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CLIMATE–ENERGY POLICY IN VIETNAM, 2010–2025: AN ASEAN COMPARISON AND A MEKONG DELTA CASE STUDY

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Abstract
Vietnam is accelerating its climate and energy transition but faces three bottlenecks: congestion in the electricity transmission grid and insufficient system flexibility; unstable price and contract signals; and limited coverage and quality of measurement, reporting, and verification alongside an underdeveloped carbon market. Drawing on qualitative analysis of legal texts, national plans, and policy processes, combined with descriptive data, the study proposes a dashboard of annual indicators and an eighteen-to-thirty-six-month roadmap: prioritize grid expansion and ancillary services; implement a transparent auction schedule with standardized long-term power purchase contracts; and launch an early-stage carbon market that is compatible with the European Union's Carbon Border Adjustment Mechanism. These measures aim to strengthen policy credibility, lower the cost of capital, and improve social and economic outcomes.

Keywords: policy mix; power auctions; measurement–reporting–verification; carbon market; just transition.

1. Introduction

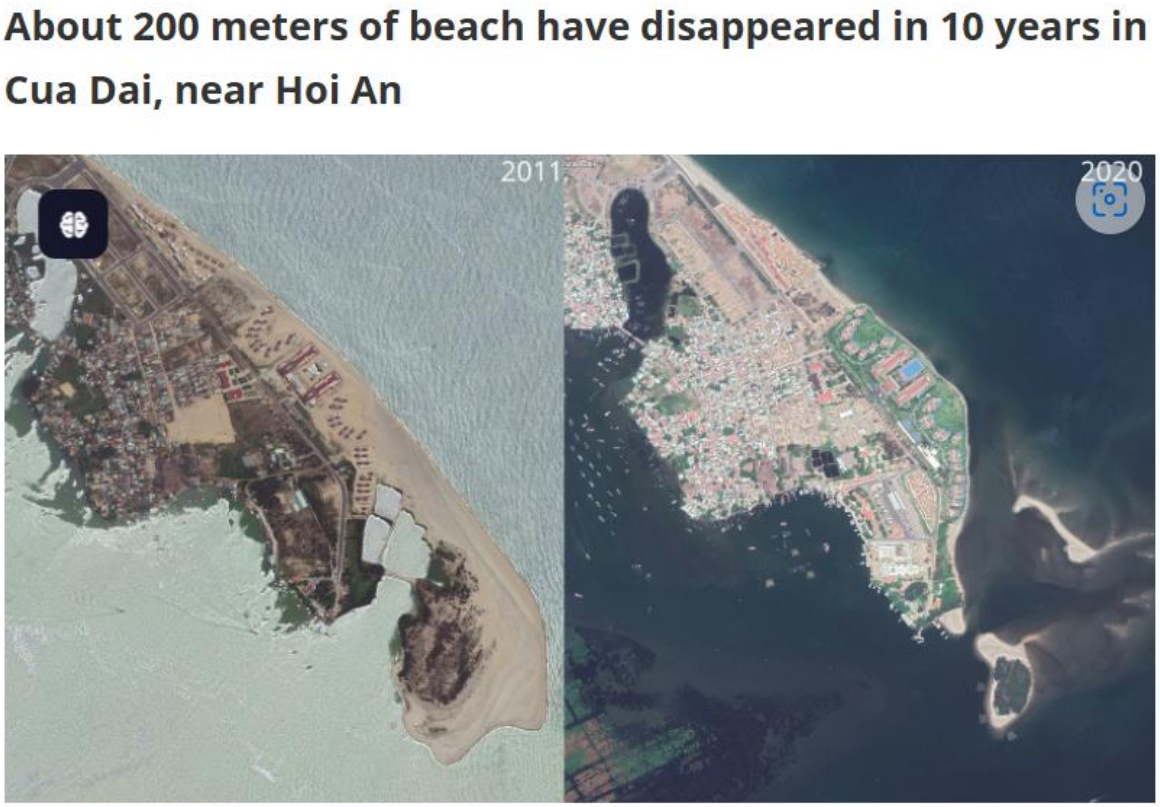
Over the past decade, Vietnam has emerged as a fast-growing, export-oriented manufacturing economy while remaining among the countries most vulnerable to climate impacts—especially in the Mekong Delta, where saltwater intrusion, drought, and land subsidence have intensified rapidly. Recent scientific assessments by the Intergovernmental Panel on Climate Change (IPCC) emphasize that the window to keep global warming "well below 2 °C" is closing quickly, requiring countries to reduce emissions and strengthen adaptation simultaneously and systematically (IPCC, 2023). In Vietnam, the severe saltwater intrusion in 2016 affected more than 1.4 million hectares of cropland in the Mekong Delta and disrupted the livelihoods of about 3 million farmers—an early signal of climate shocks likely to recur with greater intensity in the future (WBG, 2020).

Meanwhile, Vietnam's energy-related emissions trajectory has continued to rise, reflecting the typical "energy–climate security" challenge of a newly industrializing economy. In 2024, coal-fired power generation and associated emissions reached record highs amid drought-driven declines in hydropower and surging electricity demand, even as wind output hit a new peak (Maguire, 2024). International datasets (EDGAR/Our World in Data) document the recent increase in CO_2 emissions and in the carbon intensity of Vietnam's energy system, reinforcing the argument that climate–energy policy must pursue structural transformation rather than incremental fixes (EDGAR).

In response, Vietnam has gradually assembled a multi-level policy mix: (i) updated its Nationally Determined Contribution (NDC) in 2022, reaffirming net-zero emissions by 2050; (ii) approved Power Development Plan VIII (PDP8) in May 2023 as the backbone of

the energy transition; (iii) released the Resource Mobilisation Plan for the Just Energy Transition Partnership (JETP RMP) in December 2023; and (iv) issued Decree No. 06/2022/ND-CP on greenhouse-gas mitigation, ozone protection, and the development of a domestic carbon market (UNFCCC, 2022). Notably, on 15 April 2025 the Prime Minister signed Decision No. 768/QD-TTg, adjusting PDP8 and replacing Decision No. 500/QD-TTg, with updated generation structure and development directions intended to safeguard energy security while accelerating the share of renewables (Thủ tướng chính phủ, 2025a). On the market-based instruments track, Vietnam launched the pilot phase of an emissions trading system (ETS) in mid-2025, allowing up to 30% compliance through eligible carbon credits, and plans to operate a pilot carbon exchange prior to full market operation by 2029 (Reuters, 2025).

Despite this emerging toolkit, three research gaps remain. First, much policy documentation centers on targets and plans but rarely quantifies the coherence and credibility of the policy mix over time, even though international scholarship on policy mixes for sustainability transitions emphasizes strategy–instrument–process components and the attributes of the mix as a whole (Rogge & Reichardt, 2016). Second, Vietnam's polycentric governance—involving multiple ministries, tiers of government, state-owned and private firms, and development partners—creates implementation constraints that align with theory but are seldom measured through operational indicators (Ostrom, 2009). Third, the two-way linkages between mitigation (clean power, ETS, price signals) and adaptation (water infrastructure, climate-smart agriculture) in a high-risk region such as the Mekong Delta—which faces both saltwater intrusion and subsidence from groundwater extraction—have not been described using an impact–intervention–outcome framework that can be tracked annually (WBG, 2020).



*Source: Google Earth (*WBG, 2020*)*

This article addresses the above gaps by positioning Vietnam as a case study of the "evolution of the climate–energy policy mix in a polycentric context" over 2010–2025. Specifically, we combine: (i) qualitative analysis of legal, planning, and strategic documents (laws, decrees, decisions, master plans, the JETP Resource Mobilisation Plan, the Nationally Determined Contribution, etc.); and (ii) secondary quantitative extraction from international datasets (EDGAR/Our World in Data), market and industry reports (e.g., Reuters, OPIS, Vietstock), and official materials (the Ministry of Industry and Trade, the Government, UNFCCC) to illustrate trends and triangulate claims. The study is primarily qualitative; quantitative data are used descriptively for cross-checking the robustness of arguments, without original causal estimation.

Conceptually, we propose a "three-nexus" lens as an interdisciplinary reading of Vietnam's climate–energy policy mix:

(1) Grid and system flexibility (investment in transmission and distribution, ancillary services, and storage) to absorb rapid growth in renewables;
(2) Prices and contracts (auctions/contracts for difference and direct power purchase agreements) to reduce revenue risk and improve bankability;
(3) MRV/ETS and the carbon market as a central signal that links cross-sector mitigation, supports capital allocation, and manages transition risks. This framework speaks to international literature on policy mixes and polycentric governance while being calibrated to Vietnam's institutions and power-system structure. (Rogge & Reichardt, 2016)

Accordingly, the article pursues three research objectives:

(i) Reconstruct the evolution of Vietnam's climate–energy instruments during 2010–2025 and identify regime shifts (FiT → auctions, PDP8 → adjusted PDP8, ETS launch). (Thủ tướng chính phủ, 2025a)

(ii) (ii) Provide descriptive measurement of the coherence of the policy mix across the three nexuses using a set of publicly collectible indicators, thereby diagnosing implementation barriers specific to grid–contracts–MRV. (iii) Develop a Mekong Delta case study to illustrate the impact–intervention–outcome logic under high climate risk, mapping policy linkages between mitigation and adaptation (e.g., water regulation, crop switching, distributed clean power). (WBG, 2020)

The article makes three contributions. First, empirically, we systematize the core policy milestones (NDC 2022; PDP8 2023; adjusted PDP8 2025—Decision No. 768; Decree No. 06/2022; the 2025–2029 ETS roadmap and pilot carbon exchange) and provide links to official/reputable sources to enable replication. (UNFCCC, 2022) Second, methodologically, we propose a descriptive indicator set for the three nexuses—an intermediate step toward measuring coherence/credibility in the spirit of Rogge & Reichardt (2016) for an emerging-economy context. (Rogge & Reichardt, 2016) Third, for policy, we derive design implications for the next 18–36 months (auctions/CfD, assured grid and storage operation, standardized MRV and ETS pilot rules) under Vietnam's implementation constraints and the coordination demands of polycentric governance. (Ostrom, 2009)

The remainder of the paper is structured as follows: Section 2 reviews Vietnam's context and the evolution of the climate–energy policy mix; Section 3 analyzes implementation challenges through the three-nexus lens; Section 4 offers a criteria-based ASEAN comparison; Section 5 presents the Mekong Delta case study; Section 6 discusses contributions to the academic literature; Section 7 outlines short- to medium-term policy implications; and the conclusion addresses limitations and future research.

2. Vietnam's Climate–Energy Context and Policy

Context: rapid emissions growth, international commitments, and energy security needs

Over the past decade, Vietnam has had to meet the demands of fast industrial growth while honoring increasingly ambitious climate commitments. Absolute CO_2 emissions rose sharply from about 200 $MtCO_2$ in 2015 to roughly 370 $MtCO_2$ in 2023 (estimate), reflecting a surge in coal consumption and electricity use for export-oriented industry (Ritchie & Roser, 2020). Internationally, Vietnam submitted an updated Nationally Determined Contribution (NDC) in 2022, raising its unconditional reduction target from 9% to 15.8% and its conditional target (with international support) to 43.5% below the business-as-usual scenario by 2030, while affirming net-zero emissions by 2050 (Socialist republic of Viet Nam, 2022). Domestically, the Law on Environmental Protection 2020 established, for the first time, a legal basis for organizing and developing a domestic carbon market (Article 139), paving the way to legislate and implement market-based instruments such as measurement–reporting–verification (MRV), allowance allocation and trading, and offsetting (The National Assembly, 2020).

On the energy side, after a period of feed-in tariffs, Vietnam had installed over 16 GW of solar and around 5 GW of wind by end-2022; however, coal still dominates the power system, and in 2024 coal-fired electricity output was estimated at about 50% of total generation based on import and plant operation data. Rapid renewable growth, combined with grid constraints, led to significant curtailment during 2020–2022 (EREA & DEA, 2024). Regarding finance, the Just Energy Transition Partnership (JETP) announced an initial USD 15.5 billion Resource Mobilisation Plan at COP28 (12/2023) to guide priority projects, policy reforms, and financing mechanisms that support clean power and social equity (Giang, 2023).

The upshot is a need to combine market- and price-based instruments (auctions, long-term contracts, direct power purchase agreements, carbon pricing) with planning and public investment (transmission grid, storage), while mainstreaming just transition considerations—an approach consistent with policy-mix frameworks for sustainability transitions and polycentric governance.

Climate–energy policy (2010–2025): from feed-in tariffs to auctions–DPPA, and building a carbon-market framework

From 2011–2018, technology-specific feed-in tariff decisions (wind Decision 37/2011, revised by Decision 39/2018; solar Decision 11/2017 and Decision 13/2020) triggered an investment wave but also created "boom-and-bottleneck" grid risks. From 2019–2022, the focus shifted to institutional and infrastructure consolidation: preparation of Power Development Plan VIII (PDP8) and adoption of the 2020 Environmental Protection Law to ground MRV/Emissions Trading System (ETS), alongside recognition of curtailment challenges. From 2023–2025, the policy mix became more complete: PDP8 (Decision 500/2023) set the source-and-grid trajectory; adjusted PDP8 (Decision 768/2025) updated the generation mix and implementation mechanisms; Direct Power Purchase Agreements (DPPA) were formalized via Decree 80/2024 and then Decree 57/2025 (replacing and completing the framework); and Decision 232/2025 approved the carbon-market roadmap linked to ETS. According to recent regulations and trade press, the ETS pilot launched in August 2025, targets full operation by 2029, and allows up to ~30% compliance through eligible carbon credits in the initial phase (ICAP, 2025). See Table 1.

Table 1. Key milestones organized along three policy lanes: (i) targets and planning; (ii) clean-power investment instruments; and (iii) carbon pricing / ETS

Year	Instrument / Policy	Policy lane	Focus & main effects
2011	Decision No. 37/2011/QD-TTg (original) on wind-power support; amended by Decision No. 39/2018/QD-TTg increasing the wind FiT	Clean-power investment	Established technology-specific **feed-in tariffs (FiT)** for wind; the 2018 amendment raised FiT to spur wind investment ahead of the 11/2021 deadline.
2017	Decision No. 11/2017/QD-TTg — solar FiT (US¢9.35/kWh)	Clean-power investment	Triggered a 2018–2020 photovoltaic boom; resulted in curtailment due to grid congestion.
2020	Decision No. 13/2020/QD-TTg — second-phase solar FiT	Clean-power investment	Continued to stimulate rooftop and utility-scale solar to 12/2020.
2020 (in force 2022)	**Law on Environmental Protection 2020** — Article 139 on the carbon market and MRV (measurement–reporting–verification)	Carbon pricing	Established the national legal basis for an **emissions trading system (ETS)** and offsets.
2022	**Updated NDC 2022** — targets of 15.8% (unconditional) and 43.5% (conditional) below BAU by 2030	National targets	Raised ambition and provided a basis for sectoral allocation of targets.
2022	**Decree No. 06/2022/ND-CP** on GHG mitigation and ozone protection	Carbon pricing	Set requirements for GHG inventories, mitigation planning, and the roadmap for a domestic carbon market.
2023	**PDP8** — Decision No. 500/QD-TTg	Planning & investment	Defined the generation–grid mix to 2030/2050; prioritized transmission and clean power.
12/2023	**JETP — Resource Mobilisation Plan (USD 15.5 bn)** announced at COP28	Finance & reforms	Outlined priority investment pipeline and policy reforms to ensure a just energy transition.
7/2024 → 3/2025	**Decree No. 80/2024 on DPPA**, replaced by **Decree No. 57/2025**, refining two DPPA models (via national grid and dedicated lines)	Power-market design	Opened **direct power purchase agreements (DPPA)** between renewable generators and large consumers; created stable demand for clean power.
1/2025	**Decision No. 232/QD-TTg** — Scheme for establishing and developing the carbon market	Carbon pricing	Set the ETS pilot from **6/2025**, targeting full operation by **2029**.
6/2025	**Launch of the ETS pilot (2025–2029)**; some localities (e.g., Hai Phong) pilot credit trading platforms	Carbon pricing	Pilots intensity-based allowance allocation and credit trading; prepares data systems and market infrastructure.

Year	Instrument / Policy	Policy lane	Focus & main effects
4/2025	**Adjusted PDP8** — Decision No. 768/QD-TTg, with MOIT implementation guidance	Planning & investment	Updated generation mix and grid build-out; clarified investor selection and more flexible planning coordination.

Current policy components and degree of "coherence"

First, targets and planning. The 2022 NDC raises 2030 ambition, while PDP8 and adjusted PDP8 (2025) specify the 220–500 kV generation–grid configuration, enhance system flexibility, and diversify sources (renewables, liquefied natural gas, storage) to align with the 2050 goal. (Socialist republic of Viet Nam, 2022) Second, the power market and investment mobilization. Vietnam is shifting from feed-in tariffs to auctions/negotiated power purchase agreements and direct power purchase agreements (DPPA) between renewable generators and large consumers to create stable demand for clean power; however, grid congestion, payment risks, and debates over retroactivity during the transition indicate the need for standardized PPAs, grid-congestion risk-sharing, and predictable auction calendars. (Government of Vietnam, 2024) Third, carbon pricing. Decree 06/2022 and subsequent decisions/guidance set out the ETS roadmap (pilot in 2025, toward full operation in 2029), with initial free allocation and offset limits to help firms acclimate. (Programme, 2025)

Benchmarking against the academic policy-mix framework—consistency between goals and instruments, a balance of demand-pull and technology-push, and credible, predictable policies—Vietnam's structure shows clear improvement after 2022 owing to adjusted PDP8 + DPPA + ETS; nevertheless, grid bottlenecks and policy/contract credibility remain decisive variables for overall effectiveness.

Three policy "nexuses" to tighten in the coming period

First: grid and system flexibility. Establish binding KPIs for 220–500 kV corridors linked to North–Central–South renewable clusters; issue a procurement framework for ancillary services (frequency/voltage control); and incentivize battery energy storage systems (BESS)/demand response to reduce curtailment. Recent scenario analyses underline storage and balancing needs through 2030. (KPMG, 2025)

Second: a competitive power market with predictable auctions/DPPA. Publish an annual auction schedule, adopt technology-specific standard PPAs, and implement grid-congestion risk-sharing; Decree 57/2025 now provides a full DPPA framework (via the national grid or dedicated lines), creating stable demand for clean power and lowering transaction costs. (Fulbright, 2025) Third: carbon pricing with interoperability and broad coverage. Finalize sector-specific MRV standards, operate the national registry, and ensure data interoperability so the ETS aligns with consignment-level reporting required in export markets; in parallel, codify high-quality offset rules (about 30% limit in the pilot) to avoid "paper" emissions reductions. (Ministry of Agriculture and Environment of Vietnam, 2025)

3. Implementation challenges through the "three-nexus" lens

Viewed through Vietnam's transition pathway, the three nexuses—(i) grid & system flexibility, (ii) prices–contracts (auctions/CfD, DPPA), and (iii) MRV/ETS & the carbon market—are not discrete toolboxes but interlocking links that determine the overall coherence of the policy mix. On the ground, the post-FiT surge of renewables placed immediate pressure on transmission: in 2020 alone, an estimated 4.16% of solar output (about ~400 million kWh) was curtailed due to grid congestion—an emblematic "physical bottleneck" when new capacity grows faster than evacuation capability. (Cuong & Duong,

2021) Accelerating the 500 kV Circuit-3 projects—the Quang Trach–Pho Noi corridor with four segments (Quang Trach–Quynh Luu; Quynh Luu–Thanh Hoa; Thanh Hoa–Nam Dinh 1; Nam Dinh 1–Pho Noi)—signals an effort for the grid to "catch up" with the spatial expansion of new generation. Yet right-of-way clearance, inter-regional coordination, and technical standards for ancillary services/storage remain binding constraints. (VietnamEnergy.vn, 2023) The adjusted PDP8 (Decision No. 768/QD-TTg, 15 April 2025) therefore functions as a "feasibility update" to re-align source–grid timelines with system-balancing needs; however, its effectiveness ultimately hinges on project delivery capacity and transparent procurement at implementation level. (Thủ tướng chính phủ, 2025a)

The second nexus—prices and contracts—is shifting from blanket FiT incentives to predictable competitive signals (auctions/CfD, DPPA). Decree No. 57/2025/ND-CP (3 March 2025) formalizes direct power purchase between renewable plants and large consumers under two models (via the national grid and via dedicated connections), thereby opening a stable-demand channel for clean power while, if well executed, easing fiscal pressure and EVN's "contract congestion" risks. (Chính phủ, 2025) In parallel, the FiT-to-market transition has exposed policy-credibility risks: investor letters in 2025 flagged concerns about retrospective adjustments/deductions for some wind–solar projects, threatening confidence, raising the cost of capital, and delaying investment decisions just when the system needs to lock in long-term clean-power costs. (Guarascio, 2025) This underscores that having a mechanism is necessary but insufficient; a predictable annual auction calendar, technology-specific standard PPAs, and grid-congestion risk-sharing are needed to bring revenue risk to financeable levels—especially in northern load clusters, where DPPA can help balance regional supply–demand. (…)

The third nexus—MRV/ETS & the carbon market—is moving from legal design to pilot operation. The legal spine—Law on Environmental Protection 2020 (foundation for the carbon market) and Decree No. 06/2022/ND-CP on GHG mitigation—has been operationalized through Decision No. 01/2022/QD-TTg (Thủ tướng Chính phủ, 2022b)(updated by Decision No. 13/2024/QD-TTg) that lists entities subject to facility-level GHG inventories, thereby defining the "regulated universe" for MRV. A key institutional turn came on 24 January 2025 with Decision No. 232/QD-TTg, approving the Scheme to establish and develop the carbon market, assigning MONRE to lead governance and HNX to operate the exchange, and setting a pilot ETS from 2025 toward full operation before 2029—a design aligned with international carbon-pricing norms yet calibrated to Vietnam's emissions structure. (Thủ tướng Chính phủ, 2025b) The crux lies in MRV quality and offset rules: weak measurement–reporting–verification risks "paper reductions," while narrow ETS coverage blunts price signals for investment. Given Vietnam's deep supply-chain ties with the EU, ensuring CBAM compatibility from 2026 requires shipment-level emissions data granular enough to credit domestic carbon pricing at the border. (European Commission, 2024)

These three interfaces interact bidirectionally and amplify one another. The grid–flexibility (G) interface determines how far contracts (P) are realized in practice—if grid congestion persists, auctioned/DPPA capacity remains on paper. Conversely, a credible price–contract mechanism creates return signals for private capital to move first into storage infrastructure, demand response, and ancillary services (provided the regulatory framework allows cost recovery). At the system level, ETS/MRV (M) serves as the "central signal" linking the pieces via a carbon price and compliance obligations, enabling firms to optimize their investment portfolios (clean power, energy efficiency, on-site generation) under regulatory constraints; at the same time, it forges an institutional "bridge" to CBAM

requirements in key export markets. Therefore, to track how well the policy mix "meshes" over time, this study proposes a set of descriptive indicators that can be collected from open sources and official reports: (i) on the grid–flexibility side, track renewable curtailment rates, the length of completed 500-kV lines, and storage MW/volume of ancillary services; (ii) on the price–contract side, track MW awarded per year under auctions/CfD, the number and value of DPPA contracts, on-time payment rates, and procurement transparency; (iii) on the MRV/ETS side, track the share of emissions covered by MRV/ETS, ETS/eligible credit trading volumes, and the share of CBAM-exposed firms with compliant emissions documentation. From these three groups of indicators, one can construct a descriptive coherence index to detect early "break points" in implementation (…), while providing an 18–36-month monitoring dashboard for policy coordination bodies. (…) See Table 2.

Table 2: Implementation KPIs for 2025–2027

Interface	Key KPIs	12–24–36-month milestones	Data sources
Grid & flexibility	km of 500-kV lines commissioned; curtailment hours per MW of RE; MW of BESS	+500 km; ↓50% curtailment hours at priority clusters; ≥1 GW BESS	Decision 768/Amended PDP8; NLDC/EVNNPT; independent reports
Price–contract	MW awarded; number of DPPA contracts; % on-time payments	≥3 GW/year; ≥30 contracts/year; >95% on time	Decree 57/2025; MOIT/EVN reports; business associations
MRV/ETS & carbon	% of facilities submitting MRV on time; tCO_2e traded; % of CBAM-exposed firms with compliant files	≥95%; ≥5 $MtCO_2e$/year (pilot); ≥70%	Decree 06/2022; Decision 232/2025; ETS bulletins; ICAP

In short, grid-infrastructure bottlenecks, the regulatory credibility of the shift to a price–contract regime, and the quality and coverage of MRV/ETS are the three necessary and sufficient conditions for Viet Nam's climate–energy policy mix to move from "well designed on paper" to "measurable effectiveness in the field." Prioritizing a "grid that follows renewables" (with capacity-evacuation KPIs in Decision 768), finalizing a predictable DPPA/auction regime (under Decree 57/2025), and operating a pilot ETS with CBAM-interoperable MRV (under Decision 232/2025) will be the three execution pillars in the near to medium term—determining whether Viet Nam can lock in clean-power costs, maintain energy security, and still meet global climate-trade constraints.

4. ASEAN comparison

To situate Viet Nam's climate–energy policy mix in the regional picture, we select five illustrative cases using three criteria: (i) core instruments currently in operation (carbon tax/ETS; auction/DPPA; voluntary credit programs); (ii) market–contract design that affects the cost of capital and investment signals; and (iii) regional linkages (clean-power imports/grid interconnection). The five cases—Singapore, Indonesia, the Philippines, Malaysia, and Thailand—represent different policy configurations while sharing characteristics common to newly industrializing Southeast Asian economies. Our benchmarking combines qualitative evidence on institutional design with descriptive indicators extracted from official sources and reputable reports (…).

Singapore is the archetype of a "carbon-price–centric" approach. Since 2019, the country has applied a carbon tax with broad coverage (facilities emitting ≥25,000 tCO_2e/year), raising the rate from SGD 5/tCO_2e (2019–2023) to SGD 25 (2024–2025), SGD 45 (2026–2027), and aiming for SGD 50–80 by 2030, while allowing partial offsets using eligible international carbon credits under the ICC framework to keep compliance costs manageable. The carbon tax is "cushioned" by transitional support for certain EITE sectors yet still preserves a steadily rising price signal toward 2030. On the regional-linkage axis, Singapore is pursuing imports of up to 4 GW of low-carbon electricity by 2035, having launched the LTMS-PIP (Laos–Thailand–Malaysia–Singapore) pilot in 2022 (100 MW, moving toward 200 MW in phase 2) and issued additional conditional approvals for import projects from Indonesia. The combination of clean-power imports and the carbon-tax trajectory provides a long-term demand pull and expectation anchor for investment, even though multilateral negotiations over wheeling/transmission charges have at times slowed renewals of pilot arrangements. (Agency, 2024)

Indonesia is taking a "multi-instrument carbon market" path. The legal backbone for Carbon Economic Value (NEK) was established by Presidential Regulation 98/2021, followed by the launch of the national carbon exchange operated by the Indonesia Stock Exchange (IDXCarbon) on 26 September 2023. In parallel, Indonesia is piloting an intensity-based ETS initially for grid-connected coal-fired power plants (≥25 MW), covering virtually all grid-connected coal units in the first phase, and is expanding credit trading— with the forestry segment being readied for large-scale transactions. The "intensity-based ETS + centralized exchange" structure is building crucial market infrastructure, though credit quality and standards interoperability will require close tracking during the scale-up. (Indonesia, 2024)

The Philippines stands out for a "demand pull–push policy mix," combining an RPS (requiring suppliers to procure a minimum share of renewable electricity), the Green Energy Option Program (GEOP) that allows large customers to choose renewable suppliers, and the Green Energy Auction Program (GEAP) to create a project pipeline— with auction rounds of several gigawatts scheduled for delivery in 2024–2026. In addition, since 11/2022 the Philippines has allowed 100% foreign ownership in the renewable energy sector, lowering barriers to foreign capital. The RPS–GEAP–GEOP combination stabilizes demand for clean power and shortens investment decision timelines—experience that Viet Nam can directly reference when rolling out auctions/DPPA. (Energy, 2023)

Malaysia is shifting its focus to competitive LSS tenders via multi-round auctions and has opened the Corporate Green Power Programme (CGPP) for corporate-scale VPPAs. In 2024, the Energy Commission (ST) launched LSS5 (2 GW), and in early 2025 announced the LSS PETRA 5+ round to accelerate additions of utility-scale solar capacity for COD in 2027—accompanied by developer selection guidance and a shortlist. (Ikram, 2024) At the strategic level, the Ministry of Economy's National Energy Transition Roadmap (NETR, 2023) positions six transition "levers" (EE, RE, hydrogen, biomass, green mobility, and CCUS), aligning public–private resources. The CGPP/VPPA component makes Malaysia a useful comparator for Vietnam's DPPA in terms of contracting and managing offtaker risk. (Energy Commission, 1990)

Thailand combines a FiT mechanism for utility-scale PPAs (the 2022–2030 tranche targeting ≈5.2 GW) with the voluntary T-VER credit market (and the Premium T-VER branch since 2023) administered by TGO. The first investor selection round has finalized 175 companies for 5.2 GW, reflecting intense competition and a deep project pipeline. Although a national carbon tax/ETS is not yet in operation, the T-VER ecosystem helps

firms prepare for future carbon pricing while creating supplementary cash flows for renewable or carbon-removal projects. (Recessary, 2023)

Benchmarking implications for Vietnam

First, Singapore's "carbon-tax-first" approach provides a clear, escalating price signal that can pull an entire policy chain along (clean-power imports, technology innovation), yet still needs transitional buffer mechanisms for EITE sectors to maintain competitiveness—an important lesson if Vietnam wants an ETS to affect marginal prices early. Second, Indonesia's "multi-instrument carbon market" (intensity-based ETS plus a national exchange) demonstrates the value of centralized trading infrastructure; when piloting a credit exchange/ETS, Vietnam should standardize registry–MRV and credit quality to avoid "on-paper" emission reductions. Third, the Philippines' "trio of demand–competition–openness" (RPS + GEAP/GEOP + liberalized foreign ownership) is a design reference for auctions/DPPAs: fixing an annual auction calendar, establishing standard PPAs, and boosting industrial demand via DPPAs will lower revenue risk and the WACC for renewables. Fourth, Malaysia's multi-round auctions (LSS5, LSS PETRA 5+) showcase the effectiveness of transparent RFP processes and stage-gate evaluations to maintain cost and schedule discipline—what Vietnam needs as it fully shifts from FiTs to auctions/CfDs. Finally, Thailand's combination of large-scale FiT-PPAs and T-VER indicates that a domestic voluntary crediting tool can "bridge" the pre-ETS/tax period while building project-level MRV capacity—a helpful complement to Vietnam's future ETS.

Actionable recommendations for Vietnam (next 18–36 months)

(i) Publish a transparent auction calendar and standardize PPA/DPPA templates drawing on the Philippines–Malaysia models;

(ii) Tighten MRV–registry rules and credit standards from the outset, as Indonesia is doing, so a pilot ETS generates a credible price signal;

(iii) Consider a gradually rising carbon-price trajectory (tax/ETS) with buffers for EITE sectors, following Singapore's spirit; and

(iv) Accelerate grid interconnection and clean-power imports in the spirit of LTMS-PIP to increase system flexibility alongside RE expansion. Taken together—and coupled with grid/storage investment and execution discipline under the revised PDP8—these moves can yield a tighter alignment across grid–prices–carbon, reducing the risk of being "well designed on paper but stuck at implementation."

5. Mekong Delta Case Study

The Mekong Delta (ĐBSCL) is Vietnam's "rice, aquaculture, and fruit basket," contributing about half of national rice output, 65–70% of farmed seafood, and a very large share of rice exports. This role comes with high climate-risk exposure due to its low-lying topography, strong dependence on the saline–fresh–brackish water regime, and a dense mosaic of natural and engineered rivers and canals. In the preamble to Resolution 120/NQ-CP, the Government explicitly states the region's key agricultural shares, thereby affirming the Mekong Delta as a central focus of national climate–energy policy intervention. (Chính Phủ, 2017)

Regarding physical risks, recent high-resolution elevation analyses show the region's mean elevation is only approximately 0.8 m above local mean sea level—much lower than earlier estimates. At the same time, land subsidence driven by groundwater extraction is occurring at an average rate of about 1–4 cm per year across areas spanning thousands of square kilometers; for 2006–2010, the region-wide average is estimated at roughly 1.6 cm per year. If current pumping rates persist, by 2050 many areas could face an additional ~1 m of inundation risk from the combined effects of subsidence and sea-level

rise. This assessment is consistent across sediment-mechanics models and satellite InSAR measurements. (Erban, Gorelick, & Zebker, 2014)

Extreme drought–salinity shocks over the past decade have underscored this vulnerability. In the 2015–2016 dry season, saltwater intrusion reached as far as 93 km inland, damaging about 224,552 hectares of rice and leaving more than 208,000 households short of domestic water, as recorded by technical agencies and the international agricultural research partner network. The 2019–2020 episode was likewise very severe, prompting authorities and the farm sector to deploy early water-storage/transfer measures and inter-regional regulation. These events have both stress-tested irrigation infrastructure and catalyzed shifts in livelihood models. (CGIAR, 2016)

The "thuận thiên" (living-with-nature) policy framework of Resolution 120/NQ-CP (2017) has guided a shift from a defensive stance to proactively living with hydrological–tidal dynamics, restructuring production spaces along saline–brackish–fresh sub-zones and integrating infrastructure–markets–ecosystem services. (Chính Phủ, 2017) Building on this, the Mekong Delta Regional Plan 2021–2030 (Decision 287/QĐ-TTg, 2022) consolidates an intersectoral approach, emphasizing connectivity among water resources, agriculture, energy, and logistics infrastructure at the basin–regional scale rather than province-by-province silos. (Thủ tướng chính phủ, 2022a)

An engineering adaptation highlight is the Cái Lớn–Cái Bé sluice system in Kiên Giang—the largest hydraulic "mega-infrastructure" on Vietnam's western coast (Gulf of Thailand). Phase 1 broke ground in late 2019 and has been completed and operational since 2022, enabling proactive saline–freshwater control over roughly 384,000 hectares and easing water-use conflicts among rice, fruit orchards, and aquaculture. Climate-risk scenarios were assessed to PIEVC standards to optimize operating procedures. Recent dry-season operations show that when salinity approaches threshold levels, coordinated gate closures/openings together with monitoring stations have kept upstream salinity under 1‰, supporting water supplies for production and households. (TTXVN, 2022)

In parallel with adaptation, the Mekong Delta is becoming a "living laboratory" for agricultural mitigation. The program "One Million Hectares of High-Quality, Low-Emission Rice" (Decision 1490/QĐ-TTg, 2023) aims both to raise value and to cut methane emissions from rice through a package of sustainable practices (such as alternate wetting and drying irrigation, balanced fertilization, climate-resilient varieties, and straw management within a circular-economy model). (Thủ tướng Chính phủ, 2023) Synthesized international evidence indicates that AWD can reduce methane emissions by 30–70% and save 15–30% of irrigation water—depending on field conditions—without reducing yields if implemented correctly. Numerous pilots and demonstrations led by IRRI and partners in the Delta are scaling these practices, linked to monitoring systems (e.g., RiceMoRe) to quantify emission-reduction benefits. (Arai, 2022)

Straw management is a critical link in the "circular rice value chain." Instead of post-harvest open burning—which both emits greenhouse gases and degrades air quality—many localities are collecting and baling straw, cultivating straw mushrooms, composting, or using it as biomass feedstock for processing industries. Recent technical guidance issued by MARD, IRRI, and regional institutes provides standardized procedures and management recommendations to cut emissions while increasing by-product value; in parallel, field communications show that where mechanized collection services exist, farmers change practices more quickly. ((DCP), 2023)

Another innovation track that directly connects the water–energy–food nexus is distributed renewable energy for aquaculture. The "solar for shrimp ponds" model

(rooftop/greenhouse or floating) in Bạc Liêu and several coastal provinces helps operate paddlewheel aerators efficiently, reduce electricity costs, stabilize water quality, and cut indirect emissions from diesel generators. Pilot projects implemented by GIZ–Fraunhofer ISE with local firms from 2018–2020 demonstrated techno-commercial feasibility; local media report significant electricity-cost savings among adopters. While electrical-safety and grid-compatibility standards still need to be standardized, this pathway aligns with the "thuận thiên" ethos by optimizing energy while adapting to saline–brackish conditions. (ISE, 2019)

Nevertheless, major structural challenges remain. Sediment decline in the lower basin caused by the cascade of upstream hydropower dams, sand mining, and land subsidence is exacerbating coastal and riverbank erosion, threatening coastal ecosystems (mangrove belts) and critical infrastructure. Research using high-resolution satellite image series shows that more than half of the Mekong Delta's >600 km coastline shifted from accretion to erosion during 2003–2012—a clear signal of a "negative sediment budget" and mounting risk along the shoreline. This underscores the need to view the region's agriculture–energy–water policies through a "whole-basin lens," strengthening international coordination on reservoir operations and sand governance. (Anthony et al., 2015)

On implementation, key lessons for the Delta are: (i) pivot from "province-by-province fragmented investment" to "cross-regional investment organized by value chains and ecosystems" (120/NQ-CP; Regional Plan 287/QĐ-TTg); (ii) prioritize "double-lock" adaptation–mitigation solutions in agriculture (AWD, straw management, high-quality market-aligned varieties) to leverage green finance; and (iii) integrate structural and non-structural measures with real-time data monitoring (salinity–freshwater, subsidence, emissions) for flexible operations. At the policy operations level, an annual regional indicator set should be completed soon, including: area under AWD and measured/estimated CH_4 reductions; share of straw collected and reused; renewable electricity used in aquaculture; number of days per year exceeding the 1‰ salinity threshold at key stations; subsidence rates measured by GNSS/InSAR at urban and nodal clusters; and erosion–accretion frequency by priority shoreline segments. These indicators can be integrated into the interoperable data system mandated by Resolution 120 to support budgeting, plan adjustments, and project appraisal on an evidence basis. (Chính Phủ, 2017)

In sum, the Mekong Delta illustrates how a regional-scale climate–energy policy mix can shift from "passive resilience" to "proactive adaptation and mitigation" if—and only if—policy design is grounded in quantified physical risks (low elevation, subsidence, drought–salinity), prioritizes socio-economic co-benefits (lower energy costs, higher rice quality, diversified saline–brackish livelihoods), and is trackable over time. This is also the foundation for connecting just-transition finance mechanisms—from smart water infrastructure to low-carbon agriculture—to help the region "live with nature" in a substantive way during 2025–2035.

6. Discussion

This study contributes to the international dialogue on climate–energy transition in four ways: (i) proposing a "three junctions" framework as an operationalization of the policy-mix concept in the context of emerging power systems; (ii) measuring "coherence" with a set of feasible indicators derived from secondary data, aligned with the OECD's PCSD framework; (iii) linking polycentric governance with market instruments (DPPA, ETS) and trade constraints (CBAM) to clarify policy transmission channels; and (iv) embedding a "just transition" in instrument design, thereby connecting emission-reduction goals with social welfare and employment.

First, the "three junctions" framework advances from policy-mix theory to implementation design. Core literature on policy mixes emphasizes not only the set of instruments (technology-push/demand-pull) but also properties of the overall mix such as consistency, credibility, and policy processes (Rogge & Reichardt, 2016). Our framework—(G) grid & flexibility, (P) prices & contracts, (M) MRV/ETS—restructures three "touchpoints" where these properties most strongly manifest in fast-transitioning power systems. The contribution here is to translate abstract properties into trackable KPIs (curtailment hours; km of 500 kV transmission; MW of BESS; MW awarded via auctions/CfDs; number of DPPA contracts; share of emissions under MRV/ETS; carbon trading volumes), enabling the policy-mix thesis to be tested with annually updated descriptive data. This approach dovetails with the multi-level perspective (MLP) on socio-technical transitions, which calls for alignment across infrastructure–market–institutional layers to avoid regime lock-in. (Rogge & Reichardt, 2016)

Second, we measure "coherence" using feasible indicators and align it with PCSD. Rather than proposing a single "one-size-fits-all" index, we suggest a three-pillar dashboard (G, P, M) and a composite descriptor C=w1G+w2P+w3MC = w_1 G + w_2 P + w_3 M (descriptive, not causal), (Union/EC-JRC, 2008) consistent with OECD recommendations on Policy Coherence for Sustainable Development (PCSD): identifying synergies and trade-offs, linking steps of the policy cycle, and tracking progress with the PCSD toolkit/checklists. The contribution is to translate the typically whole-of-government PCSD frame into the power-sector context with indicators obtainable from operational reports and public databases.

Third, we clarify policy transmission channels under polycentric governance and climate-trade. The polycentric argument (Ostrom) holds that tackling climate change requires multiple interacting decision centers (national–local–corporate)—as seen in Vietnam's coordination among ministries, provinces, and firms in DPPA/ETS. Beyond that, we highlight the trade channel: standardizing domestic MRV/ETS not only serves emission-reduction goals but also facilitates compatibility with the EU's CBAM (transitional phase 2023–2025, full operation from 2026), thereby reducing border-cost risks for export sectors. This bridges literatures on polycentric governance and climate–trade policy that are often treated separately. (Ostrom, 2009)

Fourth, embedding a "just transition" into instrument design in emerging economies. The just transition literature emphasizes distributive and procedural justice for workers and communities in the energy transition (Healy & Barry, 2017; Newell & Mulvaney, 2013), while the ILO's 2015 Guidelines provide an implementation framework. We propose anchoring justice directly in DPPA/auction design (skill/job localization clauses; retraining funds capitalized by auction/ETS revenues) and recycling ETS revenues into grid–storage investments in affected regions (e.g., the Mekong Delta), in line with international practice on carbon-revenue redistribution. Our contribution is to connect justice theory to concrete contract–price–infrastructure components, rather than stating principles alone. (Healy & Barry, 2017)

On the dialogue with carbon pricing/ETS literature, our findings align with recent observations: carbon pricing is broadening in scope, but effective price levels remain insufficient for a Paris-aligned path. Therefore, ETS design must be credible and tighten overtime (phasing down free allocation, raising credit standards) for signals to pass through to investment decisions. Our recommendation for a pilot ETS with "high-quality" offsets and transparent MRV speaks directly to the "design lessons" in the ICAP Handbook and the ICAP Status Report 2025 (38 ETSs in operation, with many new systems in emerging

economies). The novelty here is situating this recommendation within the "three junctions" frame, showing how ETS (M) can incentivize investment in grid–storage (G) and long-term contracts (P) in EMDEs.

Methodological contribution. The study primarily employs qualitative methods (policy–institutional analysis) combined with descriptive quantification from secondary data to build operational KPIs for the policy mix. This helps bridge the gap between *conceptual frameworks*, often hard to measure—and implementation contexts where data are heterogeneous. We also suggest sensitivity analysis for the composite index CCCC (varying weights wiw_i) together with cross-validation via the PCSD framework and a policy-interaction matrix (Nilsson, Strambo, & Månsson, 2014), thereby avoiding a "single number" that obscures underlying trade-offs and synergies.

Limitations and future research. First, given reliance on secondary sources, some KPIs (e.g., node-level curtailment hours; ETS/offset transactions by sector) require more granular open data from system operators to improve accuracy. Second, the indicator set is descriptive—not causal—so it should be followed by quasi-experimental designs (difference-in-differences at the provincial level; regression discontinuity around policy changes). Third, the distributive impacts of DPPAs/auctions and the recycling of ETS revenues on vulnerable workers and households should be quantified in the spirit of the ILO/"just transition." These directions will enrich dialogue across public policy, energy economics, and transition studies.

The paper's core contribution is to establish an "implementation anchor" for the policy mix—moving from theory to measurable KPIs—linking grid–prices–carbon with justice and trade in the context of a specific emerging economy. We believe this is useful to both researchers and policymakers seeking to turn "good design on paper" into outcomes that can be verified on the ground.

7. Policy Implications for Vietnam

Building on the "three junctions" framework (grid & system flexibility; prices–contracts/auctions–DPPA; MRV/ETS & the carbon market) and ASEAN benchmarking, Vietnam's 18–36 month policy roadmap should concentrate on highly operational "course corrections" aligned with the Revised Power Development Plan VIII (Decision 768/QĐ-TTg, 15/4/2025), the DPPA mechanism (Decree 57/2025/NĐ-CP, 03/3/2025; succeeding Decree 80/2024/NĐ-CP), and the carbon market scheme (Decision 232/QĐ-TTg, 24/01/2025; amending Decree 06/2022/NĐ-CP). These pillar documents have laid the legal "runway"; the remaining task is to turn them into measurable implementation capacity in 2025–2027 while preparing for EU CBAM compatibility from 2026.

First: a renewables-led grid and flexibility services—lock in capacity-evacuation milestones directly tied to Decision 768. We recommend the Government/MOIT–EVNNPT publish mandatory milestone schedules for 500 kV segments after the Quảng Trạch–Phố Nối third circuit is energized, with KPIs: kilometers of 500 kV lines commissioned per year; regional RE curtailment rates; MW of storage (BESS); and volumes of procured ancillary services. The rapid completion of the third circuit shows that "acceleration capacity" can be mobilized when goals are prioritized—this cadence should continue for projects strengthening North–Central–South interconnection and the RE gateways of the South-Central and Central Highlands. In parallel, issue an ancillary-services procurement framework (frequency/voltage regulation, spinning reserve) with transparent settlement so BESS investors can recover costs.

Second: shift fully to "predictable signals" at the prices–contracts junction—an annual GW-scale auction calendar + cluster-based DPPAs. Within 12–24 months, MOIT

should publish an annual auction schedule (wind, solar, biomass) with technology-specific standard PPAs, harmonizing rules for grid-congestion risk and COD delays; concurrently, roll out DPPAs under Decree 57/2025 using industrial load clusters in the North to create stable demand and ease source–load balancing pressures. Current instruments already pave the way for DPPAs and price formation (Circular 19/2023/TT-BCT)—what remains is schedule discipline (posting timelines for tender launch/bid close/COD) and transparent settlement. Proposed KPIs: MW awarded per year; number and value of newly signed DPPA contracts; on-time payment rate of buyers; median time from tender launch → PPA signing.

Third: "flip the switch" on the pilot ETS—while tightening MRV and credit quality from the start to avoid "paper reductions." With Decision 232/2025 and amendments to Decree 06/2022, Vietnam initiated a pilot ETS from mid-2025 (covering thermal power, steel, cement; allowing offsets up to ~30%), aiming for full operation before 2029 and assigning HNX to build the trading platform. Over the next 18 months, three tasks are essential: (i) operate the national registry and sectoral MRV standards (intensity per ton of product) so firms file on time; (ii) define "high-quality offset" criteria (additional, durable, no leakage), prioritizing domestic sources; (iii) establish shipment-level emissions data channels to enable CBAM deductions for export sectors. KPIs: % of facilities filing MRV on time; trading volume (tCO_2e); share of "CBAM-exposed" firms with compliant dossiers.

Fourth, align the JETP–RMP with the (revised) PDP8: prioritize a "double-lock" project list that pairs grid–flexibility with industrial decarbonization. Resources under the JETP Resource Mobilisation Plan (announced at COP28) should be "translated" into a pipeline of projects eligible for rapid disbursement: (i) upgrades/investment in interregional 500 kV transmission linked to RE clusters; (ii) system-scale BESS/DSM; (iii) clean power for industrial loads (flexible gas, industrial rooftop solar, DPPA); (iv) efficiency upgrades and process electrification in steel/cement. MOIT and policy banks should jointly publish "readiness" criteria (legal—compensation—site clearance) to screen projects and avoid fragmentation. (Socialist republic of Viet Nam, 2023)

Fifth, a just-transition pathway: recycle ETS/auction revenues into reskilling and critical infrastructure in sensitive regions. In the spirit of a "just transition," we propose reallocating a portion of revenues from allowance auctions/ETS (when conditions allow) and auction fees to: (i) worker training & retraining in affected sectors; (ii) grid–storage infrastructure at regional bottlenecks; (iii) low-emission agricultural adaptation in the Mekong Delta (linked to NDC targets). KPIs: number of workers trained; additional MW of grid–storage in priority regions; area under CH_4-reducing cultivation.

Sixth, open data governance via a national "dashboard" to anchor market expectations. Within 6–12 months, NLDC/EVNNPT and MONRE should publish monthly/quarterly dashboards: node-level curtailment hours, newly evacuated capacity, 500 kV progress, MW of BESS, auction/DPPA outcomes, and MRV–ETS status. Link these data to the 2022 NDC and the JETP–RMP so society, investors, and finance partners can track progress—building policy credibility, a necessary condition to lower WACC for clean-power projects. (Socialist republic of Viet Nam, 2022)

Proposed implementation timeline (2025–2027):

0–6 months: (i) publish 500 kV milestones aligned with Decision 768 and the "cluster-based RE evacuation" list; (ii) issue standard PPA templates and the 2026 auction calendar; (iii) issue high-quality offset rules and operate the ETS registry; (iv) launch the national data dashboard.

6–18 months: (i) complete at least 500 km of priority 500 kV lines and ≥1 GW of BESS/DSM under ancillary-service contracts; (ii) sign ≥30 industrial DPPA contracts and

award ≥3 GW/year; (iii) allocate ETS allowances for 2025–2026 and run trial trading on the HNX platform; (iv) pilot CBAM deductions in 1–2 export value chains.

18–36 months: (i) cut curtailment hours at key nodes by ≥50%; (ii) institutionalize an annual auction cycle; (iii) expand ETS coverage and gradually reduce free allocation; (iv) finalize a JETP-eligible portfolio ready for large-scale disbursement, with "just transition" conditionalities attached.

Risks and policy "safety valves." The biggest risks are infrastructure delays and legal credibility in the shift from FiTs to auctions/DPPAs; therefore, uphold non-retroactivity for compliant projects, include clear arbitration/settlement mechanisms in PPAs, and apply special right-of-way procedures for 500 kV lines. For the ETS, there is a risk of "paper" emission cuts if MRV is weak and offsets are lax—mitigate via stringent offset standards and a schedule to tighten the offset cap. On trade, CBAM requires shipment-level data; without it, firms face maximum charges—hence the need to standardize CBAM-compatible dossiers per Regulation (EU) 2023/956 as soon as possible.

Operational takeaway. The current policy stack has "laid the tracks" for the transition: the (revised) PDP8 is the capacity–grid map; DPPAs/auctions are the investment signal; ETS/MRV provide the carbon price and compliance obligation. In the near to medium term, success hinges on four keywords: milestones, data transparency, contract standardization, and execution discipline. If done right, Vietnam can simultaneously evacuate RE, lock in long-term clean-power costs, reduce CBAM risk, and mobilize JETP in line with the spirit of the 2022 NDC.

Conclusion

This study shows that Vietnam's climate–energy transition will only take root if the three junctions of the policy mix—(i) grid & system flexibility, (ii) prices–contracts (auctions/CfD, DPPA), and (iii) MRV/ETS & the carbon market—are tightened in parallel and tracked with an annually measurable indicator set. At the strategic level, Vietnam already has a clear institutional "track": the 2022 NDC raises ambition to 2030 and targets net-zero by 2050; the (revised) PDP8 updates the supply–grid mix; DPPAs have been formalized; and the carbon-market scheme lays out a roadmap for a pilot ETS prior to full operation. These pillars establish the foundation for a policy mix capable of moving from "good design on paper" to "measurable results" in 2025–2030. (UNFCCC)

The study's central finding is the interaction among the three junctions: if grid expansion lags and flexibility services (storage, ancillary) are lacking, contracts (auctions/DPPA) are hard to realize; conversely, a carbon-price signal from ETS/MRV anchors investor expectations, supporting procurement of flexibility services and the signing of long-term contracts. A "dashboard" approach with the proposed KPIs—curtailment hours and kilometers of completed 500 kV lines; MW awarded via auctions/CfDs and number of DPPA contracts; the share of emissions under MRV/ETS and trading volumes—helps operationalize the policy-mix coherence concept for Vietnam.

ASEAN benchmarking reinforces the design recommendations: a gradually rising carbon-price trajectory à la Singapore; centralized market infrastructure in the style of Indonesia (exchange + MRV standards); an annual auction timetable/standard PPAs and demand-pull modeled on the Philippines–Malaysia; and Thailand's voluntary credit bridge as a "steppingstone" for project-level MRV capacity. In Vietnam's practice, these pieces will only deliver if the (revised) PDP8 ties evacuation milestones to "RE clusters," DPPAs roll out via industrial load clusters, and the pilot ETS is run with tight MRV standards and offset rules from day one. (Chinh Phu Document System)

For the short-to-medium-term roadmap, 18–36 month priorities should focus on four keywords: milestones, data transparency, contract standardization, and execution discipline. Concretely: (i) publish—and track—milestones for key 500 kV lines and the procurement framework for ancillary/storage services; (ii) fix a GW-per-year auction calendar, issue standard PPAs, and deploy DPPAs in major load clusters; (iii) "flip the switch" on the pilot ETS—per recent institutional updates, the start is expected in August 2025, aiming for full operation before 2029; and (iv) ensure EU CBAM compatibility from 2026 via shipment-level emissions data to enable border-charge deductions. Delivering on these four workstreams will cut RE curtailment risk, lower project WACC, and anchor market expectations to an emissions-reduction path consistent with the NDC. (Chinh Phu Document System)

That said, the research remains limited by reliance on secondary data, a lack of public node-level series (location-specific curtailment, detailed grid progress, ETS/offset trades by sector), and the absence of causal impact evaluation for individual instruments. Next steps include: (i) designing quasi-experimental evaluations (difference-in-differences, discontinuity) once sufficient open data are available; (ii) extending measurement to the distributive/justice impacts of auctions–DPPAs and ETS revenue recycling; (iii) quantifying clean-power–adaptation interactions in the Mekong Delta, especially under low-emission agriculture programs.

In sum, it is the coherence of the policy mix—rather than the isolated presence of individual tools—that determines transition outcomes. With the 2022 NDC, (revised) PDP8, DPPAs, and the carbon-market/ETS scheme now in place, Vietnam stands at the cusp of a "state change" if it can convert the policy framework into measurable execution capacity in 2025–2027, while locking in clean-power costs and sustaining export competitiveness under CBAM. This is an essential step toward the 2050 net-zero goal.

Author Contributions

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Nguyễn Anh Cường: Corresponding Author, Conceptualization, Data curation, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Writing - original draft, review & editing.

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Ethical approval

This article does not contain any studies with human participants performed by any of the authors.

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