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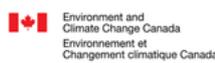


# Report

## Assessment of Transaction Methods, Management, and Supervision of Allowances and Carbon Credits Trading on the Carbon Trade Exchange of Vietnam

VIETNAM CARBON TRADE EXCHANGE - PILOT PREPARATION WITH MINISTRY OF FINANCE  
NOVEMBER 2025

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# **REPORT 4**

## **Vietnam Carbon Trade Exchange Pilot Preparation with Ministry of Finance, Phase 2**

Assessment of Transaction Methods, Management, and  
Supervision of Allowances and Carbon Credits Trading on  
the Carbon Trade Exchange of Vietnam

**November 2025**

## COLOPHON AND DISCLAIMER

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## ABBREVIATIONS

<b>ARP</b>	Auction Reserve Price
<b>CBAM</b>	Carbon Border Adjustment Mechanism
<b>CCER</b>	China Certified Emission Reduction
<b>CCERC</b>	China Carbon Emissions Registration and Clearing Co., Ltd.
<b>CCM</b>	Cost Containment Mechanism
<b>CCP</b>	Central Counterparty
<b>CCR</b>	Cost Containment Reserve
<b>CFTC</b>	Commodity Futures Trading Commission
<b>CITSS</b>	Compliance Instrument Tracking System Service
<b>CNY</b>	Chinese Yuan
<b>CTX</b>	Carbon Trade Exchange
<b>DESNZ</b>	Department for Energy Security and Net Zero
<b>DVP</b>	Delivery versus Payment
<b>EPA</b>	Environmental Protection Authority
<b>ETP</b>	Southeast Asia Energy Transition Partnership
<b>ETRS</b>	Emissions Trading Registry System
<b>ETS</b>	Emissions Trading System
<b>FCA</b>	Financial Conduct Authority
<b>GHG</b>	Greenhouse Gas
<b>HNX</b>	Hanoi Stock Exchange
<b>ICE</b>	Intercontinental Exchange
<b>MAE</b>	Ministry of Agriculture and Environment
<b>MAR</b>	Market Abuse Regulation
<b>MEE</b>	Ministry of Ecology and Environment of China
<b>MOF</b>	Ministry of Finance of Vietnam
<b>MOIT</b>	Ministry of Industry and Trade of Vietnam

<b>MRV</b>	Monitoring, Reporting and Verification
<b>MSR</b>	Market Stability Reserve
<b>NDC</b>	Nationally Determined Contribution
<b>NGMS</b>	National Greenhouse Gas Management System
<b>NRS</b>	National Registry System
<b>ORS</b>	Offset Registry System
<b>OTC</b>	Over-the-counter
<b>RTGS</b>	Real-Time Gross Settlement
<b>SAM</b>	Supply Adjustment Mechanism
<b>SEEE</b>	Shanghai Environment and Energy Exchange
<b>SLA</b>	Service-Level Agreement
<b>SSC</b>	State Securities Commission of Vietnam
<b>UNOPS</b>	the United Nations Office for Project Services
<b>VAT</b>	Value Added Taxation
<b>VNX</b>	Vietnam Exchange
<b>VSDC</b>	Vietnam Securities Depository and Clearing Corporation

## EXECUTIVE SUMMARY

Vietnam's commitment to achieving net-zero greenhouse gas emissions by 2050 has elevated the development of a domestic carbon market from a policy concept to an operational priority. The establishment of the Carbon Trade Exchange (CTX), mandated under the Law on Environmental Protection and further articulated through successive Government Decrees and the Prime Minister's Decision No. 232/QD-TTg, represents a critical institutional step toward deploying market-based instruments for cost-effective emissions reduction.

This report - Deliverable 4 - provides a focused technical and institutional assessment of the proposed CTX pilot model as set out in the Draft Decree on the domestic carbon trade exchange and consultation with key stakeholders at the Ministry of Finance (MOF), Ministry of Agriculture and Environment (MAE) and other related agencies under MOF. Its scope is deliberately confined to the transaction methods, governance structure, and supervision framework of the CTX, reflecting the core mandate of this deliverable within the broader technical assistance programme supporting the Ministry of Finance.

A central finding of the report is that the Draft Decree adopts a strategically sound institutional architecture by leveraging Vietnam's existing securities-market infrastructure. The designation of the Hanoi Stock Exchange (HNX) as the trading system operator and the Vietnam Securities Depository and Clearing Corporation (VSDC) as the depository and settlement operator provides the CTX with immediate access to mature operational systems, established market practices, and experienced supervisory arrangements. This approach significantly reduces implementation risk and aligns with international experience in jurisdictions where carbon markets are embedded within or closely linked to financial-market infrastructure.

However, the analysis also demonstrates that a carbon market, particularly one oriented toward regulatory compliance and environmental integrity, differs fundamentally from conventional securities markets in its objectives, risk profile, and regulatory logic. As a result, while many securities-market mechanisms are transferable, they cannot be applied mechanically. Effective operation of the CTX requires clear differentiation between financial-market functions and carbon-market responsibilities, especially with respect to asset eligibility, registry integration, supervision of market conduct, and coordination between environmental and financial authorities.

The report highlights the central role of the National Registry System (NRS) managed by the Ministry of Agriculture and Environment (MAE) in safeguarding the environmental integrity of the market. The proposed CTX model relies on close operational coupling between the NRS, the trading system, and the depository and settlement infrastructure. International experience confirms that this registry-exchange interface is a defining feature of successful emissions trading systems and a critical determinant of market credibility.

Benchmarking against the EU ETS, UK ETS, and China's national ETS further reinforces the importance of tailored supervision frameworks for carbon markets. While financial-market surveillance tools provide a strong foundation, carbon markets require additional attention to issues such as allowance integrity, market concentration driven by compliance positions, and coordination between environmental regulators and financial supervisors. These considerations are particularly relevant in the Vietnamese context, given the hybrid governance model proposed in the Draft Decree.

The assessment of advanced digital technologies concludes that a pragmatic, data-centric approach offers the greatest near-term value. Rather than pursuing full tokenisation of carbon units during the pilot phase, targeted use of digital tools, such as distributed ledger technologies applied to data notarisation, reconciliation, and traceability, can enhance transparency and system integrity while remaining consistent with the existing legal framework.

Overall, Deliverable 4 does not seek to redesign the CTX model proposed in the Draft Decree; instead, it clarifies how that model functions in practice, where it aligns with established market mechanisms, and what institutional considerations are essential for its credibility and effectiveness. In doing so, the report provides a concise, policy-relevant synthesis to support the Ministry of Finance and other competent authorities in finalising the regulatory framework and preparing for the successful launch of Vietnam's CTX pilot.

## 1 INTRODUCTION

Vietnam has established ambitious climate objectives, underscored by its commitment at the 26th Conference of the Parties (COP26) to achieve net-zero greenhouse gas emissions by 2050. A central pillar of the national strategy to meet these goals, including its Nationally Determined Contribution (NDC) under the Paris Agreement, is the development of a domestic carbon market. This market-based instrument is designed to facilitate cost-effective emissions reductions across key sectors of the economy and stimulate investment in low-carbon technologies.

The legal and policy foundations for this market are now firmly in place. The Law on Environmental Protection (No. 72/2020/QH14), specifically Article 139, provided the initial mandate. This was subsequently detailed in Government Decree No. 06/2022/ND-CP dated 7 January 2022 on mitigation of GHG emissions and protection of ozone layer and its amendment Government Decree No. 119/2025/ND-CP dated 9 June 2025, which outlined the foundational roadmap for market development. A critical step forward occurred with the Prime Minister's Decision No. 232/QD-TTg dated 24 January 2025 on Scheme for establishing and developing a carbon market in Vietnam. This decision approved the official scheme for establishing a domestic Carbon Trade Exchange (CTX) and, crucially, assigned clear institutional responsibilities, providing both the legal authority and political impetus to transition from policy design to practical implementation.

Decision No. 232/QD-TTg established a clear, hybrid governance structure. The Ministry of Finance (MOF) was designated as the lead agency responsible for the establishment and operational management of the CTX itself. Concurrently, the Ministry of Agriculture and Environment (MAE) was assigned responsibility for overseeing the overall carbon market framework, including managing the National Registry System (NRS) for carbon units and ensuring the environmental integrity of the scheme.

The Decision confirmed the strategic recommendation arising from earlier technical assistance: to leverage the existing, mature infrastructure and deep operational expertise of Vietnam's national securities market. This model specifically entrusts the Hanoi Stock Exchange (HNX) with operating the trading platform and the Vietnam Securities Depository and Clearing Corporation (VSDC) with managing the depository, clearing, and settlement functions for carbon assets. This approach aims to accelerate implementation, reduce costs, and ensure operational reliability by building upon proven systems and regulatory frameworks.

Most recently, "Resolution 70-NQ/TW on national energy security" is an important document issued by the Central Executive Committee of the Communist Party (on 20 August 2025). It sets the strategic orientation for ensuring Vietnam's energy security to 2030 with a vision to 2045. The Resolution highlights the role of the carbon market as solutions to contribute to the national energy security "Study the application of appropriate carbon taxation policies for the use of fossil fuels and establish standards and limits for carbon emissions. Develop a measurement, reporting, and verification (MRV) system for greenhouse gas (GHG) emissions in accordance with international standards. Urgently develop mechanisms for carbon credit trading, promote the domestic carbon market, and connect it with international markets. Introduce preferential policies to encourage the development of advanced, high-efficiency, and environmentally friendly technologies."

The MOF is receiving ongoing technical assistance through the project "Vietnam Carbon Trade Exchange - Pilot Preparation with the Ministry of Finance" (Phase 2), supported by the Southeast Asia Energy Transition Partnership (ETP). Phase 1 of this support, completed in 2024, focused on assessing national readiness and international best practices, culminating in the recommendation to utilise the securities market infrastructure. Phase 2, which commenced in January 2025, shifted focus towards detailed design and implementation support for the pilot phase.

Since the launching of Phase 2 of the project, the policy landscape evolved rapidly. On 27 March 2025, the MOF released its Draft Decree on the domestic carbon trade exchange for public consultation. This draft regulation, particularly its fifth version (hereafter "the Draft Decree"), now provides the specific, proposed regulatory framework for CTX's operation. Its release reshaped the objective of this technical assistance. Consequently, this report (Deliverable 4) is no longer focused on proposing a model from scratch. Instead, its primary purpose is to provide an in-depth analysis and expert assessment of the model already proposed in the Draft Decree. The analysis conducted in this report is based mainly on the Draft Decree and consultations with experts from MOF.

Specifically, this report concentrates on the core mandate of ***Deliverable 4: the detailed transaction methods, governance structures, and supervision mechanisms proposed for the CTX.*** It analyses these specific provisions in the Draft Decree, benchmarks them against the existing regulations and relevant transaction methods, governance structures, and supervision mechanisms in the Vietnam's securities market, as well as international practices, then identifies potential gaps or areas requiring further refinement, and finally offers actionable recommendations. A significant component of this analysis involves evaluating the feasibility and potential role of advanced digital technologies, particularly blockchain or Distributed Ledger Technology (DLT), in enhancing the transparency, security, and efficiency of the proposed governance and transaction framework. The ultimate aim is to support the MOF in finalising a robust, effective, and internationally credible regulatory framework for the successful launch and operation of Vietnam's pilot CTX.

## **2 ANALYSIS OF SECURITIES-MARKET MECHANISMS IN RELATION TO CTX TRANSACTION, MANAGEMENT, AND SUPERVISION DESIGN**

The Draft Decree on the Domestic Carbon Trade Exchange established a foundational legal framework and overall architecture for the CTX. However, it does not yet detail the specific technical procedures and operational parameters required for implementation. This chapter aims to bridge that gap by first conducting an in-depth technical analysis of the existing mechanisms within the securities market and then proposing concrete methods for mapping and adapting these mechanisms to the specific needs of the CTX, thereby providing actionable technical recommendations.

The following figure presents the functional mapping of the Draft Decree, linking the legal articles to CTX governance, infrastructure, and operational stakeholders. The further details will be elaborated in the subsequent sections.

REGULATORY & OVERSIGHT	REGISTRY & ASSET INTEGRITY	TRADING OPERATIONS	SETTLEMENT, RISK & COMPLIANCE
<p><b>Art. 33: Market Supervision</b> Allocation of roles for monitoring and handling violations.</p> <p><i>MAE (Lead), SSC (Coordinate), VNX/VSDC (Operational supervision).</i></p>	<p><b>Art. 7 &amp; 12: Asset Validity &amp; Coding</b> Registration of units on NRS &amp; issuance of domestic identification codes.</p> <p><i>MAE/NRS (Primary management).</i></p>	<p><b>Art. 10 &amp; 11: Regulatory Framework</b> Issuance of operational rules for membership, trading, &amp; surveillance.</p> <p><i>VNX (Issue regulations), HNX (Operational procedures).</i></p>	<p><b>Art. 16: Settlement Mechanism</b> RTGS and DvP model without a Central Counterparty (CCP).</p> <p><i>VSDC (Instruction), Settlement Banks (Fund transfer).</i></p>
<p><b>Art. 29 &amp; 30: Market Intervention</b> Authority to suspend or resume HNX &amp; VSDC operations during disruptions</p> <p><i>MAE (Decision-making authority)</i></p>	<p><b>Art. 14: Depository Bridge</b> Transferring units from NRS to VSDC to enable exchange trading.</p> <p><i>MAE (Instruction), VSDC (Execution), Members.</i></p>	<p><b>Art. 3: Carbon Trading System</b> Development and operation of the physical trading platform.</p> <p><i>HNX (Designated operator).</i></p>	<p><b>Art. 17: Trade Failure Handling</b> Authority to cancel trades with insufficient funds or units.</p> <p><i>VSDC (Enforcement).</i></p>
<p><b>Art. 26 &amp; 28: Cash Infrastructure</b> Requirements and selection process for settlement banks.</p> <p><i>SSC (Selection/Oversight), Commercial Banks (Settlement bank)</i></p>	<p><b>Art. 13: Ownership Transfer</b> Legal transfer of units at VSDC and daily master ledger update at NRS.</p> <p><i>VSDC (Post-trade transfer), MAE (Update NRS).</i></p>	<p><b>Art. 15: Transaction Methods</b> Negotiated transactions and pre-trade validation of funds/units.</p> <p><i>HNX (Platform), Members (Verification), Participants.</i></p>	<p><b>Art. 5, 31 &amp; 32: Market Integrity</b> Prohibition of manipulation, hierarchical reporting, &amp; public disclosure.</p> <p><i>MAE (Supervision), VNX/HNX/VSDC (Disclosure), Members (Reporting).</i></p>

Figure 1: Legal mapping of the Draft Decree on domestic carbon trade exchange

Source: Compiled by the Consultant

## 2.1 Overview of the proposed CTX model in Draft Decree

### 2.1.1 The governance structure proposed for the CTX

The Draft Decree establishes a specific governance architecture for the domestic CTX. While strategically leveraging existing institutions from the well-established securities market, the Draft assigns distinct roles and responsibilities tailored to the requirements of overseeing carbon asset transactions in the legal and institutional context of Vietnam. To assess its potential effectiveness, this study firstly examines the details of this proposed structure, particularly the division of responsibilities and coordination requirements.

The Draft Decree outlines a hybrid, multi-layered governance framework centred around key state bodies and market operators:

- **MAE:** The Draft Decree positions the MAE as the primary governmental management authority with overarching responsibility for the CTX. Its mandated functions span both the environmental integrity of the underlying assets and the stability of the trading market itself. Key governance functions assigned to MAE under Article 33 include:
  - **Leading market supervision:** Holding the responsibility for supervising trading activities on the CTX to detect, prevent, and handle market manipulation and other violations of trading regulations.
  - **Ensuring asset integrity:** Guaranteeing the validity and eligibility of the greenhouse gas (GHG) emission allowances and carbon credits permitted for trading. This includes managing the NRS to manage and track emission allowances, carbon credits, ownership, and status, and communicating the list of tradable instruments to the market operators (Article 7).
  - **Market intervention authority:** Having the authority to temporarily suspend, partially or wholly, the market operations conducted by the HNX (trading) and VSDC (depository and settlement) in response to major disruptions (e.g., technical failures, force majeure) or when deemed necessary to protect market integrity and participant interests (Articles 29 and 30).
  - **Rule approval and coordination lead:** Having the authority to provide official opinions on the operational rules and surveillance criteria developed by the market operators (VNX and VSDC) and leading the coordination efforts among all involved agencies, including initiating and coordinating joint inspections. The MAE is also mandated to lead the establishment of a formal coordination agreement between the key parties (MAE, VNX, HNX, VSDC).
- **MOF/SSC:** While primary oversight of the carbon market is assigned to the MAE, the Draft Decree assigns a crucial coordinating and specific supervisory role to the financial regulatory bodies, primarily executed through the SSC. The defined functions outlined in Article 33 for the SSC include:
  - **Coordinating on inspections:** Participating in joint inspections of the market operators (HNX, VSDC) led by the MAE.

- **Input on operational rules:** Providing official opinions on the operational rules drafted by the VNX and VSDC, ensuring alignment with established financial market practices and standards where applicable.
- **Oversight of settlement banks:** Having the responsibility for selecting the commercial bank(s) eligible to act as the settlement bank for the CTX transactions and subsequently supervising their performance and adherence to requirements (Articles 26, 28).
- **Vietnam Exchange (VNX) and HNX:** The draft assigns the operational responsibility for organising and managing the trading function to the stock exchanges under the existing parent-subsidiary structure.
  - **VNX:** As the parent entity, the VNX is responsible for developing and issuing key operational regulations governing the CTX market, including rules for trading membership, detailed surveillance criteria, and reporting requirements for members (Article 10). It holds the authority to approve, suspend, or terminate the participation of trading members. The VNX is also tasked with conducting higher-level market surveillance based on data provided by HNX and member reports, reporting surveillance outcomes to MAE, and supervising HNX's overall performance (Article 33).
  - **HNX:** As the designated operator, the HNX is responsible for building, operating, and maintaining the physical "Carbon Trading System" platform (Article 3). It implements the rules set by the VNX through detailed operational procedures (Article 11), conducts the front-line, real-time surveillance of trading activities according to the VNX criteria, and transmits confirmed trade data to VSDC to initiate the settlement process.
- **VSDC:** the VSDC is assigned the critical role of managing the post-trade infrastructure and processes, ensuring the secure holding and transfer of carbon assets traded on the exchange (Article 9). Its specific governance-related functions under the decree include:
  - **Operating the depository and settlement system:** Managing the "System for depository and settlement of carbon transactions", including the crucial function of receiving carbon units transferred from MAE's NRS for depository to make them eligible for trading (Article 14). The VSDC manages participant accounts through depository members and executes the final settlement of trades based on data received from HNX.
  - **Rulemaking authority:** Developing and issuing its own detailed operational rules governing depository and settlement activities, following consultation with MAE and SSC.
  - **Member supervision:** Overseeing the compliance of its depository members (securities companies) with its rules regarding account management and settlement procedures.
  - **Reconciliation and reporting:** Providing daily reports on settlement results and end-of-day balances for each account back to MAE, ensuring the NRS can be updated and remains the definitive master ledger for unit ownership (Articles 9, 13).

- **Market intermediaries (securities companies, settlement banks):** These entities form the essential interface between the core infrastructure and the end participants.
  - **Securities companies:** Must meet specific requirements and register separately as "carbon trading members" with VNX (Article 18) and "carbon depository members" with VSDC (Article 22). They perform vital gatekeeping and first-level compliance functions, including verifying client eligibility, managing client accounts, ensuring clients meet pre-trade requirements (sufficient funds/units under Article 15), and conducting initial monitoring of client orders (Articles 19, 23).
  - **Settlement banks:** Selected by the SSC (Article 26, 28), these commercial banks are responsible for managing the cash accounts used for settlement and executing the fund transfers required to complete trades, based strictly on VSDC's instructions (Article 16).

This governance structure, as proposed by the Draft Decree, establishes a hierarchy with MAE holding the major role, leveraging the operational capacities of established financial market institutions (HNX, VSDC, SSC) through a system that is reliant strongly on inter-agency coordination. The detailed definition of roles provides a necessary starting point but the practical effectiveness will depend on the robustness of the coordination mechanisms and the clarity of supervisory procedures.

### 2.1.2 Proposed transaction methods and procedures

The Draft Decree defines a specific set of procedures governing the lifecycle of carbon units (allowances and credits) within the CTX framework, from generating and registering them for trading through to the final settlement of transactions. These procedures adapt the established securities market workflows of Vietnam but incorporate modifications necessary for integrating with the MAE's NRS and managing the unique nature of carbon assets during the pilot phase.

#### Depository process and establishing tradability (Article 14)

A fundamental prerequisite for trading on the CTX is the secure holding of carbon units within the VSDC's depository system. The Draft Decree outlines a distinct two-stage process to achieve this, ensuring units are validated by MAE before becoming eligible for exchange transactions:

- **Registration and validation on NRS:** All GHG emission allowances and carbon credits must first be registered and assigned a unique domestic code on the NRS, which is managed by MAE. This step serves as the primary validation, confirming the unit's existence and initial ownership according to environmental regulations.
- **Depository at VSDC:** To make these registered units tradable on the HNX platform, the owning entity must initiate a depository request via the NRS. The MAE then verifies the request against its records and transmits an official instruction list to the VSDC, specifying the owner, the quantity of units, and the designated VSDC depository account (held via a securities company acting as a depository member). Upon receiving MAE's instruction, the VSDC credits the specified quantity of units to the participant's depository account, effectively immobilising the units within the financial market infrastructure and making them available for trading. Units must be deposited at the VSDC before any sell orders can be placed on the HNX.

- **Account management:** Participants are required to use a single, existing securities depository account, held with a registered carbon depository member (a securities company), for all CTX-related depository activities. They must register this specific account with their depository member for CTX purposes before initiating any depository actions. VSDC maintains the central record of these depository accounts and unit balances.
- **Withdrawal:** Units can only be withdrawn from VSDC and sent back to the NRS based on an official request initiated by the MAE, covering specific circumstances defined by the MAE regulations (e.g., for compliance surrender, voluntary cancellation, or potentially transfer outside the exchange system).

### Trading procedures (Article 15)

The Draft Decree specifies a distinct trading mechanism for the pilot phase, prioritising simplicity and control over complex order matching:

- **Exclusive use of negotiated transactions:** During the pilot phase (until end-2028), the sole method permitted for trading allowances and credits on the HNX will be negotiated transactions. This means parties bilaterally agree on the terms (price, volume) off-exchange and then use the HNX system, via their trading members, primarily to formalise and record the agreed transaction for clearing and settlement. The Draft does not currently detail on continuous order matching or auction mechanisms during this pilot period.
- **Mandatory intermediation:** All transactions must be executed through registered carbon trading members (securities companies) acting on behalf of the end participants. Direct market access is not envisaged.
- **Pre-trade validation:** A crucial risk control measure mandates that participants must have sufficient cleared funds (for buyers) or sufficient deposited carbon units (for sellers) in their respective accounts before a trading member can submit the transaction order to the HNX system. Trading members are responsible for verifying these prerequisites.
- **Trade confirmation and reporting:** Once a negotiated transaction is recorded and confirmed on the HNX system, the exchange provides the results to the VSDC to initiate the settlement process. Trading members are required to confirm the execution to their clients immediately and provide regular account statements.

### Clearing and settlement process (Article 16)

The settlement framework defined in the Draft Decree is designed to aim for ensuring security and reducing counterparty risk during the pilot phase, explicitly avoiding more complex financial market mechanisms:

- **Real-time gross settlement (RTGS):** Transactions are settled individually and immediately upon confirmation, rather than being netted and settled on a batch basis at the end of the day.
- **Delivery versus Payment (DvP) principle:** Settlement operates strictly on a DvP basis, ensuring the transfer of carbon units from the seller's VSDC account to the buyer's VSDC account occurs simultaneously with the transfer of funds from the buyer's settlement bank

account to the seller's. This eliminates the risk that one leg of the transaction completes without the other.

- **Exclusion of central counterparty (CCP):** The Draft Decree explicitly states that a CCP mechanism will not be used during the pilot phase. This means the VSDC facilitates the settlement between the members but does not act as a guarantor, stepping into the middle of each trade. Counterparty risk is primarily managed via the pre-trade validation requirement.
- **Role of settlement banks and VSDC:** The VSDC calculates the settlement obligations for each trade based on HNX data and instructs the designated settlement bank(s) to execute the necessary fund transfers between the accounts held by the depository members. The VSDC simultaneously executes the corresponding transfer of carbon units within its depository system. Depository members are then responsible for allocating the funds and units to their end clients' accounts.

### **Ownership transfer (Article 13)**

The final legal transfer of ownership for units traded on the CTX occurs within the VSDC system upon successful settlement. The VSDC is mandated to report to MAE daily the resulting end-of-day balances for all accounts in order to enable MAE to update the NRS accordingly. This ensures the NRS remains the definitive and updated national record, reflecting trades executed via the financial market infrastructure. The decree also confirms MAE's authority to handle ownership transfers occurring outside the HNX trading system (e.g., potentially administrative transfers or compliance events), but only after the relevant units have been withdrawn from the VSDC back to the NRS.

In summary, the proposed transaction procedures prioritise security and control for the pilot phase through mandatory intermediation, pre-trade validation, negotiated transactions recorded on HNX, and a risk-averse RTGS/DvP settlement model managed by the VSDC without a CCP, all while maintaining MAE's NRS as the ultimate registry via daily reconciliation.

### **2.1.3 Proposed supervision and oversight framework**

The Draft Decree establishes a multi-layered framework for the supervision and oversight of the CTX, assigning specific responsibilities across the institutional structure to maintain market integrity and ensure compliance. A defining feature is the designation of MAE as the primary market regulator, coordinating with financial authorities and market operators.

### **Regulatory oversight structure (Article 33)**

The Draft Decree delineates oversight responsibilities, creating the following dual-authority model supplemented by operational supervision, including:

- **MAE (primary regulator):** Article 33 explicitly assigns the MAE the lead role in market supervision, with the mandate to monitor trading activities to detect and handle market manipulation and other violations. MAE also leads and coordinates inspections of the market operators (VNX, HNX, VSDC) concerning their CTX functions. Furthermore, the MAE provides official opinions on the operational rules and surveillance criteria developed by the

VNX and VSDC, ensuring alignment with overall market objectives. MAE is also responsible for establishing a formal coordination agreement among the key operational parties.

- **SSC (coordinating financial regulator):** They are assigned mainly to coordinate with the MAE. It participates in the MAE-led joint inspections of market operators and provides official opinions on the operational rules developed by the VNX and VSDC. Its direct supervisory remit focuses on the selected settlement bank(s). While not explicitly stated as the lead for market conduct supervision (unlike its role in securities), its expertise is formally integrated through the coordination and rule-input mechanisms.
- **VNX (parent exchange operator):** the VNX holds significant supervisory responsibilities over the trading function and its members. It is mandated to develop the detailed surveillance criteria and supervise HNX's implementation of surveillance. The VNX also directly supervises trading members for compliance with its rules and is required to report surveillance results directly to MAE.
- **HNX (trading platform operator):** HNX performs the front-line, real-time surveillance of trading activities occurring on its platform, applying the criteria set by the VNX. It reports findings upwards to the VNX.
- **VSDC (depository operator):** the VSDC is responsible for supervising its depository members (securities companies) to ensure their adherence to rules governing depository management and settlement procedures (Article 33.5).

### **Reporting framework (Article 31)**

The decree mandates a clear hierarchical reporting structure to ensure information flows from market participants up to the primary regulator, such as:

- **Members to operators:** Carbon trading members and carbon depository members are required to submit regular and ad hoc reports to the VNX and VSDC, respectively, according to the rules set by these operators. Trading members must also report surveillance findings to VNX (Article 33.6).
- **Operators to MAE:** the VNX (incorporating HNX data) and VSDC are required to submit periodic reports (quarterly, annually) to MAE covering market activity, surveillance results, and member status. They must also provide ad-hoc reports upon MAE's request.
- **Settlement bank to SSC:** The settlement bank reports directly to the SSC regarding any inability to meet eligibility requirements or any operational disruptions affecting payment services.

### **Information disclosure framework (Article 32)**

To support transparency and ensure an orderly market, the Draft Decree requires each market operator to publicly disclose specific information on its website, including:

- **VSDC disclosure:** Must publish information regarding the approval or termination of depository members, details of disciplinary actions taken against members, and announcements concerning any suspension or resumption of its depository/settlement operations.

- **VNX disclosure:** Must publish information regarding the approval or termination of trading members and details of disciplinary actions taken against them.
- **HNX disclosure:** Required to publish end-of-day trading results (e.g., prices, volumes) and announce any suspension or resumption of its trading services.
- **Other disclosures:** The decree notes that end participants and other relevant parties are subject to disclosure requirements as stipulated by the MAE.

Overall, the proposed supervision and oversight framework of the Draft shows a reliance on the MAE as the central authority, leveraging the operational surveillance capabilities of the VNX/HNX and the member oversight functions of the VNX and VSDC. The SSC plays a coordinating role, particularly regarding financial institution oversight. Transparency is supported through mandated reporting channels and public disclosure requirements placed on the market operators. The effectiveness of this multi-agency structure will depend heavily on the detailed implementation of surveillance criteria and the efficiency of the coordination mechanisms between MAE, SSC, and the exchange operators.

#### **2.1.4 Proposed risk management and violation handling**

The Draft Decree incorporates several mechanisms aimed at managing operational risks, ensuring settlement integrity, and addressing violations during the pilot phase of the CTX. The approach prioritises controls embedded within the transaction lifecycle and assigns clear responsibilities for member discipline and market intervention.

**Management of settlement and counterparty risk:** The framework focuses heavily on mitigating risks associated with the settlement process, particularly given the explicit exclusion of a CCP during the pilot phase, including:

- **Pre-trade validation (Article 15):** A cornerstone of the risk model is the requirement for trading members to ensure participants possess sufficient funds (for buyers) or deposited carbon units (for sellers) before submitting a transaction order to the HNX. This measure aims to prevent trades from failing due to insufficient resources at the point of settlement.
- **RTGS and DvP settlement (Article 16):** The mandated use of Real-Time Gross Settlement (RTGS) combined with the DvP principle ensures that each transaction is settled individually and simultaneously, directly linking the transfer of units with the transfer of funds. This significantly reduces credit and counterparty risk on a per-transaction basis.
- **Settlement failure handling (Article 17):** The Draft Decree provides a procedure for handling settlement failures. The VSDC is authorised to cancel (eliminate) transactions if cleared funds or units are insufficient at the time of settlement, or under other specific circumstances (e.g., trading ineligible units, issues with participant accounts). Liability for losses arising from such cancellations rest with the party at fault.

**Management of operational and conduct risk:** The Draft Decree includes provisions for managing broader operational disruptions and ensuring member compliance, comprising:

- **Market suspension authority (Articles 29, 30):** MAE, as the primary regulator, is the authority to temporarily suspend, in part or entirely, the trading operations of HNX or the depository and settlement operations of the VSDC. This power can be invoked in response

to major technical failures, force majeure events, significant market instability, or when deemed necessary to protect participant interests. This provides a critical mechanism for crisis management.

- **Member discipline (Articles 20, 21, 24, 25):** The VNX (for trading members) and VSDC (for depository members) are the authority to suspend or terminate the participation of their respective members. Grounds for suspension or termination include persistent rule violations, failure to meet membership requirements (including technical capacity), or being placed under special control by the SSC. This allows the market operators to enforce operational standards directly.
- **Prohibition of manipulation (Article 5):** The Draft Decree explicitly prohibits specific manipulative behaviours, such as collusive trading, spreading false rumours, or exploiting IT system vulnerabilities to manipulate prices or misappropriate assets.

**Violation handling and sanctions:** While Article 33 designates the MAE to be responsible for supervising and handling market manipulation, the Draft Decree itself does not detail and specify on sanctions for carbon market violations. It relies implicitly on the existing framework for administrative sanctions in the securities sector. Violations by market participants would likely be addressed by the MAE or potentially the SSC (in coordination with the MAE), invoking penalties outlined in Government Decree No. 156/2020/ND -CP dated 31 December 2020 on prescribing penalties for administrative violations against regulations on securities and securities market, which covers general market manipulation and information disclosure failures. Violations by members (securities companies) would also be subject to disciplinary actions by the VNX and VSDC according to their internal rules. Article 34 generally refers to dispute resolution and compensation for damages to negotiation, arbitration, or court proceedings according to applicable law.

Overall, the risk management framework proposed in the Draft Decree for the pilot phase concentrates mainly on mitigating operational and settlement risks through pre-trade checks, RTGS/DvP settlement, and clear member discipline procedures. The MAE holds the ultimate authority for market stability interventions and primary oversight of manipulation. However, the Draft Decree currently lacks specific provisions for managing market-wide price volatility (e.g., price bands, stability reserves) and relies on the broader securities sanctioning framework without detailing carbon-specific penalties.

## 2.2 Assessment of the securities market mechanism relevant to the operations and supervision of the CTX

Building on the well-developed infrastructure and institutional framework of Vietnam's securities market, the CTX will inherit a strong operational foundation from the outset. Over the past two decades, this securities market has established a comprehensive governance structure, standardised trading and settlement systems, and robust supervisory mechanisms that ensure transparency, market integrity, and operational resilience.

Given that the CTX will be established using the infrastructure, governance arrangements, and operational systems of Vietnam's securities market, this section focuses on the specific mechanisms within the securities ecosystem that directly influence CTX transaction methods, management processes, and supervision. The purpose is to identify which elements are directly

transferrable, which require adaptation, and where structural gaps exist that must be addressed for the CTX pilot to operate effectively.

### **2.2.1 Assessment of institutional mechanisms in the securities market relevant to the governance of the CTX**

#### **a) Elements that can be directly leveraged for the CTX**

Several components of the existing securities-market institutional structure align closely with the governance and operational model proposed for the CTX. These elements can be adopted with minimal modification and form the core institutional foundation on which the CTX can be efficiently established. Key transferrable features include:

- Operational division of labour among the VNX (rule-setting), HNX (frontline operation), and VSDC (post-trade) aligns well with the Draft Decree's CTX model, reducing design complexity.
- Membership regulation, licensing, technical capability checks, and ongoing supervision of securities companies, can be applied directly to carbon trading and depository members.
- Existing supervision channels between the SSC, VNX, HNX, and VSDC provide a tested institutional foundation for CTX-related oversight.

#### **b) Institutional components requiring targeted adaptation**

Several components of the securities-market institutional framework, while operationally robust, do not fully meet the functional requirements of a carbon market and therefore require targeted adaptation when applied to the CTX. These areas reflect structural features that must be adjusted to incorporate environmental-integrity controls, NRS integration, and MAE's regulatory mandate. Key aspects requiring modification include:

- Securities-market surveillance currently covers only financial trading behaviour, not environmental-integrity risks such as trading of ineligible units, use of expired allowances, or misuse of offset credits.
- Existing coordination structures do not incorporate the MAE, which oversees unit issuance, NRS management, and environmental compliance; new inter-agency protocols are therefore required.
- Member obligations under securities law do not include NRS-related responsibilities, such as maintaining accurate CTX balances, preventing misuse of compliance accounts, or reporting unit-integrity breaches.

#### **c) Institutional elements not suitable for direct application**

Several institutional features of the securities market, despite their strengths, are not structurally compatible with the specific requirements of carbon-unit management and CTX operations. These elements cannot be transferred directly and will require alternative mechanisms or entirely new regulatory provisions tailored to the carbon market. Key limitations include:

- Securities law does not recognise carbon units as financial instruments, creating gaps in accounting, taxation, collateralisation, and solvency treatment.
- No equivalent in securities markets exists for a dual-ledger system where the VSDC maintains the trading ledger while MAE's NRS holds the legal master ledger.

- Securities oversight frameworks do not address environmental manipulation risks, such as deliberate inflation of carbon prices prior to compliance deadlines.

## **2.2.2 Assessment of securities market trading mechanisms relevant to the transactions of the CTX**

### **a) Components that the CTX can adopt with minimal modification**

Several elements of the existing securities-market trading infrastructure align well with CTX's pilot-phase transaction requirements and can be adopted with minimal adjustment. These components provide a ready operational foundation that supports basic transaction recording, settlement integrity, and member participation. The key transferrable elements include:

- The negotiated transaction module at HNX supports the CTX pilot's exclusive reliance on negotiated trades.
- DvP settlement through RTGS at the VSDC ensures simultaneous delivery of funds and units, mitigating counterparty risk.
- Trading-member procedures, including client verification, order submission standards, and system connectivity, can be applied directly.

### **b) Components requiring modification to fit the CTX characteristics**

Several components of the securities-market trading process, while operationally mature, do not fully align with the functional requirements of carbon-unit transactions and therefore need targeted adjustments before being applied to the CTX. These modifications are necessary to incorporate unit-eligibility validation, compliance-year distinctions, and the unique liquidity conditions of a pilot carbon market. The key areas requiring modification include:

- Securities pre-trade checks verify financial sufficiency only; the CTX requires unit-eligibility checks against the NRS.
- HNX systems must incorporate carbon-unit metadata, such as compliance year, allowance type, or offset eligibility, none of which exist for securities.
- Negotiated trades in a low-liquidity CTX context require additional guardrails to prevent distorted or non-representative price formation.

### **c) Components that cannot be directly applied to the CTX**

Several mechanisms embedded in the securities-market trading infrastructure are not directly compatible with the operational and integrity requirements of carbon-unit transactions. These features cannot be transferred to the CTX without substantial redesign. Key limitations include:

- Continuous matching engines and auction mechanisms rely on deep, diversified liquidity, which the CTX will not have during the pilot phase.
- Securities error-trade rules do not accommodate invalid unit types, revoked credits, or NRS discrepancies, requiring CTX-specific cancellation logic.
- Securities settlement assumes a single authoritative ledger, whereas CTX settlement requires reconciliation between VSDC and the NRS.

### **2.2.3 Assessment of securities market surveillance and enforcement mechanisms relevant to the oversight of the CTX**

#### **a) Securities surveillance tools that can support the CTX**

Several surveillance and reporting mechanisms currently used in the securities market can be readily applied to the CTX, as they already support real-time monitoring of trading behaviour and detection of irregularities. These mechanisms provide a strong foundation for frontline oversight of carbon transactions and can be leveraged to ensure basic market integrity from the outset of the pilot. The principal transferrable elements include:

- Detection of abnormal price movements or repeated bilateral trades supports early identification of potential collusion.
- Member-level monitoring enables scrutiny of trading patterns across clients and brokers, relevant for CTX integrity.
- Established reporting pipelines between HNX, VNX, SSC, and regulated intermediaries provide a model for CTX reporting flows.

#### **b) Surveillance gaps specific to carbon markets**

Several surveillance and reporting mechanisms widely used in the securities market do not capture the environmental-integrity and compliance-cycle risks inherent to carbon trading. These gaps must be addressed to ensure the CTX can detect market manipulation, misuse of ineligible units, and compliance-driven distortions. The key CTX-specific surveillance gaps include:

- Failure to detect attempts to trade ineligible or frozen units, which are specific to carbon markets.
- Lack of monitoring tools for carbon-specific manipulation patterns, such as strategic accumulation before compliance deadlines or bilateral trades at non-representative prices.
- No mechanisms to verify unit provenance or environmental validity during surveillance processes.

#### **c) Enforcement limitations that the CTX must address**

Certain enforcement and disciplinary mechanisms in the securities market cannot be applied directly to CTX operations, as they do not address violations related to environmental integrity, carbon-unit eligibility, or NRS compliance. These limitations mean the CTX will require a tailored enforcement approach that blends financial-conduct sanctions with carbon-specific remedies. The principal enforcement gaps include:

- Inadequacy of securities sanctions to penalise carbon-unit misuse, such as trading revoked or non-compliant units.
- Absence of penalties targeting environmental manipulation (e.g., creating artificial scarcity or inflating prices before surrender deadlines).
- Need for coordinated enforcement between MAE (environmental regulation) and SSC/VNX (market conduct), a structure not currently established.

## 2.2.4 Gaps and limitations in applying securities market infrastructure to the operations of the CTX

This subsection consolidates the key technical and operational gaps that arise when applying securities-market systems to CTX operations:

- Dual-ledger dependency (VSDC vs NRS) requires new reconciliation protocols.
- Lack of real-time NRS validation within trading and settlement workflows.
- Absence of market-stability mechanisms (e.g., price bands, volatility controls) suitable for negotiated carbon trades.
- Liquidity limitations necessitate alternative market-design supports not present in securities markets.
- Environmental-integrity risks require new system controls for unit eligibility and compliance use.
- Multi-agency roles increase the need for explicit coordination frameworks and shared-data standards.

These structural, technical, and operational gaps form the analytical foundation for the improvements proposed in Section 2.3.

## 2.2.5 Distinguishing securities market mechanisms from carbon market requirements

The table below compares key mechanisms from Vietnam’s securities market with the carbon-specific adjustments required for the CTX. While the CTX pilot can leverage existing infrastructure, such as member-based access, custodial account structures, RTGS/DvP settlement, and exchange-led surveillance, carbon trading introduces distinct requirements due to its compliance-driven nature, environmental integrity standards, and the central role of the NRS.

The comparison highlights areas that can be adopted directly and those requiring tailored design, including NRS-linked eligibility checks, strengthened pre-trade validation, carbon-specific conduct rules, and enhanced safeguards like price bands and position controls. This distinction provides the basis for the adaptation recommendations in Section 2.3 and supports a phased, practical pathway for CTX implementation.

*Table 1: Comparison of securities market mechanisms vs. carbon market requirements for the CTX*

Category	Mechanisms transferable from securities market	Carbon market: specific adjustments required	Rationale/ Implications for the CTX
<b>Market access and membership</b>	<ul style="list-style-type: none"> <li>• Trading and depository members (securities companies).</li> <li>• Standard KYC, client onboarding, custodial account structure.</li> </ul>	<ul style="list-style-type: none"> <li>• Eligibility screening linked to GHG reporting status.</li> <li>• Verification against NRS asset records before enabling trading.</li> </ul>	Carbon units must be linked to verified environmental information, not purely financial identity.
<b>Trading mechanisms</b>	<ul style="list-style-type: none"> <li>• Order recording and confirmation via HNX.</li> </ul>	<ul style="list-style-type: none"> <li>• Pilot-only negotiated transactions.</li> <li>• Price-anomaly</li> </ul>	Thin and compliance-driven market requires

	<ul style="list-style-type: none"> <li>• Member-intermediated trade execution.</li> </ul>	monitoring for bilateral trades.	bespoke surveillance and validation rules.
<b>Depository and account structure</b>	<ul style="list-style-type: none"> <li>• VSDC custodial structure and segregated accounts.</li> <li>• Established depository-member operating model.</li> </ul>	<ul style="list-style-type: none"> <li>• Units must be validated in NRS before becoming tradable.</li> <li>• Daily synchronisation of eligibility, cancellation, and surrender status.</li> </ul>	Environmental integrity requires NRS as master ledger for carbon units.
<b>Clearing and settlement</b>	<ul style="list-style-type: none"> <li>• RTGS/DvP settlement with settlement banks.</li> <li>• Straight-through processing between HNX → VSDC → banks.</li> </ul>	<ul style="list-style-type: none"> <li>• Strict pre-trade validation due to absence of CCP.</li> <li>• Fail-trade logic dependent on NRS-VSDC reconciliation.</li> </ul>	No CCP increases reliance on validation; environmental mismatch adds new failure modes.
<b>Surveillance and market conduct</b>	<ul style="list-style-type: none"> <li>• Real-time surveillance by HNX; higher-level supervision by VNX.</li> <li>• Member rule-compliance monitoring.</li> </ul>	<ul style="list-style-type: none"> <li>• Additional rules for carbon-specific misconduct (e.g., misuse of offsets, registry-timing exploitation).</li> <li>• Integration of environmental compliance data into alerts.</li> </ul>	Carbon markets involve behaviours unrelated to securities trading.
<b>Information disclosure</b>	<ul style="list-style-type: none"> <li>• End-of-day trading results, member lists, and operational notices.</li> </ul>	<ul style="list-style-type: none"> <li>• Disclosure on unit eligibility, crediting programme recognition, and NRS updates.</li> </ul>	Transparency must cover environmental attributes, not just price and volume.
<b>Governance and oversight</b>	<ul style="list-style-type: none"> <li>• Exchange-based supervisory hierarchy.</li> <li>• SSC oversight of settlement banks.</li> </ul>	<ul style="list-style-type: none"> <li>• Dual MAE-SSC model requiring formal coordination protocols.</li> <li>• MAE authority to suspend trading/depository operations based on environmental risks.</li> </ul>	Oversight includes both financial conduct and environmental integrity.
<b>Risk Management</b>	<ul style="list-style-type: none"> <li>• Standard operational risk controls and IT continuity.</li> </ul>	<ul style="list-style-type: none"> <li>• Position limits, holding limits, and price-stability tools (e.g., price bands).</li> <li>• Mitigation for registry-exchange interoperability risks.</li> </ul>	CTX requires stronger risk controls due to thin liquidity and compliance-driven nature.

Source: Compiled by the Consultant

## 2.2.6 Key lessons for the adaptation of the CTX

The assessment of Vietnam's securities market yields several lessons that are directly applicable to the CTX pilot:

- Clear institutional mandates are essential: The successful functioning of the securities market is grounded in explicit delegation of responsibilities. For the CTX, this underscores the need for MAE and SSC roles to be clearly separated but operationally coordinated.
- Surveillance and transparency must be robust from day one: Automated monitoring, real-time alerts, and strict disclosure requirements are critical tools that should be adapted for carbon trading.
- Effective settlement relies on tested infrastructure: The VSDC's experience with DvP settlement can be directly leveraged, but must be augmented with environmental-integrity checks from the NRS.
- Liquidity does not emerge automatically: Securities markets rely on market makers, price bands, and well-defined trading mechanisms; The CTX will require tailored liquidity-support measures given the limited number of participants and 100% free allocation in early years.
- Legal clarity over asset matters: Securities benefit from an established legal status; carbon units require explicit classification to support accounting, taxation, and collateralisation.

These lessons provide a bridge from analysis to action and highlight where the Draft Decree and the CTX operational model need refinement to ensure a stable, transparent, and liquid mark.

## 2.3 Adaptation recommendations for the CTX design

The analysis shows that although the Draft Decree establishes a solid institutional framework and effectively leverages Vietnam's securities-market infrastructure, several operational and technical gaps must be addressed for the CTX to function reliably in the pilot phase.

On the governance side, the Draft Decree assigns responsibilities to the MAE, SSC, VNX/HNX, and VSDC, but does not define how these institutions work together in practice. Key supervisory processes, such as how surveillance alerts flow from the HNX/VNX and VSDC, how the MAE and SSC jointly investigate violations, or who leads enforcement when both market-conduct and environmental-integrity issues are involved, remain unspecified. Without clear coordination protocols and escalation pathways, oversight risks becoming fragmented or inconsistent.

On the technical side, several carbon-specific system requirements are not yet operationalised. The Draft Decree describes the overall sequence of registration, depository, trading, and settlement but lacks detailed rules for data exchange and reconciliation between the HNX, VSDC, and the NRS. Pre-trade validation is mandated but not supported by definitions of eligibility checks, lock/hold functions, or failure-handling logic. Settlement-failure procedures remain high-level, and the Decree does not define a unified carbon-unit lifecycle (e.g., tradable, pending settlement, surrendered, retired), which is essential for accurate automation. Minimum requirements for carbon-specific surveillance tools and reporting formats are also absent.

These gaps indicate that procedural clarity, interoperability rules, and carbon-specific controls must be supplemented to ensure smooth registry-exchange integration and effective supervision.

These findings provide the foundation for the following technical recommendations for the priority improvements are proposed in the short- and mid-terms:

**(1) Strengthen transaction procedures and market functioning**

- Introduce daily price-fluctuation limits for negotiated trades to prevent extreme volatility.
- Require standardised templates for negotiated transactions to ensure consistency in essential terms and reporting.
- Establish a roadmap for expanding trading methods - such as call auctions or order matching - once liquidity allows.
- Implement automated pre-trade checks to verify carbon-unit eligibility and consistency with NRS records.

**(2) Enhance integration between CTX infrastructure and the NRS**

- Implement real-time data-exchange protocols between the HNX, VSDC, and the NRS to reject trades involving ineligible units.
- Establish a formal the MAE-VNX-HNX-VSDC Service Level Agreement specifying response times, outage handling, validation procedures, and escalation pathways.
- Standardise end-of-day reconciliation procedures to maintain consistency between the VSDC settlement data and the NRS master ledger.

**(3) Strengthen market surveillance and member oversight**

- Deploy rule-based surveillance capable of identifying carbon-specific risks such as repeated bilateral trades at off-market prices or pre-arranged transactions ahead of compliance deadlines.
- Adopt graduated enforcement actions - warnings, sanctions, suspension, and expulsion - for carbon-related violations.

**(4) Improve settlement resilience and handling of failed trades**

- Introduce mandatory cut-off times for trade submission and settlement to avoid operational congestion.
- Specify partial-settlement, cancellation, and liability-allocation rules to manage insufficient funds or units.
- Establish minimum liquidity and IT-system standards for settlement banks to ensure reliability during RTGS/DvP operations.

**(5) Support liquidity and early market development**

- Require HNX to publish daily transparency indicators (price ranges, volumes, counterparty count, market concentration).
- Prepare a lightweight auction module for MAE-released units, supporting improved price formation in later pilot stages.

**(6) Clarify the legal and accounting treatment of carbon units**

- Issue on legally defining carbon units as recognised assets for accounting, taxation, and collateral purposes.

- Standardise accounting rules for acquisition, holding, revaluation, surrender, and retirement.
- Provide clear guidance on VAT and corporate-income-tax treatment for carbon transactions.

### 3 INTERNATIONAL BENCHMARKING – DEEP DIVE INTO MAJOR ETS MARKETS

This section conducts an international analysis to draw practical lessons for the design and implementation of Vietnam's CTX, covering the operational frameworks, governance structures, and market mechanisms of the following exchange platforms under the following international Emissions Trading Systems (ETSs).

This section examines the operational models of major international ETS markets with a direct focus on how they manage transactions, settlement, market integrity, and supervision. The objective is not to restate general ETS policy design that was already covered in Deliverable 2, but to extract the practical, technical mechanisms that Vietnam should consider when implementing the CTX pilot and shaping its future operating model.

The review covers three systems most relevant to the Vietnamese context:

- **The European Energy Exchange (EEX) and the European Union Emissions Trading System (EU ETS):** mature, CCP-cleared spot and auction market
- **Intercontinental Exchange (ICE) and the UK Emissions Trading System (UK ETS):** strong integration with financial regulation; robust stability tools
- **China's National ETS (SEEE):** non-CCP model and daily price controls similar to the CTX pilot

Each market is reviewed through six operational dimensions:

- Trading architecture and transaction flows
- Pre-trade controls and member requirements
- Settlement model and registry–exchange coordination
- Risk-management and market stability tools
- Surveillance, conduct rules, and violation handling
- Public disclosure and transparency practices

#### 3.1 European Energy Exchange (EEX) and the European Union Emissions Trading System (EU ETS)

The EU ETS is the world's foundational compliance carbon market, having launched in 2005. It stands as the largest market globally by financial value and serves as the primary international benchmark for carbon pricing. The EEX, headquartered in Germany, functions as the principal trading venue for this system.

The governance of the EU ETS is a complex, multi-layered framework that has evolved significantly to integrate environmental policy with robust financial market regulation. The following table clarifies the distinct roles and responsibilities of the key institutions involved in this shared oversight structure as described in the multi-level governance model.

Table 2: EU ETS governance and oversight structure

Governing Body	Level	Core Responsibilities & Mandate
<b>European Commission (EC)</b>	EU-Level (Strategic Regulator)	Sets the EU-wide emissions cap, establishes rules for auctioning, and directly operates the Single Union Registry (SUR) as the central ledger for allowance ownership.
<b>National Competent Authorities (NCAs)</b>	Member State (Environmental Regulator)	Manage 'on-the-ground' implementation, approve MRV plans, manage installation accounts in the SUR, and enforce annual environmental compliance.
<b>ESMA &amp; ACER</b>	EU-Level (Market Integrity)	The EU's securities (ESMA) and energy (ACER) watchdogs. They coordinate the application of the Market Abuse Regulation (MAR) and enable cross-market surveillance between carbon and energy markets.
<b>National Financial Supervisors (e.g., BaFin)</b>	Member State (Financial Regulator)	Directly supervise financial infrastructures (like EEX) and intermediaries (banks, firms) based in their jurisdiction under MiFID II and MAR rules.

Source: Compiled by the Consultant

The EU ETS governance model provides a clear lesson in the necessity of a dual-track oversight system. It successfully separates responsibilities, allowing national environmental agencies (NCAs) to focus on environmental integrity (MRV and compliance), while empowering sophisticated EU-level and national financial regulators (ESMA, NFSSs) to police the market for abuse (MAR) and ensure the stability of the financial infrastructure (MiFID II).

### 3.1.1 Trading mechanisms and commodity flows

#### 3.1.1.1 Eligible participants

The EU ETS accommodates a wide range of participants, which contributes to its liquidity and robust price-formation dynamics. Participants fall into three main categories:

- **Compliance entities:** These include over 11,000 power plants, industrial installations, and aircraft operators that must monitor, verify, and report emissions and surrender EUAs annually. Their trading behaviour is primarily driven by compliance needs (buying when emissions exceed allocations and selling when they hold a surplus).
- **Financial intermediaries and investors:** Following the classification of allowances as *financial instruments* under MiFID II, banks, investment funds, hedge funds, and proprietary traders became major actors. They provide liquidity, offer hedging solutions to compliance entities, and engage in speculative trading, which enhances market depth and price discovery.
- **Other organisations and individuals:** Corporations, municipalities, and individuals may hold allowances through the Union Registry. To trade on exchanges such as the EEX, they typically execute transactions through authorised exchange members or intermediaries.

#### 3.1.1.2 Trading products

Reflecting its financial maturity, the EEX offers a sophisticated portfolio of products designed for both compliance and risk management.

- Spot allowances: These instruments represent immediate delivery and form the core of the EU ETS market:
  - EUA (EU Allowance): Primary compliance unit for stationary installations.
  - EUAA (EU Aviation Allowance): Used in the aviation sector; interchangeable with EUAs for airline compliance.

Spot products provide the physical basis for settlement and unit transfer in the EU ETS.

- Derivative products (futures and options): Derivatives account for the majority of EEX's trading volume and are essential for forward price discovery and hedging:
  - Futures: Standardised contracts for future delivery of EUAs, widely used by compliance entities to lock in carbon costs and by financial participants for hedging and speculative strategies.
  - Options: Contracts granting the right - but not the obligation - to buy or sell EUA futures at a set price, offering more flexible risk-management tools.

These derivative markets substantially enhance liquidity and enable long-term planning.

- Historic offset credits: In its earlier phases (Phase 1 and 2, pre-2021), a limited number of Kyoto credits (Certified Emission Reductions - CERs, Emission Reduction Units - ERUs) were permitted for offsetting compliance. Weak quality controls led to an influx of low-cost credits that reduced trading prices on the EU ETS considerably and give wrong price signals for the carbon market as well as low carbon investments. These credits are no longer eligible, highlighting the importance of strict integrity criteria - an important lesson for Vietnam when considering offset use.

### **3.1.1.3 Trading platform and methods**

The EEX offers three main channels for trading EU ETS units, each supporting different market needs and contributing to liquidity, transparency, and efficient price discovery.

#### **(a) Primary auctions**

The EEX conducts uniform-price, sealed-bid auctions on behalf of the European Commission and Member States. Participants submit bids confidentially; all successful bidders pay the same clearing price. This model provides transparent allocation and strong price signals, an important reference for Vietnam when introducing auctions in later CTX phases.

#### **(b) Continuous secondary-market trading (spot and derivatives)**

Spot and derivative products trade on a central limit order book, where orders are matched continuously based on price-time priority. This structure enables:

- transparent and fair matching
- strong liquidity
- broad participant access
- standardised clearing through the ECC

These features support efficient price formation and robust risk management that are relevant for post-2028 CTX as the market evolves beyond negotiated trades.

### (c) **Negotiated and OTC transactions (trade registration)**

Large bilateral or brokered trades often occur off-exchange. These OTC deals can be **registered with EEX/ECC** for clearing and settlement, allowing parties to benefit from CCP protections. Historically, early EUA price signals (2004–2005) emerged from such bilateral forward trades before full exchange infrastructure existed. This function is similar to the role negotiated trades may play in's early years of the CTX.

#### **3.1.1.4 Transaction specifications and clearing**

EEX transactions follow standardised specifications that support transparency, operational efficiency, and consistent risk management across the market.

##### (a) **Transaction specifications:**

- **Quotation:** All products are priced in EUR per tCO<sub>2</sub>e.
- **Tick size:** Minimum price movement is €0.01.
- **Contract size:**
  - Spot products trade in units of 1 EUA/EUAA.
  - Futures and options trade in standardised lots, typically 1,000 allowances.
- **Trading hours:** EEX publishes fixed schedules aligned with the European business day to support high liquidity.

These standardised specifications facilitate orderly trading and reduce operational risk, relevant for future CTX phases when Vietnam expands beyond negotiated transactions.

##### (b) **Clearing and settlement (CCP model)**

EEX transactions are cleared through European Commodity Clearing (ECC), which provides the central risk-management foundation of the EU ETS.

- **Central Counterparty (CCP):** the ECC becomes the counterparty to every trade, replacing the original buyer and seller and eliminating bilateral credit risk.
- **Novation:** Once a trade is matched, ECC immediately inserts itself as the following to ensure that no participant is exposed to another member's creditworthiness:
  - the buyer to every seller
  - the seller to every buyer.
- **Margining:** Clearing members must post as the following to ensure the market is fully collateralised and able to absorb member defaults:
  - **Initial margin** to open positions
  - **Variation margin** daily, based on mark-to-market changes.
- **Settlement:**

- **Spot trades:** Typically settle on T+2 under a DvP model, with ECC orchestrating the simultaneous transfer of cash and allowances.
- **Derivatives:** Marked-to-market daily, with cash settlement or physical delivery at expiry.

The CCP-based structure prevents cascading defaults and is a cornerstone of market integrity in the EU ETS. Although the CTX will not use a CCP during the pilot, these mechanisms provide important reference points for Vietnam's long-term system design.

### 3.1.2 Risk management tools

The EU ETS employs a multilayered risk-management framework that combines registry security measures, financial-market controls, and regulatory oversight. These tools evolved in response to early market vulnerabilities and now form one of the most mature integrity systems among carbon markets.

#### (a) Registry security (Trusted Account List and transfer delays)

Following early registry thefts, the Single Union Registry introduced strong operational safeguards:

- **Trusted Account List (TAL):** Transfers are only allowed to pre-approved accounts.
- **Mandatory transfer delay:** Transfers to non-trusted accounts are automatically delayed (e.g., 26 hours), providing time to detect and stop unauthorised movements.

These controls significantly reduce fraud risk, an important reference for Vietnam's future NRS enhancements.

#### (b) Financial risk controls through CCP

All exchange-traded and auctioned EUAs are cleared through **European Commodity Clearing (ECC)**. Key protections include:

- **Novation:** ECC becomes the buyer to every seller and the seller to every buyer, eliminating bilateral credit risk.
- **Margining:** Clearing members must post initial margin and meet daily variation margin calls, ensuring losses are fully collateralised and preventing cascading defaults.

This CCP model is not planned for the CTX pilot but is a useful benchmark for long-term system development.

#### (c) Market-conduct and abuse controls

With allowances classified as financial instruments under MiFID II, the EU ETS is fully subject to the Market Abuse Regulation (MAR). This provides legal tools to detect and sanction:

- insider dealing
- unlawful disclosure
- market manipulation

MAR's surveillance and enforcement powers have been critical in safeguarding market integrity.

#### (d) What the EU ETS does not use: position or holding limits

Unlike some markets, the EU ETS does not impose strict position or holding limits. Instead, it relies on:

- deep liquidity
- real-time surveillance
- the MSR for long-term supply adjustment

This reflects a preference for financial-market-based oversight rather than quantitative trading caps. The table below summarises the key risk management tools in the EU ETS.

*Table 3: Key risk management tools in the EU ETS*

<b>Risk category</b>	<b>Specific tool/Mechanism</b>	<b>Function &amp; purpose</b>
<b>Registry security</b>	Trusted Account List (TAL) and 26-Hour Transfer Delay	Prevent unauthorised transfers; allow intervention before settlement
<b>Financial integrity</b>	CCP clearing (EEC), novation and margining	Eliminate bilateral credit risk; fully collateralise exposures.
<b>Market conduct</b>	Market Abuse Regulation (MAR)	Detect and sanction insider dealing, manipulation, and unlawful disclosure.
<b>Systemic stability</b>	Market Stability Reserve (MSR)	Adjust supply to manage long-term surpluses/deficits.
<b>Tax fraud risk</b>	VAT "Reverse-Charge" Mechanism	It requires the <i>buyer</i> (not the seller) to account for the VAT, eliminating the possibility of VAT carousel fraud that cost treasuries billions.

*Source: Compiled by the Consultant*

### **3.1.3 Market abuse prevention**

The EU ETS applies a stringent market-abuse framework because EUAs are classified as *financial instruments* under MiFID II. This brings all EUA trading under the MAR, creating a comprehensive system to detect, prevent, and sanction manipulative or improper behaviour. MAR operates alongside exchange-level surveillance conducted by EEX and ECC, which together monitor trading patterns across spot, auction, and derivatives markets. Core market-abuse prevention tools include:

- Prohibition of insider dealing: Restricts trading based on non-public, price-sensitive information.
- Controls on unlawful disclosure: Prevents leaking or selectively sharing information affecting EUA prices.
- Prohibition of manipulation: Covers spoofing, wash trades, cornering attempts, artificial price inflation/deflation, and dissemination of false information.
- Real-time surveillance: EEX/ECC use automated monitoring systems to detect abnormal order flow, cross-market patterns, and algorithmic manipulation.
- Obligations for reporting and recordkeeping: Market participants must maintain full electronic audit trails, enabling investigations and enforcement.

- Coordinated supervision: Financial regulators, energy regulators, and the exchange cooperate in monitoring suspicious activity and pursuing violations.

**Relevance for the CTX:** Although Vietnam will not classify carbon units as financial instruments during the pilot, the CTX should adopt MAR-like conduct rules and surveillance protocols to detect manipulation early, especially given low initial liquidity.

### 3.1.4 Enforcement mechanisms

The EU ETS uses a dual enforcement structure combining financial enforcement and environmental compliance enforcement. This ensures that both trading conduct and emissions-related obligations are monitored and sanctioned effectively. Financial regulators enforce MAR for trading behaviour, while environmental authorities oversee reporting and surrender obligations. EEX/ECC also have disciplinary authority over exchange members. Key enforcement components include:

- MAR enforcement by financial regulators: Investigation and sanctioning of insider dealing, unlawful disclosure, and manipulation. Penalties include administrative fines, trading bans, and criminal prosecution where applicable.
- Environmental compliance enforcement: Entities must report verified emissions and surrender corresponding EUAs; non-compliance triggers substantial financial penalties and mandatory make-good requirements.
- Exchange-level disciplinary powers: EEX and ECC can suspend or revoke member access, impose trading restrictions, or require corrective actions for operational rule breaches.
- Cross-agency coordination: Financial authorities, environmental regulators, and EEX/ECC share intelligence on suspicious activity, enabling joint investigations and rapid intervention where systemic risks emerge.
- Strong audit and documentation requirements: Participants must maintain transaction records, compliance data, and registry logs, facilitating retrospective investigation and legal action.

**Relevance for the CTX:** Vietnam will require a similarly coordinated enforcement structure where the MAE leads environmental enforcement, the SSC oversees conduct and member behaviour, and HNX/VSDC retain operational disciplinary powers to maintain orderly market function.

### 3.1.5 Market stability mechanisms

The EU ETS maintains market stability through a combination of system-level supply adjustment tools and exchange-level controls designed to prevent disorderly price movements. Stability tools are structured to support long-term carbon price credibility while allowing market-based price formation in the short term. Key market stability mechanisms include:

- MSR: Automatically adjusts auction supply based on the total number of allowances in circulation (see in Figure below).
  - Reduces supply during periods of surplus to prevent prolonged price depression.
  - Releases additional allowances when the market is tight, mitigating extreme price spikes.

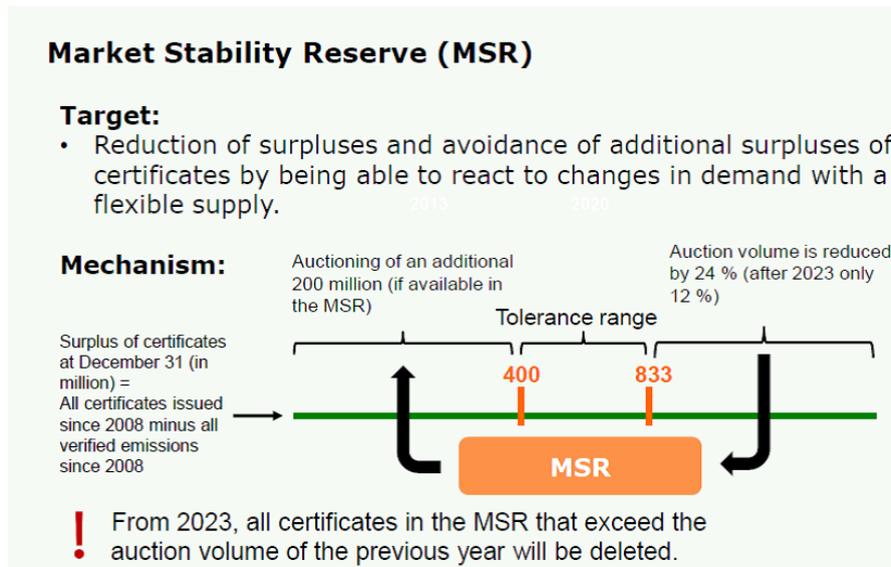


Figure 2: Operational mechanism of the EU ETS Market Stability Reserve (MSR)

Source: Adapted from Emissionshändler<sup>1</sup>

- Auction safeguards: Minimum bid requirements and eligibility rules reduce the risk of bid manipulation or artificially low clearing prices.
- Exchange-level volatility controls:
  - Circuit breakers: Temporary pauses when price movements exceed predefined thresholds.
  - Order throttling: Limits excessive order submissions that may destabilise matching engines or overwhelm liquidity.
  - Trading halts: Activated in cases of abnormal volatility, system failure, or market-wide stress.
- Liquidity support via financial participants: While not a formal mechanism, the participation of banks, funds, and proprietary traders contributes to continuous price discovery and reduces price gaps.

The diagram shows how the MSR automatically adjusts supply: auction volumes are reduced when the surplus is high and increased when it is low, helping stabilise the market without direct price intervention. Key parameters are periodically reviewed.

**Relevance for the CTX:** Vietnam's pilot cannot rely on the MSR model due to limited supply and liquidity, but should adopt exchange-level controls, such as daily price bands, maximum order sizes, and suspension rules, to maintain orderly trading during early phases.

<sup>1</sup> Emissions-händler. The market stability reserve – The fight against the EUA surplus. <https://www.emissionshaendler.com/en/knowledge-of-eu-emissions/euas-in-circulation/the-market-stability-reserve>

### 3.1.6 Transparency and public disclosure practices

Transparency is a core feature of the EU ETS and is essential for credible price discovery and market confidence. The EEX, the European Commission, and regulators publish extensive data on trading activity, auction results, and market operations, enabling participants to understand supply–demand conditions and monitor market integrity.

#### Key transparency practices include:

- Daily market data: Prices, traded volumes, and key indicators published by the EEX.
- Auction disclosures: Immediate release of clearing prices, volumes, and cover ratios after each auction.
- Regulatory publications: Regular updates on allowance supply, MSR adjustments, and policy decisions affecting the market.
- Market notices: Alerts on system maintenance, trading suspensions, or rule changes.
- Public access to emissions and compliance data: Verified emissions and compliance status of covered entities released annually.

**Relevance for the CTX:** A comparable transparency framework, especially daily trading results, auction disclosures (when applicable), and regular supervisory notices, will be crucial for building early trust and supporting robust price formation.

## 3.2 Intercontinental Exchange (ICE) and the UK ETS

The UK Emissions Trading System (UK ETS) was launched on 1 January 2021 as an independent carbon market after the UK left the EU ETS. It supports the UK’s legally binding 2050 net-zero target and retains key EU ETS design elements while adding features tailored to national priorities and a smaller market. ICE Futures Europe is the main platform for allowance auctions and secondary trading.

The system covers major emitters in industry, power, and domestic aviation, about one-third of UK emissions, and operates under a declining cap set below the UK’s former EU ETS allocation. It includes strong market-stability and oversight tools and was designed with the option of future linkage to the EU ETS.

Governance follows a clear, multi-level structure combining environmental regulation with financial-market supervision. The table below summarises the main institutions and their roles.

*Table 4: Key governance bodies and responsibilities in the UK ETS*

Governing body	Institutional type	Core responsibilities & mandate
<b>UK ETS Authority</b>	Joint Political Body (DESNZ, Devolved Admins)	Sets overall strategic direction, determines the emissions cap, and establishes rules for market stability mechanisms (e.g., CCM).
<b>Department for Energy Security and Net Zero (DESNZ)</b>	UK Government (Policy Lead)	Operates a central analytics platform to monitor market activity and stability, aggregating data from the registry, exchange, and clearing house.

<b>Financial Conduct Authority (FCA)</b>	Financial Regulator	Supervises trading conduct under UK Market Abuse Regulation (MAR). Monitors for insider dealing and manipulation, and enforces penalties for market abuse.
<b>Environmental regulators</b> (e.g., Environment Agency)	Environmental Regulator	Manages environmental compliance: oversees MRV, administers the UK ETS Registry (the legal ledger), and enforces the annual surrender of allowances.

*Source: Compiled by the Consultant*

The key lesson from the UK's governance model is the value of clear institutional separation from the outset. By designating the environmental regulators to manage compliance (MRV, registry) and the financial regulator (FCA) to police market integrity (MAR, abuse), the framework avoids jurisdictional ambiguity and ensures that specialised, competent authorities oversee each critical function.

### **3.2.1 Trading mechanisms and commodity flows**

The operational framework of the UK ETS defines the participants, products, and procedures governing the exchange of UK allowances (UKAs).

#### **3.2.1.1 Eligible participants**

Participation in the UK ETS is limited to authorised compliance entities and regulated financial actors to ensure market integrity.

- Compliance entities: Operators of covered installations and aircraft operators must hold a UK ETS Registry account and surrender allowances annually against verified emissions. Their participation is obligation-driven.
- Financial intermediaries: As UK allowances are classified as financial instruments, banks, brokers, and investment firms may participate to provide liquidity, hedging services, and trading activity, mirroring the role of financial players in the EU ETS.
- Onboarding requirements: All participants must register with the environmental regulator and open a Registry account, subject to strict Know-Your-Customer (KYC), beneficial-ownership verification, and legal-status checks. Only authorised account holders may trade.

#### **3.2.1.2 Trading products**

The primary instrument traded within the UK ETS framework is the UK Allowance (UKA).

- UKA (UK Allowance): Represents the right to emit one tonne of carbon dioxide equivalent within the UK. This is the core compliance unit for all covered sectors.
- Spot UKAs: Allowances traded for immediate or near-immediate delivery.
- Derivative UKAs: Futures and options contracts based on UKAs are listed on ICE Futures Europe. These derivatives allow participants to hedge future price risk and represent a significant portion of the market's trading volume.

#### **3.2.1.3 Trading platform and requirements**

The market infrastructure relies heavily on existing financial market systems operated by the ICE, integrated with the national registry.

- Primary market (auctions): Auctions are conducted fortnightly on the ICE Futures Europe platform. The ICE acts as the designated auctioneer for the UK government.
- Secondary market: The ICE Futures Europe also serves as the main venue for secondary market trading of both spot UKAs and UKA derivatives. It operates a continuous electronic order book.
- Over-the-Counter (OTC) market: Bilateral transactions are permitted but must be reported to the UK ETS Registry to ensure legal ownership transfer and regulatory oversight.

Participation requires a structure involving registry, trading, and clearing accounts:

- Registry account: Mandatory for all participants, held within the UK Emissions Trading Registry, which is administered by the Environment Agency. This registry records the legal ownership, transfer, and surrender of all UKAs.
- Trading account: Opened with the ICE Futures Europe (or an ICE member) to access the auction platform and secondary market trading systems.
- Clearing account: Maintained with the ICE Clear Europe, which provides mandatory central counterparty clearing for all exchange-traded and auctioned transactions.

#### **3.2.1.4 Trading method**

The UK ETS employs standard financial market trading methods for both allowance issuance and secondary trading.

- Auctions (primary market): Auctions are conducted using a single-round, sealed-bid, uniform-price format. Participants submit confidential bids, and a single clearing price is determined, which all successful bidders pay. The auctions are governed by specific regulations, including a transitional Auction Reserve Price (ARP) set at £22 per tonne to prevent prices from falling too low. Statutory caps limit any single participant (or affiliated group) to bidding for a maximum of 25% of the allowances offered in any given auction.
- Continuous trading (secondary market): The ICE operates a central limit order book for spot and derivative UKAs, matching buy and sell orders based on price-time priority in real-time.
- Negotiated transactions (OTC): Bilateral trades can occur off-exchange but must be recorded in the UK ETS Registry to be legally effective for compliance.

#### **3.2.1.5 Transaction specifications**

- Base product: UKA (UK Allowance).
- Quotation: GBP (£)/tCO<sub>2</sub>e.
- Tick size: £0.01 per tonne.
- Trading unit: Typically 1 UKA for spot, with derivative contracts traded in standardised lots (e.g., 1,000 UKAs).
- Trading hours: Defined and published by ICE Futures Europe.

### **3.2.1.6 Clearing and settlement**

Financial integrity in the UK ETS is ensured through mandatory central clearing via ICE Clear Europe.

- CCP: ICE Clear Europe acts as the CCP for all auction and secondary trades, novating each transaction and removing bilateral credit risk, consistent with EU ETS practice.
- Margining: Clearing members must post initial margin and meet daily variation margin requirements to manage exposure on open positions.
- Settlement: Trades settle on a T+2 basis under DvP, with ICE Clear Europe coordinating the simultaneous transfer of funds and UK allowances in the Registry.

### **3.2.2 Risk management tools**

The UK ETS incorporates multiple safeguards to address market concentration, price volatility, and financial integrity, drawing on lessons from the EU ETS.

- Market concentration controls: The UK imposes statutory 25% limits on (i) auction purchase volumes and (ii) total allowance holdings across spot and derivatives, aggregated across affiliates. These hard caps prevent market cornering and excessive dominance in a relatively smaller market.
- Price-stability mechanisms: A transitional Auction Reserve Price (ARP) of £22/t sets a minimum auction price, while the Cost Containment Mechanism (CCM) triggers review and potential release of additional allowances when prices exceed predefined thresholds. A Supply Adjustment Mechanism (SAM) has also been proposed to adjust auction volumes more dynamically.
- Financial risk mitigation: All trades are centrally cleared by the ICE Clear Europe, which novates transactions and applies strict margining requirements, significantly reducing counterparty-default risk.
- Operational risk controls: The UK ETS Registry employs strong authentication and account-management protocols, and because UKAs are financial instruments, intermediaries and the exchange fall under the FCA oversight for systems, controls, and cybersecurity. Integrated surveillance by the FCA and DESNZ supports early detection of anomalies or fraud.

### **3.2.3 Market abuse prevention**

The UK ETS applies a comprehensive market-abuse framework that combines financial-market rules, carbon-specific safeguards, and coordinated supervision to deter manipulation and ensure fair trading.

- Application of financial-market law: Because UKAs are classified as financial instruments, all trading is subject to the UK Market Abuse Regulation (UK MAR). This prohibits insider dealing, unlawful disclosure of inside information, and manipulative trading practices, including spoofing, layering, and dissemination of false or misleading information.
- Carbon-specific safeguards: The design of the market incorporates quantitative controls, such as the 25% auction purchase limit and 25% holding cap, to prevent cornering, squeezes,

or dominant positions that could distort price formation. Auction rules also prohibit collusion and coordinated bidding strategies.

- Real-time surveillance: ICE, FCA, and DESNZ jointly monitor trading activity using integrated data feeds. Surveillance tools detect unusual order patterns, concentrated positions, abrupt price movements, and behaviour inconsistent with compliance needs.
- Information-sharing and enforcement: Formal cooperation between the FCA and DESNZ supports the investigation of suspected market abuse. The FCA can impose financial penalties, trading bans, and licence restrictions, while the DESNZ can apply environmental-compliance sanctions where abuse overlaps with allowance obligations.
- Transparency requirements: Regular publication of auction results, allowance supply data, market notices, and compliance deadlines reduces information asymmetry and helps prevent misinformation-driven manipulation.

### 3.2.4 Enforcement mechanisms

The UK ETS applies a clear and graduated enforcement framework, combining environmental-compliance penalties with financial-market sanctions to ensure strong deterrence and uphold system integrity.

- Compliance-related penalties: DESNZ and the devolved environmental regulators enforce annual surrender obligations. Failure to surrender sufficient allowances triggers a statutory excess emissions penalty, mandatory make-good requirements in the following year, and potential publication of the non-compliant operator’s name (“naming and shaming”).
- Permit and operational sanctions: Regulators may suspend or revoke permits, restrict operations, or impose corrective action plans where entities repeatedly violate monitoring, reporting, and verification (MRV) obligations or operate without valid authorisation.
- Financial-market sanctions: As UKAs are financial instruments, the FCA can impose fines, restrict trading privileges, suspend firms, or revoke authorisation for breaches of market-conduct rules, including insider dealing, manipulation, and failures in systems and controls.
- CCP-related enforcement: The ICE Clear Europe manages default procedures for clearing members, including forced position liquidation, use of default funds, and margin forfeiture, ensuring financial risks do not propagate through the market.
- Integrated investigations: Cross-agency information-sharing allows DESNZ, FCA, and ICE to coordinate enforcement when misconduct spans both compliance and trading activity, ensuring a unified regulatory response

The UK ETS applies a dual-track enforcement framework, established under the Greenhouse Gas Emissions Trading Scheme Order 2020, in which environmental regulators and financial authorities operate in parallel (see details in Table below). This structure leverages each institution’s expertise to safeguard both environmental integrity and fair market conduct.

*Table 5: The dual-track enforcement framework of the UK ETS*

Enforcement track	Environmental compliance	Market integrity
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<b>Lead regulator</b>	Environmental Regulators (e.g., Environment Agency).	Financial Conduct Authority (FCA).
<b>Legal basis</b>	Greenhouse Gas Emissions Trading Scheme Order 2020.	UK Market Abuse Regulation (UK MAR).
<b>Focus</b>	Ensuring accurate MRV and the annual surrender of sufficient allowances (UKAs) to cover verified emissions.	Prohibiting, detecting, and sanctioning insider dealing, unlawful disclosure, and market manipulation (e.g., wash trades, spoofing).
<b>Example sanctions</b>	<p>Financial penalties for each uncovered tonne of emissions.</p> <p>Public "naming and shaming" of non-compliant operators.</p> <p>The "make-good" provision: the obligation to surrender missing allowances is <i>not</i> extinguished by paying the fine.</p>	<p>Substantial monetary fines (against firms and individuals).</p> <p>Prohibition (banning) of individuals from regulated activities.</p> <p>Criminal prosecution for severe, intentional offenses.</p>

*Source: Compiled by the Consultant*

**Relevance for the CTX:** The UK's dual-track enforcement model demonstrates the value of combining environmental-compliance penalties with financial-market sanctions. For the CTX, adopting a similar structure, clear excess-emissions penalties, permit or account restrictions for non-compliance, and coordinated oversight between MAE, SSC, HNX, and VSDC, would strengthen deterrence and ensure consistent consequences for both trading misconduct and environmental violations. This approach would reinforce market credibility from the outset and support disciplined participation during the pilot phase.

### 3.2.5 Market stability mechanisms

The UK ETS incorporates a set of built-in tools to prevent excessive price volatility, ensure orderly market functioning, and maintain confidence in allowance supply.

- Auction Reserve Price (ARP): A transitional ARP of £22/t sets a firm price floor in primary auctions, preventing allowance sales at distressed prices and anchoring minimum market value during the system's early years.
- Cost Containment Mechanism (CCM): The CCM provides a rules-based intervention tool. If the carbon price exceeds predefined thresholds for a sustained period, the UK ETS Authority must consider releasing additional allowances, such as bringing forward future auction volumes or drawing from reserves, to moderate sharp price spikes.
- Supply Adjustment Mechanism (SAM): Proposed in 2023, the SAM introduces greater flexibility by adjusting auction volumes in response to evolving market conditions, helping smooth imbalances between supply and demand.
- Predictable cap trajectory: A declining emissions cap, set below the UK's former EU ETS share, provides long-term predictability while reducing the risk of structural oversupply.

Together, these mechanisms provide a proactive, multi-layered framework that supports price stability, mitigates extreme volatility, and reinforces the credibility of the UK ETS. A summary of UK ETS market stability and risk management tools is made in the below Table.

*Table 6: UK ETS market stability and risk management tools*

<b>Risk category</b>	<b>Specific mechanism/ Tool</b>	<b>Function &amp; purpose</b>
<b>Price volatility (floor)</b>	<b>Auction reserve price (ARP)</b>	Acts as a price floor in the primary market. No allowances are sold at auction below this price (initially £22), safeguarding a minimum price signal.
<b>Price volatility (ceiling)</b>	<b>Cost containment mechanism (CCM)</b>	Acts as a 'soft ceiling' to curb excessive price spikes. If average prices exceed predefined thresholds for a sustained period, it triggers a formal review by the Authority to potentially intervene by increasing supply.
<b>Market concentration</b>	<b>Auction &amp; holding limits</b>	Proactively manages market power. A single entity (or group) is capped at purchasing 25% of allowances in any auction and holding 25% of cumulative positions (spot + derivatives).
<b>Financial &amp; default risk</b>	<b>Central counterparty (CCP)</b> (ICE Clear Europe)	Manages financial integrity. The CCP eliminates bilateral counterparty risk through novation and ensures all positions are collateralised via a mandatory margin system.

*Source: Compiled by the Consultant*

**Relevance for the CTX:** The UK ETS illustrates how a newly established carbon market can embed strong safeguards from the outset. Its use of explicit position limits and a two-sided price collar offer a practical model for Vietnam, where liquidity may initially be thin and market participants relatively inexperienced. Applying similar quantitative caps on holdings and purchase volumes would help prevent early concentration risks, while adopting calibrated price-stability tools, such as a minimum auction price or a cost-containment trigger, could reduce volatility during the CTX pilot phase. These mechanisms would reinforce market confidence, limit opportunities for manipulation, and support orderly price formation as the market develops.

### **3.2.6 Transparency and public disclosure practices**

The UK ETS embeds strong transparency requirements to promote fair pricing, reduce information asymmetry, and maintain market confidence. Regulators and the exchange publish timely, structured information that helps participants understand supply, compliance obligations, and any regulatory interventions.

- Auction transparency: Publication of auction calendars, volumes, clearing prices, and participation metrics.
- Supply and cap information: Regular disclosure of annual cap trajectories, adjustment decisions, and reserve releases.
- Market notices and rule changes: Clear communication of regulatory updates, interventions, and operational changes.

- Aggregated market data: ICE and regulators release trading statistics, open interest, and other non-confidential data to support informed analysis.
- Compliance timelines: Public posting of key surrender deadlines, MRV milestones, and operator guidance.

**Relevance for the CTX:** A similar transparency framework would benefit the CTX, especially in a low-liquidity pilot phase where clear information is critical for building user confidence. Publishing auction outcomes, supply data, regulatory notices, and compliance timelines would reduce uncertainty, limit misinformation, and support more stable and informed price formation

### 3.3 Shanghai Environment and Energy Exchange (SEEE) and the China ETS

China's national ETS, launched in 2021 after extensive provincial pilots, is now the world's largest carbon market in term of the total emissions covered under an ETS. As a state-led, compliance-driven system that evolved through phased development, it provides practical precedents for Vietnam. This section offers a focused analysis of SEEE's mechanisms, governance arrangements, and risk-management tools, highlighting lessons relevant to the CTX pilot.

#### 3.3.1 Institutional and regulatory architecture

China's ETS is built on a multi-layered governance model that combines strong central oversight, a unified national registry, and regionally coordinated supervision. This model reflects China's administrative style - highly centralised policy direction from the Ministry of Ecology and Environment (MEE) combined with operational functions executed through specialised institutions, local authorities, and state-run market platforms. The structure is unique among large ETS jurisdictions and provides particularly relevant lessons for Vietnam as it prepares a hybrid MAE-MOF governance model for the domestic CTX.

##### 3.3.1.1 Central regulatory authority: MEE

The MEE is the apex authority responsible for the national ETS. Its mandate spans three primary domains:

- **Policy and regulatory framework**
  - Formulates ETS regulations, compliance rules, allocation methodologies, and MRV guidelines.
  - Issues annual compliance timelines and oversees adjustments to system design (e.g., sector expansion roadmap).
- **Environmental integrity and market eligibility**
  - Approves the list of entities covered by the ETS and verifies their emissions.
  - Determines the eligibility of carbon emission allowances (CEAs) and any offset credits such as CCERs (when allowed).
  - Publishes benchmark allocation rules and total cap information (although caps are implicit rather than fixed in early phases).
- **Supervision and enforcement**

- Conducts national inspections and leads enforcement actions against non-compliance, including administrative penalties.
- Coordinates closely with provincial environmental authorities, who carry out local-level inspections and manage compliance documentation.

Unlike the EU and UK systems where financial regulators supervise trading conduct, China places all ETS oversight under environmental authorities, meaning MEE simultaneously oversees environmental compliance, market functioning, and enforcement. This creates a governance model where environmental integrity is the dominant priority.

### **3.3.1.2 Trading platform operator: Shanghai Environment and Energy Exchange (SEEE)**

The SEEE is designated as the national carbon trading platform, playing a role similar to an exchange operator but operating under direct administrative supervision. Its responsibilities include:

- Operating the electronic trading system where compliance entities conduct spot trading of CEAs.
- Implementing trading rules and transaction controls prescribed by the MEE.
- Managing member registration, qualifications, and access permissions for covered entities.
- Publishing trading results and aggregated market information (e.g., daily prices, volumes).
- Coordinating closely with the national registry operator to ensure that all trades are supported by corresponding unit transfers.

The SEEE does not hold independent regulatory authority; its surveillance and disciplinary actions are limited to enforcing operational compliance. All conduct-related enforcement escalates to the MEE.

### **3.3.1.3 Registry, clearing, and settlement institution: China Carbon Emissions Registration and Clearing Co., Ltd. (CCERC)**

The CCERC serves as the central registry, settlement, and data-management institution. Its mandate is structurally comparable to a combined “NRS + VSDC” model. The CCERC performs several critical functions:

- Registry operation: Maintains the national account system, including compliance accounts, trading accounts, and government accounts. It is the legal record of issuance, transfer, surrender, and cancellation of CEAs.
- Settlement and clearing: Executes unit transfer after trades are completed on the SEEE and manages account reconciliation. As China relies on T+0 settlement, the CCERC performs immediate post-trade verification and asset transfer.
- Data integrity and security: Maintains the authoritative master ledger for all CEAs and manages synchronisation with the SEEE for transaction validation.
- Compliance tracking: Records verified emissions and the final surrender of CEAs during the annual compliance cycle.

Together, the SEEE - for trading and the CCERC - for registry and settlement form a two-pillar operational architecture under MEE's unified oversight.

### **3.3.1.4 Provincial ecological environment bureaus: local compliance supervisors**

China's governance design integrates strong local administrative enforcement. Provincial bureaus act as:

- First-line supervisors for MRV auditing, document inspections, and enterprise compliance reviews.
- Issuers of administrative warnings or enforcement recommendations to MEE.
- Coordinators of local market participation, assisting enterprises in account management, reporting, and corrective actions.

This distributed enforcement model allows China to supervise thousands of covered entities across a vast geography while maintaining uniform national rules.

### **3.3.1.5 Enforcement framework and penalty system**

China's ETS uses an administrative enforcement model rather than a financial regulatory system. Penalties for non-compliance include:

- Monetary fines calibrated to the shortfall of surrendered CEAs.
- Forced purchase or compensatory measures imposed by local authorities.
- Public disclosure of non-compliant enterprises.
- Potential inclusion in China's social credit system (which can restrict financing, procurement eligibility, and permits).

Market manipulation penalties remain broad and rely on overarching environmental or administrative law rather than market-conduct statutes like the EU MAR or UK financial regulation.

### **3.3.1.6 Structural characteristics and implications**

The Chinese governance model is characterised by:

- Centralised authority: MEE directs all aspects of system design and enforcement.
- State-run infrastructure: SEEE and CCERC are administrative extensions of the regulatory framework.
- Unified registry: CCERC holds the master ledger; all trading and settlement processes integrate around this.
- Environmental-first supervision: Financial-stability considerations (volatility controls, manipulation surveillance) are embedded administratively rather than overseen by a financial regulator.

This model results in high administrative control and ensures environmental integrity remains dominant over market liberalisation.

Key parties and responsibilities of China's national carbon market are illustrated in the following figure.

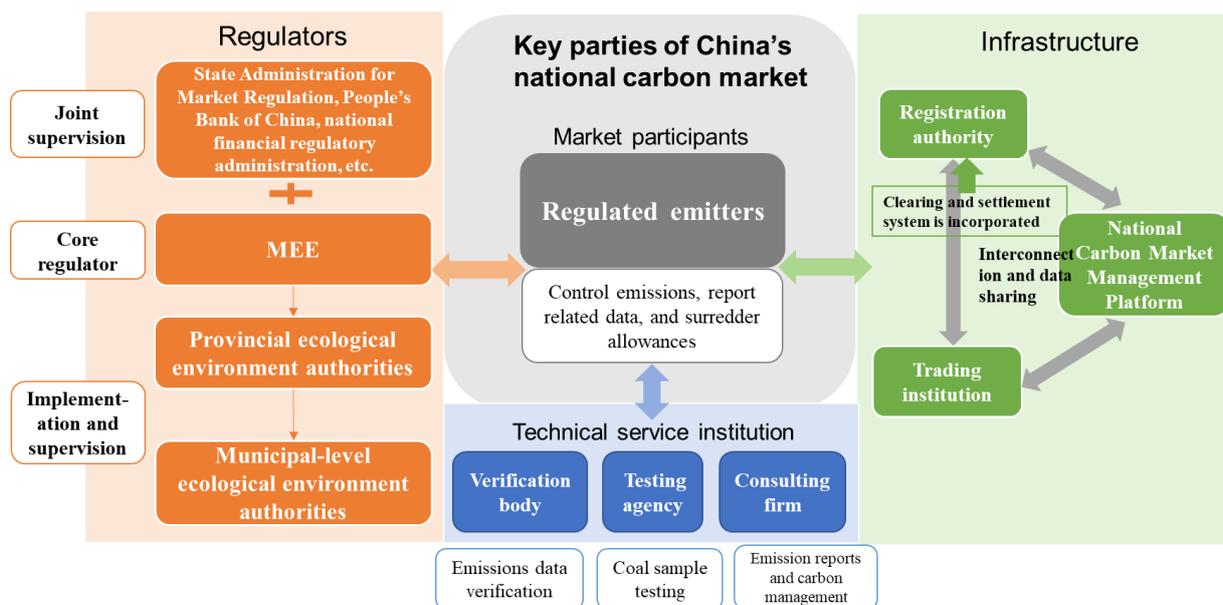


Figure 3: Key parties and responsibilities of China's national carbon market

Source: Elaborated by the Consultant

### Relevance for the CTX

- Closest comparable model for Vietnam: China's administrative ETS with a state-run exchange reflects Vietnam's MAE–HNX–VSDC hybrid architecture more closely than the EU or UK models.
- Useful reference for NRS–exchange integration: CCERC's centralised registry and T+0 settlement workflow provides a strong template for the VSDC–NRS synchronisation.
- Guidance for environmental-led supervision: China's MEE role offers lessons for MAE as the lead supervisor, particularly important since Vietnam also places environmental oversight outside financial regulators.
- Operational blueprint for compliance-driven markets: China's thin-liquidity, compliance-only trading environment mirrors what Vietnam can face during the CTX pilot phase.

### 3.3.2 Trading mechanisms, commodity flows, and market features

China's national ETS operates a controlled, compliance-driven trading environment that is structurally distinct from the more liberalised, financially oriented ETS platforms in the EU and UK. The SEEE facilitates trading of national CEAs using a small set of carefully designed trading mechanisms suited to thin liquidity, limited participants, and strong administrative oversight. These mechanisms, together with China's approach to allocation, account structure, and price-stability controls, are directly relevant to the context in which Vietnam's CTX will begin operation.

#### 3.3.2.1 Trading architecture and account structure

China's ETS is built around a dual-account architecture, managed centrally by the CCERC:

- Compliance accounts
  - Held by all covered entities (currently >2,200), used to receive annual allowance allocations and to surrender CEAs at the end of the compliance cycle.

- Units in these accounts are not freely tradable until transferred to a trading account.
- Trading accounts
  - Required for entities participating in market transactions on the SEEE.
  - CEAs must be transferred from the compliance account to the trading account before sell orders may be placed.
  - This separation helps the MEE and CCERC track compliance obligations and ensures that entities cannot inadvertently sell units required for surrender.

This dual-account structure forces registries and exchanges to maintain precise synchronisation, a design highly relevant for Vietnam as it prepares for the NRS-VSDC integration. Accounts required for participants to engage in carbon trading in China are summarised in the following table.

*Table 7: Accounts required for participants to engage in carbon trading in China*

Account Type	Institution	Purpose	Limitation
<b>Trading Account</b>	Trading platform (SEEE)	Execute buy/sell orders	One account per participant
<b>Registration Account</b>	Registration institution (CCERC)	Hold allowance inventory	Linked to the trading account
<b>Funds Account</b>	Settlement Bank	Manage transaction funds	Supports T+1 settlement

*Source: Compiled by the Consultant*

### **3.3.2.2 Trading methods used in the China ETS**

The SEEE trading system currently supports three principal trading methods. Each is designed to match the market's limited liquidity and to minimise speculative activity.

#### **(a) Negotiated (block) transactions:**

It is the dominant mode of trading.

- Parties negotiate transaction terms off-platform and submit them for confirmation through their brokers on the SEEE.
- The SEEE checks order validity and initiates settlement via the CCERC.
- Commonly used for large-volume transfers between compliance entities.
- Prices tend to cluster within administrative price-stability bands, reflecting limited negotiation flexibility.

**Relevance for the CTX:** This is effectively the same model Vietnam will use during its CTX pilot phase.

#### **(b) One-way bidding (Listing / Posting auctions)**

A uniquely Chinese mechanism resembling a "one-sided" auction:

- A seller lists a batch of CEAs with a reserve price.

- Multiple buyers can submit bids, but the seller is not allowed to bid.
- The highest eligible bid above the reserve price is accepted.
- Designed for thin markets to allow limited price discovery while avoiding volatile competitive bidding.

This mechanism has been used to dispose of surplus allowances at controlled prices or facilitate transfers from large emitters to smaller entities.

**(c) Block trades at administratively guided prices**

In some provinces or at specific times (e.g., pre-compliance periods), the SEEE permits block trades under guidance prices communicated by local ecological bureaus to prevent speculation.

- Prices observed on the SEEE often reflect these guided ranges.
- This reduces volatility but also limits transparency and competitive pricing.

So far, the main trading methods have included listed agreement trading, block agreement trading, and one-way bidding, with various transaction size requirements and price fluctuation limits, as shown in the following Table.

*Table 8: Trading method comparison*

Trading Method	Transaction Size	Price limits	Execution Process	Primary Use Case
<b>Listed agreement</b>	Up to 100,000 tonnes	±10% price corridors	System-mediated matching	Secondary market liquidity
<b>Block agreement</b>	Minimum 100,000 tonnes	±30% price corridors	Direct bilateral negotiation	Large-scale transfers
<b>One-way bidding</b>	Minimum 100,000 tonnes	±10% price corridors	Competitive auction process	Both primary and secondary markets

*Source: Compiled by the Consultant*

**(d) Role of allocation system in market behaviour**

A defining characteristic of China’s ETS is its allocation method:

- CEAs are allocated freely based on benchmarking and historical efficiency, not on fixed caps.
- Over-allocation persists in many provinces, especially for coal-based power plants.

This leads to:

- Low trading volumes relative to compliance obligations;
- Mild upward price movements but without sustained high prices;
- Transaction clustering near compliance deadlines.

Such conditions are typical of early-stage ETSs and similar to the expected environment of Vietnam’s CTX pilot.

**(e) Commodity flow: from allocation to surrender**

The commodity flow in China’s ETS follows a defined, tightly controlled sequence:

- **Issuance of CEAs**
  - Allocated by the MEE directly into compliance accounts on the CCERC.
  - Entities verify allocations via local bureaus.
- **Transfer to trading account (If selling)**
  - Entity initiates transfer from compliance → trading account.
  - The CCERC confirms eligibility and freezes units pending trade.
- **Trading on the SEEE**
  - Negotiated, bidding, or block trade occurs.
  - The SEEE submits settlement instructions to the CCERC.
- **Settlement (T+0)**
  - The CCERC moves units from the seller's trading account to the buyer's trading account.
  - Financial leg cleared via designated settlement bank.
- **Re-transfer for compliance**
  - Before the surrender deadline, buyers move CEAs from the trading account to the compliance account.
- **Surrender**
  - CCERC finalises surrender and updates compliance status.

This flow demonstrates the critical role of a unified registry in managing the life cycle of CEAs - an operational foundation Vietnam must replicate through strong NRS-VSDC data architecture.

#### **(f) Price formation and liquidity characteristics**

China's ETS displays liquidity patterns typical of compliance-driven markets with limited participants:

- Concentrated trading periods: Most transactions occur during the final months and days of the compliance cycle.
- Modest liquidity: Annual volumes remain low (typically <5% of total allocated CEAs).
- Price stability with administrative influence: Daily price limits (usually  $\pm 10\%$  or  $\pm 20\%$ ) restrict swings.
- Market depth limited: Few traders, limited competitive bidding, and no financial intermediaries.

Price behaviour is often characterised by:

- Small increments in negotiated trades;
- Flat prices for extended periods;
- Short-term jumps ahead of compliance deadlines.

These market features closely resemble the expected early-stage CTX environment.

### **(g) Market stability and administrative price controls**

To prevent disorderly market movements, SEEE implements several administrative controls:

- Daily price-fluctuation limits (e.g.,  $\pm 10\%$  from previous day's closing price).
- Maximum order sizes to prevent market concentration and large shocks.
- Position limits restricting the quantity any entity can hold or purchase.
- Special trading suspensions initiated by MEE or provincial authorities in case of abnormal activity.
- Guidance prices communicated informally before compliance deadlines.

These mechanisms are central to maintaining stable pricing in a low-liquidity market.

### **Relevance for the CTX**

- Negotiated trades as the primary method: China's dominance of negotiated trading provides direct operational precedent for Vietnam's pilot CTX.
- Daily price limits and order caps: These tools are directly applicable to the CTX to prevent disorderly trading during its early phase.
- Dual-account architecture mirrors the NRS-VSDC model: China's compliance vs. trading account separation provides a ready blueprint for Vietnam.
- Commodity flows are highly relevant: The China ETS illustrates how units should move between registry, trading platform, and compliance functions in a controlled environment.
- Administrative price controls offer lessons for managing a market with limited participants and low liquidity.

### **3.3.3 Risk management and settlement controls**

China's national ETS incorporates a highly structured set of risk-management and settlement mechanisms designed to ensure orderly market operation in a thin, compliance-driven trading environment. Unlike the EU and UK ETSS which use sophisticated market-based stability tools, financial-regulatory oversight, and central counterparties, China relies on administrative controls, eligibility checks, and strict settlement workflows integrated directly with the national registry. These mechanisms provide an important reference point for Vietnam's CTX, especially given the similar pilot-phase constraints: limited liquidity, absence of a central counterparty (CCP), dominance of negotiated trades, and an environmental regulator (MAE in Vietnam, MEE in China) as the lead supervisory authority.

#### **3.3.3.1 Administrative risk-management framework**

Risk management in the China ETS is grounded in administrative controls rather than market-driven or financial safeguards. MEE defines the overall risk-control framework, while SEEE and CCERC implement the operational safeguards. Key elements include:

#### **(a) Position limits and holding restrictions**

To prevent excessive market concentration and speculative accumulation:

- Entities face limits on the maximum quantity of CEAs they may hold or purchase within a defined period.
- Large emitters receive higher limits, reflecting compliance needs, while smaller entities face tighter caps.
- Accumulation ahead of compliance deadlines is monitored by both the SEEE and local environmental bureaus.

These controls are adjusted periodically by the SEEE under MEE guidance and are one of the primary tools for maintaining market balance in the absence of financial intermediaries.

#### **(b) Transaction caps and order-size controls**

The SEEE imposes:

- Maximum order quantities per transaction;
- Daily trading volume caps for each participant;
- Restrictions on block-trade sizes to prevent outsized bilateral deals distorting the reference price.

These measures are essential in a market where a single bilateral trade can significantly affect apparent price level.

#### **(c) Eligibility controls for trading units**

Before a unit enters the trading environment:

- The CCERC validates that CEAs are eligible, not frozen, and not reserved for compliance.
- Units may be frozen if subject to verification issues, ongoing investigations, or pending surrender.

This prevents invalid or ineligible units from circulating, critical in an ETS where the environmental regulator is also the market supervisor.

#### **(d) Pre-trade validation controls**

China's ETS relies on multiple layers of pre-trade controls to prevent settlement failures and ensure environmental integrity. These are coordinated between the SEEE (front-end) and CCERC (registry).

- Verification of Unit Availability: Before a sell order can be submitted:
  - The seller must transfer CEAs from their compliance account to their trading account.
  - CCERC "freezes" the units to prevent double-selling or withdrawal during the settlement process.

This freeze is equivalent to a pre-trade collateralisation step and substitutes for a CCP guarantee.

#### **(e) Verification of buyer's capacity**

The following verifications will be conducted for buyers:

- The system validates account status and settlement-bank connectivity.

- In some provinces, buyers must demonstrate a minimum compliance need to reduce speculative activity.

**(f) Automatic rejection of invalid transactions**

The SEEE rejects:

- Orders involving frozen units, expired units, or units linked to unresolved MRV issues;
- Orders that violate position limits or daily caps;
- Orders submitted after the trading-window cut-off.

These controls reflect the need to avoid financial-market style volatility and maintain administrative oversight. The summary of operational trading controls for China’s national ETS is presented in the below Table.

*Table 9: Operational trading controls for China’s national ETS*

<b>Control mechanism</b>	<b>Specification</b>
<b>Sell order limit</b>	Cannot exceed the tradable allowance quantity held in account
<b>Buy order limit</b>	Cannot exceed the available funds in funds account
<b>Order validity</b>	Effective immediately upon acceptance, valid for that trading day
<b>Settlement cycle</b>	T+1 basis - purchased allowances cannot be resold until the following trading day
<b>Fund availability</b>	Funds from sales available for same-day transactions

*Source: Compiled by the Consultant*

**3.3.3.2 Settlement architecture and T+0 processes**

China’s ETS operates a T+0 settlement model: trades are settled immediately on the same day, usually within minutes of order confirmation. This model is built on three pillars:

**(a) DvP without CCP**

There is no central counterparty in the China ETS. Instead:

- The CCERC executes automatic unit transfers between trading accounts upon SEEE’s trade confirmation.
- Banking partners execute the cash transfer concurrently.
- Settlement completes only if both legs succeed.

This real-time DvP eliminates settlement-cycle risk but greatly increases reliance on robust pre-trade validation.

**(b) Unit transfer and “Freeze-Unfreeze” Protocol**

Settlement follows a strict workflow:

- (1) Units frozen pre-trade in the seller’s trading account.
- (2) The SEEE confirms trade then the CCERC initiates transfer.
- (3) Upon successful cash settlement, the CCERC unfreezes and reassigns units to buyer.

(4) Both sides receive settlement confirmation notifications.

This mechanism is essential in markets without CCP novation.

### (c) Reconciliation with compliance accounts

After settlement:

- Buyers move units from trading accounts back to compliance accounts before surrender.
- The CCERC updates compliance obligations in real time.

This provides a clear, traceable path to ensure environmental integrity.

The summary of the national carbon market settlement model is captured in the following figure.

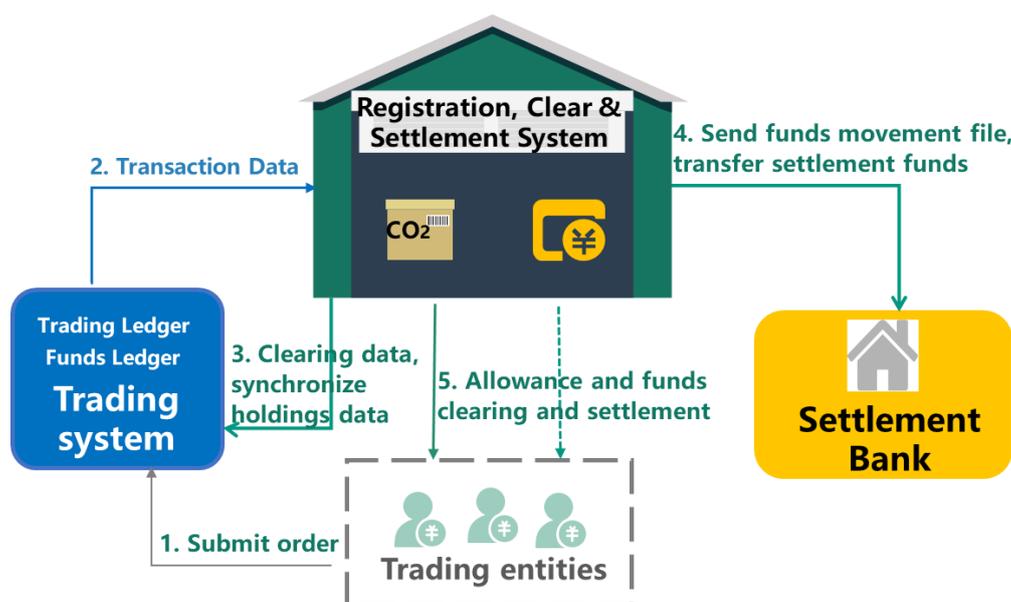


Figure 4: National carbon market settlement model

#### 3.3.3.3 Settlement failure management

China's framework includes a detailed administrative process for handling settlement failures. Without a CCP, this process must be strictly enforced:

##### (a) Immediate trade cancellation

Immediate trade cancellation will be imposed if either:

- the seller lacks sufficient eligible units,
- the buyer cannot complete the payment, or
- a registry discrepancy occurs, the SEEE and CCERC cancel the trade automatically.

The trade is voided and never reaches compliance or registry ledgers.

##### (b) Responsibility and penalties

The at-fault party may face:

- Reporting to the MEE and provincial bureaus;
- Fines or administrative sanctions;

- Temporary suspension from trading;
- Inclusion in compliance-risk watchlists.

This enforcement acts as a substitute for default-management procedures normally handled by CCPs in financial markets.

**(c) Monitoring and escalation**

Repeated settlement failures trigger:

- Heightened surveillance;
- Review of the entity’s trading permissions;
- Potential intervention by local authorities.

This ensures that systemic risks remain minimal.

**3.3.3.4 Market stability controls**

To manage volatility in a shallow market, the SEEE applies several layers of stability measures:

**(a) Daily price fluctuation limits**

Commonly ±10% (occasionally ±20%) relative to the previous close.

- Prevents sharp swings in negotiated prices.
- Limits potential for manipulative behaviour.

Pricing and order parameters are summarised in the following table.

*Table 10: Pricing and order parameters*

Parameter	Specification
Base Currency	Chinese Yuan (CNY) per tCO <sub>2</sub> e
Minimum Price Increment	0.01 CNY
Minimum Order Size	1 tCO <sub>2</sub> e
Order Validity	Single trading day
Settlement Cycle	T+1 (purchased allowances tradeable next day)

**(b) Temporary trading suspensions**

The suspensions are triggered by:

- Large orders breaching caps;
- Abnormal price movements;
- Technical issues;
- Interventions requested by provincial authorities.

Suspensions are usually short but highly effective in controlling episodic volatility.

### **(c) Pre-compliance intervention windows**

Before compliance deadlines, the MEE or provincial bureaus may:

- Issue guidance prices;
- Impose additional restrictions;
- Require entities to prioritise surrender-preparedness.

These windows stabilise market behaviour at peak trading periods.

#### **3.3.3.5 Digital surveillance and environmental integrity controls**

Although surveillance capabilities are less advanced than in the EU/UK, China integrates environmental-integrity elements not present in financial systems:

- Tracking abnormal unit flows within the CCERC, especially repeated transfers among a small group of entities.
- Monitoring of pre-surrender accumulation, identifying hoarding or strategic withholding.
- Cross-checking unit validity with MRV data, a feature unique to environmental markets.
- Identifying non-representative negotiated-trade pricing, especially during low liquidity.

These controls reflect China's administrative approach to preventing manipulation and safeguarding environmental outcomes.

#### **Relevance for the CTX**

- T+0 DvP settlement without a CCP mirrors Vietnam's pilot-phase settlement model (as described in the Draft Decree).
- Pre-trade validation and "unit freeze" mechanics are highly relevant for VSDC-NRS integration to avoid settlement failures.
- Administrative position limits and block-trade caps provide practical tools for the CTX to manage thin-market volatility.
- Settlement-failure handling through automatic cancellation offers a direct template for CTX Article 17 rule refinement.
- Risk-management architecture built around environmental authority oversight provides a blueprint for MAE's supervisory role in Vietnam.
- SEEE's stability mechanisms (price limits, trading suspensions, guidance prices) are highly applicable during the 2025-2028 CTX pilot.

#### **3.3.4 Surveillance, market conduct, and transparency**

The surveillance and transparency framework in the China ETS reflects a hybrid administrative-market model in which environmental authorities retain the dominant supervisory role, while the exchange and registry operators implement day-to-day monitoring of trading behaviour and unit movements. Unlike the EU and UK ETSs which rely on financial regulators, market-abuse regulations, and sophisticated market-monitoring systems, China uses administrative inspection powers, data-driven tracking within the national registry, and targeted local enforcement

mechanisms. This approach is especially relevant for Vietnam, where the MAE will likely serve as the similar lead environmental regulator with strong supervisory authority over market operations.

### **3.3.4.1 Surveillance Architecture: A Dual Environmental-Exchange Model**

Surveillance responsibilities are distributed across three primary entities:

#### **(a) MEE – Lead authority**

The MEE plays the central supervisory role by:

- Overseeing the full compliance cycle, including MRV and surrender behaviour;
- Coordinating nationwide inspections and investigations into abnormal trading or non-compliance;
- Issuing directives to provincial bureaus and the SEEE concerning market stability and conduct issues.

MEE's involvement ensures surveillance is anchored in environmental integrity rather than purely market-conduct regulation.

#### **(b) SEEE – Frontline monitoring**

The SEEE monitors transactions executed on the trading platform and provides:

- Real-time monitoring of trade submissions;
- Detection of off-market priced negotiated trades;
- Alerts on transaction-size anomalies, repeated bilateral patterns, or rule breaches;
- Immediate reporting of suspicious activities to MEE and provincial bureaus.

The SEEE does not have independent enforcement power; it triggers regulatory review through escalation.

#### **(c) CCERC – Registry surveillance**

The CCERC supports surveillance through registry-level controls:

- Tracks unit movements across compliance and trading accounts;
- Flags rapid, repeated transfers and circular trades among specific entities;
- Identifies attempts to trade frozen or ineligible units;
- Synchronises compliance data with provincial bureaus for cross-verification.

CCERC's role is critical because environmental integrity violations often manifest through registry behaviour rather than trading-system behaviour.

### **3.3.4.2 Market conduct surveillance and detection of manipulative behaviour**

China's surveillance framework explicitly targets manipulation patterns common in thin carbon markets. Key areas of focus include:

#### **(a) Detection of abnormal pricing patterns**

The SEEE analyses:

- Negotiated trades at prices far above or below average market levels;
- Price clustering indicating potential collusion;
- Sudden price spikes during compliance windows.

Abnormal trades are escalated to the MEE for review.

#### **(b) Monitoring for collusive or circular trades**

Registry data enables detection of:

- Repeated bilateral transactions between the same counterparties;
- Circular flows where units return to the original holder;
- Trades executed in patterns inconsistent with compliance needs.

Circular trading is a known manipulation method in markets lacking financial intermediaries.

#### **(c) Pre-compliance manipulation patterns**

The MEE and provincial bureaus monitor:

- Hoarding before compliance deadlines;
- Strategic withholding of CEAs to inflate prices;
- Late-stage block trades at non-representative prices.

These practices are common in compliance-driven markets and are closely scrutinised in China.

#### **(d) Trading by ineligible or non-compliant entities**

The system automatically blocks:

- Entities with unresolved MRV issues;
- Buyers/sellers with suspended trading permissions;
- Units under investigation or pending freeze.

#### **(e) Environmental integrity surveillance**

A key distinction between the China ETS and financial-market ETs is the integration of environmental surveillance with trading surveillance. Environmental-integrity monitoring includes:

- Cross-checking unit validity with MRV records to prevent trading of revoked or disputed allowances;
- Monitoring compliance-account balances relative to verified emissions;
- Detecting attempts to misclassify units (e.g., transferring compliance-needed CEAs into trading accounts);
- Flagging discrepancies in emissions data submitted by entities compared with trading behaviour.

These controls are essential in ensuring that environmental outcomes, not financial optimisation, drive market behaviour.

#### **(f) Enforcement mechanisms and disciplinary actions**

China's ETS uses administrative enforcement rather than financial-market penalties. Responses to misconduct or suspicious trading include:

- Administrative penalties that are applied by MEE or provincial bureaus:
  - Monetary fines;
  - Public disclosure or “naming and shaming”;
  - Mandatory corrections or withdrawal of invalid trades.
- Trading restrictions: the SEEE may impose temporary or extended restrictions on entities:
  - Suspension from trading accounts;
  - Reduced trading quotas or holding limits;
  - Enhanced scrutiny of subsequent trades.
- Escalation to environmental and social credit systems: Severe or repeated violations can lead to:
  - Entries on national social credit databases;
  - Restrictions on access to finance, government procurement, or permits;
  - Heightened supervision by local administrative authorities.

This broad administrative reach substitutes for financial-regulator enforcement and serves as a strong deterrent.

#### **3.3.4.3 Transparency and information disclosure**

Transparency under the China ETS is structured but less comprehensive than in established financial ETSS, reflecting the administrative nature of the system.

##### **(a) Publicly disclosed information**

The SEEE regularly publishes:

- Daily trading prices and transaction volumes;
- Annual compliance deadlines and related notifications;
- Lists of trading members and account-opening requirements;
- Market suspensions, trading halts, and rule changes.

##### **(b) Limited disclosure on MRV and compliance**

Unlike the EU ETS, China discloses only aggregated information.

- Verified emissions by entity are typically not publicly available;
- Compliance outcomes (e.g., entities failing to surrender enough CEAs) are selectively disclosed;

- Data on penalty decisions is not fully transparent.

This opacity reflects China’s administrative governance approach, prioritising system control over public market transparency.

### **(c) Exchange – Regulator – Registry Reporting Loops**

Clear reporting pathways exist between SEEE, CCERC, and MEE:

- The SEEE and MEE: real-time alerts, trading summaries, suspicious activity reports.
- The CCERC and MEE/provincial bureaus: unit flow reports, surrender statistics, compliance-account anomalies.
- Provincial bureaus and the MEE: on-the-ground compliance verification, audits, entity investigations.

These loops enable multi-layered supervision with rapid escalation when needed.

### **Relevance for the CTX**

- China’s dual exchange-registry surveillance model mirrors the planned MAE–HNX–VSDC framework in Vietnam, where environmental and market surveillance must be integrated.
- Negotiated-trade surveillance techniques (abnormal price detection, repeated bilateral patterns) are directly applicable to CTX’s pilot trading method.
- Registry-level monitoring for environmental integrity offers a crucial template for integrating NRS data into the CTX supervision, something absent in securities markets.
- Administrative enforcement mechanisms (suspension, compliance-account monitoring, cross-reporting) align with Vietnam’s regulatory landscape, where the MAE (not SSC) leads market-conduct enforcement.
- Transparency practices provide a realistic model for the early-stage CTX disclosure: limited but targeted publications on prices, volumes, and market operations.

## **3.4 Synthesis of international operational and technical lessons for CTX Implementation**

International ETS experience provides clear, practical guidance for designing Vietnam’s CTX pilot. The EU, UK, and China cases show that successful implementation depends on a few core elements: strong system interoperability, rigorous pre-trade validation, and carbon-specific supervision. For Vietnam, this means establishing binding technical agreements between the NRS and CTX infrastructure, ensuring real-time eligibility checks under the RTGS/no-CCP model, and configuring surveillance tools to detect abnormal negotiated trades, repeated bilateral patterns, and unit-integrity risks.

Early deployment of market-stability tools (price bands, position limits, and holding caps) is also essential to manage thin liquidity in the pilot phase. Digital innovations such as DLT should follow a phased, data-driven approach focused on auditability rather than full replacement of core systems.

Overall, while Vietnam benefits from leveraging existing securities-market infrastructure, international practice underscores the need for targeted technical adaptations in transaction workflows, data exchange, and risk controls to ensure a stable and credible CTX during its initial years.

The following table synthesises these granular lessons, emphasising their direct technical and operational relevance for the CTX pilot.

*Table 11: Key operational & technical lessons from international ETs for Vietnam's CTX*

<b>International Practice/Lesson</b>	<b>Rationale/Relevance to Vietnam</b>	<b>Specific Implication for CTX Implementation</b>
1. Robust Registry-Exchange Integration is Non-Negotiable (All ETs, esp. China)	The separation of the legal registry (NRS/MAE) from the trading/settlement infrastructure (HNX/VSDC) creates a critical technical dependency. Failures in data synchronisation can halt the market or corrupt ownership records.	<b>Mandate a binding Technical Service-Level Agreement (SLA):</b> This SLA between MAE, HNX, and VSDC must specify secure API protocols, data reconciliation frequency (near real-time preferred), error handling procedures, and system uptime guarantees before pilot launch.
2. Mandatory Central Clearing (CCP) Enhances Financial Integrity (EU, UK)	Mature, high-volume markets rely on CCPs (like ECC, ICE Clear Europe) to eliminate bilateral counterparty default risk through novation and margining. This builds significant financial stability and confidence.	<b>Plan for future CCP integration:</b> While the pilot uses RTGS without a CCP5, VSDC should incorporate CCP readiness into its system design from the outset. Develop a roadmap for potential CCP implementation in the full operational phase (post-2028) to manage risk as volumes grow.
3. Pre-Trade Validation Requires Precise Technical Logic (China, VN Draft Decree)	Mandating sufficient funds/units before order submission is a key risk control, especially without a CCP. However, its effectiveness depends entirely on the technical sequence and system integration.	<b>Codify the validation sequence in the SLA/Rulebooks:</b> Specify the exact synchronous API query-response logic: HNX must receive confirmation from VSDC (based on reconciled NRS data and bank data) before accepting a negotiated trade order into the system.
4. Surveillance Must Be Calibrated for Carbon Market Risks (All ETs, esp. China, UK)	Standard securities surveillance tools are insufficient. Carbon markets require specific alerts for compliance-driven manipulation (e.g., hoarding near deadlines) and concentration risks.	<b>Develop CTX-specific surveillance parameters:</b> Augment existing HNX/SSC systems with alerts for concentration (holding limits), compliance-period anomalies, and negotiated price outliers. Establish joint MAE-SSC investigation protocols based on correlated data.
5. Technical Readiness for Price Stability Tools is Essential (UK, California, China)	Even if not immediately activated, the technical capability for tools like daily price fluctuation limits, ARP, and CCM provides crucial optionality for regulators to manage volatility,	<b>Build technical capability from the start:</b> HNX's trading system must be designed/configured now with the built-in functionality to implement daily price limits (e.g., $\pm 10\%$ ) and circuit

	especially in a thin pilot market. China uses hard limits effectively.	breakers, even if these are only activated later based on market conditions.
6. Holding Limits Require Technical Enforcement Mechanisms (UK, California, China)	Regulatory holding limits are ineffective without the technical means to track aggregate positions across related accounts and enforce the limits (e.g., block orders/transfers).	<b>Develop VSDC position monitoring logic:</b> VSDC, in coordination with SSC/MAE (for defining 'related accounts'), needs to develop the system logic to aggregate positions and monitor compliance with holding limits, generating automated reports or alerts for SSC.
7. "Data-First" DLT Offers Low-Risk Integrity Benefits (SEEE Pilots, CAD Trust)	Full asset tokenisation carries significant legal/market risks. Using DLT primarily as an immutable data layer for reconciliation (SEEE) or metadata integrity (CAD Trust) enhances transparency and interoperability without disrupting the core market structure.	<b>Pilot DLT for data integrity, not trading:</b> Focus initial DLT exploration (Phase 2/3) on enhancing NRS-VSDC reconciliation and creating a public audit trail. Explore linking NRS to CAD Trust to boost international credibility and prevent double counting.

Source: Compiled by the Consultant

Table below summarises the China ETS model and its direct lessons for Vietnam, providing the most operationally relevant benchmark for the CTX design during the pilot phase.

Table 12: Summary of China's National ETS model and lessons for Vietnam

Feature	China's national ETS model	Key lessons learned for Vietnam
<b>Trading mechanisms</b>	<p>Multiple methods: Primarily Agreement Transactions (Listed for &lt;100k tonnes, Bulk for ≥100k tonnes) and One-Way Bidding. All trades must be executed through the designated exchange (SEEE).</p> <p>Products: CEAs and China Certified Emission Reductions (CCERs).</p> <p>Settlement: Uses Delivery versus Payment (DvP) principle on a T+1 basis (allowances bought today are sellable tomorrow). Centralised settlement managed by the registration institution (CCERC) with designated settlement banks.</p>	<p>Liquidity Path: China's use of multiple trading methods (listed agreements, bulk) provides a potential roadmap for Vietnam to expand beyond its initial negotiated-transactions-only model proposed in Draft Decree, enhancing future market liquidity.</p> <p>Settlement Model: China's T+1 DvP settlement (without a CCP) is a proven, practical, and safe approach. Vietnam's proposed RTGS DvP model (also without CCP) is even more conservative but aligns with the principle of secure settlement demonstrated by China.</p>
<b>Governance &amp; oversight</b>	<p>Clear institutional separation: Distinct roles for the National Registry (CCERC in Hubei) and the National Trading Platform (SEEE in Shanghai).</p> <p>Multi-level oversight: The Ministry of Ecology and Environment (MEE) is the</p>	<p>Validation of Vietnam's structure: China's separation validates Vietnam's similar proposed functional split between the MAE/NRS (registry) and the MOF/HNX/VSDC (trading/settlement).</p>

	<p>core regulator, coordinating with other key bodies like the State Administration for Market Regulation (SAMR - data quality) and the People's Bank of China (PBOC - financial supervision). Provincial authorities handle implementation.</p>	<p>Critical need for coordination: China's established multi-agency coordination model underscores the absolute necessity for Vietnam to formalise a binding Inter-agency Coordination Protocol between the MAE, MOF, SSC, HNX, and VSDC, a key gap identified in the analysis of Vietnam's Draft Decree.</p>
<b>Risk management</b>	<p>Explicit price controls: Hard daily price fluctuation limits are applied (<math>\pm 10\%</math> for listed agreements, <math>\pm 30\%</math> for bulk agreements).</p> <p>Position Management: Uses holding limits and requires large position reporting to prevent market concentration and manipulation.</p> <p>Financial backstop: Requires the establishment of a risk reserve fund to cover potential losses from defaults or disruptions.</p> <p>Surveillance: SEEE operates real-time surveillance systems to detect abnormal trading patterns.</p>	<p>Addressing a key gap: This is a crucial lesson. Vietnam's Draft Decree currently lacks specific, quantifiable market stability tools like daily price limits or holding limits.</p> <p>Direct Model to Adopt: China's use of explicit price bands and holding limits provides a direct, proven model for Vietnam to incorporate into its detailed CTX operational rulebooks to manage volatility and prevent concentration risk, especially during the pilot phase.</p>
<b>Enforcement and sanctions</b>	<p>Detailed and strict framework: The Interim Regulations (2024) provide a comprehensive and specific schedule of penalties for various violations, including data fraud, non-compliance (failure to surrender), and market manipulation (e.g., spoofing, wash trades). Penalties include confiscation of gains, significant fines (e.g., 1-10 times illegal gains for manipulation), and market bans.</p> <p>Conflict of interest rules: Explicitly prohibits personnel from regulatory and operational bodies (MEE, SEEE, CCERC, verifiers) from holding or trading allowances.</p>	<p><b>Need for specific carbon sanctions:</b> Vietnam's current plan relies on the general securities sanction framework (Decree No. 156/2020/ND-CP), which lacks definitions for carbon-specific market abuse (like hoarding near compliance deadlines).</p> <p>Actionable recommendation: Vietnam should learn from China and develop a dedicated circular or amend existing decrees to establish a specific penalty schedule tailored to carbon market violations, enhancing deterrence and legal clarity.</p>
<b>Transparency practices</b>	<p><b>Multi-layered disclosure:</b> Requires public disclosure at multiple levels: MEE publishes lists of covered entities and compliance status; Covered Entities publish annual GHG emission reports; The Trading Institution (SEEE) publishes daily market data (prices, volumes).</p>	<p><b>Reinforcement of Vietnam's approach:</b> China's comprehensive disclosure practices reinforce the importance of the transparency measures already proposed in the Draft Decree (e.g., HNX publishing end-of-day results). It confirms that robust</p>

		public disclosure is an international best practice for market credibility.
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Source: Compiled by the Consultant

## 4 ASSESSMENT OF ADVANCED DIGITAL TECHNOLOGIES FOR CTX GOVERNANCE AND SUPERVISION

### 4.1 Blockchain and its potential role in CTX

The carbon credit market continues to face major transparency and data-reliability challenges that pose systemic risks to the credibility of a national CTX. For a regulator like MOF, ensuring market integrity is therefore fundamental.

Key governance challenges include:

- Lack of comparability: Multiple standards and methodologies create uneven credit quality and inconsistent valuation.
- Data-integrity risks: Baseline and additionality assessments rely on assumptions, while permanence remains uncertain, especially for nature-based credits.
- Fraud and double counting: Emission reductions can be claimed or sold more than once, undermining environmental integrity.
- Operational inefficiencies: Centralised registries, high transaction costs, and low liquidity limit broad participation.

DLT offers a potential governance solution, not as a financial innovation, but as an integrity-enhancing infrastructure. Its immutable and transparent records enable verifiable tracking of a credit's entire lifecycle and strengthen safeguards against double counting by linking registries through a secure, decentralised network. This improves trust, auditability, and operational efficiency for the CTX.

To illustrate this potential, the following table compares the governance and technical attributes of DLT with traditional database and peer-to-peer (P2P) models.

Table 13: Comparison of blockchain/DLT, P2P networks, and traditional databases

Criteria	Blockchain / DLT	Peer-to-Peer (P2P) networks	Traditional databases
<b>Transparency</b>	Transactions publicly recorded, immutable, and verifiable by all parties.	No historical logging, easily altered.	Centralised data, editable only by administrators, prone to manipulation.
<b>Security</b>	Strong encryption, distributed, tamper-resistant.	Distributed but lacks authentication and access control.	Dependent on central systems, once attacked, the entire dataset is at risk.
<b>Automation</b>	Smart contracts support automatic transaction processing, settlement, and credit retirement.	No business logic support.	Requires manual processing or separate system integration.

<b>Traceability</b>	Each credit has a unique identifier (DID), easily traceable throughout the lifecycle.	No standardised identifiers, difficult to trace.	Traceability depends on system design, often limited.
<b>Scalability</b>	Integrable with multiple international platforms via DID/VC.	Poor integration due to a lack of standardisation.	Integration is limited, dependent on internal APIs.
<b>Operational costs</b>	Lower due to elimination of intermediaries; optimisable with Layer 2 (Polygon, Hedera).	Low but lacks legal enforceability.	Higher due to system maintenance, staff, and periodic audits.
<b>Processing speed</b>	Maybe slower with public blockchains, but improved via Hedera or Layer 2 solutions.	Fast but lacks data integrity assurance.	Fast internal processing, but less transparent and harder to scale.
<b>International interoperability</b>	Easily integrates with global carbon credit markets (Verra, Gold Standard, Toucan, KlimaDAO).	Incompatible with international systems.	Lacks standardisation, hard to align with international systems.
<b>Compliance and auditability</b>	Public transactions, easily auditable and transparent.	No auditability mechanism.	Requires manual audits, prone to errors or fraud.
<b>Long-term reliability</b>	Immutable data, permanent storage.	High risk of data loss or modification.	Risk of data loss or alteration without robust backups.

*Source: Compiled by the Consultant*

## 4.2 Key lessons from international DLT applications in carbon markets

DLT use in carbon markets has quickly moved from theory to real-world implementation. A wide range of operational models now exist, from secure national registries and blockchain-based trading platforms to global metadata layers that connect multiple registries and prevent double counting. These cases provide concrete lessons on organisational setup, technology choices (e.g., permissioned vs. public chains), tokenisation approaches, policy requirements, and operational challenges. Reviewing these early deployments offers practical reference points - and cautionary insights - or designing Vietnam's CTX.

The following table summarises notable platforms.

Table 14: Overview of selected DLT-based carbon platforms

Level	Platform	Management	Objective	Feature
Global	<b>Climate Action Data Trust</b> (CAD Trust) <sup>2</sup>	Initiated by IETA, the World Bank, and Singapore, CAD Trust is transitioning to an independent council working with registries and standards bodies. Its goal is to operate as an open-source public good. (metadata layer for both VCM and Article 6 mechanisms)	Creates a metadata ledger tracking credit lifecycles, standardises core datasets for interoperability, and supports double-counting prevention across on-chain and off-chain systems.	Enterprises can use CAD Trust to verify provenance of purchased/sold credits, reducing risks of miscounting/double counting; regulators gain tools for cross-registry oversight.
Regional	<b>Shanghai Environment &amp; Energy Exchange</b> (SEEE) <sup>3</sup>	Pilots often involve collaboration between SEEE, local regulators, domestic tech partners, and technical assistance organisations such as ADB.	Creates a single source of truth for trades and registry data, reduces discrepancies across siloed systems, and pilots tokenisation of selected environmental assets.	SEEE-style pilots serve as reference models for MRV devices, reconciliation, and tokenisation pilots, but enterprises still rely on official registry/exchange systems; DLT can act as a supplementary layer until standardised.
	<b>Macao International Carbon Emission Exchange</b> (MEX) <sup>4</sup>	Backed by Yunfeng Financial and the Macao Carbon Neutral Research Institute, with Ant Group as a tokenisation partner. Represents a corporate/exchange-led model rather than a neutral registry like CAD Trust.	Tokenises I-RECs and carbon credits for traceability, operates a Web3 exchange with on-chain trading and retirement, and enables cross-border liquidity for standardised credits.	MEX shows how exchange-led tokenisation can speed up tracking and procurement, but users must still assess credit quality, retirement recognition, and cross-border legal risks.

Source: Compiled by the Consultants

<sup>2</sup> Climate Action Data Trust. <https://climateactiondata.org/>.

<sup>3</sup> ADB Digital Sandbox. (2024, Feb 6). Distributed Ledger Technology-Based Carbon Asset Trading Platform in Shanghai. <https://digital.adb.org/home/2024/2/6/distributed-ledger-technology-based-carbon-asset-trading-platform>.

<sup>4</sup> Macao Emission Exchange. (2025, August 29). Building Next-Generation Web3 Carbon Exchange Infrastructure: Addressing Challenges in High-Quality Carbon Credits Through RWA. <https://www.maceex.com/en/newsDetail/20>

A review of international DLT applications shows a wide range of strategies, technologies, and governance models shaped by different market needs. The cases highlight benefits such as greater transparency and efficiency, but also reveal operational, legal, and market challenges that persist regardless of technology.

#### **4.2.1 Case study 1: Climate Action Data Trust (CAD Trust)**

CAD Trust is a decentralised metadata layer that links and standardises information from major registries (Verra, Gold Standard, etc.) to enhance transparency and prevent double counting. Initiated by IETA, the World Bank, and Singapore<sup>5</sup>, it CAD Trust uses DLT but records only metadata, not full credits, avoiding legal and performance issues associated with on-chain.<sup>6</sup>

Governance is shifting toward an independent council and technical steering committee, positioning CAD Trust as an open-source public good. Since its launch in 2022, CAD Trust has expanded by integrating more registries and adopting a common data model to support both voluntary markets and Article 6 mechanisms.

Functioning as a “master metadata ledger,” CAD Trust tracks the lifecycle of credits - from issuance to retirement - through standardised datasets (provenance, vintage, project details).<sup>7</sup> This promotes interoperability across national registries, exchanges, and marketplaces, strengthens oversight, and reduces risks of misreporting or duplicate claims.

However, limitations remain. CAD Trust depends on the quality of underlying registry data and faces legal, regulatory, and technical challenges when linking systems across jurisdictions. Integration delays may also affect synchronisation.

For businesses, CAD Trust improves credit provenance checks and reduces double-counting risks. For regulators, it enhances cross-registry monitoring and supports transparent, cross-border carbon market governance.<sup>8</sup>

#### **4.2.2 Case study 2: Shanghai Environment & Energy Exchange (SEEE)**

The SEEE is one of China’s key trading venues for carbon allowances and other environmental products, playing a central role in the national ETS/CEA system. Beyond traditional centralised electronic trading, SEEE has engaged in several pilot projects applying Distributed Ledger Technology (DLT/Blockchain) to enhance transparency and interoperability between registries and exchanges. These projects are typically conducted under research and technical cooperation

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<sup>5</sup> World Bank. (2022). IETA and Founding Partners Announce the Launch of Climate Action Data Trust. <https://ppp.worldbank.org/library/ieta-and-founding-partners-announce-launch-climate-action-data-trust>

<sup>6</sup> Chia Blockchain. <https://www.chia.net/climate/>

<sup>7</sup> Climate Warehouse. Climate Action Data Trust. <https://www.theclimatewarehouse.org/work/climate-action-data-trust>

<sup>8</sup> Carbon Wire. (2023, Dec 21). CAD Trust Launches Public Data Dashboard to Enhance Transparency in Carbon Markets. <https://carbonwire.org/announcements/cad-trust-launches-public-data-dashboard-to-enhance-transparency-in-carbon-markets/>

frameworks with international organisations such as ADB and ICAP, as well as domestic technology partners.<sup>9</sup>

The pilots have utilised permissioned blockchain platforms or locally developed consensus solutions, with the objective of creating a single source of truth for transactions and registry entries. Key features include real-time transaction verification, reduction of manual discrepancies between siloed systems, support for double-counting prevention, and testing of tokenisation for certain environmental assets as on-chain representations.<sup>10</sup>

The SEEE plays a central role in these pilots, coordinating with local regulators, technology providers, and international organisations. The projects are implemented in a sandbox setting, both to validate technical feasibility and to assess governance and legal implications.

Academic studies and reports from partners such as APEC, MDPI, and ADB highlight that applying DLT can improve transparency and security of transactions, lower reconciliation costs between registries and exchanges, and strengthen market trust, with potential positive impacts on liquidity and trading prices.

Despite the clear potential, pilots face multiple barriers. Legally, the ownership of credits and the recognition of tokens are not yet standardised. Technically, challenges include integration with legacy systems, performance scaling, and safeguarding sensitive data. Institutionally, achieving alignment among registries, exchanges, and regulators remains essential but difficult.

The SEEE pilots provide valuable reference points for testing MRV, reconciliation, and tokenisation in carbon trading. However, companies are still required to transact and comply through official registry/exchange systems. At this stage, DLT applications mainly act as a supplementary layer, serving as groundwork for future standardisation and broader adoption.

#### **4.2.3 Case study 3: Macao International Carbon Emission Exchange (MEX)**

The MEX, launched in late 2024, is an international carbon exchange built around blockchain and Web3 technologies. Its strategy focuses on bringing carbon credits and renewable energy certificates on-chain to improve transparency and liquidity. The MEX reports on-chaining hundreds of thousands of certificates as part of its “carbon trading blockchain” programme.<sup>11</sup>

Its Web3 infrastructure includes tokenising I-RECs and selected credits, enabling on-chain trading, custody, and retirement, and supporting cross-border connectivity for standardised assets. This reflects a market-driven model aimed at both traditional and Web3 investors.

The MEX is backed by Yunfeng Financial and the Macao Carbon Neutral Research Institute, with technology partnerships including Ant Group, representing a corporate/consortium-led model

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<sup>9</sup> ADB Digital Sandbox. (2024, Feb 6). *Distributed Ledger Technology-Based Carbon Asset Trading Platform in Shanghai*. <https://digital.adb.org/home/2024/2/6/distributed-ledger-technology-based-carbon-asset-trading-platform>.

<sup>10</sup> Zhang, G., Chen, S. C.-I., & Yue, X. (2024). *Blockchain Technology in Carbon Trading Markets: Impacts, Benefits, and Challenges—A Case Study of the Shanghai Environment and Energy Exchange*. *Energies*, 17(13), 3296. <https://doi.org/10.3390/en17133296>

<sup>11</sup> Macao Emission Exchange. (2025, August 29). *Building Next-Generation Web3 Carbon Exchange Infrastructure: Addressing Challenges in High-Quality Carbon Credits Through RWA*. <https://www.maceex.com/en/newsDetail/20>

rather than a neutral public-good approach like CAD Trust<sup>12</sup>. Since its launch, the MEX has processed over 1 million tCO<sub>2</sub>e worth of on-chain transactions, moving beyond pilot phase into commercial deployment.

Blockchain integration improves transparency, auditability, and transaction speed, and tokenisation may broaden investor access. However, credit quality still depends on underlying validation, not tokenisation. Cross-border legal uncertainty, ownership issues, and regulatory fragmentation remain major risks, alongside concerns about greenwashing if listings are not strictly vetted.<sup>13</sup>

The MEX illustrates an exchange-led tokenisation approach. Participants must still assess credit quality, acceptance of on-chain retirements by regulators, and cross-border legal risks. When well-implemented, it can enhance traceability and accelerate transactions - provided due diligence is applied.

The summary of key lessons learned from international DLT applications in carbon markets is made in the following table.

*Table 15: Summary of key lessons learned from international DLT applications in carbon markets*

<b>Platform / Case study</b>	<b>Model / Approach</b>	<b>Key lesson learned</b>	<b>Relevance / implication for Vietnam</b>
<b>CAD Trust</b> (Global Metadata Layer)	Global, open-source DLT layer recording <i>metadata</i> from major registries.	<b>DLT for interoperability &amp; double counting prevention:</b> Provides a ready-made, "data-first" solution for linking national registries, standardising data, preventing double counting, and supporting Article 6 cooperation without needing full tokenisation.	<b>Highly relevant infrastructure:</b> Offers a direct, low-risk pathway for Vietnam to ensure international credibility and interoperability for its carbon units by linking the NRS to this global public good, aligning perfectly with the "data-first" DLT strategy recommended for the pilot.
<b>SEEE Pilots</b> (China National ETS)	State-run compliance market piloting DLT as a <i>supplementary reconciliation layer</i> .	<b>Pragmatic DLT for existing systems:</b> Shows how DLT can enhance data integrity and reconciliation between existing registry/exchange systems without replacing them or introducing major legal/control risks. A viable, low-risk approach for state-controlled markets.	<b>Highly relevant model:</b> Validates Vietnam's potential path of using DLT as a "data integrity layer" supporting the HNX/VSDC system, enhancing transparency without disrupting the mandated centralised structure or triggering legal conflicts related to digital asset trading.

<sup>12</sup> Macau Business. (2025). Macao International Carbon Emission Exchange signs agreement with Ant Group for green digital asset project. <https://www.macaubusiness.com/macao-international-carbon-emission-exchange-signs-agreement-with-ant-group-for-green-digital-asset-project/>

<sup>13</sup> Carbon Pulse. (2025). Macao exchange rolls out blockchain infrastructure for carbon trading. <https://carbonpulse.com/429831/>

<b>MEX</b> (Macao Int. Carbon Exchange)	Corporate-backed "Web3 exchange" focused on tokenising and trading various certificates.	<b>(Cautionary) Risks of market-led tokenisation:</b> Highlights significant legal ambiguity, credit quality control challenges, and cross-border risks associated with premature, finance-driven tokenisation. Underscores the need for thorough due diligence by policymakers.	Serves as a strong warning against pursuing full asset tokenisation before Vietnam establishes clear legal frameworks for digital assets and ensures robust credit quality control, reinforcing the need for a cautious, state-led approach.
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Source: Compiled by the Consultant based on D4 Report analysis

The pragmatic "supplementary layer" approach (SEEE) and the global "data-first" infrastructure model (CAD Trust) offer viable, low-risk pathways for Vietnam to enhance data integrity, ensure international interoperability, and strengthen supervisory capabilities without conflicting with the mandated centralised trading structure or introducing the premature complexities of asset tokenisation.

These findings provide a clear strategic direction: the greatest value for Vietnam's CTX is not in speculative tokenisation, but in the pragmatic application of DLT as a governance tool to ensure data integrity, enhance supervisory efficiency, and guarantee international interoperability.

### 4.3 Feasibility, benefit, and risk analysis for Vietnam

Based on international lessons and the country's specific policy context, further assessment of the benefits, risks, and overall feasibility of DLT adoption in Vietnam will be in this session. As indicated above, the most optimal path is a "data-first" strategy, prioritising data integrity over asset tokenisation.

#### 4.3.1 Key benefits of DLT adoption for Vietnam's CTX

DLT's main value for Vietnam lies in strengthening market governance through a transparent, tamper-proof audit trail. By recording each step in a carbon unit's lifecycle, issuance, transfers, and retirement - DLT provides regulators with reliable, real-time oversight that cannot be altered or concealed. This level of data integrity is critical for building trust, particularly as transaction volumes expand.

A second key benefit is DLT's ability to prevent double counting. Its decentralised structure allows Vietnam's NRS to interconnect securely with international metadata systems, such as the CAD Trust. Linking to CAD Trust would give Vietnamese units an internationally verifiable identity, enhancing credibility in cross-border transactions and supporting future Article 6 cooperation.

In practice, this DLT-based infrastructure provides several tangible operational advantages for market management:

- Improved MRV data standardisation: DLT can help solve the "garbage in, garbage out" problem. By creating a national emission factor database (similar to Singapore's SEFR model) and using DLT to digitally sign and hash MRV data, the system enforces data quality at the source, reducing discrepancies and costly verification timelines.
- Automated supervision of market stability: DLT allows market rules to be partially codified and automated. For instance, the Beijing ETS currently applies multiple measures such as a

±20% price fluctuation band and position limits to manage volatility. These rules can be embedded as smart contracts, increasing compliance and supporting automated supervision.

- Fostering stable, policy-driven demand: A transparent and credible system is essential for implementing effective demand-creation policies. Singapore's policy allowing businesses to use Article 6-compliant credits to offset up to 5% of their carbon tax liability is a prime example. This policy, which depends on trusted credit quality, effectively maintains market liquidity and ensures demand.

Critically, this "data-first" strategy is perfectly aligned with the government's roadmap in Decision No. 232/QD-TTg. It allows Vietnam to gain the profound transparency and integrity benefits of DLT while maintaining the mandated, centralised trading and settlement system operated by HNX and VSDC. This hybrid model ensures a stable, controlled, and efficient market launch, supported by a world-class data infrastructure.

### 4.3.2 Risks and challenges to be managed

While the benefits are significant, the application of DLT introduces a range of serious risks. These challenges are not primarily technical; they are matters of legal ambiguity, regulatory design, and market integrity that must be proactively managed by policymakers to ensure CTX's stability and credibility.

- The legal and policy conflict risks are highlighted in *Section 4.3.5. Legal feasibility*.

#### 4.3.2.1 Operational and governance risks

The most fundamental operational risk is the "Garbage In, Garbage Out" problem. DLT cannot self-correct poor-quality data; it will only immutably "lock in" inaccurate or fraudulent MRV data. This means the integrity of the entire system is dependent on rigorous, off-chain verification processes before any data is recorded. Governance of the DLT platform itself is another major challenge. A clear rulebook, established by policymakers, is required to define:

- Who has the authority to issue credits or attest to data on the ledger?
- What is the process for handling errors, revocations, or corrections on an "immutable" ledger?

The table below provides mapping of cybersecurity and market risk management strategies for the CTX, aligning technical mitigation tools with the regulatory mandates of the Draft Decree.

*Table 16: Technical risk control mechanisms and cybersecurity compliance framework for the CTX operational model*

Risk category	Mitigation strategy / mechanism	Regulatory basis (Draft Decree)	Technical & operational detail
Cybersecurity & data privacy	Private permissioned DTL architecture	Decree No. 13/2023/ND-CP; Cybersecurity Law	Use of a Proof-of-Authority (PoA) consensus mechanism where nodes are managed by authorised state agencies (MAE/MOF). Sensitive data remains off-chain with only anonymised hashes recorded on the ledger.

<b>Fraud &amp; fake transactions</b>	<b>Synchronous pre-trade verification</b>	Articles 15, 19, & 23	Mandatory verification of unit availability (at VSDC/NRS) and fund sufficiency before an order is accepted by the HNX system. Digital signatures ensure non-repudiable audit trails for all transfers.
<b>Market &amp; price manipulation</b>	<b>Rule-based surveillance &amp; price controls</b>	Article 5	Implementation of daily price fluctuation limits (e.g., $\pm 10\%$ ) and automated surveillance alerts tuned to detect "off-market" negotiated prices and wash trades.
<b>System &amp; Order-book Disruption</b>	<b>Business Continuity &amp; Intervention Protocols</b>	Articles 29 & 30	MAE holds the authority to suspend or resume market operations during technical failures or force majeure. Technical SLAs define recovery procedures and data synchronisation frequency.
<b>Governance &amp; integrity</b>	<b>Rigorous off-chain validation (anti-gigo)</b>	Articles 12 & 33	Strict MRV auditing processes before issuance on the NRS to ensure only high-quality data is "locked" into the immutable DLT ledger.

*Source: Compiled by the Consultant*

By integrating these technical safeguards within the legal framework established by the Draft Decree, the CTX adopts an efficient defense approach to market integrity. The combination of state-controlled DLT nodes, synchronous pre-trade validation, and clear intervention protocols ensures that the pilot phase can effectively mitigate cybersecurity threats and price manipulation. This structured risk management framework not only protects market participants but also builds the foundational credibility necessary for Vietnam's transition to a fully operational and internationally integrated carbon market from 2029 onward.

#### **4.3.2.2 Market and financial risks**

The international experience provides clear warnings against assuming technology can create a market.

- **Market viability risk:** The failure of Nori, a blockchain-native platform in the voluntary market, is a critical lesson that technology does not create demand. The financial sustainability of the CTX will depend on stable, policy-driven demand from compliance obligations, not the novelty of its DLT infrastructure.
- **Premature tokenisation risk:** The "tokenisation" of credits introduces immense market volatility and integrity risks. The Verra registry's decision to block the "bridging" of retired credits onto blockchain platforms highlights concerns over speculation, loss of asset control, and damage to credit integrity.
- **Financial control risks:** The cross-border nature of DLT creates significant risks related to taxation, anti-money laundering (AML), and financial flow control. Given that the State Bank of Vietnam has not recognised cryptocurrencies as legal payment, any system that

integrates tokenisation or digital currency settlement risks non-compliance with existing financial laws.

#### **4.3.2.3 International integration risks**

This is a critical risk that could undermine a key objective of the CTX. Major international carbon markets (like the EU ETS), aviation compliance schemes (CORSIA), and key voluntary carbon standards (VCMs) have strict requirements for transparency and system recognition. If Vietnam's DLT system is not designed to be fully compatible with international MRV and data standards (e.g., ISO 14064-3, Verra, Gold Standard), the carbon credits issued from it may not be accepted internationally. This would directly prevent Vietnam from exporting its carbon credits and block its integration into the global market.

These combined risks strongly reinforce the conclusion that a "data-first" strategy, avoiding asset tokenisation in the pilot phase, is the most prudent and legally sound path forward.

#### **4.3.3 Technical feasibility**

From a technical perspective, the implementation of DLT for Vietnam's CTX is highly feasible, provided the correct architecture is chosen. The technical requirements for a high-volume compliance market are demanding, the EU ETS, for instance, auctioned over 517 million EUAs in 2023 alone, and the Beijing ETS handles multiple complex order types. These examples demonstrate the need for a robust system.

The most optimal and feasible path for Vietnam is a hybrid architecture that balances centralised control with decentralised transparency, aligning perfectly with the national legal framework for mandatory, state-governed carbon credits. This model consists of two distinct layers:

- **Trading and settlement layer:** This layer would be operated by HNX and VSDC, as mandated by Decision No. 232/QĐ -TTg. This leverages decades of existing expertise and mature infrastructure in running capital markets, handling all order matching, clearing, and settlement functions.
- **Data and attestation layer:** This is the foundational layer where DLT is applied. DLT would function as an immutable "notary" or audit trail, recording hashes and metadata of transactions. Its purpose is not trading, but to enhance transparency, traceability, and auditability for regulators.

A critical technical factor is ensuring international interoperability from day one. This hybrid model facilitates this in two ways. First, Vietnam can leverage the Climate Action Data Trust (CAD Trust), an initiative by the World Bank, IETA, and Singapore. The CAD Trust functions as a global metadata layer to connect registries and prevent double counting, which is essential for participation in Article 6 of the Paris Agreement.

Second, Vietnam can adopt a Digital MRV (D-MRV) approach, learning from Singapore's experience with its Emission Factors Registry (SEFR). By standardising national emission factors and using DLT to digitally sign and hash verification data on-chain, Vietnam can significantly enhance data accuracy and credibility.

This "data-first" hybrid model is also the most prudent. The cautionary lesson from Verra, the world's largest registry, which had to suspend the conversion of retired credits into crypto tokens

due to integrity and speculation risks, strongly supports this approach. It allows Vietnam to gain the transparency benefits of DLT while avoiding the significant technical and market risks of full asset tokenisation.

### ***Implications for the SSC***

The integration of DLT within the CTX infrastructure introduces significant shifts in how the SSC performs its oversight and risk management functions. These implications are categorised into three areas:

- **Real-time supervisory access and enhanced auditability:** Unlike traditional reporting models that rely on periodic data submissions, the DLT-supported system provides the SSC with "Observer Node" status. This grants the regulator real-time, read-only access to the immutable transaction ledger, enabling:
  - **Instantaneous auditing:** The SSC can verify credit ownership, transaction history, and depository balances at VSDC without manual intervention.
  - **Automated surveillance:** The system's Trading Surveillance Module uses analytical algorithms to detect abnormal patterns, such as wash trades or price manipulation, and automatically delivers violation reports directly to the SSC.
- **Cybersecurity and systemic resilience:** Adopting a private permissioned DLT architecture enhances the market's defense-in-depth posture, ensuring compliance with Vietnam's strict cybersecurity laws.
  - **Distributed resilience:** By distributing the ledger across authorised nodes (MAE, HNX, and VSDC), the system eliminates "single points of failure". If one operator's engine is disrupted, the ledger's integrity is maintained by other state-controlled nodes.
  - **Data protection:** In compliance with Decree No. 13/2023/ND-CP, sensitive participant data is kept off-chain, while anonymised hashes on the DLT ensure transparency without compromising privacy.
  - **Proactive monitoring:** The SSC will oversee the SOC Security Monitoring Service, providing 24/7 surveillance of infrastructure and security events to prevent unauthorised access.
- **Strategic management of external technology providers:** To ensure sovereign control over critical financial infrastructure and mitigate "vendor lock-in" risks, the framework establishes clear mandates for procurement and maintenance:
  - **Open-source standards:** The report recommends utilising international open-source enterprise DLT frameworks.
  - **Sovereign control:** All private keys, smart contract logic, and technical documentation must be owned and managed by the state.
  - **Operational continuity:** Maintenance and upgrade protocols are strictly defined in Technical Service Level Agreements (SLAs) to ensure that the SSC remains independent of any single external vendor for core system functionality.

#### **4.3.4 Financial feasibility**

From a financial perspective, the viability of the CTX hinges on a clear-eyed assessment of two distinct factors: the financial model of the market itself and the cost-benefit of the underlying technology (DLT).

The revenue potential of a large-scale, compliance-driven carbon market is significant. International examples demonstrate that these markets can generate substantial financial flows and stable fee income.

- In 2023 alone, the EU ETS auctioned more than 500 million EUAs, generating tens of billions of euros in cash flow.
- Even in its earlier stages, the Beijing ETS has recorded approximately 105 million tCO<sub>2</sub> traded, with a total value exceeding CNY 4.1 billion, demonstrating strong financial incentives.

However, this financial viability is entirely dependent on policy-driven demand, a risk highlighted in the failure of the DLT-based Nori platform, which collapsed in the absence of stable, institutional demand. A technology-first approach does not guarantee a market.

Therefore, a key component of financial feasibility is a policy framework that creates demand. Singapore's policy, for example, allows businesses to use Article 6-compliant credits to offset up to 5% of their carbon tax liability. This is a noteworthy financial-environmental policy that Vietnam could consider adopting, as it maintains liquidity and secures stable revenue for CTX operations.

Regarding the DLT infrastructure itself, the financial case is not about new revenue streams, but about long-term cost reduction and efficiency. A "data-first" DLT approach provides clear advantages over traditional databases by significantly reducing the high costs associated with manual reconciliation and auditing among registries, exchanges, and verifiers. Leveraging open-source, global data standards like the CAD Trust further lowers the costs of cross-border data harmonisation.

This "data-first" model is also the most financially prudent, as it avoids the volatility and legal risks of full tokenisation models, which have led to market instability elsewhere. Finally, this strategy optimises the public-private investment model. By providing a transparent and trusted data infrastructure, the state can reduce its own fiscal burden by attracting private capital to build the auxiliary ecosystem, such as credit rating platforms and digital auditing services, that will grow around the official exchange.

#### **4.3.5 Legal feasibility**

The legal feasibility of integrating DLT into Vietnam's CTX is the most complex and critical variable facing policymakers. The country's legal framework for digital assets is rapidly evolving, creating both a foundational opportunity and a direct, significant policy conflict that must be resolved.

##### ***4.3.5.1 An emerging legal foundation for DLT***

A series of recent legal and policy instruments has created a foundation that supports the use of DLT, particularly as a data infrastructure:

- **The Law on Digital Industry (No. 71/2025/QH15):** This law is a critical milestone, as it removes the long-standing "grey zone" surrounding digital assets. It provides the first official legal definitions distinguishing between "virtual assets" (like in-game items) and "crypto assets" (like cryptocurrencies, created and operated on blockchain platforms). By formally recognising "crypto assets," this law creates a "regulatory corridor" for DLT applications, allowing technologies that support carbon trading to be developed without falling into a regulatory void. While the law provides foundational principles for governance and safety, it currently lacks specific provisions for the tokenisation of environmental assets. This creates a legal gap, meaning full feasibility will depend on additional government guidance or integration with the Law on Environmental Protection 2020.
- **Decision No. 1131/QĐ -TTg on issuance of the List of strategic technologies and strategic technological products (12 June 2025):** This decision provides a high-level policy mandate by officially identifying Blockchain as a "strategic technology" for national development. This affirms the state's clear orientation toward building secure, national blockchain infrastructure, such as the permissioned NDACHain platform. This is highly relevant as a Proof-of-Authority (PoA) mechanism, where validating nodes are authorised state agencies (like MONRE or VNEEP), is considered optimal for a CTX, ensuring high performance, low energy use, and state control.
- **Decree No. 119/2025/ND -CP:** This decree, amending Decree No. 06/2022/ND -CP, provides the most direct legal basis for DLT. Article 18 establishes the NRS as a digital platform to manage the full lifecycle of carbon credits (issuance, transfer, retirement). Crucially, it mandates that the registry must integrate "advanced IT solutions, ensuring transparency, traceability, auditability, and international connectivity". These specific legal requirements are the exact core features and primary benefits of DLT. Furthermore, the complex, flexible mechanisms introduced by the decree, such as borrowing allowances (up to 15%) and using credits for offsets (up to 30%), require a robust system capable of multi-layer validation and transparent auditing, which DLT is uniquely suited to deliver.
- **Resolution No. 05/2025/NQ-CP:** This resolution represents another major legal milestone by recognising digital assets as a lawful category of property under the Civil Code. This is significant because it implies that a carbon credit, once verified by MAE and assigned a unique code, could be tokenised and transacted as a legally recognised digital asset, subject to taxation and state supervision.

#### **4.3.5.2 Core legal and policy conflict**

While the above instruments create a foundation, they also introduce a direct and significant legal conflict between two high-level government mandates. This conflict is specifically triggered by the concept of "tokenisation":

- On one hand, Decision No. 232/QĐ -TTg is clear and specific. It designates HNX and VSDC as the sole, centralised entities responsible for establishing and operating the domestic carbon market. This decision envisions a unified, state-controlled market infrastructure.
- On the other hand, Resolution No. 05/2025/NQ-CP, the same resolution that recognises digital assets as property, mandates that these assets may only be traded on a separate,

independent pilot exchange specifically licensed for this purpose, not on existing infrastructures like HNX/VSDC.

This creates a potential policy impasse. If a carbon credit is "tokenised," it would legally be defined as a "digital asset." This leads to an unworkable question: Where should this asset be traded? On the HNX (per Decision No. 232/QĐ-TTg) or on the new digital asset exchange (per No. 05/2025/NQ-CP)?

This ambiguity creates severe risks of regulatory overlap, market fragmentation, and supervisory confusion. It would undermine the unified, centralised market model that Decision No. 232/QĐ-TTg was designed to build and could lead to two parallel, competing markets for the same underlying environmental asset.

#### **4.3.5.3 Compounding legal and international risks**

This core conflict is compounded by several other legal uncertainties that make a tokenisation approach highly risky at this stage:

- Lack of enforceability for smart contracts: The automated programs (smart contracts) that run on DLT are not yet officially recognised under Vietnamese law. This limits the legal enforceability of blockchain-based transactions and creates significant uncertainty for dispute resolution.
- Ambiguous legal nature of carbon credits: The fundamental legal status of a carbon credit itself, whether it is a security, a commodity, or a digital asset, remains ambiguous. This ambiguity creates follow-on risks for taxation, financial regulation, and participant rights.
- Financial control risks: The cross-border nature of DLT creates risks for taxation, anti-money laundering (AML), and financial flow control. Furthermore, the State Bank of Vietnam has not recognised cryptocurrencies as legal payment, ruling out digital currency settlement.
- International integration risks: This is a critical risk. Major international carbon markets (like the EU ETS), aviation compliance schemes (CORSIA), and key voluntary carbon standards (VCMs) have strict requirements for system recognition. If Vietnam's DLT system is not designed in alignment with global standards (ISO 14064-3, Verra), the credits issued from it may not be accepted internationally, defeating a key purpose of the market.

The legal analysis leads to a clear conclusion: full asset tokenisation in the pilot phase is not legally feasible. It would trigger the direct conflict between Decision No. 232/QĐ-TTg and No. 05/2025/NQ-CP and expose the market to numerous unresolved legal and international risks.

The most legally sound, prudent, and feasible path forward is a strategy focused on utilising DLT as a data infrastructure. This approach completely avoids the legal conflict. By using DLT only as a notarised data layer (an audit trail) to support the HNX/VSDC-run market, the carbon credit itself never becomes a "digital asset" to be traded on the pilot exchange. The DLT system acts as a "technological support tool", not as the trading venue itself.

This model achieves two critical goals simultaneously:

- It fully complies with the centralised market mandate of Decision No. 232/QĐ-TTg.

- It fully fulfils the advanced technical requirements for transparency, traceability, and auditability set forth in Decree No. 119/2025/NĐ-CP.

This strategy allows Vietnam to harness the significant governance benefits of DLT while navigating the current, complex legal environment in the safest and most compliant manner.

#### 4.3.6 Technical Readiness and the Risk of System Duplication

While a "tokenisation-first" approach is legally sound in certain contexts, it is technically incomplete for the current pilot framework. Implementing full on-chain logic (ownership, transfer, and settlement) requires a fundamental redesign of the infrastructure currently being developed by HNX and VSDC.

- **Duplication of core infrastructure:** The current CTX design utilises a centralised Trading Engine at HNX and a Clearing & Settlement system at VSDC. Implementing on-chain settlement logic would effectively duplicate the functions of the VSDC Gateway and the Settlement Bank interfaces. This duplication would lead to high operational complexity and potential data discrepancies between the centralised SQL databases and the DLT ledger.
- **Redesign of trade validation:** Under the current model, Article 15, 19, and 23 delegate pre-trade validation (checking funds and unit availability) to Securities Company members. Moving this logic on-chain would require these intermediaries to integrate directly with smart contracts, a capability not currently supported by their legacy FIX-based systems.
- **Settlement and Taxation Implications:** The pilot infrastructure is built for T+0/T+1 DvP handled through designated commercial banks. On-chain settlement requires the issuance of a "Central Bank Digital Currency" (CBDC) or a regulated stable coin for the cash leg, neither of which is currently defined or technically integrated within the SSC's financial supervision framework. Furthermore, current reporting and taxation systems (managed via SSC/MOF) are not equipped to ingest real-time on-chain transaction data for compliance purposes.

#### 4.3.7 Identified Gaps and Recommended Future Studies

Based on the current assessment, the existing platform is not technically prepared for full on-chain tokenisation without a major infrastructural overhaul. To bridge these gaps, future studies should focus on:

1. **Hybrid settlement architectures:** Researching "Legal Wrapper" models where assets are locked in the NRS and represented by tokens for high-speed trading, with final settlement still reconciled by VSDC.
2. **Smart contract interoperability:** Investigating the development of middleware that can translate FIX protocol messages into DLT-compatible smart contract calls.
3. **Digital asset taxation frameworks:** Evaluating how MOF can automate tax reporting for digital carbon assets once the legal nature of "crypto assets" is formally established under the legal framework.

## 4.4 Recommended DLT adoption roadmap for Vietnam's CTX

The analysis in Section 4.3, particularly regarding the significant legal and policy conflicts, demonstrates that a "tokenisation-first" approach is not a feasible or prudent strategy for Vietnam. Instead, a phased, cautious approach is required. This roadmap is designed to navigate the complex legal environment, mitigate risks, and build a strong foundation. It prioritises the use of DLT as a governance and data integrity tool first, before considering its application as a trading infrastructure.

### 4.4.1 Phase 1: Pilot phase (2025-2028) – DLT as notarised data infrastructure

During this crucial preparatory and pilot phase, the immediate priority is to establish full legal certainty and technical system integrity, strictly adhering to Vietnam's existing legal mandates.

- (1) **Primary role of DLT:** In this phase, DLT should be legally recognised and applied primarily as a notarised data infrastructure. Its role is not for trading or asset creation, but to support the centralised, state-managed market.
- (2) **Core function:** The DLT's function should be limited to ensuring the transparent, immutable recording of carbon credit data. This includes hashing MRV data, recording issuance from NRS, and creating a verifiable audit trail for all transfers and retirements. This directly fulfils the technical requirements for "transparency, traceability, and auditability" mandated by Decree No. 119/2025/ND -CP.
- (3) **Strict adherence to Decision No. 232/QD -TTg:** All ownership, trading, and settlement rights for carbon credits must remain exclusively under the control of the NRS and the domestic carbon exchange (HNX/VSDC), in full accordance with the centralised model mandated by Decision No. 232/QD -TTg. The DLT system acts as a supporting ledger to HNX/VSDC, not a replacement.
- (4) **Controlled experimentation (managing No. 05/2025/NQ-CP):** To address the parallel track of No. 05/2025/NQ-CP, any "tokenisation" of carbon credits must be strictly limited. It should only be piloted as a "special category of digital asset" within the separate digital asset sandbox framework. This experimentation must be for technical testing only, must not be connected to the official compliance market, and must be designed to avoid any market fragmentation or regulatory conflict with Decision No. 232/QD -TTg.
- (5) **International alignment:** During this phase, the DLT infrastructure must be designed for alignment with international data standards, such as those used by the CAD Trust, to ensure future interoperability and prevent double counting.

### 4.4.2 Phase 2: Expansion phase (post-2028) – DLT as a "legal wrapper" and complementary infrastructure

This phase can only begin after the domestic carbon market has entered a stable, mature phase and, most importantly, after the legal framework has been fully developed and harmonised to resolve the conflict between Decision No. 232/QD -TTg and No. 05/2025/NQ-CP.

- (1) **Expanded legal recognition:** Once market stability and legal clarity are achieved, the Government may consider expanding the legal framework to recognise a tokenised carbon credit as a "legally representative certificate".

- (2) **"Legal wrapper" model:** This model is critical. The token itself is not the asset. Instead, the token functions as a digital "legal wrapper" that represents a specific carbon credit that is already verified, registered, and "locked" in the NRS. This approach maintains the NRS as the single source of truth while allowing for digital representation.
- (3) **Evolving functionality:** At this stage, DLT can evolve from a simple data infrastructure into a complementary trading infrastructure. This "legal wrapper" model, fully integrated with the HNX/VSDC system, would enable the rapid, secure, and cross-border transfer of carbon credits while remaining compliant with domestic legal requirements. This will form the critical foundation for Vietnam's deeper integration into the global carbon market and the future of digital green finance.

The following figure visualises the DLT adoption roadmap for Vietnam's CTX recommended.



Figure 5: Recommended DLT adoption roadmap for Vietnam's CTX

Source: Compiled by the Consultant

The figure below illustrates the structural integration model of DLT within the CTX ecosystem, highlighting its role as a supporting infrastructure that enhances the current state-managed systems

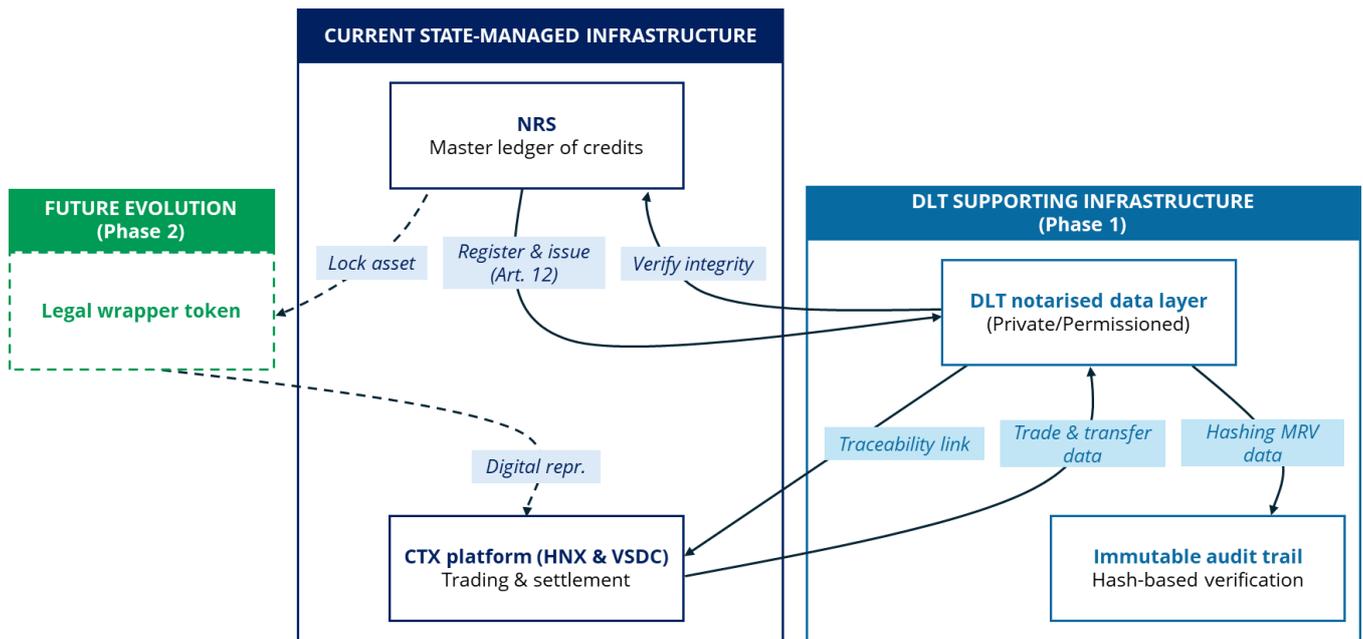


Figure 6: Integration model of DLT into the CTX infrastructure

Source: Elaborated by the Consultant

The proposed model depicts a layered architecture where DLT is integrated not as a replacement, but as a complementary 'notarisation layer' beneath the existing infrastructure. The top layer represents the 'Current State-Managed Infrastructure,' where the NRS remains the definitive master ledger for carbon units, and the HNX/VSDC handle the core trading and settlement functions. As shown in the 'DLT Supporting Infrastructure' (Phase 1), the technology functions as an immutable audit trail that hashes MRV data and issuance records from the NRS to ensure high-level transparency and traceability. This structural approach allows DLT to 'slide in' to support the current system by creating a verifiable data link between the registry and the exchange without altering the legal nature of carbon assets. Furthermore, the figure envisions the Phase 2 evolution, where a 'Legal Wrapper' token is generated by 'locking' verified credits in the NRS, enabling digital representation and potential cross-border transfers while maintaining the NRS as the single source of truth.

## 5 TECHNICAL AND OPERATIONAL GAPS IN THE PROPOSED CTX FRAMEWORK FOR TRANSACTION MANAGEMENT AND SUPERVISION

Building upon the overview of the proposed CTX model in Draft Decree and insights from international practices, particularly China's ETS, this chapter identifies specific technical and operational implementation gaps. While Deliverable 2 addressed broader strategic challenges, the focus here is narrowed to deficiencies within the proposed framework that directly impede the effective processing of transactions, the day-to-day management of market operations, and the robustness of supervisory mechanisms. Identifying these granular gaps is crucial for developing the detailed technical rules and procedures necessary for a functional and credible pilot CTX.

## 5.1 Gaps in transaction processing and data management protocols

Effective transaction processing relies on clear rules and robust data exchange, yet several technical gaps remain in the proposed framework. Firstly, there is a lack of technical specificity for the mandated negotiated transaction workflow. While the pilot phase exclusively uses this method, the Draft Decree does not detail how HNX should technically manage these bilateral agreements within its system to ensure transparency comparable to exchange-based trading. Key missing technical elements that hinder operational clarity include:

- Defined procedures and technical requirements for real-time or near-real-time public disclosure of executed trade details (price, volume), crucial for providing even basic price signals in a market lacking an order book.
- Specific technical protocols within the HNX system for order entry, confirmation matching between bilateral parties, and reporting tailored explicitly for negotiated deals, rather than adapting standard order book logic.

Secondly, the operational integrity of the entire market hinges on the accurate and timely flow of data between MAE's NRS and VSDC's depository system. However, a critical technical vulnerability exists due to the absence of a defined technical protocol or binding Service Level Agreement (SLA) governing this interface. This gap means there are no formal agreements or technical standards specifying:

- API specifications (e.g., data formats, authentication methods) for secure and automated data exchange.
- Mandated frequency and methodology for data reconciliation (e.g., real-time checks vs. batch updates) to ensure consistency between the legal registry (NRS) and the trading depository (VSDC).
- Agreed error handling and system recovery procedures in case of data discrepancies, transmission failures, or downtime affecting either system. Without these technical specifications, the risk of trading invalid units, settlement failures due to data mismatches, or market halts caused by system interface issues is significantly elevated.

Thirdly, the crucial risk control measure of pre-trade validation – ensuring sufficient funds and units exist before order submission – suffers from an unspecified operational sequence and underlying system logic. The Draft Decree mandates the check but doesn't define how the systems (HNX, VSDC, potentially settlement banks) will technically interact to perform this validation synchronously before an order is accepted. This ambiguity creates a risk of failed trades post-execution or potential loopholes if the validation timing and mechanism are not precisely defined and implemented across the interconnected systems.

## 5.2 Gaps in market supervision implementation mechanisms

While the institutional structure for supervision is outlined, significant gaps exist in the technical mechanisms and procedures needed for effective implementation. A primary concern is the lack of defined surveillance parameters and algorithms specifically tuned for CTX risks. Simply leveraging existing securities surveillance infrastructure is insufficient, as carbon markets exhibit different dynamics (compliance-driven behaviour, potential for manipulation around deadlines).

The current framework lacks the necessary technical specification of triggers required to proactively detect potential issues, such as:

- Quantifiable thresholds for concentration monitoring based on market share or position size, essential for identifying potential market power abuse by dominant players.
- Specific algorithms are designed to flag unusual trading patterns (e.g., rapid accumulation, strategic selling, abnormal price impacts) occurring specifically during critical compliance periods.
- Parameters for identifying potentially collusive or non-market price setting within negotiated transactions, given the absence of an open order book.

This technical gap is exacerbated by the lack of codified, actionable definitions for carbon-specific market abuse. Relying solely on the general provisions of Decree No. 156/2020/ND-CP (designed for securities) leaves supervisors without clear, legally grounded definitions for behaviours unique to carbon markets, such as strategic hoarding near compliance deadlines or collusive price manipulation through chains of negotiated trades. This ambiguity hinders the ability of SSC/HNX to consistently identify, investigate, and prosecute such activities.

Furthermore, the effectiveness of the dual-oversight model is fundamentally limited by the absence of a defined operational protocol for correlating MAE-SSC supervisory data. Effective supervision necessitates linking MAE's knowledge of entity compliance status, emissions data, and registry holdings with SSC's real-time trading data. The current framework lacks the technical and procedural specifics for:

- Secure, standardised, and timely data sharing channels specifically designed for supervisory information exchange between MAE and SSC.
- Joint procedures for initiating and conducting investigations based on correlated data triggers (e.g., how an SSC trading alert regarding an entity is cross-referenced with that entity's compliance position reported by MAE). Without this operational protocol, supervisory efforts may remain siloed, reducing the ability to detect sophisticated manipulative schemes that exploit information asymmetries between the environmental and financial domains.

### **5.3 Gaps in the implementation of risk management tools**

Beyond operational risks, the framework lacks technical readiness for implementing essential market-wide risk management tools common in international ETs. While Deliverable 2 highlighted the strategic absence of price stability mechanisms like ARP or CCM, a more immediate implementation gap exists concerning basic volatility controls. Specifically, the proposed HNX system lacks the specified technical functionality to readily implement daily price fluctuation limits (e.g.,  $\pm 10\%$  bands). This capability, standard in markets like China's ETS, is a fundamental tool for managing excessive short-term price swings and preventing destabilising volatility, particularly crucial during the market's initial, potentially thin, trading phase.

Similarly, while the strategic importance of holding limits to prevent market concentration is acknowledged, there is no defined technical mechanism specified within the VSDC/HNX

infrastructure for actually tracking and enforcing such limits. Effective implementation requires specific system functionalities that are currently missing, including:

- The ability to aggregate positions accurately across accounts identified as related (based on clear regulatory definitions and reliable data sources).
- Real-time or near-real-time monitoring of these aggregated positions against the defined limits.
- Automated alert generation or order/transfer blocking capabilities when limits are approached or breached. Without the technical infrastructure to support these functions, any holding limits introduced via regulation would remain largely theoretical and difficult to enforce effectively.

These identified technical and operational gaps primarily relate to the lack of specific procedural details and technical protocols needed to operationalise the framework proposed in Draft Decree effectively. They highlight critical areas where detailed rule-setting, system configuration, and inter-agency technical agreements are urgently required. Addressing these implementation gaps, focusing on the "how" rather than just the "what", is essential to ensure the CTX pilot can manage transactions securely, facilitate transparent price signals (even within negotiated trades), and maintain market integrity through effective supervision from day one. The recommendations in the subsequent chapter will propose concrete technical solutions to bridge these gaps.

## **6 RECOMMENDATIONS FOR STRENGTHENING CTX GOVERNANCE, TRANSACTION, AND SUPERVISION FRAMEWORK**

This chapter presents concrete, actionable technical and procedural recommendations derived from the gap analysis in Chapter 5. These recommendations move beyond the strategic framework outlined in Deliverable 2 and focus on the granular details required to operationalise the CTX pilot effectively, addressing deficiencies identified in transaction processing, data management, supervision implementation, and risk control configuration. The goal is to offer concrete guidance for developing the necessary operational rules, system configurations, and inter-agency working procedures for HNX, VSDC, SSC, and MAE.

### **6.1 Phase 1: Pre-launch and operational readiness (2025 – Q1 2026) – Focus on foundational rules and technical integration**

During this crucial preparatory phase, the immediate priority is to establish full legal certainty and ensure technical system interoperability before trading commences. Following the promulgation of the Decree on the Domestic Carbon Exchange, MAE and MOF should develop and issue a formal "Coordination Regulation". This regulation is essential to formalise inter-agency cooperation and must technically specify secure Data Exchange APIs (defining formats, protocols, required fields) between the NRS and CTX systems, mandate Data Reconciliation Procedures (including frequency and resolution responsibility), and detail Joint Incident Response Protocols for technical failures or data discrepancies. Concurrently, MOF should issue official guidance clarifying the legal nature (covering accounting, tax, collateral treatment) of carbon units to resolve existing ambiguities and provide market certainty.

Technical readiness hinges on seamless system integration. A binding Technical Service-Level Agreement (SLA) must be signed between MAE, HNX, and VSDC. This SLA must define API specifications, performance standards, and crucially, the synchronous query-response logic ensuring HNX confirms unit and fund availability with VSDC before accepting any trade order, based on NRS-reconciled data. HNX and VSDC must complete the development and rigorous testing of their specific CTX modules for negotiated trades and carbon unit depository functions.

Foundational operational rules need to be established promptly. HNX should issue its CTX Trading Rulebook, mandating real-time public disclosure (e.g., within 5 minutes) of executed negotiated trade details and defining the technical sequence for pre-trade validation by members. VSDC must issue its CTX Depository and Settlement Rulebook, detailing procedures for account management, unit depository from NRS, and daily reconciliation reporting to MAE. Furthermore, MOF/SSC should provide technical guidance to operators and members specifying minimum data retention standards (e.g., 10 years) and standardised regulatory reporting formats to ensure auditability and consistent data flow.

## **6.2 Phase 2: Pilot operation and system learning (2026 – 2028) – Focus on market testing, supervision tuning, and risk control implementation**

In the pilot phase, the market will operate based on the negotiated transaction model, with a focus on monitoring performance, ensuring transparency through HNX's real-time disclosure rule, and facilitating system learning. Market supervision capabilities must be actively developed and tuned. SSC and HNX should deploy and operate the market surveillance system, configuring initial alert parameters specific to CTX risks. This includes:

- Implementing compliance-period sensitivity adjustments (e.g., lower alert thresholds 30 days before the deadline).
- Implementing negotiated price outlier alerts (e.g., flag trades  $> \pm 15\%$  from a benchmark).

Internal Standard Operating Procedures (SOPs) for joint MAE-SSC alert handling and investigation initiation based on the Coordination Regulation should be developed and tested. Work should commence on legally codifying specific carbon market abuse definitions (e.g., collusive pricing, compliance-period hoarding) for future regulatory updates.

Foundational risk management tools should be introduced. HNX must ensure its trading system possesses the technical capability for daily price fluctuation limits (e.g.,  $\pm 10\%$ ) and circuit breakers, even if not immediately activated, the SSC, supported by the MOF and MAE, needs to finalise the regulatory definition of "related accounts" and set specific quantitative holding limits. VSDC must then develop and test the system logic for monitoring aggregate positions against these limits, generating internal reports for SSC. Transparency remains vital; HNX should operate the public information dashboard with daily trading data, while MAE provides compliance summaries. A formal mid-term evaluation by the end of 2027 is crucial to assess the technical and operational performance of transaction processing, data reconciliation, supervision, and risk controls, informing adjustments before full operation.

### 6.3 Phase 3: Full operation and integration (from 2029 onward) – focus on scaling, optimisation, and advanced mechanisms

Transitioning to full operation involves scaling transaction methods and optimising supervision and risk management. Based on the pilot evaluation, allowance auctions should be implemented, requiring HNX to deploy a tested auction module (e.g., uniform price format). Consideration should be given to introducing continuous order matching functionality to enhance liquidity.

Supervision and risk management systems must mature. Daily price fluctuation limits and potentially circuit breakers should be fully activated and calibrated based on market data. Holding limits must be actively enforced, supported by VSDC's automated monitoring and reporting to SSC. Surveillance algorithms should be refined, joint MAE-SSC investigation protocols fully operationalised, and carbon-specific market abuse rules and penalties formally codified. Permanent market stability tools like an Auction Reserve Price (ARP) and Cost Containment Mechanism (CCM) should be implemented, with technical triggers configured.

Data management practices should be continuously improved, particularly the NRS-CTX synchronisation, based on SLA reviews. The "data-first" DLT strategy should be implemented, piloting DLT initially to enhance NRS-VSDC reconciliation integrity and create a public audit trail using immutable records, potentially aligning with international standards like CAD Trust.

Implementing these phased technical and procedural recommendations is vital for translating the strategic intent of Draft Decree into a functioning market system. By focusing on specific operational protocols, technical standards for system interoperability, configured parameters for targeted supervision, and enabling the technical infrastructure for risk controls, these recommendations offer a clear path forward for HNX, VSDC, SSC, and MAE. This diligent focus on the "how" during the pre-launch and early pilot phases will build essential market confidence, ensure operational integrity, and lay a strong foundation for the CTX to successfully contribute to Vietnam's ambitious climate goals.

The following figure summarises the recommended implementation roadmap for CTX, captures the transition from foundational technical integration to full market maturity. This phased approach prioritises foundational technical synchronisation between MAE and CTX operators before scaling to advanced market mechanisms.



Figure 7: Strategic implementation roadmap for Vietnam's CTX pilot and expansion

Source; Elaborated by the Consultants

## 7 CONCLUSION

This report has examined the proposed pilot model for the CTX as set out in the Draft Decree, with a specific focus on transaction methods, governance arrangements, and supervision mechanisms. The analysis has been conducted through a systematic assessment of the Draft Decree's provisions, benchmarking them against Vietnam's existing securities-market infrastructure and relevant international ETS practices, while also considering the potential role of advanced digital technologies in supporting market governance.

The assessment confirms that the strategic choice to leverage Vietnam's mature securities market institutions, particularly the HNX for trading operations and the VSDC for depository and settlement, provides a credible and operationally sound foundation for the CTX pilot. This hybrid architecture allows the CTX to benefit from established market infrastructure, operational expertise, and supervisory experience, thereby reducing implementation risks and facilitating a timely launch of the pilot phase.

At the same time, the analysis highlights that a carbon market, especially one designed primarily for compliance and emissions reduction rather than financial investment, presents characteristics and risk profiles that differ materially from conventional securities markets. These differences necessitate specific technical adaptations, clearly defined operational protocols, and tailored supervision arrangements to ensure environmental integrity, market transparency, and orderly trading. This report has therefore focused on identifying areas where existing securities market mechanisms can be directly applied, where they require modification, and where additional carbon specific provisions are needed.

International benchmarking reinforces this conclusion. Experiences from the EU ETS, UK ETS, and China's national ETS demonstrate that while financial market infrastructure and tools are essential for efficient trading and settlement, successful carbon markets rely equally on robust registry integration, clear delineation of regulatory responsibilities, and supervision frameworks adapted to carbon market dynamics. These lessons are directly relevant to the Vietnamese context, particularly given the central role of the NRS managed by the MAE in maintaining the environmental integrity of allowances and carbon credits.

In addition, the assessment of advanced digital technologies indicates that incremental, data focused applications rather than full asset tokenisation offer the most practical and legally feasible pathway in the near term. Such approaches can strengthen data integrity, traceability, and reconciliation across the CTX ecosystem without altering the legal nature of carbon units during the pilot phase.

Overall, this report provides an analytical foundation for understanding how the proposed CTX pilot model operates in practice, where it aligns with established market mechanisms, and where its distinctive features require tailored solutions. By clarifying these issues, Deliverable 4 supports informed decision-making in the finalisation of the regulatory framework and contributes to the broader objective of establishing a credible, well-governed, and operationally robust domestic carbon market in Viet Nam.





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