VIETNAM CARBON TRADE EXCHANGE

PILOT PREPARATION WITH MINISTRY OF FINANCE

Deliverable 4: Assessment of Transaction Methods, Management, and Supervision of Allowances and Carbon Credits Trading on the Carbon Trade Exchange of Vietnam

Jan 2026

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1. Introduction

- ✓ **Objective:** Assess the detailed transaction methods, governance structures, and supervision mechanisms proposed for the CTX
- ✓ **Regulatory basis:** Assessment follows the Draft Decree is released by the MOF on the carbon trade exchange on 27 March 2025.
- ✓ **The research focus on:**
  - Detailed analysis of the transaction methods, governance structures, and supervision mechanisms of the CTX as proposed in the Draft Decree
  - Benchmarking these regulations against Vietnam's securities market mechanisms and international practices to identify potential gaps.
  - Assessing the feasibility and role of advanced digital technologies (such as Blockchain/DLT) in enhancing the transparency and efficiency of the CTX.
  - Providing recommendations to assist the Ministry of Finance in finalising the regulatory framework for the pilot CTX launch.

2. Analysis of Securities-market (1)

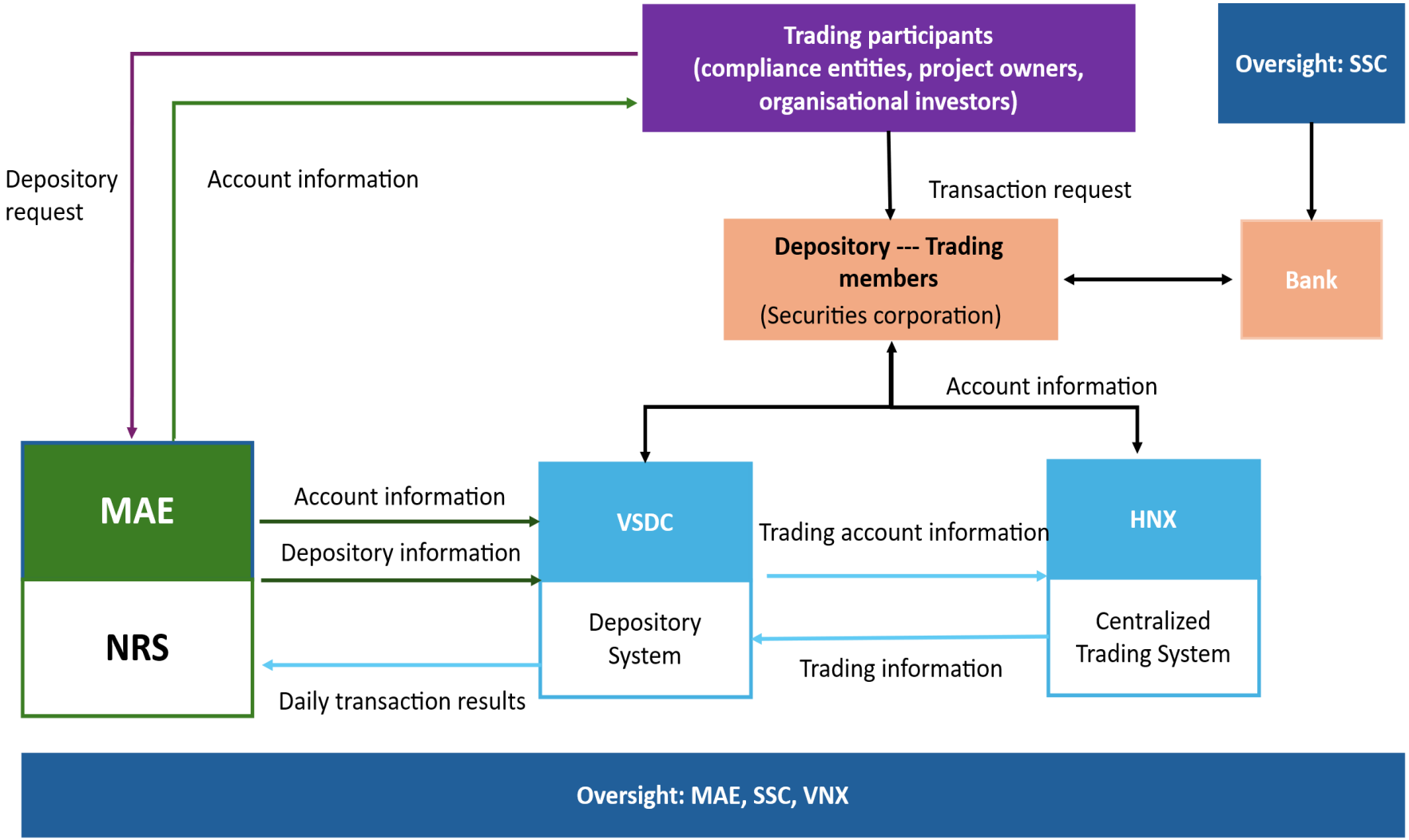
Legal mapping of the Draft Decree on domestic carbon trade exchange

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

2. Analysis of Securities-market (2)

Overview of the proposed CTX model

1. The governance structure proposed for the CTX



2. Analysis of Securities-market (2)

Overview of the proposed CTX model

2. Proposed transaction methods and procedures

Depository process and establishing tradability	• Registration and validation on NRS • Depository at VSDC • Account Management • Withdrawal
Trading procedures	• Exclusive use of negotiated transactions • Mandatory intermendiation • Pre-Trade validation • Trade confirmation and reporting
Clearing and settlement process	• Real-time gross settlement (RTGS) • Delivery versus Payment (DvP) principle • Exclusion of central counterparty (CCP) • Role of settlement banks and VSDC
Ownership transfer	• Upon successful settlement • Daily update the NRS according the VSDC report

2. Analysis of Securities-market (3)

Overview of the proposed CTX model

3. Proposed supervision and oversight framework

Organisation/ Entity	Primary role	Core tasks & responsibilities
MAE	**Primary regulator**	• **Market Supervision:** Lead oversight of trading to detect and handle market manipulation. • **Inspections:** Lead and coordinate joint inspections of market operators. • **Approval:** Provide official opinions on operational rules and surveillance criteria
SSC	**Coordinating financial regulator**	• **Bank Oversight:** Select and supervise settlement banks. • **Coordination:** Participate in joint inspections and provide inputs on financial market practices
VNX	**Parent exchange operator**	• **Rule-making:** Develop detailed surveillance criteria and member regulations. • **High-level Supervision:** Supervise HNX performance and trading members' compliance; report to MAE
HNX	**Trading platform operator**	• **Real-time Monitoring:** Conduct front-line surveillance of trading activities based on VNX criteria • **Disclosure:** Publish end-of-day trading results (prices, volumes
VSDC	**Post-trade oversight**	• **Member Supervision:** Oversee depository members regarding account management and settlement rules. • **Reconciliation:** Report daily balances to MAE to update the National Registry System (NRS)
Reporting Framework	**Information flows**	• **Member → Operator (VNX/VSDC):** Periodic and extraordinary reports. • **Operator → MAE:** Reports on surveillance results and market conditions. • **Bank → SSC:** Reports on payment incidents or issues.

2. Analysis of Securities-market (5)

Overview of the proposed CTX model

4. Proposed risk management and violation handling

Management of settlement and counterparty risk	• Pre-trade validation (Article 15) • RTGS and DvP settlement (Article 16) • Settlement failure handling (Article 17)
Management of operational and conduct risk	• Market suspension authority (Articles 29, 30) • Member discipline (Articles 20, 21, 24, 25) • Prohibition of manipulation (Article 5)
Violation handling and sanctions	• In the absence of specific carbon penalties, the pilot relies on securities administrative sanctions (Decree No. 156/2020/ND-CP) for manipulation and disclosure violations

2. Analysis of Securities-market (6)

Assessment of the securities market mechanism

1. Insitutional mechanisms

Suitable for direct application	Targeted adaptation	Not suitable for direct application
• Operational division of labour among the VNX (rule-setting), HNX (frontline operation), and VSDC (post-trade) • Membership regulation, licensing, technical capability checks, and ongoing supervision of securities companies • Existing supervision channels between the SSC, VNX, HNX, and VSDC	• 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	• 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. Analysis of Securities-market (7)

Assessment of the securities market mechanism

2. Trading mechanisms

Minimal modification	Modification	Not apply
• 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.	• 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.	• 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. Analysis of Securities-market (8)

Assessment of the securities market mechanism

3. Surveillance and enforcement mechanisms

Support tools	Surveillance gaps	Enforcement limitations
• 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.	• 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.	• 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. Analysis of Securities-market (9)

Assessment of the securities market mechanism

4. Gaps and limitations

- ✓ 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.

2. Analysis of Securities-market (10)

Assessment of the securities market mechanism

5. Distinguishing securities market mechanisms from carbon market requirements

Category	Mechanisms transferable from securities market	Carbon market: specific adjustments required	Rationale/ Implications for the CTX
Market access and membership	• Trading and depository members (securities companies). • Standard KYC, client onboarding, custodial account structure.	• Eligibility screening linked to GHG reporting status. • Verification against NRS asset records before enabling trading.	Carbon units must be linked to verified environmental information, not purely financial identity.
Trading mechanisms	• Order recording and confirmation via HNX. • Member-intermediated trade execution.	• Pilot-only negotiated transactions. • Price-anomaly monitoring for bilateral trades.	Thin and compliance-driven market requires bespoke surveillance and validation rules.
Depository and account structure	• VSDC custodial structure and segregated accounts. • Established depository-member operating model.	• Units must be validated in NRS before becoming tradable. • Daily synchronisation of eligibility, cancellation, and surrender status.	Environmental integrity requires NRS as master ledger for carbon units.
Clearing and settlement	• RTGS/DvP settlement with settlement banks. • Straight-through processing between HNX → VSDC → banks.	• Strict pre-trade validation due to absence of CCP. • Fail-trade logic dependent on NRS–VSDC reconciliation.	No CCP increases reliance on validation; environmental mismatch adds new failure modes.

2. Analysis of Securities-market (11)

Assessment of the securities market mechanism

5. Distinguishing securities market mechanisms from carbon market requirements

Category	Mechanisms transferable from securities market	Carbon market: specific adjustments required	Rationale/ Implications for the CTX
Surveillance and market conduct	• Real-time surveillance by HNX; higher-level supervision by VNX. • Member rule-compliance monitoring.	• Additional rules for carbon-specific misconduct (e.g., misuse of offsets, registry-timing exploitation). • Integration of environmental compliance data into alerts.	Carbon markets involve behaviours unrelated to securities trading.
Information disclosure	• End-of-day trading results, member lists, and operational notices.	• Disclosure on unit eligibility, crediting programme recognition, and NRS updates.	Transparency must cover environmental attributes, not just price and volume.
Governance and oversight	• Exchange-based supervisory hierarchy. • SSC oversight of settlement banks.	• Dual MAE–SSC model requiring formal coordination protocols. • MAE authority to suspend trading/depository operations based on environmental risks.	Oversight includes both financial conduct and environmental integrity.
Risk Management	• Standard operational risk controls and IT continuity.	• Position limits, holding limits, and price-stability tools (e.g., price bands). • Mitigation for registry–exchange interoperability risks.	CTX requires stronger risk controls due to thin liquidity and compliance-driven nature.

2. Analysis of Securities-market (12)

Assessment of the securities market mechanism

6. Key lessons for the adaptation of the CTX

- **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

2. Analysis of Securities-market (12)

Adaptation recommendations for the CTX design

(1) Strengthen transaction procedures and market functioning

(2) Enhance integration between CTX infrastructure and the NRS

(3) Strengthen market surveillance and member oversight

(4) Improve settlement resilience and handling of failed trades

(5) Support liquidity and early market development

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

3. International benchmarking (1)

EEX & EU-ETS

EU ETS governance and oversight structure

Governing Body	Level	Core Responsibilities & Mandate
European Commission (EC)	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.
National Competent Authorities (NCAs)	Member State (Environmental Regulator)	Manage 'on-the-ground' implementation, approve MRV plans, manage installation accounts in the SUR, and enforce annual environmental compliance.
ESMA & ACER	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.
National Financial Supervisors (e.g., BaFin)	Member State (Financial Regulator)	Directly supervise financial infrastructures (like EEX) and intermediaries (banks, firms) based in their jurisdiction under MiFID II and MAR rules.

3. International benchmarking (1)

EEX & EU-ETS

Trading mechanisms and commodity flows

Key risk management tools in the EU ETS

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

3. International benchmarking (1)

EEX & EU-ETS

Market abuse prevention

- Prohibition of insider dealing
- Controls on unlawful disclosure
- Prohibition of manipulation
- Real-time surveillance
- Obligations for reporting and recordkeeping

Enforcement mechanisms

- MAR enforcement by financial regulators
- Environmental compliance enforcement
- Exchange-level disciplinary powers
- Cross-agency coordination
- Strong audit and documentation requirements

Market stability mechanisms

- MSR
- Auction safeguards
- Exchange-level volatility controls
- Liquidity support via financial participants

Transparency and public disclosure practices

- Daily market data
- Auction disclosures
- Regulatory publications
- Market notices
- Public access to emissions and compliance data

3. International benchmarking (1)

ICE & UK ETS

Key governance bodies and responsibilities in the UK ETS

Governing body	Institutional type	Core responsibilities & mandate
UK ETS Authority	Joint Political Body (DESNZ, Devolved Admins)	Sets overall strategic direction, determines the emissions cap, and establishes rules for market stability mechanisms (e.g., CCM).
Department for Energy Security and Net Zero (DESNZ)	UK Government (Policy Lead)	Operates a central analytics platform to monitor market activity and stability, aggregating data from the registry, exchange, and clearing house.
Financial Conduct Authority (FCA)	Financial Regulator	Supervises trading conduct under UK Market Abuse Regulation (MAR). Monitors for insider dealing and manipulation, and enforces penalties for market abuse.
Environmental regulators (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.

3. International benchmarking (1)

ICE & UK ETS

UK ETS: Trading Mechanisms & Market Structure

1. Eligible Participants

Compliance Entities (Power/Industry, Aviation) → Financial Internidiaries & Investors → Onoarding (KYC, Registry Account)

2. Trading Products

Spot UKAs (EUA & EUAA) → Derivative UKAs (Futures/Options) → Historic Offset Credits (No Longer Eligible)

3. Trading Platforms & Methods

Primary Auctions (Sealed-bid, ARP £22)

ICE Futures Europe

Secondary Market (Continious Trading Trading)

Negotaized & OTC (Registry Reporting)

4. Specifications & Clearing

Transaction Specifications:
Quotation: GBP/tCO2e,
Tick Size: £001
Contrace: 1 UKA (Spot)
1000 UKA (Derivatives)

Clearing & Settlement (CCP Model:
ICE Clear Europe
IC Clear Europe
Novation, Margining,
T+2 DvP Settlement

Key risk management tools

Market Concentration Limits
25% statatuy cap on auction purchases & total holdings to prevent market cornering

Price Stability Mechanisms
£22 Auction Reserve Price (ARP) & Cost Contamient Mechanism CCM) for price spikes

Central Counterparty (CCP Clearing
ICE Clear Europe: Novation & Margining eliminate coutrarantey risk

Integrated Regulatory Oversight
FCA & DESNZ survellance + secure Registry for operational risks

3. International benchmarking (1)

ICE & UK ETS

Market abuse prevention

- Application of financial-market law
- Carbon-specific safeguards

Enforcement mechanisms

- Compliance-related penalties
- Permit and operational sanctions
- Financial-market sanctions
- CCP-related enforcement
- Integrated investigations

Market stability mechanisms

- Auction Reserve Price (ARP)
- Cost Containment Mechanism (CCM)
- Supply Adjustment Mechanism (SAM)
- Predictable cap trajectory
- Aggregated market data
- Compliance timelines

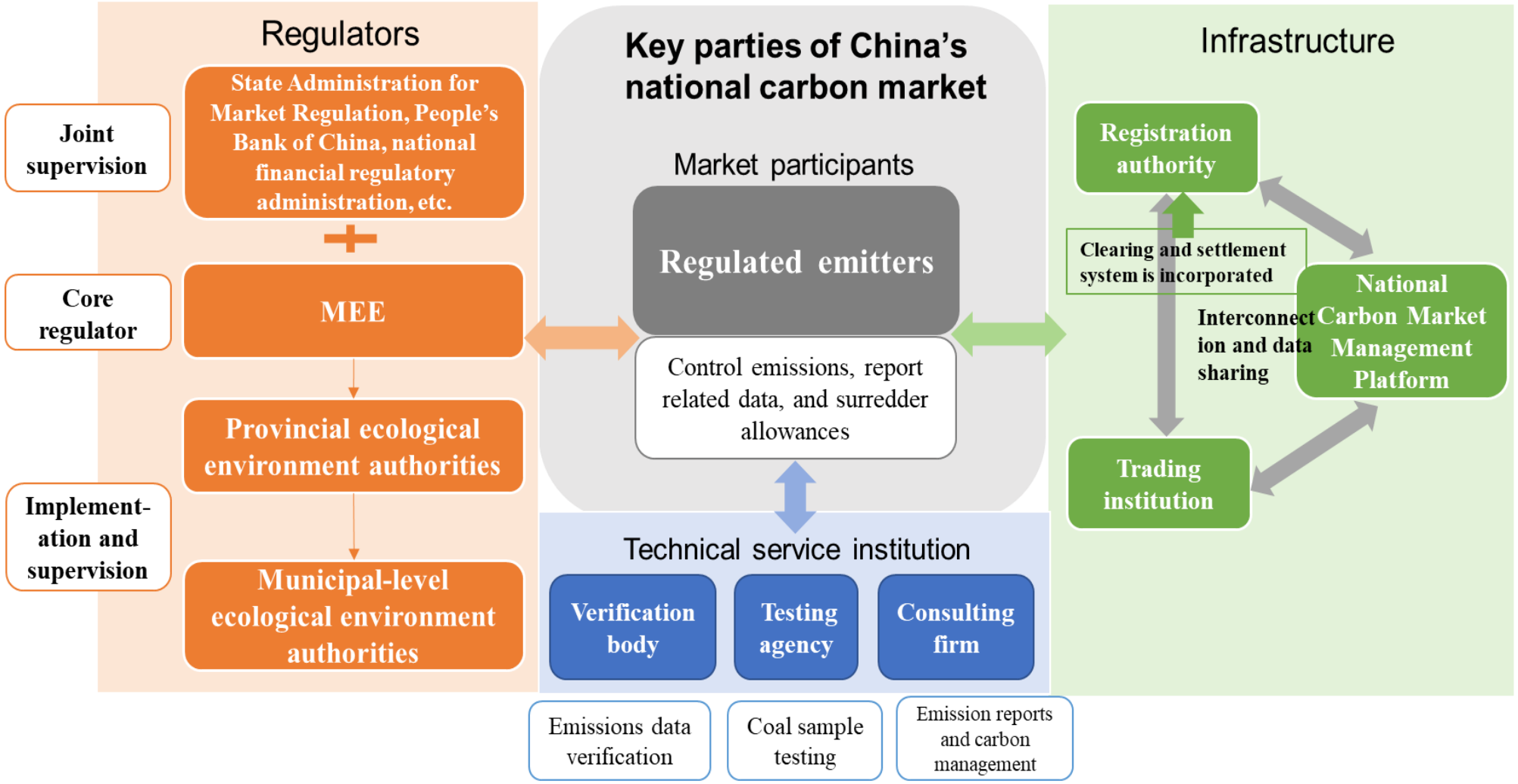
Transparency and public disclosure practices

- Auction transparency
- Supply and cap information
- Market notices and rule changes

3. International benchmarking (1)

SEEE & China ETS

Key parties and responsibilities of China's national carbon market



3. International benchmarking (1)

SEEE & China ETS

Accounts required for participants

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

Trading methods used in the China ETS

- **Negotiated block**
- **One-way bidding (Listing / Posting auctions)**
- **Block trades at administratively guide prices**
- **Role of allocation system in market behaviour**
- **Commodity flow: from allocation to surrender**
- **Price formation and liquidity characteristics**
- **Market stability and administrative price controls**

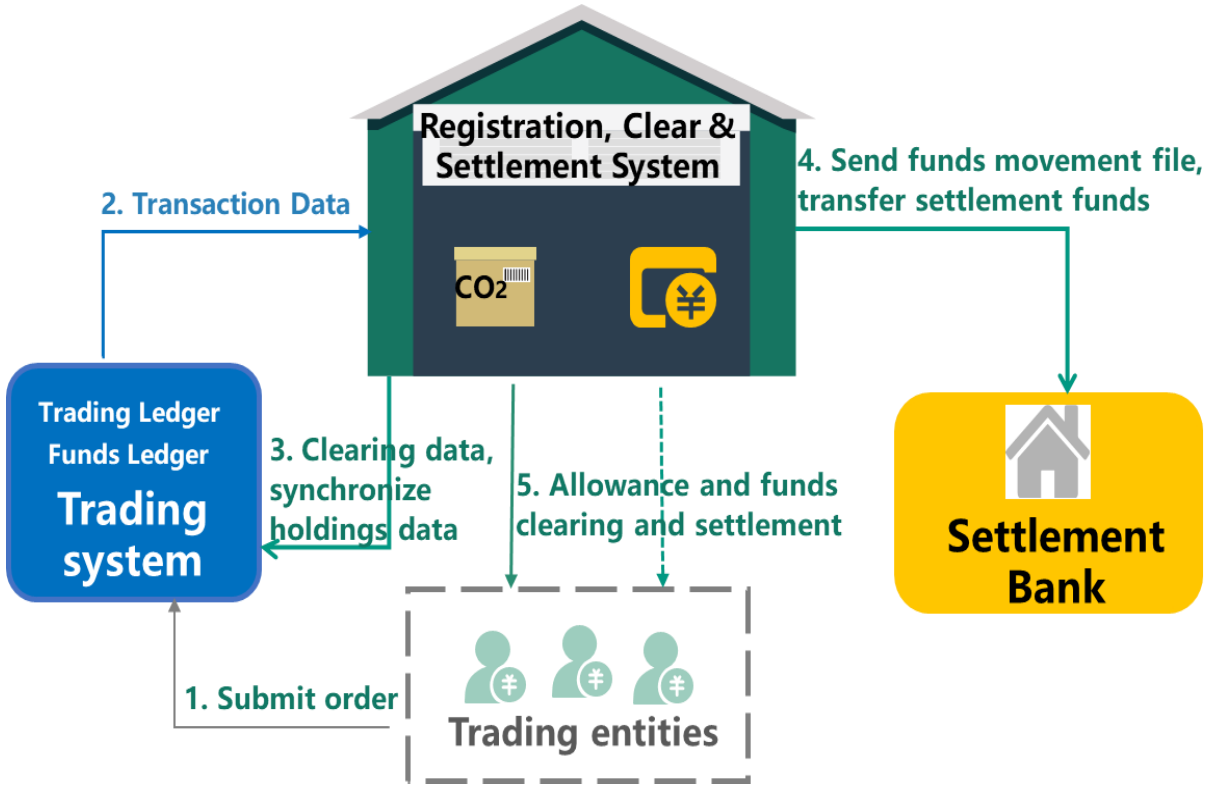
3. International benchmarking (1)

SEEE & China ETS

Risk management framework

- **Position limits and holding restrictions**
- **Transaction caps and order-size controls**
- **Eligibility controls for trading units**
- **Pre-trade validation controls**
- **Verification of buyer's capacity**
- **Automatic rejection of invalid transactions**

China's ETS operates a T+0 settlement model



Settlement failure management

(a) Immediate trade cancellation

(b) Responsibility and penalties

(c) Monitoring and escalation

3. International benchmarking (1)

SEEE & China ETS

Market Stability control

- Daily price fluctuation limits
- Temporary trading suspensions
- Pre-compliance intervention windows

Digital surveillance and environmental integrity control

- Tracking abnormal unit flows
- Monitoring of pre-surrender accumulation, identifying hoarding or strategic withholding
- Cross-checking unit validity with MRV data
- Identifying non-representative negotiated-trade pricing

3. International benchmarking (1)

SEEE & China ETS

Surveillance Architecture

- MEE – Lead authority
- SEEE – Frontline monitoring
- CCERC – Registry surveillance

Market conduct surveillance & Detection of Manipulative behavioir

- Detection of abnormal pricing patterns
- Monitoring for collusive or circular trades
- Pre-compliance manipulation patterns
- Trading by ineligible or non-compliant entities
- Environmental integrity surveillance
- Enforcement mechanisms and disciplinary actions

Transparency and information disclosure

- Publicly disclosed information
- Limited disclosure on MRV and compliance
- Exchange – Regulator – Registry Reporting Loops

4. Assessment of advanced digital technologies

Blockchain and its potential role in CTX

Comparison of blockchain/DLT, P2P networks, and traditional databases

Criteria	Blockchain / DLT	Peer-to-Peer (P2P) networks	Traditional databases
Transparency	Transactions publicly recorded, immutable, and verifiable by all parties.	No historical logging, easily altered.	Centralised data, editable only by administrators, prone to manipulation.
Security	Strong encryption, distributed, tamper-resistant.	Distributed but lacks authentication and access control.	Dependent on central systems, once attacked, the entire dataset is at risk.
Automation	Smart contracts support automatic transaction processing, settlement, and credit retirement.	No business logic support.	Requires manual processing or separate system integration.
Traceability	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.
Scalability	Integrable with multiple international platforms via DID/VC.	Poor integration due to a lack of standardisation.	Integration is limited, dependent on internal APIs.
Operational costs	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.
Processing speed	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.
International interoperability	Easily integrates with global carbon credit markets (Verra, Gold Standard, Toucan, KlimaDAO).	Incompatible with international systems.	Lacks standardisation, hard to align with international systems.
Compliance and auditability	Public transactions, easily auditable and transparent.	No auditability mechanism.	Requires manual audits, prone to errors or fraud.
Long-term reliability	Immutable data, permanent storage.	High risk of data loss or modification.	Risk of data loss or alteration without robust backups.

4. Assessment of advanced digital technologies

Key lessons from international DLT applications in carbon markets

Overview of selected DLT-based carbon platforms

Level	Platform	Management	Objective	Feature
Global	**Climate Action Data Trust** (CAD Trust)	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	**Shanghai Environment & Energy Exchange** (SEEE)	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.
	Macao International Carbon Emission Exchange (MEX)	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.

4. Assessment of advanced digital technologies

Key lessons from international DLT applications in carbon markets

Summary of key lessons learned from international DLT applications in carbon markets

Case study	Model	Key lesson learned	Implication for Vietnam
CAD Trust (Global Metadata Layer)	Global, open-source DLT layer recording *metadata* from major registries.	**DLT for interoperability & double counting prevention:** 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.	**Highly relevant infrastructure:** 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.
SEEE Pilots (China National ETS)	State-run compliance market piloting DLT as a *supplementary reconciliation layer*.	**Pragmatic DLT for existing systems:** 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.	**Highly relevant model:** 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.
MEX (Macao Int. Carbon Exchange)	Corporate-backed "Web3 exchange" focused on tokenising and trading various certificates.	**(Cautionary) Risks of market-led tokenisation:** 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.

4. Assessment of advanced digital technologies

Feasibility, benefit, and risk analysis for Vietnam

Key benefits of DLT adoption for Vietnam's CTX

- **Improved MRV data standardisation**
- **Automated supervision of market stability**
- **Fostering stable, policy-driven demand**

Risks and challenges to be managed

Operational and governance risks

- Cybersecurity & data privacy
- Fraud & fake transactions
- Market & price manipulation
- System & Order-book Disruption
- Governance & integrity

Market and financial risks

- Market viability risk
- Premature tokenisation risk
- Financial control risks

International integration risks

- Strict requirements for transparency and system recognition from international carbon market like EU ETS, CORSIA,...

4. Assessment of advanced digital technologies

Feasibility, benefit, and risk analysis for Vietnam

Technical feasibility

- **Real-time supervisory access and enhanced auditability**
  - Instantaneous auditing
  - Automated surveillance
- **Cybersecurity and systemic resilience**
  - Distributed resilience
  - Data protection
  - Proactive monitoring
- **Strategic management of external technology providers**
  - Open-source standards
  - Sovereign control
  - Operational continuity

Financial feasibility

- **Revenue potential:** Compliance markets generate massive cash flows and stable fee income, as seen in the EU and Beijing.
- **Policy-driven demand:** Success requires policy frameworks that create demand (e.g., Singapore's carbon tax offsets), as technology alone does not guarantee a market.
- **DLT value:** DLT reduces long-term costs by automating data reconciliation and auditing, replacing expensive manual processes.
- **Prudent investment:** A "data-first" approach avoids tokenisation risks and attracts private capital for auxiliary services, lowering the state's fiscal burden.

Legal feasibility

- An emerging legal foundation for DLT
- Core legal and policy conflict
- Compounding legal and international risks

4. Assessment of advanced digital technologies

Recommended DLT adoption roadmap for Vietnam's CTX

Recommended DLT adoption roadmap for Vietnam's CTX

Phase 1: Foundation
2025–2028

- **Audit trail approach:** DLT functions primarily as an immutable notary to record the lifecycle of carbon units, from MRV hashing to final retirement, fulfilling the transparency requirements of Decree No. 119/2025/ND-CP.
- **Operational control:** All trading and settlement rights remain centralized under the HNX and VSDC.
- **Sandbox testing:** Any tokenization is strictly limited to technical testing within a sandbox environment, ensuring no interference with the official compliance market.

Integration Milestone

Expansion to Phase 2 depends on resolving current legal conflicts (specifically between Decision No. 232/QD-TTg and Resolution No. 05/2025/NQ-CP) and achieving overall market stability.

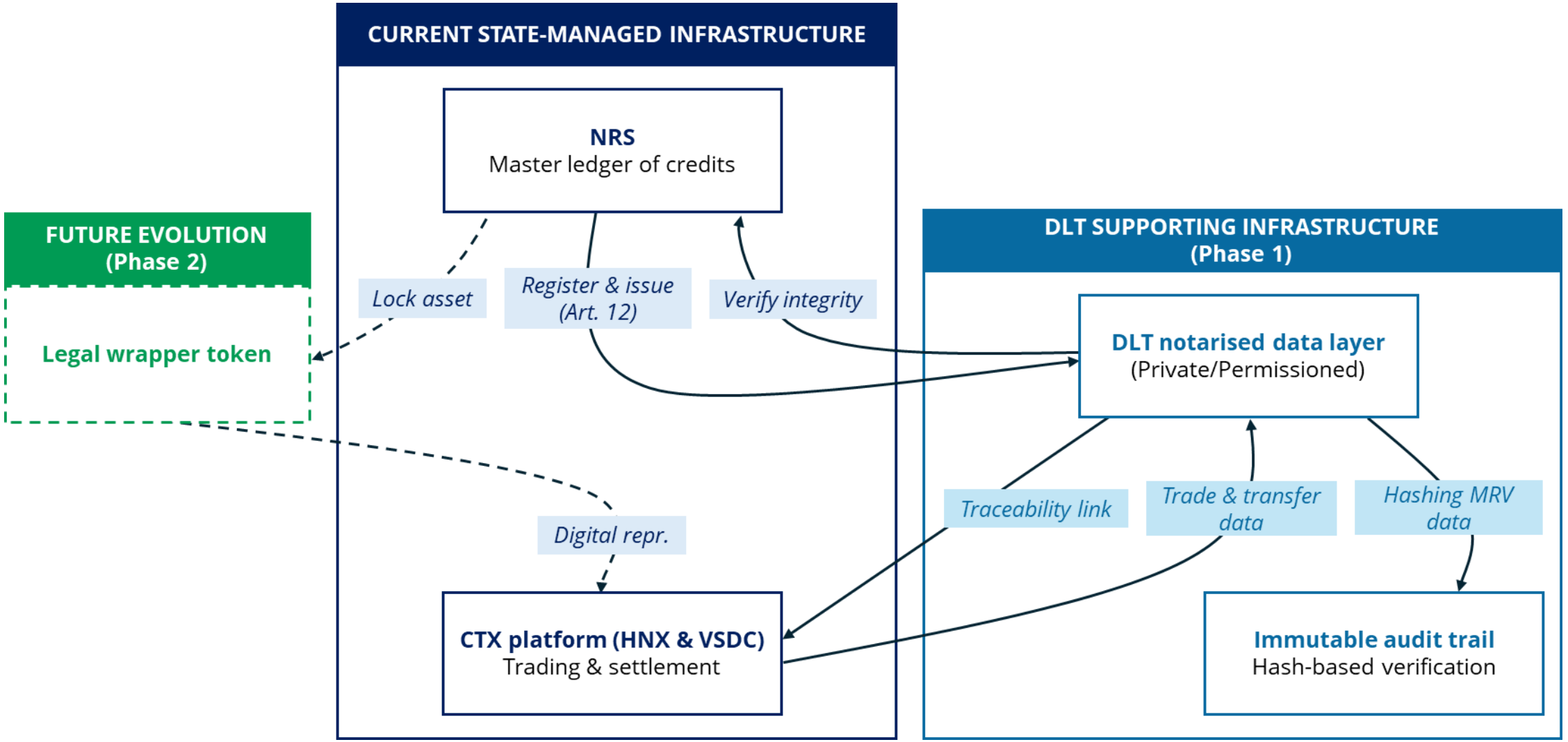
Phase 2: Digital Transformation
Post-2028

- **Legal wrapper innovation:** Tokens will act as digital representatives for physical credits verified and locked in the NRS . This allows the NRS to remain the master ledger while leveraging DLT for speed and security.
- **Financial evolution:** DLT matures into a complementary infrastructure that enables seamless, cross-border transfers and integrates Vietnam into the global green finance ecosystem.

4. Assessment of advanced digital technologies

Recommended DLT adoption roadmap for Vietnam's CTX

Integration model of DLT into the CTX infrastructure



5. Technical and operational gaps

Transaction processing and data management protocols

- **Vague Negotiated trade workflow:** There are no defined technical protocols for bilateral order matching or real-time public disclosure of trade details (price, volume).
- **Undefined NRS–VSDC integration:** The system lacks specific API standards and binding Service Level Agreements (SLAs) to govern the secure, automated flow and reconciliation of data.
- **Unspecified pre-trade validation:** The technical sequence and system logic for checking funds and units before order acceptance remain undefined, risking trade failures.

Market supervision implementation mechanisms

- **Surveillance gaps:** Lack of specialised algorithms and thresholds to detect manipulation during compliance deadlines or within negotiated trades.
- **Legal gaps:** Absence of clear, legally grounded definitions for carbon-specific abuses like strategic hoarding or collusive pricing.
- **Coordination gaps:** Missing operational protocols and secure channels to sync environmental compliance data (MAE) with financial trading data (SSC).

Implementation of risk management tools

- **Absent volatility controls:** HNX lacks the technical capacity to enforce daily price limits (e.g., ±10% bands).
- **Non-existent holding enforcement:** VSDC/HNX cannot aggregate related accounts or automate blocks to prevent market concentration.
- **Lack of operational detail:** The framework defines goals ("what") but misses the specific protocols and configurations ("how") needed for execution.

6. Recommendation

Strategic implementation roadmap for Vietnam's CTX pilot and expansion

Phase 1: Pre-launch and operational readiness (*2025 – Q1 2026*)

The focus is on establishing legal certainty and technical interoperability:

- **Coordination:** MAE and MOF issue a Coordination Regulation to formalize inter-agency data exchange APIs and reconciliation procedures.
- **Integration:** A binding Technical SLA defines the synchronous logic for HNX to confirm unit/fund availability with VSDC before accepting trade orders.
- **Frameworks:** HNX and VSDC finalize their specific rulebooks and test the negotiated trade and depository modules.

Phase 2: Pilot operation and system learning (*2026 – 2028*)

The focus shifts to market testing and tuning oversight capabilities:

- **Surveillance:** Deployment of surveillance systems with alert parameters specifically tuned for carbon risks (e.g., hoarding near compliance deadlines).
- **Risk controls:** Finalizing holding limits for related accounts and developing system logic in VSDC to aggregate and monitor these positions.
- **Transparency:** Operation of public dashboards to provide daily trading data and compliance summaries.

Phase 3: Full operation and integration *(2029 onward)*

Transitioning to a mature, high-liquidity market:

- **Expansion:** Introduction of allowance auctions and continuous order matching functionality.
- **Stability:** Full activation of permanent tools like Auction Reserve Prices (ARP) and Cost Containment Mechanisms (CCM).
- **Innovation:** Implementation of the "data-first" DLT strategy to create an immutable audit trail for NRS-VSDC reconciliation.

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