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Original Article

Opportunities for EV Charging Stations of V-GREEN Global Charging Station Development Joint Stock Company: Insights from Strategic and Competitive Theories

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Abstract - Vietnam's Electric Vehicle (EV) transition is creating uneven demand for public charging across provinces. Prior studies on EV adoption and charging infrastructure explain uptake patterns and technical requirements, yet they provide limited guidance for firm-level expansion decisions in Vietnam. This article addresses that gap through a high-level strategic screening study of V-GREEN Global Charging Station Development Joint Stock Company. Using publicly available secondary data, province-level AC/DC charging counts reported by EVCS.vn (2025), EV sales projections, and policy documents, the study: (i) stages market development with the technology adoption lifecycle; (ii) evaluates readiness disparities through spatial infrastructure patterns and EV-to-Charger Ratio (EVCR) logic; and (iii) interprets the findings through Porter's Five Forces, RBV/VRIO, and Ansoff's growth matrix. The analysis indicates that the most commercially plausible near-term opportunities lie in dense urban fast-charging clusters and selected inter-provincial corridors.In contrast, broader expansion into second-tier provinces remains more contingent on grid readiness, site access, and partnership structure. The study contributes an integrated screening framework that links market-readiness indicators with firm-level strategic choice in an emerging EV market. For V-GREEN, the evidence supports a phased rollout: densify high-uptime metropolitan clusters, extend corridor coverage where continuity matters for intercity travel, and scale more selectively through standardized site-host and fleet partnerships. As a high-level strategic screening exercise, the paper finds that V-GREEN's strongest near-term positions are in metro densification and selectively staged corridor expansion; broader nationwide growth should remain contingent on utilization evidence, regulatory clarity, and disciplined execution.

Keywords - Ansoff Matrix, Diffusion Of Innovation, Ev Charging Infrastructure, Porter's Five Forces,Resource-Based View, Strategic Screening, Vietnam

1. Introduction

Vietnam's transport decarbonization agenda and the expansion of domestic EV manufacturing are accelerating interest in public charging infrastructure, but demand is not likely to emerge uniformly across the country (Vietnam Briefing 2025; Government of Vietnam 2022; Government of Vietnam 2025). For charging point operators, the central commercial challenge is therefore geographic rather than merely national: capital is committed upfront through equipment, civil works, land arrangements, and grid connection, while revenues depend on where recurring charging demand actually materializes. In practice, low charger density, weak uptime, or long detours can quickly translate into range anxiety and suppressed repeat use, especially outside the largest cities.

V-GREEN Global Charging Station Development Joint Stock Company (V-GREEN) develops and operates an EV charging network in Vietnam and can draw on ecosystem linkages with VinFast, including a growing vehicle base and shared customer touchpoints. The managerial question addressed here is how expansion should be sequenced across provinces and travel corridors, charging formats, and customer segments when policy signals, grid readiness, and competitive moves remain uneven. Accordingly, the study asks three related questions: where charging readiness is already concentrated, where structural gaps remain visible, and which expansion paths appear most defensible for V-GREEN under current market conditions. Existing studies on EVs largely examine adoption determinants, user charging preferences, policy incentives, or broad infrastructure planning (Sierzchula et al. 2014; Hall and Lutsey 2017; Hardman et al. 2018; IEA 2023). Far less attention has been paid to how a specific charging operator should translate uneven province-level readiness into expansion priorities in Vietnam.

That gap matters because operator decisions depend not only on national EV growth but also on local combinations of charger availability, site access, corridor relevance, grid connection lead times, and partnership options.This paper addresses that gap through a high-level strategic screening study rather than a site-level investment appraisal. Its novelty lies in combining province-level charging infrastructure observations with diffusion logic and firm-level strategic frameworks to identify where V-GREEN's opportunities are more or less defensible across Vietnam. The study, therefore, contributes both an analytical framing for emerging-market charging research and a practical basis for sequencing expansion without overstating the precision of public data.

2. Literature Review

2.1. EV Adoption and Diffusion Frameworks

Diffusion of innovation remains useful because EV adoption rarely unfolds as a smooth national average. Uptake tends to cluster first among groups with stronger purchasing power, greater willingness to experiment, and better access to complementary services, before moving toward more pragmatic user segments that expect convenience and reliability rather than novelty alone (Rogers 2003).

The Technology Adoption Lifecycle (TAL) translates that pattern into a staging logic-innovators, early adopters, early majority, late majority, and laggards-that is especially relevant for charging networks. In early phases, a limited number of well-placed chargers can reduce uncertainty; once the market broadens, however, service reliability, uptime, and geographic continuity become more important than symbolic presence (Sierzchula et al. 2014).

Table 1. Summary of Technology Adoption Lifecycle stages

Stage	Share of Population	Characteristics	Adoption Motivation
Innovators	2.5%	Risk-taking, experimental	Curiosity and novelty
Early Adopters	13.5%	Visionary, influential	Perceived advantage
Early Majority	34%	Pragmatic, deliberate	Proven reliability
Late Majority	34%	Skeptical, cautious	Social pressure
Laggards	16%	Traditional, resistant	Habit or necessity

Source: Adapted from Rogers (2003).

2.2. Infrastructure Readiness and Charging Demand Proxies

Infrastructure readiness research emphasizes that EV uptake depends not only on whether charging exists, but on whether it is available, accessible, affordable, and dependable in daily use (Li et al. 2017). When operator-grade utilization and queueing data are unavailable, researchers frequently use the EV-to-charger ratio (EVCR) as a coarse planning proxy for adequacy and congestion risk, then test how that ratio changes under alternative adoption paths (IEA 2023). Cross-country evidence broadly links the expansion of public charging availability with stronger EV uptake, while user-centered studies show that charging needs vary by context: home versus public, AC versus DC, trip purpose, perceived safety, and the importance of uptime all matter (Hall and Lutsey 2017; Hardman et al. 2018). The literature also shows that charging is not a single business model. OEM-backed networks, independent point operators, destination-charging hosts, and fleet-oriented charging providers face different economics, service expectations, and expansion logics (Hall and Lutsey 2017; Bousia 2025; Wu et al. 2025). This distinction matters because a network supported by a vehicle ecosystem may prioritize coverage, customer retention, and service integration differently from a stand-alone operator that depends more heavily on third-party site economics.Evidence from emerging markets further suggests that national averages can be misleading where grid capability, permitting processes, and urban form vary sharply across regions. Metropolitan clusters, tourism corridors, industrial provinces, and apartment-dense cities can each generate different charging needs and risk profiles (Hardman et al. 2018; IRENA 2022; Hao et al. 2025). For that reason, a province-sensitive reading of readiness is more useful for strategic screening than a purely aggregate market forecast.

Table 2. Theoretical models applied in this study

Model	Key Concept	Application to EV Charging
Rogers' Diffusion of Innovation (2003)	Sequential adoption stages	Identify early-adopting provinces and segment expansion timing
Infrastructure Readiness (Li et al. 2017)	Charger density & accessibility	Assess infrastructure gaps across provinces using EVCR logic
Infrastructure-Diffusion Feedback (Hao et al. 2025)	Charging availability drives EV market share	Explain the bi-directional relationship between charger expansion and adoption growth.

Source: Author synthesis based on prior studies cited in the manuscript

2.3. Strategic and Competitive Theories for Opportunity Analysis

To move from market signals to firm strategy, the paper uses three complementary lenses. Porter's Five Forces is used to diagnose structural pressures such as entry barriers, supplier dependence, substitutes, and buyer power in Vietnam's evolving charging market (Porter 1979). RBV/VRIO logic is then used to ask whether V-GREEN's capabilities-site acquisition, uptime discipline, software coordination, commissioning speed, and partner orchestration-can translate into an advantage that competitors would struggle to reproduce quickly (Wernerfelt 1984; Barney 1991; Grant 1991). Finally, the Ansoff matrix organizes growth choices into a practical opportunity portfolio-market penetration, market development, product development, and diversification-so that expansion options can be discussed in staged rather than all-at-once terms (Ansoff 1957; Johnson et al. 2017).

2.4. Research Gap, Novelty, and Analytical Positioning

Taken together, the reviewed literature offers strong insight into adoption drivers, infrastructure adequacy, and strategic theory, but it leaves two issues underdeveloped. First, limited evidence connects province-level charging readiness to firm-level expansion sequencing in Vietnam. Second, many studies emphasize market description, policy, or consumer adoption rather than the strategic screening choices facing a specific charging operator.This paper positions itself at that intersection. It does not claim to outperform forecasting models or siting-optimization studies. Instead, it adds value by integrating publicly observable market-readiness indicators with competitive and resource-based analysis to generate actionable priorities for V-GREEN. Compared with single-lens studies, the integrated approach helps distinguish where metro densification, corridor build-out, second-tier expansion, or partnership-led growth is more plausible.

3. Materials and Methods

3.1. Data Sources and Preparation

This study uses secondary data within an interpretive case-study design because the objective is not to estimate a universal causal model, but to assess the strategic opportunity space of one focal firm in a specific national context (Yin 2018; Creswell and Creswell 2018; Saunders et al. 2019). That design is appropriate for synthesizing heterogeneous evidence-market forecasts, spatial infrastructure observations, and policy documents-into a structured strategic assessment for V-GREEN.The infrastructure dataset was compiled from EVCS.vn in October 2025 and contains province-level observations on charging stations and port counts by power category. Ports rated below 20 kW were treated as AC, whereas ports rated at 20 kW or above were treated as DC, matching the classification used in the EVCS visualization. Population statistics were used only as contextual normalizers rather than as direct demand estimates. EV sales projections for 2023-2032 were taken from Statista (2025), and policy or industry documents were used to interpret market direction, regulatory conditions, and competitive context.

3.2. Measures and Analytical Approach

The analytical sequence has four linked steps. Step 1 uses sales forecasts and the TAL to locate Vietnam's market stage. Step 2 maps the spatial distribution of AC and DC infrastructure by province to surface readiness disparities. Step 3 applies EVCR reasoning to gauge how capacity requirements change under projected adoption paths. Step 4 interprets the resulting patterns through Five Forces, RBV/VRIO, SWOT, and Ansoff so that market structure, firm capabilities, and growth options are considered together. Each lens serves a different purpose: diffusion logic frames timing, readiness indicators frame scale and geography, and strategic theories frame competitive choice.

3.3. Scope, Assumptions, and Sources of Bias

This article is intentionally framed as a high-level strategic screening study, not as a site-level investment appraisal. It identifies areas of relative attractiveness and strategic logic across Vietnam. However, it does not estimate station-level internal rates of return, queue times, land rents, transformer upgrade costs, or utilization curves.The analysis also rests on several simplifying assumptions. EVCR is used as a planning heuristic, with a benchmark of 10 treated as an illustrative threshold drawn from IEA (2023) rather than a universal optimum. The 54,094-port baseline from EVCS.vn is interpreted as an upper-bound estimate because self-reported operator data may contain double-counting or classification inconsistencies. Likewise, the Statista EV stock series is retained as reported for directional scenario analysis, even though it cannot be reconciled perfectly with annual sales additions in Table 3. A number of biases remain unavoidable in publicly sourced data. Province-level counts do not reveal charger uptime, load factors, user dwell time, or the split between household and fleet charging. Regulatory interpretation may also vary across provinces, especially for permits, land-use arrangements, and grid interconnection practices. These limitations are stated explicitly so that the results are interpreted as directional strategic evidence rather than precise investment instructions.

4. Results and Discussion

4.1. EV Market Growth and Adoption Stage

Published forecasts indicate that annual EV sales in Vietnam could rise from about 18 thousand units in 2023 to roughly 64.5 thousand units by 2032 (Statista 2025; Table 3). The pattern implies a market that is still expanding rapidly, but with growth gradually moving from a very steep early ramp toward a broader commercialization phase. Read through the TAL, the period around 2025-2027 appears particularly important because charging demand starts to depend less on novelty and more on reliable everyday use. That shift increases the strategic value of high-uptime public charging for households, ride-hailing users, and fleets, especially in dense cities where home charging may be constrained. Policy measures-including fee incentives and the broader direction of transport electrification policy-reinforce that transition (Government of Vietnam 2022; Vietnam Briefing 2025; Zhang et al. 2014).

Table 3. Forecasted EV sales and adoption stage in Vietnam (2023-2032)

Year	Forecasted EV Sales (thousands)	YoY Growth (%)	TAL Adoption Stage
2023	17.96	-	Innovators / Early Adopters
2024	27.18	51.4	Early Adopters
2025	33.26	22.4	Transition to Early Majority

2026	38.04	14.4	Early Majority
2027	42.26	11.1	Early Majority
2028	46.26	9.5	Early Majority
2029	50.33	8.8	Early Majority
2030	54.63	8.6	Late Majority (initial)
2031	59.31	8.6	Late Majority
2032	64.50	8.7	Late Majority

Source: Statista (2025). TAL classification by the author.

Table 3 suggests two managerial implications. First, the projected expansion through 2025-2027 means that charging availability becomes a reliability issue rather than a symbolic market-creation activity. Second, the moderation in annual growth rates after the initial ramp does not eliminate opportunity; instead, it shifts attention toward location quality, uptime, and capital discipline, because the market begins to reward operational execution more than early visibility.

4.2. Charging Infrastructure Distribution and Readiness Gaps

Charging infrastructure is heavily concentrated in metropolitan and industrial provinces (Figure 1; Figure 2; Table 4). EVCS.vn (2025) shows Hanoi and Ho Chi Minh City leading in DC port availability, followed by Da Nang and several industrial or corridor-linked provinces. The regional comparison in Figure 2 is consistent with metro concentration of DC infrastructure, and the overall population-port relationship is directionally positive, as would be expected when adoption begins in dense urban centers (Rogers 2003; Li et al. 2017). However, the dispersion around that relationship is substantial. Several provinces remain visibly underserved relative to population size, implying longer detours to charge and higher perceived risk for inter-provincial travel. Such gaps can suppress utilization for corridor routes and slow EV diffusion outside the largest cities (Hall and Lutsey 2017). The uneven distribution also reflects differences in grid connection feasibility and site acquisition constraints across regions, as discussed in Vietnam's energy transition planning documents (Government of Vietnam 2022; MOIT 2025). According to VAMA (2025), VinFast accounted for the dominant share of new EV registrations in Vietnam in 2024, which is consistent with EVCS.vn (2025) data showing its network outpacing independent operators in DC port count.

Table 4. Top provinces by DC chazrging ports and population context (2025)

Province	Total DC Ports	Population (thousands)
Hà Nội	8,264	8,717.6
Hồ Chí Minh	6,883	9,543.6
Đà Nẵng	1,653	1,276.0
Thanh Hóa	1,497	3,764.2
Hải Phòng	1,416	2,124.5
Bình Dương	1,377	2,870.6
Khánh Hòa	1,365	1,269.3
Lâm Đồng	1,331	1,362.5
Hưng Yên	1,189	1,318.1
Vĩnh Phúc	969	1,225.3
Quảng Nam	914	1,543.9
Quảng Bình	906	924.8
Bắc Ninh	903	1,546.6
Bình Thuận	894	1,266.2
Tây Ninh	890	1,202.8

Source: EVCS.vn (2025) and national population statistics compiled by the author.

The province pattern is not simply a population ranking. Hanoi and Ho Chi Minh City combine scale, trip density, and relatively stronger dependence on public or semi-public charging, making them logical densification markets. Da Nang, Hai Phong, Binh Duong, and adjacent industrial or tourism provinces appear more relevant as secondary nodes or corridor anchors. In contrast, smaller provinces with notable port counts may reflect route-based or ecosystem-led placement rather than broad local demand.

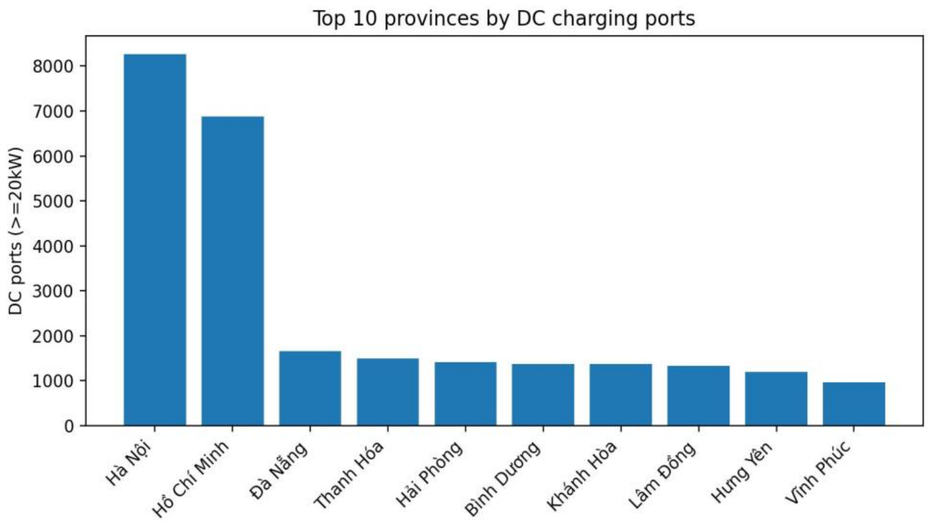

Fig. 1 Top 10 provinces by total DC charging ports (≥20 kW) (2025)

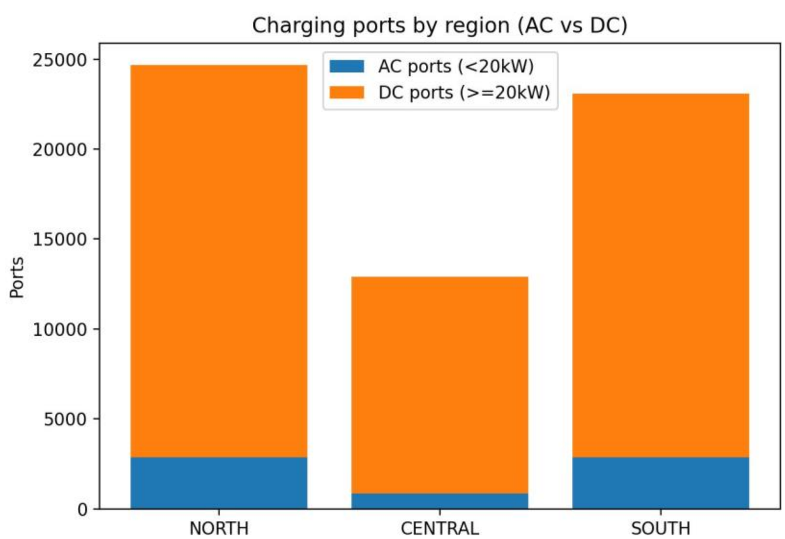

Fig. 2 Charging ports by region (AC <20 kW vs DC ≥20 kW): North, Central, South

4.3. Charging Demand Outlook Using EVCR Logic

Building on the EVCR proxy introduced in Section 2.2, this section applies the metric to the Vietnam context. EVCS.vn (2025) reports approximately 54,094 charging ports rated at or above 20 kW in 2025, but that figure requires careful interpretation: EVCS.vn aggregates operator-submitted information, so double-counting across sites or misclassification around the 20 kW threshold cannot be ruled out. The figure is therefore treated as a practical upper-bound baseline rather than a precise census. For the EV stock series in Table 5, an additional limitation must be acknowledged. No independently verified cumulative EV stock series for Vietnam was available at the time of writing, and the Statista (2025) stock figures cannot be reconciled directly with simple annual-sales accumulation from Table 3. The mismatch may reflect a broader vehicle category or a different scope of market coverage. Table 5 should therefore be read as a directional scenario exercise rather than as a literal forecast. Even with that caution, the exercise remains useful because it illustrates how quickly charger requirements can tighten if adoption broadens. Techno-economic evidence also suggests that pairing fast charging with storage or on-site renewables can mitigate grid impacts and improve station economics under some conditions (Singh et al. 2024; IRENA 2022).

Table 5. EVCR path under a fixed 2025 baseline and minimum DC additions to maintain EVCR = 10 (illustrative)

Year	Projected EV Stock (pcs)	EVCR if DC chargers are fixed at 54,094 (2025 baseline)	Required DC chargers for EVCR = 10	Minimum additional chargers vs baseline
2024	113,102	2.09	11,310	0
2025 (H1)	180,671	3.34	18,067	0
2026	451,678	8.35	45,168	0
2027	1,129,195	20.87	112,920	58,826
2028	2,822,987	52.19	282,299	228,205

Source: Author's calculation using EV stock series from Statista (2025) and a 2025 DC port baseline of 54,094 reported via EVCS.vn (2025); benchmark logic from IEA (2023).

Two points deserve emphasis. First, EVCR remains relatively comfortable under the fixed 2025 DC baseline until roughly 2026, but the scenario tightens quickly thereafter. Second, the gap becomes material by 2027-2028, indicating that nationwide expansion cannot be justified by visibility alone; it must be sequenced toward locations where additional DC capacity is most likely to absorb demand. The table is therefore best interpreted as a medium-term scale signal for capacity planning, not as a deterministic build schedule.

4.4. Strategic Opportunity Mapping for V-GREEN

The strategic issue is not simply where demand exists, but where V-GREEN can defend returns against entry pressure, supplier dependence, buyer concentration, and changing service standards. Market attractiveness in EV charging is shaped by three practical frictions: entry barriers linked to capex, land, permits, and grid connection; the composition of demand across households, fleets, and intercity travel; and the technology and interoperability choices that influence switching costs. Table 6 summarizes these structural conditions for Vietnam's EV charging market. From a resource-based perspective, V-GREEN's potential advantages are less about hardware alone-which is increasingly commoditized-and more about execution capabilities such as site pipeline quality, commissioning speed, uptime discipline, and software coordination (Wernerfelt 1984; Barney 1991; Grant 1991). Dynamic capabilities remain relevant because the market is moving from early adoption toward broader use, requiring the firm to reconfigure assets and partnership arrangements as charging behavior changes (Teece et al. 1997). Table 7 consolidates those insights into a staged opportunity map using RBV and Ansoff logic (Ansoff 1957; Johnson et al. 2017; Porter 1985).

Table 6. Market attractiveness assessment using Porter's Five Forces

Force	Assessment	Key Insights (Vietnam Context)
Threat of New Entrants	Medium-High	Barriers are meaningful-equipment, site acquisition, permits, and grid interconnection-but not prohibitive, especially for firms that can bundle charging with existing real-estate or fleet relationships. Rapid EV uptake and supportive policy signals keep entry pressure relatively high (EVCS.vn 2025; Zhang et al. 2014).
Bargaining Power of Suppliers	Medium	Hardware supply chains remain import-dependent (notably components sourced from China and South Korea), exposing operators to FX and lead-time risk. V-GREEN can partially offset this through standardized designs, multi-sourcing, and local strength in software, installation, and field service

		operations. Smart-charging integration and load management are becoming increasingly important differentiators (Bousia 2025; Wu et al. 2025).
Bargaining Power of Buyers	Medium-High	Fleet buyers and large ecosystem partners can negotiate on price and service-level terms because they bring volume and predictable demand. By contrast, in dense city markets where alternative fast-charging options are limited, individual drivers have less bargaining power and prioritize uptime and convenience (Hardman et al. 2018).
Threat of Substitutes	Low	With legally mandated restrictions on fossil-fuel motorcycles in Hanoi's urban core beginning July 2026 and expanding to Ring Road 3 by 2030, and a broader electrification policy direction (Government of Vietnam 2025; Government of Vietnam 2022), substitutes to public EV charging are structurally limited. The more relevant "substitute" is private home charging, which varies by housing form and access to parking-making public networks essential, particularly for apartment-dwelling urban commuters (IRENA 2022; Kinh Te Tieu Dung 2025).
Industry Rivalry	Medium	VinFast's proprietary network is currently the dominant benchmark in scale, while other independent operators remain small (EVCS.vn 2025). Rivalry is therefore asymmetric today; competition is likely to intensify as EV sales grow and as multi-brand interoperability and service differentiation-uptime, location quality, pricing transparency-become more visible to users (VNExpress 2025).

Source: Author synthesis based on Porter (1979; 1985) and secondary sources cited.

Table 7. Opportunity mapping using RBV and Ansoff perspectives

Strategy Type	Description	Key Opportunity	Policy and Market Enabler
Market Penetration	Deepen coverage in core metro markets	Densify high-traffic clusters in Hanoi and Ho Chi Minh City, where utilization can be sustained, and uptime metrics justify capex	Government of Vietnam (2022); Vietnam Briefing (2025); Kinh Te Tieu Dung (2025)
Market Development	Expand into second-tier growth nodes.	Build reliable corridor and city networks in Da Nang, Can Tho, Hai Phong and adjacent industrial zones.	MOIT (2025); Hall and Lutsey (2017); VAMA (2025)
Product Development	Upgrade the service proposition in fast charging	Deploy ultra-fast DC selectively with smart load management, on-site storage, and interoperability features; leverage renewable integration for tariff advantage.	EVCS.vn (2025); Singh et al. (2024); Thomas et al. (2018)
Diversification	Move into energy and fleet services around charging	Bundle charging with fleet energy management, renewable integration, and distributed storage where financially viable; use dynamic capabilities to create a scalable platform	Teece et al. (1997); Wu et al. (2025); MOIT (2025)

Source: Author synthesis based on Ansoff (1957), Barney (1991), Grant (1991), and Teece et al. (1997).

Taken together, Tables 6 and 7 suggest that V-GREEN's more defensible positions are those that reward ecosystem coordination and execution discipline rather than indiscriminate geographic breadth. Compared with smaller independent operators, the company can plausibly benefit from VinFast-linked demand visibility, shared customer touchpoints, and a broader site pipeline. Compared with a purely coverage-maximizing proprietary model, however, future expansion still requires tighter capital selectivity, interoperability choices, and partnership governance if network quality is to be preserved outside the main urban markets. The SWOT reading is therefore mixed but strategically useful: strengths include early scale, ecosystem access, and national visibility; weaknesses include hardware import dependence and the operational challenge of maintaining uptime across a widening footprint; opportunities lie in corridors, second-tier growth nodes, and fleet-energy bundling; threats include regulatory friction, grid bottlenecks, and intensifying rivalry as the market matures.

4.5. Market Trends, Regulatory Conditions, and Technology Direction

The near-term market trend is straightforward: vehicle growth is moving the sector from early adoption toward wider commercial use, but the economics of charging remain strongly location sensitive. Public fast-charging demand is likely to concentrate first in dense metropolitan areas, logistics or ride-hailing clusters, and intercity travel corridors where continuity of coverage matters more than absolute network breadth.

Regulation is supportive in direction but uneven in operational effect. National electrification policy and fee incentives improve the demand outlook, yet local implementation still shapes project timing through land access, permitting workflows, signage, power-connection lead times, and utility coordination (Government of Vietnam 2022; Government of Vietnam 2025; MOIT 2025). For V-GREEN, this means that policy should be read less as a blanket green light and more as a set of enabling conditions whose practical value varies by province.

Technology choices also affect strategic fit. Not every growth node requires the same charging mix: metro infill can often blend DC fast charging with destination or semi-public AC, whereas corridor sites place greater value on high-power DC, uptime monitoring, load management, and, in some cases, storage or on-site renewables to manage grid and tariff constraints (IRENA 2022; Singh et al. 2024; Thomas et al. 2018). The relevant roadmap is therefore modular rather than uniform: standardized site designs, interoperable software, remote diagnostics, and selectively deployed high-power formats are likely to matter more than pursuing maximum power at every location.

4.6. Stakeholder and Risk Assessment

V-GREEN's expansion depends on several stakeholder groups whose incentives are not identical. End users value convenience, speed, uptime, safety, and transparent pricing; fleet operators emphasize predictable service levels and route coverage; site hosts seek traffic, revenue sharing, and limited operational disruption; regulators and utilities focus on compliance, grid stability, and land-use discipline. A viable rollout, therefore, requires stakeholder alignment rather than charger deployment alone.

Three risks are especially material. The first is infrastructure risk: grid connection delays, transformer upgrades, and site-specific civil works can postpone revenue generation. The second is market risk: charging demand may remain thinner than expected outside major cities or may shift with housing patterns, home-charging access, and fleet behavior. The third is competitive and execution risk: import dependence, uptime inconsistency, and future interoperability requirements can erode user trust even when the nominal network size expands. These risks do not negate the opportunity, but they argue for phased capital allocation and tighter performance monitoring.

4.7. High-Level Implementation Roadmap

Because this paper adopts a nationwide high-level screening perspective, the recommended roadmap is staged rather than exhaustive. Phase 1 should concentrate on metro densification in Hanoi and Ho Chi Minh City, where demand visibility, ecosystem synergies, and service-quality learning are strongest. Phase 2 should extend selected corridor backbones linking major cities, airports, industrial zones, and tourism nodes, with priority given to routes where continuity materially lowers range anxiety. Phase 3 should expand into second-tier provinces through standardized partnerships with retail, property, hospitality, and fleet actors once utilization evidence and permitting conditions become more favorable. Operationally, each phase should be gated by a compact set of screening criteria: expected utilization potential, grid feasibility, ease of site control, compatibility with fleet or ecosystem partners, and the likely effect on network continuity. This sequencing is consistent with the logic of a high-level strategic screening study: the goal is to narrow the field of attractive opportunities before deeper site-level engineering and financial appraisal are undertaken.

5. Conclusion

This paper examined V-GREEN's charging opportunities in Vietnam by combining diffusion staging, infrastructure-readiness indicators, and strategic analysis within a high-level nationwide screening framework. Three conclusions emerge from the evidence. First, the strongest near-term opportunities are concentrated in high-throughput metropolitan clusters where uptime, convenience, and ecosystem coordination can support repeated use.

Second, corridor expansion is strategically important, but it should be selective and phase-gated because route continuity matters more than nominal geographic spread. Third, broader expansion into second-tier provinces is more likely to succeed when pursued through standardized partnerships and after local grid, site, and demand conditions have been screened more carefully.

The contribution of the study is not a claim of superior predictive accuracy relative to prior forecasting or optimization studies, but an integrated way of moving from uneven public data to strategic prioritization. That contribution is most useful where operator-grade utilization, cost, and queueing data are not publicly available. Future research can deepen the framework with official vehicle registration data, station-level performance metrics, differentiated fleet versus household demand, and province-specific regulatory evidence. Such extensions would allow the high-level screening logic developed here to be translated into detailed siting and investment appraisal.

Appendix A. Supplementary Figures

This appendix provides additional descriptive evidence from the EVCS.VN-derived dataset used in the analysis. Figures 3-5 are based on the same EVCS.vn (2025) data as the main text; they are presented as supplementary material to support the spatial and distributional claims made in Section 4.2.

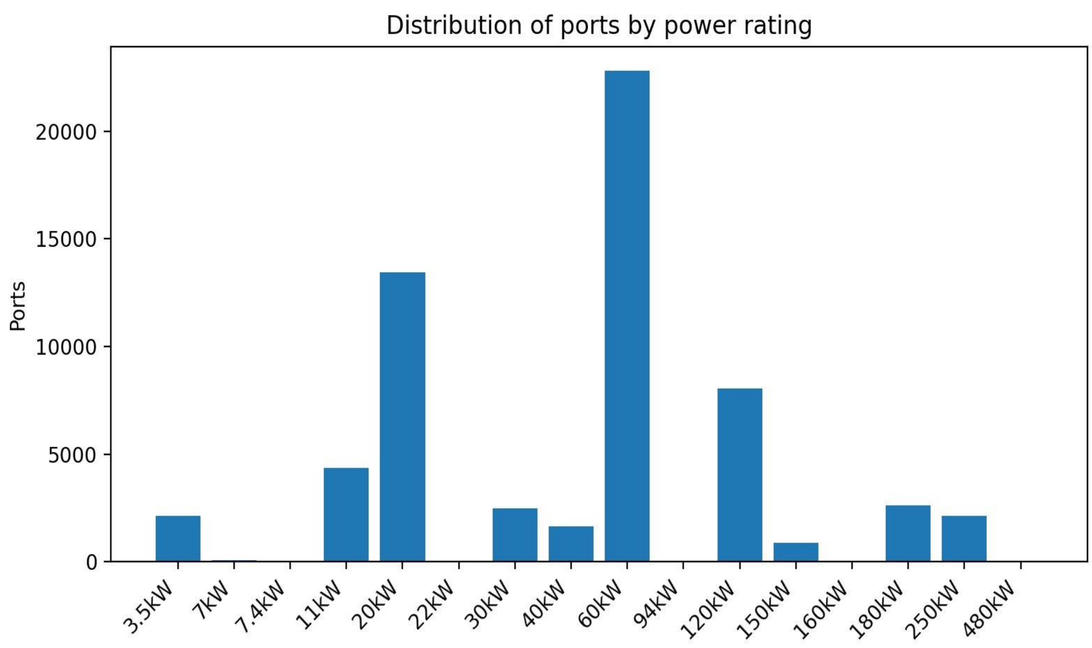

Fig. 3 Distribution of ports by power rating

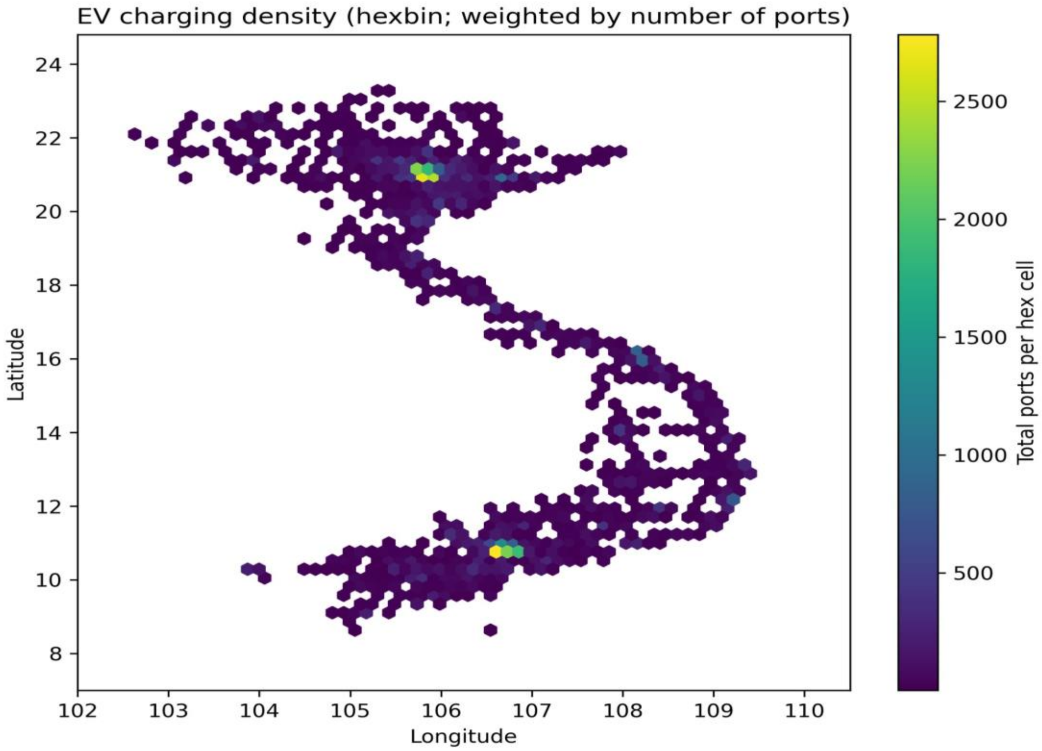

Fig. 4 EV charging density (hexbin heatmap; weighted by number of ports per site)

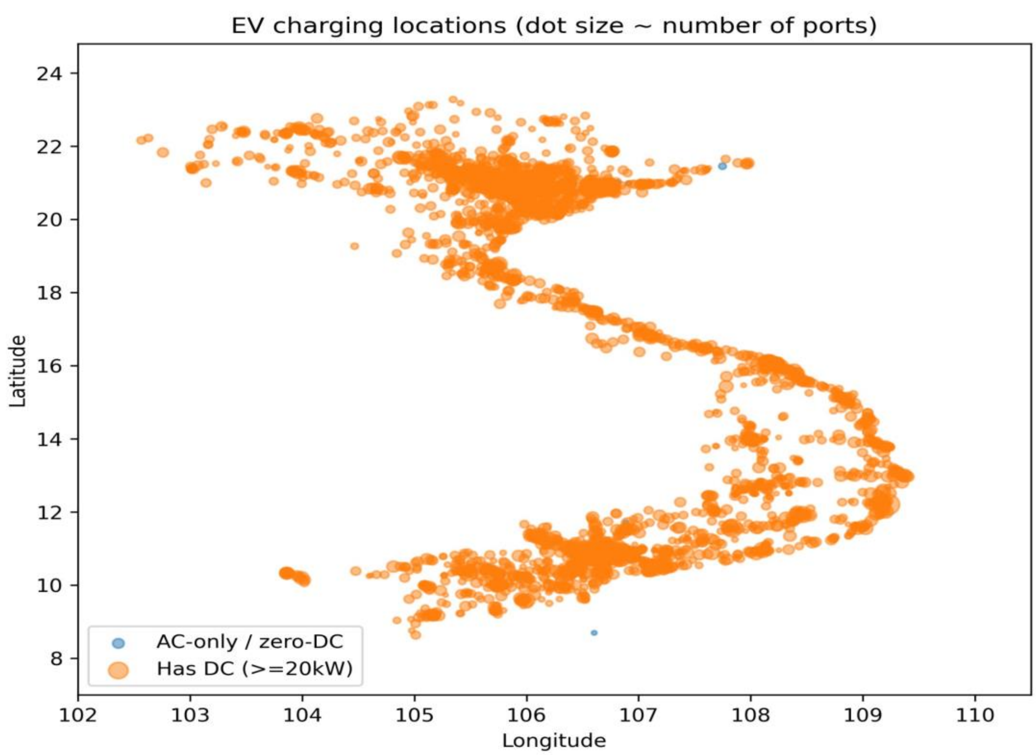

Fig. 5 EV charging locations (dot size ≈ number of ports; orange = has DC ≥20 kW port; blue = AC-only)

Data Availability

The infrastructure distribution figures in this article are based on an EVCS. VN-derived dataset compiled by the author in October 2025. The underlying station-level dataset (S1: EVCSVN DATA.xlsx; S2: EVCSVN DATA.pdf) and the visualization code (S3: EVCS_DotMap.html; S4: heatmap.ipynb) are not publicly deposited but are available from the corresponding author upon reasonable request and subject to verification of research purpose. This restriction is to protect the integrity of the dataset and prevent misuse of raw commercial location data. All other quantitative inputs (EV sales projections, population statistics, policy references) are publicly accessible secondary sources cited in the manuscript.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this paper.

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Authors' Contributions

Conceptualization, N.M.N.; Methodology, N.M.N.; Formal Analysis, N.M.N.; Data Curation, N.M.N.; Writing - Original Draft Preparation, N.M.N.; Writing - Review & Editing, N.M.N.; Visualization, N.M.N.

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