



Assessing the Impact of Environmental Corporate Social Responsibility Dimensions on Customer Brand Loyalty Towards China's Dual Carbon Goals

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ABSTRACT

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Within the framework of Chinese 'dual carbon' objectives and the progressive move towards green consumption, environmental corporate social responsibility (E-CSR) has become a vital strategic tool to create brand value. However, there is limited empirical research on the direct and differential effects of its complex dimensions on consumer brand loyalty. To fill this gap, this research constructs a detailed theoretical framework that will help to explore the direct causal relationship between the eight major dimensions of E-CSR (sustainable sourcing, carbon emission reduction, eco-packaging, recycling, transparency, community engagement, environmental education, green supply chain management) and brand loyalty. A quantitative research design was used, and 391 urban consumers in China were surveyed through a structured questionnaire, and data were analyzed using SPSS & Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings indicate two important results: First, there is great heterogeneity in the direct efficacy of E-CSR dimensions. The environmental education and efforts to reduce carbon emissions by the firms proved to be the strongest influencers of brand loyalty. Sustainable sourcing, transparency and disclosure, community engagement, and eco-friendly packaging have less significant impacts. Second, the direct effects of resource recycling or green supply chain practices were not significant. It is essential that the visibility of E-CSR initiatives and their immediate relevance to consumers translate into brand loyalty outcomes. The findings explain why different E-CSR initiatives are more effective in a hierarchy and offer managers an actionable insight. This research provides evidence-based recommendations for effective CSR strategies that directly relate to consumers to build strong brand loyalty in competitive green marketing in China.

1. INTRODUCTION

Driven by the intensification of climate change, resource shortages, and the growing demand of consumers for sustainable development practices, corporate environmental responsibility has become the focus of global attention. Across industries, consumers increasingly expect brands to fulfill their responsibilities, rewarding them with loyalty, repeat purchases, and a positive reputation [1]. International studies reveal that sustainability has changed from the 'value-added' factor to 'core expectations' in the consumers of developed countries and emerging markets.

China provides a particularly important and unique background for exploring this relationship. As the world's second largest economy, China is facing critical

environmental challenges such as high carbon emissions, air pollution and resource depletion [2]. At the same time, Chinese consumers' awareness of environmental protection is increasing rapidly, and the government is also actively promoting sustainable development planning [3]. The "dual carbon" policy - that is, to achieve the peak of carbon emissions by 2030 and achieve carbon neutrality by 2060 [4]. These policy objectives have intensified institutional and social pressure on companies to implement environmentally responsible policies; as a result, environmental corporate social responsibility (E-CSR) has emerged as a key tool connecting environmental sustainability policy-making and corporate strategy and consumer reaction.

From the perspective of consumer behavior, Chinese consumers' awareness of environmental protection is

constantly increasing. According to the Deloitte report [5], 62% of Chinese consumers are more inclined to choose brands with significant sustainable development initiatives, which is higher than the global average of 51%. The younger generation, especially Generation Z and millennials, is more willing to pay premiums for environmentally conscious brands [6]. It is worth noting that these consumers are highly skeptical of "green cleaning", which shows that enterprises must show true, transparent and verifiable environmental protection actions to win the loyalty of consumers [1].

Recent market forecasts also show that China's green consumption is growing steadily. It is expected that by 2025, the market size of sustainable products will reach \$250 billion, with an average annual growth rate of 15% since 2019 [7]. This growth reflects not only an increased supply of environmentally friendly products but also a cultural shift toward prioritizing environmental responsibility in brand selection. A study by Gazi et al. [8] reveals that CSR improves sustainable environmental performance in Small and Medium Enterprises.

Table 1 summarizes the rapid growth of green consumption from 2019 to 2025 and its impact on consumer preferences. The penetration rate of green consumers is expected to increase from 38% in 2019 to 72% in 2025, while the proportion of consumers willing to pay premiums for green brands will almost double, from 29% to 57%. These trends show that E-CSR is no longer dispensable; nevertheless, it is key to building long-term consumer brand loyalty in China.

Table 1. Environmental corporate social responsibility (E-CSR) and consumer trends in China

Year	Green Consumer Penetration (%)	Market Value of Sustainable Products (USD Billion)	% Consumers Preferring Eco-friendly Packaging	% Consumers Paying Premium for Green Brands
2019	38%	130	42%	29%
2020	44%	150	48%	33%
2021	51%	178	55%	37%
2022	57%	200	61%	42%
2023	62%	220	66%	48%
2024	67%	235	71%	52%
2025*	72%	250	75%	57%

Note: * indicates estimates for 2025.

Source: Adapted from McKinsey (2023), Deloitte (2023), PwC (2022), China Sustainable Consumption Report (2024).

Corporate social responsibility (CSR) has become a major trend in the global and Chinese markets. Still, several key issues have not been solved, which proves the rationality of this study. First, although many Chinese companies have adopted the practice of E-CSR, consumers often question the authenticity of these measures. A growing number of "green washing" cases, in which companies exaggerate or misrepresent their environmental commitments which has raised consumer skepticism [9]. This suspicion weakens the ability of CSR activities to generate long-term brand loyalty, because it may be difficult for consumers to distinguish between real environmental actions and marketing strategies [10].

Second, most previous studies either take CSR as a general concept or focus on a one-dimensional variable, such as environmentally friendly packaging or carbon emission reduction [11]. Few studies have comprehensively analyzed

multiple dimensions of E-CSR at the same time, especially in the Chinese market. Without a holistic perspective, enterprises cannot determine which CSR strategies are most effective in cultivating consumer brand loyalty.

Third, brand loyalty is usually regarded as a narrow concept. Previous studies tend to measure loyalty only based on repeated purchases or purchase intentions, ignoring other important aspects, such as recommendation willingness, emotional loyalty, cognitive loyalty and behavioral loyalty [12]. Therefore, a more comprehensive approach is needed to fully understand how CSR influences consumer loyalty.

Fourth, although CSR is considered to have a positive impact on consumer loyalty, the relative effectiveness of its various dimensions is not well understood [1]. In the Chinese market, there is a lack of comprehensive empirical comparison of how different CSR (E-CSR) schemes can be directly transformed into consumer loyalty results. This actually creates a significant research gap between theory and practice, which makes it difficult for managers to determine the priority of work [13].

By filling these gaps, this study develops a multidimensional E-CSR model and empirically validates the model on the effects of customer brand loyalty. The research contributes to the literature by (1) establishing the distinction of relevance of the different dimensions of E-CSR, (2) generalizing the CSR-brand loyalty research to the Chinese environmental transition setting, and (3) providing empirical evidence that environmental responsibility is a tactical force in long-term customer relations. The findings also offer practical implications to organizations that would like to be aligned with the national purposes of China on carbon neutrality.

1.1 Research objectives

The primary goal of this study is to explore the environmental linked CSR practices affect the brand loyalty of Chinese consumers. Based on this goal, the following specific research objectives (RO) are formulated:

RO1: Evaluate the impact of sustainable procurement on brand loyalty of Chinese consumers.

RO2: Evaluate the impact of carbon emission reduction on brand loyalty of Chinese consumers.

RO3: Evaluate the impact of environmentally friendly packaging on the brand loyalty of Chinese consumers.

RO4: Study the relationship between regional resource recycling and brand loyalty of Chinese consumers.

RO5: Explore the role of transparency and information disclosure in improving the brand loyalty of Chinese consumers.

RO6: Analyze the impact of community participation on brand loyalty of Chinese consumers.

RO7: Evaluate the role of environmental education in improving the brand loyalty of Chinese consumers.

RO8: Evaluate the impact of green supply chain practices on the brand loyalty of Chinese consumers.

1.2 Rationale of the study

This study intended to examine the direct relationship between eight dimensions of E-CSR such as sustainable procurement, carbon emission reduction, eco-friendly packaging, resource recycling, transparency and disclosure, community participation, environmental education, and green supply chain management—and the consumer brand loyalty,

which is conceptualized as a multidimensional construct comprising repeat purchase, recommendation willingness, emotional loyalty, cognitive loyalty, and behavioral loyalty [11]. The research specifically focuses on E-CSR rather than the broader CSR framework, excluding social and governance aspects to maintain conceptual clarity, consistent with prior studies emphasizing the distinct influence of E-CSR on consumer behavior [1, 4]. This study examines how eight dimensions of E-CSR directly influence consumer brand loyalty. Although earlier research indicates that factors such as consumer trust and environmental concern can play a role in shaping this relationship, the present study focuses specifically on the direct structural effects. The potential role of mediating and moderating factors is acknowledged, and exploring these mechanisms is suggested as a direction for future research [13, 14].

This paper contributes to the existing body of research by further understanding the direct effect of E-CSR by empirically comparing eight different dimensions of E-CSR and formulating those with the most significant effect on brand loyalty in the Chinese context, which is the main gap in the research [1, 4]. It also extends the measurement of brand loyalty by creating a multidimensional framework of repeat purchase behavior, recommendation intention, emotional loyalty, cognitive loyalty, and behavioral loyalty, as opposed to previous research mainly focusing on behavioral intention [11, 15]. The research also incorporates the new CSR dimensions, including transparency and information disclosure, environmental education, and green supply chain practices into the analytical framework, providing a modern extension to the classical CSR models [13, 16, 17]. Moreover, the study includes important psychological variables such as consumer trust and environmental awareness, which can be considered to be the basis of understanding the mechanisms according to which E-CSR can affect brand loyalty and provide the prerequisites for further theoretical development.

The findings of this study offer practical guidance for enterprises and practitioners by supporting more effective CSR resource allocation, emphasizing investment in environmental initiatives with stronger direct loyalty effects such as carbon emission reduction and environmental education [16-18]. The study also highlights the importance of transparency and trust in mitigating green washing risks, suggesting that open and verifiable environmental communication is essential to reduce consumer skepticism and reputational damage [13, 19]. Furthermore, by identifying key drivers of consumer brand loyalty, the research provides a pathway for building long-term brand competitiveness through repeat purchases and brand advocacy [1, 6].

2. LITERATURE REVIEW

This section systematically reviews and synthesizes a large number of academic literature, which lays a theoretical foundation for this research and clearly points out the outstanding research gaps in the existing literature, thus proving the necessity and contribution of current research.

2.1 Consumer brand loyalty

Consumer brand loyalty is defined as a consumer's long-term commitment to the brand, expressed through repeated purchasing behavior, willingness to recommend, emotional

attachment, cognitive evaluation and consistent behavioral intention. In this study, consumer brand loyalty was measured as a multi-dimensional structure to capture the attitudes and behavioral results of E-CSR [12]. Consumer brand loyalty has long been regarded as a key factor for corporate success and long-term profitability [20]. Early academic research mainly defined loyalty from a behavioral perspective, focusing on indicators such as repeat purchase frequency and wallet sharing [21]. However, recent definitions expand the essence of loyalty, covering behavioral loyalty and emotional loyalty [22]. Attitudinal loyalty includes consumers' positive affect and commitment toward the brand, reflected in product preference, willingness to pay a premium, and engagement in brand-related activities. In contrast, emotional loyalty is reflected in repeat purchases and sponsorship.

In today's fast-paced environment, consumers are increasingly connected with social media, and the factors that drive loyalty have surpassed traditional factors such as price and quality. Recent studies emphasize that the values and characteristics of consumers, especially in terms of social and environmental issues, are prerequisites for cultivating loyal behavior [23]. For example, when brands show their commitment to environmental protection through practical actions, they can establish strong emotional connections and partnerships, thus cultivating a more subtle loyalty that is not affected by competitive pressure [24]. To understand how brand loyalty evolves over time, we need to study in depth the environmental factors and how they build brand loyalty. This process requires a meticulous analysis. This research can discover the key factors that affect loyalty, thus developing a value-based approach.

2.2 Environmental corporate social responsibility dimensions and consumer brand loyalty

CSR is no longer a philanthropic activity, but a strategic part of business practice that determines the perceptions of stakeholders and market performance. Whereas previous scholarly research on CSR has focused on ethical requirements, societal good, modern-day research is increasingly focusing on environmental stewardship as a decisive factor in corporate legitimacy and competitive advantage. However, even existing studies often confuse different CSR actions under one composite notion, thus limiting understanding of the unique role of individual environmental actions in consumer judgments. The research reveals that consumers evaluate environmental actions through the combination of cognitive and affective processes that influence trust formation, identification processes, and loyalty formation, respectively. In this respect, a multidimensional view of E-CSR will be a more sophisticated understanding of consumer response and will take CSR theory beyond the generalized observation. This section systematically reviews the literature on eight key aspects of CSR closely related to environmental protection and their deep connections with brand loyalty.

2.2.1 Sustainable sourcing

Sustainable sourcing refers to the procurement of raw materials and components that meet established environmental standards, such as inputs from organic, renewable or ethical sources. In this study, sustainable procurement is regarded as a visible E-CSR practice, which can show consumers the authenticity and sense of responsibility of the brand [25]. Sustainable purchasing is the selection of environmentally

friendly raw materials and parts, such as organic, recyclable or ethically certified materials [26]. Sustainable sourcing is a critical CSR action that demonstrates a brand’s accountability to society, enhancing its authenticity, trustworthiness, and responsibility in the eyes of consumers.

Past researches indicate that sustainable sourcing can enhance customer trust and increase loyal consumers. For example, researchers studied Chinese fashion brands and found that those brands that use environmentally friendly materials have a higher customer return rate [4]. Observations in the market also support this view; that is, more and more customers are willing to buy products that can be traced back to the source and meet ethical standards [5]. The data in Table 2 indicate that sustainable sourcing is increasingly considered in purchase decisions and is associated with reported loyalty increases. From 2019 to 2025, customers know more about the responsible way of purchasing, and a greater number of customers are willing to pay more for this behavior.

Table 2. Impact of sustainable sourcing on brand loyalty

Year	Consumers Considering Sustainable Sourcing (%)	Loyalty Increase (%)
2019	41%	23%
2021	48%	28%
2023	55%	35%
2025	62%	42%

Source: Adapted from Deloitte (2023).

In practice, this study determines whether the brand purchases sustainably by looking at whether consumers think that the brand is doing good for the environment when buying raw materials. Research shows that this can make consumers trust the brand and feel that the brand and themselves are one-minded in caring about the earth, so that consumers can like the brand more and be more loyal [27].

2.2.2 Carbon emission reduction

Reducing carbon emissions is a corporate practice of reducing greenhouse gas emissions by adopting clean energy, improving energy efficiency and implementing low-carbon logistics. This study regards carbon emission reduction measures as part of the company's consistency with China's "dual carbon" goals, and evaluates its impact on consumer trust and loyalty [28]. These practices are to reduce greenhouse gas emissions by using clean energy and improving energy utilization. This is exactly in line with the "dual carbon" target proposed by China, and it has a great impact on how consumers view a brand. Previous studies revealed that low-carbon brands are easier for consumers to remember and emotionally more loyal, because consumers will feel that this brand is a partner to cope with climate change with them [29, 30]. From a practical point of view, whether the effect is good or not depends on how much consumers understand the brand's low-carbon plans.

2.2.3 Eco-friendly packaging

Environmentally friendly packaging is defined as the use of recyclable, biodegradable or intended packaging materials to minimize waste. Environmentally friendly packaging is usually the most obvious CSR activity for consumers. Due to its direct and tangible nature, it is included in this study as an influential driver of loyalty [18]. Using recyclable, naturally degradable or particularly simple materials is one of the most

direct and important environmental responsibility practices that consumers can directly feel. Previous studies have shown that this packaging method has a positive impact on consumer loyalty [31]. This finding has also been confirmed by other studies that it plays an important role in consumers' choices [14, 32]. Consistent with the views of this literature, our study uses data to calculate this aspect through consumers' evaluation of the sustainability of brand packaging.

2.2.4 Resource recycling

Resource recycling refers to the reuse and recycling of products, packaging or materials to minimize waste and improve resource efficiency. Examples include the recycling plan and the circular economy plan. In this study, resource recycling was investigated at the level of CSR, enabling consumers to directly participate in sustainable development, which may strengthen their loyalty [33]. These practices are quite meaningful because they can make consumers more responsible and understand how important it is to participate in sustainable development. This stronger sense of participation can also turn into higher consumer loyalty. Previous research shows that recycling programs can effectively improve consumers' idea of buying again by increasing their action participation and emotional input [34, 35]. This study further understands the recycling concept by looking at the degree of consumers' understanding and participation in these programs.

2.2.5 Transparency and disclosure

Transparency and disclosure include the disclosure of information about CSR activities, environmental performance indicators and sustainable development achievements through sustainable development reports, websites, or third-party certifications. This study explores whether information transparency can reduce doubts and nurture brand loyalty [9, 13]. In order to encourage the reuse and recycling of products and materials, enterprises usually implement product recycling plans. These programs are particularly important because they can encourage consumers to develop a sense of responsibility and participation in sustainable development. Empirical research has found that recycling programs can effectively improve consumers' willingness to repurchase by enhancing their action and emotional participation [34, 35]. This study built on this concept by measuring consumers' awareness and participation in these corporate plans.

2.2.6 Community engagement

Community engagement is the participation of enterprises in local ecological and environmental protection projects, and cooperation with non-governmental organizations to contribute to community sustainable development projects. This study evaluates community participation as a component of CSR to assess its impact on strengthening the relationship between consumers and brands [36]. The company's participation in local environmental projects and cooperation with non-governmental organizations reflects its fit with local culture and values. This helps to strengthen the connection between consumers and brands. This fit can also establish an emotional bond. Empirical research shows that this emotional bond is closely related to consumer loyalty and brand recommendation willingness [36]. Therefore, the realization of this concept depends on consumers' understanding of these local activities.

2.2.7 Environmental education

Environmental education refers to the activities carried out by enterprises aimed at improving consumers' and employees' awareness and understanding of the environment, such as seminars, activities or publicity materials. This study explores whether this kind of educational activity is effective [9, 13]. These measures can enhance consumers' perception of brand responsibility and promote consumer loyalty [36]. Enterprises improve consumers' awareness and knowledge through activities, seminars or publicity materials. These measures make the brand a trustworthy leader in the field of sustainable development, thus enhancing its credibility in the hearts of consumers. This enhanced credibility has been proven to strengthen consumers' cognitive loyalty and make them more willing to recommend the brand.

2.2.8 Green supply chain

Green supply chain refers to the integration of environmental protection principles into the whole supply chain, including procurement, manufacturing, logistics and distribution. Although this approach is less transparent, this systematic approach shows a genuine commitment that consumers can recognize and repay with higher loyalty. In this study, green supply chain practice is regarded as a systematic CSR initiative. These measures may not be directly visible, but they can significantly affect brand reputation and long-term loyalty [17]. Empirical research in China has confirmed that such practices significantly improve cognitive loyalty and behavioral loyalty [17]. Therefore, this dimension is measured by consumers' perception of the brand's overall environmental commitment.

Although research often finds that CSR improves consumer attitudes, an attitude-behavior gap exists in green consumption, where positive attitudes do not always lead to purchases. Consumers may support environmentally responsible firms but still prioritize price, convenience, or doubt environmental claims. Some scholars also argue that CSR may serve as an image-building signal rather than a driver of behavior. Therefore, the impact of E-CSR on brand loyalty remains debated. This study examines whether multidimensional E-CSR influences consumer brand loyalty within the context of China's Dual Carbon goals.

Table 3. Literature source of environmental corporate social responsibility (E-CSR) dimensions

Dimension	Definition	Source
Sustainable Sourcing	Use of eco-friendly inputs	Ageron et al. [25]
Carbon Reduction	Emission control practices	Wang et al. [27]
Eco Packaging	Biodegradable packaging	Nguyen et al. [18]
Resource Recycling	Reuse initiatives	Yu et al. [32]
Transparency	CSR disclosure	Siebecker [13]
Community Engagement	Local CSR activities	Tang et al. [35]
Environmental Education	Awareness programs	Zhao et al. [36]
Green Supply Chain	Sustainable operations	Geng et al. [17]

Table 3 explains the literature source of the eight E-CSR dimensions by describing what each one means, the theories behind them, and the key studies that support them. It also

shows how visible each dimension is to consumers, helping to indicate how strongly they may shape brand perception.

2.3 Research gaps

Despite the increasing amount of literature, there are several key gaps that prove the rationality of this study. Although some dimensions, such as environmentally friendly packaging, have been widely studied, other dimensions - such as environmental education, community participation and green supply chains are still relatively unexplored in a single and comprehensive framework in the context of China [17, 36]. There is a limited understanding of the underlying psychological process of transforming CSR perception into loyalty. The intermediary role of consumer trust and the regulatory impact of consumer environmental concern are theorized, but further empirical verification is needed in China's unique market [1, 14].

Many previous studies have mainly measured loyalty by behavioral intent. This study uses the multi-dimensional structure of loyalty to fill the gap and capture its emotional, cognitive and behavioral aspects to provide a more comprehensive understanding [15]. Existing research usually applies theory in a fragmented way. This study integrates stakeholder theory, resource-based perspective and consumer behavior model to provide a vigorous explanation.

2.4 Conceptual framework

Based on the literature review, this research has developed a conceptual framework to study the direct effects of E-CSR on consumer brand loyalty in the Chinese market. As shown in Figure 1, the framework suggests that the eight key environmental dimensions of CSR have a common and direct impact on the loyalty and behavior of consumers.

Measures such as sustainable procurement, carbon emission reduction and green supply chain management reflect the fundamental commitment of brands to reduce their ecological footprint. In addition, the framework also covers practical measures for consumers, such as environmentally friendly packaging and resource recycling. At the same time, the framework also covers two dimensions: communication and community orientation. Transparency and disclosure help build trust; community participation reflects the commitment of enterprises to local communities; and environmental education raises consumers' awareness of environmental issues. Therefore, the framework provides a comprehensive perspective on how enterprises can directly cultivate consumers' deep loyalty, thus transforming environmental responsibility into a sustainable competitive advantage.

The eight E-CSR dimensions used in this study were identified through a structured review of environmental responsibility and sustainability literature. Prior studies consistently highlight organizational practices related to environmental management, resource efficiency, stakeholder communication, regulatory compliance, innovation, and transparency. Dimensions were selected based on three criteria: (1) conceptual relevance to environmental responsibility, (2) repeated empirical use in CSR or sustainability research, and (3) visibility to consumers influencing brand evaluation. Dimensions limited to internal operational efficiency without consumer relevance were excluded to ensure alignment with the brand loyalty outcome. Consequently, the eight dimensions capture both firms' environmental commitment

and externally perceived responsibility, providing a comprehensive framework to examine the influence of E-CSR on consumer loyalty.

The eight E-CSR dimensions included in this study were identified through an extensive review of earlier studies on environmental sustainability and CSR. These dimensions were chosen because they are closely linked to environmental responsibility, have been commonly used in previous CSR and sustainability research, and are noticeable to consumers in ways that can shape their perceptions of brands and influence their loyalty. Collectively, the dimensions reflect a combination of operational environmental practices, communication-based initiatives, and consumer-focused sustainability activities that are particularly important in the context of China's dual-carbon goals. Rather than combining them into a single higher-order construct, this study examines each dimension separately as an independent factor. This approach provides a clearer understanding of how each specific E-CSR practice contributes to consumer brand loyalty.

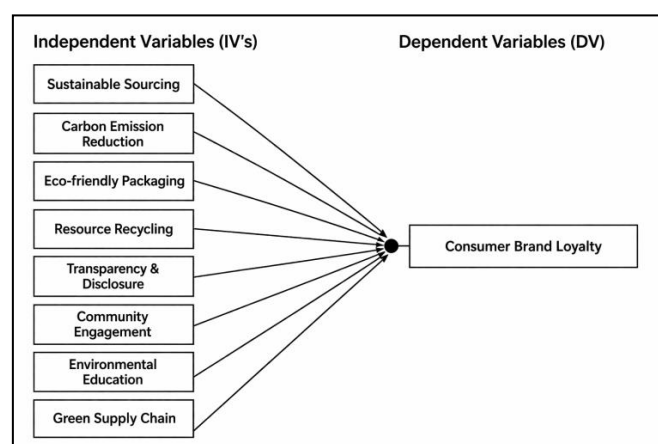


Figure 1. Conceptual framework explaining direct effects of environmental corporate social responsibility (E-CSR) dimensions on consumer brand loyalty

2.5 Hypotheses development

According to the stakeholder theory, organizations that actively engage in environmental responsibility signal accountability and long-term commitment to societal welfare, thereby strengthening stakeholder trust and relational attachment. From a social identity perspective, consumers increasingly associate themselves with environmentally responsible brands that reflect their personal values and environmental concerns. As a result, environmental initiatives are expected to positively influence customer perceptions and behavioral intentions, ultimately enhancing brand loyalty. Based on these theoretical foundations and prior empirical findings, the following hypotheses are proposed.

This research mainly aims to clarify how the eight aspects of corporate environment and social responsibility directly affect consumers' brand loyalty.

From the conceptual framework, the following hypotheses are framed for study.

H1: Sustainable sourcing has a significant positive impact on consumer brand loyalty.

H2: Carbon emission reduction has a significant positive impact on consumer brand loyalty.

H3: Eco-friendly packaging has a significant positive impact on consumer brand loyalty.

H4: Resource recycling has a significant positive impact on consumer brand loyalty.

H5: Transparency and disclosure have a significant positive impact on consumer brand loyalty.

H6: Community engagement has a significant positive impact on consumer brand loyalty.

H7: Environmental education has a significant positive impact on consumer brand loyalty.

H8: Green supply chain practices have a significant positive impact on consumer brand loyalty.

3. RESEARCH METHODOLOGY

This research is a particularly practical explanatory, quantitative and cross-sectional survey design. This design is particularly suitable for clarifying the relationship between variables and testing hypotheses that E-CSR has a direct impact on brand loyalty [37]. This study aims to examine how the eight CSR dimensions directly influence the multi-dimensional construct of brand loyalty [12, 15]. This research is to understand China's urban consumers, specifically those who are at least familiar with one brand and have participated in environmental protection activities or sustainable development projects who are more exposed to actions related to green marketing and CSR [25, 28]. Respondents had to be at least 18 years old and able to understand issues related to CSR.

This study uses the non-probability convenience sampling method, and the questionnaire is sent through WeChat. This method is quite suitable for exploratory research on consumer groups, especially those groups that are not easy to define CSR awareness [38]. Although convenience sampling may affect external validity, it is still reliable to test theoretical relationships in behavioral research, especially when the sample size is large enough to reduce random deviation [37]. Using convenience sampling has become a common methodological decision in CSR and consumer behavior research where the emphasis has been on perception-based constructs which need voluntary involvement. Respondents were also chosen using a screening process to ensure that sampling bias was reduced by evaluating their previous experience in purchasing and their knowledge of environmentally friendly brands. Further, intentional efforts were put into the demographic diversity, which in turn increased representativeness and improved the generalisability of the results against the background of the research.

A structured online questionnaire is developed and used for the collection of data and distributed by Questionnaire Star, a popular online survey platform in China. The questionnaire was initially developed in English and then translated into Chinese using a back-translation method to maintain accuracy. First, a bilingual expert translated the survey into Chinese. Then, a second independent translator translated it back into English. This process helped ensure that the meaning of the original items was preserved and that both versions were semantically consistent. Table 4 shows the structure and content of the questionnaire. All items are measured using a five-point Likert's scale. The logical order of the questionnaire - from general demographics to specific CSR perceptions and finally loyalty - aims to maintain the engagement of respondents and minimize survey fatigue [39].

Table 4. Structure of the questionnaire

Section	Construct	Key Dimensions	Number of Items
A	Demographics	Gender, age, education level, monthly income	5
B	E-CSR (Independent Variables)	Sustainable sourcing, carbon emission reduction, eco-packaging, recycling, transparency, community engagement, environmental education, green supply chain management	32
C	Brand Loyalty (Dependent Variable)	Cognitive, affective, and behavioral loyalty dimensions	15

Measurement items used in this study were adapted from previously validated scales to ensure reliability and consistency. Specifically, sustainable sourcing was measured using items from Ageron et al. [25], carbon emission reduction from Wang et al. [27], eco-friendly packaging from Nguyen et al. [18], and resource recycling from Yu et al. [32]. Transparency was assessed based on Siebecker [13], while community engagement was drawn from Tang et al. [35]. Environmental education items were adapted from Zhao et al. [36], and green supply chain measures from Geng et al. [17]. Finally, brand loyalty was evaluated using established scales from Dabbous and Barakat [40] and MacKenzie et al. [41].

The E-CSR framework encompasses eight main aspects. In this study, each dimension is measured through four items totaling 32 indicators [36]. Brand loyalty, the dependent variable, was measured using 15 items adapted from a scale covering cognitive, affective, and behavioral dimensions [40, 41]. The survey was distributed online in September 2025. The link is shared through social networks, university groups and online communities related to sustainability. Before proceeding, the participants were informed of the purpose, anonymity and scope of data use of the study [42]. Screening questions were used to ensure that participants had prior experience purchasing branded products and a basic understanding of environmentally responsible practices. Only those who indicated familiarity with at least one brand and awareness of CSR-related activities were included in the study. Participation was voluntary, and informed consent was obtained prior to survey completion. Respondents were assured of anonymity and confidentiality, and no personal identifying information was collected.

The sample size for this study was determined with the methodological standards for Partial Least Squares Structural Equation Modeling (PLS-SEM) in mind. A widely recognized guideline, the "10-times rule", recommends that the minimum sample size should be 10 times the largest number of formative indicators pointing to any construct, or 10 times the largest number of structural paths directed at a particular construct in the structural model [43]. In this study, the most demanding part of the model involves the eight independent variables predicting the single dependent variable. Since there are 8 predictive variables, the minimum required sample size should be 80.

Furthermore, it is learned from the methodological literature that a sample size of 200 to 400 is typically sufficient to ensure

the stability and statistical power of structural equation modeling (SEM) estimation [43, 44]. The number of samples for the study should be 384 according to the sample size determination formula proposed by Krejcie and Morgan [45]. While these sample size requirements were met, a total of 411 responses were received, out of which 20 were removed due to incomplete answers and repetitive response patterns, resulting in 391 valid responses. The final sample size of 391 obviously exceeds the most conservative minimum requirement and is completely within the recommended range. The sample is sufficient for subsequent multivariate analysis, including the evaluation of measurement models and structural models, so as to ensure the reliability and validity of the research results [46].

To minimize potential common method bias from self-reported survey data, both procedural and statistical steps were taken. Respondents were assured of anonymity to reduce response pressure, and the questionnaire items were clearly worded to avoid ambiguity. In addition, Harman's single-factor test showed that no single factor explained most of the variance, indicating that common method bias was unlikely to significantly affect the results.

This study uses measurement methods to evaluate the specific characteristics of the target population to carry out practical testing of the theoretical structure [47, 48]. The measurement results of this study are systematically divided into descriptive analysis, preliminary test and hypothesis test, forming a comprehensive data test strategy [49]. All data will be analyzed using IBM SPSS statistical software version 26.0, which will help to carry out preliminary tests and subsequent hypothesis tests. Then, use SmartPLS software to analyze the PLS-SEM model, including the evaluation of the measurement model and the test of the structural hypothesis (H1-H8).

Initially, descriptive analysis was conducted to summarize respondents' demographic characteristics (Part A) and identify the central tendencies of key variables. Prior to hypothesis testing, a preliminary analysis was performed to ensure data stability and the reliability of the measurement model, including re-examination of factor structure and reliability using 391 samples. Factor analysis was employed to identify the underlying dimensions among observed variables, such as the eight E-CSR aspects. The Kaiser-Meyer-Olkin (KMO) coefficient assessed sampling adequacy, with values above 0.6 considered acceptable [44], while Bartlett's Test of Sphericity examined whether correlations among variables were sufficient for factor analysis, requiring significance at $p < 0.05$ [50]. Factor loadings above 0.5 were deemed acceptable, and values above 0.7 indicated strong structural validity [51]. Reliability was evaluated using Cronbach's alpha, where coefficients above 0.70 indicate acceptable reliability, above 0.80 good reliability, and above 0.90 excellent internal consistency, confirming that the items consistently measure the same underlying construct [43].

To test the direct effect hypotheses (H1 to H8), this study uses PLS-SEM through SmartPLS software. E-CSR is viewed as a multidimensional formative construct because the eight dimensions represent different and independent aspects of environmental responsibility that cannot be used interchangeably. A company may perform strongly in one area, such as carbon emission reduction, while showing weaker performance in other areas like recycling or community engagement [52]. Therefore, these dimensions together form the broader concept of E-CSR rather than reflecting a single underlying factor [44]. This understanding supports the use of

a formative approach within the PLS-SEM framework. At the same time, the eight dimensions are analyzed as separate parallel predictors in the structural model to compare the individual influence of each E-CSR dimension on consumer brand loyalty.

In this study, the proposed hypotheses are tested using structural regression analysis to understand how different dimensions of E-CSR influence brand loyalty. The key focus is on the standardized path coefficients (β), which show both the direction (positive or negative) and the strength of the relationships. To ensure the reliability of the findings, a bootstrapping procedure with 5,000 resamples is conducted to generate t-values and p-values, where results are considered significant if $p < 0.05$ [43]. The overall explanatory power of the model is examined using the R^2 value of brand loyalty, indicating how much of the variation in loyalty can be explained by the eight CSR dimensions.

The model's predictive relevance is further assessed using the Stone-Geisser Q^2 value through blindfolding, where values greater than zero suggest that the model has meaningful predictive capability [53]. The β coefficients also allow comparison of which CSR dimensions have a stronger impact on brand loyalty. Finally, to ensure the stability and clarity of the results, multicollinearity is checked using the Variance Inflation Factor (VIF); values below 10 confirm that the independent variables do not excessively overlap and that the regression estimates remain reliable [44]. Conclusively, this study concentrates specifically on examining how the eight dimensions of E-CSR directly influence brand loyalty. Although factors such as mediation and moderation may also play a role in shaping these relationships, they are beyond the scope of this study and are recommended as avenues for future research.

4. DATA ANALYSIS AND RESULTS

4.1 Demographic and descriptive analysis

The data were collected through the online questionnaire platform, and finally received a total of 411 valid questionnaires were received. After data cleaning, 391 questionnaires were valid. As shown in Table 5, the sample is mainly composed of young and middle-aged people (18-34 years old, accounting for 77.75%), and the gender distribution is relatively balanced (men account for 55.24% and women account for 44.76%). In terms of education level, 82.86% of the respondents had an associate degree or above, indicating that the overall level of education of the sample was relatively high. According to the distribution of monthly income, most respondents (74.94%) have a monthly income of less than 10,000 Yuan, which is consistent with the characteristics of middle-income groups in contemporary Chinese cities.

To a certain extent, this sample structure reflects the typical characteristics of young and highly educated urban consumers in China, which is consistent with the goal of this study on people with high information acceptance and strong environmental awareness. However, the concentration of respondents on specific age, income and education levels may limit the applicability of the study results to a wider range of people, including the elderly or low-income groups.

After data screening, Descriptive statistical analysis was carried out on the core concept to understand the

characteristics of data distribution. As shown in Table 6 (independent variables and dependent variable), the average of all measurement items of the eight E-CSR dimensions and multi-dimensional brand loyalty concepts is between 3.75 and 4.18, and the standard deviation is between 0.860 and 1.150. These results show that respondents generally have a positive and above-average attitude towards the brand's environmental practices and self-loyalty, and there is no extreme response bias.

Table 5. Demographic profile of respondents (N = 391)

Category	Group	Number of Respondents	Percentage
Age	18-24 years old	146	37.34
	25-34 years old	158	40.41
	35-44 years old	66	16.88
	45 years and above	21	5.37
Gender	Male	216	55.24
	Female	175	44.76
Education Level	High School & Below	67	17.14
	Associate/Bachelor's	213	54.48
	Master's	98	25.06
	PhD	13	3.32
Monthly Income (RMB)	$\leq 5,000$	126	32.23
	5,001-10,000	167	42.71
	10,001-20,000	62	15.86
	20,001-30,000	28	7.16
	$> 30,000$	8	2.05

Table 6. Descriptive statistics of study variables

Construct	Mean	SD
Sustainable Sourcing	3.87	0.99
Carbon Emission Reduction	3.92	0.97
Eco-friendly Packaging	3.84	0.97
Resource Recycling	3.86	1.02
Transparency & Disclosure	3.92	0.97
Community Engagement	3.97	0.95
Environmental Education	3.85	0.99
Green Supply Chain	3.91	0.95
Brand Loyalty (DV)	3.87	0.94

4.2 Measurement model assessment

Before testing the hypothesis, SmartPLS is used to evaluate the confidence and validity of the measurement model. Although brand loyalty is generally understood as a multidimensional concept that includes cognitive, emotional, recommendation, and behavioral aspects, this study treats brand loyalty as a single overall construct within the structural model. This approach helps capture consumers' overall loyalty toward a brand while keeping the model simpler and more stable for analysis. Similar approaches have been widely used in previous CSR and consumer behavior studies, where different dimensions of loyalty are combined into one comprehensive measure of overall brand loyalty.

4.2.1 Reliability and validity of construct

As shown in Table 7, the results show that the measurement model has excellent measurement characteristics. The Cronbach's α coefficient and composite reliability (CR) values of all concepts exceed 0.9, far higher than the threshold of 0.7, indicating that its internal consistency confidence is excellent [43]. The high reliability generally indicates strong internal consistency; values above recommended thresholds may also suggest potential item similarity or redundancy. The measurement items were retained because they were theoretically grounded and adapted from established E-CSR and consumer behavior scales. All factor loads are higher than 0.7; most are higher than 0.85, and the average variance extraction value (AVE) of all concepts is greater than 0.79, which is significantly higher than the 0.5 standard. This provides strong evidence for the convergent validity of the scales used in this study [54].

Table 7. Reliability analysis of study variables

Construct	Items	Cronbach α	CR	AVE
Sustainable Sourcing	4	0.929	0.950	0.825
Carbon Emission Reduction	4	0.918	0.942	0.804
Eco-friendly Packaging	4	0.939	0.956	0.846
Resource Recycling	4	0.934	0.953	0.835
Transparency & Disclosure	4	0.925	0.947	0.817
Community Engagement	4	0.919	0.943	0.804
Environmental Education	4	0.933	0.952	0.832
Green Supply Chain	4	0.914	0.939	0.795
Brand Loyalty (DV)	15	0.958	0.963	0.632

Table 8. Heterotrait-Monotrait ratio (HTMT)

Construct	Max HTMT Value
Carbon Emission Reduction	0.747
Community Engagement	0.695
Eco-friendly Packaging	0.724
Environmental Education	0.752
Green Supply Chain	0.672
Resource Recycling	0.717
Sustainable Sourcing	0.731
Transparency & Disclosure	0.696
Consumer Brand Loyalty	0.752

Table 9. Variance Inflation Factor (VIF) values

	VIF
Carbon Emission Reduction→Consumer Brand Loyalty	2.091
Community Engagement→Consumer Brand Loyalty	2.103
Transparency and Disclosure→Consumer Brand Loyalty	1.916
Eco-friendly Packaging→Consumer Brand Loyalty	2.606
Environmental Education→Consumer Brand Loyalty	2.271
Green Supply Chain→Consumer Brand Loyalty	2.027
Resource Recycling→Consumer Brand Loyalty	2.325
Sustainable Sourcing→Consumer Brand Loyalty	2.161

The study used the Heterotrait-Monotrait ratio (HTMT) ratio to evaluate the validity of distinction [53]. As shown in Table 8, all HTMT values are below the conservative threshold of 0.90, and the highest value is 0.752 [53]. This confirms that each concept in the model is different and

captures unique phenomena, thus establishing good distinction validity.

In order to ensure the robustness of the path coefficient estimation, variance expansion factor (VIF) test was conducted. As presented in Table 9, the VIF value of all predictive variables is between 1.916 and 2.606, far lower than the commonly used threshold of 5 [43]. This shows that there are no multiple Collinearity problems in this study, and there will be no deviation in the regression results.

4.3 Structural model and hypothesis testing

Based on the verified measurement model, the structural model is evaluated to test the research hypothesis.

4.3.1 Model explanatory and predictive power

The explanatory force of the model is evaluated by the value of R^2 . As shown in Table 10, the R^2 value of consumer brand loyalty is 0.735, and the adjusted R^2 value is 0.729. This shows that the eight E-CSR dimensions together explain the variance of brand loyalty of 73.5%, which represents a very high explanatory power in behavioral research [43].

Table 10. R^2 values

	R-Square	R-Square Adjusted
Consumer Brand Loyalty	0.735	0.729

In addition, the predictive correlation of the model is evaluated by the Stone-Geisser Q^2 value obtained by the blind method. The Q^2 value of the endogenous variable is 0.451 (see Table 11), which is significantly greater than zero, confirming that the model has significant predictive correlation [53].

Table 11. Q^2 values

	$Q^2 = (1 - SSE/SSO)$
Consumer Brand Loyalty	0.451

4.3.2 Hypothesis testing results

The path coefficient, significance level and hypothesis test results are summarized in Table 12 and Figure 2.

The results of the self-sampling method (5,000 samples) show that six of the eight hypotheses are supported:

H1 (Sustainable Procurement → Brand Loyalty) is supported ($\beta = 0.177$, $t = 3.420$, $p < 0.001$).

H2 (carbon emission reduction → brand loyalty) is supported and is the strongest predictor ($\beta = 0.212$, $t = 3.796$, $p < 0.001$).

H3 (environmental packaging → brand loyalty) is supported ($\beta = 0.114$, $t = 2.085$, $p < 0.05$).

H5 (transparency and information disclosure → brand loyalty) is supported ($\beta = 0.154$, $t = 3.349$, $p < 0.01$).

H6 (community participation → brand loyalty) is supported ($\beta = 0.100$, $t = 2.129$, $p < 0.05$).

H7 (environmental education → brand loyalty) is supported and is the second strongest predictor ($\beta = 0.204$, $t = 3.614$, $p < 0.001$).

Conversely, two hypotheses were not supported by the data:

H4 (Resource Recycling → Brand Loyalty) was not supported ($\beta = 0.058$, $t = 1.032$, $p = 0.302$).

H8 (Green Supply Chain → Brand Loyalty) was not supported ($\beta = 0.052$, $t = 0.968$, $p = 0.333$).

Table 12. Summary table of the hypothesis test results

	Path	Original Sample (β)	Standard Deviation	T Statistics	p Values	Hypothesis Supported
H1	B1→D	0.177	0.052	3.420	0.001	Yes
H2	B2→D	0.212	0.056	3.796	0.000	Yes
H3	B3→D	0.114	0.055	2.085	0.037	Yes
H4	B4→D	0.058	0.056	1.032	0.302	No
H5	B5→D	0.154	0.046	3.349	0.001	Yes
H6	B6→D	0.100	0.047	2.129	0.033	Yes
H7	B7→D	0.204	0.056	3.614	0.000	Yes
H8	B8→D	0.052	0.054	0.968	0.333	No

Note: B1 = Sustainable Sourcing; B2 = Carbon Emission Reduction; B3 = Eco-friendly Packaging; B4 = Resource Recycling; B5 = Transparency and Disclosure; B6 = Community Engagement; B7 = Environmental Education; B8 = Green Supply Chain; D = Consumer Brand Loyalty.

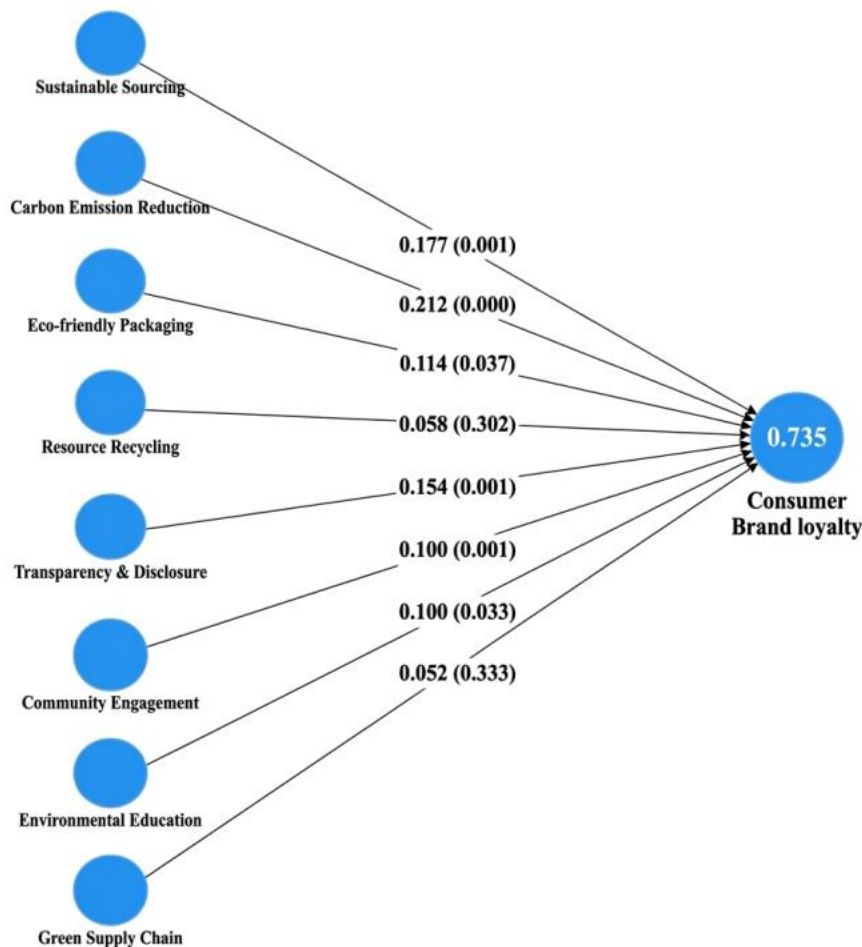


Figure 2. The structural model results chart

This study deeply analyzes how CSR measures in different environments affect the brand loyalty of Chinese consumers [24]. Carbon emission reduction exerts a strong and significant influence on brand loyalty (H2), as confirmed by the results ($\beta = 0.212$, $p < 0.001$). This result is highly consistent with literature emphasizing the importance of China's "dual carbon" policy [27], validating hypothesis H2 and demonstrating that consumers recognize and reward corporate actions that directly address climate change. Similarly, the significant impact of environmental education has been confirmed (H7, $\beta = 0.204$, $p < 0.001$). This finding verifies that initiatives aimed at educating consumers can effectively build strong cognitive and emotional loyalty, positioning the brand as a trusted authority [36].

The empirical support for sustainable procurement (H1), transparency (H5), and community engagement (H6) underscores a mature consumer ethos that prioritizes

authenticity, traceability, and local relevance. These priorities, which help reduce skepticism toward green washing [13, 35, 36], highlight a shift from passive reception to active scrutiny of corporate environmental claims. Although there is less support for environmentally friendly packaging (H3), it confirms that environmental protection initiatives that can be seen and touched in the consumption link can still effectively convey the brand's commitment, as shown by the H3 hypothesis and previous studies [18].

The non-significant results of green supply chain practice (H8) ($\beta = 0.052$, $p = 0.333$) are one of the most enlightening results. The lack of support of H8 may be attributed to the "behind-the-scenes" nature of supply chain management, which makes it less conspicuous to consumers. This finding that systematic practices like green supply chain management may lack direct consumer impact, highlights a potential "visibility gap" in CSR communication [17]. Similarly, the

non-significant results of resource recycling (H4) ($\beta = 0.058$, $p = 0.302$) may also be due to consumers' belief that it will cause inconvenience. Therefore, H4 is not supported, and this result echoes the "attitude-behavior gap" in the recycling initiative proposed, that is, the actual obstacles may outweigh the positive attitude [55].

The non-significant effects observed for recycling practices and green supply chain initiatives contribute to organizational sustainability performance; their impact may not be directly perceived by consumers during purchase evaluation [56]. Rather than confirming a definitive "visibility gap," the findings indicate that certain operational environmental initiatives may have limited direct consumer salience. Because visibility perceptions were not empirically measured in the present study, this explanation should be interpreted cautiously [57, 58].

5. CONCLUSION

The findings provide important insights into the relationship between E-CSR and customer brand loyalty. Consistent with stakeholder theory, the results show that firms engaging in environmental responsibility are perceived as more credible and ethically committed, strengthening their relationships with customers. Environmental initiatives therefore act not only as compliance measures but also as signals that build long-term stakeholder trust. The results also extend social identity theory, suggesting that consumers increasingly identify with brands that demonstrate environmental responsibility. In the context of China's Dual Carbon goals, such practices appear to strengthen consumers' connection with sustainability-oriented companies, ultimately encouraging greater brand loyalty.

This study is based on a survey of urban consumers in China, mainly young people with higher education which reveals the impact of brand loyalty in eight E-CSR dimensions. The research results directly respond to the research objectives (RO1-RO8) and draw several key conclusions. The comprehensive theoretical framework shows strong predictive ability and can explain more than 73% of the difference in brand loyalty. Such a high explanatory power confirms that E-CSR is a key factor in building consumer loyalty in the Chinese market, thus successfully achieving the overall research goal. The analysis results reveal that there is a clear hierarchical relationship between various E-CSR measures, and verify the necessity of the multi-dimensional approach proposed in the question statement. Carbon emission reduction (H2, RO2) and environmental education (H7, RO7) are considered to be the most effective drivers of brand loyalty. In addition, sustainable procurement (H1, RO1), transparency and information disclosure (H5, RO5), community participation (H6, RO6) and environmentally friendly packaging (H3, RO3) have also shown significant direct positive effects, although the impact is relatively weak, thus achieving their respective research goals.

On the contrary, the results of two dimensions do not support their corresponding assumptions and goals. Resource recycling (H4, RO4) and green supply chain practices (H8, RO8) have no significant direct impact on brand loyalty. This highlights a potential "gap in visibility", indicating that sustainable development initiatives that consumers cannot directly observe in daily interactions or actively participate in the consumption process may not have the ability to cultivate lasting customer loyalty. For example, the sustainable

development report or the environmental production methods of enterprises is commendable, but if consumers cannot directly perceive or participate in it, it may not be converted into actual loyalty. This lack of direct participation will cause disconnection and prevent relevant initiatives from establishing important emotional connections with consumers, thus limiting their effectiveness in promoting brand loyalty.

The findings indicate that consumer salience is key to how effective E-CSR initiatives are. When practices are clearly visible and feel personally relevant to consumers, they are more likely to have a positive impact on brand loyalty.

5.1 Theoretical contributions

This study contributes to the CSR and sustainability literature in three ways. First, it conceptualizes E-CSR as a multidimensional construct rather than a single variable, offering clearer insight into how specific environmental practices influence consumer behavior. Second, it extends CSR-brand loyalty research to the policy context of China's Dual Carbon goals. Third, the findings support stakeholder and social identity perspectives by showing how environmental responsibility strengthens firm-customer relationships. This research focuses on the direct impact and has made several important contributions to the relevant literature. Firstly, it makes a comprehensive empirical comparison of multiple dimensions of E-CSR, which is unique in a single model, especially in the Chinese context. This study is no longer limited to looking at CSR from a single perspective, but clearly marks the size of the direct impact of these dimensions in driving brand loyalty.

The study found that green supply chain management, which seems to be important in theory, actually has no significant direct impact on consumer loyalty, whereas E-CSR will have direct affect the combination of consumers' complex cognition, emotions and behavioral intentions. The research results enrich the application of stakeholder theory directly targeting important national goals such as "dual carbon" or having a stronger direct impact on winning the loyalty of stakeholders, i.e., consumers.

5.2 Managerial implications

This research has a number of practical implications to managers aiming to promote sustainability in China to gain a competitive advantage to meet 'dual carbon' goals. Firstly, companies need to focus on high-impact initiatives like carbon neutrality and consumer-focused environmental education, as it not only indicates ethical responsibility but also directly enhances consumer loyalty. CSR strategy should be based on sustainable procurement and transparency. Secondly, companies must maximize the visibility of their practices such as eco-friendly packaging and community involvement since the positive outcomes can be maximized through effective communication. Third, initiatives including resource recycling and green supply chain management are essential, though they may not directly influence loyalty, but need to be framed as a part of a larger sustainability commitment as it helps in operational efficiency and risk reduction rather than direct loyalty benefits alone.

On the whole, the results imply that companies should strategically allocate CSR resources, paying attention to the initiatives that have the strongest impact on brand loyalty. Carbon emission reduction, environmental education,

transparency, and sustainable sourcing have the strongest impact on brand loyalty, whereas green supply chain practices do not show a significant effect. These are long-term, systematic and transparent initiatives that create consumer trust and create emotional and behavioural loyalty as they strengthen shared values and long-term commitment. Eco-packaging or other superficial measures are too simple to be maintained over the long term of loyalty. Although there will be visible efforts can be seen in the Chinese market to build brand image, the integration of E-CSR practices with supply chain management, organizational processes and customer communications to make effective CSR instead of a mere marketing tool.

5.3 Directions for future research

Although this study applies PLS-SEM to examine the direct effects of eight E-CSR dimensions on brand loyalty and derive theoretical and practical implications, several limitations should be acknowledged for future research. First, the use of a convenience sample limits the generalizability of the findings, as respondents were mainly young, highly educated urban Chinese consumers whose attitudes toward CSR and green consumption may differ from older, less-educated, or rural populations. Future research should therefore include more diverse demographic groups to improve external validity. Employing quota sampling across age, gender, and income categories could provide more balanced representation and enable stronger comparisons of consumer responses to E-CSR practices.

Second, the study focuses mainly on direct relationships and does not explore the underlying psychological mechanisms, leaving unclear how CSR initiatives influence factors such as consumer trust, brand image, or perceived moral identity; subsequent research should incorporate mediating variables (e.g., perceived authenticity, brand trust) and moderating variables (e.g., environmental concern, product involvement) to better explain these processes. Third, the cross-sectional research design limits causal inference, suggesting the need for longitudinal or experimental studies to examine changes in consumer perceptions and verify causal relationships over time. Finally, the findings are shaped by the specific socio-economic and policy context of contemporary Chinese cities, and future research should replicate the model in different cultural and market environments to assess its broader applicability and contextual dependence.

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DATA AVAILABILITY STATEMENT

All data generated or analysed during this study are included in this published article or its supplementary files.

ETHICS & INFORMED CONSENT STATEMENT

Ethics Approval is exempted as per the IRB of INTI International University, Malaysia. The survey is anonymous

and online; hence, the IRB policies allow proceeding for research data collection. All standard procedures are adopted according to the university policies. Online Written Informed Consent is provided. The respondents are assured that the survey meant for academic purposes, and all information collected will be treated with strict confidentiality. No personal information is collected, including email in the data.

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