

DEVELOPING VIETNAM'S CARBON MARKET: COMPARATIVE ANALYSIS OF KOREAN EMISSION TRADING SYSTEM AND INDONESIA'S COMPLIANCE FRAMEWORK

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Abstract

The Korean Emission Trading System (K-ETS), implemented since 2015, is Asia's first nationwide emission trading system featuring a sophisticated cap-and-trade mechanism, gradual transition from free allocation to auctioning, and effective market stabilization measures. This study compares K-ETS with Indonesia's flexible cap-tax-and-trade model, which includes dual mechanisms (emissions trading and offsets) but applies lower carbon prices and weaker enforcement. Drawing from these models, the study recommends Vietnam adopt K-ETS's phased cap-and-trade design while incorporating Indonesia's flexibility, as well as propose that Vietnam should establish a clear legal framework, classify carbon credits as securities, and ensure market stability to meet its 2050 carbon neutrality target.

Keywords: carbon market, emission trading system, K-ETS, Indonesia, cap-and-trade, carbon credits

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As the global community intensifies efforts to combat climate change, carbon markets have become pivotal for reducing greenhouse gas (GHG) emissions. These markets provide a mechanism for countries to regulate emissions through trading systems and compliance frameworks, fostering efficiency and incentivizing low-carbon innovation. Vietnam, a rapidly industrializing Southeast Asian nation, has recognized the need for such mechanisms to achieve its climate goals, including the net-zero emissions target by 2050. Establishing a robust carbon market in Vietnam is a pivotal step toward sustainable development.

However, Vietnam's journey to creating a domestic carbon market is full of challenges. As a country balancing industrial growth and environmental preservation, Vietnam must address significant gaps in its regulatory framework, market infrastructure, and technological readiness. Studying and adapting the best practices from other countries with established carbon trading systems is essential to overcome these challenges and build an effective and competitive carbon market. The Korean Emission Trading System (K-ETS) and Indonesia's Economic Value of Carbon Trading Scheme (Indonesian Trading Scheme)

are relevant examples. The K-ETS, launched in 2015, is Asia's first nationwide carbon trading system and remains one of the region's most sophisticated emission trading systems. Its well-defined cap-and-trade mechanism, phased implementation, and effective integration of market stabilization tools have made it a model for emerging carbon markets. Conversely, while evolving, the Indonesian Trading Scheme provides an insightful example of a cap-and-trade system that aligns with Southeast Asia's local economic and environmental contexts. Indonesia's approach emphasizes flexibility and stakeholder engagement, which can be particularly relevant for Vietnam as it seeks to address its unique challenges.

This paper provides a comparative analysis of the K-ETS and Indonesia's compliance framework and their applicability to Vietnam's carbon market development. It explores these systems' strengths, challenges, and policy implications, offering insights to guide Vietnam in addressing existing legal and operational gaps, fostering international integration, and achieving its climate ambitions. Through this analysis, the study aims to identify best practices and adaptive strategies to support Vietnam's transition to a sustainable and competitive low-carbon economy.

1. An analysis of the Korean Emission Trading System

1.1. The historical evolution of the Korean Emission Trading System

K-ETS emerged from a decade of legislative and institutional groundwork. The 2010 Framework Act on Low Carbon, Green Growth (the 2010 Framework Act) established the legal basis for climate action, mandating GHG reduction targets and embedding green growth into national economic policy under Article 1. Chapter III of this act also institutionalized the Presidential Committee on Green Growth, ensuring cross-ministerial coordination. However, the immediate precursor to the K-ETS was the Target Management System (TMS), introduced in 2012 following a two-year pilot phase. The TMS required large emitters to report and verify emissions, providing critical data and training for the monitoring, reporting, and verification (MRV) processes later adopted by the K-ETS.¹ By 2012, the TMS had already exceeded its reduction targets by 2.7 times, demonstrating the feasibility of centralized emissions management similar to K-ETS.²

1.2. Legislative foundations and development stages

The 2012 Act on the Allocation and Trading of Greenhouse Gas Emission Permits (the 2012 Allocation Act) formalized the K-ETS, with the Korea Exchange (KRX) designated the trading platform in 2014. The implementation

1 Greenhouse Gas Inventory and Research Center of Korea. (2019). *Korean Emissions Trading System (K-ETS) Report for phase 1 (2015-2017)*. Ministry of Environment, Seoul.

2 Ministry of Environment. (2014). 2012 Emissions reduction target was exceeded under GHG & Energy Target Management System. *Korea's Ministry of Environment*.

process was divided into three phases. Phase 1 takes place from 2015 to 2017. Initially covering 23 sub-sectors across power, industry, buildings, waste, and transportation, this phase allocated 100% of allowances for free to ease the transition for covered entities. Subsequently, phase 2 occurs between 2018 and 2020. The scope expanded to 62 sub-sectors, disaggregating the public and waste sectors and introducing a 3% auctioning share. Benchmarking for free allocation began, prioritizing energy-intensive and trade-exposed industries. Phase 3 has been taking place since 2021. Coverage widened to 69 sub-sectors, including construction and maritime transport. Auctioning increased to 10%, and domestic financial intermediaries could participate in secondary markets, enhancing liquidity.³ Recently, Article 7.1 of the 2021 Framework Act on Carbon Neutrality and Green Growth for Coping with Climate Crisis (the 2021 Carbon Neutral Framework Act) has codified the 2050 net-zero target, aligning the K-ETS with long-term decarbonization objectives.⁴ The system covered 79% of GHG emissions in 2022, and regulated 816 entities responsible for a majority of the emissions in 2024⁵, solidifying its position as one of the largest emission trading systems (ETS) in the region and the world.

1.3. Notable design features

1.3.1. The operation mechanism of cap-and-trade

Article 46.2 of the 2010 Framework Act states that the K-ETS operates on a cap-and-trade principle.⁶ This involves the government setting a maximum limit, or “cap”, on overall GHG emissions and distributing emission allowances to participating companies within this cap. Each company must possess a permit for every ton of GHG emitted. This system shares similarities with the TMS. However, the K-ETS introduces flexibility by allowing companies operating under the ETS to exercise several options to meet their obligations. Companies can trade permits within the K-ETS to address any surplus or shortage of allowances, save licenses for future use, or utilize offset credits from GHG reduction projects outside the K-ETS. Firms with lower marginal costs for reducing emissions can cut more than required and sell their excess permits in the market. Conversely, companies facing higher costs for emission reductions can opt to buy additional permits rather than directly reduce emissions. This system enables companies to make flexible decisions based on their specific reduction capacities, fostering cost-efficient approaches to emission reductions.⁷

1.3.2. Allocation strategies: Balancing free distribution and auctioning

3 Kuneman, E. et al. (2021). *The Korea Emissions Trading System and electricity market: Influence of market structures and market regulation on the carbon market - Case study report*. German Environment Agency. Umweltbundesamt. Dessau-Roßlau.

4 Article 7.1 of the 2021 Framework Act on Carbon Neutrality and Green Growth for Coping with Climate Crisis.

5 International Carbon Action Partnership. (n.d.). *Korea Emissions Trading System (K-ETS)*. https://icapcarbonaction.com/system/files/ets_pdfs/icap-etsmap-factsheet-47.pdf

6 Article 46.2 of the 2010 Framework Act on Low Carbon, Green Growth.

7 Ministry of Environment. (2015). Emissions Trading Scheme. *Korea Environmental Policy Bulletin*, 13(1), p. 3.

Another key principle of the K-ETS design is the phased transition from free allocation to auctioning. In Phase 1, allowances were entirely allocated for free to prevent economic shocks as industries adjusted to the system. Phases 2 and 3 introduced auctioning components of 3% and 10%, encouraging market-driven behavior while allowing businesses to adapt gradually.⁸ Despite this shift, free allocation remains prioritized for Energy-Intensive and Trade-Exposed (EITE) sectors such as waste and power.⁹ Allowances are allocated using benchmarks tied to production output and trade intensity for these sectors. For instance, steel producers receive allocations based on historical production data, ensuring they remain competitive with international peers while adhering to emissions targets.

1.3.3. Sectoral coverage and regulated types of gases

In Korea, the Emissions Trading scheme applies to six sectors: power, industry, buildings, domestic aviation, waste, public services, and other sectors. The subdivisions vary depending on the stage. Specifically, 23 subsectors in Phase 1 increased to 62 subsectors in Phase 2 due to other division methods, and 69 subsectors in Phase 3 after introducing additional industrial activities. Emissions trading entities in Korea consist of controlled entities (a business entity with an average total greenhouse emissions generated in the preceding three years of not less than 125,000 tons of CO₂e or a business entity with a place of business that has produced 25,000 tons of CO₂e in the preceding three years) and voluntarily participating business entities under Article 8 of the 2012 Allocation Act.¹⁰ According to Article 2.9 of the 2010 Framework Act¹¹, the scheme encompasses six greenhouse gases recognized by Annex A of the Kyoto Protocol to the United Nations Framework Convention on Climate Change 1998 (the Kyoto Protocol), including carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulfur hexafluoride (SF₆). K-ETS allows for emissions, including direct emissions, which refer to emissions from on-site combustion or processes, and indirect emissions, which involve the consumption of electricity and heat generated and supplied by a utility. The inclusion of indirect emissions can contribute to lessening market concentration, thereby mitigating market power by lowering the share of allowances allocated to heavy emitters.

1.3.4. The nature of carbon credits and the mechanism for carbon trading

In Korea, Article 22.7(3) of the 2012 Allocation Act states that carbon credits are securities.¹² Carbon credits traded on the KRX include three types: Korean Allowance Units, Korean Credit Units, and Korean Offset Credits.

8 Suk, S., Lee, S. Y., & Yu, S. J. (2016). Business perspective on GHG ETS in Korea and its operation in the first compliance year [Conference paper]. Institute for Global Environmental Strategies. https://www.iges.or.jp/en/publication_documents/pub/conferencepaper/en/5927/KEEA2016_conference%20paper_Suk.pdf

9 International Carbon Action Partnership. (n.d.), *supra* note 5.

10 Article 8 of the 2012 Act on the Allocation and Trading of Greenhouse Gas Emission Permits.

11 Article 2.9 of the 2010 Framework Act on Low Carbon, Green Growth.

12 Article 22.7(3) of the 2012 Act on the Allocation and Trading of Greenhouse Gas Emission Permits.

Classifying carbon credits as securities will make trading them comply with the current provisions on property rights and securities in national laws, thereby avoiding the creation of many complex and overlapping regulations. This also makes the carbon market operate more quickly because investors do not need to spend much time learning new regulations on carbon trading.

There is only one mechanism for carbon trading in this country. Accordingly, a business entity eligible for allocation shall prepare an application for the allocation of emission permits under Article 13 of the Allocation Act, and the Ministry of Environment determines the number of emission permits issued to each business establishment eligible for allocation.¹³ The allocation rate of free-emission permits in each period varied. Specifically, the first stage is 100%, the second is 97%, and the third is less than 90%. This means that emission permits through auctions gradually increase throughout the stages. Before proceeding with an emissions permit transaction, the business entity must apply for an emissions trading account. After a successful account registration, the business entity can trade emission permits. In particular, emission rights have the characteristics of property rights because they satisfy both the elements of property rights: private usefulness and disposability, specified in the Constitution.¹⁴

Regarding international carbon trading, since 2018, cross-border carbon trading has been applied only to carbon credits from international projects conducted directly by Korean companies.¹⁵ It is just a regulation of the K-ETS, but it has not yet been legislated. Regarding carbon credits issued by international organizations, such as the International Carbon Registry, Korea has no regulations or policies governing their recognition and trade. However, Korea aims to recognize international carbon credits through its participation in the Climate Club and five global initiatives led by the United Arab Emirates on the mutual recognition of carbon credits in the hydropower, agriculture, and health sectors.¹⁶

1.3.5. Carbon price and market stability measures

In 2022, the carbon credit price in Korea was around 30 USD, almost equivalent to the global average cost of about 31.53 USD.¹⁷ This is one of the reasons why the carbon market in Korea is really “vibrant” with the participation of many large companies and corporations in information technology, consumer discretionary, and financials, such as Samsung, Hyundai, and Shinhan. To

13 Article 13 of the 2012 Act on the Allocation and Trading of Greenhouse Gas Emission Permits.

14 Kuneman, E. et al. (2021), *supra* note 3.

15 Asian Development Bank. (2018). The Korea emissions trading scheme: Challenges and emerging opportunities. *Asian Development Bank Report*, 12-25.

16 Wonju, Y. (2023). S. Korea, G7 and others launch ‘Climate Club’ on carbon neutrality. *Yonhap News Agency*. <https://en.yna.co.kr/view/AEN20231201009100315>

17 Alistair, R. (2022). South Korea’s carbon market a model for the rest of Asia. *Nikkei Asia*. <https://asia.nikkei.com/Opinion/South-Korea-s-carbon-market-a-model-for-the-rest-of-Asia>

address sudden price volatility, the K-ETS incorporates market stabilization measures under Article 23 of the 2012 Allocation Act, and Article 38 of the Enforcement Decree of the Allocation and Trading of Greenhouse Gas Emission Permits 2022 (the Enforcement Decree).¹⁸ Accordingly, the Ministry of Environment intervenes in the emissions trading market under specific conditions to stabilize prices and ensure balanced trading. These conditions include: (i) the market allowance price for six consecutive months being at least three times higher than the average price over the past two years, (ii) the market price for the last month being at least double the two-year average and exceeding average trading levels, (iii) the trading volume for the last month being at least twice that of the same month two years prior, (iv) the monthly average price falling below 60% of the two-year average, or (v) significant supply-demand imbalances making trading difficult. Interventions typically involve setting temporary floor prices or releasing allowances from reserves.

For example, in 2018, to ease market pressures ahead of the 2017 compliance deadline, the Allocation Committee auctioned an additional 5.5 million allowances from the stability reserve, of which 4.7 million were sold. Subsequent sales have not been conducted since then. In 2021, the Allocation Committee implemented price floors at 12,900 KR W (around 9.47 USD) per tonne in April and KR W 9,450 (approximately 6.93 USD) in June. By 2023, the government set two temporary price floors triggered by an average price of 12,088 KR W (about 8.87 USD), equivalent to 60% of the two-year average. The first floor of 7,020 KR W (approximately 5.15 USD) was introduced in July, followed by another at 7,750 KR W (approximately 5.69 USD) in November, which was lifted in early December after prices stabilized at 8,520 KR W (approximately 6.25 USD) for five consecutive days.¹⁹

1.3.6. *Legal sanctions*

Article 33 of the 2012 Allocation Act and Article 42 of the Enforcement Decree establish rigorous penalties for non-compliance to enforce accountability and ensure adherence to emissions surrender obligations under the K-ETS.²⁰ These provisions are designed to uphold the integrity of the carbon market by deterring companies from failing to meet their compliance requirements. The penalties for non-compliance are set at a stringent level, calculated as three times the average market price of emission allowances. This ensures that the financial repercussions are significant enough to discourage any breach of obligations. The laws also establish a maximum penalty of 100,000 KR W per ton of CO₂e equivalent (approximately 90 USD per ton), regardless of

18 Article 23 of the 2012 Act on the Allocation and Trading of Greenhouse Gas Emission Permits, Article 38 of the 2022 Enforcement Decree of the Allocation and Trading of Greenhouse Gas Emission Permits.

19 International Carbon Action Partnership. (n.d.), *supra* note 5.

20 Article 33 of the 2012 Act on the Allocation and Trading of Greenhouse Gas Emission Permits, Article 42 of the 2022 Enforcement Decree of the Allocation and Trading of Greenhouse Gas Emission Permits.

market fluctuations. This penalty is a robust deterrent, maintaining the system's credibility and reinforcing compliance even during low market prices.

2. Comparing the Korean Emission Trading System with the Indonesian Economic Value of Carbon Trading Scheme – An evaluation of Korea's model

2.1. The operation mechanism

K-ETS operates as a cap-and-trade system, while the Indonesian Trading Scheme follows a cap-tax-and-trade model. Under K-ETS, emission allowances are distributed freely or through auctions within a fixed cap, and companies trade these allowances to meet compliance obligations, promoting cost-effective emissions reductions. In contrast, Indonesia combines emission trading with a carbon tax to form a cap-tax-and-trade system, in which the carbon tax serves as a legal sanction for violations. According to Article 13 of Law No. 7/2021 on Harmonization of Tax Regulations (the Law No. 7/2021), the Indonesian government has implemented a carbon tax of 30 IDR per kilogram of CO₂, approximately 2 USD per ton. This tax applies to coal-fired power plants that exceed emission limits and operate alongside the Indonesian Trading Scheme.²¹ Thus, Korea exclusively relies on a carbon market mechanism, while Indonesia integrates both carbon market and carbon tax mechanisms, utilizing a dual approach to carbon pricing.

2.2. Allocation strategies of allowances

Like K-ETS, the Indonesian Trading Scheme adopts a mixed approach of free allocation and auctioning. As mentioned in 1.3.2, Phase 1 of K-ETS relied entirely on free allocation, compared to the first year of the Indonesian Trading Scheme, which provides 100% free allowances, recognized by Regulation 16/2022 Guidelines for Carbon Economic Value Implementation for the Power Generation Sub-sector. This transitional strategy was critical in minimizing financial burdens on covered entities and allowing them to adapt to the system without immediate cost pressures. When free allowances end, both systems gradually shift to auctioning. As mentioned in section 1.3.2, K-ETS increases the proportion of auctioning to 10%, compared to 15%²² of Indonesian counterparts. This illustrates the true enactment of carbon markets in both jurisdictions, in which excessive emitters must pay for excessive GHG under the polluter pays principle.

2.3. Sectoral coverage and regulated types of gases

Both K-ETS and the Indonesian Trading Scheme cover a variety of sectors such as energy, waste, and industrial processes²³, as stated under Article

21 Article 13 of the Law No. 7/2021 on Harmonization of Tax Regulations.

22 Alya, S. A. *et al.* (2023). Indonesia to enforce the implementation of carbon pricing in the power plant sub-sector. *CarbonEthics – Carbon Policy Lab*, 1-4.

23 Article 8 of the Act on the Allocation and Trading of Greenhouse Gas Emission Permits 2012, and Article 7 of president of the republic of Indonesia No. 98 of 2021 on the implementation of Carbon pricing to achieve the nationally determined contribution target and control over greenhouse gas emissions in the

8 of Korea's Allocation Act and Article 7 of President of the Republic of Indonesia No. 98 of 2021 on the Implementation of Carbon Pricing to achieve the Nationally Determined Contribution Target and Control over Greenhouse Gas Emissions in the National Development 2021 (PR 98/2021). Similarly, both trading systems regulate six types of GHG²⁴ recognized by the Kyoto Protocol's Annex A, as indicated under Article 2.9 of the 2010 Framework Act and Article 10.7 of PR 98/2021. By doing so, both systems demonstrate adherence to the globally recognized framework for emissions reduction. This alignment ensures their carbon pricing mechanisms are robust, scientifically grounded, and consistent with international best practices. It also reinforces credibility and allows for potential integration with other international carbon markets like the European Union (EU)'s Emissions Trading System (ETS),²⁵ and Canada–Québec's Cap-and-Trade System.²⁶ These systems operate on a shared set of rules and metrics.

2.4. The nature of carbon credits and the mechanism for carbon trading

Carbon credits are recognized as securities in both systems,²⁷ as indicated in Article 22.7(3) of Korea's Allocation Act 2012 and Article 26 of Indonesian Law No. 4 of 2023 on the Development and Strengthening of the Financial Sector. This can create a new legal trend in which carbon credits are classified as securities, elevating their importance as financial instruments central to achieving climate goals.

However, while there is one mechanism for carbon trading in K-ETS, as discussed in section 1.3.4, the Indonesian Trading Scheme allows for two mechanisms, including emission trading,²⁸ and GHG emission offsets.²⁹ This contrast highlights the inflexibility of K-ETS and the comprehensiveness and adaptability of the Indonesian counterpart. Unlike Indonesia's system, which can flexibly offer cost-effective alternatives for businesses to meet their obligations, K-ETS's single mechanism can limit opportunities for companies to explore alternative and potentially cost-effective pathways to compliance. The rigid structure of K-ETS may disadvantage businesses in sectors with limited emissions reduction potential or higher compliance

National Development 2021.

24 Article 2.9 of the Framework Act on Low Carbon, Green Growth 2010, and Article 10.7 of president of the republic of Indonesia No. 98 of 2021 on the implementation of Carbon pricing to achieve the nationally determined contribution target and control over greenhouse gas emissions in the National Development 2021.

25 International Carbon Action Partnership. (n.d.). EU emissions trading system (EU ETS). https://icapcarbonaction.com/system/files/ets_pdfs/icap-etsmap-factsheet-43.pdf

26 International Carbon Action Partnership. (n.d.). Indonesian economic value of carbon (Nilai Ekonomi Karbon) Trading Scheme. https://icapcarbonaction.com/system/files/ets_pdfs/icap-etsmap-factsheet-104.pdf

27 Article 22.7(3) of the Act on the allocation and trading of greenhouse gas emission permits 2012, and Article 26 of Indonesian Law No. 4 of 2023 on the Development and Strengthening of the Financial Sector.

28 Article 50.2 of president of the republic of Indonesia No. 98 of 2021 on the implementation of Carbon pricing to achieve the nationally determined contribution target and control over greenhouse gas emissions in the National Development 2021.

29 Article 14.1 of the Regulation 21/2022 Regulation of the minister of environment and forestry of The republic of Indonesia on Guidelines for Implementing the Carbon Economic Value 2022 on guidelines for implementing the Carbon Economic Value 2022.

costs. Without diverse mechanisms, Korea's system lacks the flexibility to cater to a wide range of industries and participants.

2.5. Carbon price

As mentioned in section 1.3b), K-ETS offers a higher price of a carbon credit (about 30 USD in 2022) than the Indonesian counterpart, which is only 30000 IDR per ton of CO₂ (around 1.86 USD per ton of CO₂).³⁰ The higher price in K-ETS acts as a powerful signal, effectively discouraging emissions by making it costly for businesses to exceed their allowances. In the long term, substantial investment in green technologies and energy efficiency can be promoted by a higher price of carbon credits. The high carbon price attracts more participants, including investors and financial institutions, who see potential returns in emissions reduction projects and carbon credit trading. This dynamic foster a vibrant market with greater liquidity, innovation, and competition. The Indonesian Trading Scheme may not witness these positive effects, as its carbon price is too low.

2.6. The recognition of international carbon credits

While no clear regulations allow K-ETS to recognize international carbon credits, the Indonesian peer recognises such credits issued by the International Carbon Registry under Articles 72 and 73 of PR 98/2021.³¹ This can limit flexibility for participants of K-ETS, as Korea's regulations restrict businesses to domestic mechanisms for acquiring carbon credits, narrowing their options for compliance. Furthermore, the recognition of international carbon credits can foster global cooperation by allowing countries and companies to invest in emissions reduction projects and trade carbon credits worldwide. By not recognizing these credits, K-ETS may miss opportunities to participate in foreign carbon markets (such as the EU's ETS and Canada-Québec's Cap-and-Trade System) and contribute to global climate goals through collaborative projects.

2.7. Legal sanctions

Both countries recognise the legal penalty of monetary fines for non-compliance, but Korea's sanction is much stricter than that of Indonesia. As indicated in Article 33 of the 2012 Allocation Act and Article 42 of the Enforcement Decree, a maximum penalty of 100.000 KRW per ton of CO₂ equivalent (approximately 90 USD per ton) can be applied to violations.³² This contrasts with much lower fines set by Indonesian regulations, as Article 13 of the Law No.7/2021 implemented a carbon tax of 30 IDR per kilogram of

30 Luky, I. W., & Rendi, P. S. (2022). Indonesia's carbon trading system: Challenges and opportunities. *IFLR 1000*. <https://www.iflr.com/article/2a7cuhvpor15vq47fbpc7/indonesias-carbon-trading-system-challenges-and-opportunities>

31 Article 72 and 73 of President of the Republic of Indonesia No. 98 of 2021 on the Implementation of Carbon Pricing to achieve the Nationally Determined Contribution Target and Control over Greenhouse Gas Emissions in the National Development 2021.

32 Article 33 of the The Act on the Allocation and Trading of Greenhouse Gas Emission Permits 2012, Article 42 of the Enforcement Decree of the Allocation and Trading of Greenhouse Gas Emission Permits 2022.

CO₂, approximately 2 USD per ton.³³ The high penalty in K-ETS creates a substantial financial deterrent for non-compliance, ensuring that businesses take their emissions obligations seriously. Accordingly, companies operating under K-ETS face a clear economic rationale to invest in low-carbon technologies and operational efficiencies to avoid heavy fines. This drives investment in green technologies and accelerates the transition to sustainable practices, reinforcing Korea's progress toward its carbon neutrality target by 2050. Conversely, Indonesia's lower carbon tax penalty of approximately 2 USD per ton may not be significant enough to compel companies to prioritize emissions reductions. To help readers understand this comparative section easily, we summarise the information as mentioned earlier into a table as follows:

Table 1. A summary of the comparative analysis of K-ETS and the Indonesian Trading Scheme

Comparative criteria	K-ETS	Indonesian Trading Scheme
The operation mechanism	A cap-and-trade system	A cap-tax-and-trade system
Allocation strategies of allowances	Free allocation of allowances in the first stage, followed by a gradual shift to auctioning in subsequent stages	
Sectoral coverage	Power, industry, buildings, waste, public services, and other sectors	
Regulated types of GHG	CO ₂ , N ₂ O, CH ₄ , PFCs, HFCs, and SF ₆	
The nature of carbon credits	Securities	
Mechanisms for carbon trading	Single mechanism	Dual mechanism with emission trading and GHG emission offsets
Carbon price	Around 30 USD per ton (2022)	Around 2 USD per ton (2021)
The recognition of international carbon credits	Not clear	Legally recognised
Legal sanctions	Monetary fines	
	Approximately 90 USD per ton	Around 2 USD per ton

3. Legal implications for Vietnam's roadmap of domestic carbon market

3.1. An overview of Vietnam's developing domestic carbon market

Vietnam, a rapidly industrializing Southeast Asian nation, struggles to balance economic growth with climate commitments. As the world's 19th-

³³ Article 13 of the Law on Harmonization of Tax Regulation 2021.

largest emitter of GHG in 2023,³⁴ Vietnam's energy sector – dominated by coal – accounts for over 50% of its emissions. Vietnam's power grid remains heavily dependent on coal, constituting 49.5% of electricity generation in 2024, contributing to a grid emission factor of 0.681 tCO₂e/MWh – a 3.2% increase from 2023. Despite rapid renewable energy growth (solar and wind reached 13% of generation in 2023), coal's resurgence highlights structural inertia in decarbonization efforts. The Power Development Plan VIII exemplifies this tension: while canceling 13 GW of planned coal capacity, it retains 13 GW of new projects, risking stranded assets and prolonged emissions.³⁵

Despite these challenges, Vietnam has demonstrated its commitment to climate action through international agreements, particularly its Nationally Determined Contributions under the Paris Agreement. The country has pledged to achieve net-zero emissions by 2050, emphasizing the need for transformative economic and policy shifts.³⁶ Vietnam needs stronger and more drastic measures to achieve its goal of carbon neutrality by 2050. One such measure is building a domestic carbon market, which is essential and urgent.

Fortunately, the Vietnamese government has decided to pursue a domestic carbon market. By incorporating carbon market strategies into Decision No. 232/QĐ-TTg, approving the proposal for establishment and development of a carbon market in Vietnam, issued on 24 January 2025 (Decision No. 232/QĐ-TTg), Vietnamese Law No. 72/2020/QH14 on Environmental Protection, issued on 17 November 2020 (Law on Environmental Protection 2020), and Decree No. 06/2022/ND-CP on the Mitigation of GHG Emissions and Protection of Ozone Layer 2022, issued on 07 January 2022 (Decree No. 06/2022/ND-CP). This is a pivotal step towards carbon neutrality goals and reflects Vietnam's enormous potential in building such a market. According to statistics, by June 2015, Vietnam had successfully accredited and registered 254 Clean Development Mechanism (CDM) projects with the CDM Executive Board. Globally, Vietnam ranked fourth in the number of such projects, achieving an estimated reduction of approximately 137.4 million tons of CO₂ equivalent over the credit period.³⁷

Interestingly, through a quick analysis of the above documents, Vietnam will likely build a compliance carbon market, which differs from voluntary markets in Singapore and Malaysia. However, Vietnam's current legal framework for this type of market has a variety of drawbacks. The first disadvantage is the

34 European Commission. (2024). GHG emissions of all world countries. https://edgar.jrc.ec.europa.eu/report_2024

35 Vietnam News. (2025). Study shows coal power dominant as Viet Nam's grid emissions climbed in 2024. *Vietnam News*. <https://vietnamnews.vn/environment/1716087/study-shows-coal-power-dominant-as-viet-nam-s-grid-emissions-climbed-in-2024.html>

36 Vietnam News. (2024). Viet Nam's net zero commitment: A call to action for a sustainable future. *Vietnam News*. <https://vietnamnews.vn/opinion/1656551/viet-nam-s-net-zero-commitment-a-call-to-action-for-a-sustainable-future.html>

37 United Nations Framework Convention on Climate Change. (n.d.). Vietnam's INDC. <https://unfccc.int/sites/default/files/NDC/2022-06/VIETNAM%27S%20INDC.pdf>

shortage of a robust roadmap, as Vietnam's roadmap stated in these documents does not clearly and reasonably identify (i) a formal operational mechanism, (ii) strategies for allowance allocation, and (iii) rigorous sanctions for non-compliance. Furthermore, the carbon trading mechanism is incomplete, as the government does not (i) classify carbon credits as securities, (ii) enact a flexible trading mechanism, and (iii) establish market stability measures regarding carbon prices. Finally, this roadmap lacks technology transfer, innovation, and international cooperation mechanisms necessary to connect the national carbon market to foreign ones. The absence of clear and strong strategies may lead to the hesitation of industries and investors to engage in carbon trading due to unclear rules, inefficient allocation of resources, and limited impacts on GHG mitigation. The existing drawbacks necessitate the urgent demand for learning from the best regional practices of carbon markets, including those of Korea and Indonesia. These lessons would help Vietnam build its unique and effective compliance market, tailored to Vietnam's specific socio-economic features, which does not replicate the Korean or Indonesian model.

3.2. The applicability of the Korean Emission Trading System and the Indonesian Trading Scheme in the context of Vietnam

Vietnam's commitment to achieving carbon neutrality by 2050 necessitates the establishment of a robust and effective carbon market. As the country begins to design its trading system, lessons from K-ETS and the Indonesian Trading Scheme provide valuable insights. These systems represent two distinct approaches to carbon pricing, each with strengths and limitations. By analyzing the applicability of these models, Vietnam can design a carbon market suitable for its economic structure, developmental priorities, and climate goals.

3.2.1. The applicability of the Korean Emission Trading System in Vietnam's context

3.2.1.1. Strengths

First, the performance of K-ETS has been proven in the East Asian context. K-ETS is a mature and well-tested system, having operated since 2015 in an East Asian economy similar to Vietnam regarding environmental challenges. Korea and Vietnam are among the top 20 global emitters of GHG in 2023, but Korea has played a more crucial role in reducing GHG emissions thanks to K-ETS. A 2020 survey of K-ETS participants found that 41.1% of businesses viewed the system as effective in reducing emissions, with key activities including (i) installation of high-efficiency equipment (63.9% of respondents), (ii) transition to low-carbon fuels (25.7%) and (iii) renewable energy adoption (16.7%).³⁸ The financial pressure from carbon pricing has driven investments in technologies like energy efficiency upgrades and carbon capture. Korea's success in balancing industrial competitiveness with

38 Minjo, C. (2022). 2020 Korean emissions trading system report was published. *Korea's Ministry of Environment*, 1-2.

emissions reductions demonstrates the viability of a cap-and-trade model in the region. For Vietnam, this applicability makes K-ETS a relevant model for understanding how to regulate high-emission sectors such as manufacturing, energy, and transportation, which are also Vietnam's most significant sources of GHG emissions.³⁹

Second, the gradual implementation of K-ETS helps reduce economic shock, serving as a valuable lesson for Vietnam. The phased introduction of K-ETS, beginning with 100% free allocation of allowances in Phase 1 and gradually increasing auctioning proportions in subsequent phases, minimized industry disruptions. This approach allowed businesses to adapt to the carbon pricing system while maintaining economic stability. Vietnam, with its reliance on cost-sensitive sectors like transportation and agriculture⁴⁰, can benefit from a similar strategy to ensure smooth market adoption.

Third, K-ETS is supported by a strong institutional framework, including the 2010 Framework Act, the 2012 Allocation Act, and the 2021 Carbon Neutral Framework Act. Meanwhile, the legal framework for Vietnam's carbon market is mainly mentioned in by-law documents such as Decree No. 06/2022/ND-CP. Therefore, Vietnam's adoption of such institutional rigor can enhance market credibility and legal certainty and ensure alignment with its significant carbon neutrality goals by 2050.

Fourth, learning from K-ETS can open technology transfer opportunities, as Korea's carbon market has spurred investments in green technologies, renewable energy, and emissions reduction innovations. For example, the EU-Korea ETS cooperation project (2016 – 2019) facilitated workshops on low-carbon technologies and compliance strategies, sharing EU expertise with Korean businesses.⁴¹ Vietnam could leverage similar technology transfer opportunities through partnerships and international cooperation to modernize its energy and industrial sectors.

3.2.1.2. Challenges

Differences in economic structure between Korea and Vietnam can pose a challenge to this adoption. Korea's highly industrialized and technology-driven economy differs significantly from Vietnam's, which relies more on agriculture and low-cost manufacturing. These differences may limit the direct applicability of K-ETS's advanced features in Vietnam's context.

Furthermore, K-ETS requires high ETS awareness, advanced MRV capacity, and extensive regulatory capacity of enterprises. Vietnam may face

39 Banh, T. H. L. (2022). Phân tích thực trạng phát thải khí nhà kính tại Việt Nam [The status quo of greenhouse gas emissions in Vietnam]. *Vietnam Trade and Industry Review*, 9, 172–177.

40 Nguyen, V. H., & Nguyen, H. N. (2021). Hiện trạng phát thải khí nhà kính tại Việt Nam: Cơ hội và thách thức [Current status of greenhouse gas emissions in Vietnam: Opportunities and challenges]. *Hydrometeorological Journal*, 52–60. doi: 10.36335/VNJHM.2021(728)

41 European Union. (2016). EU-Korea Emissions Trading System cooperation project launches a series of activities to benefit Korean businesses. *European Union*. https://www.eeas.europa.eu/node/14138_en

challenges in developing these capabilities, especially in the early stages of its carbon market. A 2023 survey shows low readiness and understanding of ETS principles among Vietnamese enterprises, especially domestic firms, compared to foreign-invested companies. Accordingly, only 32% of companies have conducted a GHG inventory, and less than 11% have verified reports. While 75% of respondents knew of Vietnam's carbon market development roadmap, only 13% had publicly disclosed their emissions. Regarding ETS participation, 42% expressed interest in capacity-building support across all relevant areas.⁴² These figures demonstrate a lower readiness rate of Vietnamese corporations to participate in a national ETS, potentially hindering the government's effort to implement a carbon market.

Notably, a critical strength of K-ETS is its rigorous compliance framework, which includes strict penalties for non-compliance and a robust legal structure. While effective, these mechanisms require extensive regulatory capacity and well-trained personnel to administer and enforce. In Vietnam, where institutional capacity in environmental governance is still developing, meeting these requirements would be challenging, as this country must confront a significant shortage of human resources, technical expertise, and awareness about the ETS. For instance, in 2024, no comprehensive government-led ETS training programs had been implemented in Vietnam.⁴³ Additionally, businesses may find the initial compliance costs, including upgrading technology, adjusting operations, and even paying high monetary fines, especially for small and medium-sized enterprises that dominate Vietnam's economy.⁴⁴

3.2.2. *The applicability of the Indonesian Trading Scheme in Vietnam's context*

3.2.2.1. Strengths

Both Indonesia and Vietnam are members of the Association of Southeast Asian Nations (ASEAN). These two countries rely heavily on coal-fired power (Indonesia: 60% of electricity; Vietnam: 53%),⁴⁵ face industrial emissions growth, and prioritize balancing economic development with climate goals. Indonesia's emphasis on nature-based solutions (e.g., forestry, mangroves) to generate carbon credits aligns with Vietnam's potential in agroforestry.⁴⁶ Therefore, the Indonesian Trading Scheme offers a model better suited to the regions and Vietnam's unique needs, including

42 United Nations Office for Project Services. (2025). *Technical report: Emission trading system piloting and simulation in Vietnam*. Southeast Asia Energy Transition Partnership.

43 United Nations Office for Project Services. (2025, February), *supra* note 42.

44 Khanh, L. (2025). Chiếm gần 98% tổng số doanh nghiệp, doanh nghiệp nhỏ và vừa đang ở đâu trong nền kinh tế [Accounting for nearly 98% of total enterprises, where are small and medium enterprises in the economy?]. *Online Investment*. <https://baodautu.vn/chiem-gan-98-tong-so-doanh-nghiep-doanh-nghiep-nho-va-vua-dang-o-dau-trong-nen-kinh-te-d249574.html>

45 Dave, J. (n.d.). Top coal power countries. *Ember*. <https://ember-energy.org/latest-insights/top-25-coal-power-countries-in-2020/#:~:text=The%20top%20four%20countries%20-%20China,76%25%2C%206%2C626%20TWh>

46 Vanessa, S. (2024). High-Level discussion between Indonesia and Vietnam sets the stage for sustainable business collaboration. *Fairatmos*. <https://www.fairatmos.com/blog/high-level-discussion-between-indonesia-and-vietnam-sets-the-stage-for-sustainable-business-collaboration>

a compliance carbon market supported by a robust legal framework. In addition, Indonesia's phased compliance ETS rollout (starting with coal plants in 2023)⁴⁷ aligns with Vietnam's plan to pilot its carbon market in 2025,⁴⁸ focusing initially on energy and industry. These similarities highlight the possibility of Vietnam learning from Indonesia to design its carbon market.

The Indonesian Trading Scheme offers flexibility through dual mechanisms. Unlike K-ETS, Indonesia's system combines a cap-tax-and-trade model with emission trading and GHG emission offsets. This flexibility allows businesses to choose compliance pathways that align with their operational capabilities and financial constraints. With its diverse economic sectors, Vietnam can benefit from adopting a similar dual mechanism to provide businesses with more compliance options.

Furthermore, the adoption of Indonesia's model means regional cooperation potential. The Indonesian Trading Scheme is designed with potential regional integration, aligning with ASEAN climate initiatives. Indonesia leads ASEAN in establishing a compliance-based ETS, initially targeting coal-fired power plants, marking a significant step in Southeast Asia's carbon policy trajectory.⁴⁹ At COP29 in 2024, ASEAN countries signed a Memorandum of Collaboration among carbon market associations from Malaysia, Indonesia, Singapore, Thailand, and the ASEAN Alliance on Carbon Market. This agreement aims to streamline the production of high-quality carbon credits, enhance market liquidity, and align domestic methodologies to foster regional integration.⁵⁰ By adopting Indonesia's model, Vietnam can leverage this regional approach to foster collaboration, enhance market liquidity, and attract international investments.

3.2.2.2. Challenges

Upon the above analysis, the Indonesian Trading Scheme requires high administrative management, which can be unsuitable for Vietnam's carbon market. The Indonesian Trading Scheme combines cap-and-trade with a carbon tax simultaneously. While this operation mechanism offers flexibility, it requires significant administrative oversight to manage allowances, monitor tax compliance, and verify offsets. With limited institutional capacity in environmental governance, Vietnam may struggle to effectively establish the regulatory frameworks and human resources needed to manage such a complex system. The management of offsets involves rigorous verification to prevent fraud and ensure environmental integrity, which could strain Vietnam's administrative resources. This is worsened by the fact that, in 2024, Vietnam had

47 Yuliana, S., & Riza, S. (2024). Indonesia Carbon market white paper. *PwC Indonesia Report*, 16–21.

48 Section II of Decision No. 232/QĐ-TTg, approving the proposal for establishment and development of a carbon market in Vietnam, issued on January 24, 2025.

49 Yuliana, S., & Riza, S. (2024), *supra* note 47.

50 Mega, V. et al. (2024, November 25). Advancing ASEAN's Carbon market integration: A historic step forward. *US-ASEAN Business Council*. <https://www.usasean.org/article/advancing-aseans-carbon-market-integration-historic-step-forward>

not yet implemented any comprehensive government-led training programs for its ETS despite the urgent need to establish a national pilot carbon market. This highlights Vietnam's difficulty in adopting the Indonesian model in carbon market development. In addition, Indonesia's carbon price has remained low, with the price per unit being around 2 USD, as discussed in section 2.3e). Low prices hinder optimal emission reductions because they fail to provide substantial economic incentives for industries to invest in cleaner technologies or reduce emissions. However, the solution to this is not easy, as setting a carbon price that is high enough to drive meaningful emissions reductions but low enough to avoid excessive economic burden is challenging. A price too low undermines the environmental goals of the system, while a price too high risks deterring industry participation, harming competitiveness, and slowing economic growth. Indonesia's experience reflects this tension, with policymakers needing to carefully calibrate price floors, caps, and penalties. Vietnam is at an earlier stage of carbon market development and shares many economic and institutional characteristics with Indonesia, including limited experience with carbon pricing. Therefore, Vietnam will likely face similar challenges in determining an effective carbon price if this country decides to pursue the Indonesian model.

3.3. Legal recommendations for Vietnam's design of a national carbon market

Vietnam's pursuit of a national carbon market can benefit significantly from the experiences of K-ETS and the Indonesian Trading Scheme. Both systems demonstrate unique approaches to carbon pricing, highlighting valuable lessons in operational mechanisms, allowance allocation, market flexibility, and enforcement. These insights can help Vietnam craft a robust carbon market tailored to its economic and environmental priorities. Therefore, the Vietnamese government should apply the following recommendations when designing a national carbon market.

3.3.1. Building a robust roadmap for Vietnam's carbon market

To build such a roadmap, Vietnam needs to (i) choose a formal operational mechanism, (ii) adopt suitable strategies for allowances, and (iii) apply rigorous sanctions for non-compliance. Regarding the mechanism of operation (i), it is advisable for Vietnam to adopt the cap-and-trade principle of K-ETS instead of the cap-tax-and-trade principle of the Indonesian Trading Scheme. This is simply because Vietnamese laws currently do not recognize carbon taxes, making it impossible for this country to pursue the Indonesian model. The Vietnamese Parliament can amend legal regulations to adopt the Indonesian system. Still, this procedure can be extremely lengthy and challenging due to the complicated procedure, the lack of human resources, and the practical assessment. This contrasts sharply with the intention to implement a pilot project of Vietnam's ETS from June 2025, as indicated in section II.2a) of Decision No. 232/QĐ-

TTg. Meanwhile, the cap-and-trade system is a traditional principle of several emission trading models, including K-ETS, the EU's Emissions Trading System, and Canada-Québec's Cap-and-Trade System. Therefore, it is viable for Vietnam to follow in the footsteps of previously successful ETS, laying a concrete ground for the country's carbon market and aligning it with international best practices.

Regarding allowance allocation strategies (ii), a phased approach can help Vietnam balance environmental ambitions with economic stability. Free allocations in the early stages (from 2025 to 2028) and in EITE sectors such as coal and steel, followed by gradual increases in auctioning proportions from 2029, would encourage businesses to invest in emissions reductions without creating economic shock or jeopardizing their competitiveness. This is because Korea's and Indonesia's systems begin with free allocations of allowances to minimize economic disruptions and provide businesses with time to adapt, then gradually change to auctioning to enforce the polluter-pays principle while avoiding sudden financial burdens. The Vietnamese government, therefore, should formally and legally incorporate this phased approach into Article 7 of Decree No. 06/2022/ND-CP, as they are only generally recognized with uncertainty in section III.6 of Decision No. 232/QD-TTg.

Regarding legal penalties (iii), the Vietnamese government should establish strict sanctions for violations, combining behavioral measures with monetary fines. Accordingly, Article 45 of Decree No. 45/2022/ND-CP on penalties for administrative violations against regulations on environmental protection should be expanded to cover more types of breaches and a wider range of penalties. For instance, excessive emitters who fail to buy sufficient carbon credits can be treated with a maximum fine of three times the total price of the credits they have to purchase previously. Meanwhile, more severe violations such as fraud or market manipulation may be handled according to the 2015 Vietnamese Criminal Code (amended in 2017) or the 2018 Law on Competition, with subjects responsible for these acts being prohibited from selling their surplus of GHG emissions for at least 3 years. Rigorous sanctions would ensure market integrity and transparency, prevent non-compliant behaviors, and promote compliance practices. This is of greater importance as these sanctions would enable the Vietnamese government to support providing free allowances, not to be taken advantage of for illegal purposes.

3.3.2. Building a flexible and open mechanism for carbon trading

To establish such a mechanism, it is essential to (i) recognize carbon credits as securities, (ii) adopt a flexible trading mechanism, and (iii) employ market stability measures only when necessary.

Regarding the recognition of credits, it is necessary and possible for the Vietnamese government to do so, as the current legal framework, including the 2015 Vietnamese Civil Code and the 2019 Law on Securities, does not identify

the true nature of these credits. The classification of carbon credits as securities would reflect the nature of these credits, as they can confirm the ownership of their holders, aligning with Articles 4.1 to 4.5 of the 2019 Law on Securities. In addition, a range of tasks such as providing transaction methods and registration, depository, and payment of transactions are delegated to Viet Nam Securities Depository and Clearing Corporation, and Hanoi Stock Exchange under section III of Decision No. 232/QĐ-Ttg. Recognizing these credits as securities would make these tasks easier to enact and would not cost enterprises time and resources to familiarize themselves with a new exchange or trading system, which differs from the widely used stock exchanges of securities previously.

About the trading mechanism, Vietnam could integrate a wide range of trading methods (like emission trading, GHG offset trading, international credits) into its trading system to offer diverse pathways for businesses to meet obligations, thereby increasing market participation and reducing overall costs. This is inspired by the dual mechanism of Indonesia's system, providing cost-effective alternatives for compliance, as opposed to the single trading mechanism in K-ETS. Additionally, Vietnam has registered cross-border carbon projects operating under such carbon programs as Verified Carbon Standard and Golden Standard.⁵¹ Therefore, Vietnam's carbon market should recognize carbon credits under these projects and other projects, including Plan Vivo and the American Carbon Registry, encouraging domestic carbon projects that meet international standards. Supporting cross-border projects can also lead to technology transfer, capacity building, and economic co-benefits for Vietnam and various partners.

Concerning market stability measures, although the carbon price should be set based on supply and demand, establishing a maximum or minimum price when the price is too high or too low is significant. Excessive price spikes can impose sudden and unsustainable financial burdens on businesses, potentially reducing compliance and market participation. Conversely, prices that fall too low may fail to incentivize emissions reductions or investment in green technologies. Therefore, stabilizing prices ensures that the carbon market remains predictable, enabling businesses to plan their compliance strategies effectively. This differs from the Indonesian model, in which price is set by legal provisions even in normal market conditions.

3.3.3. Building a mechanism of technology transfer, innovation, and international cooperation

As the timeline of Decision No.232/QĐ-Ttg is coming closer day by day, Vietnam still faces various challenges, such as the shortage of technical and governance capacity, the lack of human resources. Technology transfer, innovation, and international cooperation can help to bridge these gaps. The EU's ETS is a global benchmark for carbon market design, with a stringent

51 VnEconomy. (2025). Phát triển thị trường carbon ở Việt Nam [Developing carbon market in Vietnam]. VnEconomy. <https://vneconomy.vn/phat-trien-thi-truong-carbon-o-viet-nam.htm>

system of MRV and strong enforcement. Vietnam's carbon market can align with the features of the EU's ETS (e.g., the guidance, support, and ETS reporting tool) to facilitate linkage opportunities, enhance credibility, and attract international investments in Vietnam's carbon projects. Technical assistance and funding from EU climate programs like Just Energy Transition Partnership, the EU bank's Greening Financial Systems technical assistance programme, can also support Vietnam's technology transfer and innovation efforts. In the ASEAN region, ASEAN countries, including Malaysia, Indonesia, and Singapore, are developing interoperable carbon markets under frameworks like the ASEAN Common Carbon Market Initiative, and regional initiatives such as the ASEAN Carbon Forum and Memoranda of Collaboration among carbon market associations in 2024. These platforms promote harmonized methodologies, capacity building, and joint projects that accelerate technology diffusion and market development. By participating in these collaborative efforts, Vietnam can accelerate technology transfer and innovation, improve institutional capacity, and ensure its carbon market contributes effectively to national climate goals and economic competitiveness in the evolving global carbon economy thanks to sharing knowledge and experiences with ASEAN peers such as Malaysia, Indonesia, and Singapore, who have made significant progress in developing recognized carbon methodologies and market infrastructure. ●

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Author Contribution

All authors contributed to the study conception and design. All authors read and approved the final manuscript.

Declarations

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