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Bridging Sustainability and Logistics Service: Antecedents of Green Employee Service Behavior in Logistics Enterprises

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Abstract

This study examines the determinants of green employee service behavior (GESB) in maritime logistics by integrating the Theory of Planned Behavior and Social Identity Theory. Using survey data from maritime logistics employees and structural equation modeling, the findings show that environmental knowledge, green organizational climate, green organizational identity, green organizational support, perceived customer green expectations, and perceived behavioral control all significantly influence GESB. Perceived behavioral control emerges as the strongest predictor, followed by green organizational climate and green organizational support, underscoring the importance of employees' perceived capability and enabling organizational conditions. Furthermore, green organizational identity and perceived customer green expectations partially mediate the effects of organizational factors on GESB. By conceptualizing GESB as a customer-facing form of employee green behavior embedded in logistics service delivery, this study extends existing green behavior research beyond internal workplace environmental actions and offers theoretical and managerial insights for advancing sustainability in maritime logistics.

Keywords: green employee service behavior; logistics industry; theory of planned behavior; social identity theory; organizational support and climate; sustainability in emerging economies

1. Introduction

The accelerating climate crisis has positioned sustainability as a strategic imperative across industries, with the logistics sector facing mounting scrutiny due to its significant environmental footprint. Responsible for nearly 10–12% of global greenhouse gas emissions, logistics firms are under intense pressure from regulators and clients to transition toward low-carbon operations [1,2]. While technological advancements such as fleet electrification or route optimization are increasingly implemented, the behavioral dimension of sustainability remains underexplored. Employees, particularly those at the service interface, play a decisive role in translating organizational commitments into tangible customer-facing practices that influence both environmental outcomes and stakeholder perceptions [3].

A critical yet underexamined construct in this context is green employee service behavior (GESB), defined as voluntary, proactive service behaviors by logistics employees aimed at supporting environmental goals. These actions may include recommending carbon-neutral shipping, promoting sustainable packaging, or digitizing documentation [4]. Unlike general employee green behavior (EGB), which focuses primarily on internal workplace actions, GESB emphasizes customer-oriented service interactions where employees



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act as sustainability ambassadors, shaping customer choices and green value delivery [5,6]. This is especially salient in emerging economies such as Vietnam, where logistics is both a growth engine and highly vulnerable to climate risks. Despite national commitments under the green growth strategy and trade agreements such as the EVFTA, most Vietnamese logistics SMEs lack structured mechanisms for cultivating employee-level green service behavior.

Existing literature has substantially advanced our understanding of EGB and green organizational citizenship behavior (GOCB), highlighting the roles of organizational climate, HR practices, and leadership. However, the majority of studies remain inward-looking, neglecting externally directed service behaviors that are central to industries like logistics, hospitality, and transportation [7–9]. Furthermore, most research relies on single-theory frameworks, limiting explanatory power in capturing both the rational-intentional and identity-based mechanisms underlying employee green service conduct.

To address these gaps, this study employs an integrative framework combining the theory of planned behavior (TPB) [10] and social identity theory [11]. TPB is applied to capture attitudinal, normative, and control-related determinants of GESB, while social identity theory (SIT) highlights how employees' identification with environmentally responsible organizations reinforces value alignment and behavioral consistency. This dual-theory approach provides a nuanced understanding of how both individual cognition and organizational identity dynamics shape green service behavior. The model is empirically tested using survey data from frontline employees in Vietnamese logistics firms and analyzed through structural equation modeling (SEM).

This study makes three key contributions. First, it conceptualizes GESB as a distinct, customer-oriented construct, filling a theoretical blind spot in the green behavior literature. Second, by integrating TPB and SIT, it offers a novel theoretical lens that explains not only individual behavioral intentions but also the identity-driven mechanisms of green service enactment. Third, it provides empirical insights from Vietnam's logistics sector, an underrepresented but strategically critical context, thereby extending the generalizability of GESB research beyond Western settings. For practice, the findings inform managers on how to foster organizational identification and strengthen behavioral control to mobilize frontline employees as agents of sustainability. Unlike previous studies that examine employee green behavior as internal workplace environmental conduct or sustainable logistics as an organizational-level practice, this study focuses on Green Employee Service Behaviour (GESB), a service-oriented form of environmental behavior embedded in logistics service delivery. By examining how employees translate sustainability commitments into customer-facing and operational service activities, the study provides a behavioral link between sustainability management and logistics service performance.

2. Literature Review

2.1. Green Employee Behavior and Its Evolution in Organizational Research

Employee environmental behavior has become a central theme in organizational research, reflecting the global imperatives of sustainable development and corporate environmental accountability. Organizations are under increasing pressure to integrate sustainability into their operations, and scholars have identified employee-driven green behavior as a vital determinant of environmental performance, stakeholder trust, and long-term competitiveness [12,13]. The foundational concept—Employee Green Behavior (EGB)—is generally defined as any workplace action that supports environmental sustainability, such as energy conservation, waste minimization, and recycling [14,15]. These behaviors are typically routine, internally focused, and tied to employees' immediate operational environment.

Closely related is the concept of green organizational citizenship behavior (GOCB), which refers to voluntary, extra-role environmental actions that are not formally rewarded but emerge from altruism, value alignment, or organizational identification [6,16]. GOCB expands upon EGB by emphasizing discretionary behaviors, yet it still remains predominantly focused on internal organizational contexts. Indeed, much of the extant literature centers on internal pro-environmental practices such as switching off unused equipment, supporting corporate environmental policies, or promoting workplace recycling programs [7,8]. While these behaviors are valuable, they do not fully capture the scope of green conduct, particularly in service-intensive industries.

This internal orientation has led to a conceptual blind spot in the literature: the neglect of customer-facing or externally directed green behaviors. In industries such as logistics, hospitality, retail, and transportation—where frontline employees routinely interact with clients, partners, and service recipients—environmentally relevant actions frequently occur at the service interface [5,17]. These behaviors may include recommending eco-friendly packaging, advocating for carbon-neutral shipping, engaging customers in recycling initiatives, or promoting the adoption of digitalized documentation to reduce paper consumption [18,19]. Such actions represent a qualitatively distinct form of sustainability, characterized by employee initiative, customer education, and service innovation.

To address this gap, the present study introduces and conceptualizes green employee service behavior (GESB) as a distinct form of pro-environmental conduct. GESB is defined as voluntary, proactive, and customer-oriented environmental actions embedded in the service delivery process. Unlike EGB and GOCB, which emphasize internal workplace behaviors, GESB highlights how employees create and deliver green value externally, thereby shaping not only organizational practices but also influencing customer decisions and supply chain sustainability [4,20]. In doing so, GESB reflects the evolving role of employees as both implementers of corporate sustainability and ambassadors who extend environmental values beyond organizational boundaries into the marketplace.

2.2. Green Employee Service Behavior (GESB)

The conceptualization of green employee service behavior (GESB) builds upon and extends existing research on employee green behavior (EGB), green organizational citizenship behavior (GOCB), and service-oriented citizenship behavior. Rather than being an entirely independent construct, GESB is theoretically grounded in three established streams of research: employee green behavior, green organizational citizenship behavior, and service-oriented citizenship behavior. Employee green behavior focuses on environmentally responsible actions undertaken by employees in the workplace [12], whereas GOCB emphasizes discretionary environmental behaviors that go beyond formal job requirements [6]. However, both perspectives primarily address internal organizational contexts and provide limited insight into how employees translate environmental responsibility into customer-facing service activities. In logistics services, employees frequently interact with customers, coordinate sustainable logistics solutions, and communicate environmental practices. Consequently, a more service-specific construct is needed to capture how sustainability is enacted through service delivery and stakeholder interactions.

GESB refers specifically to voluntary, proactive, and customer-facing behaviors performed by employees during the delivery of services, with the intent of advancing environmental goals. These behaviors include, but are not limited to, advising clients on sustainable packaging, offering carbon-neutral delivery options, and replacing paper-based transactions with digital alternatives [7,8]. Unlike EGB, which often involves inward-facing actions such as recycling or reducing office energy use [12,14], GESB operates at the ser-

vice interface—where employees' behaviors directly influence external stakeholders and reinforce an organization's environmental commitment.

The specific characteristics of GESB in green logistics are grounded in its embeddedness in the service supply chain, where employees act as both sustainability implementers and communicators. Logistics services are inherently complex and involve various interactions between employees, clients, shippers, and supply chain partners. In maritime logistics, this service interface is even more coordination-intensive because employees must interact with shipping lines, port operators, freight forwarders, customs brokers, inland transport providers, and cargo owners under strict vessel schedules, documentation requirements, and environmental compliance pressures. Green service behavior in this context is therefore not limited to promoting environmentally friendly customer choices; it also involves supporting digital documentation, advising customers on lower-emission shipping options, coordinating cargo movements to reduce delays and idle time, and facilitating alignment with green port and shipping-related environmental requirements. Prior research on port-based green behavior and green shipping corridors similarly emphasizes that maritime sustainability depends on coordinated action among ports, shipping actors, logistics providers, and employees, rather than on isolated organizational practices alone [21,22]. This context highlights the theoretical value of GESB as a distinct service-oriented sustainability construct. While existing research on employee green behavior and green organizational citizenship behavior has primarily focused on internal workplace environmental actions, these perspectives provide limited insight into how employees translate environmental responsibility into customer-facing service activities and logistics operations. In logistics enterprises, sustainability objectives are frequently enacted through employee interactions with customers, transport partners, and operational stakeholders. Consequently, GESB extends existing green behavior research by capturing the behavioral mechanisms through which environmental commitments are integrated into service delivery processes. Within this context, GESB is characterized by three key attributes: external orientation, service integration, and value co-creation. First, the external orientation distinguishes GESB from conventional green behaviors by emphasizing its impact on customer awareness and behavior. Second, GESB is integrated directly into service workflows—such as order processing, last-mile delivery, or documentation handling—where environmentally responsible choices are presented as part of the service itself. Third, GESB fosters value co-creation between employees and clients by enabling shared responsibility for reducing the environmental footprint of logistics activities [4,23]. This positions frontline employees not only as agents of organizational sustainability but also as influencers of systemic green practices across the logistics value chain.

The role of GESB in green logistics is both strategic and operational. At the strategic level, GESB contributes to an organization's environmental differentiation and enhances brand credibility in an increasingly sustainability-conscious market. Service behaviors that reflect environmental stewardship signal authenticity and reinforce the firm's green value proposition to customers and partners [6,11]. More importantly, GESB provides a conceptual bridge between sustainability management and logistics service delivery. Whereas sustainability research has traditionally emphasized environmental policies, technologies, and organizational systems, logistics service research has largely focused on service quality, operational performance, and customer satisfaction. By introducing GESB, this study links these two domains and explains how organizational sustainability initiatives are translated into observable service behaviors at the employee level. In this sense, GESB represents the behavioral pathway through which sustainability objectives become embedded in everyday logistics service encounters. Operationally, GESB bridges the gap between top-down environmental policies and ground-level service execution. While many logistics firms

implement green technologies or carbon-reduction policies, these efforts may fall short without corresponding behavioral engagement from employees. GESB enables the translation of organizational environmental intentions into meaningful customer experiences, thereby enhancing the effectiveness of green logistics initiatives [16,24]. Moreover, in emerging economies like Vietnam—where regulatory enforcement may be weaker and sustainability standards vary widely—employee-level behaviors play a critical role in shaping credible, bottom-up transitions toward green logistics [7,8].

2.3. Hypothesis Development

The selection of the six antecedents is grounded in two complementary theoretical perspectives: the Theory of Planned Behaviour (TPB) and Social Identity Theory (SIT). From the TPB perspective, GESB is viewed as an intentional behavior shaped by employees' knowledge, perceived ability, and perceived stakeholder expectations [7,8,10]. Accordingly, environmental knowledge reflects employees' cognitive basis for understanding green service practices [25]; perceived behavioral control captures their confidence and perceived capability to perform such behaviors [10]; and perceived customer green expectations represent external normative pressure from customers. Together, these factors influence employees' willingness and perceived capacity to engage in sustainability-oriented service behaviors.

From the SIT perspective, employees are more likely to engage in behaviors that are consistent with the values and identity of the organizations with which they identify [26]. Accordingly, green organizational identity explains why employees internalize organizational environmental values and translate them into service behavior [27]. In addition, green organizational climate and green organizational support provide a shared environmental context that reinforces employees' identification with organizational sustainability goals and encourages the enactment of green service behaviors [24,28]. Employees who perceive strong environmental values, support, and norms within their organization are more likely to regard green service activities as part of their organizational role and professional responsibility.

Thus, the six antecedents collectively represent the cognitive, normative, and identity-based mechanisms through which Green Employee Service Behaviour is formed in logistics enterprises (see Figure 1).

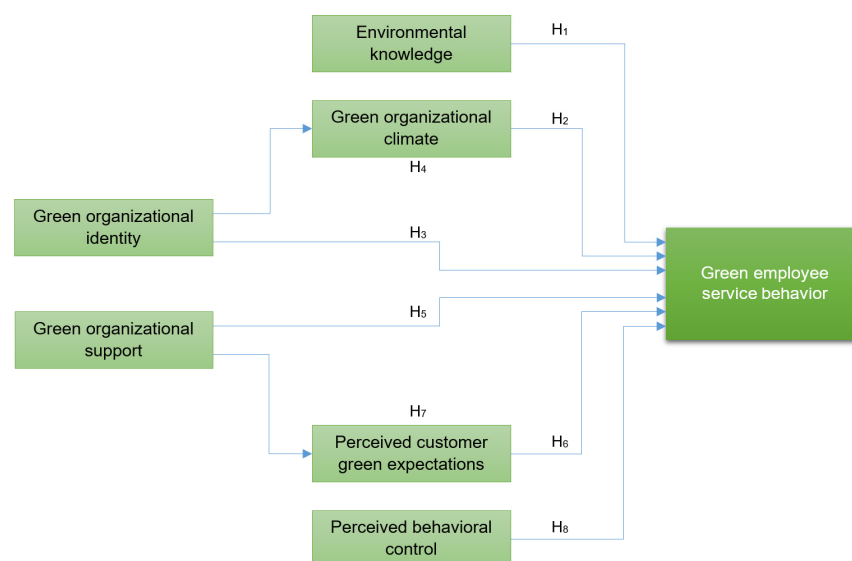


Figure 1. The research model.

2.3.1. Environmental Knowledge

Under the theory of planned behavior (TPB), knowledge enhances pro-environmental action by shaping attitudes and strengthening perceived behavioral control [10]. In maritime logistics, frontline employees make frequent service decisions—such as routing, documentation (e-BL), or packaging—that directly affect environmental outcomes. Possessing environmental knowledge (e.g., fuel-efficient routing, carbon accounting, digital tools) enables them to value greener options and feel capable of implementing them under operational pressure, thereby fostering GESB. Empirical studies confirm that environmental knowledge predicts green behavior directly and through intention, with stronger effects when supported by organizational systems [25,29,30]. In logistics and maritime sectors, knowledge and capability building are central to adopting sustainable practices [31,32], while evidence from shipping shows that green awareness and training improve crew behavior and environmental performance [33,34]. With ports and carriers increasingly mandating digitalization and emissions reporting [35,36], environmental knowledge emerges as a decisive enabler of GESB.

Hypothesis 1. *Environmental knowledge positively affects green employee service behavior at logistics enterprises.*

2.3.2. Green Organizational Climate

A green organizational climate (GOC)—shared perceptions that environmental values are supported—shapes subjective norms and perceived behavioral control [10], encouraging frontline logistics employees to deliver GESB such as e-documentation, low-emission routing, or sustainable packaging advice.

Evidence from the eco port of Kaohsiung shows that green policies, training, communication, and motivation all enhance employees' green behaviors, with motivation most influential [21]. Studies across industries confirm GOC's direct effect on pro-environmental behavior and its mediating role between leadership, HR practices, and voluntary green conduct [13,37–39]. In maritime logistics, where ports and shippers demand decarbonization and digitalization [35,36], cultivating a strong GOC equips employees to align service delivery with sustainability goals.

Hypothesis 2. *Green organizational climate positively affects green employee service behavior at logistics enterprises.*

2.3.3. Green Organizational Identity

Grounded in Social Identity Theory, green organizational identity (GOI)—employees' internalization of their organization's environmental values—aligns self-concept with “who we are” as a green logistics provider, thereby motivating extra-role, customer-facing pro-environmental conduct (e.g., proposing low-emission routings, promoting e-BL, advising on sustainable packaging). Conceptual and empirical work shows that GOI reliably translates sustainability cues into voluntary green behaviors: GOI predicts organizational citizenship for the environment and converts strategy into performance outcomes via employees' green citizenship [6,11,40]. In manufacturing and services, GOI mediates the effects of green HRM on task-related and voluntary green behaviors [41] and sits in a validated serial path GHRM → green organizational climate (GOC) → GOI → voluntary PEB [39].

In maritime logistics, port and carrier decarbonization agendas make the service interface the locus of environmental value delivery. Evidence from the eco port of Kaohsiung shows green climate dimensions (policy, training, communication, motivation) lift employees' green behaviors [21], while crew studies indicate that internalized green awareness

plus engagement elevate on-the-job green behavior and firm reputation [34]. Sector-specific CSR research in ocean freight forwarding links environmental management to corporate image and commitment—proximal identity markers that foster identification and discretionary effort [42]. Together, these findings support GOI as both a direct driver of GESB and the psychological bridge through which climate cues become customer-oriented green service actions in maritime logistics.

Hypothesis 3. *Green organizational identity positively affects green employee service behavior at logistics enterprises.*

Hypothesis 4. *Green organizational identity mediates the relationship between green organizational climate and green employee service behavior.*

2.3.4. Green Organizational Support

From a theory of planned behavior (TPB) lens, perceived green organizational support (GOS)—employees' belief that their organization values and resources environmental goals—operates as a dual mechanism: it strengthens subjective norms (clear expectations that “this is how we serve customers here”) and heightens perceived behavioral control (access to training, digital tools, time and process latitude). In logistics service encounters—where frontline employees co-produce outcomes with shippers and consignees—such normative clarity and control beliefs are pivotal for GESB: recommending low-carbon modes, nudging customers toward paperless/e-documentation, and proposing sustainable packaging options [3,10,13].

Complementing TPB, social identity arguments explain why support cues matter beyond utility: when employees perceive high GOS, they infer that environmental stewardship is a defining, valued attribute of the organization. This perception fosters organizational identification with “who we are” as a green service provider, motivating employees to enact identity-consistent behaviors in customer-facing work—precisely the domain of GESB [6,11]. Empirically, a growing body of service and hospitality studies shows that (green) organizational support is a robust predictor of multiple employee green outcomes, including green knowledge sharing, innovative green work behavior, green service performance, and task-related pro-environmental behavior—and often mediates the effects of HR practices and leadership on employee green actions [17,20,43–45]. Recent evidence further suggests that organizational (green) support improves employees' pro-environmental conduct at work broadly [46] and that HR systems can translate into greener behaviors via perceived support mechanisms [47]. Taken together, theory predicts—and evidence corroborates—that when logistics firms are perceived to support environmental goals, frontline staff are more willing and able to deliver green value in service interactions.

Hypothesis 5. *Green organizational support positively affects green employee service behavior at logistics enterprises.*

2.3.5. Perceived Customer Green Expectations

In the theory of planned behavior (TPB), others' expectations constitute subjective norms, a proximal driver of behavior [10]. For frontline staff in logistics—who co-produce outcomes with shippers, consignees, and freight forwarders—perceived customer green expectations (PCGE) make sustainability norms salient at the service interface (e.g., e-documentation, low-carbon routing/mode, sustainable packaging). PCGE should therefore elevate employees' intention and enactment of GESB. A complementary identity logic applies: when customers consistently expect “green service,” employees' organizationally

anchored identity as a provider of responsible logistics is reinforced, encouraging identity-consistent green service conduct [11].

Empirical research shows customers possess and act on green expectations: expectation–perception gaps are measurable and material for green offerings [18]; customers report willingness to pay and form robust pro-green evaluations in service settings [9,19,48]. In logistics specifically, shipper pressure and customer requirements are well-documented antecedents of green logistics practice adoption by logistics service providers (LSPs) [49,50]. In maritime contexts, regulatory and market forces (IMO decarbonization strategy; cargo owners’/ports’ green corridor initiatives) heighten customers’ expectations for low-emission services and digital, paperless documentation—expectations operationalized daily by frontline staff [22,35,36]. Together, TPB and these findings imply that when employees perceive stronger customer green expectations, they are more likely to deliver green value in service encounters.

Hypothesis 6. *Perceived customer green expectations positively affect green employee service behavior at logistics enterprises.*

Green organizational support (GOS) signals that environmental goals are valued and resourced, strengthening normative clarity and perceived behavioral control (TPB) for green service delivery [10]. GOS also equips employees with training, digital tools (e-BL, e-invoicing), and customer-facing scripts that surface and structure customers’ green requirements. Consequently, GOS should amplify employees’ perceptions of what customers expect (higher PCGE) and, through that proximal appraisal, increase GESB. Put differently, PCGE operates as a sensemaking bridge between internal support cues and external, boundary-spanning green conduct.

Across hospitality/service settings, perceived (green) organizational support reliably predicts employee green outcomes and often works through mediators (engagement, knowledge sharing, creativity) to shape behavior [17,20,43–45]. In maritime logistics, customers’ sustainability requirements and port/shipper initiatives are powerful external cues that LSPs translate into frontline practices [22,36]. When organizations provide supportive systems and training, employees are more capable of eliciting, recognizing, and prioritizing these customer expectations—raising PCGE—which, per TPB, becomes the immediate driver of green service enactment. Evidence from green marketing shows that when customer value/expectations are made salient, downstream green behaviors and citizenship actions increase [9,18,19]. Thus, it is theoretically coherent and empirically consistent to posit that:

Hypothesis 7. *Perceived customer green expectations mediate the relationship between green organizational support and green employee service behavior.*

2.3.6. Perceived Behavioral Control

Perceived behavioral control (PBC)—defined as an individual’s belief in their capability to perform a specific behavior despite potential constraints—has been shown to significantly influence GESB in logistics enterprises. Rooted in the Theory of Planned Behavior [10], PBC reflects the degree to which employees feel empowered and resourced to enact environmentally responsible service actions such as offering low-emission delivery options or using digital documentation tools. In high-demand service environments like logistics, where time pressure, customer expectations, and operational limitations are common, employees’ confidence in their ability to make green decisions becomes critical [7,8]. Empirical research affirms that individuals with higher PBC are more likely to engage in proactive environmental behaviors, particularly when they perceive they have access to

the necessary tools, knowledge, and managerial support [16]. Moreover, perceived control not only shapes behavioral intention but also directly affects the execution of voluntary service-based environmental practices [4,23]. Therefore, enhancing employees' perceived control—through training, technology enablement, and supportive systems—serves as a practical mechanism to stimulate GESB and embed sustainability into everyday logistics service delivery.

Hypothesis 8. *Perceived behavioral control positively affects green employee service behavior at logistics enterprises.*

3. Methodology

3.1. Research Design and Data Quality Assurance

This study adopted a quantitative two-wave survey design to capture antecedents and outcomes of GESB within the maritime logistics sector. The temporal separation between waves (January 2025–August 2025) reduced common method bias and enhanced the causal interpretability of the findings.

The survey instrument was translated and back-translated to ensure semantic and conceptual equivalence. Respondents were informed about the study's objectives, voluntary participation, and confidentiality assurances; electronic consent was obtained prior to participation. Data quality was safeguarded through a pilot test, embedded attention-check questions, removal of aberrant responses, and treatment of missing data using Full Information Maximum Likelihood (FIML).

3.2. Sampling Frame and Sample Characteristics

The target population comprised maritime and logistics enterprises in Vietnam, with sampling frames developed in collaboration with the Vietnam Maritime Corporation (VIMC) and the Vietnam Logistics Association (VLA). A purposive sampling approach was employed to target firms operating in Vietnam's major seaport regions, including Hai Phong, Da Nang, and Ho Chi Minh City. Participating firms were identified through the professional networks and membership databases of VIMC and VLA, which facilitated access to shipping companies, freight forwarders, port-related logistics providers, and maritime transport service firms. Given the absence of a comprehensive national sampling frame of maritime logistics employees, probability-based random sampling was not feasible. Consequently, a controlled purposive sampling strategy was adopted to ensure that respondents possessed relevant experience in logistics service operations and sustainability-related activities.

Within participating firms, questionnaires were distributed to employees directly involved in logistics service delivery, customer service, operations, documentation processing, transport coordination, and related frontline logistics activities. These positions were selected because they are most likely to engage in customer-facing service interactions and environmental practices relevant to green employee service behavior (GESB).

Data collection yielded 452 valid responses, representing the final sample for analysis. This sample size substantially exceeds the conventional minimum threshold of 200 for confirmatory factor analysis (CFA) and structural equation modeling (SEM). The resulting observation-to-parameter ratio of approximately 12:1 is above the recommended 10:1 benchmark, ensuring robust parameter estimation. A power analysis based on RMSEA further confirmed that the available sample possessed sufficient statistical power to detect potential model misspecifications.

With a sample size of 452, the composition demonstrates strong representativeness across demographic, occupational, and organizational dimensions (see Table 1). Male

respondents predominate (63.27%), with the majority aged 35–44 (32.52%) and 25–34 (29.42%), reflecting the core of the active workforce. Educational attainment is high, as 65.27% hold a university degree and 13.49% a postgraduate qualification. In terms of position, staff/specialists (42.92%) and middle managers (32.30%) provide balanced coverage of organizational layers. Medium-sized firms account for the majority (59.29%), with ownership dominated by joint-stock/private enterprises (52.88%) and a notable share of FDI/multinationals (28.09%), ensuring contextual diversity. Work experience is well distributed, led by 11–20 years (34.51%) and 5–10 years (32.74%). This structure provides sufficient heterogeneity for SEM and supports cautious generalization.

Table 1. Demographic profile of the respondents ($n = 452$).

No	Category	Frequency	Percentage (%)
1	Gender		
	Male	286	63.27
	Female	166	36.73
2	Age		
	Under 25	44	9.73
	25–34	133	29.42
	35–44	147	32.52
	45–54	86	19.03
	55 and above	42	9.29
3	Education		
	Vocational/College	96	21.24
	University	295	65.27
	Postgraduate	61	13.49
4	Position in firm		
	Staff/Specialist	194	42.92
	Supervisor/Middle manager	146	32.30
	Senior manager/Executive	77	17.04
	Other (e.g., consultant, contractor)	35	7.74
5	Firm size (employees)		
	Small (<50)	142	31.42
	Medium (50–249)	268	59.29
	Large (≥ 250)	42	9.29
6	Firm ownership		
	State-owned enterprise	86	19.03
	Joint-stock/Private	239	52.88
	FDI/Multinational	127	28.09
7	Work experience		
	Less than 5 years	78	17.26
	5–10 years	148	32.74
	11–20 years	156	34.51
	Over 20 years	70	15.49

3.3. Measures

The questionnaire encompassed six antecedent constructs—environmental knowledge, organizational climate, organizational identity, organizational support, perceived customer green expectations, and perceived behavioral control—together with the focal outcome of green employee service behavior (GESB) (see Table 2). All items were measured on five-point Likert scales and adapted from validated international sources to ensure conceptual and content validity. Scale purification was carried out through exploratory factor analysis (EFA) and subsequently verified by confirmatory factor analysis (CFA). The finalized instrument retained 36 items, all of which demonstrated satisfactory psychometric properties

(standardized loadings >0.50, composite reliability >0.70, and average variance extracted >0.50), thus confirming reliability, convergent validity, and discriminant validity [51,52].

Table 2. Properties of the measurement model.

	Description	Loading	Mean	SDs	CR	AVE
Perceived Behavioral Control (PBC)	Control1	0.786	3.17	1.222	0.86	0.55
	Control2	0.785	3.27	1.169		
	Control3	0.766	3.26	1.165		
	Control4	0.822	3.23	1.182		
	Control5	0.753	3.38	1.156		
	Control6	0.674	3.26	1.186		
Environmental Knowledge (EK)	Cronbach's α	0.858			0.84	0.52
	Knowledge1	0.842	3.85	0.657		
	Knowledge2	0.724	3.86	0.659		
	Knowledge3	0.744	3.84	0.685		
	Knowledge4	0.690	3.71	0.792		
	Knowledge5	0.718	3.90	0.640		
Green Organizational Support (GOS)	Cronbach's α	0.836			0.88	0.60
	Support1	0.848	3.95	0.689		
	Support2	0.710	3.94	0.730		
	Support3	0.804	3.98	0.640		
	Support4	0.879	4.00	0.663		
	Support5	0.864	4.02	0.606		
Green Organizational Identity (GOI)	Cronbach's α	0.877			0.86	0.51
	Identity1	0.763	4.01	0.603		
	Identity2	0.671	3.99	0.633		
	Identity3	0.811	4.02	0.578		
	Identity4	0.745	4.05	0.619		
	Identity5	0.845	4.04	0.613		
Green Organizational Climate (GOC)	Identity6	0.788	3.98	0.652	0.95	0.74
	Cronbach's α	0.864				
	Climate1	0.892	3.99	0.633		
	Climate2	0.658	4.02	0.630		
	Climate3	0.864	3.99	0.623		
	Climate4	0.939	3.97	0.634		
Perceived Customer Green Expectations (PCGE)	Climate5	0.924	3.97	0.633	0.89	0.63
	Cronbach's α	0.951				
	Expectations1	0.933	4.46	0.813		
	Expectations2	0.764	4.47	0.867		
	Expectations3	0.907	4.48	0.803		
	Expectations4	0.628	4.49	0.846		
Green Employee Service Behavior (GESB)	Expectations5	0.878	4.46	0.843	0.90	0.69
	Cronbach's α	0.890				
	GreenBehavior1	0.812	3.54	0.724		
	GreenBehavior2	0.906	3.69	0.699		
	GreenBehavior3	0.869	3.94	0.572		
	GreenBehavior4	0.925	3.96	0.556		
	Cronbach's α	0.896				

Note: PBC = Perceived Behavioral Control; EK = Environmental Knowledge; GOS = Green Organizational Support; GOI = Green Organizational Identity; GOC = Green Organizational Climate; PCGE = Perceived Customer Green Expectations; GESB = Green Employee Service Behavior; SD = Standard Deviation; CR = Composite Reliability; AVE = Average Variance Extracted.

All constructs were measured using multi-item scales adapted from previously validated studies. To ensure content validity and contextual relevance, the original items were carefully adapted to the maritime logistics setting while preserving their conceptual

meaning. The complete list of measurement items, construct sources, and corresponding references is provided in the Appendix A (Table A1).

3.4. Analytical Strategy

Analyses were conducted using SPSS 22.0 and AMOS 22.0. The measurement model was validated through CFA, while structural relationships were tested via SEM. Models were estimated using Maximum Likelihood (ML), with bias-corrected and accelerated (BCa) bootstrapping (5000 resamples, 95% CI) employed to test both direct and indirect effects. Model fit was evaluated against widely accepted thresholds ($\chi^2/df < 3$; CFI and TLI ≥ 0.90 ; RMSEA and SRMR ≤ 0.08) [52,53].

3.5. Bias Diagnostics

To address potential method bias, the study employed a two-wave survey design in which antecedent constructs (e.g., organizational climate, identity, and support) were measured in the first wave, while the focal outcome of green employee service behavior (GESB) was assessed in the second. This temporal separation reduced the likelihood of inflated associations. In addition, items were randomized across constructs, several were reverse-coded to minimize response patterns, and respondents were assured of anonymity and confidentiality.

Post hoc diagnostics confirmed the adequacy of these precautions: Harman's single-factor test indicated that the first factor accounted for only 22.7% of the variance, far below the 50% threshold; the Common Latent Factor approach showed average changes in standardized loadings below 0.20; and a marker-variable analysis detected no significant associations with substantive constructs. Tests for non-response bias, based on comparisons between early and late respondents, as well as attrition checks across the two survey waves, revealed no systematic differences. Taken together, these results provide confidence that the findings are not materially affected by common method variance or sample attrition.

4. Results

4.1. Measurement Model: EFA and CFA Confirmation

Exploratory factor analysis (EFA) using Principal Axis Factoring with Promax rotation demonstrated strong sampling adequacy (KMO = 0.850) and a significant Bartlett's test of sphericity ($\chi^2 (666) = 12,002.387, p < 0.001$), confirming the suitability of the data. The analysis validated the proposed seven-factor structure consisting of Environmental knowledge (EK), Green organizational climate (GOC), Green organizational identity (GOI), Green organizational support (GOS), Perceived customer green expectations (PCGE), Perceived behavioral control (PBC) and Green employee service behavior (GESB), with all 36 items retained. Factor loadings exceeded the 0.50 threshold, and the seven-factor solution explained 68.58% of the total variance, supporting the representativeness of the constructs.

Confirmatory factor analysis (CFA) further confirmed the adequacy of the measurement model. While the chi-square statistic indicated misfit due to sensitivity to large samples ($\chi^2 = 1537.639, df = 567, p < 0.001$; $\chi^2/df = 2.712$), other indices supported acceptable model fit. RMSEA = 0.062 (90% CI [0.060, 0.067]) and SRMR = 0.068 suggested reasonable approximation, while CFI = 0.911 and TLI = 0.901 were slightly below the 0.95 benchmark but still within acceptable limits. These results provide evidence for a satisfactory and theoretically coherent measurement structure (see Table 3).

Table 3. Model fit indices (CFA/SEM).

Index	Value	Threshold	Result
χ^2/df	2.712	<3	Good
RMSEA (90% CI)	0.062 (CI: [0.060–0.067])	≤ 0.08 acceptable	Good
SRMR	0.068	<0.08	Good
CFI/IFI	0.911/0.911	≥ 0.90	Good
TLI	0.901	≥ 0.90	Acceptable

4.2. Reliability, Convergent, and Discriminant Validity

Reliability was confirmed with Cronbach’s alpha values above 0.80 for all constructs, and composite reliability (CR) values ranged from 0.839 to 0.950, indicating high internal consistency across the measurement scales.

Convergent validity was supported by statistically significant standardized factor loadings ranging from 0.567 to 0.954, and Average Variance Extracted (AVE) values generally exceeded the recommended threshold of 0.50. The AVE for green organizational identity (0.512) was slightly above the minimum acceptable value, and still considered adequate due to its strong composite reliability (0.861) and high item loadings.

Discriminant validity was established using the Fornell–Larcker criterion, whereby the square root of the AVE for each construct exceeded its correlations with other constructs. The highest inter-construct correlation observed was between environmental knowledge and green organizational climate ($r = 0.629$), which remained lower than the square roots of their AVE values (0.872 and 0.890, respectively). Additionally, all AVE values exceeded the Maximum Shared Variance (MSV = 0.396), fulfilling the condition for discriminant validity. Taken together, these results demonstrate that the measurement model exhibits strong psychometric properties, with high reliability, convergent validity, and discriminant validity, ensuring clear construct distinctiveness across all variables including (Table 4).

Table 4. Descriptive statistics, reliability, and inter-construct correlations ($n = 452$).

Variable	Mean	SD	1	2	3	4	5	6
1. PBC	4.47	0.70						
2. Knowledge	3.83	0.54	0.120 *					
3. Support	3.98	0.55	0.210 **	0.280 **				
4. Identity	4.02	0.48	0.160 **	0.150 **	0.220 **			
5. Climate	3.99	0.58	0.230 **	0.420 **	0.350 **	0.260 **		
6. Expectations	3.26	0.90	0.140 **	0.300 **	0.210 **	0.180 **	0.450 **	
7. GESB	3.79	0.56	0.320 **	0.180 **	0.290 **	0.210 **	0.260 **	0.170 **

Note: * $p < 0.05$, ** $p < 0.01$.

4.3. Common Method Variance

As the study relied on self-reported data, common method variance (CMV) was assessed. Harman’s one-factor test showed that the first unrotated factor explained 22.70% of the total variance, well below the 50% threshold, while seven factors jointly explained 68.58% [52,54]. Combined with CFA model fit indices and strong evidence of discriminant validity, this suggests that CMV was not a significant threat to the validity of the findings. Additional corrective modeling was therefore deemed unnecessary.

4.4. Structural Model and Hypothesis Testing

Structural equation modeling was employed because the research model consists of multiple latent variables and simultaneous causal relationships. SEM allows the measurement properties of the constructs and the hypothesized structural relationships to be assessed concurrently while accounting for measurement error. This approach is particularly suitable for theory-testing studies involving complex behavioral models and multidimensional constructs.

The structural model estimated via maximum likelihood indicated satisfactory global fit ($\chi^2 = 1537.639$, $df = 567$, $p < 0.001$; $\chi^2/df = 2.712$; CFI = 0.911; TLI = 0.901; RMSEA = 0.062, 90% CI [0.060, 0.067]; SRMR = 0.068). This multi-index profile was consistent with acceptable standards for structural equation modeling (SEM), providing adequate support for proceeding with hypothesis testing.

The structural results provide strong support for all hypothesized relationships within the maritime logistics context. Hypothesis H1 is supported, as environmental knowledge (EK) positively influences green employee service behavior (GESB) ($\beta = 0.115$, $p = 0.003$), indicating that employees' understanding of environmental practices contributes to greener service delivery, though with a modest effect (see Figure 2 and Table 5).

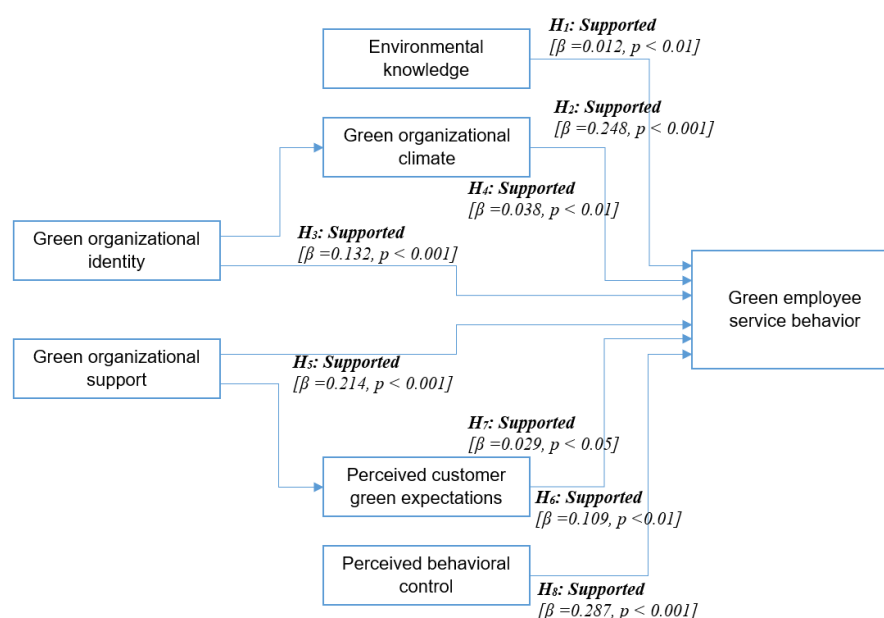


Figure 2. Structural model results.

Table 5. Direct effects of the structural model.

Hy.	Path	β (Standardized)	S.E.	C.R.	<i>p</i> -Value	Result
H1	EK $\rightarrow$ GESB	0.115	0.038	3.026	0.003	Supported
H2	GOC $\rightarrow$ GESB	0.248	0.041	6.048	***	Supported
H3	GOI $\rightarrow$ GESB	0.132	0.036	3.667	***	Supported
H5	GOS $\rightarrow$ GESB	0.214	0.039	5.487	***	Supported
H6	PCGE $\rightarrow$ GESB	0.109	0.035	3.114	0.002	Supported
H8	PBC $\rightarrow$ GESB	0.287	0.042	6.833	***	Supported

Note: *** $p < 0.001$.

Hypothesis H2 is supported, with green organizational climate (GOC) exerting a significant impact on GESB ($\beta = 0.248$, $p < 0.001$). This underscores that shared environ-

mental norms within maritime logistics firms play a key role in shaping frontline service behavior. Hypothesis H3 is also supported ($\beta = 0.132, p < 0.001$), suggesting that employees' identification with a "green" organizational identity enhances their willingness to deliver environmentally responsible services.

At the organizational level, Hypothesis H5 is strongly supported, as green organizational support (GOS) significantly drives GESB ($\beta = 0.214, p < 0.001$), highlighting the importance of training, digital tools, and operational support in enabling green practices in shipping and port-related services. Hypothesis H6 is supported with a smaller effect ($\beta = 0.109, p = 0.002$), indicating that customer expectations for sustainable logistics services act as an additional, though less dominant, driver.

Finally, Hypothesis H8 receives the strongest support ($\beta = 0.287, p < 0.001$), confirming that perceived behavioral control (PBC)—employees' ability to act under operational constraints—is the most critical determinant of GESB in maritime logistics operations.

Overall, the findings reveal a clear hierarchy: operational capability and organizational support dominate, while knowledge and customer pressure play complementary roles in shaping green service behavior in maritime logistics and shipping contexts.

4.5. Mediation Analysis

The mediation results confirm that both indirect mechanisms are significant in the maritime logistics and shipping context. Hypothesis H4 is supported, as green organizational climate influences green employee service behavior not only directly but also indirectly through green organizational identity, indicating partial mediation (see Table 6). This suggests that a shared environmental climate in logistics firms is translated into frontline green service practices partly via employees' identification with organizational values.

Table 6. Indirect and total effects of the structural model.

Hy.	Path	β_{direct}	β_{indirect}	β_{total}	95% BC CI (Indirect)	Mediation Type
H4	GOC $\rightarrow$ GOI $\rightarrow$ GESB	0.165 **	0.038 **	0.203 **	[0.015, 0.072]	Partial
H7	GOS $\rightarrow$ PCGE $\rightarrow$ GESB	0.192 **	0.029 *	0.221 **	[0.008, 0.061]	Partial

Note: * $p < 0.05$, ** $p < 0.01$.

Similarly, Hypothesis H7 is supported, with green organizational support affecting green employee service behavior both directly and indirectly through perceived customer green expectations. This partial mediation indicates that organizational support in maritime logistics settings not only enables employees to act but also heightens their sensitivity to customer-driven sustainability demands.

Overall, the findings highlight that identity-based and customer-related mechanisms function as complementary pathways through which organizational factors are converted into green service behavior in shipping and port service operations.

5. Discussion

The findings of this study provide a coherent and contextually grounded explanation of how green employee service behavior (GESB) is enacted within maritime logistics and shipping operations. At a fundamental level, the results reaffirm a core proposition of the Theory of Planned Behavior [10]: perceived behavioral control is a critical determinant of behavioral enactment, particularly when employees face operational constraints. The dominant effect of PBC highlights that, under conditions characterized by time pressure, procedural rigidity, and coordination complexity, employees engage in green service practices not merely because of intention, but because they perceive sufficient capability and

autonomy to act. This aligns with broader syntheses in the literature [3], while offering stronger contextual validation in logistics environments where execution feasibility is paramount. The dominant influence of perceived behavioral control suggests that green service behavior in logistics is primarily capability-driven rather than solely value-driven. Employees may support sustainability initiatives and recognize customer expectations, yet they are unlikely to translate these motivations into concrete service behaviors unless they possess sufficient confidence, environmental knowledge, operational autonomy, and perceived competence. This interpretation is consistent with the Theory of Planned Behaviour, which positions perceived behavioral control as a key determinant of behavioral intention and action [10,55]. It also aligns with recent employee green behavior studies showing that environmental knowledge and perceived behavioral control significantly facilitate employees' green actions at work [7,8,15,56].

Beyond individual capability, organizational mechanisms emerge as critical enablers. Both green organizational support (GOS) and green organizational climate (GOC) exert significant positive effects on GESB, confirming that sustainability-oriented behavior at the frontline is structurally embedded rather than spontaneously enacted. Organizational investments in training, digital infrastructures, and managerial commitment transform environmental objectives into actionable practices [43,46]. In parallel, environmental knowledge (EK) and green organizational identity (GOI) are also found to significantly influence GESB, although their effects are comparatively moderate. This suggests that cognitive awareness and identity-based alignment reinforce, rather than substitute for, operational capability. The significant effect of GOI is consistent with Social Identity Theory, which suggests that employees are more likely to engage in behaviors that reflect organizational values when those values become part of their self-concept [26]. In this sense, green organizational identity helps transform sustainability from an external organizational agenda into a personally meaningful service role.

Similarly, perceived customer green expectations (PCGE) exert a positive, albeit weaker, influence on GESB. This indicates that demand-side signals are increasingly relevant, even in emerging logistics markets where cost and efficiency remain dominant [9,19]. From a TPB perspective, PCGE can be interpreted as a form of external normative influence, whereby employees adjust their service behavior in response to perceived stakeholder expectations. Its significant but weaker effect suggests that customer pressure contributes to GESB but is less influential than employees' perceived capability and organizational support in operationally constrained maritime logistics settings.

Taken together, the findings demonstrate that GESB is shaped by the interaction between individual capability, organizational enablement, and external expectations. The integration of TPB and Social Identity Theory thus provides a more comprehensive explanation, wherein cognition, identity, and contextual support jointly determine behavioral execution. Importantly, the results do not suggest that knowledge, identity, climate, support, customer expectations, or behavioral control operate in isolation. Rather, they indicate that all six antecedents positively contribute to GESB, with PBC playing the strongest role and the remaining factors providing complementary cognitive, organizational, identity-based, and normative conditions.

From a broader perspective, the study underscores that pro-environmental behavior is inherently context-dependent. In maritime logistics—particularly within emerging economies such as Vietnam—structural and operational constraints do not diminish green behavior but redefine its underlying drivers. GESB therefore reflects not only environmental intentions, but also employees' ability to coordinate sustainability-oriented actions across shipping lines, port operations, cargo movements, documentation processes, and customer interactions. In maritime logistics, green service behavior is embedded within a

highly interconnected operational system, making organizational support and behavioral capability particularly important for translating sustainability objectives into practice.

Theoretical implications

This study advances theory by refining the integration of the Theory of Planned Behavior (TPB) and Social Identity Theory (SIT) in explaining green employee service behavior (GESB) within maritime logistics. The findings reaffirm the primacy of TPB's control pathway, with perceived behavioral control (PBC) emerging as the most decisive predictor. This underscores that in operationally constrained service environments, green behavior is driven less by intention than by perceived capability to act [3,10].

At the same time, the strong effect of green organizational support (GOS) extends TPB by highlighting the organizational foundations of behavioral control. Rather than being purely individual, control beliefs are structurally enabled through resources, training, and systems that legitimize green service actions [43,46]. This positions organizational support as a critical activation mechanism linking intention to execution in logistics service settings.

Environmental knowledge (EK), green organizational climate (GOC), green organizational identity (GOI), and perceived customer green expectations (PCGE) also contribute significantly to GESB, although their effects are less pronounced than those of PBC and GOS. This pattern suggests that sustainability-oriented service behavior is shaped not only by employees' perceived capability and organizational support, but also by cognitive, identity-based, organizational, and stakeholder-related influences. Consistent with TPB, environmental knowledge and customer green expectations provide informational and normative foundations that orient employees toward environmentally responsible service practices [7,8,10,25]. At the same time, the significant effect of GOI supports the propositions of Social Identity Theory, indicating that employees are more likely to enact green service behaviors when organizational environmental values become integrated into their self-concept [11,26,39].

The findings therefore suggest that cognition, identity, and organizational context remain important antecedents of GESB, but their influence becomes particularly meaningful when employees possess sufficient capability and organizational resources to translate environmental intentions into service actions. Prior research similarly shows that green work climate, organizational identity, and perceived organizational support shape employee pro-environmental behavior by creating shared environmental norms and enabling conditions for action [13,24,28,39]. Within maritime logistics operations, where service delivery is characterized by procedural complexity, coordination demands, and operational constraints, behavioral capability and organizational support appear to play a particularly salient role in enabling the enactment of sustainability-oriented service behavior [31].

Conceptually, by positioning GESB as a customer-interface construct, this study extends pro-environmental behavior research beyond internal workplace actions. The findings indicate that externally oriented green behavior is shaped by the combined influence of behavioral capability, organizational support, environmental knowledge, organizational identification, climate perceptions, and customer expectations. This interpretation is consistent with studies showing that customer expectations and perceptions of green offerings influence sustainability-related service evaluation and behavior [18,48]. In doing so, the study delineates boundary conditions for TPB and identity theories in emerging logistics systems, contributing to a more context-sensitive understanding of how sustainability is enacted at the service interface [31].

Practical implications

The empirical results point clearly to two actionable levers for enhancing green employee service behavior (GESB) in maritime logistics: perceived behavioral control (PBC) and green organizational support (GOS). Given that PBC is the strongest predictor, man-

agers should prioritize interventions that increase employees' ability to act under operational constraints. In practice, this entails embedding green options directly into service processes—such as default digital documentation (e-BL), standardized eco-routing suggestions, and simplified decision protocols—so that environmentally responsible actions become operationally feasible rather than discretionary. Complementing this, strengthening GOS is critical. Firms should invest in targeted training, accessible digital tools, and clear managerial endorsement to legitimize and support green service delivery, consistent with evidence that organizational support enables employee-level environmental behavior [43,46].

The significant effects of green organizational climate (GOC), environmental knowledge (EK), green organizational identity (GOI), and perceived customer green expectations (PCGE) indicate that managerial efforts should extend beyond operational support mechanisms alone. Developing a supportive environmental climate, strengthening employees' environmental knowledge, reinforcing organizational sustainability values, and communicating customer sustainability expectations can further encourage green service behavior. Although these factors exert weaker effects than PBC and GOS, they contribute to the broader organizational conditions under which sustainability-oriented service practices emerge and persist.

Accordingly, environmental training programs should focus not only on raising awareness but also on translating knowledge into practical service applications. Similarly, initiatives aimed at strengthening green organizational identity should be integrated with operational systems and managerial support so that sustainability values are reflected in day-to-day service activities. Customer-facing sustainability communication may also reinforce employees' perceptions that environmentally responsible service practices are valued by external stakeholders.

At the policy level, the findings suggest that reducing implementation barriers is particularly important for promoting green service behavior in maritime logistics. Targeted support for SMEs—such as subsidies for digitalization (e-documentation, emissions tracking), standardized green service tools, and practice-oriented training—can directly enhance PBC and GOS. At the same time, industry-wide sustainability guidelines, environmental awareness initiatives, and stakeholder engagement programs may strengthen the complementary influence of environmental knowledge, organizational climate, organizational identity, and customer expectations. Alignment with international frameworks, including IMO decarbonization initiatives and green shipping corridors, can further reinforce organizational adoption by embedding sustainability into operational requirements [36].

Overall, the findings suggest that the promotion of GESB in maritime logistics requires both motivational and enabling mechanisms. While environmental knowledge, organizational identity, organizational climate, and customer expectations contribute to employees' orientation toward sustainability, perceived behavioral control and organizational support play a particularly important role in translating these influences into actual service behavior.

Limitations and Future Research

While this study provides empirically grounded insights into green employee service behavior (GESB) in maritime logistics, several limitations should be acknowledged. First, the cross-sectional design limits the ability to draw causal inferences. Although SEM provides a rigorous approach for examining structural relationships among latent constructs, it does not capture the temporal dynamics through which organizational support, perceived behavioral control, or green service practices evolve. This issue is particularly relevant in logistics systems undergoing rapid digitalization and decarbonization. Future research should therefore employ longitudinal or panel designs to examine how GESB

develops over time and how it responds to sustained organizational, technological, or policy interventions.

Second, the use of self-reported data may introduce potential bias, including common method variance and social desirability effects, although diagnostic tests indicated no substantial concern. Given that GESB is conceptualized as a service-interface construct, future studies should triangulate data sources by incorporating supervisor assessments, customer evaluations, peer ratings, or objective service indicators, such as the adoption of e-documentation, the use of emission-reducing service options, or participation in green logistics initiatives. Qualitative approaches, including case studies of port operators, freight forwarders, shipping agents, or logistics firms, would also be valuable for uncovering context-specific mechanisms that are not fully captured through survey instruments.

Third, the sample is concentrated in Vietnamese logistics enterprises, with a strong representation of small and medium-sized firms. While this reflects the structural characteristics of the Vietnamese logistics sector, it may limit the generalizability of the findings to larger multinational logistics providers or to institutional contexts with more mature sustainability regimes. Future studies should adopt comparative designs across countries or regions, such as ASEAN and Europe, to examine how regulatory pressure, market maturity, customer sustainability expectations, and institutional frameworks shape the determinants of GESB.

Building on these limitations, several research directions emerge. First, future studies could further examine the interplay between perceived behavioral control and green organizational support, particularly under varying levels of operational pressure, service complexity, and environmental compliance requirements. Second, although environmental knowledge, green organizational identity, green organizational climate, and perceived customer green expectations significantly influence GESB, their effects are less pronounced than those of perceived behavioral control and green organizational support. Future research could investigate the boundary conditions under which these cognitive, identity-based, organizational, and stakeholder-related factors become more influential. Third, future research could extend the TPB–SIT framework by incorporating cross-level mechanisms involving green leadership, organizational systems, sustainability-oriented HR practices, and external institutional pressures. Comparative studies across shipping lines, port operators, freight forwarders, terminal service providers, and third-party logistics firms would also help clarify whether the antecedents of GESB vary across different segments of maritime logistics. Addressing these directions would contribute to a more context-sensitive and mechanism-based understanding of employee-driven sustainability in maritime logistics.

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Institutional Review Board Statement: This study is waived for ethical review by the Human Research Ethics Committee (HREC), Faculty of Business Administration, Industrial University of Ho Chi Minh City, Ho Chi Minh City, Vietnam. Since the research involved only an anonymous voluntary questionnaire survey; participation was entirely voluntary; participants were free to decline participation or withdraw at any time without any adverse consequence; no clinical, biomedical, psychological, or behavioural intervention was undertaken; no deception, manipulation, or experimental treatment was involved; no personally identifiable information or sensitive personal data was collected; the study presented no more than minimal risk to participants; and the data were collected, processed, and analysed solely for academic research purposes.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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Appendix A

Table A1. Construct Measures.

Construct	Sample Items	References
Environmental knowledge (EK)	“I know how daily port and shipping activities, such as fuel use or waste handling, can impact the marine environment.”; “I am aware of effective logistics solutions, such as eco-shipping routes or digital bills of lading, to reduce environmental impact.”	[57,58]
Green organizational climate (GOC)	“In my organization, environmental issues, such as emission reduction and energy efficiency, are considered a top priority.”; “The organizational climate encourages employees to adopt eco-friendly behaviors in port and logistics operations.”	[28,59]
Green organizational identity (GOI)	“Protecting the environment is an important part of who we are as a shipping and logistics company.”; “Our company strongly identifies itself with being green in its logistics and maritime operations.”	[11,27]
Green organizational support (GOS)	“My organization supports employees who propose or implement green initiatives in logistics and port services.”; “The organization provides resources, such as training and technologies, to help employees act in environmentally responsible ways.”	[5,44]
Perceived customer green expectations (PCGE)	“Our customers expect us to provide sustainable transport services, such as carbon-efficient shipping or eco-packaging.”; “Customer requirements push us to adopt greener practices in port handling and logistics operations.”	[60]
Perceived behavioral control (PBC)	“Whether or not I engage in green service behaviors, such as reducing waste or saving fuel, is entirely up to me.”; “I feel confident in my ability to carry out eco-friendly behaviors during logistics and port operations.”	[10,61]
Green employee service behavior (GESB)	“I provide shipping and logistics services in ways that minimize environmental impact, such as avoiding unnecessary emissions.”; “I actively promote eco-friendly practices, such as digital documentation or green routing, when serving customers.”	[6,14]

References

1. McKinnon, A. *Decarbonizing Logistics: Distributing Goods in a Low Carbon World*; Kogan Page: London, UK, 2018.
2. Evangelista, P.; Santoro, L.; Thomas, A. Environmental Sustainability in Third-Party Logistics Service Providers: A Systematic Literature Review from 2000–2016. *Sustainability* **2018**, *10*, 1627. [\[CrossRef\]](#)
3. Tang, G.; Ren, S.; Wang, M.; Li, Y.; Zhang, S. Employee Green Behaviour: A Review and Recommendations for Future Research. *Int. J. Manag. Rev.* **2023**, *25*, 297–317. [\[CrossRef\]](#)
4. Hooi, L.W.; Liu, M.-S.; Lin, J.J.J. Green Human Resource Management and Green Organizational Citizenship Behavior: Do Green Culture and Green Values Matter? *Int. J. Manpow.* **2022**, *43*, 763–785. [\[CrossRef\]](#)
5. Lamm, E.; Tosti-Kharas, J.; King, C.E. Empowering Employee Sustainability: Perceived Organizational Support toward the Environment. *J. Bus. Ethics* **2015**, *128*, 207–220. [\[CrossRef\]](#)

6. Boiral, O.; Paillé, P. Organizational Citizenship Behaviour for the Environment: Measurement and Validation. *J. Bus. Ethics* **2012**, *109*, 431–445. [\[CrossRef\]](#)
7. Yuriev, A.; Boiral, O.; Guillaumie, L. Evaluating Determinants of Employees' Pro-Environmental Behavioral Intentions. *Int. J. Manpow.* **2020**, *41*, 1005–1019. [\[CrossRef\]](#)
8. Yuriev, A.; Dahmen, M.; Paillé, P.; Boiral, O.; Guillaumie, L. Pro-Environmental Behaviors through the Lens of the Theory of Planned Behavior: A Scoping Review. *Resour. Conserv. Recycl.* **2020**, *155*, 104660. [\[CrossRef\]](#)
9. Abdou, A.H.; Shehata, H.S.; Mahmoud, H.M.E.; Albakhit, A.I.; Almakhayitah, M.Y. The Effect of Environmentally Sustainable Practices on Customer Citizenship Behavior in Eco-Friendly Hotels: Does the Green Perceived Value Matter? *Sustainability* **2022**, *14*, 7167. [\[CrossRef\]](#)
10. Ajzen, I. The Theory of Planned Behavior. *Organ. Behav. Hum. Decis. Process.* **1991**, *50*, 179–211. [\[CrossRef\]](#)
11. Chen, Y.-S. Green Organizational Identity: Sources and Consequence. *Manag. Decis.* **2011**, *49*, 384–404. [\[CrossRef\]](#)
12. Ones, D.S.; Dilchert, S. Environmental Sustainability at Work: A Call to Action. *Ind. Organ. Psychol.* **2012**, *5*, 444–466. [\[CrossRef\]](#)
13. Norton, T.A.; Zacher, H.; Ashkanasy, N.M. Organisational Sustainability Policies and Employee Green Behaviour: The Mediating Role of Work Climate Perceptions. *J. Environ. Psychol.* **2014**, *38*, 49–54. [\[CrossRef\]](#)
14. Robertson, J.L.; Barling, J. Greening Organizations through Leaders' Influence on Employees' Pro-Environmental Behaviors. *J. Organ. Behav.* **2013**, *34*, 176–194. [\[CrossRef\]](#)
15. Katz, I.M.; Rauvola, R.S.; Rudolph, C.W.; Zacher, H. Employee Green Behavior: A Meta-Analysis. *Corp. Soc. Responsib. Environ. Manag.* **2022**, *29*, 1146–1157. [\[CrossRef\]](#)
16. Kim, A.; Kim, Y.; Han, K.; Jackson, S.E.; Ployhart, R.E. Multilevel Influences on Voluntary Workplace Green Behavior: Individual Differences, Leader Behavior, and Coworker Advocacy. *J. Manag.* **2017**, *43*, 1335–1358. [\[CrossRef\]](#)
17. Karatepe, O.M.; Hsieh, H.; Aboramadan, M. The Effects of Green Human Resource Management and Perceived Organizational Support for the Environment on Green and Non-Green Hotel Employee Outcomes. *Int. J. Hosp. Manag.* **2022**, *103*, 103202. [\[CrossRef\]](#)
18. Tseng, S.-C.; Hung, S.-W. A Framework Identifying the Gaps between Customers' Expectations and Their Perceptions in Green Products. *J. Clean. Prod.* **2013**, *59*, 174–184. [\[CrossRef\]](#)
19. Hashish, M.E.S.; Abdou, A.H.; Mohamed, S.A.K.; Elenain, A.S.A.; Salama, W. The Nexus between Green Perceived Quality, Green Satisfaction, Green Trust, and Customers' Green Behavioral Intentions in Eco-Friendly Hotels. *Int. J. Environ. Res. Public Health* **2022**, *19*, 16195. [\[CrossRef\]](#) [\[PubMed\]](#)
20. Rubel, M.R.B.; Kee, D.M.H.; Rimi, N.N. Unpacking the Eco-Friendly Path: Exploring Organizational Green Initiatives, Green Perceived Organizational Support and Employee Green Behavior. *Int. J. Contemp. Hosp. Manag.* **2025**, *37*, 2049–2071. [\[CrossRef\]](#)
21. Tsai, H.-L.; Lu, C.-S.; Chang, C.-C. The Influence of Organisational Green Climate on Employees' Green Behaviours: Evidence from the Eco Port of Kaohsiung. *Int. J. Shipp. Transp. Logist.* **2017**, *9*, 696–723. [\[CrossRef\]](#)
22. Ismail, A.M.; Ballini, F.; Ölçer, A.I.; Alamoush, A.S. Integrating Ports into Green Shipping Corridors: Drivers, Challenges, and Pathways to Implementation. *Mar. Pollut. Bull.* **2024**, *209*, 117201. [\[CrossRef\]](#) [\[PubMed\]](#)
23. Pham, N.T.; Tučková, Z.; Jabbour, C.J.C. Greening the Hospitality Industry: How Do Green Human Resource Management Practices Influence Organizational Citizenship Behavior in Hotels? A Mixed-Methods Study. *Tour. Manag.* **2020**, *72*, 386–399. [\[CrossRef\]](#)
24. Lamm, E.; Tosti-Kharas, J.; Williams, E.G. Read This Article, but Don't Print It: Organizational Citizenship Behavior toward the Environment. *Group Organ. Manag.* **2013**, *38*, 109–132. [\[CrossRef\]](#)
25. Zhang, W.; Xu, R.; Jiang, Y.; Zhang, W. How Environmental Knowledge Management Promotes Employee Green Behavior: An Empirical Study. *Int. J. Environ. Res. Public Health* **2021**, *18*, 4738. [\[CrossRef\]](#) [\[PubMed\]](#)
26. Ashforth, B.E.; Mael, F. Social Identity Theory and the Organization. *Acad. Manag. Rev.* **1989**, *14*, 20–39. [\[CrossRef\]](#) [\[PubMed\]](#)
27. Chang, C.-H.; Chen, Y.-S. Green Organizational Identity and Green Innovation. *Manag. Decis.* **2013**, *51*, 1056–1070. [\[CrossRef\]](#)
28. Norton, T.A.; Zacher, H.; Ashkanasy, N.M. On the Importance of Pro-Environmental Organizational Climate for Employee Green Behavior. *Ind. Organ. Psychol.* **2012**, *5*, 497–500. [\[CrossRef\]](#)
29. Ahmad, S.; Islam, T.; Sadiq, M.; Kaleem, A. Promoting Green Behavior through Ethical Leadership: A Model of Green Human Resource Management and Environmental Knowledge. *Leadersh. Organ. Dev. J.* **2021**, *42*, 531–547. [\[CrossRef\]](#)
30. Farrukh, M.; Ansari, N.; Raza, A.; Wu, Y.; Wang, H. Fostering Employee's Pro-Environmental Behavior through Green Transformational Leadership, Green Human Resource Management and Environmental Knowledge. *Technol. Forecast. Soc. Change* **2022**, *179*, 121643. [\[CrossRef\]](#)
31. Leung, T.C.H.; Guan, J.; Lau, Y.-Y. Exploring Environmental Sustainability and Green Management Practices: Evidence from Logistics Service Providers. *Sustain. Account. Manag. Policy J.* **2023**, *14*, 461–489. [\[CrossRef\]](#)
32. Lai, K.-H.; Wong, C.W.Y. Green Logistics Management and Performance: Some Empirical Evidence from Chinese Manufacturing Exporters. *Omega* **2012**, *40*, 267–282. [\[CrossRef\]](#)

33. Maulita, M.; Adham, M.; Rahmat, R. Green Shipping and Green Knowledge Effect on Sustainable Economy and Environmental Performance (Maritime Student Perception). *AIP Conf. Proc.* **2023**, *2706*, 020056. [\[CrossRef\]](#)
34. Nurcholis, G.; Supriyono, B.; Hakim, L.; Hermawan, R. Employee Green Behavior in Shipping Industry: The Mediating Role of Employee Engagement with Environmental Initiatives and Green Awareness. In *Proceedings of the Conference "Critical Vision: Mediatizing Populism and Authoritarianism"*; Brawijaya University: Malang, Indonesia, 2024; pp. 33–48.
35. International Maritime Organization. IMO Strategy on Reduction of GHG Emissions from Ships. 2022. Available online: <https://www.imo.org> (accessed on 7 July 2023).
36. United Nations Conference on Trade and Development. Review of Maritime Transport 2023: Towards a Green and Just Transition. 2023. Available online: <https://unctad.org/publication/review-maritime-transport-2023> (accessed on 9 February 2023).
37. Zientara, P.; Zamojska, A. Green Organizational Climates and Employee Pro-Environmental Behaviour in the Hotel Industry. *J. Sustain. Tour.* **2018**, *26*, 1142–1159. [\[CrossRef\]](#)
38. Iqbal, Q.; Piwowar-Sulej, K. Organizational Citizenship Behavior for the Environment Decoded: Sustainable Leaders, Green Organizational Climate and Person-Organization Fit. *Balt. J. Manag.* **2023**, *18*, 300–316. [\[CrossRef\]](#)
39. Zafar, H.; Ho, J.A.; Cheah, J.-H.; Mohamed, R. Promoting Pro-Environmental Behavior through Organizational Identity and Green Organizational Climate. *Asia Pac. J. Hum. Resour.* **2023**, *61*, 483–506. [\[CrossRef\]](#)
40. Chang, T.-W.; Chen, F.-F.; Luan, H.-D.; Chen, Y.-S. Effect of Green Organizational Identity, Green Shared Vision, and Organizational Citizenship Behavior for the Environment on Green Product Development Performance. *Sustainability* **2019**, *11*, 617. [\[CrossRef\]](#)
41. Zhu, J.; Tang, W.; Wang, H.; Chen, Y. The Influence of Green Human Resource Management on Employee Green Behavior—The Mediating Effect of Environmental Belief and Green Organizational Identity. *Sustainability* **2021**, *13*, 4544. [\[CrossRef\]](#)
42. Yang, C.-C.; Lai, P.-L.; Zhu, X. Can Corporate Social Responsibility Enhance Organizational Image and Commitment in the Ocean Freight Forwarding Industry? *Marit. Bus. Rev.* **2021**, *6*, 358–376. [\[CrossRef\]](#)
43. Aboramadan, M.; Karatepe, O.M. Green Human Resource Management, Perceived Green Organizational Support and Their Effects on Hotel Employees' Behavioral Outcomes. *Int. J. Contemp. Hosp. Manag.* **2021**, *33*, 3199–3222. [\[CrossRef\]](#)
44. Aboramadan, M.; Crawford, J.; Turkmenoglu, M.A.; Farao, C. Green Inclusive Leadership and Employee Green Behaviors in the Hotel Industry: Does Perceived Green Organizational Support Matter? *Int. J. Hosp. Manag.* **2022**, *107*, 103330. [\[CrossRef\]](#)
45. Aboramadan, M.; Kundi, Y.M.; Becker, A. Green Human Resource Management in Nonprofit Organizations: Effects on Employee Green Behavior and the Role of Perceived Green Organizational Support. *Pers. Rev.* **2022**, *51*, 1788–1806. [\[CrossRef\]](#)
46. Zhang, Y.; Dong, Y.; Zhang, Y.; Wang, R.; Jiang, J. Can Organizations Shape Eco-Friendly Employees? Organizational Support Improves Pro-Environmental Behaviors at Work. *J. Environ. Psychol.* **2024**, *93*, 102200. [\[CrossRef\]](#)
47. Paillé, P.; Chen, Y.; Boiral, O.; Jin, J. The Impact of Human Resource Management on Environmental Performance: An Employee-Level Study. *J. Bus. Ethics* **2014**, *121*, 451–463. [\[CrossRef\]](#)
48. Sarmiento, C.V.; El Hanandeh, A. Customers' Perceptions and Expectations of Environmentally Sustainable Restaurant and the Development of Green Index: The Case of the Gold Coast, Australia. *Sustain. Prod. Consum.* **2018**, *15*, 16–24. [\[CrossRef\]](#)
49. Sureeyatanapas, P.; Poophiukhok, P.; Pathumnakul, S. Green Initiatives for Logistics Service Providers: An Investigation of Antecedent Factors and the Contributions to Corporate Goals. *J. Clean. Prod.* **2018**, *191*, 1–14. [\[CrossRef\]](#)
50. Jazairy, A. Aligning the Purchase of Green Logistics Practices between Shippers and Logistics Service Providers. *Transp. Res. Part D Transp. Environ.* **2020**, *82*, 102305. [\[CrossRef\]](#)
51. Le, S.-T.; Nguyen, T.-H. The Development of Green Ports in Emerging Nations: A Case Study of Vietnam. *Sustainability* **2023**, *15*, 13502. [\[CrossRef\]](#)
52. Hair, J.F.; Hult, G.T.M.; Ringle, C.M.; Sarstedt, M. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, 2nd ed.; SAGE Publications: Thousand Oaks, CA, USA, 2016.
53. Le, S.-T. Investigating the Drivers of the Reverse Logistics Implementation in Reducing Waste in Vietnam. *Environ. Health Insights* **2023**, *17*, 11786302231211058. [\[CrossRef\]](#) [\[PubMed\]](#)
54. Bui, Q.-T.; Le, S.-T. Barriers to Blockchain Technology Implementation in Small and Medium-Sized Logistics Enterprises. *SAGE Open* **2025**, *15*, 21582440251367622. [\[CrossRef\]](#)
55. Ajzen, I. Perceived Behavioral Control, Self-Efficacy, Locus of Control, and the Theory of Planned Behavior. *J. Appl. Soc. Psychol.* **2002**, *32*, 665–683. [\[CrossRef\]](#)
56. Galván-Mendoza, O.; González-Rosales, V.M.; Leyva-Hernández, S.N.; Arango-Ramírez, P.M.; Velasco-Aulcy, L. Environmental Knowledge, Perceived Behavioral Control, and Employee Green Behavior in Female Employees of Small and Medium Enterprises in Ensenada, Baja California. *Front. Psychol.* **2022**, *13*, 1082306. [\[CrossRef\]](#) [\[PubMed\]](#)
57. Frick, J.; Kaiser, F.G.; Wilson, M. Environmental Knowledge and Conservation Behavior: Exploring Prevalence and Structure in a Representative Sample. *Personal. Individ. Differ.* **2004**, *37*, 1597–1613. [\[CrossRef\]](#)
58. Duerden, M.D.; Witt, P.A. The Impact of Direct and Indirect Experiences on the Development of Environmental Knowledge, Attitudes, and Behavior. *J. Environ. Psychol.* **2010**, *30*, 379–392. [\[CrossRef\]](#)

59. Norton, T.A.; Zacher, H.; Parker, S.L.; Ashkanasy, N.M. Bridging the Gap between Green Behavioral Intentions and Employee Green Behavior: The Role of Green Psychological Climate. *J. Organ. Behav.* **2017**, *38*, 996–1015. [[CrossRef](#)]
60. Zhu, Q.; Sarkis, J.; Lai, K.-H. Green Supply Chain Management: Pressures, Practices and Performance within the Chinese Automobile Industry. *J. Clean. Prod.* **2007**, *15*, 1041–1052. [[CrossRef](#)]
61. Han, H.; Hsu, L.-T.; Sheu, C. Application of the Theory of Planned Behavior to Green Hotel Choice: Testing the Effect of Environmental Friendly Activities. *Tour. Manag.* **2010**, *31*, 325–334. [[CrossRef](#)]

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