

DEVELOPING GREEN ENTERPRISE THROUGH INTEGRATED PCI- PGI-DCCI GOVERNANCE AND DDCI EVIDENCE IN BAC NINH, VIETNAM

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Abstract

Green enterprise development is increasingly central to provincial governance in Viet Nam, where local authorities must pursue competitiveness while aligning with national sustainability goals. Provinces are assessed through the Provincial Competitiveness Index (PCI) and the Provincial Green Index (PGI).

In practice, these agendas are often implemented separately, creating coordination gaps in policy design and delivery. The present paper examines how green enterprise development can be advanced when PCI and PGI are integrated and informed by officially published DDCI evidence on enterprise perceptions. Bac Ninh is selected as the case study.

The analysis focuses on what the 2025 DDCI program reports about the business environment—transparency, time costs, informal costs—and about expectations related to green transition. The initial objective is to present a coherent design for developing green enterprises at the provincial level based on existing, publicly available findings.

A parallel objective is to specify a practical policy bundle that is compatible with routine PCI/PGI monitoring and sub-national implementation capacity. Methods consist of secondary analysis of published DDCI materials, a restatement of survey scope, and a structured mapping of reported insights to policy levers commonly used in PCI/PGI practice (digitalized procedures, ESG disclosure, human-capital programs, green finance, green public procurement, and public recognition schemes).

Findings are synthesized by firm scale (SMEs, medium firms, large/FDI) and by location (urban and non-urban). Results indicate that public spaces of policy—administrative procedures, advisory services, finance, and recognition—are widely “used” by enterprises for economic and organizational reasons, while green transition instruments are perceived as important across the board.

During periods of heightened administrative constraints or external shocks, these instruments are used primarily for basic compliance and business continuity; under more normal conditions, they are used for capability upgrading and market positioning. Overall, differentiated access and readiness suggest targeted, tiered support rather than a single, uniform scheme.

Key words: *Green enterprise development; PCI; PGI; DDCI; sub-national governance*

INTRODUCTION

Vietnam's governance measurement system offers a structured way to observe how firms experience policy. The Provincial Competitiveness Index (PCI) was designed to capture economic governance through enterprise perceptions and has become a long-running reform signal across provinces (Malesky, 2009). Its enduring value lies in the diagnostic dimensions it stabilizes over time—transparency, time costs, informal costs, and competitive fairness—which help local governments identify where administrative reform most directly affects business conditions (VCCI, 2021). The Provincial Green Index (PGI) extends this measurement logic into environmental governance by assessing not only compliance and risk reduction but also leadership and the enabling supports that make green practices more adoptable for firms (VCCI, 2024). Together, PCI and PGI allow researchers to examine whether a province is building both the economic-governance backbone and the green-governance ecosystem required for enterprise transition.

However, provincial averages can obscure where frictions are produced. Firms interact with departments, districts, and one-stop service units that interpret requirements, process dossiers, and provide—or fail to provide—usable guidance. The Department and District Competitiveness Index (DDCI) was developed to make that intra-provincial variation visible and to support targeted reform by pinpointing which agencies and localities drive firm experiences (VCCI, 2021). Vietnam-focused scholarship similarly frames DDCI as the layer that explains why business perceptions differ within the same province and why departmental/district performance increasingly differentiates local competitiveness (Nguyen et al., 2024).

This diagnostic architecture becomes especially relevant in northern Vietnam, where environmental governance is tested under dispersed industrialization. In the Red River Delta, the expansion of craft villages and industrial clusters has delivered jobs and income while intensifying pollution and compliance pressures. The governance problem is not purely technical; it is also institutional, shaped by uneven capacity, trade-offs in enforcement, and the challenge of managing many small, dispersed emitters (Dang, 2020). In such a setting, indices are not just “rankings”; they become a way to trace whether green ambitions and administrative performance converge into conditions that firms can actually navigate.

Bac Ninh is a useful research area because it combines strong growth-facing incentives with visible environmental constraints, making the governance of green enterprise both urgent and empirically observable. The province's integration into large production networks means environmental externalities are structurally tied to growth trajectories, so policy must balance investment competitiveness with tightening environmental performance in ways that firms can operationalize.

Bac Ninh also provides an instructive contrast because its provincial green-governance signal is strong. In the 2024 PGI results, Bac Ninh is placed in the top group with 27.78 points and rank 4, indicating credible provincial-level signals of environmental governance and green enablement (VCCI, 2024). For research design, this matters: it shifts the focus away from “lack of intent” and toward the practical question of how intent translates into firm-facing conditions across heterogeneous production spaces.

That translation challenge is visible in localized hotspots associated with craft-village systems and small-scale recycling/production. An IUCN dialogue-based report on craft village pollution in Bac Ninh highlights governance constraints—limited participation, weak accountability, and uneven compliance routines—that shape why environmental problems persist even when formal frameworks exist (IUCN, 2011). Applied research on environmental security in Bac Ninh's craft villages similarly documents substantial pressures linked to production and recycling activities and argues for local economic development policy that

embeds environmental management more directly (Nguyen, 2018). These studies support treating transition capacity as uneven across firm types and locations, rather than assuming a single provincial pathway.

At the same time, Bac Ninh illustrates modernization potential through industrial-park governance. UNIDO's Environmental and Social Management Plan for Vietnam's Global Eco-Industrial Parks Programme describes VSIP Bac Ninh's environmental management system and wastewater treatment capacity, alongside resource monitoring efforts and remaining challenges related to consumption and emissions (UNIDO, 2024/2025). This juxtaposition—managed industrial parks versus dispersed craft-village/SME ecosystems—creates a high-contrast environment well suited for examining how green enterprise conditions vary inside one province.

The literature suggests that green enterprise development accelerates when environmental ambition is aligned with institutional capacity and consistent service delivery. PCI and PGI capture different parts of that alignment: PCI reflects whether day-to-day governance reduces friction for business activity, while PGI reflects whether environmental governance provides credible signals, standards, and enabling supports for greener practices (VCCI, 2021; VCCI, 2024). DDCI adds the missing explanatory layer by showing whether those provincial-level signals translate into consistent experiences across departments and districts, where firms actually conduct procedures and absorb compliance costs (Nguyen et al., 2024).

This integrated framing also clarifies why PCI and PGI may diverge in the short run. A province can improve green-governance signals through stronger leadership and policy tools while firms continue to face administrative burden or uneven handling across agencies, slowing behavioral change. The policy–practice gap is a coordination and implementation problem: coherence can be weakened when responsibilities are fragmented, and firm experience can vary with frontline discretion and capacity constraints (Rodrigo et al., 2009; Lipsky, 1980). In Bac Ninh, where both high-level green signals and localized governance bottlenecks are visible, the PCI–PGI–DDCI triad therefore offers a coherent way to explain not only “what improved,” but also “where adoption is likely to stall,” and which institutional nodes matter most for moving from formal greening to enterprise-level practice.

LITERATURE REVIEW

Green enterprise development and competitiveness: an institutional mechanism

Green enterprise development is best understood as an investment decision made under uncertainty. Firms adopt cleaner technologies, environmental management systems, and resource-efficiency routines when they can reasonably expect returns—lower input costs, reduced exposure to regulatory and reputational risks, and sustained access to more demanding markets. These expectations are not formed in markets alone. They are shaped by the institutional setting—how rules are specified, communicated, and enforced—which alters both perceived risk and the real cost of upgrading (North, 1990). When administrative processes are slow or unpredictable, transaction costs rise and long-horizon commitments are deferred, which is typical for green upgrading (Williamson, 1985).

This lens clarifies why the regulation–competitiveness debate is not a simple trade-off. The Porter Hypothesis argues that stringent but well-designed environmental rules can spur innovation and efficiency improvements that offset compliance costs and may strengthen competitiveness (Porter & van der Linde, 1995). Later syntheses treat this as a conditional mechanism: outcomes depend on regulatory design, enforcement credibility, and the presence of complementary instruments that allow firms to respond through re-optimization rather than mere compliance (Ambec et al., 2013). Empirical research aligns with this conditional reading.

Regulatory pressure is often associated with higher innovation effort, commonly measured via increased R&D expenditure, even when productivity gains do not appear immediately or uniformly across sectors (Jaffe & Palmer, 1997). Evidence consistent with productivity improvements also tends to appear in settings where adaptation is feasible and effects materialize with time lags (Lanoie et al., 2008). The implication for sub-national analysis is precise: competitiveness effects hinge less on the existence of environmental standards and more on whether firms face an institutional environment that makes upgrading responses practicable.

Provincial indices (PCI–PGI–DDCI) and implementation stress tests in Northern Vietnam

Vietnam’s governance measurement system offers a structured way to observe how firms experience policy. The Provincial Competitiveness Index (PCI) was designed to capture economic governance through enterprise perceptions and has become a long-running reform signal across provinces (Malesky, 2009). Its enduring value lies in the diagnostic dimensions it stabilizes over time—transparency, time costs, informal costs, and competitive fairness—which help local governments identify where administrative reform most directly affects business conditions (VCCI, 2021). The Provincial Green Index (PGI) extends this measurement logic into environmental governance by assessing not only compliance and risk reduction but also leadership and the enabling supports that make green practices more adoptable for firms (VCCI, 2024). Together, PCI and PGI allow researchers to examine whether a province is building both the economic-governance backbone and the green-governance ecosystem required for enterprise transition.

However, provincial averages can obscure where frictions are produced. Firms interact with departments, districts, and one-stop service units that interpret requirements, process dossiers, and provide—or fail to provide—usable guidance. The Department and District Competitiveness Index (DDCI) was developed to make that intra-provincial variation visible and to support targeted reform by pinpointing which agencies and localities drive firm experiences (VCCI, 2021). Vietnam-focused scholarship similarly frames DDCI as the layer that explains why business perceptions differ within the same province and why departmental/district performance increasingly differentiates local competitiveness (Nguyen et al., 2024).

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RESEARCH AREA: BAC NINH AS A HIGH-CONTRAST SETTING FOR GREEN ENTERPRISE GOVERNANCE

Bac Ninh is a useful research area because it combines strong growth-facing incentives with visible environmental constraints, making the governance of green enterprise both urgent and empirically observable. The province’s integration into large production networks means environmental externalities are structurally tied to growth trajectories, so policy must balance investment competitiveness with tightening environmental performance in ways that firms can operationalize.

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What PCI, PGI, and DDCI jointly explain Bac Ninh

In sum, the literature suggests that green enterprise development accelerates when environmental ambition is aligned with institutional capacity and consistent service delivery. PCI and PGI capture different parts of that alignment: PCI reflects whether day-to-day governance reduces friction for business activity, while PGI reflects whether environmental governance provides credible signals, standards, and enabling supports for greener practices (VCCI, 2021; VCCI, 2024). DDCI adds the missing explanatory layer by showing whether those provincial-level signals translate into consistent experiences across departments and districts, where firms actually conduct procedures and absorb compliance costs (Nguyen et al., 2024).

This integrated framing also clarifies why PCI and PGI may diverge in the short run. A province can improve green-governance signals through stronger leadership and policy tools while firms continue to face administrative burden or uneven handling across agencies, slowing behavioral change. The policy–practice gap is a coordination and implementation problem: coherence can be weakened when responsibilities are fragmented, and firm experience can vary with frontline discretion and capacity constraints (Rodrigo et al., 2009; Lipsky, 1980). In Bac Ninh, where both high-level green signals and localized governance bottlenecks are visible, the PCI–PGI–DDCI triad therefore offers a coherent way to explain not only “what improved,” but also “where adoption is likely to stall,” and which institutional nodes matter most for moving from formal greening to enterprise-level practice.

METHODOLOGY

Research Design. The study employs a single-province case design (Bac Ninh) and a secondary-data strategy, leveraging existing index datasets rather than fielding an original

survey. This design matches the paper's explanatory objective: to interpret governance conditions as revealed by established measurement frameworks and to translate those signals into policy-relevant mechanisms. Empirically, the analysis triangulates PCI, PGI, and DDCI 2025, allowing province-level movements to be interpreted alongside implementation-layer evidence from the administrative units that firms engage with in routine transactions. The inclusion of DDCI 2025 addresses a key measurement gap: PCI and PGI summarize provincial performance, but they are less informative about where bottlenecks arise within the delivery chain. To preserve comparability, the analysis is conducted within a consistent window of 2016–2025, which is maintained throughout synthesis and heterogeneity analysis.

Data sources, constructs, and operationalization. The paper operationalizes “green enterprise development conditions” as a multi-level governance construct built from three complementary index families. PCI proxies core economic-governance frictions (e.g., transparency, time costs, informal costs, and fairness) that shape firms' operating environment. PGI captures environmental-governance enablement relevant to green transition through its component structure. Because PCI and PGI are primarily province-aggregated indicators, the analysis brings in DDCI 2025 to recover variation at the implementation margin, i.e., performance of provincial departments and localities as experienced by enterprises, using DDCI's structured component framework.

For policy interpretation, the study applies the project's bridging logic by mapping DDCI evidence into six commonly used reform levers in PCI/PGI-oriented practice (including digitalized procedures, ESG disclosure, human-capital programs, and green finance). This mapping serves as the operational link between unit-level implementation signals and a standardized reform vocabulary, enabling coherent synthesis and recommendation design.

Analytical procedure. The empirical strategy proceeds in stages. First, the analysis applies the consistent 2016–2025 scope to ensure that cross-index comparisons are not driven by mismatched periods. Second, it characterizes PCI and PGI as parallel province-level trajectories—economic governance versus environmental governance—then uses DDCI 2025 to diagnose how observed province-level patterns relate to implementation performance across administrative units. This sequencing follows the reporting logic in the DDCI materials, which juxtapose PCI component variation over recent years with the DDCI component system for 2025.

Third, the analysis explicitly tests for heterogeneity rather than relying on a representative-firm interpretation. Results are examined by firm group (SMEs, medium firms, and FDI enterprises) and by location (urban versus non-urban districts). This segmentation is substantively motivated by the two-layer institutional structure captured in DDCI (departments and localities) and by the expectation that exposure to administrative frictions and green-policy support differs across firm types and geographic settings.

Validity, limitations, and ethics

Validity. The primary validity strategy is triangulation across indices and levels of observation. PCI and PGI provide structured province-level benchmarks, while DDCI 2025 supplies implementation-layer granularity where firms directly experience public administration. Combining these sources strengthens interpretability by enabling consistency checks between aggregate movements and frontline delivery patterns.

Limitations. The design is non-causal: as a secondary analysis, it does not identify treatment effects or causal mechanisms. Findings reflect index-based evidence and enterprise experience rather than direct measurement of emissions or investment outcomes.

Comparability is also bounded by differences in index design and measurement scope across PCI, PGI, and DDCI.

Ethics. The analysis relies on aggregated, report-based evidence as presented in the index and DDCI materials and does not disclose individual firm identifiers.

Statistical data and results

Macro-economic context

Table 1 reports the headline macro indicators cited in the DDCI 2025 summary report for Bac Ninh’s 2024 recovery. The report records quarterly acceleration in GRDP growth in Q2/2024 (8.06% year-on-year), which is reported to bring first-half growth to 2.32% (year-on-year). For the full year 2024 (current prices), GRDP is estimated at 232.8 trillion VND, corresponding to 6.03% growth relative to 2023. The same section reports per-capita income of 73 million VND per person per year, increasing 14.8% relative to 2023. In addition, the report provides baseline index levels for 2023 to situate the subsequent governance evidence: PCI 2023 is reported at 65.96 points (down 3.12 points versus 2022) and PGI 2023 at 22.53 points, ranked 21/30 within the Top-30 group. The introductory framing also notes “green growth” and “digital transformation” as leading trends shaping policy priorities, providing background for linking governance metrics to sustainability-related reforms.

Category	Indicator	Year/Period	Value	Note
Macro-economy	GRDP growth (YoY)	Q2/2024	8.06%	Quarterly acceleration in Q2/2024
Macro-economy	GRDP growth (YoY)	H1/2024	2.32%	First-half growth (YoY)
Macro-economy	GRDP (current prices)	2024	232.8 trillion VND	Estimated full-year GRDP
Macro-economy	GRDP growth (YoY)	2024 vs 2023	6.03%	Full-year growth rate
Macro-economy	Per-capita income	2024	73 million VND/person/year	+14.8% vs 2023
Governance baseline	PCI score	2023	65.96 points	Down 3.12 points vs 2022
Governance baseline	PGI score	2023	22.53 points	Rank 21/30 within Top-30 group
Policy framing	Provincial priorities/trends	2023–2025 framing	“Green growth” & “digital transformation”	Used as background trends in the report’s introduction

Table 1. Bac Ninh macro indicators and index baselines (2023–2024).

Source (compiled by author): DDCI 2025 Report and DDCI 2025 Synthesis Report

PGI outcomes: overall score, rank shift, and component profile

Figure 1 presents Bac Ninh’s 2024 PGI position within the Top-30 provincial ranking. The report states a 2024 PGI total score of 27.78 points for Bac Ninh, with an increase of 5.25 points and an improvement of 17 ranks compared with 2023, placing Bac Ninh at rank 4/30 in 2024.

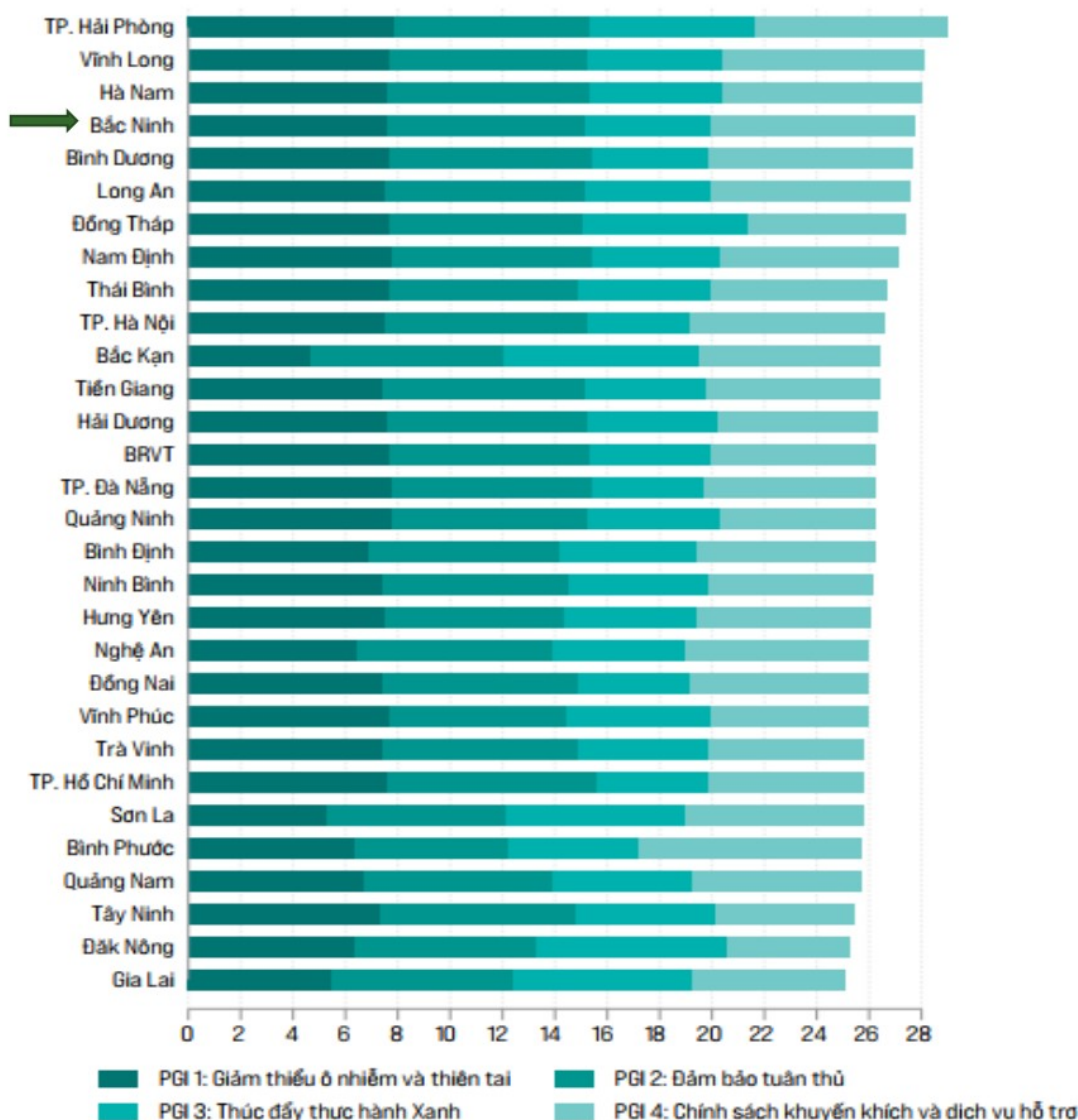


Figure 1. PGI 2024 score and rank for Bac Ninh (Top-30 group)

Table 2 decomposes the PGI total into its four component indices (CSTP1–CSTP4) for 2022–2024 and reports the province’s rank in each year. The table reports that, in 2024, CSTP1 (pollution and disaster mitigation) = 7.64, CSTP2 (compliance) = 7.47, CSTP3 (green practices) = 4.88, and CSTP4 (incentives and support services) = 7.78. For reference, the same table provides the corresponding component levels for 2022 (6.85; 5.23; 3.59; 1.58) and 2023 (7.29; 5.99; 3.64; 5.61), as well as the associated rank sequence (3 in 2022; 21 in 2023; 4 in 2024). Within the 2024 component profile, CSTP3 is reported as the lowest component score relative to the other three components.

PGI component	2022	2023	2024
CSTP 1: Pollution reduction and disaster risk mitigation	6.85	7.29	7.64
CSTP 2: Environmental compliance	5.23	5.99	7.47
CSTP 3: Green practices promotion	3.59	3.64	4.88
CSTP 4: Incentive policies and support services	1.58	5.61	7.78
Rank	3	21	4

Table 2. PGI component scores for Bac Ninh (2022–2024) and rank

PCI-linked constraints reported as time-series component movements

Figures 2–5 reproduce PCI component time-series for Bac Ninh over 2019–2024 as presented in the DDCI 2025 report.

Figure 2 plots the “informal costs” component (chi phí không chính thức) and reports the sequence 7.24 (2019), 7.69 (2020), 7.27 (2021), 6.83 (2022), 6.79 (2023), and 6.58 (2024).

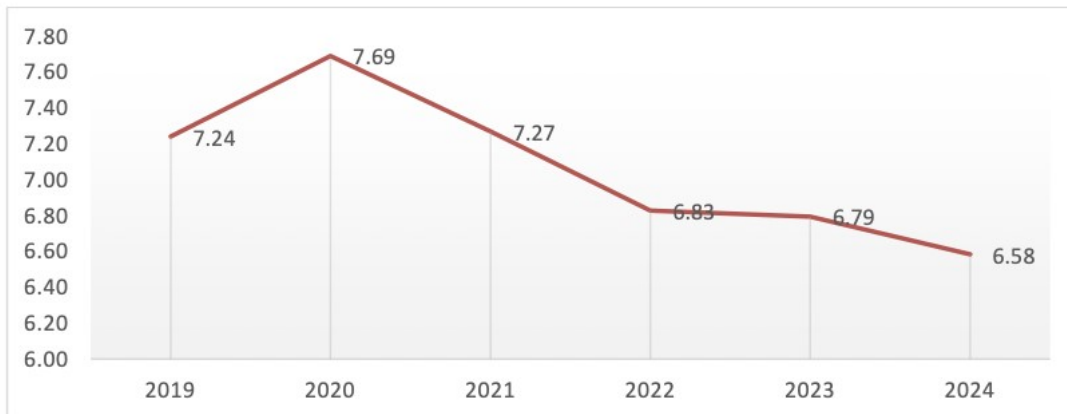


Figure 2. PCI informal costs, 2019–2024 (Bac Ninh)

Figure 3 plots the “time costs” component (chi phí thời gian) and reports the sequence 7.23 (2019), 8.42 (2020), 8.47 (2021), 8.54 (2022), 7.74 (2023), and 7.14 (2024).

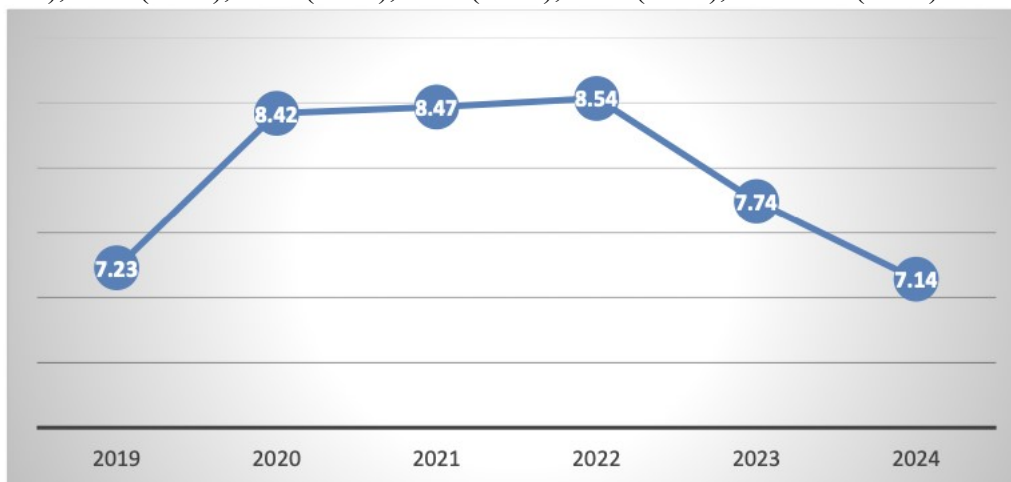


Figure 3. PCI time costs, 2019–2024 (Bac Ninh)

Figure 4 plots “equal competition” (cạnh tranh bình đẳng) and reports the sequence 7.51 (2019), 6.46 (2020), 6.29 (2021), 6.93 (2022), 5.91 (2023), and 5.36 (2024).

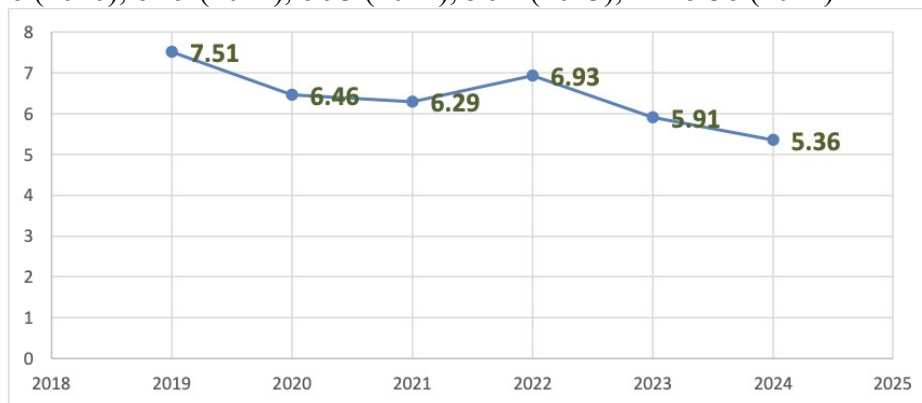


Figure 4. PCI equal competition, 2019–2024 (Bac Ninh)

Figure 5 plots “business support policy” (chính sách hỗ trợ doanh nghiệp) and reports 6.62 (2019), 6.75 (2020), 7.27 (2021), 6.48 (2022), 5.47 (2023), and 7.41 (2024), with accompanying text indicating that 7.41 represents the highest value recorded for the province since the component has been measured in the PCI series.

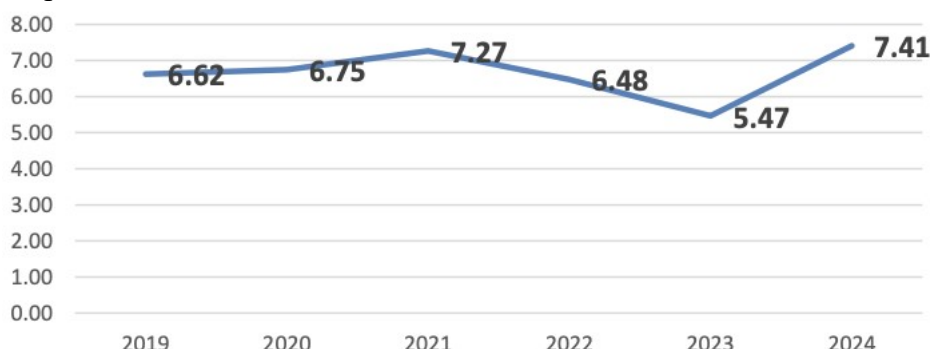


Figure 5. PCI business support policy, 2019–2024 (Bac Ninh)

Together, these figures document the direction and magnitude of recent changes in administrative and business-environment components reported within the PCI framework.

DDCI 2025: implementation-layer structure and selected distributional evidence

The DDCI 2025 report defines the DDCI instrument as an eight-dimension framework capturing transparency, dynamism/proactiveness, informal costs, time costs, equal competition, business support policy, legal institutions, and the effectiveness of business-environment improvement. Figure 6 is constructed directly from this definition statement to document the measurement architecture used to interpret implementation performance at the department and locality level.

Purpose ("zoom-in" use)	A diagnostic instrument designed to “zoom in” to departments and localities, clarifying responsibilities and implementation capacity, to support improvements in the provincial business environment (aligned with PCI/PGI improvement).
Dimensions (8)	
(1) Transparency	(5) Equal competition
(2) Dynamism / Proactiveness	(6) Business support policy
(3) Informal costs	(7) Legal institutions
(4) Time costs	(8) Effectiveness of business-environment improvement

Figure 6. DDCI 2025 eight-dimension framework (compiled by author from DDCI 2025 definition statement).

Beyond the framework, the report provides distributional evidence for environment-related administrative and inspection items. Figure 10 summarizes enterprise assessments of the importance of a set of compliance-related environmental governance items (reported as “Hoạt động đảm bảo tuân thủ các tiêu chuẩn môi trường tối thiểu (PGI)”). The accompanying text reports that the combined share of responses in the “very important / important / normal” categories exceeds 70% for most items and identifies the largest “very important” share as 11.43% for the item “The local government has solutions to prevent pollution.”

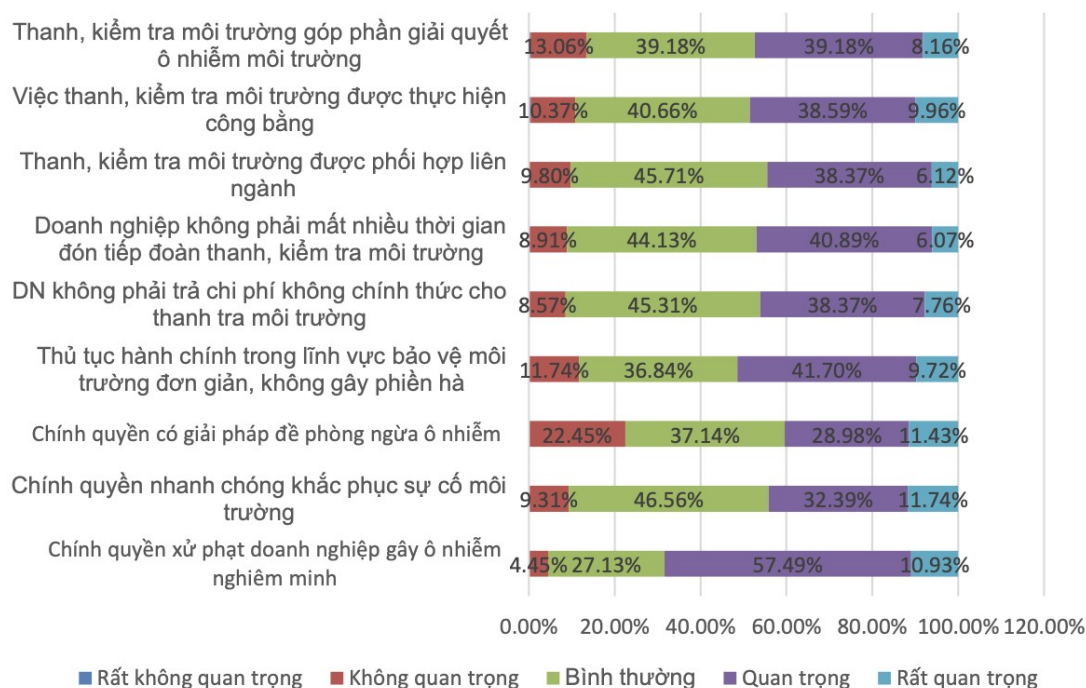


Figure 10. Aggregate distribution: importance of environmental compliance-related items (PGI).

To document locality heterogeneity using a compact presentation, Table 3 reports the urban-area subgroup distribution (Table 3.14 in the DDCI report) for key administrative-process and inspection-related items. For the item “Environmental administrative procedures are simple and not troublesome,” the urban subgroup shares are 13.58% “very important,” 48.15% “important,” 28.40% “normal,” 9.88% “not important,” and 0.00% “very unimportant.”

Item	Very important	Important	Neutral	Not important	Not at all important
The government penalizes firms that cause serious pollution	14.81%	59.26%	19.75%	6.17%	0.00%
The government promptly remedies environmental incidents	16.25%	33.75%	40.00%	10.00%	0.00%
The government has measures/solutions to prevent pollution	10.00%	43.75%	23.75%	22.50%	0.00%
Environmental administrative procedures are simple and not burdensome	13.58%	48.15%	28.40%	9.88%	0.00%
Firms do not have to pay unofficial costs for environmental inspections	10.00%	43.75%	36.25%	10.00%	0.00%
Firms do not spend much time receiving environmental inspection teams	7.41%	49.38%	37.04%	6.17%	0.00%
Environmental inspections are coordinated across agencies/sectors	7.69%	50.00%	33.33%	8.97%	0.00%

Table 3. Urban-area subgroup distribution for environment administration/inspection items.

For the item “Firms do not have to pay informal costs for environmental inspections,” shares are 10.00%, 43.75%, 36.25%, 10.00%, and 0.00%, respectively. For the item “Firms do not spend much time receiving environmental inspection teams,” shares are 7.41%, 49.38%, 37.04%, 6.17%, and 0.00%. These same distributions are visualized in the report via Figure 7 and Figure 8 (Figures 3.25 and 3.26 in the report), which plot response shares for two of the urban-area items.

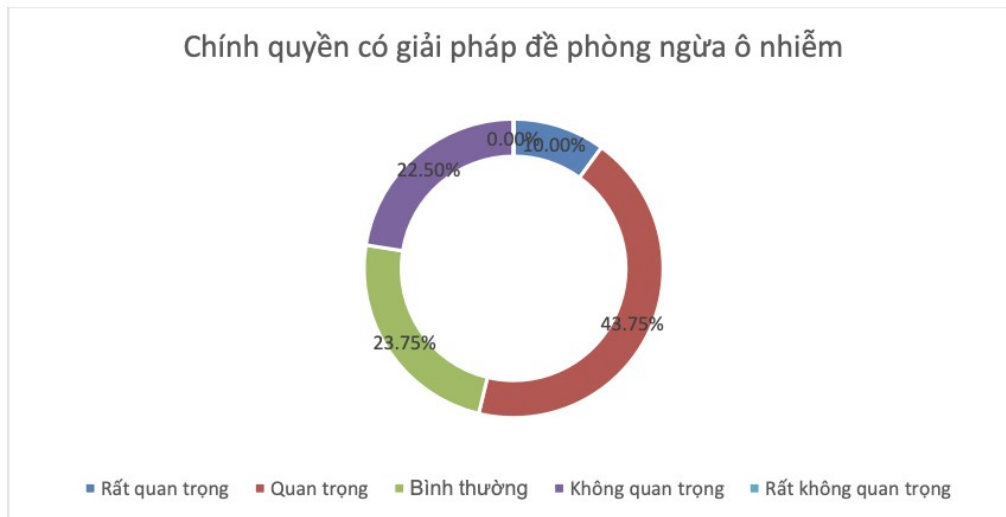


Figure 7. Urban subgroup: “Environmental procedures are simple, not troublesome.”

Thủ tục hành chính trong lĩnh vực bảo vệ môi trường đơn giản, không gây phiền hà

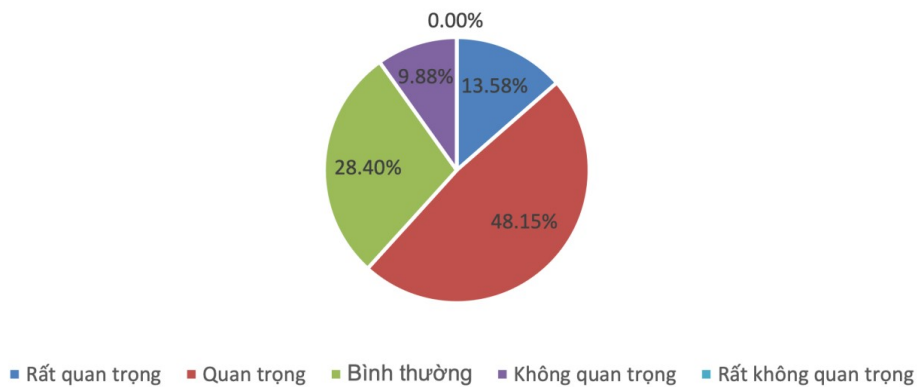


Figure 8. Urban subgroup: “No excessive time receiving environmental inspection teams.”

To illustrate firm-size heterogeneity, Table 4 reports selected entries from the micro-firm subgroup table (enterprises with fewer than 10 employees) on the “pollution and disaster mitigation” set of PGI-related items. For example, the table reports 31.25% “very important,” 46.88% “important,” and 15.63% “normal” for “Environmental quality is good”; and the same distribution for “Firms are not affected by pollution and climate change.” The table also reports 35.48% “very important,” 45.16% “important,” and 19.35% “normal” for “Waste treatment services in industrial clusters/parks are good.” The accompanying text reports an average combined share of 91.91% for the micro-firm subgroup in the “very important / important / normal” categories across the listed items.

Item	Very important	Important	Neutral	Not important	Not at all important
Good environmental quality	31.25%	46.88%	15.63%	6.25%	0.00%
Businesses are not affected by pollution and climate change	31.25%	46.88%	15.63%	6.25%	0.00%
Pollution caused by local businesses is not common	26.67%	43.33%	20.00%	10.00%	0.00%
Good quality of clean water supply services	34.38%	37.50%	25.00%	3.13%	0.00%
Good quality of waste treatment services in industrial parks/clusters	35.48%	45.16%	19.35%	0.00%	0.00%
Businesses do not face difficulties due to natural disasters and climate change	18.75%	53.13%	15.63%	12.50%	0.00%
Businesses can easily access information on weather and hydrometeorology	16.13%	51.61%	22.58%	9.68%	0.00%
Infrastructure quality is sufficient for climate-change and pollution prevention	25.00%	43.75%	21.88%	9.38%	0.00%
Most communes/wards have daily solid-waste collection activities	25.00%	40.63%	18.75%	12.50%	3.13%

Table 4. Enterprises with fewer than 10 employees: assessment of the impact of pollution reduction and disaster risk mitigation (PGI) on sustainable development

Finally, Figure 9 reports the micro-firm subgroup distribution for a green-transition support item: “Firms receive policy incentives when investing green.” For enterprises with fewer than 10 employees, the report states shares of 22.58% “very important,” 64.52% “important,” 12.90% “normal,” and 0.00% in both “not important” categories.

DN được hưởng ưu đãi chính sách khi đầu tư xanh

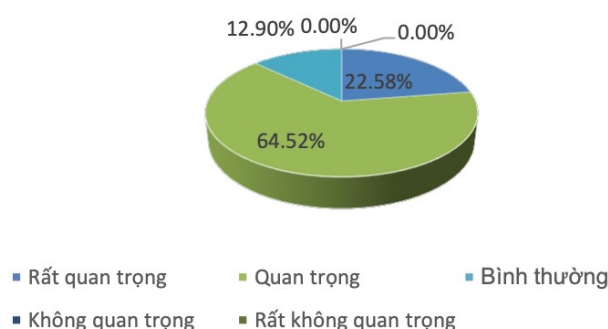


Figure 9. Micro firms (<10 employees): “Policy incentives when investing green”.

DISCUSSION

Interpreting short-run divergence between PGI improvement and uneven PCI performance

The empirical record indicates a short-run divergence in governance signals: Bac Ninh’s PGI improves sharply in 2024 (Figure 1; Table 2), while PCI-linked administrative frictions

exhibit uneven movements and, for several core components, deterioration in the same period (Figures 2–5). This divergence is not necessarily contradictory. PGI and PCI capture related but non-identical dimensions of governance performance, and they can move asynchronously when policy priorities shift faster than administrative process reform. In the report evidence, the PGI surge is consistent with a strengthening of green-governance capacity at the provincial level—especially in compliance and support-policy dimensions (Table 2)—whereas the PCI series continues to register burdens in time costs, informal costs, and perceived unequal competition (Figures 2–4).

From a political-economy perspective, the pattern is consistent with a “two-speed” reform process: policy framing, compliance infrastructure, and outward-facing support programs can be strengthened relatively quickly, while deep reductions in transaction costs and improvements in perceived fairness require changes in discretionary implementation and inter-agency coordination, which are typically slower-moving. The DDCI report’s own emphasis on using DDCI to “zoom in” on departments and localities reinforces the interpretation that province-level improvements may coexist with implementation-layer frictions that are not visible in aggregate PGI outcomes (Figure 6).

From green governance to green practices: why the weakest PGI pillar matters

The PGI component profile provides a disciplined way to locate where the green transition remains constrained. Table 2 shows that the 2024 improvement is broad-based, but green practices (CSTP3) remains the lowest component relative to compliance and incentives/support services. This configuration is analytically informative because it separates two margins: (i) the province’s capacity to enforce and incentivize environmentally relevant behavior (captured more strongly by compliance and support-policy components) and (ii) the extent to which firms internalize green upgrading as an operational and investment strategy (captured by “green practices”).

The report’s narrative interpretation is consistent with this structural reading: green practices tend to lag when firms face capability constraints—particularly for SMEs and firms outside core urban areas—because adoption requires complementary inputs such as financing, technology, and skilled labor, as well as predictable administrative procedures. Thus, the reported weakness in CSTP3 should be understood less as a lack of policy intent and more as evidence that private-side adoption is still limited relative to the pace of governance-side acceleration.

What DDCI adds empirically: identifying the implementation margin

The DDCI contribution is methodological and substantive. Methodologically, it introduces an implementation-layer measurement architecture that is conceptually aligned with the mechanism through which governance reforms affect firms. Substantively, it provides granular, experience-based evidence that can explain why province-level indices may not fully capture execution bottlenecks. The eight-dimension framework (Figure 6)—spanning transparency, proactiveness, informal costs, time costs, equal competition, business support policy, legal institutions, and the effectiveness of improving the business environment—maps directly onto the channels through which administrative quality shapes both general competitiveness and the feasibility of green upgrading.

In that sense, DDCI functions as a diagnostic bridge between the PCI time series and the PGI component profile. Where PCI signals persistent frictions in time costs and informal costs (Figures 2–3), DDCI provides a structured means to localize these frictions across agencies and territories rather than treating them as a uniform provincial characteristic. This is particularly relevant in a green-transition context because policy compliance and green

investments are sensitive to administrative predictability, inspection burdens, and the credibility of support instruments.

Heterogeneity is systematic: firm type and location as governance “exposure”

A core implication of the report evidence is that heterogeneity should not be treated as noise. The DDCI environment-related distributions provide a concrete illustration. In the urban-area subgroup, the response distributions for administrative simplicity and inspection-related burdens (Figures 7–8; Table 3) indicate that these items are salient and evaluated in a way consistent with procedural exposure in denser regulatory environments. For micro firms, distributions highlight strong stated importance attached to incentives for green investment (Figure 9) and to several environment-quality and service-related items (Table 4).

This segmentation is consistent with the broader report framing that SMEs and non-urban firms face tighter constraints in capital, technology, and skills, while larger and FDI firms are more likely to have the organizational capability to comply with and benefit from green-governance systems. Economically, this suggests that the effective incidence of green-transition policies depends on the interaction between firm capacity and administrative delivery. When administrative frictions remain elevated (time costs, informal costs, and perceived unequal competition), these frictions are likely to be more distortionary for smaller firms and peripheral locations, potentially slowing diffusion of green practices even as province-level governance scores improve.

Uneven PCI performance and green transition: why transaction costs and fairness matter

The PCI component series points to a tension that is particularly important during transition periods. Figures 2–4 document that informal costs, time costs, and equal competition reach low points by 2024 relative to the 2019–2024 window, while Figure 5 shows that business support policy improves sharply in 2024. A plausible interpretation—consistent with the report’s synthesis—is that programmatic support can expand even as firms continue to experience administrative burdens and perceived unequal treatment.

In a green-transition setting, this tension is consequential. Green upgrading often increases compliance requirements, documentation demands, and interaction frequency with administrative bodies (e.g., permits, inspections, reporting). If time costs and informal costs remain high and fairness perceptions deteriorate, the marginal burden of transition becomes unevenly distributed, undermining broad-based adoption of green practices (as reflected in the persistently low CSTP3 score). In other words, policy acceleration without commensurate reduction in transaction costs risks producing a governance profile in which compliance improves and support exists on paper, yet firm-level practice diffusion remains partial.

Synthesis: an integrated governance interpretation consistent with the report evidence

The results support an integrated interpretation: Bac Ninh’s 2024 governance profile reflects (i) accelerated green-governance performance in PGI, (ii) persistent or worsening administrative frictions in key PCI components, and (iii) implementation-layer heterogeneity documented through DDCI’s structured framework and subgroup distributions. The policy-relevant inference is not that any one index is “right,” but that each captures a distinct layer of the same institutional system. The joint reading implies that strengthening green governance at the province level is necessary but not sufficient; diffusion of green practices requires that implementation performance—especially in transaction costs, transparency, and equal treatment—be sufficiently improved for smaller firms and non-urban districts to participate effectively.

CONCLUSIONS

The aim of this study was to assess the conditions for green enterprise development in Bac Ninh by integrating three complementary sources of governance evidence: PCI as a signal of economic governance, PGI as a signal of green governance, and DDCI 2025 as evidence on frontline implementation performance. A parallel goal was to show why province-level index movements alone are insufficient for interpreting firms' transition conditions, and how an implementation-layer "zoom-in" can clarify where policy delivery becomes binding in practice.

The results highlight a clear improvement in Bac Ninh's green-governance signal in 2024. PGI rises to 27.78 points and places Bac Ninh 4/30 in the top group (Figure 1; Table 2). At the same time, the component profile indicates that "green practices" remains the weakest pillar relative to the other PGI dimensions. This pattern suggests that stronger green-governance performance does not automatically translate into the diffusion of firm-level green practices at scale, particularly in an industrial province where upgrading requires both compliance capacity and operational capability.

The PCI evidence reported in the DDCI document describes a mixed economic-governance configuration over 2019–2024 (Figures 2–5). By 2024, several transaction-cost and fairness-related components—including informal costs, time costs, and equal competition—remain weaker, while business support policy shows a notable increase. Read together, these results describe a policy environment in which support-policy signals strengthen, but firms may still face friction in the administrative interfaces that shape predictability and perceived fairness.

The DDCI 2025 evidence provides the key bridge between these provincial signals and firm experience. The report explicitly defines DDCI as an eight-dimension framework—covering transparency, dynamism, informal costs, time costs, equal competition, business support policy, legal institutions, and the effectiveness of business-environment improvement—and frames it as a tool to "zoom in" on performance across departments and localities (Figure 6). The subgroup results for urban-area enterprises (Figures 7–8; Table 3) and micro firms (Figure 9) further illustrate that the salience of procedures, inspection burdens, and incentives differs across firm groups and place contexts, which is consistent with an implementation-centered view of green transition.

Overall, this study shows that an integrated PCI–PGI–DDCI reading provides a more complete description of green enterprise conditions in Bac Ninh than any single index can offer. It allows policy to be interpreted not only through aggregate improvements, but also through the day-to-day implementation channels that shape firms' effective transition costs. The evidence supports a synchronized and tiered reform logic: reducing administrative friction and improving transparency in environment-related procedures, while strengthening capability-building instruments that move firms from compliance toward adoption, and differentiating delivery by firm group and locality to match the uneven transition capacity revealed by DDCI.

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