Fund**
   Released by the European Commission to provide financial assistance to vulnerable households impacted by EU ETS pricing, in the form of direct income support and to assist the emission reduction investment in the road transport and building sectors.[78] The development of a Social Climate Fund would provide immediate incentives to micro-enterprises and vulnerable households that will assist them to sustain in the ETS ecosystem. The fund is obtained from allowances auctioned from the ETS cap on the road transport and building sectors that would progressively decline, resulting in excess of GHG emissions that can be auctioned to other stakeholders in need of purchasing more allowances.[79]

2. **Innovation Fund**
   The Innovation Fund provides funding and grants which can support the industry to develop low-carbon technologies and initiatives. The fund is obtained from ETS revenues and intended to create a sustainable approach in transitioning the EU industry toward a green business ecosystem. Proposals are encouraged to be generated by Proponents, supported by the active involvement of the Innovation Fund Expert Group and the Project Development Assistance (PDA).[80]

71 Denny Ellerman & Paul L. Joskow, *The European Union's Emission Trading System in Perspective,* Massachusetts Institute of Technology (2008).
72 https://climate.ec.europa.eu/system/files/2016-12/factsheet_ets_en.pdf; European Commission. Special Eurobarometer; Technical Report 459; European Commission: Luxembourg, 2017.
73 https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets_en
74 https://climate.ec.europa.eu/eu-action/european-green-deal/2030-climate-target-plan_en#:~:text=With%20the%202030%20Climate%20Target,40%25EN•••.
75 https://climate.ec.europa.eu/system/files/2017-03/ets_handbook_en.pdf
76 https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/revision-phase-4-2021-2030_en
77 https://mdpi-res.com/sustainability/sustainability-15-06394/article_deploy/sustainability-15-06394-v2.pdf?version=1681704354
78 https://climate.ec.europa.eu/eu-action/european-green-deal/delivering-european-green-deal/social-climate-fund_en
79 Ibid.
80 https://climate.ec.europa.eu/eu-action/funding-climate-action/innovation-fund_en

3. **Free Allocation Incentivization**

From 2013, European industry manufacturers have received 80% of free carbon allowances and the allowance proportion given would be decreased gradually on a yearly basis. The EU has targeted to decrease the free carbon allowances distribution by 30% in 2020, with the expectation that the participating industry players have transitioned and adjusted their emission reduction schemes accordingly.[81] The most efficient industry installation would be eligible to be listed on the Free Allocation program and get their emission allowances covered, which refers to a product that is eligible to be referred to as a benchmark will have to produce the best performing 10% of the average of GHG emissions produced.[82]

If an industry player does not meet the criteria and wants to receive the Free Allocation benefits, they have three options to be qualified: reducing their carbon emissions, purchasing additional allowances/credits to cover the emissions, or combining the two options.[83] This incentivization scheme has provided a beneficial proposition, favoring the industry's prospect of participating in the ETS market, shown by the registered 54 benchmarks listed on the Free Allocation initiative with extensive technical works and multi-stakeholder consultations.[84]

3.1.4 Monitoring and Evaluation Tools

1. Carbon Border Adjustment Mechanism (CBAM)

Carbon Border Adjustment Mechanism (CBAM) is introduced as a tool for the EU ETS to maintain the balance of carbon prices from intensive goods imported from outside EU countries.[85] CBAM requires EU importers to report the GHG emissions embedded in their imports, both direct and indirect emissions and buy CBAM Certificates to be declared according to the corresponding GHG emissions embedded. The price to purchase the CBAM certificate will be calculated from the weekly average auction price of EU ETS allowances (€/tonne of CO2 emitted);[86] Hence, once the imported goods enter the EU market, the carbon price would be equivalent to the carbon price in the domestic production.

2. ETS Compliance Cycle

This ETS Compliance Cycle takes place annually through the submission of monitoring and reporting documents by industries operated within the EU ETS ecosystem.[87] As a part of the permit criteria, industry stakeholders are obliged to submit the emission report, containing data from the previous year that has been verified by the National Accreditation Body-Accredited Verifier.[88] Two regulations are set out to provide further entailed mechanisms in EU's Monitoring, Reporting, Accreditation, and Verification (MRAV) protocol:

1. The **Monitoring and Reporting Regulation (MRR)** extends the existing MRAV framework by providing a monitoring system for tracking the GHG emissions produced among EU member states through an EU-wide GHG Inventory system that records 7 types of GHG across sectors, including the energy, industrial process, waste, agriculture, and land use, land use change and forestry (LULUCF) sectors.[89] The inventory will be updated annually by the European Commission, assisted by the European Environment Agency.[90]
2. The **Accreditation and Verification Regulation (AVR)** provides a transparent, accommodative, and accessible database for the active industry players involved in the carbon market. The European Commission has provided templates that can be filled by business individuals, entailed for the monitoring plans, annual emission reports, verification reports, and improvement reports, complete with the guidance, examples, and tools needed by the stakeholders to utilize in fulfilling their MRV functions through cost-effective application methods.[91]

81 https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/free-allocation/allocation-industrial-installations_en
82 Ibid.
83 Ibid.
84 Ibid.
85 https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en
86 Ibid.
87 https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/monitoring-reporting-and-verification-eu-ets-emissions_en
88 https://climate.ec.europa.eu/system/files/2022-05/quick_guide_verifiers_en.pdf
89 https://www.eumonitor.eu/9353000/1/j4nvk6yhcbpeywk_j9vvik7m1c3gyxp/vjs5ga5aifou#:~:text=This%20regulation%2C%20the%20Monitoring%20Mechanism,and%20rules%20for%20GHG%20emissions.
90 Ibid.
91 https://eur-lex.europa.eu/EN/legal-content/summary/the-new-eu-accreditation-and-verification-regulation.html

3.2 Singapore

3.2.1 History and Landscape

Before implementing a Carbon Tax model, Singapore has resorted to Carbon Capture and Storage (CCS) strategy since 2005, when the national GHG emission hit 40 million tCO2.[92] Several energy-intensive industries aimed to participate in the initial CCS strategy were the refinery, petrochemical, and semiconductor industries. Introduced in 2013, Singapore began its embark on a five-year plan (2013-2018) of prioritizing GHG emissions reduction domestically.[93] The initiative was spearheaded by the National Parks Board (Nparks), a statutory board formed under the Ministry of National Development. In this five-year plan, Singapore sought to establish an emission tracking system for carbon before the country implemented the first nationwide taxing regulation for carbon in 2018.[94]

3.2.2 Singapore's Carbon Tax

Singapore is the first country in Southeast Asia to introduce a carbon tax, which was formally established by the Carbon Pricing Act (CPA) of 2018 (No. 23 of 2018) starting from 1st January 2019.[95] The CPA tax scheme is intended to accelerate Singapore's ambition to achieve net zero emissions by 2050 by amplifying the participation of all industrial facilities in reducing their carbon footprints by an annual GHG emissions of 25,000 tonnes of carbon dioxide equivalent (tCO2e).[96] The tax revenue gathered is utilized to fund decarbonization activities and green economy models in business and household levels.

Furthermore, the CPA aims to progressively increase carbon tax rates by providing an industry transition framework, especially for the Emission-Intensive Trade Exposed (EITE) sectors, and an International Carbon Credits (ICC) framework.[97] With the aim of emitting 60 million tons of GHG emission annually,[98] The gradual taxation is introduced in phases, beginning from 2024 to 2025 with SGD 25/tCO2e and continuing from 2026 onwards with SGD 45/tCO2e.[99] The CPA divides its emission threshold into two, the emission threshold at 2,000tCO2e to be registered as a 'reportable facility' and the emission threshold at 25,000tCO2e to be registered as a 'taxable facility,' requiring the industry to register their threshold by the June 30th prior year through the Emissions Data Monitoring and Analysis (EDMA) system.[100]

3.2.3 Incentivization Schemes

1. **EITE Sector Transitory Allowance**
   The transitional allowance scheme is intended to reduce the EITE industry, such as chemicals, electronics, and biomedical manufacturing sectors, to receive an offset allowance up to 5% from their taxable emissions from 2024.[101] [102] This transitory allowance is implemented to provide flexibility and support for hard-to-abate industry sectors within the EITE category, hence, accommodating the market shift toward decarbonization through incentives.

92 National Climate Change Secretariat and National Research Foundation (2011).
93 https://www.straitstimes.com/singapore/government-to-track-singapores-carbon-emissions
94 https://www.straitstimes.com/singapore/government-to-track-singapores-carbon-emissions
95 https://singaporelegaladvice.com/law-articles/pay-carbon-tax-rate-singapore/#:~:text=In%20sum%2C%20persons%20operating%20bus iness,pay%20carbon%20 tax%20in%20Singapore.
96 https://www.nea.gov.sg/our-services/climate-change-energy-efficiency/climate-change/carbon-tax
97 https://www.globalcompliancenews.com/2023/03/28/https-insightplus-bakermckenzie-com-bm-energy-mining-infrastructure_1-singapore-carbon-pricing- amend ment-act-2022-comes-into-force-on-7-march-2023_03242023/#:~:text=As%20part%20of%20Singapore%27s%20plan,–%20SGD%2025%2FtCO2e%3B%20and
98 https://www.channelnewsasia.com/brandstudio/netzero-singapore
99 https://www.globalcompliancenews.com/2023/03/28/https-insightplus-bakermckenzie-com-bm-energy-mining-infrastructure_1-singapore-carbon-pricing- amend ment-act-2022-comes-into-force-on-7-march-2023_03242023/#:~:text=As%20part%20of%20Singapore%27s%20plan,–%20SGD%2025%2FtCO2e%3B%20and
100 https://www.nea.gov.sg/our-services/climate-change-energy-efficiency/climate-change/carbon-tax
101 https://www.pwc.com/sg/en/tax/singapore-budget-2022/commentary/sg-strengthens-resolve-to-achieve-net-zero.html#:~:text=Examples %20of%20EITE%20sec tors%20include,power%20generation%20and%20waste%20management
102 Ibid.

2. Sustainable Bond Grant

Initiated by the Monetary Authority of Singapore (MAS), the Sustainable Bond grant accommodates offsets up to SGD 125,000 of additional expenses and costs for external reviews in issuing green bonds.[103] The eligible stakeholder would have been certified of its green, social, and sustainability-linked agenda;[104] Hence the Grant would be beneficial for green business players to have streamlined financial activities within the green finance ecosystem.

3. Resource Efficiency Grant for Energy (RGE(E))

Managed by Singapore's Economic Development Board (EDB), RGE(E) incentivizes manufacturing facilities and knowledge centers for energy efficiency and competitiveness, including low-carbon business ventures. The Grant is calculated and determined by the carbon abatement achieved from the project registered and the funding support would extend up to 50% of the qualifying costs.[105]

4. International Carbon Credits (ICCs)

Through its ICC framework, Singapore will allow companies to use high-quality international carbon credits to offset up to 5% of their taxable emissions starting in 2024, which will reduce their carbon tax liabilities and support demand for a carbon market.[106] The framework reveals Singapore's capacity to provide alternative options for companies to fulfill their obligations under the carbon tax regulation through eligible and verified ICCs. However, it is notable that ICC will not be recognized in the VCM.

3.2.4 Monitoring and Evaluation Tools

The Emissions Data Monitoring and Analysis (EDMA) system is a digital platform that is used by the National Environment Agency (NEA) to collect, manage, and analyze greenhouse gas (GHG) emissions data in Singapore. The EDMA system is structured to collect input and activity data from various sources, generate emissions estimates, and facilitate quality control (QC) checks. The data collected through EDMA is used to compile the national GHG inventory and would facilitate the accurate calculation of the carbon tax.

3.3 India

3.3.1 History and Landscape

India, the world's third-largest CO_2 emitter in 2021, trailing only China and the United States,[107] faces unique challenges due to its massive population. Despite its lower per capita emissions, its sheer size results in substantial overall emissions. In response to these challenges, India initiated a pilot Emission Trading System (ETS) in Surat, Gujarat, in 2019, which was also the world's first cap-and-trade market aimed at reducing particulate pollution by 29% from business-as-usual levels.

India's efforts to combat climate change include the implementation of market-based instruments like the Perform, Achieve, and Trade (PAT) scheme, which establishes energy-saving targets for industries and facilitates energy-saving certificate trading, and the Renewable Energy Certificates (RECs) trading scheme, which helps states meet their Renewable Purchase Obligations (RPOs). The government's ambitious plan for the transition from PAT to a comprehensive Emission Trading System (ETS) is divided into three phases, intending to ultimately align with India's National Determined Contributions (NDC) for greenhouse gas emissions reduction, highlighting India's commitment to energy efficiency, renewables, and carbon market exploration.[108]

103 https://www.mas.gov.sg/schemes-and-initiatives/sustainable-bond-grant-scheme
104 https://www.hoganlovells.com/~/media/hogan-lovells/pdf/new-mas-green-bond-grant-scheme.pdf?la=en
105 Economic Development Board (EDB). *Resource Efficiency Grant for Energy.*
106 https://www.nccs.gov.sg/singapores-climate-action/mitigation-efforts/carbontax/
107 https://ourworldindata.org/co2/country/india
108 https://www.ceew.in/sites/default/files/carbon-credit-markets-in-india-prospects-stakeholder-perspectives.pdf

3.3.2 India's Carbon Credit Trading Scheme (CCTS)

Before the introduction of the Carbon Credit Trading Scheme (CCTS) in 2022, India initiated a large-scale pilot Emission Trading System (ETS) in Surat, Gujarat, in 2019. This pioneering ETS was the world's first cap-and-trade market for particulate pollution, aiming to achieve a 29% reduction in emissions compared to business-as-usual levels.[109] The Carbon Credit Trading Scheme (CCTS) is introduced under the Energy Conservation (Amendment) Bill 2022.[110] This domestic emission trading system is designed for the Indian Carbon Market (ICM) and is set to be fully operational by 2026.[111] While specific policy details are still being developed, the 2022 Bill provides a foundational framework to understand how this domestic ETS will work.

Subsequently, the Indian Carbon Market (ICM) will function as a carbon credit trading platform in India and will operate under two mechanisms: a compliance market for the obligated sectors and an offset market for the non-obligated and non-energy sectors.[112] As the focal point, the ICM National Steering Committee is established by the Central Government of India and it comprises key representatives from various ministries. The involved ministries range from the Ministry of Environment, Forest, and Climate Change, the Ministry of Chemical and Fertilizers, the Ministry of Petroleum and Natural Gas, the Coal and Steel ministries, and the Ministry of Finance.[113] Complimentarily, the ICM National Steering Committee also extends to 3P (Public and Private Partnership) in enriching recommendations produced for the Indian carbon market institutionalization, including NITI Aayog, a public policy think tank for the Government, along with the Central Electricity Authority, and Grid Controller of India Limited.[114]

The ICM's Compliance Market will be conducted in two phases beginning from 2023 to 2025 for the First Phase, followed by the Second Phase from 2026 onwards.[115] On the Offset Market, ICM defines non-obligated sectors as the eligible project proponents under the criteria set by the Bureau of Energy Efficiency, based on ICM Steering Committee approval. Proponents can utilize existing methodologies from CDM, Gold Standard, and other voluntary carbon markets to demonstrate emission reduction and generate carbon credits.

3.3.3 Green Credit Program

The Green Credit Programme is a market-based mechanism providing incentives in the form of tradable Green Credits for individuals and various entities.[116] The program objective is to generate more credible green credits as a supplementary element in supporting the supply of carbon credits in the country, bolstered by the participation of individuals. Activities generating these Green Credits may also generate tradable Carbon Credits for the carbon market. Eight types of Green Credits have been established, categorized by the sector or activity involved: Tree Plantation-based, Water-based, Sustainable Agriculture-based, Waste Management-based, Air Pollution Reduction-based, Mangrove Conservation and Restoration-based, Ecomark-based, and Sustainable Building and Infrastructure-based Green Credit.[117]

3.3.4 Monitoring and Evaluation Tools

Modeled after the Perform, Achieve, and Trade (PAT) program,[118] the Ministry of Power drafts ICM's Monitoring, Reporting, and Verification (MRV) that will include verified annual greenhouse gas emission reports and continuously updated data, structured to align with government emission mitigation efforts and

109 https://epic.uchicago.in/wp-content/uploads/2019/10/ETS_INDIA_ResearchSummaryFinal-.pdf
110 https://www.spglobal.com/commodityinsights/en/ci/research-analysis/indias-carbon-credit-trading-scheme-notification-reflects-.html
111 https://www.ceew.in/blogs/how-energy-system-modelling-tools-can-inform-design-of-indian-carbon-emission-trading-scheme
112 Ibid
113 https://beeindia.gov.in/sites/default/files/CCTS.pdf
114 https://beeindia.gov.in/sites/default/files/CCTS.pdf
115 Ibid
116 https://moef.gov.in/wp-content/uploads/2023/06/draft-gcp-notification-inviting-comments-27062023.pdf
117 Ibid
118 https://cer.iitk.ac.in/odf_assets/upload_files/blog/Draft_Carbon_Market_Policy_DocumentFor_Stakeholder_Consultation.pdf

performance.[119] Assessment of the energy consumption will rely on the benchmarks developed by the Bureau of Energy Efficiency, which will be verified by accredited auditors to ensure that monitoring and verification processes align with the latest greenhouse gas emission policies.[120]

3.4 Regional Greenhouse Gas Initiative (United States)

3.4.1 History and Landscape

In 2003, discussions began among nine northeastern U.S. states, including Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont, to create a regional cap-and-trade program addressing power plant carbon emissions. This effort led to the establishment of the Regional Greenhouse Gas Initiative (RGGI), officially announced by seven the states in December 2005 through a Memorandum of Understanding (MOU). This MOU, later joined by Massachusetts, Rhode Island, and Maryland, provided the framework for RGGI, culminating in the release of a Model Rule in 2006. Individual states then developed their CO2 Budget Trading Programs, creating a regional cap-and-market system for carbon allowances.[121]

3.4.2 RGGI Cap and Invest Initiative

RGGI operates as a market-based, cap-and-invest initiative where regulated power plants are required to acquire RGGI CO2 allowances corresponding to their emissions, with one allowance needed for every short ton of CO2 emitted.[122] These allowances are distributed through quarterly auctions, open to all qualified participants, resulting in a single clearing price.[123] Additionally, entities can trade allowances on secondary markets, either directly or through futures contracts on exchanges. Fossil-fueled power plants of 25 megawatts or more must obtain enough RGGI allowances to cover their emissions.

In maintaining market stability, RGGI introduces two strategies to maintain the carbon prices through the Cost Containment Reserve (CCR) and the Emissions Containment Reserve (ECR). These strategies deploy a containment reserve approach. The CCR comprises additional allowances held beyond the emissions cap, to be sold if allowance prices exceed predetermined levels, ensuring emission reduction costs remain manageable.[124] Similarly, the ECR holds back allowances to encourage further emissions reductions if prices fall below a specific trigger price, activating only when emission reduction costs are unexpectedly low.[125] These reserves set thresholds for both allowances and emissions levels to prevent the market from collapsing.

3.4.3 Incentivization Schemes

1. **Auction Mechanism:** In RGGI states, the bulk of CO_2 allowances are distributed through quarterly regional auctions. The revenue generated from these auctions primarily funds consumer benefit programs, such as energy efficiency, renewable energy, and direct energy bill assistance, along with other greenhouse gas reduction initiatives.[126] The auctions are conducted online and open to qualified participants who receive Auction Notices detailing offered allowances and important dates.

119 https://cer.iitk.ac.in/odf_assets/upload_files/blog/Draft_Carbon_Market_Policy_DocumentFor_Stakeholder_Consultation.pdf
120 Ibid
121 https://www.rggi.org/program-overview-and-design/design-archive
122 https://www.rggi.org/sites/default/files/Uploads/Fact%20Sheets/RGGI_101_Factsheet.pdf
123 https://www.rggi.org/program-overview-and-design/elements
124 https://www.rggi.org/program-overview-and-design/elements
125 https://www.rggi.org/program-overview-and-design/elements
126 https://www.rggi.org/auctions/about-auctions

2. **Allowance For CCM**: In the CO_2 Budget Trading Program of each participating RGGI state, power plants with at least one unit serving a generator capacity of 25MW or more, are obligated to hold a quantity of CO_2 allowances equivalent to their carbon dioxide emissions over a three-year control period. These CO_2 allowances symbolize a restricted authorization to emit one ton of CO_2, granted by the respective state authority. To ensure compliance with the program's regulations, each RGGI state's environmental regulatory agency utilizes RGGI COATS for the purpose of comparing a source's emissions covered by the program with the allowances stored in their compliance account.[127]

3. **Allowance For VCM/Offset Projects**: RGGI CO_2 offset allowances represent project-based emissions reductions outside the power generation sector, limited to five designated categories. These offsets acknowledge CO_2-equivalent (CO_2e) emissions reductions and carbon sequestration beyond the capped sector, promoting compliance flexibility and cost-effective emission cuts. These allowances can cover up to 3.3 percent of a regulated power plant's compliance obligation. However, some RGGI states do not issue CO_2 offset allowances, allowing power plants within those states to utilize allowances from other RGGI states.[128]

3.4.4 Monitoring and Evaluation Tools

1. RGGI CO_2 Allowance Tracking System (RGGI COATS)

The RGGI CO_2 Allowance Tracking System (RGGI COATS) serves as the central platform for managing data within each state's CO_2 Budget Trading Program.[129] It plays a crucial role in enabling market participation by facilitating processes such as the allocation, award, and transfer of CO_2 allowances, certification for compliance-related tasks, and registration of offset projects along with the submission of relevant applications and reports. To engage in CO_2 allowance-related activities, all parties must create an RGGI COATS account and obtain an associated account number. Account holders use a username and password for access. Offset project sponsors can also utilize RGGI COATS to register their projects, submit necessary documents, and obtain a project ID code.

2. Independent Market Monitor

RGGI employs an independent market monitor through the Potomac Economics that serves as an expert monitor for the RGGI Allowance Market. Potomac Economics ensures competitive performance and carbon market efficiency,[130] which the participant behavior would be evaluated from RGGI auctions and secondary markets. The independent market monitor will detect any potential anti-competitive actions, participation barriers, and other risks of manipulation by examining auction clearing prices, allowance quantities, and values. Accordingly, Potomac Economics verifies the compliance of auctions conducted to safeguard the market competition, prompt more participation, and maintain public confidence and RGGI integrity.

127 https://www.rggi.org/allowance-tracking/compliance
128 https://www.rggi.org/allowance-tracking/offsets
129 https://www.rggi.org/allowance-tracking/rggi-coats
130 https://www.rggi.org/auctions/market-monitor-reports

Table 3.1 Adaptable Lessons from the Compliance Carbon Market (CCM) Global Benchmarks

Indicator	European Union	Singapore	India*	RGGI (United States)
Industry-Rewarding Incentivization Scheme and Facility	Social Climate Fund, Innovation Fund, and Free Allocation Incentivization	EITE Sector Transitory Allowance, Sustainable Bond Grant, GST Voucher-U-Save Rebate, and Resource Efficiency Grant for Energy	Green Credit Incentivization Programme	RGGI CO2 Allowance Tracking System (RGGI COATS) *State-to-State Coordination*
MRV Protocol/ Facility	ETS Compliance Cycle	Emission Data Monitoring and Analysis (EDMA) system	Perform, Achieve, and Trade (PAT)	Independent Market Monitor

**) India's Carbon Credit Trading Scheme (ICCTS) is still under development*

Voluntary Carbon Market (VCM)

In engaging in voluntary emission trading, entities often maximize multiple market instruments, which may include investments in green bonds and active participation in exchange platforms. This benchmark analysis focuses on two specific VCMs, aiming to extract valuable insights that can be incorporated into the current Government-backed exchange platform (IDXCarbon) and other possible VCM instruments currently under development. The key facets under assessment in this benchmarking process will include the carbon crediting process and the supporting infrastructure integrated within the market.

3.5 Climate Impact X

3.5.1 Background

As a marketplace, auction house, and exchange platform for carbon credits in Singapore, Climate Impact X (CIX) establishes a hub for carbon-related facilities and solutions for both national and global trading.[131] CIX is launched as a part of the Emerging Stronger Taskforce (EST) Alliance for Action (AfA), an industry-led coalition between the Government and 3P sector in Singapore.[132] Initiated by a collaboration between DBS Bank, Singapore Exchange, Standard Chartered, and Temasek, ICX intends to leverage Singapore's financial, legal, and commodities infrastructures in accommodating the national ambition to create a resilient system for the carbon market.[133] To maintain its quality, ICX sets a specific qualification for projects interested to participate in the market. Projects eligible for entering the VCM shall be able to support up to 30% of required mitigation efforts, as encouraged by the Below-2°C of the Natural Climate Solutions Alliance initiative.[134] The credits accepted are verified by global standards, especially Verra and Gold Standard.[135]

131 https://www.climateimpactx.com/about

132 https://www.mti.gov.sg/FutureEconomy/Emerging-Stronger-Taskforce/Industry-Coalition-Groups-Alliances-for-Action

133 https://www.climateimpactx.com/about

134 The Natural Climate Solutions Alliance is a joint intiative, CEO-led convention of the World Economic Forum (WEF) and the World Business Council on Sustainable Development (WBCSD) since 2019.

135 https://www.climateimpactx.com/about

3.5.2 Credits Verification and Issuance Process

In providing guidance on environmental integrity and advocacy for the carbon market, the CIX International Advisory Council (IAC) is established as a diverse panel of experts responsible to ensure market credibility through the comprehensive quality of credit standards verified and endorsed to be globally competitive and acceptable in other registries.[136] The IAC's scope extends to due diligence works on the registered projects, aligns the project impacts to the United Nations Sustainable Development Goals (UN SDGs) indicators, and facilitates learning and insights-sharing among the participating ICX members. By providing guidance on environmental integrity and advocacy, the IAC helps to ensure that the carbon market is a valuable tool for reducing GHG emissions and achieving the UN SDGs.

Additionally, the ICX incorporates independent rating companies to extend the support given to the market participants in assessing the risks of participating projects in the platform.[137] ICX also advances its monitoring system by introducing a tech-based satellite surveillance facility to observe the Natural Climate Solutions (NCS) projects.[138] Aside from the independent rating companies, ICX extends and empowers its collaboration with intermediaries, especially brokers, in streamlining the trading process. ICX publishes a roster of the registered brokers that could facilitate private transactions in VCM, containing the information of the company, Person in Charge (PIC), email address, telephone number, and the company location.[139]

3.5.3 Supporting Facilities

1. Visible Project Portfolios

The ICX website facilitates accessible information and portfolio for buyers to learn about available projects participating as sellers in the marketplace and auctions. The information provided in each section of features embedded in the Website, hence, highlights the knowledge provision contained in the platform.

2. Market Notices

The Market Notices section is located in the Exchange Solution webpage of ICX and it intends to facilitate information on the timely recent and historical notices issued and will be issued to participants if there are updates on the impact development from the trading activities carried out.[140] The notices listed range from system-related updates, changes on the products, and general notifications on the platform, i.e., market closure schedules and procedural amendments

3. Hands-On Engagement and Learning Facility

As the IAC is responsible for endorsing the guidance on responsible use of carbon credits, the ICX is developing a community engagement in amplifying joint-learning and knowledge transfers among the market participants. The facilities provided allow the ICX market participants to be able to access insights from project developers, updated third-party ratings and M&E reports, and responsive in-web assistance buttons.[141] Two of the offered in-web assistance services are a demonstration session and a request for a callback.

136 https://www.climateimpactx.com/the-cix-international-advisory-council
137 https://www.climateimpactx.com/auctions
138 Ibid.
139 https://www.climateimpactx.com/clear
140 https://www.climateimpactx.com/exchange
141 https://www.climateimpactx.com/marketplace

3.6 Carbon Trade Exchange

3.6.1 Background

Carbon Trade Exchange (CTX) is a global digital marketplace that facilitates carbon credits trading established in 2009, currently operating in the United Kingdom and Australia.[142] The CTX primarily serves as a global exchange for high-quality carbon credits by serving as a platform for buyers and sellers from various backgrounds, including companies, NGOs, brokers, banks, and intermediaries. Notably, the CTX recognizes a wide range of global carbon credits, such as the United Nations CDM credits, the Gold Standard, the Verified Carbon Standard, and other mechanisms, including the Verified Emission Reductions (VERs) and CERs.[143] Other than becoming a trade platform, CTX facilitates carbon services, such as carbon offsetting, carbon neutral certification, project development, and carbon footprinting.[144] CTX aims to fund renewable energy initiatives, forest conservation, and community projects.

3.6.2 Credits Verification and Issuance Process

In maintaining the platform credibility, the CTX introduces a comprehensive verification and validation protocol requiring participants to get verified by the Standard Registry and issued in the platform's Approved Registry.[145]

To start trading inside the CTX, a verified member will follow through this process: completing an application at the CTX website, listing credits or certificates for sale or browsing existing listings, uploading cash to a trading account for immediate purchases, and settling trades in real-time with instant cash and credit transfers.[146] In this process, members gain access to the CTX Trading Platform, an online system, through a web interface that can be accessed from any computer or mobile device. To use this platform, members must adhere to specific rules. It's their responsibility to ensure the security of their devices, both physically and in terms of online security.

Once members meet certain requirements outlined in the rules, they will receive an Access Code from Carbon Trade Exchange. This code allows them to access their Trading Account and use the CTX Trading Platform to create Sales Listings and Purchase Orders. Furthermore, members are required to designate a contact person from their list of Authorized Representatives who will act as the main point of contact with Carbon Trade Exchange for administrative matters related to the rules and the platform's operation.[147]

142 https://ctxglobal.com/carbon-trade-exchange-global-re-launch/
143 https://ctxglobal.com/about/
144 https://ctxglobal.com/history-2/
145 https://static.prod.ctxglobal.net/cr-ctx-ae-onboardingdocs/CarbonTradeExchangeRulesV19_05August2022.pdf
146 https://ctxglobal.com/about/
147 https://static.prod.ctxglobal.net/cr-ctx-ae-onboardingdocs/CarbonTradeExchangeRulesV19_05August2022.pdf

3.6.3 Supporting Facilities[148]

Wholesale Rates
Buyers can purchase credits at wholesale rates, providing cost savings compared to open market prices. This offers a financial advantage for the market participants that are looking to invest in environmental credits.

Transparent and Timely Registry
The platform provides transparency in market pricing and compliance with Islamic Banking Principles to ensure that transactions are ethical and financially responsible. The CTX allows the buyers to gain access to timely carbon market data. This facility would provide information to the participants in the decision-making process in environmental investments. Additionally, the availability of project information and documentation via direct links to Registries enhances transparency and accountability in the process.

Global Access
Sellers can reach buyers worldwide without direct interaction, maximizing their potential market.

Revenue Share and Data Access
Sellers receive 95% of proceeds and gain access to valuable carbon market data for informed decision-making.

Table 3.2 Adaptable Lessons from the Voluntary Carbon Market (VCM) Best Practices

Indicator	Climate Impact X	Carbon Trade Exchange
Credits Accreditation	Supported by the International Advisory Council and registered intermediaries for global standardized credits, i.e., Verra and Gold Standard	Facilitates and acknowledges various global standards by establishing registries for each standard
User Support Facilities	Project portfolios, market notices, and a community- oriented learning facility	Wholesale rates, Transparent registry, Global access and exposure, and Revenue-sharing framework

3.7 Selected Global Carbon Credit Certification Standards

In pursuit of enhancing the established SRN PPI and national credit standards, it is essential to conform a comprehensive understanding of carbon credit certification to the global issuance standards. Such knowledge plays a pivotal role in fostering a dynamic, internationally competitive market environment. This analysis delves into a thorough examination of four prominent global carbon credit certification standards, scrutinizing their guiding principles, the credit issuance process, and the supporting market features designed to optimize operational efficiency. The objective is to obtain valuable lessons and insights from these standards, which can be applied to the ongoing process of validating and refining Indonesia's creditworthiness and regulatory standards.

3.7.1 Integrity Council for the Voluntary Carbon Market (ICVCM)

As an independent governing body for VCM, the Integrity Council for the Voluntary Carbon Market (ICVCM) rules out a definitive threshold standard for the world to generate high-quality carbon credits.[149] Setting out the basis of high integrity, ICVCM seeks to make a rippling chain of changes from accountability and confidence to transparency and efficiency; hence, establishing a robust, standardized ecosystem for VCM

148 https://ctxglobal.com/the-exchange/
149 https://icvcm.org

to function sustainably.[150] Empowering the global VCM through the Core Carbon Principles (CCP), ICVCM defines a threshold standard for carbon credits to be valued as high-integrity credits with real and verifiable impacts.[151]

The CCP anchors its principles on scientific knowledge and best industry practices on VCM to best align the means provided with the situation on-the-ground.

Core Carbon Principles[152]		
Pillar 1: Emission Impact	**Pillar 2: Governance**	**Pillar 3: Sustainable Development**
1. Additionality *GHG emission reductions or removals from the mitigation activity shall be additional; they would not have occurred in the absence of the incentive created by carbon credit revenues*	**5. Effective governance** *to ensure transparency, accountability, continuous improvement, and the overall quality of carbon credits*	**9. Sustainable development benefits and safeguards** shall have clear guidance, tools, and compliance procedures to ensure mitigation activities conform with or go beyond widely established industry best practices
2. Permanence *shall be permanent or, where there is a risk of reversal, there shall be measures in place to address those risks and compensate for reversals*	**6. Tracking** *shall operate or make use of a registry to uniquely identify, record, and track mitigation activities and issued carbon credits*	**10. Contribution to net zero transition** The mitigation activity shall avoid locking-in levels of GHG emissions, technologies, or carbon-intensive practices that are incompatible with the objective of achieving net zero GHG emissions by mid-century
3. Robust quantification of emission reductions and removals *shall be robustly quantified based on conservative approaches, completeness, and sound scientific methods*	**7. Transparency** shall provide comprehensive and transparent information on all credited mitigation activities which publicly available in digital format	
4. No double counting *shall not be double counted, this includes double issuance, double claiming, or double use*	**8. Robust independent third-party validation and verification** *shall have program-level requirements for carbon-crediting*	

Derived from the CCP, ICVCM develops an Assessment Framework (AF) as a guiding protocol for VCM to assess carbon credits eligibility and category in acquiring the CCP label. Once a project is measured to be eligible for the CCP, any carbon credits produced by the project would become high-quality credits with the CCP label embedded in them. The CCP label entails which carbon crediting program issued the credit, what kind of credit it is, and where the credit is generated;[153] thus, bolstering the confidence for CCP-eligible projects to enter any VCM available worldwide. ICVCM provides two forms of assessment, a Program Assessment

150 https://icvcm.org/about-the-integrity-council/
151 https://icvcm.org/the-core-carbon-principles/
152 https://icvcm.org/the-core-carbon-principles/
153 https://icvcm.org/assessment-framework/

(to evaluate the eligibility of projects to obtain a CCP label)[154] and a Category Assessment (to decide a designated category of a project after it is declared as CCP-eligible).[155] These two assessments are carried out by different authorities in issuing the credit labels for the proponents. The Program Assessment falls under the ICVCM Governing Board's authority to decide whether the project is CCP-eligible or not qualified as one. The Category Assessment, on the other hand, is conducted by a multi-stakeholder Categories Working Group (CWG) that will assess specific Categories and methodologies of the CCP-eligible projects through public classification of categories, publicly available academic literature, information ratings agencies, and carbon-crediting program specific information.[156] Once the project is deemed passed the assessment, the project's tag will change from CCP-Eligible to CCP-Approved.

To monitor the credits assessed, ICVCM sets a Performance Monitoring protocol oriented on the potential risks and impacts resulting from the projects.[157] Several instruments used to monitor are market intelligence, program oversight and complaint, Spot-checks, sample-based auditing, consultations, and feedback from relevant stakeholders on the project's possible risks and impacts.[158]

3.7.2 Verra's Verified Carbon Standard (VCS)

Initiated and managed under Verra, a Verified Carbon Standard (VCS) is a crediting program that establishes rules and requirements enabling the validation of GHG emission reductions and removal projects and initiatives worldwide.[159] The Verified Carbon Unit (VCU) labeled by Verra's VCS can be applied in both voluntary and compliance markets globally with one VCU representing one metric tonne of GHG emission (MtCO2e) reduced/removed from the atmosphere.[160] Slightly different with ICVCM's CCP labels that prioritize the credit's quality, the VCS focuses on the quantification, validation, and verification of any eligible greenhouse gas emission reduction reports according to the criterion determined by Verra.[161] The focus areas eligible for VCS are all climate mitigation and adaptation actions, including blue carbon, carbon capture and storage, agriculture, forestry, and other land use (AFOLU), and energy transition. Nevertheless, it does not include carbon footprint assessments or carbon neutrality claims.[162]

VCS Principles of Eligibility[163]		
Pillar 1	Real *All projects reducing and removing GHG must be proven to have factually taken place*	
Pillar 2	Measurable *All projects reducing and removing GHG must be quantifiable using recognized measurement tools, including adjustment tool for leakage, and credible emission baseline*	
Pillar 3	Permanent *When a project carries a reversibility risk, an adequate safeguard measurement must be prepared to ensure risk minimization and guarantee compensation when reversibility occurs*	
Pillar 4	Additional *GHG emission reduction and removals must be additional to business-as-usual activities*	
Pillar 5	Independently Audited *All projects reducing and removing GHG must be verified by an accredited validator/verificator with credible expertise background relevant to the project*	

154 https://icvcm.org/wp-content/uploads/2023/07/CCP-Section-6-R2-FINAL-26Jul23.pdf (p 115)
155 Ibid (p 119)
156 Ibid (p 119)
157 Ibid (p 126)
158 Ibid.
159 https://verra.org/programs/verified-carbon-standard/
160 https://verra.org/programs/verified-carbon-standard/#areas-of-focus
161 https://verra.org/wp-content/uploads/2023/08/VCS-Program-Guide-v4.4.pdf p 1
162 https://verra.org/wp-content/uploads/2023/08/VCS-Program-Guide-v4.4.pdf p 3
163 https://verra.org/wp-content/uploads/2023/08/VCS-Program-Guide-v4.4.pdf p 10

Pillar 6	Unique *Each VCU is deemed to be unique and genuinely representing a single GHG emission reduction or removal activity; no double counting and double claiming is allowed, especially for environmental benefits*	
Pillar 7	Transparent *There must be an adequate and appropriate public disclosure on GHG-related information to allow the intended participants to make decisions with confidence*	
Pillar 8	Conservative *The conservative assumptions, values, and procedures are required to ensure the integrity of GHG emission reduction and removal projects in avoiding overestimation*	

In issuing a VCU, Verra establishes the Validation/Verification Bodies (VVBs) as the appointed validator for projects that have conformed with the VCS requirements and has a verified statement of data and information necessary.[164] Once passing the validation and verification processes, the proponent shall proceed with registration, before requesting the verification approval of the GHG emissions reduction and removal activities on the Verra registry. Accordingly, a VCU can be issued incrementally from a verification report that has stated the project performances assessed and verified by Verra.[165] VCUs can be issued periodically, and initiated by the project proponent to maintain the project's standards. Additionally, Verra provides a timely status of every VCU issued under the VCS Program on the Verra Registry; The VCU statuses available are active, retired, and canceled.

To ensure its platform quality, Verra implements a set of circumstantial protocols to conduct a review on registered projects and issued VCU when an error or quality issue is identified during or after the registration and issuance processes, when a stakeholder conveys concerns about a registered project, or when an error occurs during the routine operations.[166]

3.7.3 Gold Standard

The Gold Standard for the Global Goals (GS4GG) stands as a standard that measures, monitors, and reports impacts of climate mitigation and adaptation projects, including the GHG emissions reduction and removal activities around the world.[167] Similar to the VCS, the Gold Standard facilitates projects to obtain credibility and global recognition of their impacts through carbon credits. GS4GG measures, validates, and verifies climate protection projects according to its assessment criteria and methodologies in generating credible claims of credits.[168] To maintain its values, the GS4GG forms the Gold Standard Validation and Verification Bodies (GS VVBs) and Certification Bodies (CBs) as the authority figures to conduct its validation and verification protocols for the Gold Standard crediting program.[169]

Eligibility Criteria[170]

1. Types of Project
the project shall include physical action or implementation on the ground

2. Location of Project
the project may be located in any part of the world

3. Project Area, Boundary, and Scale
to avoid double counting, a project shall not be included in the other voluntary or compliance standards program unless approved by Gold Standard

5. Contact Details
the project shall provide detailed contact details as part of the Project Documentation

6. Legal Ownership
the project shall demonstrate full and uncontested legal ownership of the products generated under Gold Standard Certification

7. Other Rights
the project shall also demonstrate uncontested legal rights or permissions concerning changes in the use of other resources if required

164 https://verra.org/wp-content/uploads/2023/08/Registration-and-Issuance-Process-v4.4-last-updated-4-Oct-2023.pdf p 10
165 Ibid.
166 https://verra.org/wp-content/uploads/2023/08/Registration-and-Issuance-Process-v4.4-last-updated-4-Oct-2023.pdf p 37
167 https://www.goldstandard.org/our-story/gold-standard-global-goals
168 https://www.goldstandard.org/our-story/gold-standard-global-goals
169 https://globalgoals.goldstandard.org/113-par-validation-and-verification-standard/
170 https://globalgoals.goldstandard.org/101-par-principles-requirements/ p 6

4. Official Development Assistance (ODA) Declaration
the project located in a country named by the OECD Development Assistance Committee's ODA recipient list shall declare the Official Development Assistance (ODA) support

8. Host Country Requirements
the project shall be in compliance with the applicable Host Country's required regulations

Principle and Requirement[171]

1. Contribution to Climate Security & Sustainable Development
the project shall define its baseline and project scenario, and demonstrate its proposed contribution to at least 3 Sustainable Development Goals, one of which must be SDG 13

2. Safeguarding Principles
the project shall conduct a Safeguarding Principle Assessment to define the relevance of the project

3. Stakeholder Inclusivity
the project shall identify and engage with relevant or expert stakeholders and demonstrate that the concerns raised by the stakeholders have been addressed or resolved

4. Demonstration of Real Outcomes
the project shall demonstrate real and verified outcomes by undergoing several certification, performance, and monitoring procedures

5. Financial Additionality & Ongoing Financial Needs
the project shall demonstrate that the impacts generated are additional compared to their baseline scenario

The project assessment process consists of several key stages.[172] Initially, there is a Preliminary Review, where the Gold Standard conducts a desk review to evaluate if the project aligns with the necessary requirements. Once a project achieves Listed status, it undergoes a Validation and Design Review, during which a VVB assesses its design and monitoring plan. After successfully completing the validation process and obtaining Gold Standard Certified Design, the project undergoes Verification and Performance Review, wherein a VVB evaluates its Monitoring Report and supporting documents to ensure compliance.

Projects that have reached the Project Design Certification stage or transitioned to Gold Standard for the Global Goals must provide transparent, annual update reports by the end of the following calendar year, which is a part of the Annual Reporting requirement. To maintain Gold Standard Certified Project status for more than five years, a Design Certification Renewal is necessary. This renewal process, initiated by the submission of a Renewal opinion by a VVB for Design Review to Gold Standard, should commence no later than the last date of the current certification cycle.

To streamline and improve the efficiency of its MRV system, the Gold Standard collaborates with SustainCERT, a technology platform that digitizes certification processes of climate actions. The Information Technology (IT) system, GS4GG utilizes a digital application for project design requirements and methodologies for carbon credits, certification process, sensors, satellite imagery, and other technologies for project monitoring.[173] Additionally, GS4GG's technological leverage facilitates an Impact Registry for dynamic reporting and matchmaking features for project proponents and funders.[174]

171 https://globalgoals.goldstandard.org/101-par-principles-requirements/ p 6
172 https://globalgoals.goldstandard.org/101-par-principles-requirements/ p 20
173 https://www.goldstandard.org/our-story/gold-standard-global-goals
174 https://www.goldstandard.org/resources/impact-registry

3.7.4 American Carbon Registry Standard

The American Carbon Registry (ACR) is a nonprofit organization under Winrock International with a prominent accrediting program for carbon emission reduction and removal efforts in both voluntary and regulated carbon markets/CCM. The ACR maintains an open e-registry system for stakeholders to enroll projects and documents of the issuance, transfer, and retirement of carbon credits that have been individually-validated and have unique serial numbers. The ACR's system facilitates and records any transaction negotiated directly between buyers and sellers, where other offset transactions occurring outside of ACR (over-the-counter dealings or through exchanges) can be traced within the ACR using distinct serial numbers designated to every offset.[175]

ACR Eligibility Criterion[176]		
Criteria 1	Start Date *Eligible projects are required to process their validation process in decided time periods within the Start Date; AFOLU projects must be validated within 3 years of the project Start Date, Non-AFOLU within 2 years, and projects with newly approved methodology is granted for 10 years.*	
Criteria 2	Minimum Project Term *The Minimum Project Term is determined according to the relevant ACR sector requirements and methodology. For instance, the AFOLU projects shall commit to a minimum or 40 years from the Start Date and if the project term exceeds, ACR credits shall be renewed.*	
Criteria 3	Crediting Period *The Crediting Period for Non-AFOLU projects is 10 years and the AFOLU projects' Crediting Period vary according to the sector requirements/methodology. ACR defines the start of the Crediting Period the same as the Start Date.*	
Criteria 4	Real *Quantifiable and verifiable GHG emissions reduction and/or removal projects approved by the ACR Methodology*	
Criteria 5	Emission/Removal Origin *The ACR defines 'Direct Emission' as GHG emissions removal from sources/sinks over which the Proponent has control and 'Indirect Emission' as the emissions removal from sources/sinks with no control owned by the Proponent.* *Documents stating the status of origin shall be submitted to the ACR, especially in acknowledging the prohibition for other entities to claim Indirect Emission registered.*	
Criteria 6	Offset Title *Documentation and attestation of the undisputed title of all offsets prior to project registration*	
Criteria 7	Additional *To qualify as additional, ACR requires every project to pass either an approved performance standard and a regulatory additionality test, or a three-pronged test of additionality in which projects demonstrate that the activity exceeds currently effective regulations, exceeds common practice in the relevant industry sector and geographic region, and faces at least one of three implementation barriers: financial, technological, or institutional.*	
Criteria 8	Regulatory Compliance *Projects must adhere to laws, regulations, and other legally binding mandates relevant to the activities carried out, where any misconduct or error within the administrative process will be treated on a case-by-case basis.*	
Criteria 9	Permanent *Projects with reversal risk must provide a mitigation, monitor, report, and compensation schemes for the ACR using the Tool for Risk Analysis and Buffer Determination and submit the legally- binding Reversal Risk Mitigation Agreement with ACR/Winrock.*	

175 https://acrcarbon.org/wp-content/uploads/2023/07/ACR-Standard-v7.0-Dec-2020.pdf
176 https://acrcarbon.org/wp-content/uploads/2023/07/ACR-Standard-v7.0-Dec-2020.pdf

Criteria 10	Net of Leakage *Projects are required to address and mitigate certain types of leakages as a preventive measure against the unintended leakage potential along the project period*	
Criteria 11	Independently Validated *Validation and verification processes must be conducted by an ACR-approved independent third-party VVB. The ACR will conduct a preliminary listing review of every project and may request clarifications or corrections regarding a proposed project's listing documentation before allowing the project to be validated.*	
Criteria 12	Independently Verified *Each project that wishes to acquire the ACR Credit must be verified through the end of their crediting period to the relevant eligibility criteria.*	
Criteria 13	Environmental and Community Assessments *Projects registered are responsible for a GHG Project Plan to identify the community and environmental impacts from their activities by disclosing and describing contributions that are aligned with the UN SDGs.*	

The overall goal of third-party validation implemented by ACR is to endorse impartiality and objectiveness in a GHG Project Plan against the requirements laid out in the ACR Standard and relevant methodology. The VVB must independently evaluate the project design and planning information, based on supporting documentation and GHG validation best practices.[177] Within the validation process, the VVB would assist project proponents to collect and test sufficient evidence to ensure that the methods are appropriately selected and applied to develop accurate and conservative estimates of emission reductions and removals before a Validation Report is submitted and posted publicly in the ACR portal.

Once the validation process is complete, the VVB continues to assist project proponents to reassess and verify the project's claimed GHG emission reductions/removal enhancements against relevant ACR standards and the approved methodology. The VVB must independently evaluate the GHG assertion, based on supporting evidence and GHG verification best practice, such as the GHG Project Plan, the previous Verification Statements, operational and control procedures, documentation of quantification methodologies, documentation of monitoring and measurement systems, and other documentation.[178] These validation and verification protocols would determine the project's eligibility to obtain the ACR standard according to the criterion settled.

Table 3.3 Compiled Key Takeaways From the Selected Global Carbon Credit Certifications

Indicator	Compiled Key Takeaways for Indonesia
Credit Issuance Process	1. **Clear criterion of credit eligibility:** These criteria should be communicated to the project developers to ensure that the carbon credits generated consistently adhere to the rigorous standards of high quality and integrity. 2. **Digitized registration and verification process:** Streamline the registration and verification process through user-friendly websites and provide a structured, step-by-step guide for project developers to guide them through the process.
Monitoring Procedure	1. **Employing various instruments for performance monitoring:** Utilize systematic analysis of market and trends data along with the stakeholders' input to ensure all potential risks and errors inside the registered projects are preemptively mitigated. 2. **Third-party monitors and evaluators:** Consider employing a third party to act as an independent evaluator of the registered projects to contribute to a more objective and robust evaluation process.

177 https://acrcarbon.org/wp-content/uploads/2023/05/ACR-Validation-and-Verification-Standard-Feb-2018.pdf
178 https://acrcarbon.org/wp-content/uploads/2023/05/ACR-Validation-and-Verification-Standard-Feb-2018.pdf

3.8 Summary

The presented benchmark serves as a tapestry of global practices and standards, providing valuable insights and guidance to enhance Indonesia's efforts in establishing a resilient and adaptable carbon market infrastructure. Several key takeaways that can be considered for integration into Indonesia's existing system can be found as follows:

1. **The "From Industry-to-Industry" Incentivization Chain** The taxes and levies charged to the more capable industries would be allocated to the eligible, participating industry players and Research and Development institutions in need of financial support to participate in the CM, hence establishing circular financial arrangements among industry player to industry player.
2. **Expanding the Current Collaboration Bandwidth Multi-Financial Sectors Collaboration**, specifically with banking institutions, has served as one of the common elements endorsed by the selected benchmarks with both the CM and VCM models. The facilities extended to tangible banking facilities would attract more participants with limited options of financing capacity to enter the carbon market, i.e., green bonds opportunity.

   Secondly, Cross-Provincial **cooperation** shall be considered as a way of accelerating equal participation from stakeholders in provinces. The best practice evident from the RGGI is a State-to-State collaboration in setting a collective GHG emissions cap among states with similar capacities and progress. In terms of Indonesia, the cross-provincial collaboration can be carried with the supports of the regional governments/ *Pemerintah Daerah*.

   Subsequent to the priority of expanding the carbon market, **eligible intermediaries needs to be empowered** in streamlining the existing verification and accreditation processes; hence, by facilitating independent project risk and impact assessments, participants can be hindered from lengthy and ineffective protocols before participating in the market.
3. **Strengthening the National VCM**

   In bolstering the current structure of Indonesia's VCM ecosystem, a **formation of a global advisory board** is deemed to be imperative in initiating international exposure among reputable stakeholders and registries, and enhancing the SRN-PPI national standards' credibility to be accepted and recognized globally in enabling it to compete with other VCMs worldwide. Additionally, the **Standard Acknowledgement Mechanism** process needs to be clarified and informed, especially for the international standardized credits wanting to participate in the existing VCM platforms, i.e., the IDXCarbon and the Indonesia Climate Exchange.

In summary, the presented benchmarks served a plenty takeaways to ruminate Indonesia's carbon market trajectory for the next decade. With a clear path forward, grounded in the lessons learned and best practices highlighted, Indonesia has the momentum to make impactful strides towards a more sustainable and environmentally responsible future.

4. Understanding Indonesia's Carbon Market Regulatory Landscape

As a party to the Paris Agreement under the United Nations Framework Convention on Climate Change, as stipulated in Law 16/2016 (as defined below), Indonesia is dedicated to fulfilling its NDC. The objective is to restrict the global average temperature increase to 1.5°C - 2°C from pre-industrial levels, ultimately achieving Net Zero Emission (NZE) by 2060. The Enhanced NDC, submitted to the Secretariat of the United Nations Climate Change Conference on 23 September 2022, outlines an unconditional 31.89% emission reduction target by 2030, or 43.20% with international technical cooperation.

To realize these goals, the Government of the Republic Indonesia employs a market-based approach, involving emission trading, joint implementation, and clean development—a strategy commonly referred to as Carbon Trading. This commitment is reflected in various laws and regulations governing Carbon Market and environmental protection in Indonesia.

Carbon Trading delves around the concept of Carbon Units, which function as evidence of carbon ownership, symbolizing one ton of carbon dioxide. These units find their meticulous documentation in the National Registry System for Climate Change Control (Sistem Registri Nasional Pengendalian Perubahan Iklim - "SRN PPI")

Under Indonesian laws and regulations, the identified Carbon Units encompass Business Entity Emission Cap Approval (Persetujuan Batas Atas Emisi Pelaku Usaha - "PTBAE-PU") or Greenhouse Gas Emission Reduction Certificate (Sertifikat Pengurangan Emisi Gas Rumah Kaca - "SPE-GRK"). In the realm of Carbon Market, businesses involved in renewable energy or decarbonization ventures can create and exchange carbon credits using SPE-GRK instruments. Conversely, emitters, such as coal power plant operators, possess the flexibility to acquire these credits, mitigating carbon emissions that surpass the defined limits of their PTBAE-PU. Therefore Units constitute a fundamental element within Indonesia's Carbon Trading regulatory landscape.
This analysis is important to understand how Carbon Trading works in Indonesia. It helps assess whether existing regulations align with the present conditions. In this chapter, we'll delve into key regulations shaping the execution of Carbon Trading activities.

4.1 Laws and Regulations of Carbon Market in Indonesia

We will focus our analysis pertaining to Carbon Market regulatory analysis based on these laws and regulations:

1. Law No. 8 of 1995 on Capital Market as amended by PPSK Law ("**Capital Market Law**");
2. Law No. 21 of 2011 on Financial Services Authority as amended by PPSK Law ("**OJK Law**");
3. Law No. 16 of 2016 on the Ratification of Paris Agreement to the United Nations Framework Convention on Climate Change ("**Law 16/2016**");
4. Law No. 7 of 2021 on the Harmonization of Tax Regulations ("**HPP Law**");
5. Law No. 4 of 2023 on the Development and Strengthening of the Financial Sector ("**PPSK Law**");
6. Regulation of the President of the Republic of Indonesia No. 98 of 2021 on Implementation of Carbon Economic Value to Achieve Nationally Determined Contribution Targets and Control of Greenhouse Gas Emissions in National Development ("**PR 98/2021**");
7. Regulation of the Minister of Environment and Forestry of the Republic of Indonesia No. 21 of 2022 on Procedures for the Application of Carbon Economic Value ("**MOEF Reg. 21/2022**");
8. Regulation of the Minister of Environment and Forestry of the Republic of Indonesia No. 7 of 2023 on Procedures for Carbon Trading in the Forestry Sector ("**MOEF Reg. 7/2023**");

9. Regulation of the Minister of Energy and Mineral Resources of the Republic of Indonesia No. 16 of 2022 on Procedures for the Implementation of Carbon Economic Value within the Power Plant Subsector ("**MOEMR Reg. 16/2022**");
10. Regulation of the Financial Services Authority of the Republic of Indonesia No. 14 of 2023 on Carbon Trading Through Carbon Exchanges ("**POJK 14/2023**");
11. Decree of the Board of Directors of PT Bursa Efek Indonesia No. Kep-00295/BEI/09-2023 on the Regulation of the Registration of Carbon Units in the Providers of Carbon Exchange ("**IDX Decree 00295/2023**");
12. Decree of the Board of Directors of PT Bursa Efek Indonesia No. Kep-00296/BEI/09-2023 on the Regulation of the Trading of Carbon Units through Carbon Exchange ("**IDX Decree 00295/2023**");
13. Decree of the Board of Directors of PT Bursa Efek Indonesia No. Kep-00297/BEI/09-2023 on the Regulation of the User of Carbon Exchange Services ("**IDX Decree 00297/2023**"); and
14. Decree of the Board of Directors of PT Bursa Efek Indonesia No. Kep-00298/BEI/09-2023 on the Regulation of the Supervision of Trading through Carbon Exchange ("**IDX Decree 00298/2023**").

4.2 Paris Agreement to the United Nations Framework Convention on Climate Change ("Paris Agreement")

Indonesia became one of the signatories of Paris Agreement on 22 April 2016. Further, Indonesia has ratified this treaty on 31 October 2016 through Law 16/2016.

As a member country that ratified the Paris Agreement, Indonesia has committed itself to making a national contribution that is legally determined (Nationally Determined Contribution / "**NDC**") in order to limit the global average temperature rise to 1.5°C - 2°C from pre-industrial levels, with a Net Zero Emission ("**NZE**") target of no later than 2060 through the submission of the Enhanced NDC to the Secretariat of the United Nations Climate Change Conference ("**UNFCCC**") on 23 September 2022 with an unconditional 31.89% emission reduction target by 2030 or 43.20% with the support of international technical cooperation. The mechanism the Government is pursuing to achieve these aims is a market-based mechanism using emission trading, joint implementation, and clean development. This market-based mechanism is known as Carbon Trading.

Furthermore, the ratification of Paris Agreement emphasizes the alignment of domestic legislation with the Paris Agreement's provisions, ensuring that Indonesia's laws support climate action. This legal framework recognizes the necessity of international cooperation and accountability in the fight against climate change. Indonesia's ratification of the Paris Agreement signifies its dedication to environmental responsibility and collaboration on a global scale.

4.3 Carbon Trading Related Regulations in Indonesia

4.3.1 PPSK Law

PPSK Law was enacted by President Joko Widodo on 12 January 2023. The law consists of 27 chapters and 341 (three hundred forty one) articles, representing the government's effort to reform the financial sector by adapting to the changes of the current era. There are at least 17 (seventeen) laws related to the financial sector have been amended following the issuance of the PPSK Law, making it to be also named as the omnibus law of the financial sector. In this part, we will delve into the specifics of the amendment of the OJK Law and Articles 23 to 28 of PPSK Law, which introduces the Carbon Trading mechanism in Indonesia.

4.3.1.1 Additional Authorities of the Financial Services Authority of the Republic of Indonesia ("OJK")

After the enaction of the PPSK Law, OJK shall implement the regulatory and supervisory duty against financial services activities within the Capital Market, Derivative finance and carbon exchange sectors.[179] Besides, OJK also has the regulatory authority for regulate the secondary trading of instruments in relation to the carbon economic value on the exchange.[180]

4.3.1.2 Carbon Trading Mechanism

PPSK Law outlines the trading mechanism as a market-based approach to reduce GHG emissions through the buying and selling of Carbon Units.[181] These units, are financial instruments established by the law. The inclusion of Carbon Trading reflects the government's commitment to addressing environmental concerns and mitigating climate change.[182]

4.3.1.3 Carbon Trading through Carbon Exchange

PPSK Law elaborates on the trading of carbon, both domestically and internationally, through carbon exchange mechanisms.[183] PPSK Law defines carbon exchange as a system that regulates Carbon Trading and ownership records.[184] PPSK Law further restricts the establishment and operation of carbon exchanges to the financial market operators with approval from the OJK.[185] The OJK regulations may provide market organizers with the flexibility to develop activities or products based on Carbon Units.[186]

Carbon trading through the carbon exchange involves:[187]
1. Development of Carbon Trading infrastructure.
2. Regulation of the utilization of state revenues from Carbon Trading; and/or
3. Administration of carbon transactions.

The development of Carbon Trading infrastructure is a coordinated effort between ministries/agencies and the carbon exchange supervisory authority.[188]

4.3.1.4 Licensing of Carbon Trading

The authority of the OJK, as referred to in this provision, encompasses the licensing of companies engaged in carbon trading activities and oversight, including the governance of such companies. This involves monitoring commitments to environmental friendliness and other relevant aspects. However, emission permits for individual companies or an entire industry, calculated collectively, may be issued or certified by the ministry responsible for environmental protection and management.[189]

179 Article 6 paragraph (1) letter b of OJK Law
180 Article 5 letter a number 8 of Capital Market Law
181 Article 23 paragraph (1) of PPSK Law
182 Article 23 paragraph (2) of PPSK Law
183 Article 24 paragraph (1) of PPSK Law
184 Article 23 paragraph (2) of PPSK Law
185 Article 23 paragraph (3) and (4) of PPSK Law
186 Article 24 paragraph (5) of PPSK Law
187 Article 24 paragraph (5) of PPSK Law
188 Article 24 paragraph (6) of PPSK Law
189 Article 25 of PPSK Law

4.3.2 HPP Law

HPP Law is the law that adjusts policies in the fields of general taxation provisions and procedures, income tax, value-added tax, and excise as well as regulations on carbon taxes and policies in the form of a Taxpayer voluntary disclosure program in 1 (one) comprehensive Law.

Under HPP Law, the government may impose a carbon tax on companies that emit carbon waste, as a means of mitigating climate change.[190] This carbon tax is set at minimum Rp30 per kilogram[191] and is applicable in two scenarios as follows:[192]

1. When purchasing goods containing carbon.
2. At the end of the calendar year during which activities producing a certain level of carbon emissions occurred.

Furthermore, Taxpayers participating in Carbon Trading, carbon offsetting, and/or other mechanisms according to environmental laws and regulations may be eligible for:[193]

1. carbon tax reduction; and/or
2. other treatment related to carbon tax compliance.

In which, the procedures for calculating, collecting, paying, or depositing, reporting, and the mechanisms for imposing carbon tax, as well as the procedures for carbon tax reduction or other treatment related to carbon tax compliance, are regulated by the Minister of Finance of the Republic of Indonesia ("**MOF**"). [194] However, until the issuance of this White Paper, such regulation has never been enacted by MOF.

4.3.3 PR 98/2021

PR 98/2021 is the basis for implementing Carbon Economic Values (*Nilai Ekonomi Karbon* or "**NEK**") and also a guideline for reducing Greenhouse Gas (*Gas Rumah Kaca* - "**GHG**") emissions through the implementation of various policies and actions aimed at achieving the country's NDC target in line with national development. PR 98/2021 has emerged as one of the significant outcomes following the ratification of the Paris Agreement.

PR 98/2021 addresses the economic value of carbon, which is one of the instruments in realizing the Indonesian government's obligations in contributing to GHG gas emission reduction. The implementation of efforts to achieve NDC targets is carried out through the organization of Climate Change Mitigation and Climate Change Adaptation.

4.3.3.1 Climate Change Mitigation

Climate Change Mitigation is an effort to control and reduce the risks resulting from climate change through activities that can lower emissions or enhance the absorption of GHG as well as the storage/reinforcement of carbon reserves from various emission sources.[195] The implementation of Climate Change Mitigation is carried out in sectors (energy, waste, industrial processes and product use, agriculture, forestry, and/or other sectors in line with advancements in science and technology) and sub-sectors (power generation, transportation, construction, solid waste, liquid waste, waste management, agriculture, livestock, plantations, forestry, peat and mangrove management, and/or other sub-sectors in line with advancements in science and technology).[196]

190 Article 13 paragraph (1) of HPP Law
191 Article 13 paragraph (9) of HPP Law
192 Article 13 paragraph (7) of HPP Law
193 Article 13 paragraph (13) of HPP Law
194 Article 13 paragraph (14) of HPP Law
195 Article 1 number 6 of PR 98/2021
196 Article 7 of PR 98/2021

Furthermore, Climate Change Mitigation is carried out through as follows[197]:
Climate Change Mitigation Action Planning, which is an activity aimed at reducing greenhouse gas emissions, enhancing carbon absorption, and/or storage/strengthening of carbon reserves[198];
Implementation of Climate Change Mitigation Actions; and
Monitoring and evaluation of Climate Change Mitigation Actions.

Climate Change Mitigation Action is carried out in stages as follows:[199] (i) GHG Emission Inventory[200], (ii) preparation and determination of a GHG Emissions Baseline[201], (iii) Preparation and determination of Climate Change Mitigation targets, and (iv) preparation and determination of Climate Change Mitigation Action plans. In essence, Climate Change Mitigation is implemented by determining the GHG Emission Baseline on a national, provincial and city scale, in order to become the emission limit that can be produced on a certain regional scale.

On the other hand, Climate Change Adaptation is carried out in the fields of food, water, energy, health, ecosystems, and/or other areas in accordance with the advancements in science and technology, resilience needs, and national capacity. Essentially, Climate Change Adaptation aims to enhance the ability to adapt to climate change, including climate variability and extreme events, thereby reducing the potential damage caused by climate change, capitalizing on opportunities presented by climate change, and addressing the consequences arising from climate change. Similar to Climate Change Mitigation, Climate Change Adaptation is conducted through the following stages:

Designing Climate Change Adaptation Actions, which involves adapting to anticipate the actual adverse effects of climate change by developing anticipatory strategies and leveraging favorable opportunities;
Implementation of Climate Change Adaptation Actions; and
Monitoring and evaluation of Climate Change Adaptation Actions.

4.3.3.2 NEK Establishment

PR 98/2021 introduces the concept of NEK which assigns economic value to each unit of greenhouse gas ("**GHG**") emissions resulting from human and economic activities. NEK becomes a foundational element in the carbon market, allowing for the accurate tracking and valuation of carbon emissions. This valuation system operationalizes Carbon Trading, economic incentives, Carbon Levy, and other mechanisms related to scientific and technological advancements. It signifies a significant shift for Indonesia from a voluntary

197 Article 6 paragraph (1) of PR 98/2021
198 Article 1 number 7 of PR 98/2021
199 Article 9 of PR 98/2021
200 Article 1 number 25 of PR 98/2021
201 Article 1 number 8 of PR 98/2021

carbon market to a legally binding compliance carbon market. By assigning a value to carbon emissions, it encourages businesses and industries to take measurable steps towards reducing their carbon footprint and adopting sustainable practices.

Both Climate Change Mitigation Actions and Climate Change Adaptation actions can be carried out through the implementation of NEK, which is carried out in sectors and sub-sectors as explained in the Climate Change Mitigation section. The implementation of the NEK to fulfill the NDC is carried out through mechanisms[202]which we summarize as follows:

i. **Carbon Trading**;
   Trade can be carried out domestically or internationally[203] through mechanisms as follows[204]:
   a. **Trading instruments**
      i. Emission Permit Trading (ETS). ETS occurs when an entity that emits more buys emissions permits from one that emits less. In other words, the party with excess emissions buys emissions.
      ii. Offset Emissions (Crediting Mechanism). This happens when an entity sells its carbon credits to those who need them. In other words, the party that emits less sells its emission rights.
   b. **Non-trading instruments.**
      i. Taxes/levies on carbon (carbon tax), which is imposed on activities that produce emissions.
      ii. RBP, where payments are given to entities for the results of their emission reductions.

ii. **Performance-based payment;**

iii. **Carbon Levy; and/or**

iv. **Other mechanisms established by the Minister of Environment and Forestry of the Republic of Indonesia** ("**MOEF**").

4.3.3.3 Carbon Trading and SRN PPI

Carbon Trading is one of the mechanisms for implementing the NEK. Carbon Trading can be conducted domestically and/or internationally (abroad). The traded commodity is the SPE-GRK from Climate Change Mitigation activities. The SPE-GRK serves as documentary proof of emission reduction by businesses and/or activities that have been carried out through Measurement, Reporting and Verification ("**MRV**"), and recorded in the SRN PPI in the form of a registration number and/or registry code.[205]

SRN PPI acts as the overseeing body that is responsible for monitoring carbon emissions within the context of Indonesia's NDC. To accomplish this, a robust Measurement, Reporting, and Verification ("**MRV**") system is instituted.[206] This system collects data on GHG emissions and performance data related to climate change policies and adaptation efforts from various businesses. These businesses are obliged to annually report and register their climate change mitigation initiatives, adaptation actions, and allocation of climate change resources with the SRN PPI. The verification of these reports is conducted by the MOEF. Successful reporting is the basis for businesses to access sustainable financing and participate in Carbon Trading. Conversely, non-compliance with reporting could lead to sanctions, as further elaborated in subordinate legislation.

Moreover, Carbon Trading can be done by (i) Emission Trading, and (ii) GHG Emission Offsets. In essence,

202 Article 47 paragraph (1) of PR 98/2021
203 Article 48 paragraph (1) of PR 98/2021
204 Article 49 paragraph (2) of PR 98/2021
205 Article 1 number 31 of PR 98/2021
206 Article 61 of PR 98/2021

Emissions Trading is applied to businesses and/or activities that have a predetermined Upper Limit of GHG Emission.[207] Meanwhile the GHG emissions offset mechanism shall be applied to businesses and/or activities without an Upper Limit on GHG Emissions.[208] Still, it is done voluntarily by the business actors to achieve specific targets.

4.3.3.4 Result-Based Payment ("RBP")

RBP is an incentive or payment obtained from the results of GHG emission reduction achievements that have been verified and/or certified and benefits other than carbon that have been validated.[209] RBP is carried out in relation to the results and benefits of each GHG emission reduction achieved by ministries/agencies, regional governments and business actors.[210]

This feature incentivizes businesses to reduce GHG emissions. In return for their efforts to lower emissions, they become eligible for payments based on the verified success of their emission reduction initiatives. Payments can be received at different levels, including international, national, or provincial, depending on the scale and effectiveness of their contributions to emission reduction. These RBP provide an additional financial incentive for companies to take concrete actions in reducing their carbon footprint, aligning their goals with national and international targets.

Implementation of RBP does not result in a transfer of carbon ownership from one party to another,[211] and further provisions regarding RBP procedures are regulated in separate ministerial regulations.[212] However, up to the time this White Paper was drafted, there was no ministerial regulation that further regulated RBP procedures.

4.3.3.5 Carbon Levy

Carbon Levy is a levy imposed on goods and/or services that have potential and/or carbon content, the potential for carbon emissions, and/or emit carbon that can have a negative impact on the environment.[213] Collections are carried out through the field of taxation, including central and regional taxation, customs and excise, as well as other state levies. Non-tax state revenue (*Penerimaan Negara Berbasis Pajak* - "**PNBP**") is obtained from trade transactions of GHG emissions offset, or from emissions trading transactions. PNBP payments are made through the non-tax state revenue information system (*Sistem Informasi Penerimaan Negara Bukan Pajak* – "**SIPNBP**"), and determination of the type and rate of PNBP is carried out in accordance with relevant tax regulations[214]. In more detail, the regulations regarding Carbon Levy are regulated in the Minister of Finance's regulations, which at the time of the preparation of this White Paper, the relevant regulations had not yet been issued.[215]

4.3.3.6 Certification and Verification

Under this regulation, businesses are required to obtain certification for their emission reduction achievements in the form of SPE GR for the implementation of the NEK.[216] The certification process involves a three-step

207 Article 50 paragraph (2) PR 98/2021
208 Article 52 paragraph (2) PR 98/2021 and Article 5 MOEF Reg. 7/2023
209 Article 1 number 20 of PR 98/2021
210 Article 55 paragraph (1) of PR 98/2021
211 Article 55 paragraph (4) of PR 98/2021
212 Article 55 paragraph (6) of PR 98/2021
213 Article 1 number 24 of PR 98/2021
214 Article 17 of MOEF Reg. 7/2023
215 Article 58 paragraph (3) of PR 98/2021
216 Article 71 paragraph (1) of PR 98/2021

procedure: registration, independent verification, and certification issuance.[217] Certification is granted based on accurate emission data and the effectiveness of reported reduction efforts, as reported to the SRN PPI.[218] Moreover, in the event that businesses and/or activities utilize GHG emission certification schemes other than SPE-GRK, these certification schemes must align with internationally recognized standards, such as ISO 14064 and ISO 14065, and must be endorsed by the National Accreditation Committee.[219]

4.3.4 MOEF Reg. 21/2022

MOEF Reg. 21/2022 directs the implementation of carbon pricing to achieve Indonesia's NDC of reducing GHG emission by 29%-41% by the year 2030. MOEF Reg. 21/2022 acts as the implementation regulation for PR 98/2021.

MOE Reg. 21/2022 provides that climate change mitigation is to be carried out in the following sectors and sub-sectors:

1. Sectors:[220]
2. energy;
3. waste;
4. industrial processes and product use;
5. agriculture;
6. forestry; and/or
7. other sectors in accordance with the development of science and technology.

Sub Sectors, among others:[221]

1. solid waste;
2. liquid waste;
3. waste;
4. industry;
5. plantation;
6. forestry;
7. peat and mangrove management; and/or
8. other sub-sectors in accordance with the development of science and technology.

The the government (ministries, regional governments), business actors and the community can apply NEK in the aforementioned sectors through the following mechanisms:[222]

1. Carbon Trading;
2. performance based payments;
3. carbon levies; and/or
4. other mechanisms in accordance with the development of science and technology.

In general, the provisions of MOEF Reg. 21/2022 specify the application of each of the aforementioned mechanisms. Nevertheless, we have focused in this part on the underlying principles related to Carbon Trading under the Indonesian regulations. Notwithstanding the foregoing, please note that the relevant Government institutions will issue the implementing regulation to be used as the legal basis for business actors to get involved in the mitigation of climate change.

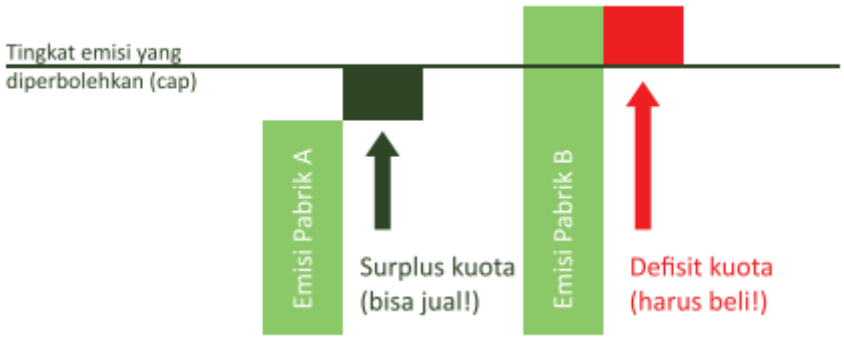
217 Article 71 paragraph (3) of PR 98/2021
218 Article 71 paragraph (2) of PR 98/2021
219 Article 72 paragraph (1) of PR 98/2021
220 Article 2 paragraph (3) of MOEF Reg. 21/2022
221 Article 2 paragraph (4) of MOEF Reg. 21/2022
222 Article 3 paragraph (2) of MOEF Reg. 21/2022

4.3.4.1 Carbon Trading in General

Types of Carbon Trading based on the basis of its formation may include; (i) voluntary trade which is formed because there is a desire to reduce GHG, not because there is an obligation or necessity to reduce it from the limit, [223] and (ii) mandatory trade which is formed because there is a policy that requires the business/activity to reduce it. The types of carbon crediting market programs included in the mandatory market are Clean Development Mechanism (CDM) and Joint Implementation. Meanwhile, the types of Carbon Trading based on trading methods include as follows:

Emissions trading / ETS / Cap and Trade.

This system is implemented in the mandatory carbon market, because this system requires limiting GHG emissions. Each market participant is given the obligation to reduce/limit carbon emissions (cap). Generally, the cap is applied in the form of an emissions allotment/quota at the beginning of the period. At the end of the period, participants must deposit quota units with the specified institution for the amount of the actual emissions they have released. Participants who exceed their cap can purchase additional quota units from those whose quota is unused, resulting in Carbon Trading.



Source: Buku Pengantar Pasar Karbon untuk Pengendalian Perubahan Iklim, oleh Dewan Nasional Perubahan Iklim, p. 21.

***Baseline and Credit/Offset*GHG emissions**[224]

In this system, there is no need for a quota at the beginning of the trading period like the ETS system. The commodity traded is carbon credits, which is a certification of emissions reductions resulting from project implementation. Thus, the traded commodity is obtained after the end of a period. One unit of Carbon Credit is equivalent to reducing emissions by 1 ton of CO2e. The credits purchased can be used to meet emission reduction targets, or even to make the activities carried out by the buyer carbon neutral or zero emissions. Most of these systems are used in voluntary markets. In this system, emission reduction is the difference from the emissions scenario without an emissions reduction project (baseline), compared to actual emissions after the project.

223 Those included in the voluntary market include GSF, Verra, Plan Vivo, Panda Standard, American Carbon Registry, and so on.

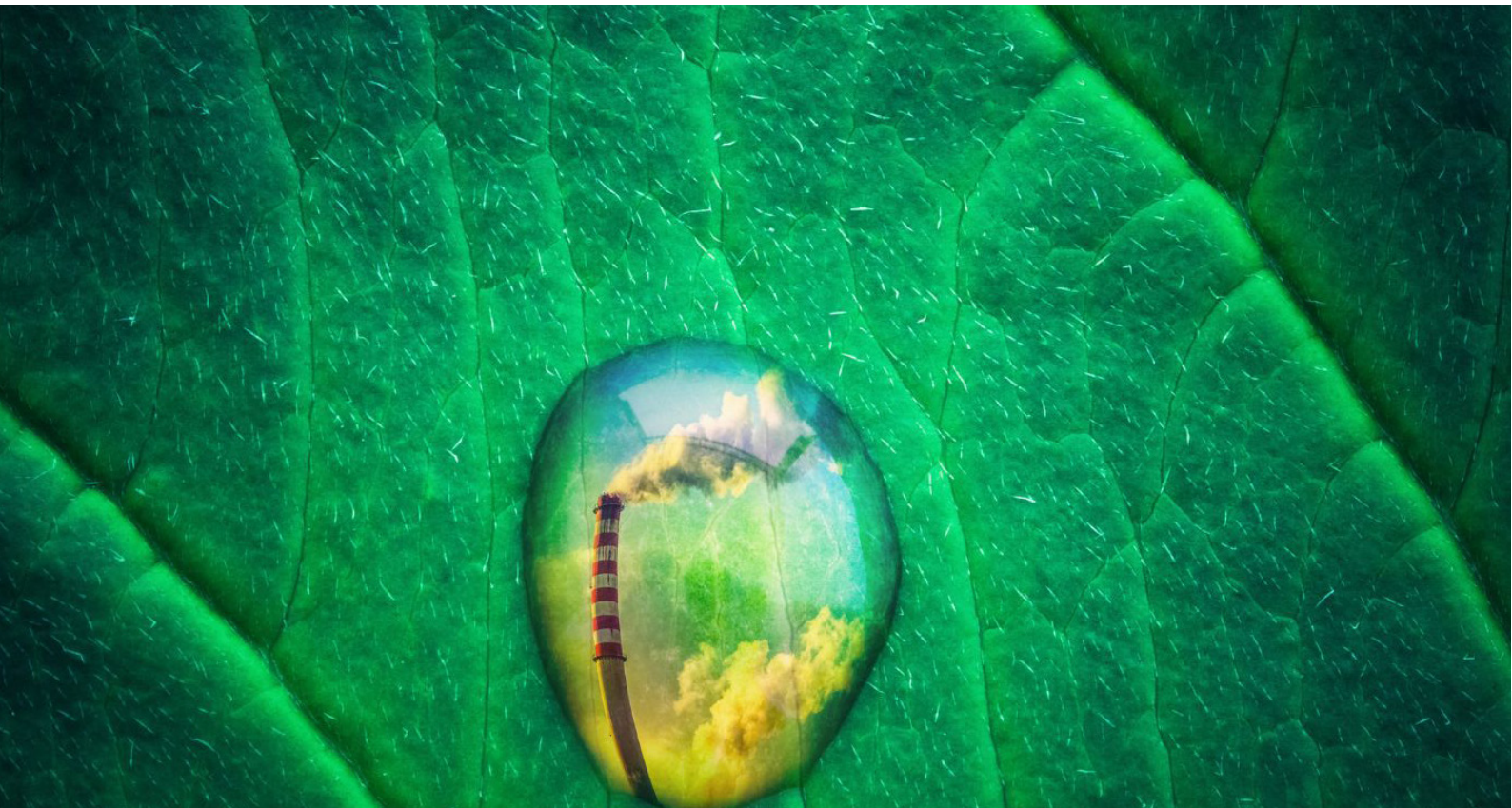
224 The Carbon Trading mechanism through Verra and GSF is included in the baseline and credit system.

Source: Buku Pengantar Pasar Karbon untuk Pengendalian Perubahan Iklim, oleh Dewan Nasional Perubahan Iklim, p. 22.

The goal of carbon credit buyers is to offset (offsetting) GHG emissions that are released as a result of their activities. Purchasing carbon credits can neutralize or replace the resulting GHG emissions.

Therefore, In general, it can be concluded that the differences in mechanisms can be contained in the difference matrix as follows:

No.	Characteristic Features	Emissions Trading	GHG emissions Offset
	The Parties	1. Business actors who carry out their business activities based on emission allotments/quotas (“**Carbon Unit Purchasers**”); with 2. Other business actors within/ abroad who wish to sell their emission allotments/quotas (“**Carbon Unit Sellers**”).	1. Business actors who release carbon emissions due to their business activities (“**Carbon Credit Buyers**”); with 2. Other parties who carry out activities/projects for the release of carbon credits carried out by Carbon Credit Buyers (“**Carbon Credit Sellers**”).



	Mechanism	Carbon Unit Buyers whose business activities exceed the emission allotment/quota (emission quota deficit) purchase quota/capacity to emit more emissions from Carbon Unit Sellers who have a surplus of carbon emission quota/capacity.	Carbon Credit Buyers who wish to emit carbon emissions from their business activities purchase carbon credits to offset (offsetting) GHG emissions released as a result of their activities from the Carbon Credit Seller.
	Sector	It has been determined by the government.	Outside of the emissions trading sector that has been determined by the government.
	Trading Methods	Sales and purchases are made on carbon exchanges and/or through direct trading, where both methods can be done either within or outside the country.	Sales and purchases are made on carbon exchanges and/or through direct trading, where both methods can be done either within or outside the country.

In relation with the types of Carbon Trading based on the trading method as explained above,It is important for business actors to register their activities on the SRN so that business actors can then record their NEK implementation on the SRN PPI. The steps that business actors need to take in registering with SRN are as follows:[225]

Stage	Stage Description
Account Registration	
Early stage	In this step, the business actor as the person responsible fills out the registration form by filling in data regarding climate change control activities, contact person, and account of the person responsible for the activity. The person in charge of the activity will then receive registration validation via electronic mail, and will then receive a notification in electronic mail as notification that registration has been received. Based on the electronic letter, the secretariat team will check the registrant's data and continue with sending the registration number via electronic mail by the SRN.

225 Minister of Environment and Forestry's guidebook regarding SRN PPI

Activity Registration	
Stage I	In this step, the person responsible for the activity fills in a general data form which will be checked by the SRN secretariat team and will then be approved if it has passed the checking stage. The person in charge of the activity will then receive an account number via electronic mail. General data includes: a. Form 1 i. Activity Title: Fill in the activity title of the climate change action registered with the SRN; ii. Activity Status: The Person in Charge of the Activity selects the activity status in the form of Plan; New Activities; Activity is Running and Activity Has Ended; iii. Activity Duration: The person in charge of the activity fills in the activity period by selecting the initial month and year of the activity as well as the month and year; iv. Type of Activity: The Person in Charge of the Activity explains the conditions of the activity based on the type of activity carried out in the form of action, resources and others; v. General Objective: Fill in the general objective of the climate change control activities carried out; vi. Specific Objectives: Fill in the specific objectives of the climate change control activities carried out. b. Form 2 i. Type of Action: The person responsible for the activity chooses the type of climate change control activity which is divided into three categorizations, namely Mitigation; Adaptation; Joint Mitigation and Adaptation; and Other Activities; ii. Scheme/Actor: The type of scheme follows the choice of action type selected. The schemes in the SRN are grouped by the object approach of the actor carrying out the activity; iii. Field/Sector: The choice of field or sector follows the selected Action Type; iv. Program Linkages: Program linkages accommodate information and relationships between activities carried out by the person responsible for the activity and programs that have been initiated by the government. c. Form 3 i. Technology Transfer; ii. Capacity Increase; iii. Funding Status; iv. Source of funds; v. Amount of Domestic Funds; vi. Amount of International Funds; vii. Experts. d. Form 4 (location of activity) i. Latitude; ii. Longitude; iii. Province; iv. Regency/City; v. Subdistrict; vi. Village/Subdistrict. e. Form 5 (Person in charge of activities) i. Full name; ii. Mobile phone number; iii. Email address. f. Form 6 (Verifier) i. Full name; ii. Institution; iii. Mobile phone number; iv. E-mail; v. Address. g. Form 7 (Upload supporting documents, if any, for example): i. Proposal Document: Document containing the Activity Plan, background, activity objectives, program implementation location, person in charge and so on; ii. Study Document: Scientific study document that underlies the implementation of activities; iii. Regulatory and statutory data documents: Regulatory and statutory documents related to the implementation of activities; iv. Other documents related to activities.

Stage II	In this step, the person responsible for the activity fills in the technical data form in accordance withThe criteria for registered activities are adaptation, mitigation, joint adaptation and mitigation activities and other related activities. Climate Change Mitigation technical data includes: a. Form 1 i. Activity Scheme: The person in charge of the activity selects the activity scheme with the No Data option; JDM (Joint Crediting Mechanism); VCS (Verified Carbon Standard); CDM (Clean Development Mechanism) and others; ii. Activity Basis: The Person in Charge of the Activity fills in the activity basis or activity background; iii. Baseline: The Person in Charge of Activities selects baseline information consisting of National, Provincial, Regency, Management Unit and Project/Activity; iv. Baseline Determination Methodology: The person responsible for the activity fills in the description of the baseline determination method by selecting Historical Based; Forward Looking and Adjust Forward Looking; v. Baseline Data: a) Base Period/Year; b) Baseline emissions (in Thousand Tons CO2e/year); c) Conditions before/without the action being carried out vi. Emissions After Mitigation: a) Planning Target (end of activity period / per year); b) Conditions after mitigation is implemented b. Form 2 (Calculation of the amount of emission reduction and/or increase in IGRK from mitigation actions) i. Methodology; ii. Activity Data; iii. Emission Factors. c. Form 3 (Monitoring) i. Monitoring Techniques; ii. Monitoring Frequency; iii. Monitoring Instruments. d. Form 4 (Other) i. Financial support; ii. Managerial Systems; iii. Benefits of Carbon. The SRN secretariat team validated the technical data. If there is incomplete data then the teamThe SRN secretariat will return the technical data form to the person in charge of the activity for completion. SRN provides the registration number to the person responsible for the activity via electronic mail.
Stage III	In this step, the SRN secretariat team fills in a verification data form for each activity technical data component, where the SRN secretariat team verifies the reduction in emissions from actions and use of resources reported by business actors. If there is incomplete data, the SRN secretariat team will return the form to the person in charge of the activity. However, if it is complete, activities that have been verified are given verified status.

Apart from registering an account and registering activities carried out by business actors as explained above, the table of stages for registering business actors with the SRN also touches on MRV. MRV is defined as activities to ensure that data and/or information on Climate Change Mitigation Actions and Climate Change Adaptation actions have been implemented in accordance with established procedures and/or standards and are guaranteed to be correct.[226]MRV is carried out on the implementation of Carbon Trading, Performance Based Payments, and other NEK organizing mechanisms.[227] MRV includes activities carried out by business actors and/or the government, regional government and the community as implementers of the NEK, where these parties must carry out the preparation of documents and report on the results of the implementation of the NEK.[228] The preparation of the document will then be validated by a party called the validator and the report will be verified by a party called the verifier.[229] Both validators and verifiers must meet certain criteria, as required by statutory regulations. These criteria include:[230]

226 Article 1 number 30 of MOEF Reg. 21/2022
227 Article 38 letters a, b and c of MOEF Reg. 21/2022
228 Article 39 paragraph (1) letters a and b of MOEF Reg. 21/2022
229 Article 39 paragraphs (3) and (6) and Article 40 paragraph (1) of MOEF Reg. 21/2022
230 Article 40 paragraph (2) letters a, b and c of MOEF Reg. 21/2022

i. Accredited by the national accreditation committee; and
ii. Have competence as a validator and verifier of climate change mitigation action achievements within the framework of the NEK, as proven by the following qualifications:[231]
    a. Have a certificate in accordance with Indonesian national work competency standards in the field of validation and verification of GHG emission reduction;
    b. Have at least 2 (two) years of experience.

As a minimum requirement, validators and verifiers must fulfill at least 2 (two) qualifications in order to legally act as validators and verifiers. However, in the event that validators and verifiers who have met the qualifications are not sufficient, validation and verification can be carried out by experts registered in the SRN PPI. So, based on the explanation above, parties who need to fulfill certain requirements cannot be selected outside of the specified requirements and qualifications.
Specifically for carbon trading with the GRK Emission Offset mechanism, to engage in this specific mechanism within the forestry sector (as the example), businesses need to follow several procedures as outlined below:

i. Preparation[232]

Stages:

i. Preparation and determination of a Carbon Trading road map for the forestry sector.
ii. Determination of provision of emission reduction reserves (*buffers*).
iii. Determination of the GHG Emission Baseline in the forestry sector.
iv. Determination of forestry sector emission reduction targets.

ii. Climate Change Mitigation Action Plan Document ("DRAM")[233]

Stages:

i. Business actors arrange DRAM.
ii. The validator validates the DRAM, and the results of the validation are stated in a report and submitted to business actors.
iii. Business actors record DRAM and report validation results on SRN PPI.

iii. Report on the results of implementing Climate Change Mitigation Actions[234]

Stages:

i. Business actors prepare reports on the results of implementing Climate Change Mitigation Actions each structuring period.
ii. The verifier verifies the report, and the results of the verification are included in the report and submitted to the business actor.
iii. Business actors record reports on the results of implementing Climate Change Mitigation Actions and these reports are recorded in the PPI SRN.

iv. Final review[235]

Stages:

i. The Director General of Climate Change formed an MRV team to carry out a final review of the records made by business actors on the SRN PPI.
ii. Based on the results of the MRV team's study, the Director General of Climate Change issued the SPE-GRK.
iii. After SPE-GRK is published, only then can business actors trade carbon with the SPE-GRK commodity itself.

Based on the procedures above, new business actors can carry out Carbon Trading using either the Carbon Trading/ETS mechanism or the GHG Emission Offset as the mechanism has been explained above. However, after carrying out Carbon Trading in such a way, business actors have obligations that must be carried out in relation to achieving Indonesia's NDC targets. This obligation is to record the implementation of NEK, where

231 Article 40 paragraph (3) letters a, b, c, and d of MOEF Reg. 21/2022
232 Articles 11 and 12 of MOEF Reg 7/2023
233 Article 15 of MOEF Reg. 21/2022
234 Article 16 of MOEF Reg. 21/2022
235 Article 17 of MOEF Reg. 21/2022

business actors as one of the NEK organizers are obliged to record Carbon Units in the SRN PPI[236], in which it functions to providing data and web-based information about actions and resources for Climate Change Mitigation, Climate Change Adaptation, and NEK in Indonesia.[237]Business actors are required to record the results of NEK implementation, both for emissions trading and GHG Emission Offsets to SRN PPI, where the recording of NEK implementation for emissions trading mechanisms and GHG Emissions Offsets has differences in the matters that need to be recorded by business actors. Things that need to be recorded by business actors in the event that business actors carry out emissions trading and GHG Emission Offsets to SRN PPI are as follows:

Emissions Trading[238]	GHG Emissions Offset[239]
a. Business actor data; b. PTBAE-PU; c. PTBAE-PU transaction results; d. Monitoring and evaluation plan for implementing climate change mitigation actions; e. Results of emissions reduction achievements during the PTBAE-PU measurement structuring period; f. Verification results by the verifier; g. SPE-GRK; h. Movement of SPE-GRK domestically and abroad; i. Transfer of emission reduction achievements among PTBAE-PU owners.	a. Business actor data; b. Report on the results of GHG emission reduction achievements in each measurement, reporting and verification period; c. Validation results by validators; d. Verification results by the verifier; e. Amount of SPE-GRK that can be traded via GHG Emission Offset; f. Domestic SPE-GRK movement; g. SPE-GRK's move abroad during the first transfer; and h. SPE-GRK live trading results.

Apart from recording the implementation of NEK by business actors to the SRN PPI, business actors are also required to record Carbon Units to the SRN PPI for:

i. the emission achievement results that are above PTBAE-PU, or if the emission achievement results are below PTBAE-PU, it must contain at least information about:[240]
   d. issuance of SPE-GRK and PTBAE-PU;
   e. domestic transfer of Carbon Units;
   f. movement of Carbon Units abroad during the first transfer in SRN by the MOEF;
   g. the results of the annual emission balance obtained by adding up the actual emissions from the GHG emissions inventory plus Carbon Units from PTBAE-PU and the results of emissions reduction achievements from PTBAE-PU, and SPE-GRK which were first transferred abroad;
   h. transfer of Carbon Units or emission reduction certificates during the first transfer abroad through the international registry system as a recording adjustment;
   i. first transfer of carbon exchange, both domestically and foreign; and
   j. final results for the trading of PTBAE-PU and SPE-GRK emissions on the carbon exchange,

ii. SPE-GRK, which at least contains information regarding:[241]
   c. SPE-GRK holder data;
   d. emission reduction performance in each measurement, reporting and verification period;
   e. the amount of SPE-GRK that can be traded through the GHG Emission Offset;
   f. domestic SPE-GRK movement;
   g. SPE-GRK transfers abroad are recorded during the first transfer in the SRN PPI;
   h. SPE-GRK direct trading results at the end of the year;
   i. movement of SPE-GRK during the first transfer abroad to the international registry system as a recording adjustment;
   j. transfer of SPE-GRK to countries or overseas cooperation partners during the first transfer, followed by recording of the first transfer in the international registry system; and

236 Article 52 paragraph (1) of MOEF Reg. 21/2022
237 Article 1 number 25 of MOEF Reg. 21/2022
238 Article 44 paragraph (1) letter b of MOEF Reg. 21/2022
239 Article 46 paragraph (1) letter d of MOEF Reg. 21/2022
240 Article 52 paragraph (2) letter a jo paragraph (3) of MOEF Reg. 21/2022
241 Article 52 paragraph (2) letter b in conjunction with paragraph (4) of MOEF Reg. 21/2022

k. the results of the annual emission balance obtained by the actual number of emissions from the GHG emissions inventory plus the SPE-GRK transfer, GHG Emission Offset plus the SPE-GRK transfer to countries and overseas cooperation partners, and

iii. results of GHG Emission reduction achievements in Performance Based Payments, which at least contain information regarding:[242]
   d. GHG Emission reduction performance;
   e. incentives received from performance-based payments; and
   f. incentives received from benefits other than carbon.

So, if a business actor wants to carry out Carbon Trading (both emissions trading and/or GHG Emissions Offset), it is important for that particular business actot to record the NEK implementation made to SRN PPI. As of the date of making this White Paper, there have been no sanctions related to business actors' non-compliance in not recording the results of NEK implementation to the SRN PPI. However, we note that there is a possibility that the provisions regarding these sanctions can be regulated by the relevant institutions and can be imposed on business actors who violate these provisions.

4.3.4.2 Domestic Carbon Trading

Business actors who have SPE-GRK can carry out Carbon Trading domestically, abroad, or across sectors,[243] all three of which must be done via SRN. SPE-GRK is verified by an independent verifier, and considered by the MOEF for issuance of the SPE-GRK through the SRN system. In the event that the MOEF decides to issue SPE-GRK, business actors will be given a certificate number, where the certificate number (SPE-GRK)is an item that is bought and sold.

4.3.4.3 Cross-Sector Carbon Trading (Both Domestic and Foreign)

Carbon trading can be done across sectors. Implementation of Climate Change Mitigation is carried out in sectors and sub-sectors:[244]

Sector	Sub Sector
a. energy; b. waste; c. industrial processes and product use; d. agriculture; e. forestry; and/or f. other sectors in accordance with developments in science and technology.	a. power-plant; b. transportation; c. building; d. solid waste; e. liquid waste; f. garbage; g. industry; h. rice fields; i. farm; j. plantation; k. forestry; l. peat and mangrove management; and/or m. Other sub-sectors are in accordance with developments in science and technology.

242 Article 52 paragraph (2) letter c jo. paragraph (5) of MOEF Reg. 21/2022
243 Article 13 paragraph (5) of MOEF Reg. 21/2022
244 Article 7 paragraphs (1), (2), and (3) of MOEF Reg. 21/2022

Implementation of Climate Change Adaptation is carried out in the areas of:[245]

Field
a. food; b. water; c. energy; d. health; e. ecosystem; and/or f. others in accordance with developments in science, technology, resilience needs and national capacity.

Foreign cross-sector Carbon Trading is carried out if the sub-sector GHG emission reduction targets and/or climate change mitigation action plans have been achieved. Meanwhile, domestic cross-sector Carbon Trading is carried out based on cross-sector Carbon Trading quotas determined by MOEF.[246]
Cross-sector Carbon Trading must also (i) be carried out after the relevant minister determines and submits plans and strategies for achieving NDC targets to the MOEF, (ii) must be after achieving NDC targets in the relevant sub-sector or sub-sub-sectors for foreign Carbon Trading, and (iii)) must obtain authorization from the MOEF.[247]

4.3.4.4 Foreign Carbon Trading

As explained above, the business actors that are carrying out foreign Carbon Trading are required to carry out registration through the SRN PPI first. This is because Carbon Trading abroad must first meet the domestic carbon targets. The procedures followed in domestic trade must be followed in advance by business actors who wish to carry out foreign trade, including obtaining validation of general data and special data via SRN.

However, to carry out foreign trade, business actors must also submit an application and authorization from the government, as explained below. Thus, foreign Carbon Trading has a longer procedure than domestic Carbon Trading. Authorization of applications submitted by business actors to carry out foreign trade will first consider whether the domestic NDC target has been met or not, and whether the project is considered suitable for sale on an international scale or not. In the event that the domestic NDC target has been met, and/or the project is deemed suitable for trading abroad, the MOEF will issue authorization.

Requirements of foreign Carbon Trading are as follows:[248]

i. In accordance with the Carbon Trading road map for both sectors and sub-sectors prepared and determined by the relevant minister;
ii. Providing an emission reduction reserve (buffer), which is the setting aside of a number of Carbon Units as a risk control in achieving the NDC target due to Carbon Trading carried out throughout the year before 2030;
iii. Must be in the form of SPE-GRK for cross-sector Carbon Trading;
iv. Carried out after the relevant minister determines and submits plans and strategies for achieving NDC related to the sector or sub-sector to the Minister;
v. Has achieved the NDC target in the sub-sector or sub-sectors for foreign Carbon Trading; and
vi. Obtain authorization from the MOEF.

Based on the requirements for foreign Carbon Trading that are explained above, the significant difference that can be seen between foreign Carbon Trading and domestic Carbon Trading is in the authorization process that must be carried out by business actors, which is preceded by an approval process by the MOEF.[249]Business actors who wish to carry out foreign Carbon Trading are required to obtain approval and authorization from

245 Article 31 paragraph (2) of MOEF Reg. 21/2022
246 Article 23 paragraph (4) of MOEF Reg. 21/2022
247 Article 4 paragraph (3) of MOEF Reg. 21/2022
248 Article 4 paragraphs (2) and (3) of MOEF Reg. 21/2022
249 Article 20 paragraph (1) of MOEF Reg. 21/2022

the MOEF, where the procedure is as follows:

Article of MOF Reg. 21/2022	MOEF Authorization Procedures:
Foreign Carbon Trading Agreement	
Article 24 paragraph (1)	Business actors submit applications to the MOEF by attaching proposals and draft Carbon Trading cooperation agreements.
Article 24 paragraph (2)	MOEF reviews proposals and draft cooperation agreements by involving the relevant ministers within a maximum period of 14 (fourteen) working days.
Article 24 paragraph (3)	If the results of the review are not appropriate, the MOEF will return the application for completion within a maximum period of 14 (fourteen) working days.
Article 24 paragraph (4)	If the results of the study are appropriate, the MOEF issues an agreement for foreign cooperation in Carbon Trading.
Authorization of Foreign Carbon Trading	
Article 25 paragraph (2)	Business actors submit applications to the MOEF by attaching: a. SPE-GRK which has been issued by the Director General; or b. Emission reduction certificates that have been issued by other certificate issuing institutions that have collaborated on mutual recognition.
Article 25 paragraph (3)	MOEF reviews the application within a maximum period of 14 (fourteen) working days;
Article 25 paragraph (4)	If the results of the review are not appropriate, the MOEF will return the application for completion within a maximum period of 14 (fourteen) working days.
Article 25 paragraph (5)	If the results of the study are appropriate, the MOEF issues an agreement for foreign cooperation in Carbon Trading.

In connection with the authorization given by the MOEF, authorization for applications submitted by business actors to the MOEF in the context of implementing foreign Carbon Trading can be given to business actors if the business actor concerned wishes to carry out the process of transferring Carbon Units[250] owned (either addition or subtraction of Carbon Units owned). Furthermore, the transfer of Carbon Units from one business actor to another is carried out based on the project carried out by the business actor.[251]So, in the event that the a business actors wants to sell or purchase Carbon Units for a project carried out by themselves or with another party, the business actor needs authorization by the MOEF.

Apart from the typical characteristics of foreign Carbon Trading which can be seen from the authorization process by the MOEF, there is another process that is specific to foreign Carbon Trading. This process is called a recording adjustment (corresponding adjustment), where the corresponding adjustment is a process that is carried out to avoid double registration (double counting) of the transfer of Carbon Units from business actors to other business actors. Implementation of corresponding adjustments is carried out based on the obligation of business actors to record the results of NEK implementation. As explained above in this White Paper, business actors are required to record the results of NEK implementation, both for emissions trading and GHG Emissions Offsets. The recording of the results of NEK implementation related to corresponding adjustments in the emissions trading mechanism can be seen in the recording of data on SPE-GRK movements within the country and abroad.[252] Based on the results of recording emissions trading that has been carried out by

250 Article 25 paragraph (1) of MOEF Reg. 21/2022
251 Appendix I.B to of MOEF Reg. 21/2022
252 Article 44 paragraph (1) letter b number 8 of MOEF Reg. 21/2022

business actors, the MOEF will then prepare an annual emissions trading report,[253]one of which contains the transfer of SPE-GRK abroad when the corresponding adjustment is carried out.[254]

After that, business actors as one of the NEK organizers are also required to record Carbon Units in the carbon registry (SRN PPI),[255] where the recording results include emission achievements below and above PTBAE-PU[256]. The recording of the results of these achievements at least contains information regarding the transfer of Carbon Units or emission reduction certificates during the first transfer abroad through the international registry system as a corresponding adjustment.[257]So, corresponding adjustments in emissions trading are carried out by business actors in the event that business actors have transferred Carbon Units through the international registry system, which then records the transfer of Carbon Units to SRN PPI to find out if there is a corresponding adjustment.

So, in the case of business actors carrying out emissions trading, business actors only need to record emissions trading and record Carbon Units (transfer of Carbon Units to other business actors abroad) so that the MOEF can issue annual emissions trading reports on corresponding adjustments. which has been carried out previously based on recording in the international registry system and adjusted to the implementation of recording the transfer of Carbon Units to the SRN PPI as explained above.

On the other hand, regarding the corresponding adjustments carried out in the GHG Emission Offset mechanism, there are differences in data recording relating to the implementation of the NEK carried out by business actors. In the GHG Emission Offset mechanism, record of results of NEK implementation related to corresponding adjustments in the emissions trading mechanism are shown in SPE-GRK to abroad during first transfer.[258] Based on the recording of GHG Emission Offsets that have been carried out by business actors, the MOEF will then prepare an annual GHG Emission Offset report[259] one of which contains the transfer of SPE-GRK to abroad, when the corresponding adjustment is carried out.[260]

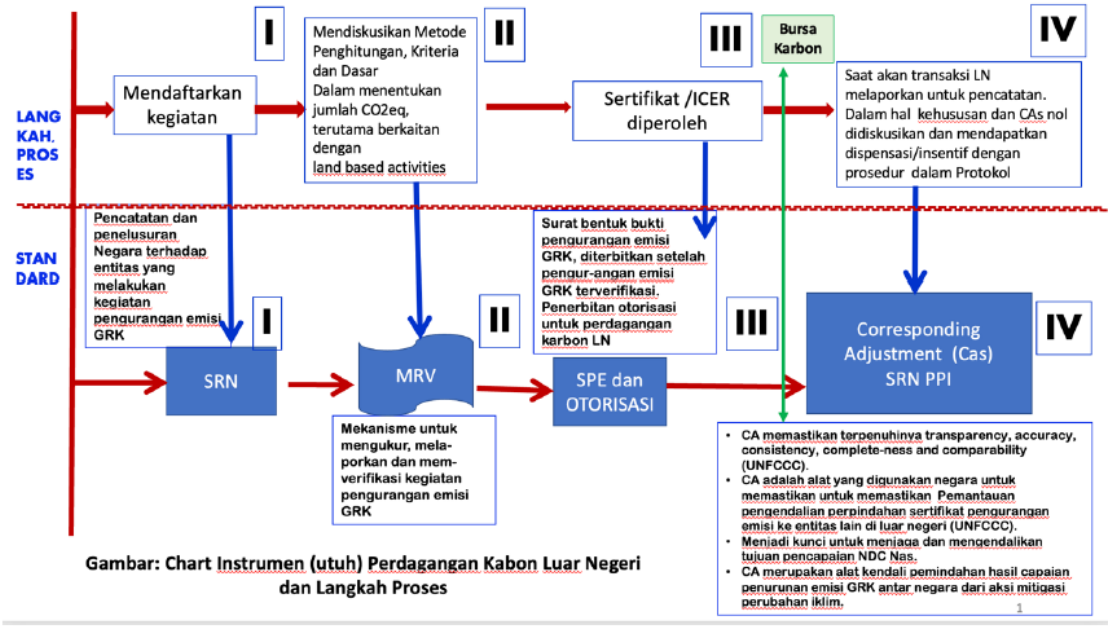
After that, just like emissions trading, business actors as one of the NEK organizers are also required to record Carbon Units in the SRN PPI[261] one of which includes the recording of the results of SPE-GRK[262].The recording of the results of these achievements at least contains information regarding the movement of SPE-GRK during the first transfer to abroad through the international registry system as a corresponding adjustment.[263] So, just like emissions trading, the corresponding adjustment in the GHG Emission Offset is carried out by the business actor in the event that the business actor has transferred SPE-GRK through the international registry system, which then the business actor records the SPE-GRK transfer to SRN PPI to find out if there is a corresponding adjustments.

So, business actors only need to record the GHG Emission Offset and record Carbon Units in the SRN PPI every time a carbon unit is transferred, then a GHG Emission Offset report will be prepared for the corresponding adjustments that have been made previously based on the recording in the registry system.international and adjusted to the implementation of recording the transfer of Carbon Units to SRN PPI.

Thus, in general it can be concluded and simplified that the flow of foreign Carbon Trading can be depicted

253 Article 45 paragraph (1) of MOEF Reg. 21/2022
254 Article 45 paragraph (2) letter b of MOEF Reg. 21/2022
255 Article 52 paragraph (1) of MOEF Reg. 21/2022
256 Article 52 paragraph (2) letter a of MOEF Reg. 21/2022
257 Article 52 paragraph (3) letter e of MOEF Reg. 21/2022
258 Article 46 paragraph (1) letter d of MOEF Reg. 21/2022
259 Article 45 paragraph (1) of MOEF Reg. 21/2022
260 Article 45 paragraph (2) letter b of MOEF Reg. 21/2022
261 Article 52 paragraph (1) of MOEF Reg. 21/2022
262 Article 52 paragraph (2) letter b of MOEF Reg. 21/2022
263 Article 52 paragraph (4) letter g of MOEF Reg. 21/2022

through a chart as follows:[264]



Gambar: Chart Instrumen (utuh) Perdagangan Kabon Luar Negeri dan Langkah Proses

4.3.4.5 Mutual Recognition

MOEF Reg. 21/2022 introduces mutual recognition. It states that certificates issued by external certification bodies can be deemed equivalent to the SPE-GRK standard through collaboration and acknowledgment by the Minister.[265] MOEF will oversees this process, especially in the context of foreign Carbon Trading.[266] The mutual recognition process involves steps such as information exchange, compliance assessment, and publication of certifications that is recognized by both parties in the SRN PPI.[267]

4.3.5 MOEF Reg. 7/2023

Indonesia aims to both achieve its own climate goals and contribute to the Paris Agreement's objectives. To make this happen, Indonesia is using Carbon Trading in its forestry sector. On June 14, 2023, the MOEF introduced procedures for Carbon Trading, specifically in the forestry sector through MOEF Reg. 7/2023. This regulation highlights actions to mitigate climate change and trading activities related to carbon. Indonesia's commitment to a balanced global temperature is also evident in its FOLU (Forestry and Other Land Uses) Net Sink 2030 plan, aiming to reduce emissions from forests and land sectors while maintaining a higher absorption rate than emissions by 2030.

264 Minister of Environment and Forestry Position Paper
265 Article 68 paragraph (1) of MOEF Reg. 21/2022
266 Article 68 paragraph (2) of MOEF Reg. 21/2022
267 Article 68 paragraph (3) of MOEF Reg. 21/2022

Forestry sector Carbon Trading for permanent production forest areas, convertible production forest areas and protected forest area utilization blocks that have been burdened with Forest Utilization Business Licensing (*Perizinan Berusaha Pemanfaatan Hutan* – "**PBPH**"), approval for social forestry management , or management rights, is exercised on condition that (i) implement a mechanism GHG emissions offset, and (ii) implemented by the holder of PBPH, social forestry management approval, or management rights.[268]

4.3.5.1 Climate Change Mitigation Actions in the Forestry Sector

Climate Change Mitigation Actions (*Pelaksanaan Aksi Mitigasi Perubahan Iklim*) are activities that may reduce GHG emissions, increase carbon sequestration and/or storage/strengthen carbon stocks. The implementation of Climate Change Mitigation Actions in the forestry sector may be carried out through carbon trading, which includes reduction of GRK emission and storage and/or sequestration of forest carbon.

The implementations of Climate Change Mitigation Actions may be carried out through the following activities:
a. Reduction of the rate of deforestation of mineral lands;
b. Reduction of the rate of deforestation of peatlands and mangroves;
c. Reduction of the rate of forest degradation of mineral lands;
d. Reduction of the rate of forest degradation of peatlands and mangroves;
e. Development of plantation forests;
f. Sustainable forest management;
g. Rehabilitation by rotation;
h. Non-rotational rehabilitation;
i. Peat restoration;
j. Improvement of peat water systems;
k. Mangrove rehabilitation;
l. Afforestation in ex-mining areas;
m. Construction of permanent nurseries;
n. Rehabilitation of plants under 5 (five) years old;
o. Conservation of biodiversity;
p. Social forestry;
q. Mentoring in customary forests;
r. Introduction of ecosystem replication;
s. Development of green open spaces;
t. Eco-riparian activities;
u. Supervision and law enforcement to support the protection and security of Forest Areas (Kawasan Hutan); and/or
v. Other activities in accordance with the development of science and technology.

Furthermore, carbon trading within the forestry sector is stipulated to occur in the forestry sub-sector and peat and mangrove management sub-sector, encompassing the following sub-sub-sectors:
a. State Forest Areas that are not subject to any licensing, approval, or right-to-manage;
b. Working areas of licensing/approval units;
c. Right-to-manage working areas;
d. Customary Forest Areas;
e. Private Forest Areas; and
f. State forests that are not designated as Forest Areas.

268 Article 7 in conjunction with Article 6 letter a of MOEF Reg. 7/2023

4.3.5.2 Emission Trading

Carbon trading in the forestry sector involves the execution of emission trading and GRK emission offsets, targeting the following areas:[269]

a. Permanent production Forest Area, convertible production Forest Area, and protected Forest Area utilization blocks subject to PPBH, social forestry management approval (persetujuan pengelolaan perhutanan sosial), or right-to-manage;
b. Permanent production Forest Area, convertible production Forest Area, and protected Forest Area utilization blocks not subject to PBPH, social forestry management approval, or right-to-manage;
c. Other protected Forest Area blocks;
d. Peat and mangrove areas within Forest Areas;
e. Peat and mangrove areas outside Forest Areas;
f. Conservation Forest Areas;
g. Customary forests;
h. Private forest areas; and
i. State forests outside Forest Areas.

Actors participating in carbon trading within the forestry sector are bound by the following provisions:[270]

a. Holders of PBPH, right-to-manage, and ownership right forest owners must possess sustainable forest management certificates, forest product legality certificates, or forest product declarations, complying with applicable laws and regulations.
b. Holders of social forestry management approvals (Persetujuan Pengelolaan Perhutanan Sosial) must attain at least the silver classification within the organization of social forestry, as per the stipulations of laws and regulations.
c. Customary law communities, holders of social forestry management approvals, and private forest owners engaging in GRK emission offset businesses and/or activities must secure mentoring or partners with experience or expertise in carbon measurement, project planning and implementation, or accessing carbon markets.

As per the terms of MOEF Reg. 7/2023, it is evident that the entities eligible for carbon trading in the forestry sector are limited to project businesses holding rights to forest concessions or land rights, and those engaged in social forestry or customary community forestry.

As for the description of the implementation of forestry sector Carbon Trading, Article 10 of MOEF Reg. 7/2023 that Forestry Sector Emission Trading as intended in Article 5 letter a of MOEF Reg. 7/2023 (Emission Trading) is carried out through:

a. Formulation and stipulation of a Carbon Trading road map for the Forestry sector;
b. determining the provision of emission reduction reserves (buffers);
c. determination of PTBAE for peat management in the peat and mangrove management sub-sector;

269 Article 6 of MOEF Reg. 7/2023
270 Article 8 of MOEF Reg. 7/2023

d. determination of PTBAE-PU;
e. determining peat management quotas in the peat and mangrove management sub-sector;
f. actual emission measurements;
g. submission of PTBAE-PU reports;
h. Verify PTBAE-PU report;
i. Verification results report; and
j. Implementation:
    1. Domestic Emission Trading and/or fellow PTBAE-PU owners; or
    2. Storage,
    towards the remaining unused Upper Limit of GHG Emissions and/or GHG Emission quota.

As for the mechanism of GHG Emission Offset as intended in Article 5 letter b, Article 11 of MOEF Reg. 7/2023 regulates to be carried out through:
a. preparation and determination of a Carbon Trading road map for the Forestry sector;
b. determining the provision of emission reduction reserves (buffers);
c. determination of the Forestry sector GHG Emissions Baseline;
d. setting emission reduction targets for the Forestry sector;
e. DRAM arrangement;
f. DRAM Validation;
g. DRAM Validation results report;
h. Report on the results of implementing Climate Change Mitigation Action;
i. Verification of reports on the results of implementing Climate Change Mitigation Actions;
j. preparation of reports on the results of Verification of the implementation of Climate Change Mitigation Actions;
k. establishment and review by MRV; and
l. SPE-GRK issuance.

Furthermore, the provision of emission reduction reserves (buffers) is carried out for Emissions Trading which has SPE-GRK, domestic GHG Emissions Offset, foreign GHG Emissions Offset and foreign GHG Emissions Offset outside the scope of the NDC. The amount of provision of emission reduction reserves (buffers) is determined in the forestry sector Carbon Trading roadmap established by the MOEF.[271]

MOEF Reg. 7/2023 implies that foreign Carbon Trading can be carried out if the Minister has determined the highest amount that can be traded abroad; In connection with this matter, determining the highest amount that can be carried out by Carbon Trading can be carried out with the following provisions:

271 Article 12 of MOEF Reg. 7/2023

a. the annual average achievement of targets for reducing GHG emissions and storing and/or sequestering forest carbon for business actors within a certain period of time shows above the sub-sector NDC targets;
b. there are Business Actors who do not achieve the targets for reducing emissions or storing and/or sequestering forest carbon, in the above term; and
c. the specific time period as intended in letters a and b is determined based on the NDC target setting period.

4.3.5.3 PNBP

This regulation also outlines the collection of non-tax state revenues related to Carbon Trading within the forestry sector.[272] These revenues are obtained in the form of non-tax state receipts derived from the utilization of forests for carbon absorption and storage activities. Such revenue is generated through transactions involving both GHG Emission Reduction Offset (*Offset Emisi GRK*) trading and Emission Trading (*Perdagangan Emisi*). The payment of these non-tax state revenues is managed through the Non-Tax State Revenue Information System (SIPNBP), and the determination of the revenue types and rates is carried out in accordance with relevant legislative provisions.

4.3.5.4 Issuance of SPE-GRK

Each issuance of SPE-GRK undergoes systematic recording in SRN PPI, involving the assignment of a registration number and/or code upon the execution of outstanding PTBAE-PU and GRK Emissions reduction.

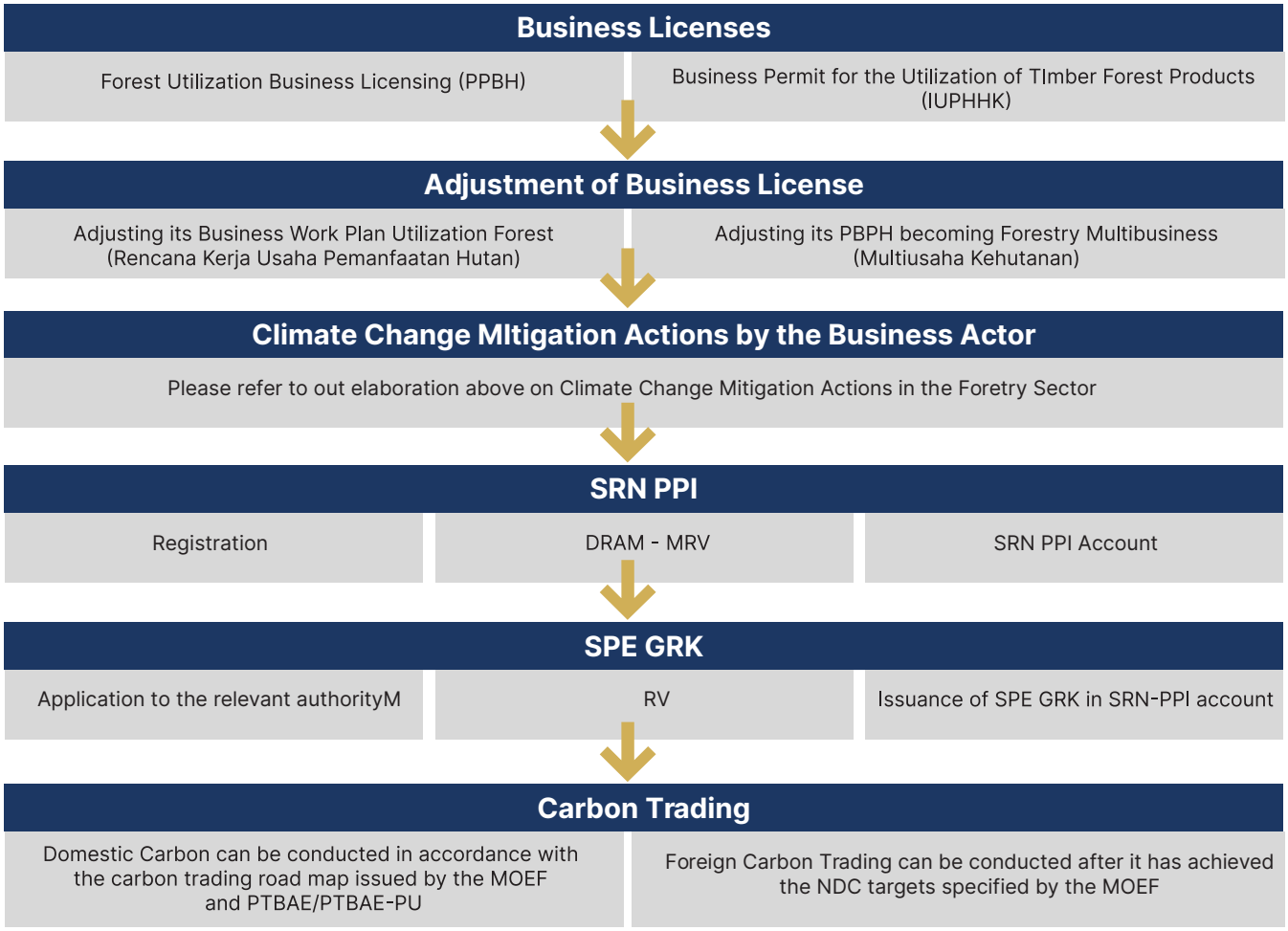
The issuance of SPE-GRK for the remaining PTBAE-PU unfolds through the following stages:
a. Registration in the SRN PPI: The initial step involves registering the performance in the SRN PPI.
b. Low-emissions Activity Plan and/or Climate Change Mitigation Actions Plan: Subsequently, a comprehensive plan detailing low-emissions activities and Climate Change Mitigation Actions is devised.
c. Reporting of PTBAE-PU Implementation Results: Business actors involved in PTBAE-PU report on the implementation results.
d. Verification by Verifiers: Independent verifiers assess and verify the reported data.
e. Issuance of SPE-GRK: Finally, the performance of the remaining PTBAE-PU is formally issued in the form of an SPE-GRK.

The issuance of SPE-GRK from GRK Emissions reduction performance involves the following stages:
a. Registration in the SRN PPI: Initiated with the registration in the SRN PPI.
b. Planning and Preparation of the DRAM: Subsequent steps include planning and preparing the DRAM.
c. DRAM Validation by Validators: The DRAM undergoes validation by designated validators.
d. Implementation and Monitoring of Climate Change Mitigation Actions: Once validated, the Climate Change Mitigation Actions are implemented and monitored.
e. Verification of the Implementation: Verifiers independently verify the implementation of Climate Change Mitigation Actions.
f. Issuance of the SPE-GRK and Recording: The final stage comprises the issuance of the SPE-GRK and recording the results in the SRN PPI.

Business actors seeking SPE-GRK issuance must submit applications to the Directorate General of Climate Change Control under the Ministry of Environment and Forestry through the SRN PPI. They are required to enclose verification results, prepare the DRAM, obtain validation from validators, and use the validation outcome as the basis for registering the action as a Climate Change Mitigation Action within the SRN PPI.

272 Article 17 of MOEF Reg. 7/2023

4.3.5.5 Flowchart of the Implementation of Carbon Trading in Forestry Sector



4.3.6 MOEMR Reg. 16/2022

MOEMR Reg. 16/2022 contains guidelines for implementation of carbon pricing (NEK) in the power generation sub-sector. It recognizes the need for GHG emission reduction in power generation. Therefore, the regulation is applied to power plants both utilizing fossil fuels and renewable energy resources. The regulation covers 6 points regarding implementation of carbon pricing in this sub-sector. The points can be categorized into 4 (four) parts: determination, designing monitoring plan, Carbon Trading, report and evaluation.

4.3.6.1 Determination of PTBAE

The determination part includes determining the PTBAE and PTBAE-PU. First, the regulation mentioned that GHG Emission Cap for power plant is determined by the Minister based on baseline GHG emission on power plant subsector, NDC target for the subsector, GHG Emissions Inventory results for power generation sub-sector electricity from APPLE-Gatrik, and achievement time of the sub sector NDC target. PTBAE is conducted through 3 (three) phases, the 2023-2024 period (1st phase), the 2025-2027 period (2nd phase), and the 2028-2030 period (3rd phase).

4.3.6.2 Drafting of Monitoring Plan

Business actors involved in Carbon Trading have to design a plan for monitoring every unit of their power

plant GHG emission. The plan consists of a Gross Electricity Production Plan and target GHG emission for power plants. The plan has to be submitted to the Minister through the Director General using the APPLE-Gatrik as medium for the latest time of December 31st before it will be implemented next year. Business actors who failed to submit the monitoring plan cannot be engaged in Carbon Trading on the same period of submission.[273]

4.3.6.3 Determination of PTBAE-PU

Determination of PTBAE-PU is conducted by the Director General considering PTBAE for every type of power plants, data of average GHG emission intensity, and data on average GHG emission, and must be conducted no later than every 31st January.[274] PTBAE-PU allocated to businesses cannot exceed the PTBAE.[275]

However, if the data for the consideration above are unavailable, then PTBAE-PU should be calculated proportionally through comparisons of operational power-plant units that meet the following criteria:[276]

a. Have the same classifications;
b. Have equal mounted capacities; and
c. Utilize the same technologies.

Business actors that have received PTBAE-PU are obligated to engage in Carbon Trading.[277]

For periods beyond 2023, PTBAE-PU allocations will be granted based on the results of Trading transactions that are completed by the relevant PLTU during the course of the previous year and will encompass the following provisions:[278]

a. If Trading transactions amount to at least 85%: the PTBAE-PU allocation will be granted in accordance with the Trading transaction result; or
b. If Trading transactions amount to less than 85%: 85% of the PTBAE-PU allocation will be granted.

4.3.6.4 Carbon Trading in Energy Sector

The regulation also detailed mechanisms on Carbon Trading. Carbon Trading period began on January 1st and ended on December 31st. The transaction is calculated at the end of the period based on PTBAE-PU and SPE-GRK performance. Surplus emission can be traded in the next period and available for the latest period of 2 (two) years. The surplus cannot be converted into SPE-GRK. The Carbon Trading can be done domestically and internationally based on the Carbon Trading roadmap for the power generation sub sector through emission trading and/or carbon offset mechanism.[279]

273 Article 7 and 9 of MOEMR Reg. 16/2022
274 Article 10 paragraph (1) and (3) of MOEMR Reg. 16/2022
275 Article 10 paragraph (2) of MOEMR Reg. 16/2022
276 Article 10 paragraph (4) of MOEMR Reg. 16/2022
277 Article 10 paragraph (5) of MOEMR Reg. 16/2022
278 Article 12 paragraph (2) of MOEMR Reg. 16/2022
279 Article 13 of MOEMR Reg. 16/2022

The following table provides an overview of the applicable Trading requirements:

Articles in MOEMR Reg 16/2022	Trading Aspects
Article 13 paragraph (2)	Calculation of trading transaction shall be calculated at the end of the relevant Trading period in accordance with the performance of the following: 1. PTBAE-PU; and/or 2. SPE-GRK
Article 13 paragraph (3), (4), and (5)	While any surplus of PTBAE-PU may be traded during the following year, said permission will only remain valid for two years after the most recent Trading period and may not exceed the relevant PTBAE phase. Moreover, surplus PTBAE-PU may not be used in order to apply for SPE-GRK.
Article 14 paragraph (4)	Trading should be carried out through the following means: 1. Carbon market mechanism through the carbon exchange; and/or 2. Direct Trading.
Article 15 paragraph (1)	This mechanism cannot be implemented between power plants located within a single power-plant area unit.
Article 16	GHG offset mechanism should be implemented if: 1. The relevant businesses and/or activities have not yet secured PTBAE but have provided GHG reduction statements in relation to other mitigation efforts; and 2. The business and/or activities have secured SPE-GRK in relation to Emissions reduction activities undertaken within the energy sector (e.g. power plants that utilize new and renewable sources of energy).
Article 17	Energy-sector emissions reduction certificates that are issued by other certification agencies may be classified as equivalent to SPE-GRK and may be utilized through the GHG offset mechanism.

4.6.3 Carbon Trading in Energy Sector

Lastly, business actors involved in Carbon Trading are required to submit reports that will undergo evaluation. The report submitted is of every power plant unit with data on its activity and exploitation. The report is to be submitted through APPLE-Gatrik for the latest time of January 31st of the next year.[280] After submission, the report will be evaluated by the Director General. During the process, the Minister through the Director General has the ability to do field verification and/or inquire about other supporting documents.[281] If the evaluation result deemed the reports to be inadequate, it will be returned and the business actor has the opportunity to revise it and resubmit the document at the latest time of 5 working days upon the returned document time. Upon failure of revision during the designated time, the business actor will be considered not delivering any report.[282] If the report has been deemed appropriate during the evaluation process it will continue to undergo the validation and verification process by an independent party.[283] The Minister through the Director General will conduct evaluation on Carbon Trading implementation. If the result shows a lack of supply of PTBAE-PU in the carbon market, PTBAE-PU tender will be held. Outcome of the tender will be used for other GHG emission reduction action in the sub-sector.[284]

4.3.7 Regulations on Carbon Trading Through Carbon Exchange in Indonesia

4.3.7.1 POJK 14/2023

PPSK Law mandates market organizers in the capital market to conduct Carbon Trading through the Carbon Exchange by enacting POJK 14/2023. These organizers must first obtain a business permit from the OJK.

280 Article 21 paragraph (4) of MOEMR Reg. 16/2022
281 Article 23 paragraph (2) of MOEMR Reg. 16/2022
282 Article 24 of MOEMR Reg. 16/2022
283 Article 25 and 26 of MOEMR Reg. 16/2022
284 Article 30 and 31 of MOEMR Reg. 16/2022

Therefore, to establish a regulatory framework for Carbon Exchange Organizers, covering the application process, governance, requirements, and supervision, the OJK has issued a regulation as a follow-up to its mandate. This regulation guides institutional aspects and supervision of Carbon Trading through the Carbon Exchange, serving as a reference for market organizers and assisting the OJK in coordinating with relevant ministries or institutions involved in Carbon Trading through the Carbon Exchange.

General Aspects

Carbon units, which function as evidence of carbon ownership, which take the form of certificates/technical approvals and which are stated in single tons of carbon dioxide listed in the SRN PPI. Said Carbon Units are also defined as securities. [285] The requirements for Carbon Units involve mandatory recording in both SRN PPI and with Carbon Exchange Organizers.[286] Additionally, there is a provision allowing Carbon Exchange Organizers to facilitate the trading of Carbon Units from abroad, provided it aligns with applicable laws and regulations.[287]

Foreign Carbon Units that are not listed in SRN PPI must meet specific criteria as follows:[288]

a. including registration, validation, and verification by accredited institutions;
b. eligible to be traded on foreign Carbon Exchanges; and
c. adherence to additional requirements set by OJK.

Lastly, regulatory coordination involves the OJK establishing further requirements in consultation with the MOEF.[289]

Organizational Requirements

Organizers of Carbon Exchange ("**Organizers**") are mandated to operate as limited-liability companies (PT) based in Indonesia,[290] requiring business licenses obtained through the OJK.[291] A critical aspect of this is the necessity for a minimum paid-up capital of Rp. 100 billion, excluding loans, to ensure financial stability.[292]

Transaction of Carbon Units

Transactions of Carbon Units can occur directly between relevant parties or through brokers. Furthermore, organizers may enter into agreements with other parties for tasks such as customer due diligence and creating main service user identity numbers.[293] The Carbon Units eligible for trading on these exchanges include PTBAE-PU and SPE-GRK.[294]

Ownership and Shares

The ownership structure is carefully defined, limiting shares to sui generis institutions, Indonesian citizens/ legal entities, and foreign legal entities (up to a maximum of 20%) with relevant permits. Foreign entities are restricted from securing special rights during decision-making processes. Notably, the use of the nominee arrangement scheme is strictly prohibited, requiring prior OJK approval for any changes in shareholding.[295]

285 Article 1 number 3 and 3 paragraph (1) of POJK 14/2023
286 Article 3 paragraph (2) of POJK 14/2023
287 Article 3 paragraph (3) of POJK 14/2023
288 Article 3 paragraph (4) of POJK 14/2023
289 Article 3 paragraph (5) of POJK 14/2023
290 Article 11 of POJK 14/2023
291 Article 4 of POJK 14/2023
292 Article 13 of POJK 14/2023
293 Article 7 paragraph (3) and (4) of POJK 14/2023
294 Article 5 of POJK 14/2023
295 Article 14 and 15 of POJK 14/2023

Governance and Integrity

The Board of Directors ("**BOD**") and Board of Commissioners ("**BOC**") play a pivotal role, subject to rigorous fit-and-proper tests, ensuring integrity, competence, and expertise. The OJK oversees the compliance of these members with regulatory standards.[296]

Organizers are required to have a minimum of two BOD members domiciled in Indonesia, along with two BOC members. These key figures must refrain from affiliations with each other, holding shares or controlling services users of the Organizers. Engaging in Carbon Unit transactions through the Organizers and involvement in illegal activities, including drug use, are strictly prohibited.[297]

Operational and Compliance Guidelines

Organizers of Carbon Exchanges in Indonesia bear a responsibility to uphold measured, reasonable, and efficient practices in carbon trading. This includes the implementation and utilization of electronic systems capable of processing carbon unit transactions.[298] The organization's framework must facilitate essential functions such as meetings between traders and buyers and carbon unit transaction settlements, which can utilize clearing mechanisms with or without guarantees. These transactions can occur between parties in the same or different sectors, complying with relevant laws and regulations.[299]

During these settlements, Organizers must ensure that participating parties possess adequate risk management, funding, and Carbon Units.[300] Importantly, Organizers are explicitly prohibited from acting as parties completing transactions for their own purposes through their organized systems.[301]

In the course of regular business activities, Organizers are obliged to adhere to nine key obligations. These include providing supporting systems and facilities, establishing robust internal controls and risk management procedures, formulating regulations on service users, traded Carbon Units, trading, and supervision. Additionally, Organizers must administer, store, and maintain all carbon unit trading data for a minimum of five years and take appropriate actions in response to any indications or violations.[302]

Reporting Requirements

Eight matters are required to be reported to the OJK, including: 1) Monthly transaction recapitulation reports (to be submitted within the following five-month period); 2) Annual activity report (to be submitted by no later than the end of the third month after the date of an annual financial statement); 3) Reports on violations and sanctions that are imposed on services users (to be submitted by the following trading day).[303]

4.3.7.2 Regulations Within Indonesian Carbon Exchange

On 26 September 2023, the Indonesian Stock Exchange ("**IDX**") launched the Indonesia Carbon Exchange ("**IDX Carbon**"). IDX has obtained the approval from OJK to organize the IDX Carbon as the Organizers. Below are the key points of the regulations that are enacted by IDX to regulate the IDX Carbon:

Key Points of IDX Decree 00295/2023

IDX Decree 00295/2023 stipulates the regulations on the technical aspects of Carbon Units registration in the IDX Carbon with the key points as follows:

296 Article 16 of POJK 14/2023
297 Article 18 to 21 of POJK 14/2023
298 Article 7 paragraph (1) and (2) of POJK 14/2023
299 Article 7 paragraph (5) and (6) of POJK 14/2023
300 Article 8 paragraph (1) of POJK 14/2023
301 Article 9 of POJK 14/2023
302 Article 24 of POJK 14/2023
303 Article 31 paragraph (1) of POJK 14/2023

Aspects	Remarks
Eligible Carbon Units	PTBAE-PU and SPE-GRK are the Carbon Units that can be registered and traded on the Carbon Exchange.
Facilitation of Foreign Carbon Units	• Carbon exchange providers can facilitate the trading of foreign Carbon Units, whether listed or unlisted in SRN PPI, by submitting registration requests to the OJK. • Trading facilitation begins after obtaining a registered status for the Carbon Units from the OJK.
Approval Authority	• Providers has the authority to approve or reject registration requests from users, prospective users, or relevant ministries. • Providers does not provide assessments of Carbon Units, and it is not responsible for the content, including specifications, of the registered Carbon Units.
Code Assignment	IDX may assign codes for each carbon unit, including those not listed in SRN PPI but recorded in the Carbon Exchange.
User Responsibilities	Users must ensure that registered Carbon Units are not traded, transferred, or retired outside the Carbon Exchange procedures.
Coordination and Fees	• Providers can coordinate with the MOEF or accredited international registration system providers to ensure compliance. • Users are obligated to pay registration fees according to the specified rates

Key Points of IDX Decree 00296/2023

IDX Decree 00296/2023 stipulates the regulations on the technical aspects of the trading of Carbon Units through IDX Carbon with the key points as follows:

Aspects	Remarks
General Provisions	• **Trading Volume**: Units traded on the Carbon Exchange should be in multiples of 1 lot or 1 ton of carbon dioxide equivalent (CO2e). • **Market Segments:** The Carbon Exchange has four segments, including Auction Market, Regular Market, Negotiation Market, and Non-Regular Providers Market. • **Trading Hours**: Trading of Carbon Units occurs during specified market hours, aligning with the Carbon Exchange Time**.**
Auction Markets	• **Units Traded:** PTBAE-PU and SPE-GRK. • **Minimum Price:** Rp1,00.
Regular Market	• **Units Traded**: PTBAE-PU and SPE-GRK. • **SPE-GRK Trading**: Standard grouping set by IDX. • **Participants:** Emission Trading Businesses for PTBAE-PU, and both Emission Trading and Non-Emission Trading Businesses for SPE-GRK.
Negotiation Market	• **Units Traded:** PTBAE-PU and SPE-GRK. • **Participants:** Emission Trading Businesses for PTBAE-PU, and both Emission Trading and Non-Emission Trading Businesses for SPE-GRK. • **Pricing:** Determined by mutual agreement between buying and selling parties.
Non-Regular Market	• **Units Traded**: only SPE-GRK. • **Participants**: Project Owners or designated participants. • **Ownership Transfer**: In case of a designated participant, ownership transfers, and the participant acts as the Project Owner until completion of the trading process. • **Pricing**: Determined by mutual agreement between buying and selling parties with a minimum price of Rp1,00.

Key Points of IDX Decree 00297/2023

IDX Decree 00297/2023 stipulates the regulations on the users of the service from IDX Carbon with the key

points as follows:

Aspects	Remarks
Types of Users	Users of Carbon Exchange services include Emission Trading Businesses, Non-Emission Trading Businesses, Project Owners, and other parties approved by the OJK.
Ministry Participation	Relevant Ministries may utilize facilities provided by the Carbon Exchange in conducting carbon trading activities.
Emission Trading Businesses	• Eligible to acquire PTBAE-PU allocation through purchases in the Carbon Exchange Auction Market. • Allowed to conduct sales and purchases of PTBAE-PU in the Regular Market and Negotiation Market. • Permitted to engage in sales and purchases of SPE-GRK in the Regular Market and Negotiation Market. • Authorized to buy SPE-GRK in the Auction Market and Non-Regular Market. • Able to surrender PTBAE-PU and retire SPE-GRK.
Non-Emission Trading Businesses	• Prohibited from sales and purchases of PTBAE-PU. • Permitted to engage in sales and purchases of SPE-GRK in the Regular Market and Negotiation Market. • Authorized to buy SPE-GRK in the Auction Market and Non-Regular Market. • Able to retire SPE-GRK.
Project Owners	• Obligated to register SPE-GRK according to carbon unit registration regulations. • Allowed to sell SPE-GRK in the Auction Market and Non-Regular Market.

Key Points of IDX Decree 00298/2023

IDX Decree 00298/2023 stipulates the regulations on the supervision of the trading of Carbon Units in IDX Carbon with the key points as follows:

Aspects	Remarks
Trading Supervision	Users of Carbon Exchange services include Emission Trading Businesses, Non-Emission Trading Businesses, Project Owners, and other parties approved by the OJK.
Prohibited Actions	Relevant Ministries may utilize facilities provided by the Carbon Exchange in conducting carbon trading activities.
Monitoring Parameters	• Eligible to acquire PTBAE-PU allocation through purchases in the Carbon Exchange Auction Market. • Allowed to conduct sales and purchases of PTBAE-PU in the Regular Market and Negotiation Market. • Permitted to engage in sales and purchases of SPE-GRK in the Regular Market and Negotiation Market. • Authorized to buy SPE-GRK in the Auction Market and Non-Regular Market. • Ability to surrender PTBAE-PU and retire SPE-GRK.
Trade Monitoring	• Prohibited from sales and purchases of PTBAE-PU. • Permitted to engage in sales and purchases of SPE-GRK in the Regular Market and Negotiation Market. • Authorized to buy SPE-GRK in the Auction Market and Non-Regular Market. • Able to retire SPE-GRK.

5. Evaluating Indonesia's Climate Commitments and Carbon Market Potential

From the previous chapters, we have explored the potential of the carbon market to realize Indonesia's NDC commitments and decarbonization. However, we cannot deny that the successful implementation of the carbon market also depends on the willingness of business participants to engage in the market. Thus, this chapter evaluates the economic implications of the carbon market by assessing the challenges and potential in emission reduction instruments (Command-and-Control, Market-based, and Information-based), showcasing market-based as the most cost-effective means to decarbonization pathway.
In addition, this chapter also explores Indonesia's climate and development pathway, its climate efforts and the interlinking factors to NDC, as well as the challenges in the national climate budget to successfully realize its NDC commitments. This chapter seeks to present an economic analysis of the carbon market as an additional revenue that could finance Indonesia's climate adaptation and mitigation efforts.

5.1. Theoretical Background: *Carbon pricing and its historical progress*

Carbon emission has been indicated as the source of global climate change that creates an adverse impact on economic welfare. In economic theory, carbon emission is categorized as a negative externality. Whenever consumption and production activities create a negative impact on the third party (external cost) and the impact is not reflected in the market price of the product, then the market is not efficiently allocated. Therefore, the market should be corrected by taxing the polluter (polluter pay principle) or internalizing the externality by alternating the polluter's behavior using a disincentive to pollute (Pigouvian tax). However, since there is no market for carbon (missing market), then no reference price for carbon exists. Therefore, some countries set a carbon tax that directly establishes a price on carbon emissions.[304] The price signal created will shift consumption and investment patterns, making economic development compatible with climate protection.[305] The implementation of carbon pricing is carried out through carbon taxes and Emissions Trading Systems (ETS).[306] Currently, carbon taxes are operational in 27 nations, encompassing Argentina, Canada, Chile, China, Colombia, Denmark, the European Union (consisting of 27 countries), Japan, Kazakhstan, Korea, Mexico, New Zealand, Norway, Singapore, South Africa, Sweden, the UK, and Ukraine. Other countries such as Brazil, Brunei, Indonesia, Pakistan, Russia, Serbia, Thailand, Turkey, and Vietnam are contemplating the prospect of implementing similar measures.[307]

In a carbon tax framework, this strategy extends existing fuel taxes, ensuring predictability in emission costs to incentivize investments in clean technology. Revenue generated from carbon taxes can be channeled towards easing tax burdens on workers and businesses or directing funds into climate technology advancement.
Through an Emission Trading System, companies must obtain allowances for their greenhouse gas emissions which are controlled by the government to manage the supply of permits. In this system, businesses can engage in buying and selling allowances, thus establishing a market-driven price for emissions. Additionally, emissions trading programs can be designed to replicate the benefits of taxes, utilizing mechanisms such as price floors and generating revenue through permit auctions.

Carbon pricing in Indonesia itself is quite new. The pressure to fulfill enhanced NDC in 2030 has accelerated the use of market mechanisms to reduce carbon emissions. As an integral part of a tax reform package, Indonesia enacted a law in 2021 that pledges to implement a carbon tax by 2025. The initial plan was to implement the so-called "cap-and-tax" scheme for coal-fired power generation from April 1, 2022. This was

304 https://www.wri.org/insights/carbon-tax-vs-cap-and-trade-whats-better-policy-cut-emissions
305 https://unfccc.int/about-us/regional-collaboration-centres/the-ciaca/about-carbon-pricing?gclid=EAIaIQobChMIru7s4p7wgQMVQg2DA x0z3AwJEAAYASAAEgJkd_D_BwE#What-is-Carbon-Pricing?-
306 https://www.imf.org/en/Publications/fandd/issues/2021/09/five-things-to-know-about-carbon-pricing-parry
307 https://earth.org/what-countries-have-a-carbon-tax/#:~:text=Carbon%20Tax%20Countries,%2C%20the%20UK%2C%20and%20Ukraine

postponed to July 1, 2022, and as of February 8, 2023, extended since then. Indonesia values carbon emission at $2.09 per tonne CO2e for coal-fired power plants.[308]

5.2. Instruments to Carbon Emissions Reduction

Most environmental problems deal with the issue of negative externality. Despite the possibility of solving the problem using private negotiation as stated by Coase Theorem, many economists do see a role of government in helping to solve environmental problems. There are three broad categories of instruments that can be used by the government.[309] [310] Each instrument has different characteristics based on several criteria, such as cost-effectiveness, long-run effects, dynamic efficiency, ancillary benefits, equity, dependability, flexibility, cost of use under uncertainty, and information requirements (more in Annex).

5.2.1. Command and Control (CAC)

Command and control (CAC), also known as prescriptive regulation, focuses on regulating the behavior or performance of individual polluters, either consumers or producers. The instrument has been widely used as a conventional approach to environmental regulation, and usually relies on the state's authorities to enforce and monitor regulations, primarily aiming to directly control the amount and type of carbon emissions emitted.[311] An example of the instrument is the *technological standard* that requires firms to use a particular abatement technology.[312] Alternatively, the government might impose a ceiling on the GHG emissions an individual firm can release (*performance standard*).[313] The regulation usually comes from the central government.

Advantages and Disadvantages of Command and Control Approach (CAC)	
Advantages	• It is simple. The government sets the technological or performance standard based on the target (optimal) emission to achieve.[314] [315] • The instrument does not need individual firms' cost information. The regulation just stipulates the standard and the industry should follow the standard ignoring firms' cost structure.
Disadvantages	• The regulation offers no incentive to improve the quality of the environment beyond the standard set by a particular law. Once the command-and-control regulation has been satisfied, polluters have zero incentive to do better. In other words, it does not promote technological innovation.[316] • It limits the firm's ability to find the most cost-effective way to continue production while reducing carbon emissions. This occurs because each individual firm might have differing cost structures, so a one-size-fits-all standard mandated by a centralized government agency doesn't afford the firms flexibility to address their particular externality problems. This leads to economic inefficiency.[317] • Command-and-control regulations are written by legislators and the Environmental Protection Agency, so they are subject to compromises in the political process. Consequently, real-world environmental laws are full of loopholes and exceptions. • Without quick responses and strict consequences for non-compliance, the approach is unlikely to succeed. There will be an incentive for firms to find loopholes if the regulatory agency or the regulation itself is weak.

308 https://www.ojk.go.id/keuanganberkelanjutan/en/newsmedia/detailnews/3039/indonesia-introduces-carbon-trading-policy-to-reduce-emission
309 Keohane, Nathanael U. And Sheila M. Olmstead. 2007. Markets and the Environment. Island Press, Washington DC.
310 Perman, Roger et. al. 2003. Natural Resource and environmental Economics, 3rd ed. Pearson Education Limited, London.
311 Berck, P. (2018). *"The Theory and Practice of Command and Control in Environmental Policy"*, London: Routledge.
312 Zhao, X., et al. (2015). "Impact of environmental regulations on the efficiency and CO2 emissions of power plants in China", *Appl. Energy 149*, pp. 238–247.
313 Zhao, X., et al. (2015). "Impact of environmental regulations on the efficiency and CO2 emissions of power plants in China", *Appl. Energy 149*, pp. 238–247.
314 Berck, P. (2018). *"The Theory and Practice of Command and Control in Environmental Policy"*, London: Routledge.
315 Berck, P. (2018). *"The Theory and Practice of Command and Control in Environmental Policy"*, London: Routledge.
316 https://www.sciencedirect.com/science/article/pii/S0048969719363582
317 https://www.sciencedirect.com/science/article/pii/S0959652620300585

The Command and Control approach (CAC) is a fundamental aspect of environmental regulation, establishing clear standards for business operations. By establishing precise technological and performance standards, the CAC eliminates uncertainties, making it easier for various industries to comply with regulations. It is crucial to consider these factors when determining the most effective emission thresholds or handling materials with inherent hazardous properties. One notable aspect of the CAC is its broad applicability without requiring detailed knowledge of specific businesses' cost structures. This method guarantees that companies, regardless of their internal intricacies, adhere to the established standards, which promotes efficient regulatory oversight and enforcement.

Though the CAC's strengths are apparent, it does face some difficulties. After meeting the initial requirements, the approach needs more motivation for companies to go beyond the established boundaries or to promote innovative practices. With a proper system of incentives, the motivation to incorporate advanced technologies or embrace environmentally friendly practices increases. In addition, the CAC's comprehensive standardized methodology can have both positive and negative implications. With their unique operations and cost structures, companies may find a one-size-fits-all approach limiting, which can result in economic inefficiencies. Such a structured framework may encourage companies to explore unique, cost-efficient emission reduction strategies, damaging their financial resources. Overall, it is important to consider the benefits and limitations of the CAC to find a balanced and flexible approach that meets the ever-changing needs of the industry and the ecosystem.

5.2.2. Market-based approach

Market-based approach, also known as the *incentive-based approach*, incorporates market principles into government policies. These approaches are more decentralized, focusing on aggregate or market-level outcomes such as total emissions. In addition, many presume the flexibility of the approach as opposed to other approaches, in which regulatory information is reflected through market prices, including ETS and environmental taxation, among others.[318]

Market-based instruments can be divided broadly into two categories. First, market-based instruments can work **by influencing prices**. This means that they use a carbon emission tax set by the government and paid by the polluting firms on each unit of emission. A tax will force firms to internalize social costs (emission) along with their private cost (internalizing externality). The emission tax need not be levied on all units of emission, but could be assessed relative to the optimal baseline level of carbon emissions. On the other hand, subsidies may be given to the firms that produce less emission, i.e. by adopting a new green technology. A carbon tax and abatement subsidy can be viewed as the flip sides of the same coin. Tax is considered a "stick", while subsidy is treated as a "carrot".

Another approach for market-based instruments is **by limiting the quantity** of carbon emissions, also known as the **cap-and-trade scheme**.[319] Within this scheme, the government first establishes a total allowable quantity of carbon emissions (cap) for a group of firms in a particular industry. Then, the government will allocate allowances (or, tradable permits) to the regulated firms. Under cap-and-trade schemes, firms that find it relatively expensive to reduce their carbon emissions will buy allowances from firms that can reduce their carbon emissions at lower cost. In this way, the total amount of carbon emissions is fixed by regulation, but the allocation of those emissions among firms is left up to the market.

318 https://www.mdpi.com/2071-1050/13/12/6913#B9-sustainability-13-06913

319 Keohane, Nathanael U. And Sheila M. Olmstead. 2007. Markets and the Environment. Island Press, Washington DC.

Advantages and Disadvantages of Market-based Approach		
Influencing prices	Advantages	• Tax effectively reduces emissions, because firms will try their best to minimize the cost related to emissions. Thus, it corrects the problem of market inefficiency created by negative externality. • The revenue from emission tax could be used by the government to fund reductions in distortionary tax. This is sometimes referred to as a *double dividend* since the emission tax not only corrects the negative externality but also alleviates the distortion caused by taxes on income and capital.
	Disadvantages	• Standard economic theory shows that any kind of tax will potentially raise product prices, where consumers and producers will share the burden. The market will be misallocated creating deadweight loss or market inefficiency. Therefore, the industry does not like tax and prefers subsidies (carrot).
Limiting quantity	Advantages[320]	• No high information costs are incurred, similar to command and control. The government just sets the cap and monitors the emission and the market, and lets free market capitalism control the rest (creating market efficiency). This allows the market to reach the target reduction, but at a lower overall cost than other techniques. • This instrument also promotes technological innovation as firms will try to employ the latest technology that may reduce emission so they can sell the remaining allowance to the others. • The cap may decline each year. They are designed to bring down carbon supply, pushing up prices of carbon allowance, thus making it more expensive to pollute. • If the allowances are distributed by using auction, the government may collect some revenues that can be used to fund reduction in distortionary tax (double dividend hypothesis).
	Disadvantages	• Critics of cap-and-trade point to problems that actual programs have confronted, such as weak emission, volatility of emission prices (too high or too low), and overly generous allocation of emissions to regulated entities. These are actually the problems related to the ***design*** of cap and trade that can be fixed. • On ethical grounds, emission trading allows the wealthy to evade their responsibilities to reduce emissions. In addition, there are also some concerns raised on the distributional justice of emission trading.[321]

The market-based approach to environmental regulation is gaining popularity as a viable alternative to traditional command and control regulations. An important aspect of this approach is the ability to impact prices. One of the benefits of this approach is that it encourages firms to reduce emissions to minimize costs, which helps to address market inefficiencies caused by negative externalities. In addition, the revenue generated from these taxes could be used by governments to decrease other taxes that cause distortions, resulting in what some refer to as a 'double dividend.' This is due to the emission tax's ability to address externalities and mitigate the impact of income and capital taxes.

Nevertheless, there are drawbacks. Conventional economic theories suggest that taxes can increase product prices, creating a shared burden for producers and consumers. This may lead to market inefficiencies, often referred to as deadweight losses. Given this, industries often have a preference for subsidies over taxes.

Another important aspect of the market-based approach is the restriction on quantities. The benefits of this approach resemble certain characteristics of a professional command and control system. One key advantage is the reduction of information costs. Here, the government establishes a cap, oversees emissions and market activities, and allows the free-market dynamics to handle the rest competently. This has the potential to enable efficient market outcomes. The method promotes technological innovation as companies may adopt cutting-edge emission-reducing technologies, enabling them to trade any excess allowances. The gradual decrease in the cap from year to year can lead to a decrease in the supply of carbon, resulting in a gradual increase in the prices of carbon allowances. This, in turn, will contribute to the overall cost of pollution. When allowances are auctioned, they can generate additional revenues for governments, allowing them to address other taxes that may cause distortions. However, there are some drawbacks. Experts point out concerns regarding the shortcomings in emissions, fluctuating emission prices, and the disproportionate allocation

320 https://development.asia/explainer/why-market-based-solutions-are-smart-way-protect-environment

321 https://www.cambridge.org/core/journals/royal-institute-of-philosophy-supplements/article/abs/carbon-trading-unethical-unjust-and- ineffective/C6F4EC116F98AC017A12E52DDDAE081C

of emissions to regulated entities. Design modifications can resolve these issues, but they have proven persistent challenges in real-world applications. Ethical concerns also arise, as some argue that emission trading allows wealthier entities to avoid their obligations to reduce emissions. There are still lingering questions about the distributive justice of emission trading.

5.2.3. Information-based approach

The basic essence of the information-based approach lies in the belief that informed consumers can either reward or penalize companies based on their environmental behaviors, influencing market dynamics.[322] The methodology adopted by the approach itself entails firms and corporations voluntarily complying with specific environmental standards and afterward communicating their adherence to the public.[323]

The information-based approach works through two mechanisms. The first approach is based on the "*public disclosure principle*" that requires information provision by private firms. For example, a program launched by the MoEF in 1995 called PROPER (Public Disclosure Program for Environmental Compliance). PROPER is not a substitute for the existing conventional environmental compliance instrument, however, it is a complementary and synergistic program with other instruments so environmental protection can be effectively and efficiently enhanced. The program provides awards to firms that comply with environmental protection. It is a kind of recognition by the government to the firms.[324]

The second approach includes ecolabelling and certification programs which provide consumers with information about how a product is manufactured. Ecolabelling and certification programs aim to advertise and verify environment-friendly production processes. Unlike public disclosure, they are voluntary rather than mandatory. While market-based instruments tend to be centralized, these two approaches are decentralized. Rather than setting up a new market (allowance trading) or introducing price signals (emission taxes), these approaches essentially work by providing information.

Advantages and Disadvantages of Information-Based Approach	
Advantages	• Being transparent improves the credibility of a firm's environmental footprint and can help engage with broad stakeholders, including consumers, employers, and communities, and demonstrate a commitment to responsible business practices.[325] • In contrast to stricter regulatory frameworks, corporations have the autonomy to decide which environmental policies they adopt and how they prefer to disclose them.[326] • By demonstrating explicit environmental commitments, firms can establish a unique market position, providing them with competitive advantages. [327]
Disadvantages	• The public disclosure principle and ecolabelling programs only overcome the market failure from *asymmetric information*. They tell consumers about the characteristics of the products they buy. But, the underlying problem of externalities and public goods provisions still exists. • Due to its voluntary nature, only a subset of enterprises may choose to disclose, potentially leading to fragmented dissemination of market information. [328] • The issue of firms potentially exaggerating or misrepresenting their environmentally friendly activities continues to be a prominent problem, as it can potentially deceive consumers.[329] • The successful deployment of these systems predominantly hinges on the prevailing public mood.[330]

Overall, the biggest advantage for implementing an information-based approach lies in its capacity to provide industries with the autonomy to develop their own environmental policies that can be specifically tailored to

322 Konar, Shameek & Cohen, Mark. (2001). Does The Market Value Environmental Performance?. The Review of Economics and Statistics. 83. 281-289. 10.1162/00346530151143815.

323 Konar, Shameek & Cohen, Mark. (2001). Does The Market Value Environmental Performance?. The Review of Economics and Statistics. 83. 281-289. 10.1162/00346530151143815.

324 https://proper.menlhk.go.id/proper/home

325 Arimura, T.H., Darnall, N., & Ganguli, R. (2016). The effect of ISO 14001 on environmental performance: Resolving equivocal findings.

326 Bansal, P., & Clelland, I. (2004). Talking trash: Legitimacy, impression management, and unsystematic risk in the context of the natural environment.

327 ibid.

328 Lyon, T.P., & Montgomery, A.W. (2015). The means and end of greenwash.

329 https://doi.org/10.1007/s10551-011-0901-2

330 Arimura, T.H., Darnall, N., & Ganguli, R. (2016). The effect of ISO 14001 on environmental performance: Resolving equivocal findings.

their company's needs and environmental objectives. This differs with the CAC mechanism which relies on its rigid structure of compliance. In addition, unlike the previous approaches, the information-based approach seeks to establish green credibility and transparency in businesses, hence the approach encourages engagement from a diverse array of stakeholders, including with customers and local communities. Such transparency in demonstrating sustainability commitments may position the industry as the green future-oriented player in the business landscape.

Nevertheless, whilst programs such as eco-labelling and public disclosure may help the industry in addressing asymmetric information in the market, information-based approach does not have the capacity to solve issues in regards to externalities and public good provisions. This can be seen in an activity where, due to the non-binding participation in the approach, there is a likelihood that only a fraction of businesses opt to disclose their environmental objectives and practices, which, in turn, leads to uneven distribution of market information. In addition, there is the ongoing issue of companies potentially exaggerating or misrepresenting their environmentally friendly efforts. This kind of greenwashing can be misleading for consumers, which undermines the trust that these programs are trying to build. The effectiveness of these disclosure systems also heavily relies on the prevailing sentiments and priorities of the public, which can make their outcomes somewhat unpredictable.

5.3. Market Mechanisms for Emissions Reduction

Based on the analysis above, it is clear that the market-based approach, particularly the cap and trade scheme, is preferable and potentially more cost-effective than other instruments. The implementation of market-based approaches was later introduced in the Kyoto Protocol, with further realization under the Paris Agreement, resulting in the carbon market mechanism we know today.[331]
There are generally two mechanisms of the carbon market, i.e. compliance (mandatory) market and voluntary market. Each market is explained below.

5.3.1. Compliance Carbon Market

A compliance market is a market system used by companies and governments that by law have to account for their GHG emission. It is regulated by national, regional, or international carbon reduction regimes. The compliance market legally requires companies to hold permits equal to their emission based on a binding emission cap or regulation.

At the international level, the Kyoto Protocol in 1995 tried to apply the compliance market mechanism. Developed countries listed in Annex 1 are required to limit their GHG emissions and to report on steps adopted with the aim of returning individually or jointly to their 1990 emission level. The mechanism used includes the Clean Development Mechanism (CDM),[332] Joint Implementation (JI),[333] and Emission Trading (ETS). At the regional level, for instance, the European Union Emission Trading System (EU ETS) is a "cap and trade" regime in which regulated entities are granted allowance (EU Allowance) for a given share of overall emission, which they can then exchange with others in order to reduce the overall cost of compliance with emission limit. Whilst, at the national level, the UK now manages and runs its own carbon emissions program called the United Kingdom Emissions Trading System (UK ETS) as the result of Brexit, where UKAs (UK Allowances) are

331 https://www.thejakartapost.com/academia/2021/08/14/maximizing-our-massive-carbon-trading-potential.html#:~:text=In%20the%20calculation%20of%20the ,area%20of%20forests%20in%20Indonesia.

332 The Clean Development Mechanism (CDM) is a market-based mechanism that allows industrialized countries to invest in projects to reduce greenhouse gas emissions in developing countries. This helps developing countries achieve sustainable development and reduce their carbon footprints and enables industrialized countries to meet their emissions reduction commitments under the Kyoto Protocol. The CDM was initially successful but it collapsed in 2012 due to a number of factors including a crash in the credit process and concerns about the addition and leakage of CDM projects. The CDM has been criticized for its lack of effectiveness in reducing green house gas emissions and for issuing "fake" emission reduction credits that do not actually reduce emissions.

333 Joint Implementation (JI) is a market-based mechanism under the KyotoProtocol that allows countries with emission reduction commitments to trade emission reduction with each other. It is similar to the Clean Development mechanism (CDM), but the trade of emission reduction happens between rich countries rather than from developing to developed countries. Projects under Joint Implementation earn emission reduction units (ERUs) which are each equivalent to one tonne of carbon dioxide. As with the CDM, all emission reductions under JI must be real, measurable, verifiable, and additional to what would have happened without the project

traded on the UK registry.[334]

The enabling architecture for an ETS comprises three main elements.[335] First is the system framework, which encapsulates the rules that govern what it will cover and how it will function. Second is the institutional infrastructure that covers the implementation systems and regulatory oversight arrangements. Third is the underpinning legal basis for the system.

1. **Trading Framework**

An ETS is structured around two key elements.[336]

- **Coverage of sector, activities, and GHGs**. In theory, this element emphasizes the importance of broad coverage. When more sectors of the economy and a substantial proportion of emissions within those sectors are included, there is a greater potential for mitigation. This inclusivity can maximize the greenhouse gas (GHG) reductions and enhance the economic efficiency of the system.
- **Target and cap**. The cap of an ETS represents the quantity of GHGs that covered entities are allowed to emit in a compliance period or phase of compliance periods. An ETS is an enabler for governments to achieve national, regional, or local aims or targets within a sector or selected group of sectors. This means that it should be set by reference to those targets. Within this umbrella, several sub-elements are identified.
  a. **Allocation of allowance**: Allowances have value and the method of allocation is important and needs to be fair. Allowances may be allocated for free or through the use of auctions, or a combination thereof.
  b. **Monitoring, reporting, and verification (MRV)**: Monitoring is the process of gathering data that is used to determine emissions produced or saved. It can be based on direct emissions monitoring or calculation methods that derive emissions from other parameters. Reporting is the mechanism and infrastructure by which the regulated entity provides emissions information to the regulator. This can employ a range of possible tools from the use of templates to electronic reporting systems and web interfaces. In addition, verification is the process for third-party checking of the correct application of the monitoring method and the accuracy of the reported emissions. Verifiers will be independent of operators and should be accredited to carry out their work in accordance with established standards and protocols.
  c. **Compliance and enforcement**: A regulatory body is required to establish the systems for compliance activities, manage approval processes, and take action to enforce penalties for noncompliance in cases where participants fail to comply with their obligations.
  d. **Flexible measures**: Fleaxible measures support the achievement of caps at lower cost to participants and provide them with options for meeting their compliance obligations. They include banking, borrowing, offsets, and linking.

2. **Institutional Infrastructure**[337]

An ETS requires a robust institutional infrastructure.

- **Allowance registry**, in which participants are obliged to acquire and surrender allowances equal to their verified emissions, and the allowances themselves are tradeable between obligated participants and (possibly) other parties. A registry system for recording ownership, transfer, and surrender of allowances is a prerequisite for a compliance mechanism and the functioning of the market.
- **Trading platforms** or architectures comprising the mechanisms by which market participants can buy or sell allowances, covering a spot market and potentially a futures market. It may include one or more exchanges, brokerage services, and auctions for the government sale of allowances. Services may be provided by the private sector or government agencies.
- **Market oversight** that is independent of the operation of the market. The regulator will have powers

334 https://www2.deloitte.com/uk/en/blog/risk-powers-performance/2023/understanding-the-compliance-and-voluntary-carbon-trading-markets.html
335 https://www.adb.org/sites/default/files/publication/182501/emissions-trading-schemes.pdf
336 ibid.
337 ibid.

of inspection and enforcement, able to pursue any evidence of fraud or market manipulation.

- **Regulation and enforcement**. The regulatory body will monitor the involvement of obligated entities including carrying out checks on compliance actions such as the management of permits, approval of monitoring plans, reporting of emissions, and surrender of allowances. The regulator should be independent from the participants and have powers to enforce penalties, including, if applicable, bringing criminal prosecutions.

3. Legal Foundation[338]

An emissions trading system (ETS) requires a robust legal framework to support its establishment and operation. This legal framework should clearly define the key components of the ETS, such as the legal nature of allowances, the trading of allowances, related taxation, liability, and accounting issues, legislation on cap setting, allocation, monitoring, reporting, and verification (MRV), penalties for noncompliance, registry, trading platform and trading rules, and market oversight. The legal framework should also provide detailed technical guidance and standards on each component of the ETS, as well as administrative regulations for the management and governance of the system's operation.

338 ibid.

While the enabling architecture for an ETS provides a foundational framework for carbon trading, ensuring consistency for compliance in the market poses its own challenges that can hinder its effectiveness. The following table highlights the primary issues and challenges of compliance within the ETS landscape.[339]

Issues and Challenges of Compliance Carbon Market	
Policy Interaction	Successful GHG mitigation requires a mix of policies appropriate to national circumstances and the nature of the sectors and abatement opportunities being targeted. The interactions and boundaries between these policies must be well-defined and clearly articulated to avoid mixed or split incentives and excessive administrative burdens.
Target setting and flexibility	Emissions caps must be stringent enough to ensure additional abatement in line with national targets and commitments, yet wider experience has shown that poorly set baselines and unexpected broader economic changes can lead to allowance surpluses that hinder abatement.
Legal Framework and Enforcement	Any ETS must be built upon a strong legal foundation, with oversight and enforcement arrangements, to ensure that participants comply with their obligations. This underpins wider confidence in the allowance market. Experience with ETSs in Asia and the Pacific highlights challenges related to legal frameworks and regulatory enforcement regimes.
Institution and MRV Capacity	The implementation of new ETSs requires the establishment of new rules and processes related to the MRV of emissions. These may be built on past measures in the country, or draw on experience elsewhere. Either way, there will likely be the need for increased capacity on MRV technical matters within the government and regulatory as well as implementation bodies.
Allocation mechanism	Introducing a carbon price through an ETS can lead to an increase in production costs for the industry, especially in cases where allocations are not made for free. This could impact industrial competitiveness in the short term and, when taken with the impact of an economic slowdown, there can be challenges in gaining industrial acceptance for a new system. The free allocation of allowances can help mitigate this, at least partially and over an initial period of time. For DMCs, there are some important considerations when developing an allocation mechanism.
The function of the market	A strong and well-functioning emission allowance market is necessary to underpin significant and long-term investment in GHG mitigation activities. A high degree of transparency concerning market-sensitive data, such as allocations, use of new entrant reserves, and verified emissions, will help the smooth functioning of the market. The use of futures can improve liquidity and support longer-term carbon price signals.
Enabling condition	Mitigation actions can be costly, as they involve the use of new technology, new facilities, and fundamental changes to operational management. The prerequisite of taking mitigation actions is that entities can finance and acquire mitigation technology. Financing these activities and access to affordable mitigation technologies is a common challenge.

As seen on the table above, the success of an ETS in addressing GHG emission relies heavily on various aspects. Key considerations include a careful calibration of policies to avoid counterproductive interactions, the establishment of rigorous yet adaptable targets, a robust legal and enforcement backbone, as well as the development of institutional capacity especially in MRV. In addition, the mechanism for allowance allocation needes a balanced approach to maintain industrial competitiveness without undermining the intent of carbon pricing.

Above all, a transparent, robust, and liquid allowance market is paramount for encouraging long-term GHG mitigation investments. Nonetheless, even with a perfectly designed ETS, its success will be limited unless entities have the means to finance and access the necessary mitigation technologies. Addressing each pillar is, therefore, vital for the holistic effectiveness of the compliance system.

339 https://www.adb.org/sites/default/files/publication/182501/emissions-trading-schemes.pdf

Building block	Description
Legal Foundation	Emissions trading was identified as a key strategic policy to achieve the Republic of Korea's GHG mitigation target and was legislated in the Low Carbon Green Growth Act Article 46. The Allocation and Trade of the GHG Emission Allowances Act Enforcement Decree was approved in November 2012, which outlines the institutional framework for governing the system.
Coverage	Covers about 60% of the nation's GHGs. **GHG:** CO_2, CH_4, N_2O, SF_6, HFCs, PFCs. **Sectors:** Power and energy, waterworks, waste, buildings, telecommunication, aviation, mining, food and drink, textile, lumber, paper, oil-refining, petrochemicals, glass and ceramic, cement, steel, nonferrous, machinery, semiconductor, display, electric and electronic, automobile, shipbuilding. **Threshold:** Facilities with annual emissions of more than 25,000 tCO_2e/year per year and business entities with combined average annual emissions from multiple installations at or above 125,000 tCO_2e over the past 3 years prior to ETS start.
Targets and cap	37% reduction relative to business-as-usual (BAU) by 2020, which will allow emissions to grow in the short term. Absolute caps: CPI (2015–2017): 573.5 $MtCO_2$ in 2015 with a decline to 550.9 $MtCO_2$ in 2017 CPII (2018–2020): 543 Mt CO2e by 2020 CPIII (2021–2025)
Allocation of Allowance and Carbon Leakage	CPI – 100% free allocation, based on historical benchmarks. CPII – 97% of allowances will be allocated for free to energy-intensive and trade-exposed sectors. Remainder auctioned. CPIII – Free allocations will decrease to not less than 90% in phase III. 10% reserved for new entrants. 3% reserve for early action. **Carbon leakage:** During CPII 97% of allowances will be allocated for free to energy-intensive and trade-exposed sectors.
Monitoring, Reporting, and Verification	MRV system under the pre-existing Energy Target Management System. Participants are required to establish annual emissions inventories, which need to be verified by third parties before being reported to the government. Reports are then reviewed and certified by the Certification Committee of the Ministry of Environment.
Compliance and Enforcement	Shortfalls incur a penalty of three times allowances for each allowance not surrendered (at most) with a maximum penalty of W100,000 per tCO_2e.
Flexible Measures	**Banking.** Surplus allowances can be banked between years in the same compliance period and within 1 year following the compliance period. **Borrowing** is only allowed between years over a compliance period for up to 10% of annual emissions. **Offsets:** Domestic offsets are allowed from the start of the ETS limited to a maximum of 10% of total obligations. International offsets are not allowed in Phase I and Phase II, and a limit of 50% of total offsets and 5% of annual emissions will be imposed after 2020. Eligible credits must have methodologies approved by the Republic of Korea Verification Committee. **Linking:** The Act on Allocation and Trading of the GHG Emission Allowances allows linking provided that the other ETSs are comparable and credible. Discussions about linking are ongoing with New Zealand (formerly Australia). They have also expressed interest in building an integrated East Asian carbon market through linking its ETS with the People's Republic of China ETS and the Japan ETS.
Institutional Infrastructures	**Trading platform:** Korea Exchange Derivatives Market **Market oversight:** Korea Exchange, Ministry of Environment
Measures to manage market supply and demand	**Allowance reserve, limits on the number of allowances held by any one participant, amendment to borrowing rules, offset limits, and price controls may be introduced**, in the event that (i) the price of allowances increases more than threefold for six straight months compared to the previous year or the year before that, (ii) the average price of allowances increases more than twofold for six straight months compared to the average price for the previous 2 years because traded volumes have increased more than twofold, and (iii) there is a 60% reduction in price in one month compared to the average prices of the last 2 years.
Cost Containment	Not applicable

Source: ADB, 2016

Case Study: The Republic of Korea Emission Trading System

The Republic of Korea's ETS started on 1 January 2015, and is the first nationwide cap-and-trade program in operation in Asia. This is a major step; as a non–Annex I country under the Kyoto Protocol, the Republic of Korea has no legally binding obligation to reduce its emissions.

5.3.2. Voluntary Carbon Market

Voluntary markets allow firms and corporations to achieve their climate goals using carbon credit (called '*offset*') from projects that reduce or sequester carbon emissions. Carbon offset represents one tonne of CO2 equivalent removed, reduced, or avoided in the atmosphere. In this kind of market, companies are buying offsets to neutralize their own emissions, in which they essentially subtract the amount of carbon offsets purchased from their total emissions from their operations and supply chain.

The phrase "Voluntary Carbon Market" can be used in various ways.[340] First, it may refer to the global voluntary carbon market in its broadest conception. This is a non-centralized, fragmented, and emergent global industry ecosystem. Private buyers and sellers exchange carbon credits that represent one ton of GHG gasses avoided or removed, though the exact specification of these credits is likewise unregulated and non-standardized. In this case, credits are generated by diverse types of projects globally and certified by a variety of independent organizations, which then buyers can purchase to offset their emissions and meet internally set voluntary goals, or to sell forward to other end users of the credit.
Another type of "voluntary carbon market" is the emerging class of voluntary carbon markets that are demarcated from the global marketplace – that is, organized voluntary carbon market initiatives. These markets share many of the basic principles and in some cases share the same credits with the broader global market. However, the initiative represents attempts by commercial and government bodies to create regulated centralized marketplaces that cover their respective jurisdictions, industries, or interests.
Key market participants of VCM typically consist of:[341]

- **Project developer**: Organizations that design, develop, and operate carbon projects and sell the resulting credits into the market. Each credit has a specific vintage, which is the year in which it was issued, and a specific delivery date, which is when the credit will be available on the market. Together with their primary purpose of avoiding or removing GHGs from the atmosphere, credit projects can also generate additional 'co-benefits' and help meet some of their SDGs. For example, they may contribute to improved welfare for the local population, better water quality, or the reduction of economic inequality.
- **Standard-setting bodies, registries, and other verifiers**: Entities that set minimum requirements for the creation and issuance of credits, and/ or third parties that conduct due diligence or auditing, either to support issuance or subsequent trading of credits. Standards-setting bodies are organizations such as NGOs that certify whether a particular project meets its stated objectives and its stated volume of emissions. These bodies also perform MRVs where their standards may vary in their approaches, methodologies, and requirements. The main carbon standard-setting bodies are the Verified Carbon Standard (VCS)/ Vera and Gold Standard. For instance, on March 30, 2023, the Integrity Council of Voluntary Carbon Market issued Core Carbon Principle to ensure integrity in the Voluntary Carbon Market: (i) Additionality, (ii) Permanence, (iii) Robust quantification of emission reduction or removal, (iv) No double counting, (v) Effective governance, (vi) Tracking, (vii) Transparency, (viii) Robust independence of third-party validation and verification, (ix) Sustainable development benefit and safeguard, and (x) Contribution to net zero transition.[342]
- **Traders, retailers, and brokers**: Intermediaries that provide liquidity, distribution, and other services, which can increase overall participation in the market. Some options on VCM trading: (i) Private conversation and over-the-counter (OTC) deals: Deal between two counterparties, all elements of the deal are negotiable; and (ii) Online marketplace and platform: high transaction cost, delivery option can be limited, spot only, huge array of projects/locations/vintage, and (iii) Exchanges: Standardized contract,

340 https://www.csis.org/analysis/voluntary-carbon-markets-review-global-initiatives-and-evolving-models
341 https://www.jpmorganchase.com/content/dam/jpmc/jpmorgan-chase-and-co/documents/carbon-market-principles.pdf
342 https://unfccc.int/sites/default/files/resource/Session%204%20Introduction%20to%20International%20VCMs.pdf

contracts cover subset of the market, settlement guaranteed, standardized terms, future delivery and settlement dates offered. Exchanges' standardized products – especially those for forward delivery – are currently preferred by traders and financial players looking to buy and hold in anticipation of skyrocketing carbon credit demand. While brokers buy carbon credits from a retailer trader and market them to an end buyer, usually with some commission.[343]

- **End purchasers**: Typically companies, other institutions, or even individual consumers seeking to offset their own emissions and/or help support climate solutions by purchasing and retiring carbon credits. The implementation of Article 6 of the Paris Agreement on Nov 13 at the UN Climate Conference, or COP26, in Glasgow, set the rules for a crediting mechanism to be used by the 193 parties to the Paris Deal to reach their emission reduction targets or nationally determined contributions. The article implementation has made it possible for countries to buy voluntary carbon credits, as long as Article 6 rules are respected.

As we explore the ecosystem of VCM with its diverse participants, it becomes apparent that these key actors contribute to the market dynamics. However, understanding the role of actors in VCM is just one part of the equation. In order to fully grasp its impact and relevance, it is necessary to also consider the advantages and disadvantages it presents, as outline in the following table:

Advantages of Voluntary Carbon Market	
Innovation	Compliance carbon markets are often strictly regulated and subject to stringent bureaucratic constraints. Whereas voluntary carbon markets have a lot more freedom in this regard, this means that project developers have the freedom to be more innovative. For example, they may be able to implement a project that would be considered too small or not viable for the compliance carbon market. This can result in innovations that may help to lower the cost of emerging green technologies.
Complementary	Voluntary carbon markets do not substitute compliance carbon markets, they complement them by providing an opportunity for projects that wouldn't be feasible under the compliance carbon market. It is estimated that the compliance carbon market and tax scheme only serves 25% of the total carbon market, while the rest might be served by the voluntary carbon market. VCM is still needed even though the market size of the compliance carbon market doubled.[344]
Inclusive	Not all organizations are subject to the compliance carbon market requirements, thus the voluntary carbon market allows organizations (and individuals) to gain experience with carbon markets and their inventories, reductions, storage, etc. Some organizations that want to comply with zero net emission targets are not mandated under the current regulation, such as airline, banking, etc. In this case, VCM may potentially cover a larger sector.
Cross-border	VCM helps mobilize funds to where it is needed, such as the southern hemisphere, nature-based solution projects, and technological innovations. Offset plays an important role in financing a marginally green project in developing countries, such as geothermal projects.
Disadvantages of Voluntary Carbon Market	
Quality supply	The lack of high-quality credit supply hinders further development of the voluntary market to support large-scale decarbonization. In particular, the scarcity of CDRs to help organizations meet net-zero commitments, coupled with an excess supply of lower-quality and less-expensive credits, limits the flow of capital needed to enable the development of higher-quality carbon projects. Making more revenue and financing available to the highest-quality projects and technologies will stimulate both further development of the market and more widespread deployment of decarbonization solutions.

343 https://www.spglobal.com/commodityinsights/en/market-insights/blogs/energy-transition/061021-voluntary-carbon-markets-pricing-participants-trading-corsia-credits

344 https://www.youtube.com/watch?v=GEOSII2Ef5Y (Bloomberg Live Channel)

Market integrity	Variation in the availability and quality of the information needed to assess the quality of carbon credits results in a lack of confidence for many stakeholders, and purchasing low-quality credits can lead to significant financial and reputational risks for market participants. Building alignment around robust principles and enhancing accountability and transparency are necessary to increase confidence and mitigate risk, which will strengthen the utility of the market for all participants. There are many efforts currently underway to address these issues and the need for international standards (less market variety and more standardization).
Market complexity or fragmentation	Multiple marketplaces, competing frameworks and principles, and other complexities make it difficult and costly for organizations to effectively navigate the market. Strong leadership, alignment on best practices, and greater continuity are needed to reduce inefficiencies and attract more market participants, which will ultimately increase the flow of capital to support decarbonization.

From the table above, it is clear that with its potential for fostering innovation, inclusivity, the potential for fostering cross-border cooperation, and as a complement to compliance with the carbon market, VCM highlights the importance of the mechanism in our pursuit of internalizing the externalities. Nonetheless, as we delve into the intricacies of the mechanism, we also identify several disadvantages posed by the VCM, such as the lack of high-quality supply, as well as market integrity and complexity. Unfortunately, these disadvantages are not the end of the story. The understanding of advantages and disadvantages of the VCM further brings us to the deeper, structural issues and challenges of VCM.

Issues and challenges in Voluntary Carbon Market	
Lack of regulation	With no long-term regulatory obligation or pricing signals on carbon, firms are left to chart their net-zero path with little guidance or policy vision. The question is whether organized voluntary carbon markets can help resolve these challenges by creating credible incentives for emission reduction.[345]
Corresponding adjustment	Article 6 of the Paris Agreement becomes a big issue over the entire global voluntary carbon market ecosystem, particularly over the potential role of the voluntary market in achieving NDCs. Article 6 is primarily focused on country-to-country transfer of carbon credits. These credits can then be used to meet NCCs. The uncertainty over Article 6 with voluntary markets has led some developing countries to ban exports of carbon credit because of concerns that the trade (*correspondence adjustment*) might hinder their NDCs' achievements.[346]
Bifurcation of credit types	One significant challenge for the voluntary market is growing bifurcation between credit types. The global voluntary market has historically been dominated by avoidance credit, such as preventing deforestation and developing renewable energy where fossil fuel-fired resources would have been developed. The other credits (removal credits) that certify direct removal and sequestration of CO2 from the atmosphere are scarce, such as direct air capture due to the immature technology and reforestation programs that are difficult to undertake. Furthermore, the emission reduction contribution is considered more scientifically rigorous relative to avoidance credit. In this case, increasing the supply of carbon removal credit is seen as a critical component in meeting the net-zero goals.[347]
Concerns over greenwashing	A company may use the voluntary carbon market in an effort to look 'green' while failing to take any real climate action. In this situation, instead of actively trying to reduce carbon emissions, a company takes the easy way out by simply 'offsetting' emissions.[348]

Unlike carbon allowances at compliance markets, where rules are set by national or international public authorities, the voluntary carbon market does not have any governance body. At VCM, the entities that set the criteria for project certification and carbon credits generation – the platforms – are purely private entities. Oftentimes they take the form of non-governmental organizations. Each platform establishes its own eligibility criteria for projects that it registers, as well as for entities that can obtain access to the registry and thus trade in carbon credits. These differences in rules between platforms could potentially create issues. Other than that they could contribute to price discrepancies affecting the overall efficiency of the market, companies or individuals seeking to offset their emissions may face compliance challenges if they purchase credits from

345 https://www.csis.org/analysis/voluntary-carbon-markets-review-global-initiatives-and-evolving-models

346 https://www.omfif.org/spijournal_winter_23_london-school-of-economics/

347 https://www.csis.org/analysis/voluntary-carbon-markets-review-global-initiatives-and-evolving-models

348 https://greenly.earth/en-gb/blog/company-guide/voluntary-carbon-market-principles-and-examples

one exchange that are not recognized or accepted by another exchange or regulatory body.

It is also equally important for both the government, project developers, and firms to clearly understand the overall aim of VCM. Offsetting schemes under the VCM, in the most basic sense, are limited to residual emissions, namely emissions that remain after polluters have taken action to reduce GHG emissions optimally (through CCM or other emission reductions efforts). For example, making cement at industrial scale typically involves a chemical reaction, calcination, which accounts for a large share of the cement sector's carbon emissions. Because of that, the emissions-reduction pathway to a 1.5-degree warming target effectively requires "negative emissions," which are attained through offsetting schemes designed to counterbalance activities that are inherently challenging to replace with greener alternatives. One example is the aviation industry, where airplanes remain substantial contributors to CO2 emissions and currently, viable alternatives for more eco-friendly engines are nonexistent. Hence, the primary avenue for mitigating their emissions lies in offsetting strategies." In addition, companies must recognize that offsetting their emissions does not immediately result in climate benefits if the carbon credits they buy match the emissions they generate. Most VCMs maintain a balance between the emissions produced and those offset without generating additionality; redeeming them carbon neutral.[349]

Without the offsetting limitation, the scheme risks becoming counterproductive for incentives, which could hinder the implementation of ambitious mitigation actions. In fact, these practices are what leads companies being accused of greenwashing. Greenwashing can be defined as a practice where an entity claims their product or actions are "green" or "sustainable" without any reasonable proof that says they have met the basic environmental standards. These practices are often conducted solely due to the lack of awareness, or with the intention to deceive the public into thinking that the entity is environmentally-friendly.[350] Greenwashing can occur when companies' offset efforts lack external transparency about the merit of the credits generated and the genuine impact of these credits in offsetting the industry or company's emissions.

5.3.3. Cost and Benefit Consideration of Participating in Carbon Market

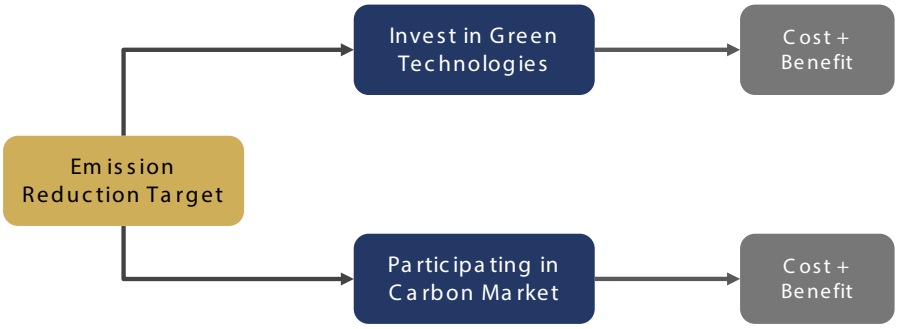
5.3.3.1 Concept and Approach

In the effort to pursue emission reduction targets, there are at least two schemes which can be used by industries, i.e. participate in the carbon market and invest in green technologies. Both mechanisms entail trade-offs for companies in terms of investment costs. Industries participating in carbon markets may face additional compliance costs related to meeting emissions reduction targets or purchasing carbon credits. These costs can be substantial, particularly for industries with high baseline emissions. On the other hand, reducing emission by investing in green technologies often requires the adoption of new or the enhancement of existing ones. Industries may need to invest in cleaner and more sustainable production processes, which can be capital-intensive.

Considering the options to meet the targeted number of emission reductions, a simple cost and benefit analysis (CBA) is conducted to shed light on which scheme is more beneficial and cost-saving for business entities. Although companies can actually employ both mechanisms, the analysis aims to examine if participating in the carbon market is considered cost-efficient than deploying new technologies in terms of cutting emission from economic activities. Picture 1 illustrates an overview on how the CBA in this discussion is estimated. The conclusion is potentially different for various sectors.

349 Carbon neutrality refers to achieving a balance between emitting carbon and absorbing carbon from the atmosphere in carbon sinks. Unlike green practices that aim to both decrease emissions and increase sequestration, carbon neutrality primarily focuses on counterbalancing emitted carbon through initiatives like forestation projects.

350 https://www.esma.europa.eu/sites/default/files/2023-06/ESMA30-1668416927-2498_Progress_Report_ESMA_response_to_COM_RfI_on_ greenwashing_risks.pdf; https://asic.gov.au/about-asic/news-centre/articles/what-is-greenwashing-and-what-are-its-potential-threats/



Picture 5.3.5.1. Emission Reduction Mechanisms

5.3.3.2. Case Example: CBA of Participating in Carbon Market for Coal-fired Power Plant

		Baseline	Co-firing with Biomass	CFPP with CSS
Exsiting Technology	NPV Total Cost (USD)	220,710,978		
	Total Emission (tonne CO2e)	8,440,594		
Deploying New Technologies	NPV Total Additional Cost (USD)		3,422,531	321,035,213
	Potential Emission Reduction (ton CO2e)		675,248	3,376,238
	Average cost per ton CO2e (USD) – over 30years period		5.1	92.4
Offsetting in Carbon Market	NPV Total Additional Cost (USD)		4,376,119	21,880,596
	Potential Emission Reduction (ton CO2e)		675,248	3,376,238
	Average cost per ton CO2e (USD) – over 30years period		6.5	6.5

Table 5.3.5.2. Result of CBA for CFPP

Source: Author's estimation, 2023

Notes: Several assumptions applied: 1) The CFPP technology is supercritical steam cycle; 2) 10% co-firing will reduce emission by 8% of the baseline; 2) CCS deployment reduces emission by 40% of the baseline; 3) cost data for estimation are adopted from the Ministry of Energy and Mineral Resources & Danish Energy Agency (2021).[351]

From the result above, two implications are drawn. A 10% biomass co-firing is less costly (USD5.1/ton CO2e) than offsetting in the carbon market (USD 6.5/ton CO2e). While 10% biomass co-firing does not require

351 MEMR & Danish Energy Agency. (2021). Technology Data for the Indonesian Power Sector: Catalogue for Generation and Storage of Electricity.

incremental CAPEX, it raises OPEX for additional feedstock – net off reduction of fuel cost (coal). However, additional CAPEX will be incurred if the co-firing rate is more than 10%, which might alter the conclusion in this analysis.

Meanwhile, offsetting in the carbon market (USD 6.5/ton CO2e) is much cheaper than installing carbon capture technology (USD 92.5/ton CO2e). This result is supported by the International Energy Agency finding which estimates that utilization of CCS/CCUS will cost up to USD 120/ton CO2e and will significantly increase the cost of steam power generation, approximately USD 0.08 – 0.1/kWh.[352] This number clearly indicates that, in the meantime, reducing emission through the carbon market is considered cost-efficient than installing carbon capture technology, assuming carbon price remains below $100/ton CO2e for the next couple of years.

5.4. Context of Indonesia

5.4.1. Indonesia's Development Goals and Climate Change Commitments

The middle-income trap is a phenomenon in which a country experiences rapid economic growth but stagnates at a middle-income level, unable to transition to a high-income economy.[353] Indonesia has set a target to escape the middle-income trap by 2045. This target is in line with Indonesia's efforts to achieve sustainable development, which includes inclusive and environmentally friendly economic growth. The energy sector is one of the key sectors in the Indonesian economy, as energy is crucial to its growth and employs 12.7 million people in 2021.[354] Therefore, this sector has a key role to play in supporting Indonesia's target of escaping the middle-income trap.[355] Integral with the human development and mastery of science and technology pillar (1st pillar), sustainable economic development (2nd pillar), and equitable development (3rd pillar), the development of sustainable, clean energy resilience is one of the sub-pillars of the 2026-2045 National Medium-Term Development Plan (RPJPN)[356] Under the sub-pillar, Indonesia aims not only to develop renewable energy as a response to the ever-increasing energy demand per capita following the economic growth, but also to encourage the implementation of Low Carbon Development.

Indonesia has set a NDC that has been agreed upon by the Paris Agreement. NDC is a commitment by a country to reduce greenhouse gas (GHG) emissions. Indonesia has committed to achieving a target of reducing GHG emissions by 31.89% (unconditional) and 43.2% (conditional) by 2030. This target is stated in the National Medium-Term Development Plan (RPJMN) 2020-2024, which is in line with Indonesia's efforts to escape the middle-income trap and achieve sustainable development. The National Medium-Term Development Plan (RPJMN) 2020-2024 also sets a target to increase the share of new and renewable energy (EBT) to 23% by 2025. This target will be achieved through various efforts, including the development of solar power plants (PLTS), hydroelectric power plants (PLTA), and wind power plants (PLTB).[357] In the 2020-2024 RPJMN, there are three national priority programs that support the NDC: improving environmental quality, increasing resilience to disasters and climate change, and developing a low-carbon economy.

Indonesia's Long Term 2026-2045 (RPJMN) sets a more ambitious target for reducing GHG emissions compared to its NDC target by 2030. The RPJPN aims to reduce GHG emissions by 41% with its own efforts and 60% with international support by 2045.[358] To achieve this target and escape the "Middle-Income Trap", Indonesia

352 IESR (July, 2022). Profit and Revenue from Coal to Accelerate Energy Transition. Retrieved from https://iesr.or.id/en/profit-and-revenue-from-coal-to-accelerate-energy-transition

353 Maryanti, S., Widayat, P. ., & Lubis, N. . (2023). Economic Transformation To Get Out of the Middle Income Trap Condition To Reach Indonesia Gold 2045. *ADPEBI International Journal of Business and Social Science*, *3*(1), 63–78. https://doi.org/10.54099/aijbs.v3i1.356

354 https://iesr.or.id/tag/lapangan-kerja-hijau

355 https://www.adb.org/sites/default/files/institutional-document/666741/indonesia-energy-asr-update.pdf

356 https://indonesiabaik.id/motion_grafis/pilar-pembangunan-indonesia-2045

357 https://perpustakaan.bappenas.go.id/e-library/file_upload/koleksi/migrasi-data-publikasi/file/RP_RKP/Dokumen%20RPJMN%202020-2024/Lampiran%201.%20Narasi%20RPJMN%202020-2024.pdf

358 Muhjidin, Mawardi., Winanti, Winanti., Teddy, Sudinda., Khaerul, Amru., Atina, Saraswati., Suhendar, I., Sachoemar., Zainal, Arifin., Achmad, Alimin. (2023). Analysis of net-zero emission index for several areas in Indonesia using individual carbon footprint and land use covered. IOP conference series, 1201(1):012058-012058. doi: 10.1088/1755-1315/1201/1/012058

needs to transform its economy by shifting from less productive to more productive sectors (industrialization) by adopting a green economy model that synergizes economic growth with environmental protection through low-carbon development and energy transition.[359]

Transforming the economy towards a green economy can drive innovation in the energy sector, especially renewable energy innovation. As energy consumption increases, there is a growing tendency to transition energy structures to renewable energy.[360] Green innovation, compared to the total number of BAU innovations, can reduce energy consumption and benefit economic sustainability. To support the transition to a green economy, the Indonesian government has set targets in the Medium-Term Development Plan (RPJMN) 2020-2024 [361] and continues to develop green programs, such as: [362]

- A minimum 29% reduction in emissions by 2030, following the initial NDC prior to the ENDC.
- A gradual reduction in energy intensity (energy efficiency) from 1% to 6% per year,
- A transition to electric vehicles, up to 95% of total vehicles,
- A near-100% renewable energy target by 2060,
- The elimination of energy subsidies by 2030,
- The implementation of a carbon tax,
- The maintenance of 43 million hectares of primary forest cover and 94 million hectares of total national forest cover,
- Forest reforestation of up to 250,000 hectares per year and peatland restoration of up to 390,000 hectares.

Indonesia's green energy sector is essential for the country's economic and environmental future. Investing in renewable energy and energy efficiency will help Indonesia to escape the middle-income trap and achieve sustainable development.

5.4.2. NDC and Indonesia's National Climate Budget: A Very Risky Road

Indonesia's Enhanced Nationally Determined Contributions (ENDCs) serve as a critical pathway for the integration of climate change considerations into the country's broader development strategy. The ENDCs directly support the RPJMN and RPJPN, by incorporating key climate change indicators in the formulation of their respective program targets. This initiative marks a significant step towards the mainstreaming of the climate agenda into Indonesia's holistic development planning process. Indonesia's ENDC also underscores the importance of promoting climate resilience in critical sectors such as food, water, and energy. With a growing young population, the challenge is to meet the escalating demand for these resources without compromising environmental integrity. By improving natural resource management and protecting and restoring key ecosystems, Indonesia aims to enhance climate resilience and ensure the sustainable provision of these essential resources.

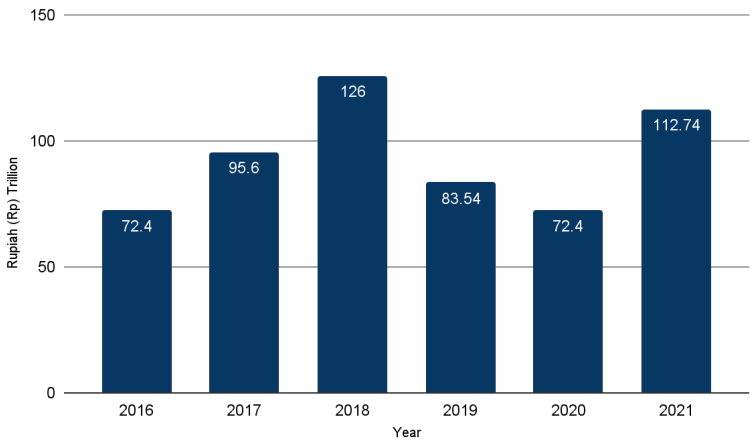
Nevertheless, transforming these ambitious plans into reality comes with a hefty price tag. The execution of these environmental strategies and initiatives, as crucial as they are, necessitates substantial financial investment. According to Indonesia's Ministry to Finance, in order for the country to meet its climate objectives as per the NDC by 2030, a substantial investment of USD 4.4 trillion is necessary.[363] The NDC strategy itself calls for nearly USD 294.97 billion to be dedicated to emission reduction initiatives,[364] while an additional USD

359 https://bsilhk.menlhk.go.id/wp-content/uploads/2021/11/BAPPENAS-Irfan_Towards-2045_BSILHK-COP26.pdf
360 Mücahit, Aydın. (2023). The effects of green innovation, environmental taxes, and financial development on renewable energy consumption in OECD countries. Energy, doi: 10.1016/j.energy.2023.128105
361 https://perpustakaan.bappenas.go.id/e-library/file_upload/koleksi/migrasi-data-publikasi/file/RP_RKP/Dokumen%20RPJMN%202020-2024/Lampiran%201.%20Narasi%20RPJMN%202020-2024.pdf
362 https://bsilhk.menlhk.go.id/wp-content/uploads/2021/11/BAPPENAS-Irfan_Towards-2045_BSILHK-COP26.pdf
363 https://fiskal.kemenkeu.go.id/nda_gcf/berita/indonesia-membutuhkan-us4-4t-untuk-mencapai-target-perubahan-iklim
364 Diirektorat Jenderal Pengendalian Perubahan Iklim (DJPPI) KLHK. (2019). "Buku Road Map NDC Mitigasi".

77.81 billion should be channeled towards climate adaptation measures.[365] The total funding requirement to achieve the carbon emission reduction target in Indonesia in the energy and transportation sector, especially the costs of converting or transitioning fossil energy to renewable energy, reached IDR 3,500 trillion.[366] These estimates amount to almost the total of the 2022 national budget, which is set at IDR 3,106.4 trillion.[367]

In the light of these sizable financial requirements, the government has formulated a plan to leverage domestic sources, including the national budget and private funding, alongside foreign aid and national investments to meet the necessary climate financing. However, every year, the government on average only allocates 3.5 percent of the national budget (APBN) for climate change mitigation and adaptation activities.[368]

Graph 5.4.1. Indonesia's National Climate Budget (2016-2021)



Source: Ministry of Finance (2021)

Indonesia's NDC commitments were marked by an increase in climate budget allocation. Following Indonesia's first NDC in 2016, the budget marking results indicate that the climate budget grew by almost 50% from IDR 72.4 trillion in 2016 to IDR 126 trillion in 2018. The majority of Indonesia's climate change budget in 2018 was allocated to mitigation activities (55%), followed by adaptation activities (34%), and 11% for the mitigation budget that also benefits the adaptation budget.[369] Nevertheless, it was short-lived, as the budget allocation decreased in 2019 and 2020, returning to the initial amount of IDR 72.4 trillion. The revision of Indonesia's NDC in 2021 appears to have stimulated a renewed commitment to funding climate change initiatives, as evidenced by the increase in budget allocation reaching IDR 112.74 trillion.

This condition illustrates the magnitude of the risks that could occur if climate funding only relies on the national budget. Differentiation of funding sources through innovative financing instruments, global funding access and private investment is inevitable, thus one potential source of funding to be considered can be explored through private and blended investment under the Carbon Pricing scheme.

5.4.3. Estimating the Value of Carbon Market in Indonesia

As mentioned earlier, relying solely on the country's national climate budget to fund NDC goals can be risky due to significant differences in available funds, as it revealed that the national climate budget falls short of the funds needed for climate mitigation and adaptation. In such cases, additional funding sources like revenue generated from carbon trading and carbon tax can be a helpful solution.

We acknowledged that, given the relatively recent establishment of the carbon trading scheme in Indonesia,

365 Roadmap Nationally Determined Contribution (NDC) Adaptasi Perubahan Iklim.
366 https://ekonomi.bisnis.com/read/20221215/44/1609097/luar-biasa-sri-mulyani-transisi-energi-butuh-dana-rp3500-triliun
367 https://www.menpan.go.id/site/berita-terkini/berita-daerah/realisasi-sementara-belanja-negara-capai-rp2-376-triliun
368 https://databoks.katadata.co.id/datapublish/2023/09/15/realisasi-anggaran-perubahan-iklim-indonesia-naik-turun-selama-2016-2021
369 https://fiskal.kemenkeu.go.id/files/buku/file/Buku-PCF.pdf

it remains challenging to determine its full potential in adequately financing Indonesia's climate mitigation endeavors. Therefore, for the purpose of this assessment, we rely on estimated values based on different approaches and information from various sources.

5.4.3.1. Economic Value of Carbon Market

There have been many estimates of the potential value that can be collected by the carbon market. First, according to the Coordinating Minister for the Economy, carbon credits could be valued at US$ 5 per tonne of CO2, suggesting that Indonesia stands to generate approximately IDR 8,000 trillion (US$ 500 billion) in revenue.[370] Meanwhile, a differing projection from the Coordinating Ministry for Maritime and Investment Affairs estimates the potential revenue to be closer to IDR 3,000 trillion.[371] In the calculation of the Ministry of the Environment and Forestry (KLHK), the potential of economy and carbon trading in Indonesia can reach IDR 350 trillion (about US$ 19 billion[372]) for the next five years, in accordance with the area of forests in Indonesia.[373]

On the other hand, several research highlights that, with Indonesia's rich natural resources, it is estimated that the potential domestic economic values of the carbon market will come from nature-based projects (nature-based solutions). Indonesia has the largest mangrove area of 4 million Ha and the second largest tropical forested area with peatlands in the world. It is estimated about 1GtCO_2 potential carbon credits from nature-based solutions, in which about 14 MtCO_2 of the total potential carbon credits have a high degree of viability in 2030 earning a potential revenue of US$ 1,5 billion. Moreover, there is also potential carbon revenue from energy transition programs of about US$ 16-17 billion and another US$ 0.2-0.7 billion from taxes related to domestic carbon trading transactions.[374]

Second, the value of the carbon trading scheme can also be explored using the estimated baseline carbon prices in the global and national landscape. The Indonesian government has determined a baseline carbon tax of IDR 30,000 per tCO2e in 2025,[375] starting from coal-fired power plants.[376] On the global stage, the voluntary carbon market has seen prices ranging from IDR 41,400 to IDR 251,100 per tCO2e throughout 2022 (Annex 8), specifically in the land sector (AFOLU). If all the emissions reduction target of 912 mtCO2e[377] is integrated into the carbon trading scheme, it is projected that by 2030, the scale of Carbon Trading transactions in Indonesia could span from IDR 37 trillion to IDR 229 trillion using global market carbon prices, or approximately IDR 27 trillion based on the local carbon tax rates.

Third, by classifying carbon emissions as a commodity, carbon trading revenue calculation can be carried out using simulations that are guided by the concept of commodity trading. In this case, various studies have

370 Press Release of the Coordinating Minister for the Economy, 14 March 2022, https://www.kompas.id/baca/opini/2023/07/21/menanti-kehadiran- bursa-karbon
371 https://www.cnbcindonesia.com/news/20230926181855-4-475759/anak-buah-luhut-ungkap-potensi-dagang-karbon-lebih-rp3000-t
372 Assuming US$ 1 equals Rp15,722.
373 https://www.thejakartapost.com/academia/2021/08/14/maximizing-our-massive-carbon-trading-potential.html.
374 Mahendra, Edo. 2023. Mengoptimalkan Pasar Karbon di Indonesia. Kementerian Koordinator Bidang Kemaritiman dan Investasi
375 Law No. 7 of 2021: Harmonization of Tax Regulations
376 https://www.cnnindonesia.com/ekonomi/20221013114052-532-860011/airlangga-sebut-perdagangan-dan-pajak-karbon-berlaku-mulai-2025
377 Enhanced Nationally Determined Contribution (NDC) Republic of Indonesia

calculated potential revenues from carbon trading using the Norwegian carbon price (US$ 5 per tCO2) and the EUA carbon price (EUR 11 per tCO2).[378]

Table 5.4.3.1. Potential state revenues from carbon trading within the period 2011-2030 using projected Norwegian carbon prices and EU Allowances

Unconditional Mitigation Scenario	Non-tax revenue potential (IDR billion)		Conditional Mitigation Scenario	Non-tax revenue potential (IDR billion)	
Sector	Norway	EUA	Sector	Norway	EUA
Energy	19.281	52.211	Energy	24.438	66.178
Waste	675	1.829	Waste	1.596	4.323
IPPU	169	457	IPPU	200	540
Agriculture	553	1.496	Agriculture	246	665
Forestry	30.517	82.640	Forestry	39.912	108.080
Total	**51.195**	**138.634**	**Total**	**66.392**	**179.788**

Source: Irama, A.B. (2020). "Perdagangan Karbon di Indonesia: Kajian Kelembagaan dan Keuangan Negara". INFO ARTHA, 4(1), pp. 83–102. https://jurnal.pknstan.ac.id/index.php/JIA/article/view/741

The table shows that the largest contributor to state revenues from carbon trading comes from the forestry sector (59.6%), followed by the energy sector (37.7%). In addition, the waste sector, agriculture, and IPPU contribute to 1,3% to 0,3% of the country's total revenue, respectively. Overall, carbon trading could bring in revenues ranging from IDR 51.2 trillion to IDR 179.8 trillion for Indonesia. This figure represents the earnings from carbon trading as the nation continues to enforce its carbon emission reduction efforts in accordance with the ENDC.

From the projections above, it can be concluded that the potential value of the carbon market can range from IDR 27 trillion up to IDR 8000 trillion depending on the carbon price, supplies, and the implemented instruments. Nevertheless, the aforementioned calculations are based solely on hypothetical scenarios without estimating market price fluctuations and other factors that can influence price changes. To truly ascertain the value and benefits a carbon trading might bring to Indonesia, comprehensive research is imperative, utilizing the precise carbon prices applied and existing supplies within the nation.

5.4.3.2. Social Value of Carbon Market

There are several considerations of the social value of the carbon market. First, the "polluters pay" framework embodies a fundamental principle of environmental justice and economic responsibility in the context of carbon markets. At its core, it mandates that entities responsible for emitting GHG emissions bear the financial burden of the environmental damage they cause, rather than passing it on to society at large.[379] When applied to the realm of carbon emissions, this principle can be paired with the social costs of carbon, which quantifies the economic damages from emitting a single metric tonne of GHG. By instituting mechanisms such as carbon taxes, carbon permits, or cap-and-trade mechanisms, polluters are not only made to pay for their emissions. Additionally, revenues can be utilized to fund greener projects, for instance, revenues from EU ETS have generated EUR 86.7 billion to be mobilized by the Social Climate Fund from 2026 to 2032.[380] In this case, the framework not only recognizes the inherent social value of a healthy environment but also seeks to correct market failures by internalizing external costs.[381] Hence, the "polluters pay" principle aligns economic motives with environmental preservation, fostering a sustainable future for both the economy and the planet.

Second, taking into account the inclusive nature of the market-based mechanism of the carbon market, it can provide a chance for local communities to engage in carbon sequestration projects like reforestation, agroforestry, or sustainable land use practices; which, in turn, generate carbon credits that can then be sold in the carbon market. The revenue from these sales can be used to fund local community projects, from

378 https://jurnal.pknstan.ac.id/index.php/JIA/article/view/741
379 https://www.lse.ac.uk/granthaminstitute/explainers/what-is-the-polluter-pays-principle/
380 https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets_en
381 https://www.eea.europa.eu/publications/ENVISSUENo12/page025.html

infrastructure to education. This can clearly be seen in projects implementing REDD+ schemes, which at heart ensure that local communities receive direct investments that could finance their livelihoods.[382] It is important to showcase that the carbon market is not just an economic or environmental tool, but also a powerful social instrument for equality and equity. By involving local communities in decision-making processes related to carbon projects, it is possible to ensure that their needs and priorities are addressed. This encourages community ownership, long-term commitment to the project's success, and overall empowerment.

5.4.3.3. Environmental Value of the carbon market

Carbon market holds the potential for climate stability on a broader scale. As mentioned in the previous section, The International Renewable Energy Agency estimates that US$ 4.4 trillion must be invested annually by 2050 for a 1.5°C climate pathway.[383] This is to finance projects with an abatement value of approximately 1.23 GtCO2e per year, including energy transition technologies, such as renewable energy, end-use electrification, hydrogen innovation; and carbon removal measures, implying an investment cost of US$ 3,550 per tCO2e reduced.[384] Indonesia is no exception[385], in which beyond the issue of inadequate funding, there is still an issue on the uneven distribution of budget allocations among the main three pillars of climate action. The 2021 APBN reveals this disparity with 6.15% dedicated to the Improvement of Environmental Quality, a large 77.63% for bolstering Resilience to Disasters and Climate Change, and a smaller portion of 16.22% towards Low Carbon Development.[386]

Indeed, its primary purpose is to reduce GHG emissions, accomplished by assigning a monetary cost to the release of carbon, thereby incentivizing businesses and nations to minimize their carbon emissions. Nevertheless, aligning to this, the revenues generated from the carbon market can be substantial. First, part of revenues from the market can act as much-needed subsidies for the first climate action pillar on the Improvement of Environmental Quality. Second, through offsetting mechanisms, the carbon market can encourage the use and investment to develop more sustainable technologies. Integral to this, revenues can be allocated for the high Capital Expenditure (CapEx) projects in the renewable energy sector, making it financially viable for companies to transition away from fossil fuels and thus contribute to climate stability. Third, carbon markets can also support nature-based solutions to climate change. Projects that protect or restore forests, wetlands, and other natural habitats can earn carbon credits by sequestering carbon dioxide, helping to preserve biodiversity and ecosystem health. Lastly, the existence of a carbon market can raise environmental consciousness, highlighting the importance of reducing carbon emissions and adopting sustainable practices, thereby leading to wider environmental benefits.

5.5. Summary

The examination of Indonesia's journey towards achieving its NDC as an integral part of Indonesia's development framework and addressing the financial challenges hindering its climate mitigation and adaptation efforts reveals a promising avenue through the carbon market. With this in mind, several key takeaways of the chapter are presented:

1. **Compliance market vs. voluntary market in Indonesia**
   The pressing need for Indonesia is to reinforce a compliance market to fulfill its NDC targets, whilst maintaining a voluntary market as a complementary mechanism supporting the compliance market.
2. **Regulation and Ethical Standards for Voluntary Markets**
   Greenwashing usually occurs due to the lack of stakeholder understanding on public disclosure to their environmental objectives and practices. In addition, the inadequate control environment, including

382 https://unfccc.int/topics/land-use/workstreams/redd/what-is-redd?gclid=Cj0KCQjw0bunBhD9ARIsAAZI0E0e8yO9e3cg14TwS35rrBlPwF 9b27k_B0MXW2jy5DNY5-kI 1y9AE64aAmhwEALw_wcB; https://www.energymonitor.ai/carbon-markets/the-interwoven-fortunes-of-carbon -markets-and-indigenous-communities/

383 https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2021/Jun/IRENA_WETO_Executive_Summary_2021.pdf?rev=3f70ca0981244f7ebe0 fb4305fbfa566

384 https://www.robeco.com/en-int/insights/2021/12/the-capex-costs-of-reaching-the-paris-goals

385 https://ekonomi.bisnis.com/read/20221215/44/1609097/luar-biasa-sri-mulyani-transisi-energi-butuh-dana-rp3500-triliun

386 https://anggaran.kemenkeu.go.id/in/post/optimalisasi-pendanaan-penanggulangan-perubahan-iklim

government oversight to industry practices can contribute to greenwashing accusations. This issue is tricky and requires involvement and willingness for both the government and industries. First, the government should properly define what is considered and not considered as greenwashing, which requires effective regulation and the establishment of clear standards in the national, sub-national, sectoral, and business level. Second, the government should establish a set of provisions or guidelines applicable to the preparation and presentation of information that should be disclosed by the business industries. Third, to make the provisions as the fundamental principles in the VCM. Fourth, the application of incentives for business industries that successfully achieve the provisions.

3. **Potential revenue for the carbon market**

   Through the aforementioned evaluation of economic implications, it can be summarized that the carbon market has the potential to generate potential revenue ranging from IDR 27 trillion to IDR 8,000 trillion depending on the availability of high-quality carbon credits, capacity of offsetting/insetting projects, fluctuations in carbon prices, among other influencing factors. Nevertheless, in preparation to fully tap into the revenue potential, the government still needs to develop a comprehensive roadmap, enhancing recognition/acknowledgement through recognition tools such as SRN-PPI and *Taksonomi Berkelanjutan Indonesia* (TBI), and other robust regulatory frameworks. Standardization of carbon credits used for VCM should be regulated as well to guarantee the consistent production of high-quality carbon standards.

4. **Social and Environmental Impact of the Carbon Market**

   Social and environmental implications and values beyond economic gains of the carbon market are massive. Not only that the carbon market can bring forth more involvement and engagements between business industries, the carbon market has the leverage to support and amplify the voices and participation of local communities. In addition, its implications to address the national climate budget constraints makes it a comprehensive and transformative tool for the nation in generating additional revenues to be allocated for the high Capital Expenditure (CapEx) projects in the renewable energy sector.

6. Conclusion and Recommendation

6.1 Conclusion

The carbon market represents a strategic intersection of environmental and economic interests and is a relatively new and evolving concept. It presents a promising prospect for the world to develop a resilient ecosystem, where businesses can reap benefits from their efforts to restore the environment through mitigation and adaptation strategies. This White Paper aims to illuminate the intricacies of the carbon market concept, highlighting the global momentum that is positioning Indonesia as a key player in pioneering the establishment of a robust carbon market in the region. The paper has provided a comprehensive overview of Indonesia's current position in this context, followed by an examination of notable benchmarks and best practices, as well as an in-depth analysis of the existing regulatory and economic infrastructure in supporting the carbon market created in the country.

Indonesia's carbon market is strategically positioned, boasting abundant green resources and a strong industrial sector. The nation is committed to establishing a robust ecosystem for supply and demand chains in primary and secondary carbon markets. To achieve its NDC goals, Indonesia must continue to build on these efforts. This White Paper offers valuable insights derived from several benchmarks, emphasizing industry cooperation, financial sector collaboration, cross-provincial engagement, and strengthening the VCM facility to advance the nation's carbon market initiatives for a more sustainable future over the next decade.

The regulatory foundation, however, presents challenges with complex carbon pricing and trading, hampering businesses with authorization procedures, licensing requirements, and environmental expenses. Nonetheless, the Carbon Pricing (NEK) concept shows promise in attracting investors. Recommendations for improving the regulatory framework include establishing and strengthening the compliance market to meet NDC targets and nurturing a voluntary market. Government regulation is crucial in the Voluntary Carbon Market to ensure integrity. The potential revenue in the carbon market is substantial, contingent on high-quality credits and prices. Research is still imperative, specifically in deep diving on a Cost-Benefit Analysis of the carbon market, to facilitate growth. There's optimism for Indonesia's carbon market, driven by business interest and government collaboration, which can aid the country in achieving its climate goals with effective and efficient change.

6.2 Recommendations

The crux of this White Paper lies in the importance of strengthening the value chain of the Carbon Market in Indonesia and this includes enabling a supply side, demand side, and market that is business-friendly, ensures freedom of movement for industry players and provides a set of measurable incentives going forward. Initial findings are outlined below:

6.2.1. Short Term Recommendations

1. **Enhancing SRN PPI as an Integrated National Registry for Carbon**

   To bolster the role of SRN PPI as an integrated national carbon registry in Indonesia and address existing challenges, it is vital to optimize its functions for all stakeholders, particularly the Industry, recognizing its pivotal role in the Indonesian Carbon Market. The Strategic SRN PPI Enhancement Initiative, fostering collaboration between the Government Focal Point, the Ministry of Environment and Forestry (MOEF), and Industry representatives, aims to transform SRN PPI into a government-backed national registry favoring the Industry. Key aspects include streamlining business processes, such as registration and verification, to facilitate efficient industry engagement. Moreover, improving the User Experience

through a website UI/UX overhaul by emphasizing readability and interactive visualization will enhance accessibility, enabling more effective participation in carbon management and emissions reduction efforts. Furthermore, the improvement of SRN PPI will continue indefinitely, as occasional maintenance shall take place in constantly upgrading the national registry to fit with the dynamic market trend.

To transform SRN PPI into a registry that caters to industry needs we suggest following a three phase action plan. In the phase (January. February 2024) the focus is on initiating a strategic enhancement plan for SRN PPI. This involves considering outsourcing customer service and enhancing the web interface to improve stakeholder engagement. We aim to create a web platform with user registration processes. Moving into the phase (March 2024) the focus shifts towards optimizing SRN PPIs business processes. We plan to introduce an in web customer service feature and conduct a revamp of the user experience and interface. During this phase we will also begin collaborating with stakeholders as part of our enhancement initiative. In Phase 3 (starting December 2023) and onwards the main objective is to improve SRN PPIs website design and enhance user experience. This will involve submitting a compiled proposal for enhancements to the National Focal Point and seeking collaboration with entities such as KLHK, Kemenkomarves, the State Secretariat and IBC partners. Additionally internal consultations will be proposed to assess existing business processes. Through these planned phases we aim to elevate SRN PPI's industry national registry while ensuring seamless operations and enhanced user satisfaction.

2. **Maximizing the participation for businesses within the Carbon Exchange & Green Taxonomy to pave the way for recognition**

In the effort to ensure the success of Indonesia's carbon market and strike a balance between economic growth and environmental consciousness and integrity, the Indonesian government needs to engage more with industry players and provide recognition for their efforts in aligning with the nation's climate commitment as outlined in the Nationally Determined Contributions NDCs. Such recognition can be achieved by promoting their participation in the Indonesian Sustainability Taxonomy (TBI) –the continuation of Indonesian Green Taxonomy (THI), which would enhance the credibility of businesses that aligns their efforts with the national green economy scheme, thus providing green lights for more industry players to access sustainable funding from climate-conscious investors. Additionally, the inclusion of more industry pioneers in the Carbon Exchange can demonstrate the government's full support for the exchange, promoting transparency, and mitigating concerns about greenwashing.

Furthermore, reinforcing adherence to the Indonesian Sustainability Taxonomy can provide a platform for businesses to showcase their commitment to green initiatives. Spanned across 919 classifications and grouped into 6 sectors (Energy, Forestry, Agriculture, Waste, Industry Processing, Others), the Indonesian Green Taxonomy serves as a guidance for both the private and public sector to determine what economic activity is categorized as green. However, not all economic activities brought forward by the Indonesian Green Taxonomy automatically translates to a green category with the exception of several activities including but not limited to the agriculture sector. Hence, in preparation to support the maintenance of a supply side that requires support and a demand side that still necessitates incentives, the inclusion and business of carbon management, trading and restoration projects that produce carbon credits should be directly related to this proposed sector. In doing so, the proposed sector may provide industries with the "green" category, further enhancing their credibility and facilitating access to green financing that is vital for the development and maintenance of green projects, thus fostering a robust and sustainable green economy in Indonesia.

To address bottleneck issues surrounding industry recognition via the Carbon Exchange and Taksonomi Berkelanjutan Indonesia (TBI), a strategic debottlenecking initiative is recommended to unfold across three phases. In Phase 1 (January 2024 - March 2024), the focus is on mutual recognition through participation, where the International Business Council (IBC) initiates the development of a position paper,

proposes refinements in the Environmental Objectives (EOs) and Economic Criteria (ECs), and suggests quantified targets. Simultaneously, capacity building for industry players to achieve Green classification is facilitated through CMIC. Moving to Phase 2 (December 2023 - January 2024), the agenda shifts to enhancing Taksonomi Berkelanjutan Indonesia (TBI), where the OJK socializes the Enhanced TBI, IDX notifies stakeholders on updates, and IBC encourages alignment with the Enhanced TBI. Phase 3 (March 2024 - May 2024) focuses on the socialization of the Enhanced TBI, encouraging IBC members to register on SRN PPI and participate in the Indonesia Climate Exchange through dialogue and socialization. This comprehensive approach aims to refine Indonesia's taxonomy, increase participation in IDX Carbon, and promote recognition for businesses, solidifying their role within the sustainable framework.

3. **Building A Robust Information Center For Industry To Participate In Carbon Market, a Carbon Market Impact Center (CMIC)**

Despite the existence of Carbon Trading since the Kyoto Protocol, it's crucial for the evolution of the Carbon Market to align with the objectives set in Nationally Determined Contributions (NDCs). This alignment necessitates comprehensive education for all stakeholders, with a particular emphasis on industry players, to equip them with the knowledge and understanding to navigate the intricate terminology, mechanisms, and systems inherent in the carbon market. To facilitate this, establishing a Carbon Market Impact Center (CMIC) is essential. The Carbon Market Impact Center (CMIC) is envisioned as a pivotal institution set to catalyze a vibrant and prosperous carbon market in Indonesia. Rooted in a commitment to future expert-driven research, stakeholder collaboration, and business matching, the CMIC aims to empower industries by creating an enabling environment within the future carbon market landscape. Functioning as a forthcoming knowledge hub, it will endeavor to provide comprehensive and updated information, supporting future initiatives for training, capacity building, and educational opportunities for industry players.

The CMIC shall distinguish itself by aspiring to foster cooperation between the private, public, and people sectors, aligning future government policy with industry practices. With a strategic organizational structure anticipated to encompass an Advisory Board, Expert Panel, Carbon Market Supply Chain Roster, and an operational team, the CMIC strategically positions itself to offer tailored solutions to future carbon market-related issues. Through future programs such as expert consultation and research, training, capacity building, and future matchmaking facilities, the CMIC strives to guide future industry players, facilitate robust future supply chains, and advocate for a stronger future carbon market. The logic underpinning the CMIC lies in its envisioned role as a dynamic and comprehensive platform geared towards driving sustainable practices, promoting future industry collaboration, and propelling the carbon market ecosystem toward a robust and fair future in Indonesia.

The establishment of the CMIC is recommended to unfold through strategic phases. In Phase 1 (December 2023 - January 2024), the focus is on preparing for the CMIC by conducting consultation sessions, planning development in collaboration with RKKIK, and ensuring open access through SRN PPI. Moving on to Phase 2 (February 2024 - March 2024), the emphasis would then shift to developing the CMIC as a platform, which includes creating educational content, analyzing data gaps, fact-checking and ensuring the platform design is user-friendly. Then, Phase 3 (April 2024) would be the launch of the CMIC to the stakeholders, which would include developing the algorithm for the matchmaking process, and socializing the CMIC's presence to stakeholders through various channels. Finally, Phase 4 (April 2024 - May 2024) focuses on initial matchmaking and socialization, which would include an intensifying engagement with stakeholders and officially launching the CMIC with a symbolic ceremony led by the Ministry of Environment and Forestry. This comprehensive approach is aimed at creating a centralized repository of information, facilitating matchmaking, and raising awareness, thus empowering stakeholders to actively participate in the carbon market.

4. **Equipping Industry Players With Funding Opportunities & Grant Facility By The IEF/BPDLH**

In order to effectively address the current obstacles hindering industry awareness of the incentives provided by IEF/BPDLH, as well as the limited visibility of their role in the national carbon market ecosystem, it is essential to take a strategic approach to the debottlenecking process. By tackling the challenges of an awareness gap and inadequate visibility, the aim is to improve accessibility to the IEF/BPDLH portal. This can be achieved by seamlessly integrating a direct link to the IEF/BPDLH portal on the SRN PPI registry website, creating a streamlined connection for industry players seeking information on funding opportunities and grant facilities. Additionally, the strategy also includes amplifying public dissemination and assistance efforts for eligible industries to engage with the incentive facility. Socialization initiatives will be intensified through various channels, particularly through the use of social media platforms, to provide extensive information and step-by-step guidance for industry players. Through these measures, the proposed debottlenecking strategy on funding opportunities and grant facility awareness for businesses, shall enhance visibility, and empower industry players to actively participate in the IEF/BPDLH incentives within the national carbon market ecosystem.

In the mission to empower industry players with funding opportunities and grant facilities from the IEF/BPDLH, we recommend a strategic plan that unfolds across three phases. During the first phase, which runs from December 2023 and January 2024, the focus will be on disseminating essential information and materials to stakeholders. This includes collaborating with the International Business Council (IBC), the OJK, and market platforms to ensure that information on the IEF/BPDLH and its initiatives reach the wider public. As we move into the second phase, from January to March 2024, the aim will be to develop and implement a comprehensive communication strategy. This will introduce the IEF/BPDLH to stakeholders in the carbon market, and launch a dedicated webpage for the IEF/BPDLH funding and grant schemes on the SRN PPI registry. This webpage will provide detailed information on the various funding schemes available to interested parties. The final phase, which takes place between March to April 2024, the IEF/BPDLH will be actively involved as the focal point and present a model for incorporating their facility into the SRN PPI registry. Our all-encompassing strategy strives to seamlessly integrate the IEF/BPDLH's financial offerings into the dynamic carbon market, guaranteeing ease of access and widespread recognition among key players.

5. **Urging the Public Sector to Determine and Calculate Emission Caps at the Entity Level (PTBAE)**

The task of determining and enforcing emission caps at the entity level (PTBAE) presents a complex and multifaceted challenge. One of the main issues is the lack of clarity and effective enforcement mechanisms, which is further complicated by PTBAE's centralized approach focused on broad national and subnational sectors. This is largely due to a lack of political will and inadequate sharing of information between different sectors. As part of the effort to address these bottlenecks, the goal is to prioritize sectors for a gradual transition and improve market liquidity. To achieve this, a transformative strategy has been proposed that involves decentralizing emission limits from the national and subnational levels to the entity level. However, this approach requires the development of a comprehensive "Whole-of-Government" framework, which will ensure effective regulation and implementation.

To drive the public sector towards setting and measuring emission caps on an entity level (PTBAE), we recommend a strategic and step-by-step approach that would unfold over three phases as well. The initial phase (December 2023 - January 2024) will concentrate on gathering relevant policies and input from the industry, conducting stakeholder analysis, creating research briefs, conducting interviews, and hosting focused discussions on Emission Caps in Indonesia. Then in Phase 2 (January-February 2024), the emphasis will be on developing a compelling Position Paper and Advocacy Tools, highlighting the benefits of financial rewards for public sector adoption and devising an effective communication strategy. The final phase, scheduled for March-April 2023, focuses on engaging with the public sector. This will be

achieved through the release of a thorough working document containing key regulatory articles, as well as informative expert panel sessions and collaborative discussions with government stakeholders. The end goal of this all-encompassing strategy is to cultivate a well-informed and multifaceted approach to determining emission caps. By advocating for regulatory uniformity and stimulating demand within the carbon market, we strive to drive meaningful change in our environmental landscape.

6.2.2. Medium to Long Term Recommendations

1. **Appoint an Industry Champion and Form an Acceleration Team to Determine the Indonesian Carbon Market Implementation Strategy**

   Creating an Acceleration Team is essential in igniting the advancement of an efficient carbon market in Indonesia. By involving a diverse range of stakeholders and proactively addressing potential setbacks, this team would play a pivotal role in driving progress. Composed of industry leaders, NGOs, CSOs, and academics, the Acceleration Team's main objective would be to identify challenges and produce comprehensive White Papers. These documents would serve as the framework for developing the Carbon Trading Roadmap and Carbon Exchange Roadmap, promoting cooperation among various government bodies. The well-structured and fact-driven White Paper would prioritize value creation by identifying and refining potential business ventures. Additionally, it would propose incentive schemes supported by credible regulations, aligning with Indonesia's National Determined Contributions (NDCs). To put this plan into action, the Coordinating Ministry for Maritime Affairs and Investment (MARVES) can take the lead in establishing an Acceleration Team by issuing a Ministerial Decree (KepMenkoMarves). By producing a White Paper, the Acceleration Team can hasten the progress of creating a Carbon Trading Roadmap, OJK Regulations for Carbon Exchanges, and the Carbon Exchange Development Roadmap – facilitating cooperation among multiple ministries and agencies.

2. **Finalizing the Carbon Trading Roadmap**

   In order to further develop the carbon market, in accordance with the Minister of Environment and Forestry's directive (no. 21/2022) on Carbon Economic Value (NEK) implementation, the KLHK should select a capable and competent Focal Point to develop the Carbon Trading Roadmap. The Ministry of Environment and Forestry can assemble a team of experts and technical professionals to lead this effort, ensuring it encompasses industry, civil society organizations, and academia for a balanced approach to environmental integrity and economic sustainability. This roadmap should clearly outline the supply chain and clearly define the technical roles and responsibilities of relevant ministries and agencies. This roadmap must receive thorough review and revisions to ensure policy consistency and program effectiveness among related ministries and institutions. By doing so, we can ensure that our efforts are well-coordinated and effective in driving forward Indonesia's carbon market.

3. **Reassessing the Carbon Exchange Roadmap**

   To further boost the impact of the Carbon Exchange Roadmap, it is vital that OJK conducts a thorough evaluation of its original plan. This updated roadmap must include inclusive consultations with knowledgeable individuals from various sectors, such as experts from the industry, academia, and civil society organizations. This approach will provide a well-rounded perspective and garner support for the roadmap's implementation. Moreover, as the roadmap is being crafted, it is essential to incorporate global best practices by actively engaging with industry experts and professionals. The ultimate goal of the roadmap should align with the S.M.A.R.T. principles -Specific, Measurable, Attainable, Realistic, and Time-specific. By doing so, it can pave the way for a business-friendly environment that meets international standards, thereby further boosting the green economy.

7. Annex

Annex 1: Indonesia Climate Exchange

1) Background

Launched in September this year, the Indonesia Climate Exchange (ICX) is the first carbon exchange established by Indonesia as a part of the Indonesia Commodity & Derivatives Exchange (ICDX) Group.[387] As a tangible form of the national pledge in constructing the carbon neutral future, ICX is embedded within the country's 2050 climate goals with support from the $20 billion Just Energy Transition Partnership (JETP) pledge by the International Partners Group back from G20 the Indonesian presidency in 2022.[388] ICX provides both the Offset Market for voluntary mitigation actions and the Emission Market to sustain the 'cap-and-trade' scheme of a mandatory/Compliance carbon market in Indonesia.

2) Credits Verification and Issuance Process

As a platform operator that is in sync with the International Renewable Energy Certificate Standard Foundation (I-REC Standard), ICX is responsible for enhancing registry functions but doesn't hold the main custody record of Product Certificates. However,it can initiate actions within a registry remotely.[389]

In the process of handling product certificates on the ICX Platform, these certificates are kept within a specific account under a registry who maintains a record of the legal titleholder. Issuers can issue these certificates directly inside the in-platform account, and the participants or certificate owner can transfer them via the platform. Redemptions or claiming the benefit of the certificates initiated by non-Participants will go to a Redemption Account held by the platform operator, while those initiated by participants are directed to their Redemption Accounts. Product certificates can also be transferred from the ICX Platform to a Participant Trade Account without Redemption, with all such actions promptly reported to the registry associated with the platform's account for processing, ensuring transparency and accountability throughout the process.[390]

As a national offset market, ICX recognizes the SPE-GRK, the Renewable Energy Credit (REC),[391] and the Global Carbon Credit (GCC) as the trading instruments among the participating players.[392] In facilitating the CCM, ICX recognizes the SPE-GRK and PTBAE as the utilized instruments.[393]

3) Supporting Facilities

- **Auction Method Variety**

  ICX proves two auction types, the Dutch Auction model and the Minimum-Bid Auction. The variety is intended to facilitate participants to choose the most suitable method to their business. The Dutch Auction model allows participants to make bids on an auction that has an incrementally descending price until a bid is placed and the price would become a single price forward.[394] Contrarily, the Minimum-Bid Auction publishes a minimum price to initiate the bidding process, hence it would attract the selected bidders with suitable capacity in participating within the auction.[395]

- **Information Hub for a Feasible and Transparent Marketplace**

  The Information Webpage of ICX provides multiple educational videos on carbon and climate impacts, along with the timely publications on the carbon market. Embedded within the website portal, ICX provides a timely record on credits sold periodically, dated from the year of selling and with a roster of volume and price processed under the "Historical Price" section.[396]

387 https://www.icdx.co.id/our-market/carbon
388 https://www.thejakartapost.com/business/2023/09/26/indonesia-launches-first-carbon-exchange.html
389 https://www.irecstandard.org/platform-operators/
390 The International Attribute Tracking Standard
391 REC is issued by the International REC Standard Foundation (I-REC Standard) for certifying electricity production from Renewable Energy power plants.
392 https://www.climate-x.id
393 Ibid.
394 https://www.investopedia.com/terms/d/dutchauction.asp
395 https://martinjurisch.com/types-of-auctions/
396 https://www.climate-x.id/information

- **Payment of Ecosystem (PES)**
  The PES system aims to facilitate the transformation of ecosystem services, which are provided by nature without cost, into financial incentives. These incentives are then channeled towards individuals or entities who are responsible for owning or managing natural resources, with a primary emphasis on conservation efforts.[397] ICX charges no fee for this facility.

397 https://www.climate-x.id/our-platform

Annex 2. Command-and-control (CAC)

Definitions	CAC tools (mechanisms, laws, and measures) set definitive guidelines to achieve certain emission-reduction goals, and non-compliance results in punitive measures.[398]
Theoretical Background	CAC relies on the state's authority to enforce and monitor environmental regulations, primarily aiming to control the amount and type of pollution emitted directly.[399]
Features	• **Emission Standards**: These are specific limits on the pollution a company or sector can emit. Such standards can be uniform across an industry or vary depending on specific conditions or criteria.[400] • **Technological Standards:** These are explicit mandates issued by the government directing firms to use certain pollution control technologies or processes.[401]
Advantages	• **Certainty:** Provides a clear and definitive environmental outcome, as the limits are set.[402] • **Understandability:** Given its directive nature, the command-and-control approach is straightforward for businesses to comprehend.[403]
Disadvantages	• **Cost Inefficiencies:** The approach might lead to unequal and possibly higher costs for companies to comply, as not all businesses operate under the same conditions.[404] • **Limited Innovation:** Since standards are set, companies must be more incentivized to innovate or surpass the minimum requirements.[405]
Stakeholder	Vehicle emission testing by local governments ensures vehicles on the road adhere to a certain environmental standard. The challenge lies in the high enforcement costs and the potential stagnation of technological advancements due to set standards.
Practical Example	• Government agencies are responsible for the formulation, execution, and enforcement of regulations. In the United States, the Environmental Protection Agency (EPA) enforces the Clean Air Act. • Businesses and industries must comply with established regulations, which may result in incurring expenditures for compliance. • Environmental non-governmental organizations (NGOs) play a crucial role in advocating for more stringent laws and actively monitor and report on industry adherence to these regulations. • The general public is affected by the environmental consequences and potentially bears the financial burden resulting from the actions of enterprises.
Country Example: Indonesia	In 2019, the Indonesian government implemented a number of CAC measures to reduce plastic pollution in the country. Under Gubernatorial Regulation No. 142/2019, the Indonesian government has prohibited single-use plastic bags in Jakarta's shopping areas. Non-compliance leads to warnings and fines of up to IDR 25 million. Unpaid fines within five weeks may result in permit suspension or revocation.[406]

Annex 3. Market-based Approach

Definitions	Mechanisms that use market forces to incentivize emission reductions, including carbon pricing strategies like cap-and-trade.[407]
Theoretical Background	Market-based approach is flexible, in which regulatory information is reflected through market price, including emissions trading schemes (ETS), environmental taxation, etc.[408]
Features[409]	• **Cap:** A maximum allowable emission level is established. This typically reduces over time, pushing industries towards greener solutions. • **Trade:** Companies can buy or sell emission allowances based on their capabilities, providing flexibility and promoting cost-effectiveness

398 https://www.eea.europa.eu/help/glossary/eea-glossary/command-and-control
399 Berck, P. (2018). *"The Theory and Practice of Command and Control in Environmental Policy"*, London: Routledge.
400 Zhao, X., et al. (2015). "Impact of environmental regulations on the efficiency and CO2 emissions of power plants in China", *Appl. Energy 149*, pp. 238–247.
401 Zhao, X., et al. (2015). "Impact of environmental regulations on the efficiency and CO2 emissions of power plants in China", *Appl. Energy 149*, pp. 238–247.
402 Berck, P. (2018). *"The Theory and Practice of Command and Control in Environmental Policy"*, London: Routledge.
403 Berck, P. (2018). *"The Theory and Practice of Command and Control in Environmental Policy"*, London: Routledge.
404 https://www.sciencedirect.com/science/article/pii/S0959652620300585
405 https://www.sciencedirect.com/science/article/pii/S0048969719363582
406 https://www.projectplanetid.com/post/on-the-way-to-a-plastic-pollution-free-indonesia
407 https://www.c2es.org/content/market-based-strategies/
408 https://www.mdpi.com/2071-1050/13/12/6913#B9-sustainability-13-06913
409 https://www.c2es.org/content/market-based-strategies/

Advantages[410]	• **Economic Incentives:** Profit motives can spur innovative emission-reducing technologies. • **Early Action Incentive:** Businesses who reduce emissions early on stand to gain from the future sale of their surplus allowances. • **Flexibility:** Companies can choose how to reduce emissions, leading to potentially cheaper and more innovative solutions. • **Dynamic Adjustments:** As technology and environmental conditions evolve, businesses are continuously motivated to cut their emissions since more allowances are sold when emissions are lower. • **Efficiency:** Costs are reduced throughout the system by allowing businesses with lower mitigation costs to cut more and sell excess allowances.[411] • **Encourages Green Investments:** Companies have a greater incentive to invest in renewable energy and other low-carbon technologies when the price of carbon rises. • **Revenue Generation:** The auctioning of carbon permits can bring in substantial sums of money for governments, which they can reinvest in environmentally friendly initiatives or distribute to their constituents.[412] • **Transparency:** There is improved transparency in how businesses achieve their emission reductions with a transparent system of allowances and exchanges.[413] • **Global Participation:** Incorporating cap-and-trade mechanisms into international regulatory frameworks opens the door to international trade and cooperation.[414]
Disadvantages[415]	• **Price Uncertainty:** Carbon allowance prices can be volatile, creating business unpredictability. • **Setting the Cap:** If the cap is too lenient, meaningful reductions in emissions may not be achieved.
Stakeholders	• Government/Supranational Entities: Organizations like the European Commission create and manage the framework for carbon trading. • Businesses and industries that buy or sell emission allowances on the carbon market. • Financial Institutions: Provide trading services and occasionally trade for speculative purposes. • Environmental NGOs: Promote sensible cap values and monitor the market's environmental effects.
Example: European Union ETS	The EU Emissions Trading System (EU ETS) is a fundamental component of the European Union's strategy to address the issue of climate change. The utilization of this instrument is crucial in efficiently mitigating industrial greenhouse gas emissions while maintaining cost efficiency. Established in the year 2005, the carbon market under consideration holds the distinction of being the foremost global initiative of its kind and continues to maintain its position as the largest market.[416]

Annex 4. Information-based Approach

Definition	The proposed methodology entails enterprises voluntarily complying with specific environmental standards and afterward communicating their adherence to the public.[417]
Theoretical Background	The essence of this strategy lies in the belief that informed consumers can either reward or penalize companies based on their environmental behaviors, influencing market dynamics.[418]
Features	• **Transparency**: Business enterprises frequently exhibit their environmental practices and performance through various means, such as sustainability reports or eco-labels.[419] • **Reputation**: Companies can build a positive reputation and gain competitive advantages by publicly sharing their environmental initiatives.[420]

410 https://development.asia/explainer/why-market-based-solutions-are-smart-way-protect-environment

411 https://scholar.google.co.id/scholar_url?url=https://ageconsearch.umn.edu/record/10726/files/dp030043.pdf&hl=en&sa=X&ei=PA7wZI yQHZn0yATE_oXICg&scisig=AFWwaeYn8Zuhf5aBKZbAIChEPYP2&oi=scholarr

412 https://scholar.google.co.id/scholar_url?url=https://ageconsearch.umn.edu/record/10726/files/dp030043.pdf&hl=en&sa=X&ei=PA7wZI yQHZn0yATE_oXICg&scisig=AFWwaeYn8Zuhf5aBKZbAIChEPYP2&oi=scholarr

413 https://www.cleanenergyregulator.gov.au/Infohub/Markets/cert-report

414 https://icapcarbonaction.com/system/files/document/benefits-of-ets_updated-august-2018.pdf

415 https://www.resources.org/archives/market-based-approaches-to-environmental-policy-a-refresher-course/

416 https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets_en; https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_3542

417 Konar, Shameek & Cohen, Mark. (2001). Does The Market Value Environmental Performance?. The Review of Economics and Statistics. 83. 281-289. 10.1162/00346530151143815.

418 Konar, Shameek & Cohen, Mark. (2001). Does The Market Value Environmental Performance?. The Review of Economics and Statistics. 83. 281-289. 10.1162/00346530151143815.

419 Bansal, P., & Clelland, I. (2004). Talking trash: Legitimacy, impression management, and unsystematic risk in the context of the natural environment.

420 Ghuslan, M. I., Jaffar, R., Mohd Saleh, N., & Yaacob, M. H. (2021). Corporate Governance and Corporate Reputation: The Role of Environmental and Social Reporting Quality. *Sustainability*, *13*(18), 10452. MDPI AG. Retrieved from http://dx.doi.org/10.3390/su131810452

Advantages	• **Positive Public Image**: Companies that openly disclose their good environmental practices have the potential to enhance their public perception, potentially leading to higher levels of brand loyalty and sales.[421] • **Flexibility**: In contrast to stricter regulatory frameworks, corporations have the autonomy to decide which environmental policies they adopt and how they prefer to disclose them.[422] • **Market Differentiation**: By demonstrating explicit environmental commitments, firms can establish a unique market position, providing them with competitive advantages. [423]
Disadvantages	• **Voluntary Participation**: Due to its voluntary nature, only a subset of enterprises may choose to disclose, potentially leading to fragmented dissemination of market information. [424] • **Greenwashing**: The issue of firms potentially exaggerating or misrepresenting their environmentally friendly activities continues to be a prominent problem, as it can potentially deceive consumers.[425] • **Enforcement Difficulties**: The successful deployment of these systems predominantly hinges on the prevailing public mood, although there are still obstacles in ensuring the veracity of firms' information.[426]
Practical Example	The PROPER award by KLH serves as an embodiment of this approach. Participating companies undergo evaluations based on their environmental stewardship, and their subsequent rankings can influence their market image. Nonetheless, the voluntary nature means that only some enterprises participate.
Stakeholders	• Businesses and industries: voluntarily provide environmental data and occasionally adapt as a result of public feedback. • Environmental or sustainable certifications are offered by certifying bodies, such as the Eco Mark in Japan. • Environmental NGOs frequently contribute to the development of certification or disclosure criteria. • Customers: Businesses are influenced by the purchases consumers make depending on the available information.
Example	Japan has taken strides in implementing information-based environmental regulations. One such initiative is the "Eco Mark" program started by the Japan Environment Association (JEA). Companies can use the Eco Mark label on products that meet specific environmental criteria. It aids consumers in making environmentally conscious purchasing decisions. This mechanism hinges on consumers being well-informed and valuing environmental stewardship.[427]

421 Arimura, T.H., Darnall, N., & Ganguli, R. (2016). The effect of ISO 14001 on environmental performance: Resolving equivocal findings.

422 Bansal, P., & Clelland, I. (2004). Talking trash: Legitimacy, impression management, and unsystematic risk in the context of the natural environment.

423 ibid.

424 Lyon, T.P., & Montgomery, A.W. (2015). The means and end of greenwash.

425 https://doi.org/10.1007/s10551-011-0901-2

426 Arimura, T.H., Darnall, N., & Ganguli, R. (2016). The effect of ISO 14001 on environmental performance: Resolving equivocal findings.

427 Nakamura, M., Takahashi, T., & Vertinsky, I. (2001). *"Why Japanese firms choose to certify: A study of managerial responses to environmental issues."*

Annex 5. Key Difference of Instruments to Carbon Emissions Reductions

The instruments for carbon emissions reductions differ in their mechanisms, implementation, and outcomeS. CAC approach sets forth direct emission standards, whereas market-based instruments employ economic principles to incentivize reductions. However, tools that prioritize delivering information have the goal of educating and influencing consumer decisions. Each instrument possesses unique advantages and disadvantages when it comes to addressing the global challenge of carbon emissions. A comprehensive explanation will be provided in the table below.

Elements	CAC	Market-based	Information-based
Focus	Regulating the behavior of performance of individual polluters through enforcement and/or state authority	Incorporating market principles into government policies	Providing information to consumers about the environmental commitments and impacts of products and companies
Features	Technological standards, performance standards	Emission taxes, subsidies, cap-and-trade schemes	Public disclosure programs, eco-labeling, certification programs
Advantages	Standard set based on emission targets, does not require individual firms' cost information	Market-led and/or taxes leading to lower costs for emissions reduction, generate additional revenues for the government, technological innovations	Promote transparency and can provide firms with a competitive advantage
Disadvantages	Does not promote innovation, can be economically inefficient	Can raise product prices, may be subject to political influence	Does not address the underlying problem of externalities, may be fragmented or misleading (greenwashing)

The detailed task of reducing carbon emissions has given rise to various instruments, each crafted with a unique approach and clear results. The Command and Control (CAC) approach relies on direct regulation, where standards are set for individual polluters through the weight of state authority. This approach, known for its high expertise and quality standards, provides the benefit of maintaining consistent emission targets. However, it's often critiqued for its lack of innovation encouragement and potential economic inefficiencies. On the other hand, market-based instruments strive to combine market principles with governmental policies. In this context, instruments such as emission taxes, subsidies, and cap-and-trade schemes are prominent features. These solutions offer the potential for more cost-effective emissions reduction and provide governments with potential revenue streams, encouraging the development of new technologies. However, they come with their fair share of challenges, such as the potential for higher product costs and the impact of political factors.

Additionally, strategies centered around information aim to raise consumer awareness about companies' environmental commitments, thus influencing their choices. By implementing eco-labeling, public disclosure programs, and certification, their goal is to promote transparency and provide businesses with a competitive advantage. However, the approach receives criticism for potentially failing to address the underlying problems and runs the risk of becoming fragmented or even misleading through greenwashing. These notable distinctions underscore the complex nature of instruments focused on reducing carbon emissions.

Annex 6. Key Difference Between Compliance Carbon Market and Voluntary Carbon Market

The primary difference between the Compliance Carbon Market (CCM) and the Voluntary Carbon Market (VCM) is rooted in their inherent characteristics and objectives. The CCM is a market that operates under strict regulations, requiring entities to comply with governmental or international standards in order to

offset their emissions. These standards are established to guarantee that countries or regions fulfill their predetermined greenhouse gas (GHG) reduction goals. On the other hand, the VCM operates as a non-regulated market where both organizations and individuals have the option to purchase carbon credits in order to offset their emissions. Participation in the VCM is motivated by a range of factors, including corporate social responsibility, brand image enhancement, and personal environmental commitments. Legal mandates are not the sole driving force behind involvement in the VCM.

Elements	Compliance Carbon Market	Voluntary Carbon Market
Participation	Mandatory	Complementary to compliance market
Regulation	National, regional, or international carbon reduction regimes	Functions outside of the compliance market.
Enabling architecture	Coverage, target and cap, allocation, MRV, regulation and enforcement, registry, platform, market oversight, and legal foundation.	Project developer, standard-setting bodies and registries, verifiers, intermediaries (traders, brokers, retailers), and end purchasers.
Commodity	Allowances are facilitated by a cap-and-trade system.	Carbon offsets, facilitated by a project-based system.
Price	More expensive as they are driven by regulatory obligations.	Cheaper and unstable impacted by market size, project type, quality of credits, co-benefits, etc. Voluntary credits cannot be used in compliance markets.
Buyers	Primarily regulated entities.	Governments, companies, individuals, and organizations to offset emissions.
Marketplace	Credits can be sold under regulated emissions trading schemes; or under the compliance carbon exchange.	There is currently no centralized voluntary carbon market; Project developers can sell their credits directly to buyers, usually through intermediaries or brokers. It can be sold in voluntary carbon exchange
Issues and challenges	Complex policy interaction, stringent target-and-cap settings, the need for a strong legal framework and enforcement, institution and MRV capacities, allocation mechanism, well-functioning emission allowance market, other enabling conditions.	Lack of regulation, debates on CA, bifurcation of credit types, concerns over greenwashing.

The carbon market is divided into two main categories: the Compliance Carbon Market (CCM) and the Voluntary Carbon Market (VCM). The CCM operates within strict regulatory frameworks, whether national, regional, or international, requiring entities to comply with specific carbon reduction regimes. It follows a methodical approach, emphasizing comprehensive coverage, specific targets and limits, effective regulation and enforcement, and the need for a solid legal framework. The market mainly deals with allowances through a cap-and-trade system. This careful arrangement frequently results in increased costs for carbon credits, primarily due to regulatory requirements. These credits are primarily sold under regulated emissions trading schemes, serving a marketplace mostly of regulated entities. Nevertheless, implementing such a rigorous system comes with its own difficulties. These include navigating the complexities of policy interactions, ensuring the presence of strong institutions and effective Monitoring, Reporting, and Verification (MRV) capabilities, and the task of establishing a fully operational emission allowance market.

On the other hand, the VCM serves as a supplementary area to the CCM, allowing entities to participate voluntarily. It operates in a manner that is not bound by the strictness of regulated markets, providing a more adaptable option for balancing out emissions. The VCM involves various individuals and organizations, including project developers, standard-setting bodies, verifiers, and intermediaries such as traders and brokers. This market revolves around carbon offsets primarily generated through project-based systems. It is worth noting that the voluntary nature of this market results in more affordable and fluctuating prices, which are influenced by various factors such as project type, credit quality, and co-benefits. Although it offers

governments, companies, and individuals a platform to offset emissions, where credits are sold directly to buyers, typically through intermediaries. However, despite its flexibility, the VCM does come with its fair share of challenges. Stringent regulations, debates surrounding Corresponding Adjustments (CA), the division of credit types, and worries about greenwashing are just a few of the significant challenges the market is currently grappling with.

Annex 7. Case Study – Canada Carbon Tax-Rebate Program

In Canada, the government introduced a carbon tax and rebate plan in 2019. It applies in four out of ten provinces (Ontario, Manitoba, Saskatchewan, and Alberta) and is meant to reduce carbon emissions. Initially, the tax was $20 for every ton of carbon, and it was supposed to go up to $50 by 2022.' Then, in 2020, the government announced it would increase to $170 by 2030. As part of this plan, the government provides money back to the public as a rebate known as the Climate Action Incentive (CAI) payment. This payment is distributed as a tax credit to one adult in each household and it is based on factors such as the number of people in a household, household size, and location with additional considerations 10% increase for rural households. The CAI payment is designed to offset the impact of the carbon tax on households.

The purpose of the implementation of the tax rebate in Canada is to help offset the cost of the carbon tax that is paid by individuals. The carbon tax is a price that individuals pay for the greenhouse gas emissions that their consumption generates. The tax rebate is also intended to encourage individuals to transition towards green products and services.[428] The process of the tax rebate mechanism in Canada begins when a company produces a product that emits greenhouse gasses. The government then adds a carbon tax to the company that produces emissions, based on the amount of greenhouse gasses emitted. The cost of the carbon tax is then passed on to consumers in the form of higher prices for goods and services. The government then collects the carbon tax from the company and gives a rebate to the consumer, based on the amount of carbon tax they paid.[429]

Approximately 70% of households will receive more in tax rebates than they pay in carbon costs. This means that these households will be able to keep more of their money, which can be used to offset the higher costs of goods and services that are associated with the carbon price. The top 20% of income earners will pay more in carbon taxes than they receive in rebates. However, the government has stated that it will provide additional support to these households to help them cope with the higher costs of the carbon price.[430]
The policy exhibits strong progressivity, as 80% of households experience greater dividends than their carbon tax expenditures.[431] The carbon tax and rebate plan is a market-based approach to reducing carbon emissions. It is designed to make polluters pay for their emissions, and it provides an incentive for households to reduce their energy consumption. So, this mechanism not only helps mitigate the impact of higher energy costs but also aligns with supporting lower-income households, thus fostering environmental goals through the utilization of the carbon pricing approach.

428 https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/putting-price-on-carbo n-pollution.html
429 https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/putting-price-on-carbo n-pollution.html
430 https://ecofiscal.ca/wp-content/uploads/2019/03/Ecofiscal-Commission-10-Myths-about-carbon-pricing-March-2019-FINAL.pdf
431 https://www.nature.com/articles/s41558-021-01268-3

Annex 8. Nature Based Carbon Offset Price N-GEO

N-GEO futures contracts are comprised of Nature-Based offsets projects from the Verra registry – projects that fall under the Agriculture, Forestry, or Other Land Use (AFOLU) categories. Nature-based solutions can provide valuable contributions to biodiversity, but it's also often considered more difficult to accurately verify the amount of carbon actually offset in nature-based projects.

Annex 9. Assumption for CBA Estimation

Financial Assumptions

Variable	Value	Source
Inflation rate	3% p.a	Bank of Indonesia
Discount rate	6% p.a	Bank of Indonesia
Carbon price	4.5 USD/ton CO_2e	IDXCarbon
Plant economic lifetime	30 years	PLN

Technical Assumptions

Variable	Value	Source
Plant capacity	100 MW	Own Assumption
Capacity factor	70%	PLN
Operating time	8760 hours	PLN
Electricity production	613,200 MWh/year	Calculation
Emission factor	1 ton/MWh	IESR[432]

432 IESR (June, 2022). IESR Encourages Utilizing Coal Profits to Accelerate Energy Transition. Retrieved from https://iesr.or.id/iesr-dorong-manfaatkan-keuntungan-batubara-untuk-akselerasi-transisi-energi

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Law No. 4/2023 Part 3, Article 24
Law No. 4/2023 Part 3, Article 26
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MOEF Regulation 21/2022 Article 4 (2), (3)
MOEF Regulation 21/2022 Article 10 (2) & (3)
MOEF Regulation 21/2022 Article 13 (1),(2),(3),(4), (5)
MOEF Regulation 21/2022 Article 14 (1), (2),(4),(5)
MOEF Regulation 21/2022 Article 15
MOEF Regulation 21/2022 Article 16
MOEF Regulation 21/2022 Article 18 (3)
MOEF Regulation 21/2022 Article 20 (1)
MOEF Regulation 21/2022 Article 24 (1),(2),(3),(4)
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MOEF Regulation 21/2022 Article 38
MOEF Regulation 21/2022 Article 39 (1)
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MOEF Regulation No. 7/2023 Article 13
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