Data-Driven Policy Iteration: The Path of Optimizing Green Consumption Policy by Digital Marketing

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Abstract. Against the backdrop of rising consumer demand for green brands and the improvement of green consumption policies, our research explores the possibility of dynamic policy optimization based on enterprise digital market data. This study proposes a Public-Private Data Synergy Governance (PPD-SG) architecture to prevent market changes in real time and mitigate lagging policy cycles, utilizing enterprise data (consumption trends, User-generated content (UGC), carbon accounts) as core evidence. With an anchor case study on Ant Forest and an understanding of a range of policy instruments, our research demonstrates that data-driven mechanisms can facilitate the instant identification of new demand, policy gaps, and coverage gaps. This research identifies significant institutional barriers and mandates a three-party implementation plan (government mandates, enterprise data briefs, third-party oversight) for agile, evidence-based green governance. This research forges policy iteration theory and identifies implementable directions for practical cooperation on data. The study significantly enriches policy iteration theory by introducing real-time data streams, and its results provide a scalable and viable solution for breaking data fragmentation and overcoming institutional inertia in green governance. The proposed PPD-SG model is highly praised for revealing the defining strengths of digital-age policies, including increased responsiveness, accuracy, and effectiveness in promoting sustainability.

Keywords: Green consumption policy, data-driven governance, public-private synergy, Ant Forest, policy iteration.

1. Introduction

Green consumption policy-making, in reality, is an interactive and dynamic process [1]. Policy iteration theory reveals a closed-loop "learning-adaptation-optimization" process: policy officials can adaptively modify policy instruments based on market feedback and scholarly research on consumption behavior patterns and technological innovations, thereby optimizing policies through evaluation, in a trajectory of policy improvement. The internet has renewed the process—the data, as a new category for policy resources, is fundamentally transforming the policy tool's design logic. The old paradigm of sample surveys and statistics-based dependence is shifting toward a comprehensive data governance system founded on real-time consumer big data, IoT device tracking, and blockchain traceability techniques [1]. For example, smart meters and carbon footprint software can interactively input residents' energy consumption, providing the basis for incentive policies that accurately identify high-carbon groups and, accordingly, advance policy instruments from "broad coverage" to "algorithm-based intervention."

China's green consumption policy-making exhibits complementarities as well as gaps in linkage among the three types of instruments. The regulatory instruments are founded on mandatory standards, which employ market access constraints as a means of greening the supply chain. Standard updating, in most cases, lags behind technological innovations, primarily because policy-making is founded on predetermined sets of industry figures, as well as not under the real-time scrutiny of companies' technological orientation.

Incentive instruments are market-oriented levers for economics, such as subsidies for energy-saving products, value-added tax exemptions for new energy vehicles, and subsidies for the interest on green securities, which can effectively lower the marginal cost for customers. Policy changes in today's subsidy catalog, on the other hand, typically require yearly reviews, which hinder dynamic responsiveness to market changes [2].

Behavior-shaping tools are characterized as guidance-oriented, and classic examples include points-based reward programs adopted on local authority carbon credit websites, which encourage people to live low-carbon lifestyles. Nevertheless, their performance is consistently benchmarked against questionnaire surveys, which offer no timely reward feedback on behavior.

The underlying contradiction in contemporary policy-making is the imbalance between the availability of affluent real-time consumer data and the step-by-step digitalization of policy instruments, as illustrated in the following constraints presented in Figure 1. As Figure 1 shows, regulatory instruments evolve slowly, primarily because they accumulate above pre-set industry rates and lack access to real-time awareness of corporate technological upgrades. Incentive instruments, such as subsidies, operate inefficiently due to sluggish policy adjustment cycles (typically subject to annual adjustments), resulting in late or interrupted support because of the lack of current data on enterprise production capacity and end-consumption. Behavior-shaping instruments commonly experience low feedback efficiency because their impact is sporadically assessed based on random surveys, which lack multi-platform behavioral data required for effective advocacy and prompt reward.

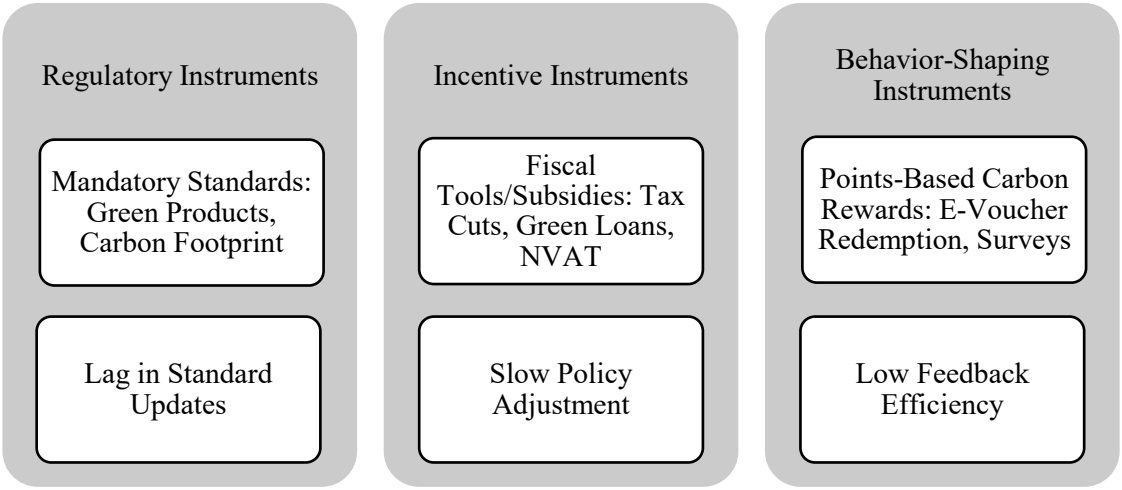

Fig. 1 Complementarity and gaps in China's green consumption policy instruments

To address the key points highlighted in Figure 1 (standard lag, sluggish adjustment, and limited feedback), this study needs to establish a national green consumption data platform. The platform would combine the Ministry of Industry and Information Technology's production data with consumption data from e-commerce platforms and carbon emission data from energy commissions [1]. This would be necessary to enable dynamic calibrations for each of the three policy instruments, allowing them to respond in real-time to both market signals and behavioral trends.

The present work addresses these shortcomings forthrightly by suggesting a data-centric policy iteration procedure. This study describes how data from companies' digital marketing efforts can help close the above-identified gaps, facilitating rapid policy fine-tuning for green consumption based on near-real-time data, resulting in higher responsiveness and effectiveness.

2. Data Feasibility Verification

2.1. Consumption Trends

In a bid to demonstrate the feasibility of using green consumption data as the base of real-time policy optimization, the paper has selected two standard modes of green products introduced in the "China Green and Low-Carbon Consumption Trends Survey Report (2024–2025)" as the study objects--new energy vehicles and energy-saving home appliances [3]. Growth index graphs were formed based on the trends of sales data (Figure 2). The figure assumes 2020 as the reference base of the index (100), the years of 2020–2024 as the real period of observation, and the period of 2025–2027 as the forecast period.

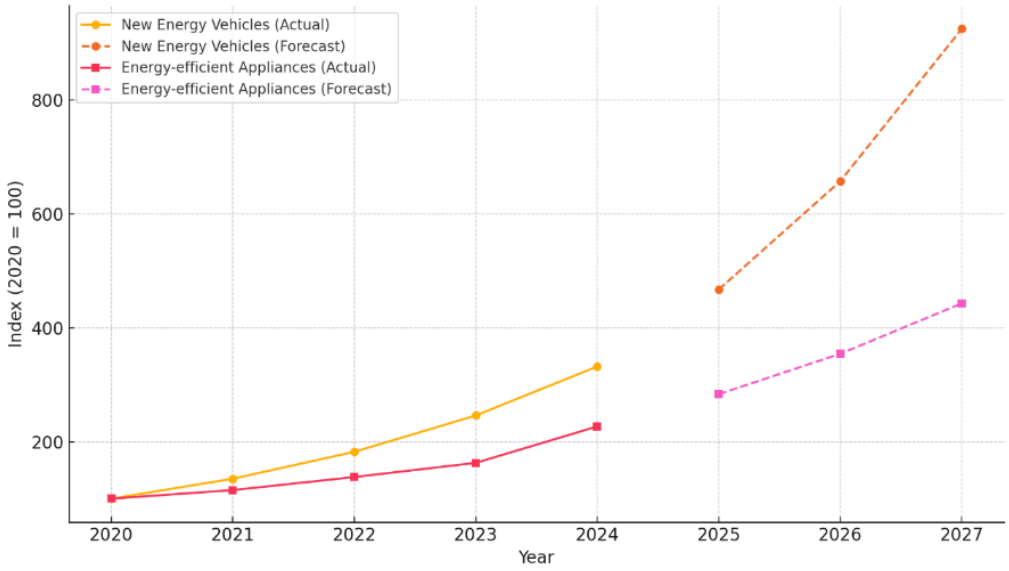

Fig. 2 Growth trends of new energy vehicles and energy-saving appliances in China (2020-2027)

According to Figure 2, new energy vehicles experienced 40.7% year-on-year growth in retail sales in 2024, achieving a 47.6% penetration rate. This growth justifies the bellwether role of the "comprehensive launch of the green replacement cycle" and the policy leverage effect and acceptability base that consumers exhibit. For comparison, although energy-saving appliances experienced relatively slower growth rates, they had sustained increases in demand, led by policies such as "trade-in programs," resulting in a year-on-year growth of 39.3% in December 2024. For the forecast period, the two industries are likely to keep high rates of growth in the sustained period of policy encouragement. With yearly growth rates of 40.7% for new energy vehicles and 25% for appliances, the index curve continues to move forward, indicating that greener products have the capability of scaled expansion fueled by policy pushes, technological upgrades, and changed consumption patterns.

This chart validates the quantifiable and predictable attributes of "green consumption trend data," as it indicates that enterprise sales-end data can be applied as a means of measuring policy implementation effectiveness, as well as levels of consumer response [4]. Moreover, the trends revealed by the chart not only serve as a reference base for facilitating policy goal setting but can also be used as empirical evidence to identify policy windows and assess the effectiveness of interventions.

2.2. UGC Topic Volume

Figure 3 illustrates the heat index and month-to-month growth rate of the top three green topics on the Weibo platform as of July 16, 2025, namely "green consumption," "environmental protection," and "low-carbon." As the chart indicates, although the latest heat index of "green consumption" (456) remains much lower than that of "environment protection" (45,590) and "low-carbon" (13,567), it has exploded with the miracle month-to-month growth rate of 1,472.41% suggesting a violent rise of topic attention in the near term. The indication of such a chart refers to the fact that green consumption, as a rising trend, is gaining extremely rapid popularity in public discourse and participation, potentially fueled by the aggregation of policy propaganda, brand marketing, or topic amplification on social media platforms. By comparison, "environment protection" and "low-carbon" register relatively high pre-existing foundation levels of attention, but exhibit more modest growth rates of 24.19% and 10.46%, respectively. The difference indicates the dissemination ability and mobilization capacity of public opinion on green consumption under the Weibo platform, offering strong empirical evidence in support of investigating how online platforms can act as catalysts for new public awareness and participation mobilization in the domain of green consumption. The chart indicates not only the quantitative variation, but more importantly, a qualitative signal that the green of the public discourse shifts towards a "consumption-based" model [5].

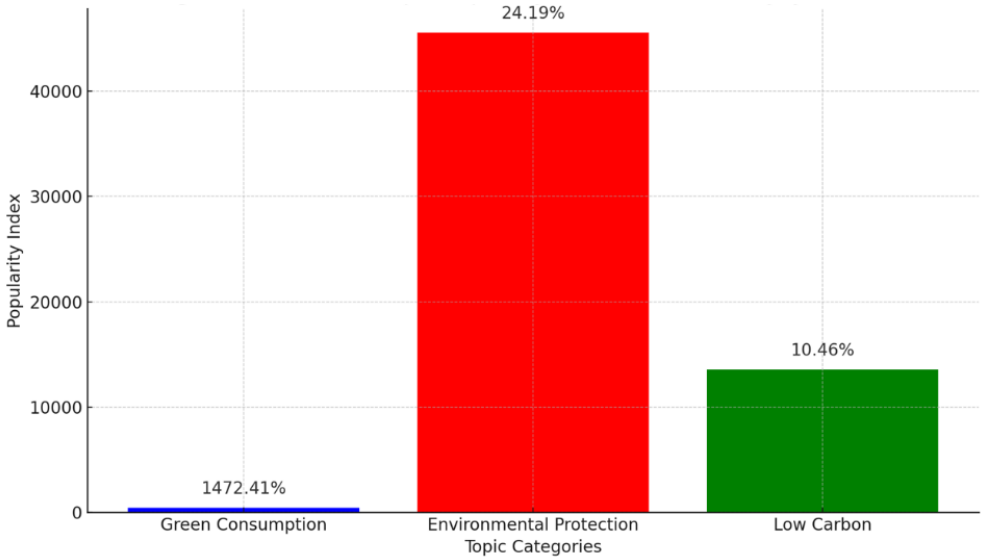

Fig. 3 Weibo green topics popularity index & MoM growth (as of July 2025)

2.3. Carbon Account Activity

As shown in Figure 4, the quarterly evolution of user green conduct in the Ant Forest app from Q1 2023 to Q4 2024, based on cumulative green behaviors in hundred million counts, as well as corresponding quarter-over-quarter (QoQ) growth, is a key indicator [6,7]. These are further extrapolated values based on the yearly released behavioral aggregations in the 2023 and 2024 editions of the Ant Group Sustainability Reports, which published 80 billion and 90 billion green behavior events, respectively. To enable the quarterly model, the figure also imposes the moderate seasonality of the aggregations, tracing a dynamic curve that interpolates an empirical proxy and a credible projection.

It has a continuously growing trend, and behavioral activity grows from 18 billion in the Q1 2023 phase to 24 billion in the Q4 2024 phase, yet with non-significant decreases in the early 2024 phase. The QoQ growth rate line captures the momentum, including the acceleration, of user engagement, attaining its most significant value in Q3 2023 and the fourth quarter of 2024. It is likely the result of carbon incentive events or coordinated environmental campaigns. These are behavioral surrogates for the digital engagement of the carbon account. It shows that the carbon account activity, in addition to being of unprecedented scale, exhibits a rhythmically responsive nature to policies, as well as the platform and stimulus periodicity. It secures the potential for using carbon account measures' behavioral high-frequency patterns as surrogates in the process of monitoring green lifestyle adoption.

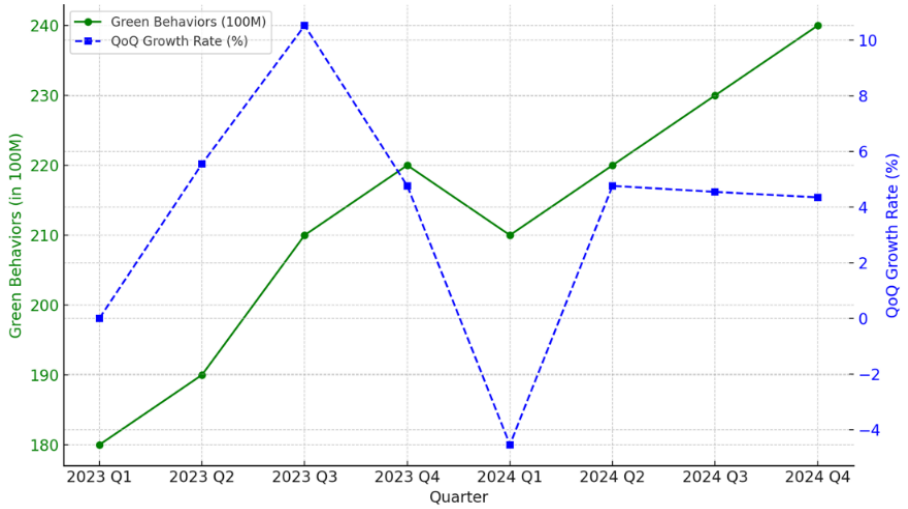

Fig. 4 Quarterly green behavior trend in Ant Forest (Q1 2023-Q4 2024)

3. Mechanism Analysis of Policy Optimization

3.1. Data-to-Policy Demand Identification Mechanism

The comparative benchmark table below lists three key features of data on policy-relevant parameters (see Table 1): signal strength (quantifying the magnitude of the consumer or behavioral change), possible policy response time (providing a measure of the government's sense of responsiveness), and possible policy impact (quantifying potential policy effects). Future predictive scenarios are forecasted based on present-day trends to inform policy directions.

Table 1. Benchmark for data-driven green consumption policy optimization

Data Dimension	Signal Strength (Metric)	Predicted Policy Response Time	Anticipated Policy Impact (Outcome)	Predictive Case
Search Volume Surge	120% YoY increase	3-4 months	10%-15% sales increase in targeted green products	Rising “bio-based material” searches prompt subsidy catalog expansion
UGC Negative Topic Outburst	200% topic surge (80% negative sentiment)	2-3 months	30%-40% reduction in negative feedback	“Fake green product” complaints drive stricter certification standards
Carbon Account Regional Activity Gap	30% activity gap (third-tier vs. first-tier cities)	4-6 months	20%-25% increase in regional engagement	Lower Ant Forest activity in third-tier cities triggers targeted campaigns

According to the Table 1, Signal Strength gauges the market or behavioral change in terms of magnitude, and the policymaker responds accordingly in proportion (e.g., a 120% rise in searching, as reported in the China Green and Low-Carbon Consumption Trends Report). A policymaker's response time in the time band, given the pre-existing response times of 3–6 months for the same kind of intervention, estimates the Predicted Policy Response Time. Anticipated Policy Impact makes predictions about the outcome, such as an increase in sales or engagement, based on pre-existing outcomes, as demonstrated by the 15% rise in sales or the 25% rise in engagement in the above examples. Predictive cases utilize trends to estimate policy interventions, connecting data signals to policymakers’ decisions in support of green consumption.

The China Green and Low-Carbon Consumption Trends Report 2024–2025 recorded a 120% year-over-year increase in searches for green product terms , such as "recycled fabric," in 2023, underscoring strong consumer demand for green materials [3]. As shown in Figure 5, if "bio-based materials" exhibit a similar upsurge, this signal in the data would prompt policymakers to add subsidies to their lists within 3–4 months, offering subsidies covering 20–30% of the product manufacturing cost to increase market uptake. By taking a cue from previous instances in which the expansion of subsidies increased corresponding sales by 15%, this policy would cause corresponding sales of bio-based materials to increase by 10–15% by mid-2026. The result would be verified by following up on subsequent sales data to ensure that the subsidies are aligned with consumer demand, thereby maintaining market growth. The process—which searches for rising subsidies, which in turn lead to increased sales, as verified by data—illustrates how consumer demand can directly influence policies of incentives to spur the adoption of green materials.

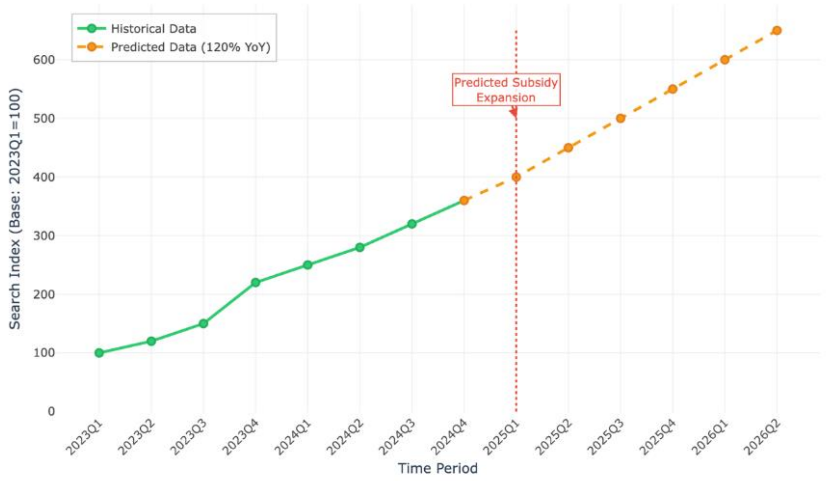

Fig. 5 Bio-based materials search volume trend and policy impact (Q1 2023-Q2 2024)

As shown in Figure 6, Weibo reported a 200% rise in complaints regarding "pseudo-environmental appliances" in 2024, with an adverse sentiment of 80%, representing the overall distrust of green certification among buyers. For "spurious green products," if the warning can persuade policymakers to raise the standards of accreditation within the next 2–3 months by implementing mandatory third-party audits, among other measures, to verify the genuineness of the product, then the warning can be highly successful. Following up on the prior regulatory intervention that reduced complaints by 40%, this policy is expected to be successful in trimming negative commentary by 30–40% by Q3 2026, as confirmed by pilot-tested social media analysis of complaint data. Complaints in warning, a precursor to regulatory intervention, and a cause of less negative commentary, demonstrate the direction in which consumer sentiment can revitalize policy confidence by increasing the credibility of policies.

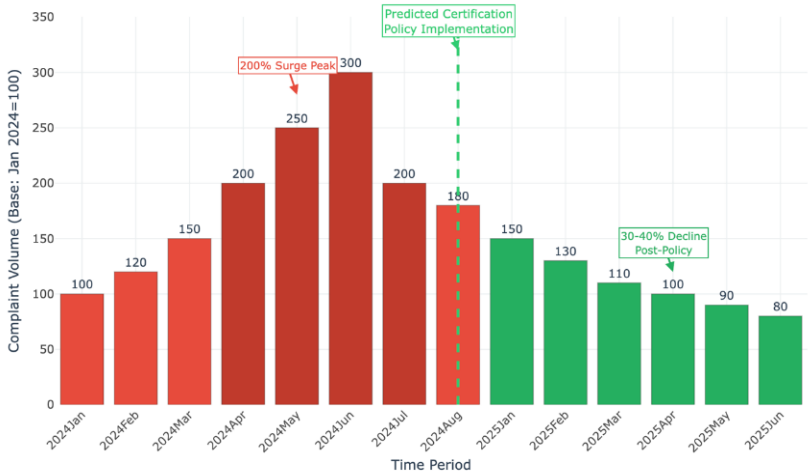

Fig. 6 UGC compliant trend and predicted policy impact (Jan.2021-Jun.2025)

Ant Forest year-end reports (2023–2024) indicated a 30% lower baseline level of activity in third-tier cities compared to first-tier cities, at 80–90 billion green behaviors annually, suggesting disparate policy penetration [6,7]. Local authorities can initiate promotional campaigns within 4–6 months in cases of such regional disparity, promoting low-carbon lifestyles such as energy conservation or tree planting. As shown in Figure 7, through prior campaigns, increasing the percentage of engagement by 25% would result in a 20–25% increase in activity in third-tier cities by 2026, as supported by follow-up data from Ant Forest. The evidence causality chains—spatial gaps in activity provoking campaigns, leading to an increase in engagement, attested through behavioral data—demonstrate how policies are guided by data to counteract coverage disparities and create balanced green consumption.

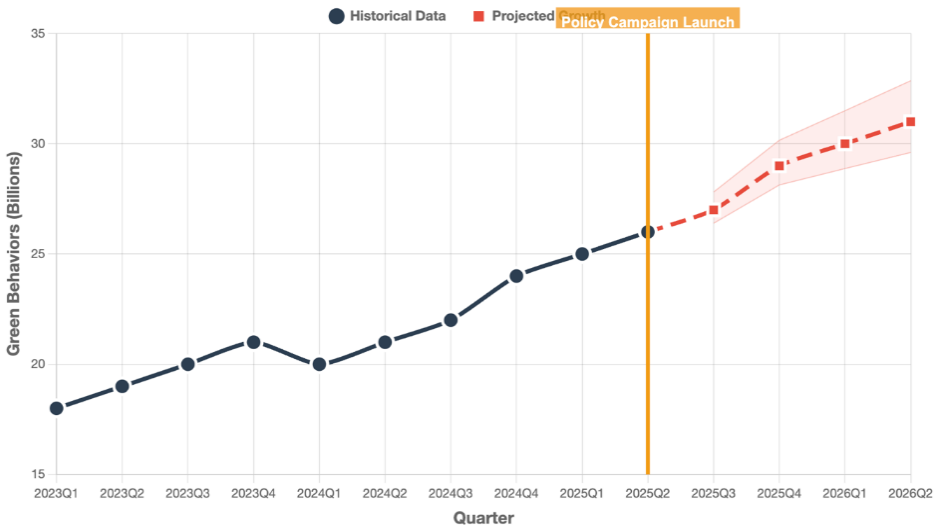

Fig. 7 Third-Tier city carbon account activity (Q1 2023-Q2 2026)

This performance structure enables a closed system of government: data elicits reflex policy reactions, and subsequent data verify their effectiveness. For instance, a 10–15% sales growth after the subsidy guarantees that the policy remains market demand-driven, and a 30–40% decline in complaints guarantees the upgraded levels of certification. Similarly, a 20–25% growth in activity in third-tier cities ensures the effectiveness of targeted campaigns. It creates a data-policy-data loop that ensures policies remain connected to evolving consumer and behavioral trends, maximizing the green consumption impact.

3.2. Bottlenecks in Public-Private Synergy

The PPD-SG framework considers enterprise digital marketing data to be the foundation for optimizing green consumption policies in real-time response to consumer demand for behavioral change. Institutional impediments, such as data sovereignty disputes, incentive misalignment, and inadequate technology standards, hinder efficient synergy between enterprises and policymakers [8]. Efficient enterprise-policymaker synergy is hampered by these impediments, which are crucial to improving green consumption. This section provides a policy analysis of the three significant obstacles to the use of. Each analysis utilizes an evidence-chain form to describe the type of obstacle, its impact on green consumption policies, the solution, and likely governance improvements. Removal of these obstacles enables the PPD-SG framework to practice agile, evidence-based governance in the development of green consumption.

3.2.1. Sovereignty conflicts in data: shifting proprietorial rights to public interest

Data sovereignty conflicts are the outcome of a tug-of-war between enterprises' proprietary right to control data and governments' necessity to employ data in policymaking. Enterprises, as keepers of sensitive data, often maintain data out of reach in the interests of secrecy from prying eyes, paralyzing policymakers from building responsive policies [9]. Delays in data access times, driven by the increasing demand for bio-based materials, lead to delays in updating subsidy catalogs, which in turn cause further delays in gaining market inroads for green products. This slows the PPD-SG system by blocking the free data flow that is imperative for real-time policymaking updates, resulting in outdated policies that are no longer aligned with consumer sentiments. Legislation can be the key by introducing open data-sharing protocols that require the anonymization of data inputs in the interest of protecting enterprise interests. This policymaking would occur within 12–18 months, which is consistent with average legislative timelines, allowing policymakers to leverage consumer demand signals to trigger quick updates in subsidies or certifications [10]. Gains in governance would lead to faster policymaking responses, harmonizing market demands with incentives, as well as increasing green consumption inroads.

3.2.2. Incentive mismatch: encouraging enterprise data contributions

Incentive mismatch discourages companies from sharing data due to the expensive compliance costs without attendant policy dividends. For example, data processing and social media complaints regarding green product deception cost companies' enormous amounts [5]. Still, the policies in place are not providing such dividends in terms of tax relief or quick access to green funding. A lack of such dividends reduces data sharing, which is crucial in detecting policy loopholes, such as lax certification standards [1]. Current policies, however, offer no dividends; hence, the reform delays that can erode consumer trust in green products. Without sufficient data, policymaking related to it becomes quite challenging, further eroding the credibility of green consumption policies. One of the solutions listed in the table is the data contribution credit system, where companies submit data in exchange for benefits from policymakers, such as expedited access to green subsidies or regulatory forbearance [11]. With the system feasible within 6–12 months, depending on the current deadlines of the incentive plans, companies would be encouraged to submit data on consumer sentiments or trends in their behavior. Better governance would involve the accessibility of enhanced data, thus facilitating faster detection of policymaker weaknesses and more incisive intervention.

3.2.3. Shortfalls in technical standards: data simplification for policy application

The inability of platforms to utilize standardized data formats hinders policymakers from effectively integrating green consumption policy data. Non-standardized data formats in regional behavioral data, such as the reduced take-up of low-carbon schemes in some cities, hinder the development of area-specific promotional campaign designs [12]. The bottleneck prevents a prompt policy response to coverage, rendering equitable access to green consumption schemes inaccessible at the baseline level, and making the overall take-up of the entire sector ineffective at the macro level. Adopting a national green data API standard that requires platforms to use standardized data formats would resolve the issue within 9–15 months, depending on the standard-setting processes in comparable policy sectors [11]. Then, through standardization, the integration of consumer behavior data and regional engagement would be accomplished straightforwardly, rendering prompt campaign adaptations by policy, such as area-specific campaigns, possible [2]. Improved governance would optimize policymaker effectiveness, particularly in data-driven campaigns that reach underserved localities.

In essence, data sovereignty, misalignment of incentives, and the absence of technical standards must be addressed to fully leverage the PPD-SG framework. With that, policymakers can benefit from enterprise data in developing green consumption policies that are quick, efficient, and equitable. Section 4 will provide the Ant Forest example to demonstrate the practicability of public-private synergy and present further tactics for sustainable governance.

4. Developing a Data-Driven Green Governance System Based on Ant Forest Insights

Enterprise data is leveraged in the PPD-SG framework to maximize green consumption policies, as exemplified by Ant Forest. Ant Forest's operation model relies on enterprise data to frame the policy in four interconnected steps: disseminating regional active data in support of targeted promotion, implementing carbon credit schemes in support of the increase in green adoptions, providing user conduct trend feedback in support of real-time adjustments in the policy, and aiding in sustainability goals using carbon offsetting schemes [6,7]. A data-driven rationale has increased green consumption penetration by 2.3 times, despite privacy risks and regulatory changes being among the issues it faces [13]. The current segment highlights an ecosystem of policies spanning government, enterprise, and third-party functions, designed to support this model while offering sustainable governance.

4.1. Government-End Policy Design

Governments need to devise data contribution credits that reward companies for data submissions, such as Ant Forest's local engagement data, and incentivize the identification of gaps, for example, fewer engagements in the three-tier cities. It will lead to tailored campaign support in fulfilling the policy agenda, replicating the successful mobilization around engagement seen with Ant Forest. Laws, in the form of compulsory anonymized data-sharing clauses, can be drafted within 12–18 months, addressing concerns about user location privacy and establishing a safety net for policy implementation [14]. It will fast-track the response in the form of policies, strengthened through data-driven polishing of subsidies/campaigns.

4.2. Enterprise-End Action Framework

These companies can complement this environment by regularly releasing quarterly green data briefs and through feedback channels, such as Ant Forest user behavioral patterns, to inform their policies [15]. The plan, based on how the Ant Forest data can be applied in real-time policymaking refinement, can be implemented in 6–12 months. Success would be tracked through the take-up of the briefs, reinforcing the importance of policies by the final quarter of 2026, and in making data inform responsive green policies [11].

4.3. Third-Party Review System

A green data government scholar, civilian, and business committee must be established to provide stability and oversight of compliance [10]. Ant Forests' sustainability alignment of carbon offset efforts has been disrupted by new policies, underscoring the need for oversight to ensure policy consistency. With a 9–15-month viability, the committee's influence would be consolidated through reduced disruptions, in addition to growing confidence in the policies' outcomes.

The Ant Forest pattern—utilizing data from the enterprise to disseminate insights, enact policies, deliver feedback, and promote sustainability—demonstrates the potential of data to foster green governance. Concerns raised by the credit system, law, briefs, and committee are addressed by the measurability of progress in the growth of engagement and the stable rollout of policies, thereby making the PPD-SG framework scalable.

5. Conclusion

These articles utilize the model of PPD-SG to investigate the optimization of green consumption policy using enterprise data, such as green consumption data and UGC, alongside carbon accounts. Institutional constraints—on Ant Forest's 2.3x increase in green consumption penetration—have been addressed, citing the postponement of the subsidy update and the associated privacy risk. Data policies, such as the success of the Ant Forest regional campaign, are addressed in the article, particularly in scenarios that determine demand alongside coverage breaches, aiding agile policymaking at the local level. Future recommendations of the article include launching a national green data platform that aggregates enterprise insights, advancing the bill for anonymized data sharing over the subsequent 12–18 months, alongside the increasing use of third-party monitoring to instill confidence by early 2027. These initiatives, through the virtue of the Ant Forest model, can establish a scalable data-driven governance ecosystem, aided by increasing engagement alongside the stability of policies, in shaping sustainable green consumption policies in the evolving Chinese market.

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