

## Overview of the Global Carbon Market and Lessons Learned for Developing the Carbon Market in the Agricultural Sector in Vietnam

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### Abstract

The carbon market has experienced significant growth, particularly since the Paris Agreement in 2015. Currently, there are 80 active carbon markets worldwide, with a total value exceeding USD 100 billion and covering 28% of the world's total carbon emissions. This trend presents a substantial opportunity for carbon credits in general and Vietnam's agricultural sectors specifically. This study aimed to provide an overview of the development of the global carbon market and draw lessons learned for the development of the carbon market in Vietnam. Despite having significant carbon credit potential, including 57 million credits from agriculture and 40-70 million credits from forest carbon sequestration, Vietnam's economic benefits from carbon trading are limited due to the lack of a formal carbon trading market. Carbon credits from Vietnam's forests have been traded, primarily through voluntary markets, with transactions and funding largely derived from donors. Developing Vietnam's formal carbon market faces many challenges, including an incomplete legal framework; a lack of methods and standards for measuring, monitoring, and verifying credits; limited production systems that simultaneously generate agricultural products and carbon credits; and insufficient financial resources and specialized human capital throughout the process from production to carbon market transactions. This paper recommends the establishment of a comprehensive carbon market, including a robust legal framework that enables both domestic and international transactions, alongside capacity building and research to develop processes from carbon credit production to market trading.

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### Keywords

Agriculture, carbon credits, carbon market, carbon trading, sustainable development

### Introduction

Climate change is now a global environmental problem that threatens the economies and societies all humans worldwide

Reducing greenhouse gas emissions has become an urgent task for all countries to mitigate the negative impacts of climate change (Bibi and Rahman, 2023). To reduce climate change, the top priority is to cut greenhouse gas emissions. In this situation, many countries have worked together to create agreements for reducing emissions, starting with the Kyoto Protocol. After the Kyoto Protocol in 1997, many mechanisms were created, such as the CDM (Clean Development Mechanism) and REDD+ (Reducing Emissions from Deforestation and Forest Degradation) (Le Van Vien, 2025). The Paris Agreement in 2015, especially Article 6 about the carbon market, gave countries the chance to trade carbon credits to meet their emission reduction targets on a global scale (Ta Dinh Thi, 2024).

The concept of the “carbon market” was introduced in the Kyoto Protocol, in which countries with surplus carbon emission rights could sell, donate, or purchase from countries that emit more or less than their committed targets (UNDP, 2022). This concept gave rise to a new type of commodity: greenhouse gas emission reduction or absorption certificates. Since greenhouse gases are converted to a common unit of carbon equivalent (CO<sub>2</sub>e), the trading and exchange of emission allowances is collectively referred to as the carbon market. The emergence of the carbon market has opened a new pathway for many countries to transition from a “brown” economic growth model based on natural resource exploitation and environmental degradation towards a “green” growth model, which emphasizes economic development alongside environmental protection and sustainable resource use. Globally, carbon markets are generally categorized into two main types: compliance markets and voluntary markets. Compliance markets, such as the European Union Emissions Trading System (EU ETS), require member states to follow specific emission quotas to manage greenhouse gas emissions in sectors like industry and energy. In contrast, voluntary markets allow enterprises and individuals to purchase carbon credits to offset their emissions without legal obligations (ICAP, 2024). As of now, the total value of global emissions trading systems (ETS) has reached approximately USD 303 billion since 2007, with

USD 74 billion traded in 2023 alone (UNDP, 2022). According to the latest World Bank report (World Bank, 2025), there are currently 80 ETS systems operating globally. The total value of transactions across these systems exceeds USD 100 billion, with 50% of that amount used to support environmental projects and improve infrastructure in countries around the world. Approximately 28% of the total global carbon is now traded directly on the market, compared to 5% in 2005. This reflects the strong growth trend of the global carbon market.

Vietnam is among the countries most vulnerable to climate change globally. The country’s greenhouse gas emissions quadrupled between 2000 and 2018, increasing from 0.79 tons to 3.81 tons of CO<sub>2</sub>e per capita (World Bank Group, 2022). In response to international climate commitments, Vietnam has pledged to achieve net-zero emissions by 2050 and has identified carbon market development as a key solution. This approach not only serves as a tool for meeting emission reduction targets but also creates opportunities for businesses to invest in clean technologies and renewable energy sources (Ministry of Agriculture and Environment, 2023). According to Vietnam's greenhouse gas inventory, agriculture is the second largest emitter of greenhouse gases in the economy, accounting for 30% (second only to the energy sector). The three main sources of emissions from agriculture are: i) rice cultivation, emitting 49.7 million tons of CO<sub>2</sub>eq year<sup>-1</sup> (accounting for 50%); ii) livestock farming, emitting 18.5 million tons of CO<sub>2</sub> eq year<sup>-1</sup> (accounting for 19%); and iii) land management and fertilizer use, emitting 13.2 million tons of CO<sub>2</sub>eq year<sup>-1</sup> (accounting for 13%) (Ministry of Agriculture and Environment, 2018). This forms the basis for the agricultural sector to generate carbon credits through measures such as transitioning to low-emission production; managing agricultural waste and by-products; and transforming land-use structures. In addition, Vietnam has over 14.8 million hectares of forest (40% of which are natural forests) with a forest cover rate of over 42%. This forest area creates a large carbon sink, estimated to absorb between 40 and 70 million carbon credits between 2021 and 2030 (Ministry of Agriculture and Environment, 2023). Therefore, by effectively combining emission reduction

measures in agricultural production with enhancing the carbon sequestration capacity of Vietnamese forests, a significant source of revenue can be generated from the sale of carbon credits.

Agricultural production has long been one of Vietnam’s major strengths; however, this sector also contributes a significant share of the country’s greenhouse gas emissions, ranking second and accounting for 30% according to a report from the Ministry of Agriculture and Environment (2018). Therefore, the development of low-carbon, ecological agriculture is a strategic direction for Vietnam in the coming years. Promoting the carbon market in agricultural production will not only help reduce emissions in this sector but also enable Vietnam to access substantial financial resources from developed countries, thereby improving the livelihoods and prosperity of farmers. To capitalize on this advantage, the Project for Developing the Carbon Market in Vietnam was approved by the Vietnamese Government in Decision No. 232/QĐ-TTg dated January 24, 2025. Accordingly, Vietnam's carbon trading market will be piloted from June 2026 to December 2028 and officially operational from 2029 (Vietnam Government, 2025). Nonetheless, several major challenges remain, including an incomplete legal framework, measurement and monitoring systems that do not meet international standards, and limited

financial and human resources (Ta Dinh Thi, 2024). This study aimed to provide an overview of the global carbon market, analyze the potential and current statuses of carbon credit development in Vietnam’s agricultural sector, and propose solutions for building a coherent and sustainable carbon market.

## Methods

### Data collection

This study employed a literature review approach and analyzed secondary data. The data sources were collected from reports and publications of the International Carbon Action Partnership (ICAP), as well as from scientific papers and national and international reports related to the carbon market (Figure 1). The data spanned the period from 2008 to 2024, ensuring both up-to-date information and the ability to accurately reflect the current state of the carbon market globally. Information and data on the carbon market in Vietnam were collected from the Climate Change Department of the Ministry of Agriculture and Environment of Vietnam.

### Data analysis

The data were compiled and processed using Microsoft Excel 2010 to analyze the key components and development statuses of carbon markets in pioneering countries.

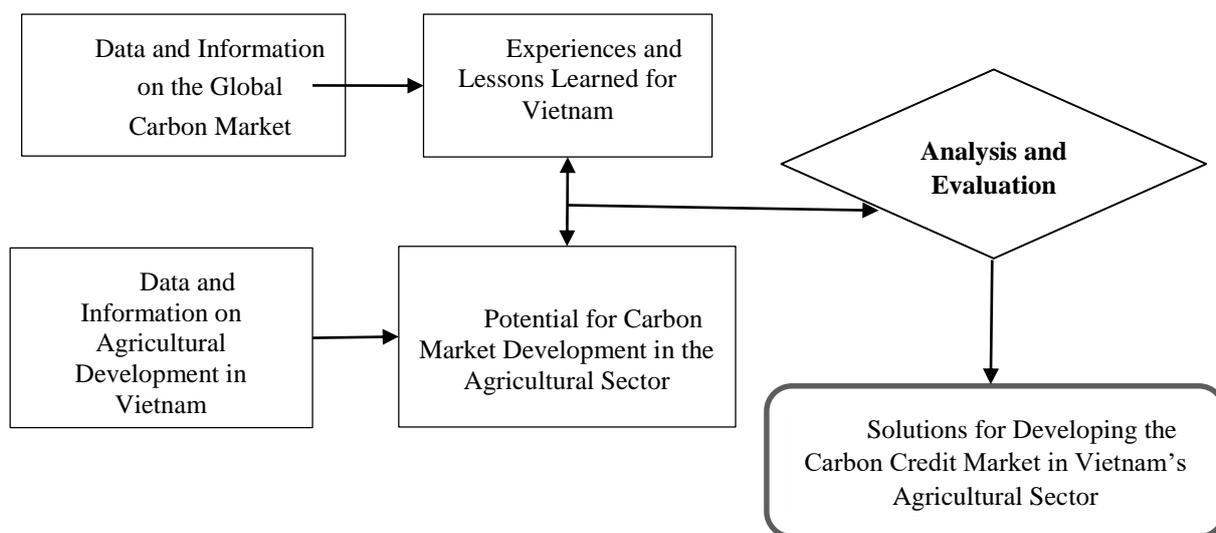


Figure 1. Overview of the research implementation steps

## Results and Discussion

### Development of the global carbon market and lessons for Vietnam

#### *Current status of development*

Carbon markets around the world are generally divided into two main types: compliance markets and voluntary markets (Vien *et al.*, 2017; Karen *et al.*, 2022). The compliance market requires countries or organizations to adhere to specific emission quotas, primarily managing emissions from the industrial and energy sectors. In contrast, the voluntary market allows businesses and individuals to purchase carbon credits to offset their emissions without being legally obligated to do so (Ridhi *et al.*, 2025). Funding in the voluntary market is often directed towards projects that promote clean technology development, natural ecosystem conservation, and forest expansion for carbon sequestration. The main commodity traded in both markets is the carbon credit, which represents one ton of CO<sub>2</sub> equivalent (CO<sub>2</sub>e) that has been removed or reduced from the atmosphere. The price of carbon credits varies depending on the market and the emission sector. These credits are quantified and verified using different tools and methodologies specific to each field (Karina, 2012). Currently, the primary sectors involved in carbon trading include: (i) industry, (ii) energy, (iii) construction, (iv) transportation, (v) domestic aviation, (vi) waste management, (vii) maritime transport, and (viii) forestry and land use. As carbon markets continue to expand, several carbon credit exchanges have also been established to enhance market flexibility and facilitate large-scale trading (Newell *et al.*, 2013; Ridhi *et al.*, 2025).

At present, carbon credit trading activities have become increasingly diversified, marked by the emergence of dedicated carbon credit exchanges and secondary carbon markets, where credits are bought and sold multiple times. This development enhances market liquidity and competitiveness. Among the 37 carbon markets globally (**Table 1**), 34 operate as domestic markets at the state, national, or regional level, such as those under the European Union (EU) (ICAP, 2024; World Bank, 2025). These domestic markets are regulated and authorized

by local or national governments to ensure that financial flows remain within their jurisdictions. Such regulatory mechanisms also aim to encourage domestic enterprises to adopt green and clean technologies, thereby fostering local technological innovation. Most of these markets allow carbon credit trading across sectors such as industry, energy, construction, and road transportation (Tristan & Anubhav, 2025). However, carbon credits from the “forestry and land use” sector are currently accepted in only two markets—New Zealand (Miaomiao *et al.*, 2024) and Singapore (Rouxuan, 2024; Pacific Group, 2024). Currently, only three international carbon markets permit cross-border trading of carbon credits: New Zealand (Miaomiao *et al.*, 2024), South Korea (Minchul *et al.*, 2024), and Singapore (Rouxuan, 2024) (as shown in **Table 1**). These open international markets provide greater access for voluntary carbon credits—particularly those generated from forestry and land use projects—to reach a broader base of international investors.

Currently, there are 36 operational emissions trading systems (ETSS) worldwide where carbon credit transactions are actively conducted. Singapore’s carbon market, launched in 2024, represents the 37<sup>th</sup> system, although updated data have yet to be reported. In addition to these, 14 ETSS are under development and eight others are under consideration—including Vietnam. Altogether, these 85 existing, developing, and proposed systems cover approximately one-third of the global population and account for around 58% of the total carbon credit transactions worldwide. Among the 36 currently operational ETSS, the volume of emissions covered has reached 9.9 gigatons of CO<sub>2</sub> equivalents (GtCO<sub>2</sub>e), representing roughly 18% of the global greenhouse gas emissions. The cumulative market value since 2007 has reached USD 303 billion, with USD 74 billion traded in 2023 alone (ICAP, 2024) (**Table 2**).

Among the 36 operational carbon markets worldwide, 26 have disclosed their annual primary carbon allowances. The largest of these is China’s market, covering approximately 2,500 million tCO<sub>2</sub>e, followed by the European Union’s market at around 1,415 million tCO<sub>2</sub>e

**Table 1.** Basic information about the global carbon credit market

Region/Country	Number of markets	Scope of trading	Key characteristics
Canada	10	Domestic	Decentralized system at the provincial level
China	9	Domestic	8 pilot markets + 1 national market
European Union	2	Intra-union	EU ETS (2005) and Germany National ETS (2021)
United States	4	Domestic	Markets in California, Massachusetts, Washington, and the Regional Greenhouse Gas Initiative (RGGI)
Japan	2	Domestic	Tokyo and Saitama metropolitan ETSs
International Markets	3	Cross-border	New Zealand, South Korea, and Singapore
Other Countries	7	Domestic	Australia, Kazakhstan, Indonesia, and Montenegro, etc.
Total	37		

and South Korea's system at about 548 million tCO<sub>2</sub>e. Of these three major systems, Vietnam should pay particular attention to the South Korean market, as it is one of the international markets permitting cross-border carbon credit trading. Vietnam should also consider the other two open international ETS platforms: New Zealand (with an annual allowance of approximately 27.9 million tCO<sub>2</sub>e) and Singapore, whose carbon market was launched in 2024 and is still pending allowance data (ICAP, 2024).

*Potential carbon markets and lessons for Vietnam*

*The European Union Emissions Trading System (EU ETS):* The EU ETS is one of the world's earliest and most established carbon markets. Launched in 2005, it involves 30 member states of the European Union (FMSB, 2025). Trading of carbon credits within the EU ETS is restricted to the internal bloc; however, over time, the system has undergone multiple expansions and policy improvements, including the development of a secondary carbon market. In the secondary market, carbon credits are traded through mechanisms such as auctions and free allocations, without the use of carbon offsets. Credits under the EU ETS are primarily exchanged within sectors, including maritime transport, domestic aviation, industry, and

energy. In 2024, the total emission allowance across these sectors reached approximately 1,386 million tCO<sub>2</sub>e, with 28.9 million tCO<sub>2</sub>e specifically allocated to the domestic aviation sector (ICAP, 2024). **Figure 2** illustrates the significant growth in carbon prices and the total market value of the EU ETS since 2008. By 2023, the auction price had reached USD 90/tCO<sub>2</sub>e, while the secondary market price was USD 90.25/tCO<sub>2</sub>e. The cumulative market value since inception totaled USD 206 billion, with USD 47.1 billion traded in 2023 alone. As the EU ETS is an internal market limited to EU member states, Vietnamese-generated carbon credits currently cannot be traded directly within this system. However, the EU has launched the Carbon Border Adjustment Mechanism (CBAM), a pilot mechanism running from 2023 to 2025, which is expected to take full effect in 2026. Under CBAM, a carbon tax will be imposed on all goods imported into the EU, based on the carbon intensity of production processes in the country of origin (Viet Hang, 2023). This implies that starting in 2026, Vietnamese exports, including agricultural, forestry, and fishery products, will be subject to this mechanism. Exporters with products that meet "Net Zero Carbon" certification will enjoy a significant competitive advantage in the EU market.

**Table 2.** Carbon trading allowances of current markets worldwide

ETS System	Country	Allowance (MtCO <sub>2</sub> e)
Australian Safeguard Mechanism	Australia	n/a
Austrian National Emissions Trading System	Austria	n/a
Alberta Technology Innovation and Emissions Reduction Regulation	Canada	n/a
British Columbia Output-Based Pricing System	Canada	n/a
Federal Output-Based Pricing System	Canada	n/a
New Brunswick Output-Based Pricing System	Canada	n/a
Newfoundland and Labrador Performance Standards System	Canada	n/a
Nova Scotia Output-Based Pricing System for Industry	Canada	n/a
Ontario Emissions Performance Standards Program	Canada	n/a
Saskatchewan Output-Based Performance Standards Program	Canada	n/a
Québec Cap-and-Trade System	Canada	51.60
Beijing Pilot ETS	China	44.00
Chongqing Pilot ETS	China	78.39
Fujian Pilot ETS	China	116.20
Guangdong Pilot ETS	China	297.00
Hubei Pilot ETS	China	180.00
China National ETS	China	2,500.00
Shanghai Pilot ETS	China	100.00
Shenzhen Pilot ETS	China	28.00
Tianjin Pilot ETS	China	74.00
EU Emissions Trading System (EU ETS)	European Union	1,414.90
German National Emissions Trading System	Germany	291.10
Nilai Ekonomi Karbon	Indonesia	238.20
Saitama Target Setting Emissions Trading System	Japan	6.90
Tokyo Cap-and-Trade Program	Japan	11.10
Kazakhstan Emissions Trading System	Kazakhstan	161.20
Korea Emissions Trading Scheme	South Korea	547.90
Mexican Emissions Trading System	Mexico	237.10
Montenegro ETS	Montenegro	3.15
New Zealand Emissions Trading Scheme	New Zealand	27.90
Swiss ETS	Switzerland	5.50
United Kingdom ETS	United Kingdom	92.10
California Cap-and-Trade Program	United States	280.70

ETS System	Country	Allowance (MtCO <sub>2</sub> e)
Massachusetts Limits on Emissions from Electricity Generators	United States	7.60
Washington Cap-and-Invest Program	United States	63.00
Regional Greenhouse Gas Initiative (RGGI)	United States	58.50
Singapore Carbon Market Alliance (SCMA)	Singapore	n/a

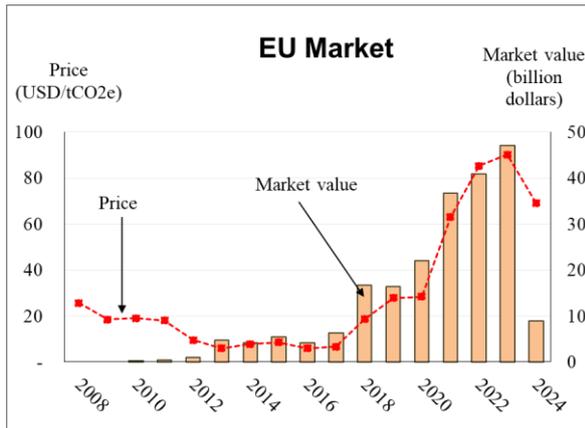
Source: Data compiled from ICAP reports in 2022, 2023, and 2024; "n/a" – no information available or no allowance cap specified; 1 MtCO<sub>2</sub>e = 1,000,000 tCO<sub>2</sub>e.

**China's Carbon Market:** China's national carbon market (China National ETS) officially launched in 2021, building upon several local pilot carbon trading markets established in cities such as Beijing (2013), Chongqing (2014), Fujian (2016), Guangdong (2013), Hubei (2014), Shanghai (2013), and Tianjin (2013) (Weng & Xu, 2018). Currently, it is the largest carbon trading market in the world by volume, with an allocation of approximately 5 billion tonnes of CO<sub>2</sub>e for the years 2021 and 2022. Carbon credits in China are primarily traded across sectors, including industry, energy, construction, road transportation, domestic aviation, and maritime shipping. The market operates through a combination of free allocation and domestic auctions (ICAP, 2024). **Figure 3** illustrates the price and market value of China's carbon market, aggregated from local pilot markets. Although prices and market value fluctuated between 2013 and 2024, the average carbon credit price remains significantly lower than that of the EU market—only around USD 9.65 per tCO<sub>2</sub>e, roughly one-tenth of the EU price. As a result, despite having the highest trading volume globally, China's total market value remains relatively low, reaching only USD 49 million in 2023. Although China's carbon market currently operates domestically and credit prices remain low, its trading volume is substantial (Weng & Xu, 2018; Wang *et al.*, 2025). With experience gained from local pilot markets and a consistent political and institutional framework, China may serve as a valuable reference model for Vietnam in developing and expanding its carbon market in the near future (Minh, 2023; Le Van Vien, 2025).

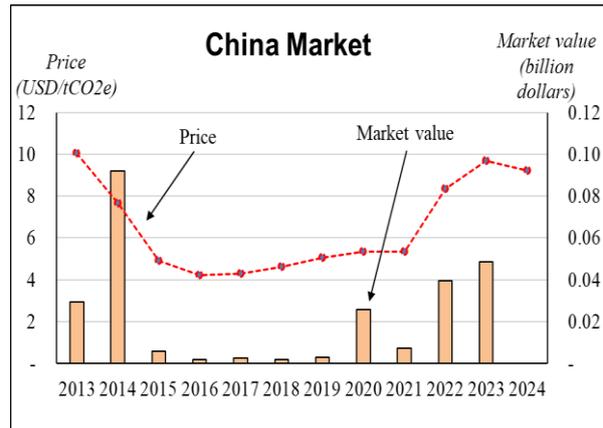
**South Korea's Carbon Market:** The Korea Emissions Trading Scheme (K-ETS) was launched in 2015, allowing carbon credit trading

across seven major sectors, namely maritime transport, domestic aviation, road transportation, construction, industry, and energy. This is an open market, permitting both domestic and international trading, with a combination of free allocation and auction mechanisms. In 2024, the Korean market had an emissions cap of 547.9 million tonnes of CO<sub>2</sub>e, making it one of the largest carbon markets globally. As of now, the cumulative market value has reached USD 901.14 million (ICAP, 2024). **Figure 4** shows significant fluctuations in carbon credit prices and market value in South Korea. Prices peaked in 2019 and 2020 at around USD 25.56 per tCO<sub>2</sub>e, but have since dropped sharply, currently standing at just USD 6.55 per tCO<sub>2</sub>e. The total market value in 2023 was USD 64.4 million, a substantial decline compared to the 2019–2022 period—only one-fourth of the peak value in 2021. South Korea's carbon market is one of the few open markets that allows international trading (Minchul *et al.*, 2024), offering potential opportunities for carbon credits from Vietnam. However, credits from the forestry and land-use sectors are not yet accepted in this market, limiting Vietnam's participation in these areas.

**New Zealand's Carbon Market:** New Zealand's carbon market was launched in 2008 and allows carbon credit trading across all eight sectors, including forestry and land use. It is a large and open market for international trading, utilizing free allocation, auctions, and dedicated funds for forestry and land-use sectors (Miaomiao *et al.*, 2024). Although the government's allocated cap is relatively low (27.9 million tonnes of CO<sub>2</sub>e in 2023), the market value remains high. The cumulative market value since its inception has reached USD 3.1 billion (ICAP, 2024). **Figure 5** illustrates the

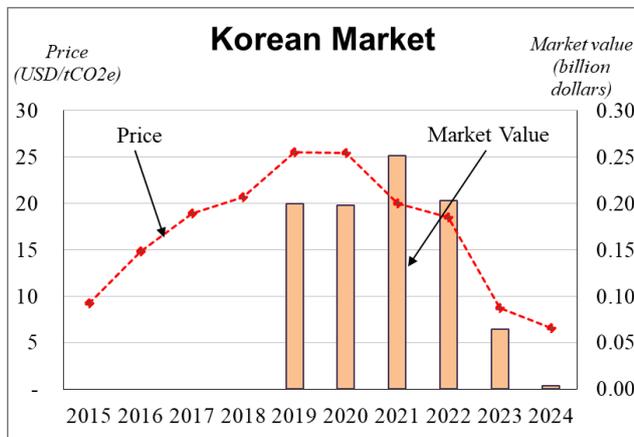


**Figure 2.** CO<sub>2</sub>e credit prices and the carbon market value in the European Union from 2008 to 2024

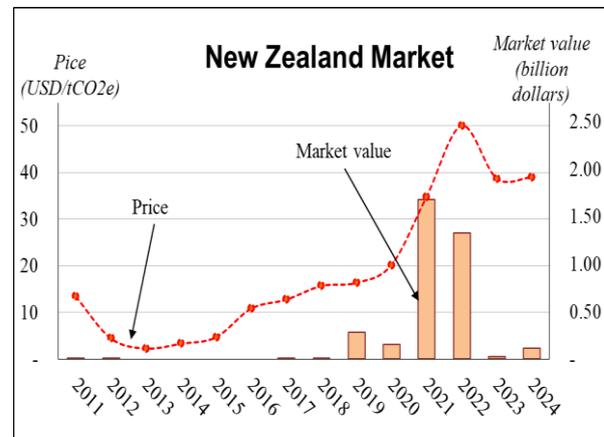


**Figure 3.** CO<sub>2</sub>e credit prices and the carbon market value in China from 2013 to 2024

Note: Data for the year 2024 is updated as of July 2024



**Figure 4.** CO<sub>2</sub>e credit prices and the carbon market value in South Korea from 2015 to 2024



**Figure 5.** CO<sub>2</sub>e credit prices and the carbon market value in New Zealand from 2011 to 2024

Note: Data for the year 2024 is updated as of July 2024

fluctuations in carbon credit prices and market value in New Zealand. Prices surged and peaked in 2022 at USD 50.03 per tCO<sub>2</sub>e, then slightly declined to the current level of USD 38.97 per tCO<sub>2</sub>e. Market value has also varied significantly over the years, reaching USD 1.68 billion in 2021 before dropping to just USD 21.3 million in 2023. However, by 2024, the market value rebounded to USD 115.9 million (Hon, 2024). Despite these fluctuations, New Zealand's carbon market remains open to international trading, offering opportunities for carbon credits from Vietnam—especially in the forestry and land-use sectors. This makes it a promising market that Vietnam should consider engaging with as it develops and expands its carbon trading system in the future (Le Van Vien, 2025).

*Singapore's Carbon Market:* In July 2024, Singapore officially launched the Singapore Carbon Market Alliance (SCMA)—a national platform designed to connect carbon credit project developers with potential buyers, positioning Singapore as a global hub for international carbon credit trading. The SCMA plays a key role in supporting carbon credit development projects by facilitating international transactions and enhancing bilateral cooperation (Rouxuan, 2024). Singapore is currently collaborating with several international partners, including Kenya, Rwanda, Paraguay, and Mongolia, to promote carbon credit trade. Notably, Singapore has signed bilateral agreements with Papua New Guinea and Ghana to implement carbon credit projects in these

countries (Tat Dat, 2024). Under its carbon tax mechanism, Singapore requires businesses to pay taxes on their carbon emissions. However, companies are allowed to offset up to 5% of their total tax liability by purchasing carbon credits. This policy encourages businesses to seek emission offset solutions and supports the growth of the voluntary carbon credit market. In 2023, the value of Singapore's carbon credit market reached USD 14.5 million and is projected to grow to USD 55.14 million by 2030 (Pacific Group, 2024). Additionally, Singapore's carbon market allows international carbon credit trading, enabling participation from other countries, including Vietnam. Importantly, Singapore accepts credits from forestry and land-use projects, presenting a significant opportunity for Vietnam to develop carbon credits in the agriculture and forestry sectors. With its strategic location and strong potential for international cooperation, Singapore's carbon market could serve as a vital channel for Vietnam to engage with global investors and advance its carbon credit trading efforts.

### **Potential and Current Status of Carbon Credit Market Development in Vietnam's Agricultural Sector**

#### *Potential and strengths*

Vietnam is ranked among the top 15 out of 60 countries worldwide with the capacity to sell carbon credits (VDCC, 2018). Among these, the agricultural sector leads in carbon credit generation. According to estimates from the Ministry of Agriculture and Environment (2023), the agricultural sector alone could generate up to 57 million carbon credits per year (equivalent to 57 million tonnes of CO<sub>2</sub>) if its full potential is harnessed. With an average international market price of USD 5 per carbon credit, this could bring in nearly USD 300 million annually for the country. Vietnam has successfully executed several carbon credit transactions in agriculture in recent years, with a total value of up to USD 60 million (Quang Tue, 2024; Le Van Vien, 2025).

Additionally, according to the Vietnam Department of Climate Change (2018), Vietnam

currently ranks fourth globally in the number of projects implemented under the Clean Development Mechanism (CDM), with 258 approved projects and 13 programs operating under the CDM framework, potentially contributing nearly 140 million carbon credits. Among these, 17 projects under the Gold Standard have sold 3 million carbon credits on the international market, while 24 projects under the Verified Carbon Standard (VCS) have issued over 600,000 carbon credits (Ministry of Agriculture and Environment, 2023). Specifically in agriculture, Vietnam still has the potential to develop up to 57 million tCO<sub>2e</sub> per year (Chu Khoi, 2024). A notable example is the Biogas Program for the Livestock Sector, which has built 181,683 biogas facilities to treat livestock waste, generate clean energy, and reduce greenhouse gas emissions. This program has produced 3,072,265 carbon credits, valued at USD 8.1 million (Quang Tue, 2024). Furthermore, the program to develop one million hectares of low-carbon rice by 2030 in the Mekong Delta has been launched, with expectations of generating VND 2,500 billion per year from carbon credit sales. Vietnam has also engaged in international cooperation projects to develop carbon credits from the forestry sector, such as the agreement with the Forest Carbon Partnership Facility (FCPF) of the World Bank. Through a project in the North Central Region, Vietnam could sell 10.3 million tons of CO<sub>2</sub> from its forests between 2018 and 2024, with most credits used to fulfill national emission reduction commitments (Ministry of Agriculture and Environment, 2023). With significant potential and room for growth in agriculture, Vietnam can expand its carbon credit generation from sustainable farming and livestock practices, meet international market demand, and contribute to the goal of net-zero emissions.

Despite its significant potential, with approximately 57 million carbon credits from agriculture and 40-70 million tonnes from forestry, Vietnam has currently only exploited a small amount. These credits have primarily been exchanged voluntarily through international cooperation programs and projects. Carbon trading on the formal exchange market is not

currently being implemented because the country has not yet established a carbon market. To address this issue, the Vietnamese government has implemented several policies to support and promote carbon trading in the near future. Vietnam has officially legalized the carbon market in its 2020 Environmental Protection Law (Vietnam National Assembly, 2020). Subsequently, the Government also issued Decree 107/2022/ND-CP (Vietnam Government, 2022a) to pilot the implementation of a carbon trading market from 2026 to 2028, with official operation beginning in 2029. In addition, regulations on mandatory greenhouse gas emission inventories for large production and business establishments are stipulated in Decree 06/2022 (Vietnam Government, 2022b). In the agricultural sector, the mechanism for payment for forest environmental services is regulated by Decree 99/ND-CP, which includes provisions on payment for forest carbon sequestration services (Vietnam Government, 2010). The Strategy for Sustainable Agricultural and Rural Development for the period of 2021–2030, with a vision to 2050, emphasizes the development of agriculture in a sustainable, low-emission manner (Prime Minister of Vietnam, 2022). As a result, many environmentally friendly agricultural production models that reduce greenhouse gas emissions have been formed and developed, such as circular agriculture models, the 1 million hectare high-quality rice program, and biogas programs, among others. These factors create a solid foundation for the formation and development of the carbon market in Vietnam in the future.

#### *Challenges and limitations*

Despite its significant potential and strengths, the development and implementation of the carbon market in Vietnam's agricultural sector still face numerous challenges and limitations. First, the legal framework remains incomplete and standards are unclear, creating uncertainty in the implementation of carbon credit projects. Existing regulations are not strong enough to support Vietnam's commitments under its Nationally Determined Contributions (NDCs). Additionally, the measurement, reporting, and verification (MRV) system is underdeveloped, limiting the accuracy

and reliability of carbon credits (Ta Dinh Thi, 2024). The lack of a comprehensive legal framework for both domestic and international carbon markets hinders the negotiation, exchange, and trading processes.

Second, awareness and understanding of the importance of the carbon market are still limited. Moreover, there are shortages in terms of financial resources and specialized human capacity, which restricts the ability to implement large-scale and effective carbon credit projects (Ta Dinh Thi, 2024). Domestic demand for carbon credit trading is also unclear, while global transactions largely depend on international donors. Vietnam has yet to access compliance markets that allow international trading, such as those in South Korea, New Zealand, or Singapore (Minchul *et al.*, 2024; Miaomiao *et al.*, 2024; Rouxuan, 2024).

Third, Vietnam has not yet established an official carbon credit exchange platform, making it difficult for domestic and international businesses to engage in carbon credit trading.

Fourth, global political and economic instability have led to volatility in the international carbon market.

Fifth, the green transition in the production and business sectors remains slow, and the carbon trading market has not officially come into operation (Le Van Vien, 2025).

Sixth, there are only a few databases and methodologies for measuring, evaluating, and verifying carbon credits. In agriculture and forestry, developing, quantifying, and certifying carbon credits is more challenging than in other sectors. Measurement tools and methods must be tailored to specific agricultural production systems, but Vietnam's current infrastructure and expertise are still limited. Some agricultural systems may even increase greenhouse gas emissions instead of reducing them—for example, traditional rice cultivation or livestock farming without biogas systems (Ta Dinh Thi, 2024).

Lastly, international carbon market regulations may negatively impact Vietnam's agricultural export products in ways that are not yet fully understood. Furthermore, international carbon credit trading faces restrictions from

major markets, which often prioritize internal credit trading and do not accept credits from forestry and land use, except for New Zealand (Rouxuan, 2024). This poses a challenge for Vietnam in expanding its international carbon market, despite its rich natural resources and development potential.

### **Proposed solutions for developing the carbon market in Vietnam's agricultural sector in the coming years**

#### *Mechanisms and general policy recommendations*

The pilot carbon credit exchange will be implemented from now until the end of December 2028 and will officially become operational in 2029 (Vietnam Government, 2022a). As such, there are numerous steps Vietnam could take over the next few years to help make its carbon market as successful as possible. First, the country should accelerate the completion of the legal framework for managing carbon credits and greenhouse gas emission quota trading; and establish clear regulations and guidelines for domestic and international carbon credit exchange and offset mechanisms.

Vietnam should also develop a comprehensive legal framework for the carbon market to promote domestic carbon credit trading and facilitate Vietnam's access to international markets. This would require specific regulations on standards, certification, and trading methods for carbon in international markets such as those of the EU, China, South Korea, New Zealand, and Singapore (Miaomiao *et al.*, 2024; Minchul *et al.*, 2024; Rouxuan, 2024; Wang *et al.*, 2025).

Another recommendation is to promote international cooperation to expand carbon markets, especially by connecting with major markets that have the potential to purchase carbon credits from Vietnam. Building partnerships and receiving support from international organizations can help improve certification and trading processes.

Vietnam should strengthen the capacity of government agencies and stakeholders in developing and monitoring the carbon credit market. Professional training and collaboration

with international organizations are key to building the infrastructure needed for a functioning carbon market.

The country should also develop a dedicated mechanism for carbon credit generation in the agricultural sector, which has significant potential but faces challenges in production processes, measurement, verification, and certification (Minh, 2023).

Finally, Vietnam should establish a high-quality carbon database system to serve as the basis for determining emission quotas for enterprises. This database should emphasize the need for a flexible and diverse combination of mechanisms and tools, such as the Clean Development Mechanism (CDM), Joint Credit Mechanism (JCM), and both mandatory and voluntary markets (ICAP, 2024; World Bank, 2025).

#### *Research, training, and technology transfer*

Steps can also be taking in terms of research, training, and technology transfer to improve the outlook for Vietnam's carbon market. Researchers should work to develop production processes tailored to specific crops and livestock, aiming to generate both agricultural products and carbon credits. These processes should be optimized to produce high-quality goods while minimizing greenhouse gas emissions (Ministry of Agriculture and Environment, 2023).

Experts should study the measurement and certification methods for carbon credits from agricultural, forestry, and fishery production systems. These methods should be standardized and widely applied to ensure transparency and efficiency in carbon credit certification. In-depth assessments can also be conducted of the carbon market's impact on Vietnam's export products—especially in agriculture, forestry, and fisheries—to develop appropriate response strategies.

Personnel should be trained to carry out the measurement and certification of carbon credits from agricultural, forestry, and fishery systems. This includes specialized training for experts, government officials, and farmers. Universities and academies should develop training programs to raise awareness and provide basic knowledge on greenhouse gas reduction and carbon markets

for citizens, businesses, cooperatives, university students, and even high school students. Practical training should also be provided on technical solutions for low-emission agricultural production and carbon market participation.

Experts should also coordinate to promote awareness and transfer production processes to farmers, helping them adopt methods that generate both agricultural products and carbon credits. This would not only enhance economic efficiency but also contribute to environmental sustainability.

### *Production systems*

As mentioned above, agricultural production is currently the second largest emitter of greenhouse gases in the economy (accounting for 30%). Of these, traditional farming and livestock raising (intensive farming and the use of many chemically derived inputs) contribute 70% of the total emissions of the entire agricultural sector (Ministry of Agriculture and Environment, 2018). Therefore, the Vietnamese government has oriented the transformation of traditional agricultural production models towards ecologically sustainable practices that minimize emissions in order to achieve green growth (Vietnam Government, 2025). Thus, it is important to promote the development of production systems aimed at achieving net-zero emissions and carbon accumulation, which can help minimize environmental impacts while contributing to Vietnam's international climate commitments. Specific solutions include:

**Expanding and improving forest systems:** Vietnam should work on developing protective, conservation, and production forests to enhance the country's carbon sequestration capacity. Forests play a vital role in carbon storage and are essential for achieving net-zero goals. Reforestation and forest protection programs should be strengthened to increase both forest area and quality.

**Developing ecological farming, organic agriculture, and agroforestry systems:** These methods not only improve production efficiency but also support net-zero targets. Integrating crop cultivation and livestock farming within a unified system can reduce greenhouse gas

emissions and enhance carbon accumulation in soil and vegetation.

**Improving rice cultivation systems:** A key measure is reducing emissions from wet rice farming by shifting to upland rice varieties or replacing rice with other upland crops. This transition can help rice farming systems achieve net-zero by lowering methane emissions and improving land-use efficiency.

**Developing circular production systems in livestock and aquaculture:** These systems offset emissions by reusing waste, such as installing biogas systems to capture methane from livestock waste. Integrating small-scale renewable energy solutions—like solar and wind power—using the rooftops of barns or pond areas also helps reduce emissions and optimize resource use.

**Strengthening linkages among businesses and stakeholders in the carbon trading market:** This can be achieved by promoting international cooperation to proactively seek and expand partnerships with potential carbon credit buyers.

These solutions will not only help reduce greenhouse gas emissions but also offer long-term environmental and economic benefits, creating a sustainable development model for Vietnam's agriculture and forestry sectors

## **Conclusions**

The carbon market has experienced significant growth, especially since the 2015 Paris Agreement, marked by an increase in the number of markets, carbon prices, and overall market value. This trend presents a major opportunity for countries like Vietnam, which has a strong potential for carbon credit development. Among the 37 operational carbon credit markets, Vietnam should focus on five key ones: (i) the European Union (EU), which applies the Carbon Border Adjustment Mechanism (CBAM) to exported goods, including Vietnam's agricultural, forestry, and fishery products; (ii) China, which has the largest carbon credit trading volume in the world and a wealth of experience from its pilot local markets—providing a valuable model for Vietnam; (iii) South Korea, where both domestic and international carbon

credit trading is active, offering good cooperation potential for Vietnam; (iv) New Zealand, the only market that accepts carbon credits from forests and land use, offering a unique opportunity for Vietnam to develop credits from its agriculture, forestry, and fishery sectors; and (v) Singapore, which allows international carbon credit trading, creating further collaboration opportunities for Vietnam.

Vietnam's agricultural sector holds significant potential for carbon credit development, estimated at up to 57 million tCO<sub>2e</sub> per year. However, carbon credits from forests have mainly been traded on the voluntary market, with transactions largely driven by donor-led initiatives. The development of a carbon credit market in Vietnam faces multiple challenges, including an incomplete legal framework, a lack of standardized methods for measuring, monitoring, and verifying credits, and a production system that is not yet capable of simultaneously generating agricultural products and carbon credits. Additionally, limited financial resources and a shortage of technical personnel for both production and trading present major obstacles.

Vietnam needs to establish a comprehensive carbon credit market with a robust legal framework that allows for both domestic and international trading. Furthermore, it is essential to invest in workforce training and develop end-to-end processes for generating and trading carbon credits—from production to market integration—to fully harness the country's long-term sustainable development potential.

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