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CARBON MARKETS IN VIETNAM

BRIEFING PAPER

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ACRONYMS AND ABBREVIATIONS

IP5G	-	1-must-5-decrease
3G3T	-	3-decrease-3-increase Program
AAU	-	Assigned Amount Unit
ADB	-	Asian Development Bank
BAU	-	Business as Usual
BOCM	-	Bilateral Clearing Credit Mechanism (BOCM) (later renamed JCM)
CDM	-	Clean Development Mechanism
CER	-	Certified Emissions Reductions
CH_4	-	Methane
CO_2	-	Carbon Dioxide
COP21	-	United Nations Climate Change Conference
ERU	-	Emission Reduction Unit
ETS	-	Emissions Trading System
EU	-	European Union
FTA	-	Free Trade Agreements
GHGs	-	Greenhouse Gases
GIR	-	Greenhouse Gas Inventory and Research Center of Korea
Ha	-	Hectares
ICAP	-	International Association for Cooperative Carbon Action
ICM	-	Integrated Crop Management
IET	-	International Emission Trading
IPCC	-	Intergovernmental Panel on Climate Change
JI	-	Joint Implementation
KP	-	Kyoto Protocol
LULUCF	-	Land Use, Land Use Change and Forestry
MRV	-	Monitoring, Reporting and Verification
NDCs	-	Nationally Determined Contributions
NF_3	-	Nitrogen Trifluoride
OTC	-	Over the Counter
REDD	-	Reducing Emissions Through Reducing Deforestation and Degradation
RTA	-	Regional Trade Agreement
SDM	-	Sustainable Development Mechanism
SO_2	-	Sulfur Dioxide
UNDP	-	United Nations Development Program
UNFCCC	-	United Nations Framework Convention on Climate Change
VCS	-	Verified Carbon Standard
VETS	-	Voluntary Emissions Trading Scheme
VER	-	Voluntary Emissions Reduction
WTO	-	World Trade Organization

INTRODUCTION

According to the Intergovernmental Panel on Climate Change (IPCC), the main cause of climate change is an increase in the concentration of greenhouse gasses (GHGs) in the atmosphere, beginning with the 18th-century industrial revolution. In response to climate change, an international conference convened by the United Nations in Rio de Janeiro in 1992 adopted the United Nations Framework Convention on Climate Change (UNFCCC). To reduce GHG emissions, for the first time, an international legal framework on climate change of the United Nations with the participation of governments of participating countries was adopted in the draft dated December 11, 1997, in Kyoto and officially put into force on February 2, 2005.

The idea of carbon trading first appeared in the form of "pollutant trade" in the United States in the 1970s. However, it was not until 1997 that the idea was formalized when the Kyoto Protocol was signed. Immediately after the Kyoto Protocol entered into force in 2005, the trading of carbon credits developed quite strongly. However, in recent years, the price of carbon credits has decreased sharply because many developed countries have withdrawn as investors in phase II of Kyoto, such as Canada, Russia, Japan, and New Zealand. In contrast, the United States has not yet ratified the Kyoto Protocol.

Carbon trading is a market-based tool for climate change mitigation, done in two ways—cap and trade and carbon offsetting. The European Union (EU) Emissions Trading System (ETS), the largest carbon trading market, has been operating since 2005. The Clean Development Mechanism (CDM) and Joint Implementation (JI) are two project-based mechanisms under the Kyoto Protocol (KP). CDM projects are implemented in developing countries, and JI projects are implemented in developed countries and countries with economies in transition. In parallel with the official UNFCCC carbon market, a voluntary carbon market has been established that is not subject to any mandatory emission reduction targets. “Limit and trade” and “carbon offsetting” mechanisms, and an overview of their implementation in Vietnam, were analyzed in this study.

According to Article 17 of the Kyoto Protocol, a carbon market allows countries with the right to excess emissions to sell or buy from countries that emit more or less than the committed target. As a result, a new commodity appeared globally, as a certificate to reduce/absorb two greenhouse gas emissions. Because Carbon Dioxide (CO_2) is a greenhouse gas equivalent to all greenhouse gases, it is often referred to simply as carbon trading. Trading in carbon credits forms carbon markets. Since the advent of the Kyoto Protocol, the carbon market has developed strongly in Europe, the United States, and Asia with two main types of markets, including the compulsory carbon market and the voluntary carbon market. The Paris Agreement, adopted by countries at the 21st Conference of Parties to the UNFCCC (COP 21) in 2015, is a legally binding international treaty on climate change. Central to the Paris Agreement are the provisions relating to each party's responsibilities to develop and implement each party's Nationally Determined

Contributions (NDC) to the UNFCCC. As of November 2021, the agreement has been ratified or acceded to by 193 out of 197 members of the convention.[1]

Although countries submitted NDCs by the end of 2015, even if all NDCs were fully implemented, average global temperatures could still increase by about 2.9°C to 3.4°C. Achieving the 1.5°C target will require global GHG emissions for the period 2060–2080 and achieving the 2°C zero-emissions target in the 2080–2090 period for the 2°C target. As a result, Decision No. 1/CP21 of the Paris Agreement on Climate Change requires all parties to review and update their NDCs at least every five years with an ever-increasing ambition to contribute to mitigating climate change GHG emissions. The UNFCCC requires parties to submit the first revised NDC by 2020.

On July 24, 2020, the Prime Minister approved Vietnam's NDC Update, which sets a target to reduce national GHG emissions by nine percent compared to a business as usual (BAU) scenario using financial resources within the country, and the unconditional contribution could increase to 27 percent if Vietnam received international support. In the updated NDC, Vietnam has allocated mitigation targets to five sectors, notably energy, agriculture, industrial processes, land-use, land-use change, and forestry (LULUCF), and waste from 2021–2030. Resources to achieve these goals are expected to run into the tens of billions of dollars over the next decade. Developing a carbon market is one of the ways to mobilize social resources transparently and flexibly. The new regulations are expected to reinforce Vietnam's commitment to reducing GHG emissions under the Paris Agreement on climate change.

Vietnam is considered a country with many advantages to developing a voluntary carbon market and has demonstrated its commitment to reducing greenhouse gas. In addition, Vietnam has received some direct support from international organizations such as the Asian Development Bank (ADB), the United Nations Development Program (UNDP), and the World Bank. Another important issue is that the Government of Vietnam is advocating a sustainable economic transformation. Low carbon will be an important premise to support the development of the carbon market. Vietnam's participation in developing the domestic carbon market will contribute to joining hands with the world in the goal of reducing greenhouse gasses and in developing the country's economy in a green and sustainable direction.

Vietnam has issued a legal framework and policies to establish a carbon market, such as the Law on Environmental Protection 2020. Most recently, Vietnam has issued decree 06/2022/ND-CP dated January 7, 2022 on mitigation of greenhouse gas emissions and protection of the ozone layer, Circular 01/2022/TT-BTNMT dated January 7, 2022 detailing the implementation of the Law on Environmental Protection. In the field of climate change response, Decision No. 01/2022/QD-TTg dated January 18, 2022 promulgating the list of fields and facilities that emit greenhouse gasses that must carry out a greenhouse gas inventory. In these documents, there are many specific provisions related to the establishment and operation of a carbon market in Vietnam, in which the roles and responsibilities of relevant ministries and sectors have been mentioned. The Ministry of Natural Resources and Environment is the focal agency and coordinates with the

[1] Only Eritrea, Iran, Libya, and Yemen have not ratified or acceded to Paris

related ministries to organize the operation of a carbon credit trading system to serve the management, monitoring, and supervision of the carbon market.

Current domestic studies on the carbon market are quite limited. This study goes deeper and analyzes the theory and practical experience in the world, identifies potential assessments, and makes recommendations for forming a carbon market in Vietnam.

1. THEORIES AND EXPERIENCES FOR ESTABLISHING AND OPERATING CARBON MARKETS

1.1. THEORETICAL FOUNDATIONS FOR CONSTRUCTING AND OPERATING A CARBON MARKET

1.1.1. ORIGIN OF THE CARBON MARKET

There are four pillars under which the global carbon market system operates:

1. **International commercial law obligations.** Countries participating in the World Trade Organization (WTO) are committed to meeting their international trade obligations, which may influence the enactment of new legislation to reduce greenhouses emissions and build carbon markets.

2. **Regional commercial and investment law obligations.** Most countries have entered into Regional Trade Agreements (RTAs) or bilateral Free Trade Agreements (FTAs). These agreements are discriminatory in nature and are designed to grant certain trade preferences to participating countries. However, the agreement can create platforms for developing innovations, including those related to carbon markets.

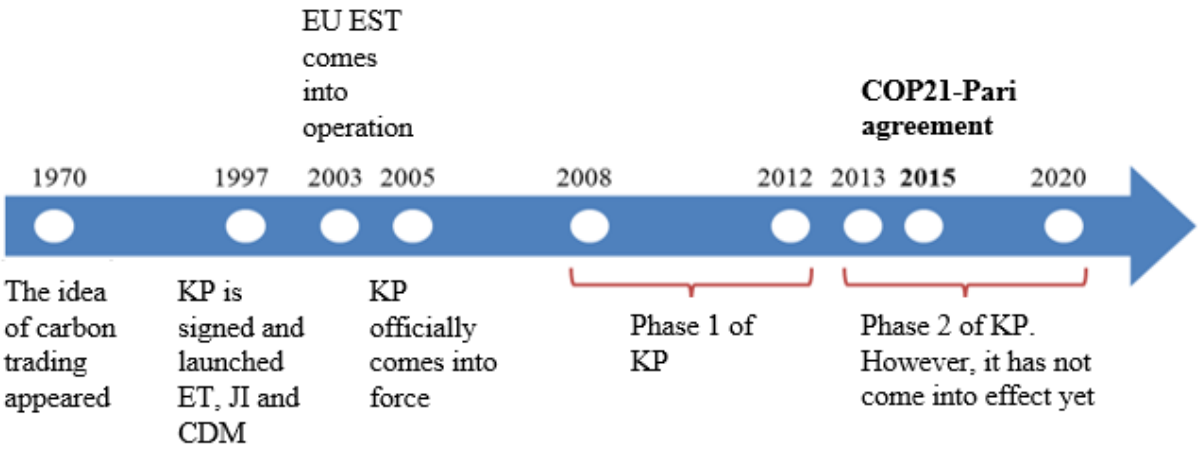
3. **Sustainable development goals of the national climate change strategy.** The signatories of the UNFCCC, the Kyoto Protocol, and the Paris Agreement are committed to achieving targets on climate change and greenhouse gas emissions. The Kyoto Protocol and the Paris Agreement are discussed below.

4. **The national system of policies, laws, and regulations.** Governments, mainly at the national level, develop rules for the markets in which investors seek profits. Important factors are economic, political, social stability, and good governance. Policies that are important for investing in low-carbon operations include environmental, industrial, and energy policies.

Kyoto Protocol

The idea of carbon trading first appeared as "pollution trading" in the United States in the 1970s when the United States decided to trade in sulfur dioxide (SO_2) and nitrous oxide to prevent acid rain.[2] However, the idea was not formalized until 1997 when the Kyoto protocol was signed, setting a target to reduce the total average GHG emissions from other industrialized countries by 5.2 percent (compared to 1990 levels) from 2008–2012. Immediately after the Kyoto protocol came into effect in 2005, the trade in carbon credits developed quite strongly.[3] Kyoto protocol has proposed three flexible mechanisms, including 1) Emissions Trading (ETS), 2) JI, and 3) Clean Development Mechanism (CDM).[4] The carbon trading market development process, within the framework of Kyoto protocol, is presented in Figure 1.

Figure 1. The formation and development of the carbon trading mechanism process.



Source: Nguyen Thi Lieu et al. (2021)

The Kyoto protocol Phase I has set the stage for developing the international carbon market. However, while carbon markets continue to function, the future of the Kyoto protocol as a framework for GHG emission reductions is uncertain.[5] At the 18th Conference of the Parties to the U N F C C C (COP18), the Parties agreed that the second Kyoto commitment period would start from January 1, 2013, and end December 31, 2020. The goal for this period is to cut total GHG emissions below 1990 levels by at least 18 percent between 2013 and 2020. Nitrogen trifluoride (NF_3) is a controlled GHG starting from the Kyoto investor's second commitment period.

Paris Agreement

The Paris Agreement on climate was adopted at COP21 in Paris, France, and came into force on November 4, 2016. This agreement developed a completely different framework from Kyoto

[2] MONRE, 2006. Q&A on carbon trading, accessed at http://www.noccop.org.vn/modules.php?name=Airvariable_protec&op=ndetail&n=212&nc=4 on December 22, 2015

[3] Laing et al., 2013. *International Experience with Emissions Trading.* Climate Strategies.

[4] Bohm and Dabhi, 2009. *Upsetting the Offset: The Political Economy of Car- bon Markets*. London: Mayfly Books.

[5] Richard et al., 2012. *Carbon Markets: Past, Present and Future*. Resources for the Future Discussion Paper No. 12-51 https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2188930

protocol. Instead of setting emission limits, the Paris Agreement required the Parties to submit a Nationally Determined Contribution (NDC). The agreement has been signed by 193 countries and ratified by 189 Parties. About 100 countries that account for 58 percent of GHG emissions are considering or planning to use a carbon pricing instrument to achieve GHG emission reduction targets.

The Paris Agreement has fundamentally resolved the difference in levels of responsibility between developed and developing countries. It is built on a foundation of countries' shared commitment to best and continuous reinforcement in the coming years. The agreement reaffirms the goal to control the increase in average global temperature below 2˚C and calls for the national effort to limit the increase of global average temperature to 1.5˚C.

1.1.2. NECESSARY CONDITIONS FOR FORMING A CARBON MARKET

According to The International Carbon Action Partnership (ICAP), 2014,[6] some of the key factors to be considered for the formation of an emissions trading market include:

- **Determining the emission ceiling and scope:** Theoretically, this ceiling should be determined when the marginal costs of emissions reductions equal the marginal benefits of emissions reductions. In practice, the ceiling is determined based on the emission reduction target that each country and each organization has set. Policymakers will rely on the “curve point on the cost curve.” That is the point when the cost per unit of emission reduction begins to rise rapidly. In addition to determining the emission ceiling, the market for gas emission rights also needs to determine which emissions will be traded? Is it only trading CO_2—the main cause of the greenhouse effect? In addition to CO_2, methane (CH_4) and N_2O emissions are also significantly related to the greenhouse effect, but so far, these two gasses have not been considered. Therefore, in parallel with the purchase and sale of the right to emit CO_2, it is necessary to put these two types of CH_4 and N_2O gas on the market. Industry scope is also a factor to be considered. Due to the problems associated with measuring greenhouse gas emissions, building an emissions trading market can begin with sectors such as the power sector or large and energy-intensive industries.

- **Allocation of emission rights:** Another very important factor for the emission rights market is the allocation of emission rights among the total ceiling set. Deciding on an allocation method is highly political because it is a valuable and scarce asset class with implications for different interest groups. If the emission rights are free, two methods of allocation can be used, including quantifying emission rights based on past emissions (grandfathering) or determining the number of emission rights based on a metric of defined emissions performance for an industry, product group, or unit of output (benchmarking). It is relatively easy to allocate emissions rights based on the “grandfathering” method, as it

[6] ICAP (2014). Emissions Trading Worldwide - ICAP Status Report 2014
https://icapcarbonaction.com/en/status-report-2014

only requires historical emissions data. The disadvantage of "grandfathering" is that those who pollute the most will enjoy the right to emit the most.

- **Price stabilization and cost control:** The advantages of the emission rights trading market are its cost-effectiveness compared to other policy instruments and the flexibility it gives emitters in making decisions about when and when to do so. However, for any market, especially carbon markets, where politics, trading volume, and liquidity are low and price volatility and extreme conditions can reduce market efficiency. There are several tools that can stabilize the market, control the price of carbon, and reduce the cost of trading emissions rights. These tools include reserve gas emission rights, borrowing gas emission rights, floor price, price ceiling, and offsetting.

- **Monitoring activities and enforcement mechanisms:** The marketplace for emissions rights creates new and valuable assets—emissions rights, but these assets only have economic value because they are regulated. Therefore, to ensure a reliable functioning market, regulatory agencies must ensure accuracy in measuring actual emissions, testing, and reporting (referred to as monitoring, reporting, and verification (MRV) activities. Preventing fraud is important not only for the market functioning but for ensuring environmental integrity. Establishing an MRV system to track the implementation and fulfillment of each enterprise's emission reduction requirements is to ensure that each ton of GHG reduction is correct. The process should be reported to the relevant authorities, which should ensure a quality control system that ensures compliance with established standards, can be audited, and verified by Government ombudsmen or an independent third party independent private organization, engaged in providing corporate emissions certifications.[7]

- **Market instruments:** Buying and selling the right to emit greenhouse gasses will open a market operating with a mechanism like the current stock market. In addition to the primary market, where emitters buy emission rights directly from the government (through an auction), the secondary market is where emitters can buy and sell emission rights to each other. The government has many ways to operate the primary market, such as auctioning, outsourcing to auction, or hiring financial institutions to sell emissions rights. The government can restrict auction participants or decide how many emissions rights to sell at an auction. In the secondary market, exchanges can offer products related to trading emission rights such as clearings or derivatives, just like other commodities. Derivatives can also be traded on the gas emission rights market, including forward contracts, futures contract, and options contracts. Market participants have good reason to use various market instruments.

1.1.3 OPERATING MODELS OF CARBON MARKETS

[7] ICAP (2017). Emissions Trading Worldwide - ICAP Status Report 2017
https://icapcarbonaction.com/en/status-report-2017

A carbon market is a market formed from carbon credit exchange transactions. The carbon market exists in two forms, including a mandatory and voluntary mechanism.

Mandatory Carbon Market: A market in which carbon trading is based on the commitments of countries in the United Nations Framework Convention (UNFCCC) to achieve greenhouse gas reduction targets. This market is mandatory and is mainly for projects under the CDM or JI.

The Kyoto Protocol requires participating countries to commit to the goals mentioned above through three main mechanisms set out in the Marrakesh Agreement (Marrakesh Accord) adopted in 2001, including 1) mechanism emissions market, also known as emissions trade, 2) clean development mechanism, and 3) co-implementation Mechanism. Accordingly, countries with excess emissions quotas can sell these quotas to countries with excess emissions through the emission market mechanism. The clean development mechanism allows developed countries to finance projects that reduce emissions in developing countries, thereby increasing the amount of emission quotas in their countries. This is considered an effective tool to help developing countries join the Kyoto Protocol, help improve technological capacity in these countries, and at the same time solve the problem of benefits between the economy and the environment in developed countries. Similarly, co-implementation also allows a Member State to undertake a project on its own in another Member State and thereby obtain additional emissions quotas in its own country. The process of trading carbon credits in the market is compliant with market prices.

There are two main types of trading systems, including “Cap-and-trade systems” or ETS and “baseline-and-credit-systems.” In an ETS, an upper limit on emissions is fixed and emission permits are either auctioned or distributed for free according to specific criteria. Under a baseline-and-credit system, there is no fixed limit on emissions, but polluters that reduce their emissions more than they otherwise are obligated to can earn “credits” that they sell to others who need them to comply with regulations they are subject to.

Voluntary Carbon Market: This market type is based on bilateral or multilateral cooperation agreements between organizations, companies, or countries. This takes place between parties or organizations through GHG emission reduction projects. The products of the voluntary carbon market include renewable energy, energy conversion or efficiency, forestry, or the extraction of methane from landfills.

The market operates voluntarily, where companies (or others) can choose to purchase carbon offsets to increase their environmental certification. A compliance market typically does not regulate these entities, including companies, NGOs, or even individuals—any entity that wants to reduce its carbon footprint. The private sector mainly purchases voluntary carbon credits (VER). The most common motivation to buy VER is corporate social responsibility and public relations. Other reasons are certification, reputation, and social and environmental benefits. Some may require customers to purchase carbon credits. For example, British Airways requires one customer company, Morgan Stanley, to provide a carbon certificate. The private sector can buy carbon credits directly from projects, companies (such as securities companies) or from carbon funds (World Bank's Biocarbon Fund).

Emission Quota and Trading Mechanism (cap and trade): Carbon trading is a market-based tool for climate change mitigation, implemented in two forms, including 1) quotas and cap-and-trade and 2) carbon offsetting. The carbon trading market is divided into two categories: the compulsory market is the market where the carbon trading is based on the commitment of the countries in the Kyoto investor to achieve the GHG reduction target, mandatory and intended primarily for CDM or JI projects. Parallel to the compulsory market is the carbon market outside the Kyoto investor framework (also known as the voluntary market) based on bilateral or multilateral cooperation agreements between organizations, companies, or nations.[8]

TABLE 1. OVERVIEW OF CARBON TRADING MECHANISMS

	MARKET IN KYOTO INVESTOR FRAMEWORK	**EXTERNAL MARKET TO KYOTO INVESTOR FRAMEWORK**
Emission quota and trading mechanism	EU-ETS	New South Wales GHG Emissions Reduction System (NSW GGAS) Regional GHG Initiative (RGGI) Western Climate Initiative (WCI) Midwest GHG Reduction Treaty (MGGRA) The Chicago Climate Exchange (CCX) China's experimental emissions trading program
Carbon Offsetting Mechanism	JI, CDM, POA	Japan's Bilateral Credit Clearing Mechanism (JCM/BOCM) REDD+

According to the principle of the quota and trading mechanism, the government will set a carbon emission limit for the companies (cap) and then issue them carbon permits. Companies can meet their quota commitments through adopting green technologies, purchasing carbon licenses/credits from other companies, or a carbon offsetting mechanism. If emissions quotas are low, there is no incentive for companies or industries to innovate. However, if these changes do not work, companies will have to spend a considerable amount of money on green technologies and thus will be allowed to purchase more emissions permits to meet the quota. Conversely, if companies find it very easy to change production processes and emit less GHG than quotas, they can sell carbon credits to other companies.

[8] Laing et al., 2013. *International Experience with Emissions Trading.* Climate Strategies.

As can be seen, this mechanism can reduce emissions at the lowest cost and encourage environmentally friendly improvements in the industry.[9] In addition, this mechanism is also more effective than taxes by managing total emissions and creating financial incentives. However, this mechanism can create a delay in investment in low-carbon technologies[10] and benefit large companies because these companies are granted multiple discharge licenses.[11] The problem of "hot gas" in the countries of the former Soviet Union and Eastern Europe has also been criticized because emissions reductions stem from economic transformation, not GHG reduction efforts.[12] In addition, there are a number of other barriers to effectively implementing this mechanism such as companies seeking to lobby for more emissions permits and the non-transparent emissions trading market.

Carbon Offsetting Mechanism: Carbon trading can occur as "carbon offsetting" through credits generated from GHG emission reduction projects. CDM and JI are two "carbon offsetting" mechanisms under the management of Kyoto investors. In theory, this mechanism would reduce GHG emissions at a low cost and contribute to sustainable development in developing countries. However, the fundamental issue of all offsetting projects is the baseline and actual GHG reductions compared with the BAU scenario.[13] Determining the BAU and the environmental complementarity criteria is highly uncertain. Therefore, emissions may increase due to exaggerated baselines of the companies and misallocating CERs.[14]

In parallel with the market legalized by the UNFCCC, a voluntary carbon offsetting market has emerged and is not required to achieve binding targets. Any corporation, NGO, and individual that wants to "neutralize" their emissions can pay companies (e.g., Chicago Climate Exchange) to invest in "green projects." While the regulatory carbon market has not yielded the expected results and has become increasingly quiet amid climate change negotiations around the world, the voluntary carbon market is evolving and has been deployed in many countries (e.g., Australia, New Zealand, USA, China, Korea, and Thailand).

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[9] Ellerman et al., 2010. *Pricing Carbon: The European Union Emissions Trading Scheme*. Cambridge : Cambridge University Press.

[10] Smith, 2007. *The Carbon Neutral Myth Offset Indulgences for your Climate Sins*. The Netherlands: Transnational Institute, Imprenta Hija de J. Prats Bernadás.

[11] Bohm and Dabhi, 2009. *Upsetting the Offset: The Political Economy of Car- bon Markets.* London: Mayfly Books

[12] Soroos, 2001. *Global Climate Change and the Futility of the Kyoto Process.* Global Environmental Politics, 1, 1-9. https://doi.org/10.1162/152638001750336541

[13] Bumpus and Liverman, 2009. *Accumulation by Decarbonization and the Governance of Carbon Offsets*. Economic Geography, 84, 127-155.

[14] Woerdman, 2000. *Implementing the Kyoto Protocol: Why JI and CDM Show More Promise than International Emissions Trading*. Energy Policy, 28, 29-38. https://doi.org/10.1016/S0301-4215(99)00094-4

Michaelowa, 2005. *Determination of Baselines and Additionality for the CDM: A Crucial Element of Credibility of the Climate Regime.* In F. Yamin (Ed.), Climate Change and Carbon Markets: A Handbook for Emissions Reduction Mechanisms (pp. 305-320). London: Earthscan.

Schneider, 2007. *Is the CDM Fulfilling Its Environmental and Sustainable Develop-ment Objectives? An Evaluation of the CDM and Options for Improvement.* Berlin: Öko-Institut.

TABLE 2. DIFFERENCES BETWEEN THE TWO CARBON CREDIT SCHEMES		
MAIN FEATURES	**EMISSION QUOTA AND TRADING MECHANISM (CAP AND TRADE)**	**CARBON OFFSETTING MECHANISM**
Exchange goods	Emission quotas, in which emission reductions are not created or eliminated, but exchanged between the parties.	Carbon credits with which the buyer can comply with emission regulations, and offset emissions activities (such as those of an airline).
Quantity that can be sold	Determined by the overall limit.	Created by individual projects.
Targeted market	Compulsory market.	Both the compulsory market and the voluntary market.
Market structure	Both buyers and sellers have common interests, but there can also be disputes and conflicts in emissions trading.	Both buyer and seller want to maximize the Carbon credits and offset the Carbon generated from the project.
Financial sources	Usually high-emission parties such as the energy sector and high-emission industry.	Regulated by each standard and not just dependent on high-emission parties.
Independent 3rd party expertise	Play an unimportant role in the verification of emissions inventory results..	Play a key role in validating the accuracy and adequacy of proposed emission reductions

Source: Kollmuss et al (2008)

1.2. EXPERIENCE IN SETTING UP AND OPERATING A CARBON MARKET

1.2.1. PRACTICAL EXPERIENCE IN IMPLEMENTING A CARBON MARKET UNDER THE KYOTO PROTOCOL

The Kyoto Protocol was the first mechanism to open the global market for greenhouse gases, but the idea of trading in pollutant agents has appeared for the first time since the 70s, when the United States decided to buy and sell sulfur dioxide (SO_2) and nitrous oxide to prevent acid rain. The idea of buying and selling support for ecological protection is also not new.

The Kyoto Protocol is a set of mandatory targets for 37 industrialized countries in the world and the E.U. on reducing greenhouse gas emissions. Accordingly, these countries must reduce their greenhouse gas emissions, mainly carbon dioxide, by at least five percent by 2012 compared to 1990 levels. The specific reductions applied to each country vary. For example, it is eight percent for the E.U. countries, seven percent for the United States, six percent for Japan, eight percent

for Australia. Countries including New Zealand, Russia and Ukraine are allowed to maintain their current emissions levels. Only a few countries with low greenhouse gas emissions are allowed to increase their emissions, such as Norway with a one percent increase or Iceland by ten percent.

Within the framework of the Kyoto Protocol, types of emission reduction certificates that are include:

- **Certified Emission Reductions (CER):** A certificate of GHG emission reduction issued by the CDM Executive Board for emission reductions achieved by CDM projects.
- **Emission Reduction Unit (ERU):** A unit of GHG emission reduction generated by project activities through a JI between developed countries;
- **Assigned Amount Unit (AAU):** A tradeable unit of GHG emissions generated by trading in emissions rights between developed countries.

Industrialized countries have an obligation within 100 days of the final annual assessment to compensate for any shortfalls in relation to the specified emission limits by purchasing credits or other support through emission trading mechanisms . Failure to do so results in heavier fines. In contrast, this provision does not apply in cases of voluntary emission reduction.

1.2.2. PRACTICAL EXPERIENCE IN OPERATING CARBON MARKETS OUTSIDE THE FRAMEWORK OF THE KYOTO PROTOCOL (USA, EU, NEW ZEALAND, CHINA, KOREA, AND THAILAND)

United States Carbon Market

There are many models for building a mandatory domestic carbon market in the United States such as regional greenhouse gas initiatives (RGGI) and the Western Climate Initiative (WCI, 2012).

The RGGI is the first mandatory market-based program to reduce GHG emissions by the United States. It is a cooperative effort among 11 states on the East Coast[15] to cap and reduce (CO_2) emissions from the power sector. RGGI establishes a regional cap on the amount of CO_2 pollution that power plants can emit by issuing a limited number of tradable CO_2 allowances. Each allowance represents an authorization for a regulated power plant to emit one short ton of CO_2. Individual CO_2 budget trading programs in each RGGI state create a regional market for CO_2 allowances.[5]

Industries have three options to meet emissions reductions, including 1) improving facilities and operations, 2) purchasing credits, or 3) contributing to the Emissions and Variables Management Fund. The RGGI Model Rule has developed details for five general categories of domestic Carbon offsetting and recovery, including 1) Landfill methane capture and removal, 2) Reducing sulfur hexafluoride (SF6) emissions, 4) carbon sequestration and storage by afforestation, 4) reducing or avoiding emissions of CO_2 from combustion of natural gas last, oil or propane by using energy

[15] Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont, and Virginia. Pennsylvania and North Carolina are considering joining.

efficient end [improvement], and 5) Preventing methane emissions from fertilizers used in the agricultural sector.

The E.U. Carbon Market

The principle of operation of EU-ETS is on the principle of "quota and trade." Accordingly, absolute limits on the amount of greenhouse gas emissions are established and gradually reduced over time. The distinctive feature of the European carbon market model is its sector-by-sector implementation, with its distribution and market scope adjusted in phases.

- Phase 1 (2005–2007): The scope includes thermal power plants and large electricity users (from 20MW or more). The credits will be distributed 100 percent free of charge to all market participants.

- Phase 2 (2008–2012): The scope is expanded to include the aviation industry, including civil aviation. Approximately 90 percent of the credits will be distributed free of charge, the remainder will be distributed by auction.

- Phase 3 (2013–2020): Expanded scope to include carbon sequestration and storage facilities and petroleum chemical production facilities. About 43 percent of the credits are allocated for free. The remaining is distributed according to the same auction formation as phase 2.

In addition, the European carbon market also allows the use of credits from CDM and JI projects with a finite amount in the market. The total amount of credits from these two mechanisms accounts for about 50 percent of the total emission reductions in the market. Credit allocation is done by free allocation. The emission business parties receive the credits free of charge or through an auction mechanism. Five percent of total credits are reserved for free allocation to new entrants. During phases 1 and 2 of the EU ETS, most of the credits were awarded to the participants free of charge. In phase 3, auction is the default allocation method, although still free allocation, mainly for industry. A cap has been placed on the industry's maximum free allocation, capped at about 43 percent of the total phase 3 cap.

New Zealand Carbon Market

The New Zealand Carbon Market (NZ–ETS) has been in operation since 2008 and covers most sectors of the economy. The New Zealand government has twice conducted a market review and adjustment. The first time in 2011 and the second in 2015, ending in 2017. A special feature of the market is that it includes the forestry sector, which mainly absorbs greenhouse gasses instead of emissions. The method of market operation follows the limit and trade method. Emissions credits or permits are distributed free of charge or by auction. The New Zealand Government requires all industries to report their emissions annually to purchase or remit against government quotas. In addition, the New Zealand Government imposes fines for organizations that fail to fulfill their data collection obligations or intentionally correct errors in reported information. At the same time, in the first phase, an emissions exchange market was built to link the international carbon market under the Kyoto Protocol. However, starting in 2015, the New Zealand Government

focuses only on the domestic market and international credits are not recognized. As of 2019, there were more than 2,360 registered organizations and businesses, accounting for about 52 percent of the total national emissions. In addition, the New Zealand Government also introduced a price floor mechanism, with a fixed price of NZD25 for the carbon market. Although there are many similarities to the European carbon market, the New Zealand carbon market model has several key differences.

- New Zealand's credit allocation is completely free, and the carbon market has expanded in scope to include the forestry sector. This is a special point because the forestry sector is a carbon-absorbing sector, so is not subject to emission quotas like other enterprises in the market. However, if forestry enterprises wish to clear or convert forests, it is necessary to acquire credits equal to the expected absorbed emissions from the cleared forests.

- Credits from other mitigation mechanisms, such as CDM and JI, were not traded on the market until 2015. After 2015, international mitigation credits were not traded on the market.

- The European carbon market focuses on the management of emission enterprises downstream, while the New Zealand carbon market manages the emission enterprises upstream.

China's Carbon Market

The Chinese carbon market launched in 2020. The principle of operation of the Chinese carbon market is according to the method of "quota and trade." However, the biggest difference in the Chinese carbon market is that the market is piloted in relatively economically developed provinces and cities with emission intensity lower than the national average (Shanghai, Beijing, Guangdong, Tianjin, Hubei, Chongqing and Fujian). However, these are also densely populated places, with differences in their economy, gross domestic product, and emission intensity. In each province and city, the Chinese government regulates certain aspects from the scope of management, the method of distribution, or the subjects to be reported.

Among the eight pilot markets in China, the legal hierarchy and institutional arrangement of the ETS emissions trading system varies from pilot market to pilot market. Only Shenzhen and Beijing conduct operations according to national laws, supplemented by local rules and regulations. Another six pilot markets were established according to local laws and administrative regulations. Standards and methods related to quota allocation and monitoring, reporting and appraisal are normative documents developed and issued by the local Development and Reform Commissions of the provinces and cities. streets in the pilot area. The absence of a common guideline on regulatory frameworks and arrangements at the national level has resulted in differences in the standards of local legislation and has become an obstacle to connecting pilot carbon markets.

China planned to establish a common carbon market for the energy industry—with a view to piloting a national domestic carbon market by the end of 2017. However, there have been only

provisional regulations for the carbon emission trade management mandate issued by the National Development and Reform Commission in 2014. This is the main regulatory framework of the central government. At the national level, there is still a lack of a legal framework and an absent regulatory system. Due to the difference in actual conditions between the pilot projects, along with differences in local administrative measures and legal frameworks, the legal basis for market formation—domestic carbon in China lacks effective support of high-level legal documents. Due to the lack of a unified legal basis and uniform standards between local laws and regulations, carbon pilot projects in different regions and cities are subject to a variety of interventions and regulatory adjustments. Therefore, they cannot bring into full play the flexibility of the market. Furthermore, the lax general penalties of various local laws and regulations for carbon trading contract violations make carbon markets inefficient.

Korean Carbon Market

In 2011, Korea released information on emissions levels to use as a baseline scenario and GHG reduction targets for each sector (GIR, 2011). This was followed by the Law on Allocation and Transactions of GHG Emissions Limits in 2012 (GIR, 2015) allowing the development and implementation of a carbon market. In 2014, the Emissions Trading System Steering Plan and Phase 1—National Quota Distribution Plan, together with the National GHG Mitigation Target Implementation Roadmap (GIR, 2015).

Like other countries, the Korean carbon market trades on a “cap and trade” model, the facilities participating in the system have the right to buy and sell emission credits in case of excess or shortage of credits. Emissions. Institutions in Korea are also entitled to receive credits from Clean Development projects (GIR, 2015). In addition, the Korean emission trading system allows participating facilities to borrow credits from other facilities; however, the effect of borrowing only exists in 1 phase active (eg phase 1: 2017–2019). Since January 15, 2014, the Korea Exchange has been the coordinating body for the Korean carbon market.[16] Participating establishments are required to conduct a GHG inventory. After completing the inventory report, it is verified by the third party and reported to the Government. Once the report is licensed, the facilities are sorted into the list of registered emission limits according to the Government's regulations. In addition, participating facilities must also deduct the limit corresponding to the previous year's emissions.[17] Establishments that do not comply with the regulations of the Korean carbon market are fined no more than three times the price per tCO_2 billion. The maximum fine is 10,000 won per ton of CO_2 eq, or about USD 91/tCO_2 tn.

Businesses will be in the list of management of management system targeted greenhouse gas (TMS) if pass the following limits: emissions from 50,000 tCO_2 eq or more per year and consumes more than 200TJ energy per year (for the company), emissions from 15,000 tCO_2 eq or more per year and consumption of energy per year than 80TJ (for establishments) (Republic of Korea,

[16] Korea Ministry of Environment (KME), 2014. *Phase I National Allowances Allocation Plan.*

[17] Government of the Republic of Korea, 2012. *Enforcement Decree of Act on the Allocation and Trading of Greenhouse Gas Emission Permits.*

2011). Eligible companies or establishments on the ETS list will not be on the TMS list (Republic of Korea, 2012).

Thai Carbon Market

Unlike the above countries, Thailand, before implementing the mandatory carbon market, established several voluntary carbon credit exchange mechanisms. The voluntary carbon market operates on the sidelines of the mandatory market and supports businesses and individuals to buy and sell carbon credits on a voluntary basis. A special feature of the voluntary carbon market is the diversity of projects by the parties and is often seen as a testing ground prior to introducing a mandatory carbon market.

The pilot credit exchange mechanisms being piloted in Thailand include:

- Thailand Voluntary Emission Reduction Program (T-VER): domestic C-credit scheme (project-based), using methods obtained from CDM and J-VER. The T-VER program has ongoing since October 2013. There are 65 projects, using 28 methods such as RE, EE, WM, AE, Forestry, and Agriculture.

- Thailand's Voluntary Emissions Trading Scheme (Thailand VETS): the ceiling and voluntary exchange system was tested to validate the MRV system and operating cycle since October 2014.

- Thailand's Carbon Offsetting Program was launched in March 2013 to use the contributions of the participating parties to support activities to reduce GHG emissions in the country, especially projects under the T-VER program.

- Voluntary emission reduction (VER) projects: international standards (VCS and GS).

The voluntary nature of V-ETS, and joint decision-making on goal setting and allocation, has helped generate significant interest with companies and increase awareness and understanding. Extensive efforts on developing an MRV system, collecting and testing data seem to have resulted in a relatively robust system, although there has been no real test when trading has started, especially as are no penalties. Currently, the basic facilities of the ETS system, which are voluntarily registered by enterprises, will help perfect environmental protection policies, and find a carbon market model suitable to the conditions of Thailand.

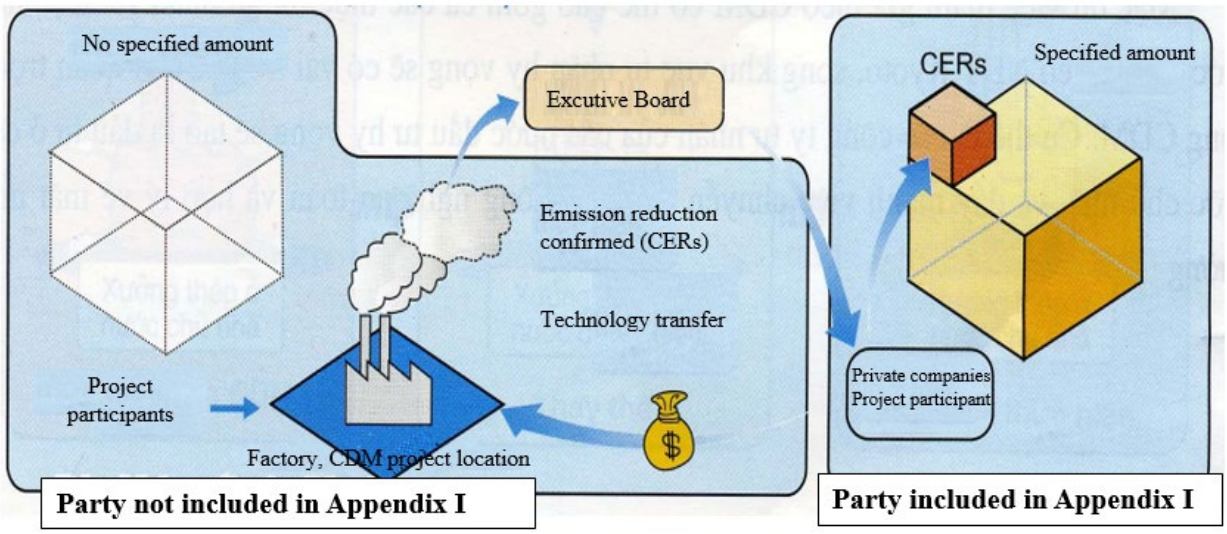
The Thai Government has developed a framework for measuring, reporting, and appraising the system. Detailed regulations on measuring and reporting are in 11 chapters and there are 13 chapters on the appraisal framework.

1.2.3. CURRENT STATUS OF CARBON TRADING IN VIETNAM DURING AND AFTER IMPLEMENTING THE KP

Under the KP, CDM projects aimed to help Non-Annex I Parties achieve sustainable development, contribute to the goal of the Convention, and help Annex I Parties achieve compliance with their country's

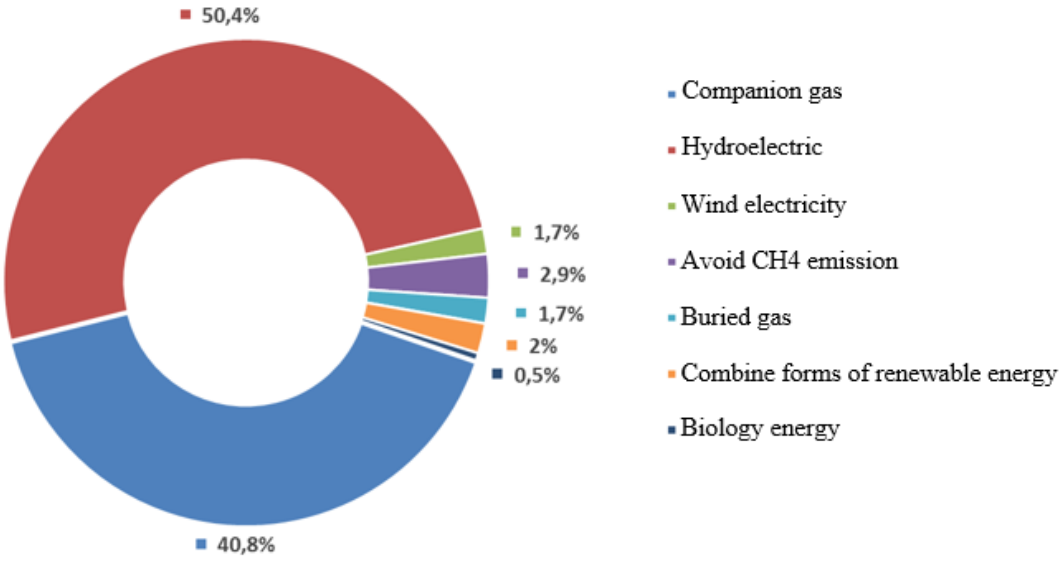
GHG emission reduction targets. The CDM project implementation mechanism and CDM project operation are illustrated in Figure 2 below. Vietnam is one of the countries actively participating in the CDM Mechanism. To date, Vietnam has 254 CDM projects and is ranked fourth in the world for the number of registered CDM projects. The total amount of GHG reduction from the 254 CDM projects is about 140 million tons of CO_2 equivalent. The percentage of projects that received CERs by type is shown in Figure 3.

Figure 2. Mechanism for CDM adoption



Source: Mai Kim Lien et al. (2020)

Figure 3. Percentage of CDM projects that have received CERs by sector.



Source: Mai Kim Lien et al. (2020)

The JCM mechanism was proposed by the Japanese Government to developing countries to promote the transfer and dissemination of low-carbon technologies towards green growth in the host country and support Japan's international commitments on mitigating greenhouse gas emissions implementation. The Japanese Ministry of Environment supports up to 50 percent of investment capital for initial technology. For projects with similar technology that have already been funded, the commitment to support will gradually decrease. Specifically, if the projects have similar technology, the maximum support level is 40 percent for the second and third projects and 30 percent for the fourth. The Japanese Ministry of Environment assigned the GEC Global Environment Center to be the focal point for approving project proposals that receive support to join the JCM Mechanism.

Vietnam was one of the first countries to sign up for the Joint Credit Mechanism (JCM) with Japan, represented by the Memorandum of Understanding on Cooperation on Low Carbon Growth between Vietnam and Japan (signed first on July 2, 2013, and signed second on July 1, 2017). On April 6, 2015, the Minister of Natural Resources and Environment issued Circular No. 17/2015/TT–BTNMT stipulating the construction and implementation of the project under the Common Credit Mechanism within the framework of cooperation in the field of environmental protection—Low-carbon growth between Vietnam and Japan.

To direct, coordinate and manage activities to implement the JCM Mechanism, a Joint Committee with members from relevant ministries and sectors of the Vietnamese and Japanese governments participated, including 18 members, six from Japan and 12 from Vietnam from 2013 to now, the Joint Committees of the two countries Vietnam and Japan have held eight meetings (in 2015 there were two meetings in January and February). August). The relevant forms were first approved at the second meeting in 2014 in Tokyo and revised at the fifth meeting in 2016 in Hanoi.

Currently, seven entities are accredited and operate as Third-Party appraisals for projects under the JCM Mechanism in Vietnam. To become a Third Party in the JCM Mechanism, an organization or agency needs to meet the following conditions, including 1) Accredited according to ISO 14065 by an accreditation body that is a member of the International Accreditation Forum based on the international standard according to ISO 14.064–2 standard, or 2) is a Specialized Professional Body (DOE) or a professional body certified by the Clean Development Mechanism's Executive Board. Registrants becoming Third Parties are responsible for submitting their documents for review and recognition by the Joint Committee.

As of 2020, there have been 14 projects registered with the potential to reduce greenhouse gas emissions, reaching 15,996 tCO_2 equivalent/year. Vietnam has the second most registered projects after Indonesia, with 19 projects. Of the 14 registered projects, 11 projects received funding from the Japanese Ministry of Environment, and three projects received funding from the Ministry of Economy and Trade and Japanese Industry. The total funding received was nearly US$35 million, accounting for 38 percent of the total project implementation budget.

To date, six projects have been put into operation and have been monitored, verified, and issued carbon credits. The joint committee of the two countries granted 4,415 credits made of carbon, equivalent to 4,415 tons of carbon equivalent $CO_{2,}$. The amount of carbon credits is allocated to the Government of Japan, the Government of Vietnam, and project participants.

2. THE LINK BETWEEN THE CARBON MARKET IN VIETNAM AND EMISSION REDUCTION TARGETS

2.1. THE ROLE OF THE CREDIT MECHANISM IN THE OPERATION OF THE CARBON MARKET IN VIETNAM

2.1.1. ANALYSIS OF THE ROLE OF NORMS AND TRADE MECHANISMS IN THE FUNCTIONING OF THE CARBON MARKET IN VIETNAM

Vietnam can apply three methods of allocating carbon emission quotas when operating a carbon market, including allocating through the Government, an auction, or a combination of the two. Each method has advantages and disadvantages, based on the actual situation. Government support can be used when the market is starting to operate and auctions when the market is fully operational.

- **Allocating free emission quotas by the Government to businesses:** There are two common methods used to make this allocation—based on the past or the limit. Limit allocation grandfathering is based on the actual emissions of a business in a certain year or period in the past. These allocations are enforceable because they avoid high initial emission reduction costs for sectors participating in the ETS. However, the disadvantage of these allocations is that it is beneficial for enterprises with high emissions and will have to add regulations when new businesses enter the market for the first time. The allocation by quota (benchmarking) is determined based on the enterprise's mitigation performance indicators. This method is beneficial for businesses that effectively reduce emissions and is easier to apply for first time new market entrants.

- **Allocating emission limits through auction:** Auction activities happen in two ways, including static auction through the primary market with a closed auction mechanism. Businesses participate in the auction once and then pay the same price. In a dynamic auction, a continuous bidding process continues over many rounds until the final price is fixed. The advantage of this approach is that auction design and market entry regulations help prevent market manipulation through groups of small businesses colluding, affecting single large enterprises. For enterprises to do emissions trading and auction activities, the governments of countries/regions generally set up an exchange with the same operating method as a stock exchange, and units of carbon emissions are priced like stocks. In fact, countries that currently have carbon emission markets are using the financial transactions system to conduct carbon emissions transactions.

Because Vietnam has established and operates a stock market, it may be feasible to allocate emission quotas through an auction. However, in the early days of forming a carbon market, it was possible to simply use the free emission quota allocation mechanism and then gradually

combine it with the allocation of quotas through auction when the carbon market has entered the fully operational stage.

2.1.2. THE ROLE OF THE CARBON OFFSET MECHANISM IN OPERATING A CARBON MARKET IN VIETNAM ANALYSIS

For the carbon offsetting mechanism, like other markets globally, operating a carbon market in Vietnam can exist in the primary and secondary markets.

Primary Market (Issuer Market): The primary market is where credits, created and issued by a market authority (usually the state), enter the system. Allocation decisions are made by the governing body that shapes the primary market. If allowances are provided free of charge or at a fixed price, there is no opportunity for price or market manipulation. However, this allocation method does not offer the opportunity to adjust carbon market prices. On the other hand, if allowances are to be auctioned, not only providing the market with an early price discovery mechanism, but also reducing the risk that profits from market leverage, auction design, and market monitoring will close—an important role in ensuring fair price discovery and should be robust to protect against collusion and market manipulation. Therefore, the primary role and responsibility of the primary market participant will depend on the government or state regulator. This aspect will be studied in detail in the following section.

Secondary Market: This will include many parties involved in trading many different types of financial instruments. Participants include businesspeople directly in the market that are subject to limits set by governments and other intermediaries who may enter the market to provide expertise to those involved other market participants and provide liquidity. Some examples are included below.

- **Over the Counter (OTC) Transactions:** transactions between buyers and sellers of carbon credits or carbon credits can occur directly when two parties conduct bilateral transactions or through a third party. OTC contracts are often less standardized and can be customized to meet the individual needs of the buyer or seller and are therefore not qualified to find enough markets to warrant an exchange. OTC contracts can be tailored to fit those companies' exact time frame needs, something they cannot find in the more standard contract trading markets. With OTC transactions, since one party may not know and be familiar with the other party, direct transactions will involve certain risks that when the other party enters the transaction, there is nothing to request or intend to make a bargain. This risk can be minimized by making a transaction through a third party. Executing a transaction through a clearinghouse means that the clearinghouse essentially becomes the counterparty to each transaction. If it is a central clearinghouse, there will continue to be an aggregate picture of the market and individual market positions through the clearinghouse. This clearinghouse service comes with a fee for its services and a required margin that serves as a guarantee, usually in cash, that at least the determination of positions taken in the trade can be insured. If one counterparty is unable to perform part of the contract, the other party's cost margin, together with the mutual guarantees of other market participants, will help ensure that the other party of the contract

will not default on the transaction. While this deposit sent to the clearinghouse is being held as security, it cannot be used for other potential investments, making sense for fewer companies.

- **Carbon Credit Exchanges:** Exchanges provide a central meeting place for buyers and sellers to meet and buy and sell. They are useful because the identities of market participants are confirmed as members and trade on the exchange, their trades are cleared, and they regularly report yield and price information market transparency. Being a member of an exchange or paying a broker to buy or sell on an exchange on one's behalf can have several benefits, including increased market liquidity versus contracts more customizable but may also result in additional transaction costs.

2.2. THE LINK BETWEEN THE CARBON MARKET IN VIETNAM AND THE EMISSION REDUCTION TARGETS COMMITTED IN THE NDC

According to Vietnam's net zero commitment by 2050 at COP26, Vietnam will issue detailed strategies, plans, and provide specific implementation roadmaps in sectors and fields such as energy, agriculture, forestry, land use, waste etc. At COP26, in addition to declaring that Vietnam will achieve net zero emissions by 2050, Vietnam has joined the Leaders' Glasgow Declaration on Forests and Land Use and the Commitment to Reduce Measles Emissions- Global meltdown, Global Joint Declaration on the transition from coal to clean energy. All sectors have strategies to mitigate greenhouse gas emissions. Accordingly, according to Vietnam's emission scenario under normal development (BAU), by 2050 Vietnam's total GHG emissions are forecasted to reach 1495.4 million tons of CO2eq, of which, energy is 1210 million tons of CO2eq, accounting for 81 percent LULUCF accounted for 4 percent, agriculture accounted for 10 percent. These greenhouse gas mitigation activities help facilities, factories, and enterprises earn their carbon credits. Thereby, helping organizations/individuals to participate in the implementation of the domestic and international carbon credits exchange and clearing mechanism in accordance with the provisions of law and international commitments of Vietnam. Besides, after Vietnam's net zero commitment by 2050 at COP26, Vietnam has issued decrees, circulars and policies related to greenhouse gas emission reduction and domestic carbon market development to promote the implementation of the net zero goal by 2050. In addition, the development of a carbon market is indispensable for Vietnam to successfully achieve its net zero emissions target by 2050. Therefore, it is an important factor in formatting and developing Vietnam's carbon market.

National GHG emission mitigation measures for 2021–2030 are identified for the energy, agriculture, LULUCF, waste, and industrial processing sectors. Contribution to GHG emission reduction is determined for two cases—by the country itself and international support through bilateral and multilateral cooperation and the implementation of new mechanisms under the Paris agreement.

With domestic resources, by 2030, Vietnam will reduce its total greenhouse gas emissions by nine percent compared to the national BAU, equivalent to 83.9 million tons of CO_2 equivalent. The estimated mitigation of greenhouse gas emissions in the energy sector is 51.5 million tons of CO_2eq, accounting for 5.5 percent of the national BAU; the agricultural sector is 6.8 million tons

of CO_2 Bn, up 0.7 percent compared to BAU countries; LULUCF sector is 9.3 million tons of CO_2 Bn, accounting for 1.0 percent compared to BAU countries; waste sector is 9.1 million tons of CO_2 Bn, accounting for 1.0 percent compared to BAU countries; IP field is 7.2 million tons of CO_2 Bn, accounting for 0.8 percent compared to BAU countries. GHG emission reductions are estimated in each sector. However, during the implementation of the updated NDC, it will be adjusted to suit actual conditions to ensure the national contribution target.

The contribution rate above nine percent could be increased to 27 percent compared to the national BAU (equivalent to 250.8 million tons of CO_2) receiving international assistance through bilateral, multilateral, and implement the mechanisms of the Paris Agreement on climate change. In particular, the estimated reduction of greenhouse gas emissions in the energy sector was 155.8 million tons of CO_2 Bn, accounting for 16.7 percent compared to BAU countries; the agricultural sector is 32.6 million tonnes of CO_2 Bn, accounting for 3.5 percent compared to BAU countries; LULUCF sector 21.2 million tons of CO_2 Bn, accounting for 2.3 percent compared to BAU countries; the waste sector is 33.2 million tonnes of CO_2 Bn, accounting for 3.6 percent compared to BAU countries; IP field is 8.0 million tons of CO_2 Bn, accounting for 0.9 percent compared to BAU countries.

Compared to the current NDC, the contribution to GHG emission reduction in the updated NDC in the case of country self-actualization has increased in both emissions reductions and emission reduction rates compared to the BAU up to 2030. Then, the amount of greenhouse gas emissions increased by 21.2 million ton s CO_2 equivalent (from 62.7 million tons in the current NDC to 83.9 million tons in the NDC updates), and the corresponding rate of deflation emissions increased by one percent (from eight percent in the current NDC to nine percent in the updated NDC). The contribution rate for mitigating greenhouse gas emissions when international assistance increased from 25 percent to 27 percent, greenhouse gas emissions fell by 52.6 million tons of additional CO_2 equivalent (from 198.2 million ton s in NDC is now up to 250.8 million tons in updated NDC).

2.3. THE RELATIONSHIP BETWEEN THE CARBON MARKET IN VIETNAM AND INTERNATIONAL CARBON EXCHANGE MECHANISMS

As of June 2020, Vietnam has 257 CDM projects by the CDM Executive Board (EB), ranking fourth in the world in the number of projects, with the total amount of GHG reduction potential of about 140 million tons of CO_2 . Out of 257 projects, projects on energy accounted for 87.6 percent. Waste treatment accounted for 10.2 percent, afforestation and reforestation accounted for 0.4 percent and 1.8 percent. However, most projects on energy, waste treatment, afforestation and forest regeneration are registered quite late after the price on the CER market plummeted. This is also reflected in the announcements that Vietnam has only had over 18 million CERs issued by EB so far, ranking sixth in the world.[18]

[18] Nguyen Thi Lieu et al (2021). Research on the scientific and practical basis for the construction of a carbon market in Vietnam. Code TNMT.2018.05.01. Science and Technology Project at the Ministry of Natural Resources and Environment

Vietnam also has ten CDM programs of activities (PoA), 14 registered VCS projects, and four Gold Standard registered projects. Regarding the fields covered by the PMR, Vietnam has six registered projects in the waste sector. However, no CDM/VCS projects have been registered in the construction and steel sectors.

As for the voluntary carbon market, which is not under the framework of the Kyoto Private Decree, Vietnam also has the potential to participate through mechanisms such as the Bilateral Clearing Credit Mechanism (BOCM) (later is called JCM) and the Program on Reducing Emissions Through Reducing Deforestation and Degradation (REDD).

Vietnam joined the JCM mechanism in July 2013 through a memorandum of understanding on "Low-carbon growth and building JCM joint credit mechanism." The purposes of the JCM Mechanism include 1) disseminating Japanese low-carbon technologies, products, systems, services, and infrastructure, contributing to sustainable development in developing countries, 2) quantitative greenhouse gas emission reduction contribution through mitigation action in developing countries and achievement of emission reduction targets of developed countries (Japan), and 3) contributing to the UNFCCC's goal of reducing global emissions.

According to this mechanism, when Japanese enterprises consult and transfer energy-saving and emission-reducing technologies to Vietnamese enterprises, they will enjoy preferential credits from Japan. The maximum credit limit is 50 percent of the total project cost. At the same time, the amount of CO_2 reductions will be calculated for the Japanese side.

Total potential emissions reductions of 28 projects JCM is undergoing a feasibility study (by the Ministry of Environment and Ministry of Economy, Trade and Industry of Japan proposed) estimated at ten million tonnes CO_2 TD/year. There are 18 projects in the energy sector, four transportation projects, three waste management projects, and three forestry projects.

Regarding the REDD mechanism, Vietnam is one of nine countries participating in the United Nations Collaborative Program on REDD (UN-REDD) to prepare for REDD. Preparing for REDD, several issues need to be considered, namely "components to prepare for readiness". The Government of Vietnam (GoV) has identified the design of a transparent, clear, and fair benefit-sharing system for REDD (BDS) as a priority for UN-REDD to support. This is a very new initiative as only a few countries are interested in sharing the benefits of REDD. This is also a very bold and challenging job because it is not the same as the carbon monitoring process and other technical issues.

If implemented in Vietnam, REDD+ could generate about US$80–100 million per year, three to four times more than the existing ODA support for the forestry sector (UN-REDD, 2009). The opportunities and prospects for REDD+ in Vietnam are huge, but whether the potential turns into reality or not depends a lot on the national implementation capacity, seizing opportunities, and overcoming difficulties and challenges.

Since 2012, Vietnam has participated in the Program "Ready to enter the carbon market" (PMR). Since 2015, with the support of the World Bank, Vietnam has implemented the project

"Getting ready for a carbon market in Vietnam" (VNPMR). After five years of preparing and implementing, the project has achieved some results, laying the foundation for Vietnam to form and develop a domestic carbon market towards joining the carbon market world.

From 2021–2030, Vietnam will continue to participate in the initiative "Partners for the Implementation of Carbon Markets" (PMI) initiated by the World Bank to form and develop a carbon market in the future. This is the next phase of PMR to deploy market tools in the participating countries. The focus is on the specific implementation of carbon pricing activities, contributing to the development of policies, tools for managing carbon credits, and carbon pricing in Vietnam in the next decade.

3. RECOMMENDATIONS FOR ESTABLISHING AND OPERATING A CARBON MARKET IN VIETNAM

3.1. COMMON SOLUTIONS FOR DEVELOPING A CARBON MARKET IN VIETNAM

3.1.1 PROPOSED SOLUTIONS RELATED TO ESTABLISHING THE CARBON MARKET

Vietnam has been issuing legal documents related to forming a domestic carbon market.

- The Law on Environmental Protection 2020 has a provision on organizing and developing a carbon market (Article 139), according to which the domestic carbon market includes activities of exchanging greenhouse gas emission quotas and carbon credits obtained from the domestic and international carbon credits exchange and offsetting mechanism following the provisions of laws and international treaties the Socialist Republic of Vietnam is a member. Greenhouse gas-emitting establishments must inventory greenhouse gasses on the list of regulations allocated GHG emission quotas and have the right to exchange, trade, and sell on the domestic carbon market.

- The draft decree regulating GHG emission reduction and ozone layer protection that MONRE is developing stipulates the roadmap for the development of the domestic carbon market and the implementation of credit exchange projects domestically and internationally.

- According to Vietnam's NDC in 2020, Vietnam commits that with domestic resources, by 2030, it will reduce its total greenhouse gas emissions by nine percent compared to the BAU. This level of commitment can be increased to 27 percent if it receives international support through bilateral, multilateral cooperation and market mechanisms under the Paris Agreement.

- At the COP26 Conference in November 2021 in Glasgow, UK, the Prime Minister made a strong statement on reaching net zero emissions by 2050, demonstrating national determination and commitment in accelerating the economic transformation to help tackle the climate crisis. Vietnam's commitment is highly appreciated by COP26 presidents and countries worldwide for its strong but very practical determination.

- Vietnam's carbon market needs to be built and formed based on the set criteria. In particular, the scope, scale, objects, and market tools need to be strictly guaranteed according to the criteria developed for Vietnam.

The proposed carbon market model in Vietnam is divided into three levels:

1. **Government level**: The State management structure for the construction and operation of the carbon market impacts the whole system to bring greenhouse gas emissions to a certain limit. State management of the construction and operation of the carbon market, in a broad sense, is carried out by all state agencies. In a narrow sense, state management of credit exchange activities from GHG emission reduction is enforcement and operating activity characterized by organizational factors; is implemented on an emission-limiting basis and to enforce (future) emission reduction legislation and is guaranteed to be implemented primarily by a system of public administrations (or several social organizations in case they are assigned state management tasks). State management of the construction and operation of the carbon market is also a product of the division of labor among ministries, branches, and localities to link and coordinate the subjects being managed.

2. **Ministries and sectoral level:** An agency with a specialized function in carbon market management needs to be established to deploy, manage, and operate a carbon market. This agency has the role of managing, regulating, and supervising the credit granting, buying, and selling activities of market participants. It is also the agency that manages the credit registration and appraisal system and the market participation status of organizations and individuals. This agency was established with the coordination between relevant ministries, such as the Ministry of Natural Resources and Environment, the Ministry of Industry and Trade, the Ministry of Construction, the Ministry of Transport, and the Ministry of Finance. In addition, several agency representatives of businesses such as the VCCI and business associations are also proposed as one of the members of the carbon market regulator. The carbon market regulator will be the body that proposes regulations and regulations on market operation. At the same time, the carbon market regulator will be the body that proposes and decides on the allocation of quotas to market participants, sets out the procedures for registration and appraisal of the credits formed, trading and trading in the carbon market in Vietnam.

3. **Grassroots level**: direct participation in the carbon market is the business establishments, individuals directly participating in the exchange of buying and selling credits. The participation of businesses and individuals in the carbon market must satisfy the criteria of the carbon market participants. The seller is the enterprises that have, are, and will be producing in the territory of Vietnam and corresponding to such activities are causing GHG emissions; Indirect Buyers and Sellers are finance-investment public-private companies, carbon credit speculators in Vietnam. In addition, there is another target group of the market, which is between the Seller who is an enterprise (domestic private or foreign direct investment) producing in the territory of Vietnam with the potential to reduce GHG emissions, and the Buyer who is the Vietnamese government or the governments of other countries (e.g., Japan). Organizations and enterprises, when participating in the operation of the carbon market, operate under the regulated mechanisms of the carbon market. Enterprises can participate in reflecting, commenting on the regulations and operating mechanisms of the carbon market, and making reports according to the regulations on the market's MRV.

3.1.2 PROPOSED SOLUTIONS FOR DEVELOPING AND OPERATING THE CARBON MARKET

Policy Integration

Successful GHG mitigation requires a combination of policies appropriate to the national circumstances, the nature of the sectors, and the mitigation opportunities being targeted. The integration and boundaries between these policies must be clearly defined to avoid incentives for confusion or separation and undue administrative burden.

To enhance harmonizing market-based measures, the following options should be considered:

- Strengthen cooperation between ministries and central and local governments to ensure all relevant agencies have a common view on the role and function of emissions trade and avoid conflicts between future policies.

- Take an integrated approach to ETS and related policies. Assess the economic and environmental impact of implementing various viable programs such as ETS, energy efficiency certificates, renewable energy certificates, and carbon taxes. Clearly define the boundaries of policies and their respective mitigation roles.

- Research the possibility of linking related programs. Mechanisms that allow the use of credits between systems, such as clearing, can help establish a broader market for mitigation and create a consistent level of mitigation incentive.

Strengthen Monitoring, Reporting, and Verifying Capacity

Implementing new ETS requires establishing new rules and procedures related to MRV of emissions. These processes can build on existing measures in the country or learn from other systems. Capacity-building on MRV technical issues in government and regulatory bodies and implementation plays an important role in ETS implementation.

At the same time, sharing information and experiences on the development of MRV mechanisms in different countries can facilitate harmonization and help build the foundation for linking emerging systems in the future.

Clear guidance on MRV helps to improve stakeholder understanding of system requirements. For example, guidance on monitoring will include requirements for monitoring equipment, monitoring, data collection, and emission calculation methods. Reporting guidelines will include data and report format, submission deadlines, responsible agencies, and penalties for false submissions. The verification guidelines will include accreditation standards and procedures, verification requirements, and rules.

Propose an implementation roadmap for operating the carbon market in Vietnam

The roadmap for forming and developing a carbon market in Vietnam is divided into three phases:

1. **Preparation Phase**

- Review, supplement, and complete the system of legal documents on strengthening the management of carbon credit business activities generated from the mechanism of exchange and clearing of carbon credits domestically and internationally.

- Complete the national system of greenhouse gas inventories, including sectoral, local, and grassroots greenhouse gas inventories.

- Raise awareness of the scope and role of the domestic carbon market and the benefits of trading in GHG emissions quotas and carbon credits.

- Improve state management knowledge for policymakers and officials on the management of business activities of greenhouse gas emission quotas and carbon credits in the domestic carbon market and the international carbon market.

- Train and foster knowledge for agencies, organizations, businesses, communities, and individuals in accessing and implementing activities to reduce greenhouse gas emissions according to exchange mechanisms, offset domestic and international carbon credits and GHG emission quota business activities and carbon credits in the domestic and international carbon markets.

- Strengthen multimedia communications about the benefits and opportunities from participating in the domestic carbon market, contributing to increasing the country's competitiveness towards developing a low-carbon economy and green growth associated with sustainable development.

2. **Pilot Carbon Market Operation Phase**

- Continue to perfect policies and legal frameworks and create favorable conditions for developing the domestic carbon market.

- Continue to strengthen the capacity of carbon market participants.

- Identify sectors and sub-sectors with activities causing greenhouse gas emissions to participate in the pilot carbon market.

- Determine the current and past greenhouse gas emissions of selected enterprises to participate in the pilot carbon market.

- Allocate greenhouse gas emission quotas to establishments (enterprises) selected to participate in the pilot carbon market.

3. **Complete Carbon Market Operation Phase**

- Continue to improve policies and legal frameworks to form and create favorable conditions for the development of the domestic carbon market based on the results of the pilot phase assessment, including regulations on:

- Regulations on adjustment of allocation and recovery of greenhouse gas emission quotas for enterprises participating in the carbon market.

- Trade greenhouse gas emission quotas and derivative carbon credits on the carbon market.

- Stabilize the carbon market.

- Identify enterprises causing large greenhouse gas emissions participating in the carbon market.

- Determine the current and past greenhouse gas emissions of selected enterprises to participate in the carbon market.

- Fully operate the system of registration and transaction of greenhouse gas emission quotas.

3.1.3. PROPOSING SOLUTIONS ON CARBON MARKET MANAGEMENT IN VIETNAM

Carbon Market Regulation Mechanism

Like normal commodities markets, the carbon market is regulated through the laws of the market economy and the regulatory policy of the state. A carbon market is formed based on the need to buy, sell, or exchange carbon credits or emission quotas between economic actors or between countries based on the agreement during a specified period. The market is regulated through the laws of the market economy, including the law of value, the law of supply and demand, the law of surplus-value, and the law of competition.

The objectives of the carbon market regulation mechanism include:

- Form and develop a stable domestic carbon market under the regulation of the State. An effective market regulation mechanism will stimulate trading activities in the market, ensuring cost savings, transparency, and convenience.

- An effective market regulation mechanism also attracts the active participation of both the state and private sectors and other economic sectors in the market and greenhouses mitigation activities, towards a green economy and responding to climate change.

- Promote the transfer of green technology between countries and parties towards clean products, strengthen carbon pricing mechanisms to create valuable products.

- Contributing to implementing international commitments on climate change and national goals as part of international cooperation on greenhouse gas reduction and response to climate change.

Proposed Tools for Regulating the Carbon Market

Under the Paris Agreement Implementation Plan, GHG emission reduction implementation activities have set the task of building a domestic carbon market and piloting it in potential areas. However, currently, the general financial policies on buying, selling and using different types of carbon credits are not adequate, especially for carbon credits on the voluntary market and market instruments on carbon credits. GHG emission reduction, green growth in potential fields also has a gap, accordingly, it is necessary to consider and select appropriate actions to implement. Although in the past, Vietnam has developed many CDM projects and established a financial policy framework in Decision No. 130/2007/QD-TTg to conduct the exchange of carbon credits, 04 projects have been registered. signed under the Joint Crediting Mechanism (JCM), several greenhouse gas mitigation projects in Vietnam are registered under the Verified Carbon Standard (VCS) and the Gold Standard (GS) ... but the main policies There is no financial policy to directly support the formation of a single market for the exchange of carbon credits in Vietnam. In addition, according to the Paris Agreement, the carbon credits from the CDM project will be transferred to the sustainable development mechanism (SDM) by the end of 2020. At the same time, the establishment of the emission trading mechanism is quite complicated. complexity requires substantial preparation for the establishment and operation of carbon pricing infrastructure and capacity.

Over the years, carbon pricing has become the most promising market-based policy instrument. Pricing can take place as an emissions trading system (ETS) or as a carbon tax. Therefore, the study and identification of regulatory financial mechanisms for the carbon market based on the study of carbon pricing contributes to the formation of the domestic carbon credit trading market. It is essential to focus on mobilizing investment from the private sector to actively participate in GHG emission reduction activities and develop the domestic carbon market.

- **Establish a carbon tax:** The carbon tax is a market regulating mechanism being studied and applied in many countries worldwide under different methods and names. A carbon tax is an environmental tax levied on the CO2 emissions of fuel and is a form of carbon pricing. The carbon tax study is considered from two angles: develop a carbon tax as a new policy directly levied on emissions into the environment and correct the existing tax based on an environmental protection tax levied directly on the source of greenhouse gas emissions. A carbon tax is considered an important market-based solution to reduce emissions and respond to climate change and a mechanism for storing and trading emissions. The carbon tax aims to change energy-related choices. This includes individual choices about the use of electrical and energy equipment and the choices businesses make in designing new products, capital investment, and government choices in policy-making and resource planning.

The development of new carbon tax policies in Vietnam needs to be implemented in parallel with the review and amendment of the current tax system in the field of environmental protection to avoid duplicating other related revenues. to emissions of carbon and other gasses subject to adjustment under the proposed carbon tax. The carbon tax is designed as an absolute tax, fixed per unit of emissions (tonnes of CO2 or equivalent) and must strike a balance between the goal of ensuring that the cost of emissions is high enough to has the effect of limiting emissions, creating motivation for the transition to low-carbon technology and fields, while also avoiding negative socio-economic impacts on businesses and increasing energy prices. high. A carbon tax needs to be built in the long term to ensure maximum benefits to the market as well as national and international mitigation goals and strategies.

- **ETS:** ETS offers the benefits of cost-effectiveness, environmental effectiveness, flexibility, transparency, and innovation incentives. Market mechanisms such as emissions trading markets are seen as a superior tool to replace traditional climate change policies. The emission trading market is a cross between the effectiveness of environmental protection policy and economic efficiency and is increasingly becoming a priority choice for many countries worldwide. An emission quota trading system is a regulated system where entities within a given industry are only allowed to emit certain levels of greenhouse gasses .

  ETS requires excess users to offset excess emissions by purchasing offsets through a formal carbon market. Emissions units with emissions below the limit may be allowed to sell the remaining emissions within their cap to units that emit above the cap. This system establishes a market price for carbon offsets through a supply and demand mechanism, which results in prices that are often volatile. The impact of emissions prices on the market on the outcome of greenhouse gas reductions; reduce the ability to encourage manufacturers to switch to low-carbon technology because it can internationalize the cost of greenhouse gas emissions. For domestic enterprises, carbon pricing can affect their competitiveness in the international market. In addition, the construction and development of the ETS system requires a long and complicated study. In the immediate future, it is necessary to study the implementation in the first phase of piloting in a number of large emission industries that are easy to measure and monitor emissions such as the thermal power industry or the steel industry.

- **Carbon credit generation mechanism:** Currently in Vietnam, in addition to clean development projects (e.g., CDMs) implemented following the provisions of Decision No. 130/2007/QD-TTg, many types of carbon credits are also established in Vietnam, including JCM, VERs, REDD^{+}. The JCM mechanism agreement with Japan does not carry out trading in the market, and the remaining credits still generate trading activities in the market. However, there has not been any mechanism or financial policy for this activity, leading to problems with the implementation process.

  In the current situation in Vietnam, the issuance of a tax, a carbon fee, or an emission quota trading system requires implementation in the long term, in front of the carbon

credits and other mechanisms. Carbon offsetting, when continuing to implement in the short term, will have more advantages and efficiency. Through mechanisms to generate carbon credits, the government will continue to regulate trading activities in the market through tax support policies and incentives in accordance with the current legal system, most recently the Decree No. Decree No. 06/2022/ND-CP dated January 7, 2022, on mitigation of greenhouse gas emissions and protection of the ozone layer in order to complete a financial legal framework governing the above credits. as well as their trading on voluntary carbon markets. This Decree stipulates that the scope of regulation includes projects that generate carbon credits and projects implemented under the carbon offsetting mechanism.

However, in the current situation in Vietnam, the introduction of taxes, carbon fees, or emission quota trading systems requires long-term implementation, in the face of carbon credit and carbon offsetting mechanisms, when continued to be implemented in the short term, will have more advantages and efficiency.

3.1.4. PROPOSING TECHNICAL SOLUTIONS OF THE CARBON MARKET IN VIETNAM

The market is complex, with many parties participating and many components. Therefore, it is necessary to design and develop an architectural framework for the carbon market in Vietnam. This framework will include the following:

The transaction system processes:

- Credit sales process
- Credit purchase process
- Member account registration process
- Process of identifying and managing carbon credits

The system structure:

- User Floor
- Communication channel layer
- Process layer, business is computerized
- Platform layer for sharing and integrating the system
- Data layer, database
- Technical Infrastructure
- Document layer of the system

The user account:

- Management accounts - including main management functions, including updating news, allocating quotas to accounts, updating emissions of enterprises, checking credits of

enterprises, verifying, receiving, and tracking market transactions, and verifying business accounts.

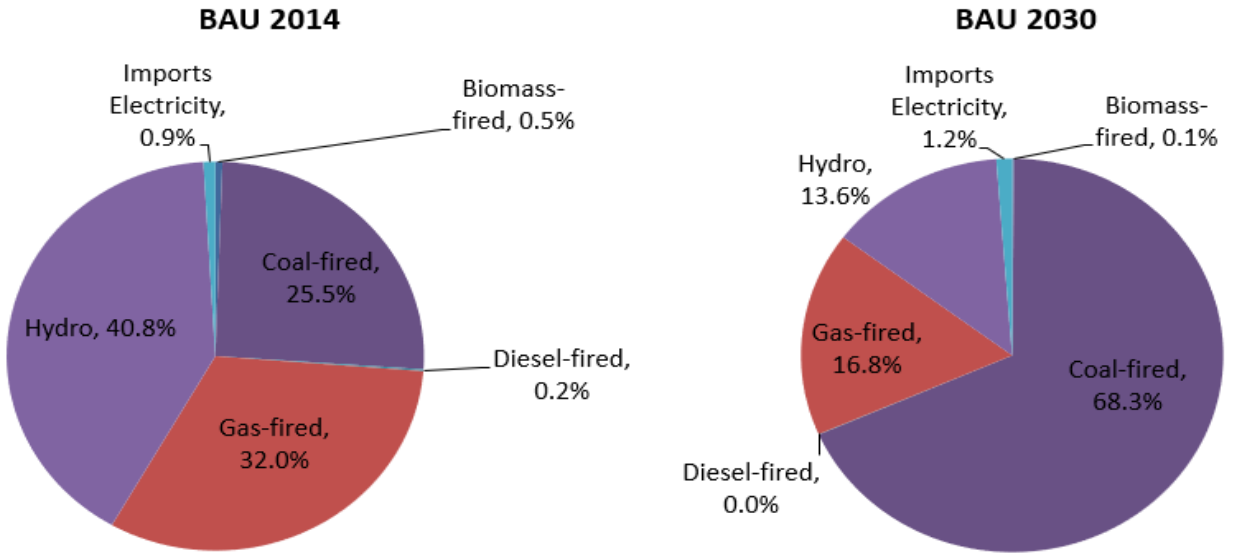
- Trading accounts - participants can check account information and conduct transactions on the market.

3.2. PROPOSING SOLUTIONS FOR INDUSTRIES/FIELDS WITH THE POTENTIAL TO PARTICIPATE IN THE VIETNAM CARBON MARKET

3.2.1. PROPOSING SOLUTIONS FOR THE ENERGY INDUSTRY TO PARTICIPATE IN THE VIETNAM CARBON MARKET

According to the development plan, the electricity industry will increase by 304 percent in the period 2014–2030, and the power generation structure in 2030 will be mainly dominated by coal-fired power plants (68.3 percent) natural gas (16.8 percent) and hydropower (13.6 percent), total power plant capacity also grew significantly, with coal power plant configuration in 2030 (49.8 percent) and natural gas (31.2 percent) increasing faster hydroelectricity (18 percent).

Figure 4. Structure of Vietnam's energy supply development scenario to 2030.



Source: TIMES Model, 2019

Therefore, to reduce greenhouse gas emissions in the electricity generation sector, the solutions outlined in Table 3 below should be implemented.

TABLE 3. POTENTIAL SOLUTIONS TO REDUCE GREENHOUSE GAS EMISSIONS BY 2030 IN THE POWER SECTOR

SOLUTION	DESCRIPTION	2030 GOALS
	Total concentrated renewable energy output (GWh)	118.992

TABLE 3. POTENTIAL SOLUTIONS TO REDUCE GREENHOUSE GAS EMISSIONS BY 2030 IN THE POWER SECTOR		
SOLUTION	**DESCRIPTION**	**2030 GOALS**
Promoting renewable energy sources	Proportion in the total centralized power supply	21.9 percent
Promote wind power	Wind power output (GWh)	23.180
	Proportion of total supply	4,3%
Promote concentrated solar power	Concentrated solar power output (GWh)	15.577
	Proportion of total supply	2.9%
Biomass power plants [including bagasse]	Electricity production from wood and bagasse (GWh)	9.506
	Proportion of total supply	1.7%
Landfill gas power plant	Power output from landfill gas (GWh)	218
	Proportion of total supply	0.62%
MSW Power Plant	MSW Power Output (GWh)	3.361
	Proportion of total supply	0.6%
Biogas biogas power plant	Biogas electricity production (GWh)	0
	Proportion of total supply	0.0%
Small hydroelectric plant	Power Output SHP (GWh)	14.912
	Proportion of total supply	2.7%
Co-fired coal-biomass plant	Power generation from coal and biomass (GWh)	0
	Proportion of total supply	0.0%
Supercritical coal power plant	Supercritical coal power output (GWh)	135.121
	Proportion of total supply	24.8%

Source: TIMES model research results for Vietnam, 2019.

3.2.2. PROPOSED SOLUTIONS FOR THE AGRICULTURAL SECTOR TO PARTICIPATE IN THE CARBON MARKET IN VIETNAM

GHG mitigation solutions for agriculture to participate in the Vietnamese carbon market include:

- Converting long-day rice varieties with short-day varieties.
- Applying water withdrawal between crops and alternating wet and dry irrigation. Until recently, 45,000 hectares (Ha) of rice areas have been applied with full alternating wet and dry irrigation, reducing CO2 emissions by160 tons.
- Applying integrated crop management (ICM), the 3-decrease-3-increase (3G3T) program, and the 1-must-5-decrease (1P5G).
- Converting inefficient rice areas to rice-shrimp and rice-rice models to upland crops (maize, beans, fruit trees, and perennial industrial crops). It is estimated that more than 100,000 hectares have been planted. Implementing rational use of natural resources and reducing GHG emissions could reduce CO2 emissions by an estimated 400 tons.
- Improving diets with imported, industrially produced, or self-added feed. Tens of thousands of dairy cows have been applied to reduce GHG emissions and increase milk yield.
- Collecting and treating livestock organic matter as organic fertilizer, reducing environmental pollution, increasing efficiency of use and reducing GHG emissions (millions of tons implemented).
- Applying water-saving irrigation technology, drip irrigation integrated with fertilizer, with hundreds of hectares of coffee being implemented.
- Eliminating straw burning after harvest.

3.2.3. PROPOSED SOLUTIONS FOR THE WASTE INDUSTRY TO PARTICIPATE IN THE CARBON MARKET IN VIETNAM

It is necessary to continue researching domestic waste management models in urban and rural areas to reduce environmental pollution and reduce greenhouse gas emissions.[19] For solid waste and hazardous waste management, several new mechanisms and policies on power generation from waste, construction waste management, control of waste from plastic bags, and recovery of discarded products have been issued. In addition, the National Strategy on Integrated Solid Waste Management to 2025 with a Vision to 2050 has been adjusted and promulgated.[20]

There have been strides in solid waste management. Collection rates have increased from 78 percent in 2008 to 85.5 percent in 2017. The urban daily-life solid waste collection rate has increased from 78 percent in 2008 to 85.5 percent in 2017. Collection service has been extended

[19] MOC, 2017. Report on the implementation of the National Strategy on Integrated Solid Waste Management to 2025, vision to 2050, July 3, 2017

[20] According to Decision No. 491/QD-TTg dated May 7, 2018.

to grade V cities and rural residential areas, including the socialization of collection, transportation, and investment in constructing solid waste treatment facilities.[21]

Nationwide, 114 hazardous waste treatment facilities licensed by the Ministry of Natural Resources and Environment. The total amount of hazardous waste collected and treated in 2016 was about 752,181 tons, reaching the collection and treatment rate of 90 percent. Most medical facilities and hospitals have done the waste classification for appropriate treatment. Hazardous medical waste is collected and treated by incinerators at large hospitals or centralized treatment facilities in the area.

Promulgating a mechanism to support developing power generation projects using solid waste in Vietnam.[22] Solid waste management programs and projects are also being actively implemented by many localities to reduce the landfill rate and increase the recycling rate (MONRE 2018).[23] Hanoi city just put into trial operation a construction waste crushing line for recycling at the construction site, this is one of the first steps in the recycling and treatment of construction waste. Ho Chi Minh City has also piloted a program to separate solid waste at source in wholesale markets, supermarket systems, enterprises in Tan Thuan Export Processing Zone, Hi-Tech Park, and residential clusters in some areas. In addition, several solid waste incineration projects for power generation have been prepared to be implemented in several provinces such as Hanoi, Binh Duong, Hau Giang, Long An, Nam Dinh, Quang Tri, Thai Binh and Thanh Ho Chi Minh City, and Thua Thien Hue.

In addition, the application and replication of technology to treat domestic waste into organic fertilizer has been applied by some localities, such as Ha Tinh, Ninh Binh, Ninh Thuan, and Yen Bai.

3.2.4. PROPOSING SOLUTIONS FOR THE LULUCF INDUSTRY TO PARTICIPATE IN VIETNAM'S CARBON MARKET

Vietnam has issued several policies related to socio-economic development, land use planning, green growth and low carbon agriculture, and sector development plans for agriculture. Therefore, it is necessary to implement the following related policies:

- ***National land use planning for the period* 2021–2030, *vision to 2050, and the national five-year land-use plan 2021–2025*:**[24] The targets for using agricultural, forestry, and other land by 2030 include 1) rice land, 3.57 million ha, 2) forestry land, 15.8 million ha, 3) non-agricultural land, 4.9 million ha, 4) unused land, 1.2 million ha, 5) economic land, 1.65 million ha, and 6) urban land, 2.95 million ha.

[21] Ministry of Construction, 2017. Report on the implementation of the National Strategy on Integrated Solid Waste Management to 2025, vision to 2050, July 3, 2017

[22] According to Decision No. 31/2014/QD-TTg dated May 5, 2014.

[23] MONRE, 2019. Report on the current state of the national environment: Domestic solid waste management

[24] Resolution *39*/ 2021 /*QH15* dated November 13, 2021.

- **The Target Program on Sustainable Forestry Development:**[25] sets out the main tasks for forest protection and management up to 2020, including 1) forest protection and conservation, to ensure the recovery of 15 percent of degraded forest areas, especially special-use forests. Increase the area of special-use forests by 100,000 hectares by 2020, 2) develop and improve forest productivity and quality, including planting and post-harvest rehabilitation with an area of 1,025,000 ha, of which 75,000 are special-use and protection forests; intensive afforestation of 200,000 ha for large timber production; zoning for natural regeneration 360,000 ha/year; planting scattered trees: 250 million trees; converting small timber production plantations into large timber: 90,000 ha; the percentage of planted forests planted with quality control varieties is from 75–80 percent, and 3) sustainable forest management and forest certification: 100,000 ha/year and supports the national forest certification program.

- **The National REDD+ Action Program to 2030:**[26] focuses on reducing emissions from deforestation and forest degradation, conserving, and enhancing forest carbon stocks, and sustainable management of forest resources. The main objectives include 1) increasing forest cover to 42 percent by 2020 and reaching a total forest area of 14.4 million ha, 2) increasing forest cover to 45 percent by 2030, and 3) implementing measures to reduce emissions, increase forest carbon stocks, and sustainably manage forests.

- **Target Program for Sustainable Forestry Development.**[27] The goals by 2020 include 1) increasing the value of forestry production from 5.5 percent to 6.0 percent/year, 2) achieving national forest cover of 42 percent, and the forest area is 14.4 million ha, 3) an average yield of planted forests of 20m ^{3}/ha/year, 4) provide 25 million jobs, increase income, contribute to hunger eradication and poverty alleviation, improve living standards for people living in forests, build new rural areas, and ensure national security.

- **Project on sustainable forest management and forest certification.**[28] The scheme aims for sustainable forest resource management, biodiversity conservation, environmental services, and promoting forest certification: meet 80 percent of raw materials to produce wooden furniture for export and increase the value of planted forest wood, reduce hunger, and reduce poverty.

3.2.5. OTHER SOLUTIONS

- Continue further studies and pilot projects on specific sectors/sectors of carbon markets to have a realistic view of creating a basis for forming and developing Vietnam's carbon market;

[25] Decision No. 886/QD-TTg dated June 16, 2017.

[26] Decision No. 419/QD-TTg dated April 5, 2017.

[27] Decision No. 886/QD-TTg of the Prime Minister dated June 16, 2017.

[28] Decision No. 1288/QD-TTg dated October 1, 2018.

- Review, supplement, and complete the system of legal documents on strengthening managing carbon credit business activities generated from the exchange mechanism and clearing carbon credits.

- Complete the national system of greenhouse gas inventories, including sectoral, local, and grassroots greenhouse gas inventories.

- Regulations on the measurement, reporting, and appraisal (MRV) system for GHG emission reduction activities according to domestic and international carbon credit exchange and offset mechanisms.

- Raise awareness of the scope and role of the domestic carbon market and the benefits of trading in GHG emissions quotas and carbon credits.

- Training and fostering knowledge for agencies, organizations, businesses, communities, and individuals in accessing and implementing activities to reduce greenhouse gas emissions according to exchange mechanisms, offset domestic and international carbon credits and GHG emission quota business activities and carbon credits in the domestic and international carbon markets.

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