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Research Article

Environmental Responsibility as Strategic Capital: Rethinking Business Competitiveness in the Green Economy

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Abstract

This study presents an exploratory comparative case study of BYD and Tesla from 2023 to 2025 to examine when environmental responsibility may be interpreted as potential strategic capital. Using corporate reports, regulatory filings, and third-party market evidence, it assesses organizational embedding, relative market performance, and environmental counterevidence. At BYD, the clearest evidence lies in company-wide energy management. BYD's battery-electric passenger-vehicle sales rose while its renewable indirect-energy share increased, but gross margin slipped and water withdrawal and hazardous waste grew. Tesla followed a different path. Its energy-storage deployments, segment revenue, gross margin, and global BESS position strengthened, although manufacturing credits reduced reported segment costs and company-wide emissions, water withdrawal, and waste remained above 2023 levels. The comparison identifies two partial pathways: BYD shows broader organizational embedding but weaker commercial attribution, whereas Tesla shows clearer cross-site scaling and market conversion but mixed company-wide environmental performance. These patterns are consistent with potential strategic capital without establishing durable causal advantage.

Keywords

Environmental responsibility, Potential strategic capital, Business competitiveness, Green economy

1. Introduction

Environmental performance has come into focus of competitive strategy as electric vehicles, batteries, renewable electricity, and energy storage transform demand. Electric vehicles represented one-quarter of global new-car sales in 2025 (International Energy Agency, 2026), but green-product growth can co-exist with higher emissions, water usage, or waste.

Environmental action can be a source of knowledge and routines (Hart, 1995), but in and of themselves, neither spending nor product narratives have shown themselves to be particularly competitive performances. Inputs, capabilities, consequences and counterevidence must therefore be disentangled.

By asking these questions we hope to learn how BYD's and Tesla's announced environmental actions relate to these organizations' capabilities and relative performance in the market, and their market commercial success in 2023–2025 and what limits their interpretation as possible strategic capital. The exploratory question is about within-company configurations and not causal effects.

The comparison separates operational eco-efficiency from clean-technology commercialization; total R&D, green-product growth, and favorable intensity indicators provide context rather than proof of strategic value.

2. Literature Review and Analytical Perspective

The natural-resource-based view connects pollution prevention, product stewardship, and sustainable development to valuable capabilities (Hart, 1995). Porter and van der Linde (1995) posit that environmental pressure can spur innovation and resource productivity. Dynamic capability theory locates advantage in repeated sensing, seizing, and resource reconfiguration (Teece et al., 1997).

More recent research also finds support for capability-based relationships in the form of environmental responsibility and innovation. Yuan and Cao (2022) find green dynamic capability to mediate the relationship between corporate social responsibility and green innovation, and Sarwar et al. (2023) find a relationship between dynamic capabilities and competitiveness. Zhao and Li (2024) find ESG ratings to be associated with green technology innovation, and this relationship to be moderated by institutional conditions (Wang et al., 2024).

There are also some evident contingencies suggested by Chinese listed-firm evidence. Financing, employee innovation efficiency, risk-taking and rating uncertainty are listed by Fang and Hu (2023) as contingencies; capital access, talent agglomeration, and external supervision are highlighted by Qian et al. (2025). Clearly, these composite ESG studies do not demonstrate how firm-specific environmental action becomes capability. Case evidence can place action, capability, commercial performance, and missing links in each of the firms.

Environmental responsibility describes initiatives which reduce negative impacts on the environment, i.e. reduce the operational effects, or facilitate lower-carbon products, processes and services. Environmental capability is the ability to pursue such activities, and dynamic capability is the ability to sense change and reconfigure resources. Organizational capital is taken to mean the more general stock of institutionalized knowledge, routines and so on (Prescott & Visscher, 1980); potential strategic capital is that part of the environment whose competitive relevance remains to be discovered.

The reason for using the term capital is to focus attention upon accumulation and retention by an organization, not practice. Potential strategic capital is retained environment knowledge, routines or technologies, that is embedded and repeatable: durability and redeployment need evidence beyond first use. Commercial performance is not part of the definition, but provides external evidence of strategic relevance when present at the same level of organization. The analysis searches then for environment action, embedding by the organization, durability or redeployment, commercial outcome, and counterevidence.

3. Methodology

The study is a multiple embedded case (Yin, 2018). BYD and Tesla are purposely selected because both of them are vehicle, battery and energy storage companies operating globally; both are releasing continuous financial and environment data through 2023–2025; and both having their strongest disclosed capabilities at less top of their organizations. The point of comparison is company wide energy management by BYD and segment level storage manufacturing by Tesla. The design supports analytical comparison, not statistical generalize and also not causal attribute.

The time horizon is 2023–2025. Financial data are from audited annual reports and regulatory filings; environmental indicators and reporting scopes are from BYD's and Tesla's sustainability report and extended impact report (BYD Company Limited, 2026a, 2026b; Tesla, Inc., 2026a, 2026b). Relative market evidence is from company filings and Wood Mackenzie's BESS rankings.

Each case was then interrogated in the same sequence: environmental action, recurrent organisational practice, evidence of durability/deployments elsewhere, commercial outcomes at the appropriate level and adverse signals/boundary differences. A stated operational measure was taken to constitute environmental action and recurring targets/audits/routines of management count as organisational embedding. Persistence over years or replication over sites was confirmed as durability or redeployment, respectively, where evidence of commercial or relative-market was only accepted if it was at the same level of organization as the capability, One off statements, no persistence or replication, level mismatch, and negative environment indicators were included as limiting or contradict evidence. Mission statement and total R&D were not included as embedded capability.

Within-case analysis then cross-case comparison. Since the firms employ varying environmental units and reporting boundaries, the absolute levels of environment is not ranked. Cross-case comparison focuses on the location and completeness of evidence instead of regarding the observations as equivalent firm-level measures.

4. Findings

4.1. Comparative trajectories

Tables 1 and 2 summarise the trajectories used in the case study. Total R&D is context, not green-specific, market position, margins and resource pressures are distinct pieces of evidence.

Table 1

BYD Financial and Environmental Evidence 2023–2025

Company	Indicator	Unit	2023	2024	2025	Change, 2023–2025
BYD	Revenue	RMB billion	602.32	777.10	803.96	+33.5%
BYD	Gross profit margin	%	19.0	19.0	18.0	-1.0 pp
BYD	Contextual total R&D expense (not green-specific)	RMB billion	39.57	53.19	57.98	+46.5%
BYD	Battery-electric passenger-vehicle sales	Million vehicles	1.575	1.765	2.257	+43.3%
BYD	Scope 1+2 emissions, location-based	million tCO_2e	12.34	10.10	12.26	-0.6%
BYD	Reported Scope 1+2 intensity	tCO_2e/RMB10,000 revenue	0.2049	0.1300	0.1525	-25.6%
BYD	Renewable share of indirect energy	%	4.58	17.30	36.12	+31.54 pp
BYD	Water withdrawal	million m^3	73.81	94.27	109.26	+48.0%
BYD	Hazardous waste generation	thousand metric tons	118.38	150.46	155.67	+31.5%

Table 2

Tesla Financial and Environmental Proof 2023–2025

Company	Indicator	Unit	2023	2024	2025	Change, 2023–2025
Tesla	Total revenue	USD billion	96.77	97.69	94.83	-2.0%
Tesla	Total gross margin	%	18.2	17.9	18.0	-0.2 pp
Tesla	Energy generation and storage revenue	USD billion	6.04	10.09	12.77	+111.6%
Tesla	Energy generation and storage gross margin	%	18.9	26.2	29.8	+10.9 pp
Tesla	Contextual total R&D expense (not green-specific)	USD billion	3.97	4.54	6.41	+61.5%
Tesla	Scope 1+2 emissions, location-based	million tCO_2e	0.677	1.056	1.139	+68.2%

Tesla	Renewable electricity	million kWh	420.08	681.36	1,088.92	+159.2%
Tesla	Vehicle deliveries	Million vehicles	1.809	1.789	1.636	-9.5%
Tesla	Energy-storage deployments	GWh	14.7	31.4	46.7	+217.7%
Tesla	Energy manufacturing credits	USD billion	0.115	0.756	1.120	+873.9%
Tesla	Freshwater withdrawal	Million m3	3.872	6.043	5.448	+40.7%
Tesla	Total waste	Thousand metric tons	397.211	699.691	670.209	+68.7%

Note. Pertains to Table 1 and Table 2. Percentage changes are calculated by the authors, pp = percentage points. Financial and operating data are obtained from the firms' 2025 annual reports and regulatory filings; environmental data are from their 2025 sustainability and impact reports (BYD Company Limited, 2026a, 2026b; Tesla, Inc., 2026a, 2026b). BESS market reference is from Wood Mackenzie (2025, 2026). BYD battery-electric sales and Tesla deliveries have similar but not identical transaction quantities. Currencies, organization levels and reporting boundaries are not the same. Absolute levels of environment are not comparable.

4.2. BYD: Company-wide expansion and environmental pressures

BYD's revenue rose 33.5%, while gross margin declined from 19% to 18%. R&D expense rose 46.5%, but its environmental share is not disclosed. More substantial evidence of capability is in a common energy-management system that connects annual business-unit targets to appraisal, ISO 50001 implementation, and regular audits (BYD Company Limited, 2026b, p. 43). These recurring procedures indicate organizational embedding, although their durability, redeployment, and contribution to revenue are not established.

BYD has mixed operational results: renewable share of indirect energy has increased from 4.58% to 36.12%, but Scope 1,2 emissions closed close to 2023 level and revenue based emissions intensity has decreased with 25.6%. Renewable energy certificates were by far the largest single reported renewable indirect-energy category in 2025, making it difficult to interpret all of it as equivalently physical green-electricity consumption. Water withdrawal increased from 73.81 million to 109.26 million m3 and hazardous waste from 118.38 to 155.67 thousand metric tons (BYD Company Limited, 2026b, pp. 147–150).

The emissions-intensity result also will be boundary dependent: BYD's environment indicators do not include overseas sites or sales outlets, while revenue does include consolidated activity. The ratio improved, but not in a way that indicates group-wide physical decoupling. BYD thus exhibits wide organizational embedding and good battery-electric market performance, but no isolated commercial effect of its energy-management routines (BYD Company Limited, 2026a).

4.3. Tesla: Energy-segment growth and operational emissions

Tesla's energy business provides evidence of clean-technology commercialization. The Lathrop and Shanghai Megafactories had stated annual manufacturing capacity above 80 GWh; this is nominal capacity, not actual supply. Shanghai moved from project initiation to production in less than nine months and began Megapack production in early 2025 (Tesla, Inc., 2026b, p. 114). Storage deployments rose from 14.7 to 46.7 GWh, while energy revenue increased 111.6% and segment gross margin rose from 18.9% to 29.8%. Tesla held an estimated 15% of the global BESS integrator market in 2024 and remained among the top two providers in 2025 (Wood Mackenzie, 2025, 2026). Manufacturing credits recorded against energy cost of revenue increased from USD 0.115 billion to USD 1.12 billion, so the margin trend does not isolate underlying manufacturing performance (Tesla, Inc., 2026a). Yet company-wide revenue fell 2.0%, gross margin stayed near 18%, and R&D remained contextual. The segment includes activities beyond Megapack manufacturing; its financial trajectory cannot be attributed solely to the two factories.

Tesla's operational trajectory qualifies the segment result. Renewable electricity rose from 420.08 million to 1,088.92 million kWh, while Scope 1 and 2 emissions increased from 0.677 million to 1.139 million tCO_2e (Tesla, Inc., 2026b, pp. 191, 193). The report shows consumption, not a distinct procurement mechanism, and the concurrent trends do not imply causation. Clean-energy business growth coexisted with a larger operational footprint. Freshwater withdrawal increased from 3.872 million to 5.448 million m3 and total waste from 397.2 to 670.2 thousand metric tons between 2023 and 2025, although both declined from 2024 (Tesla, Inc., 2026b, pp. 193–194). Tesla reports environmental indicators only at the company level, preventing a like-for-like comparison with the energy segment's commercial performance.

4.4. Cross-case synthesis

The cases differ in the location and completeness of their strongest evidence. BYD's standardized energy management reveals company-wide embedding but weak commercial attribution. Tesla's storage manufacturing shows more proximate segment-level commercialization but cannot establish whole-firm environmental performance. BYD therefore faces an attribution problem, whereas Tesla faces an aggregation problem.

In any other conditions, counterevidence would have prevented either path from claiming overall dominance. BYD's water withdrawal and hazardous waste went up when gross margin came down; Tesla's operating emissions, water withdrawal, and waste were all greater than 2023 despite expansion in the energy segment. Environmental action can be considered as putative strategic capital to which embeddable capability is claimed by persistent or re-deployable use and discrete commercial attest. BYD has deeper embedding organizationally but questionable attribution; Tesla has more

segment-level conversion clarity but equivocal company-wide environmental performance.

5. Discussion

The cases elaborate the natural-resource based view even further, which would treat embedded, but reusable and environment routines or technologies as potential, rather than demonstrated, strategic capital.The positioning product or spending are not enough. This interpretation relates Hart's (1995) environmental capabilities to the repeated reconfiguration described by Teece et al. (1997) and leaves the commercial effects to be shown rather than assumed. It also points to the importance of level: company-wide routines need to be compared to company-wide results, while segment capabilities could be compared with segment revenue and margins.

Large-sample studies report positive ESG-innovation associations, but these cases are more qualified. Public disclosures identify operational eco-efficiency at BYD and clean-technology commercialization at Tesla without tracing internal capability formation. Rising emissions or resource use therefore limit broader claims about environmental and competitive value.

For managers, environmental indicators have to be linked also to the operating practices producing them and to commercial outcomes at the same level of the firm. BYD's lower emissions intensity has to be disentangled from growing water consumption and hazardous waste; Tesla's energy-segment extension has to be disentangled from firm-wide operating emissions. It is more convincing when a practice, its organizational unit and a repeating result can be associated without jumping over reporting levels. This is what separates documented activity from a capability that affects an investment, production or market decision.

We do not find evidence that total R&D is a proxy of green innovation, nor that revenue growth or lower emissions intensity are evidence of competitive advantage or of physical decoupling. A short time window, changing reporting boundaries and a lack of independent process evidence preclude making claims about durability, redeployment, demand, pricing, capacity, policy and product mix.

6. Conclusion

The two cases reveal partial pathways toward potential strategic capital. BYD shows organization-wide embedding through recurrent targets, ISO 50001 adoption, and routine audits, although their commercial contribution cannot be isolated. Tesla's cross-site manufacturing expansion coincides with rising storage deployments and a leading BESS position, but the segment extends beyond Megapack, manufacturing credits affect reported costs, and company-wide environmental trends remain mixed. The cases suggest that strategic relevance is more credible when organizational embedding, redeployment, and commercial evidence align at the same organizational level. These patterns do not establish durable causal advantage.

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