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Consumer Perception of Shipbreaking Products in Bangladesh: An Investigation of Economic, Environmental, and Regulatory Impacts

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Abstract

Purpose: This study investigates the factors influencing consumer perceptions of shipbreaking products in Bangladesh, focusing on economic benefits, environmental hazards, product features, and compliance with laws and regulations, with organizational climate as a mediating variable.

Design/Methodology/Approach: A quantitative, descriptive research design was adopted. Data were collected from 415 Bangladeshi consumers across Chattagram, Cumilla, Dhaka, and Mymensingh via a structured questionnaire using purposive sampling. Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed for hypothesis testing using SmartPLS 4.0.

Findings: Economic benefits and regulatory compliance significantly and positively influence consumer perceptions, and organizational climate itself exerts a strong direct effect on consumer perception. Environmental hazards and product features did not produce significant direct effects. The mediating role of organizational climate between economic benefits, product features, laws and regulations, and consumer perception could not be conclusively established and warrants further verification.

Originality/Value: This study is among the first to empirically examine consumer perceptions of shipbreaking products in Bangladesh through an integrated model incorporating organizational climate as a mediator, extending the Theory of Planned Behavior to an industrial by-product market in a developing country context.

Implications: The findings offer actionable guidance for industry stakeholders and policymakers seeking to improve public trust and promote sustainable practices within Bangladesh's shipbreaking sector.

Keywords: Consumer perception; Environmental sustainability; Laws and regulations; PLS-SEM; Shipbreaking products; Bangladesh

JEL Classifications: D12, L51, M14, Q53, Q56

1 Introduction

1.1 Background and Context

The shipbreaking industry has become an essential economic sector in Bangladesh, contributing significantly to the supply of raw materials such as steel and other by-products used in manufacturing and construction (Afrin et al., 2020; Tanha et al., 2022). However, the industry faces persistent environmental and regulatory challenges, including hazardous waste management, air and water pollution, and unsafe labor practices (Islam et al., 2023; Udokporo et al., 2020). Consumer perceptions of shipbreaking products are therefore shaped by a complex interplay of economic, environmental, and regulatory factors. Understanding these perceptions is vital for the industry to achieve competitive advantage while meeting global sustainability standards (Jahanshahi et al., 2023; Moslehpour et al., 2018; Olaleye, 2023).

Bangladesh emerged as a prominent player in the global shipbreaking industry due to its favorable geographical location, low labor costs, and strong domestic demand for raw materials (Ananno et al., 2021; Maitra et al., 2024). The industry began to flourish in the late 20th century and is primarily concentrated in Sitakund, north of Chittagong, along the Bay of Bengal. Shipbreaking products, ranging from steel and furniture to cables and kitchen equipment, supply both local households and businesses, and some are exported for foreign currency (Chowdhury et al., 2021). Despite these economic contributions, the industry faces criticism regarding its environmental footprint and worker safety conditions, which in turn influence how consumers perceive the resulting products (Barua et al., 2018).

1.2 Research Problem and Gap

Although consumer perception is widely recognized as a critical driver of market behavior, there is a noticeable absence of empirical research examining consumer attitudes toward shipbreaking products specifically within the Bangladeshi context. While prior studies have explored aspects of the industry's economic and environmental dimensions (Dey et al., 2021; Udokporo et al., 2020), the factors that shape Bangladeshi consumers' perceptions remain underexplored. Negative barriers such as environmental hazards and unsafe labor practices can adversely affect consumer perception, while economic benefits and regulatory compliance may strengthen it (Uzir et al., 2021). This gap motivates the central research question of this study: *Which constructs most significantly influence consumers' perceptions toward shipbreaking products in the context of Bangladesh?*

1.3 Theoretical Framework

To provide a structured theoretical foundation, this research applies the Theory of Planned Behavior (TPB), which posits that human behavior is driven by three components: attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991). In the context of shipbreaking products, attitudes reflect consumers' evaluations of economic benefits and environmental risks. Subjective norms relate to social pressures, including the influence of regulatory compliance signaling safety and environmental

responsibility. Perceived behavioral control reflects consumers' assessments of product features and their ability to make informed purchasing decisions. By grounding the study in TPB, we systematically link each independent variable to the theoretical dimensions driving consumer behavior, thereby verifying the scope and main contributions of this research.

1.4 Research Objectives and Overview of Findings

The primary objective of this study is to investigate consumers' perceptions of shipbreaking products in Bangladesh by examining four key constructs: economic benefits, environmental hazards, compliance with laws and regulations, and product features. Additionally, the study introduces organizational climate as a mediating variable to capture how the internal environment of shipbreaking organizations shapes consumer-facing outcomes. The study employs Partial Least Squares Structural Equation Modeling (PLS-SEM) using data collected from 415 consumers across Chattagram, Cumilla, Dhaka, and Mymensingh.

The findings indicate that economic benefits and compliance with laws and regulations significantly and positively influence consumer perceptions, while environmental hazards and product features do not produce significant direct effects. Organizational climate exerts a significant direct effect on consumer perception; however, its mediating role between the independent variables and consumer perception was not supported by the revised analysis. These insights highlight the complex interplay between economic considerations, regulatory frameworks, and environmental concerns in shaping consumer attitudes in Bangladesh (S. M. Rahman & Kim, 2020).

The remainder of the paper is organized as follows: Section 2 reviews relevant literature and develops the hypotheses; Section 3 describes the methodology; Section 4 presents the results; Section 5 discusses the findings; and Section 6 presents conclusions, implications, limitations, and directions for future research.

2 Literature Review, Theoretical Background, and Hypothesis Development

2.1 Consumers' Perception

Consumers' perception refers to the beliefs, opinions, and feelings that individuals hold about products or brands, shaping their attitudes and behavior towards purchasing decisions. This concept plays a critical role in fostering brand loyalty, retaining customers, and establishing brand awareness and reputation in increasingly competitive markets (Tanha et al., 2022; Wójcik-Karpacz et al., 2023). According to Safeer et al. (2022), perception is the process by which individuals select, organize, and interpret sensory information to create a meaningful understanding of the world around them. This process is shaped by various factors, including personal experiences, societal influences, and interactions with products and services, both direct and indirect (Ding et al., 2022).

Recent studies have emphasized the importance of consumers' perception in the context of environmentally sustainable products, such as those made from recycled or upcycled materials (Tanha et al., 2022; Wójcik-Karpacz et al., 2023). For instance, environmental psychology research has highlighted how increasing environmental awareness influences consumer behavior, especially in emerging markets where economic growth coincides with a growing consciousness of sustainability (Tanha et al., 2022). Consumers in these markets are becoming more mindful of the environmental impacts of their purchases, particularly when it comes to products made from recycled materials or by-products of industries like shipbreaking (Jaiswal & Kant, 2018; Wójcik-Karpacz et al., 2023).

Within the context of industrial recycling markets, recent scholarship has begun to examine how consumers in emerging economies balance economic pragmatism with environmental awareness when evaluating recycled or upcycled products (Ding et al., 2022; Nga & Tam, 2024). Studies from South Asia and Southeast Asia indicate that consumers are more inclined to accept recycled industrial products when they perceive them as cost-effective and when a credible regulatory framework assures product safety and quality (Ding et al., 2022; Kumar & Polonsky, 2017). This literature also points to the role of institutional trust, consumer confidence in the organizations and regulatory bodies overseeing an industry, as a key moderator of product acceptance (Glogoveţan et al., 2022; Kumar & Polonsky, 2017; Mohseni et al., 2018). In the context of Bangladesh's shipbreaking industry, where institutional capacity is developing and environmental awareness is unevenly distributed across socioeconomic groups, these insights are particularly relevant (Jaiswal & Kant, 2018; Wójcik-Karpacz et al., 2023). The present study extends this emerging literature by empirically mapping the relationships among economic, environmental, regulatory, and organizational determinants of consumer perception in a single integrated model, a contribution that is largely absent from prior work on shipbreaking markets (Abdullah et al., 2023; Mannan et al., 2023).

Perception is the process through which individuals collect, evaluate, and retain internal and environmental stimuli, which ultimately shape their purchasing behavior (Kotler, 2001; Safeer et al., 2022). In this context, consumers' perception of environmentally sensitive industries like shipbreaking is increasingly shaped by their awareness of sustainability and corporate social responsibility (CSR) practices, which influence not only their attitudes but also social norms surrounding sustainable consumption (Biswas & Roy, 2015; Wójcik-Karpacz et al., 2023). The Conservation of Resources (COR) Theory suggests that consumers may perceive both risks and benefits in purchasing recycled or upcycled products, balancing their concerns for environmental sustainability against the economic advantages these products may offer (Hobfoll, 2011).

Contemporary research on consumer perception emphasizes the growing influence of environmental concerns on consumer behavior, particularly in developing and emerging markets (Kumar & Polonsky, 2017). To better understand consumer attitudes towards recycled and upcycled products, it is crucial to account for the evolving socio-economic conditions, environmental awareness, and regulatory landscapes in these regions (T. Nga & Tam, 2024). This study, therefore, aims to contribute to this growing body of literature by examining how Bangladeshi consumers perceive products derived from

the shipbreaking industry, with a particular focus on the interplay between economic benefits, environmental hazards, and regulatory compliance.

2.2 Shipbreaking Products

Shipbreaking enables the recycling and production of new goods from the ship's materials, particularly steel. This process reduces the demand for mined iron ore and decreases energy consumption in steel manufacturing (Chowdhury et al., 2021; Wójcik-Karpacz et al., 2023). Additionally, fixtures and other equipment on board these vessels can also be reused. Bangladesh is becoming an emerging country in the global shipbreaking products industry. The country benefits from low labor costs, a flat and uniform intertidal zone, relatively moderate law enforcement, and strong domestic demand for steel and iron, creating advantageous conditions for the shipbreaking sector (Alam et al., 2019; Chowdhury et al., 2021; Wójcik-Karpacz et al., 2023). Shipbreaking items involve the removal of reusable parts from a used ship, such as steel scraps, furniture, and electronic components (Chowdhury et al., 2021). Shipping companies use ships for recycling to produce shipbreaking products for their trade and finally sell to the end-users (Chowdhury et al., 2021). Ship disposal involves dismantling vessels to salvage reusable parts or extract raw materials, primarily steel, for repurposing. Shipbreaking provides a way to reuse materials and recycle steel that would otherwise be sunk in the ocean or wasted (Wójcik-Karpacz et al., 2023).

2.3 Economic Benefits

Economic benefits are tangible gains that can be quantified in terms of revenue earned or money saved through the implementation of specific policies. This section examines the economic benefits generated by the shipbreaking industry, focusing on revenue generation and its contribution to national economic development (Roy et al., 2022a). The shipbreaking products industry plays a significant role in Bangladesh's economy. The sector contributes over Taka 5 billion (about US \$68 million) annually through customs duties, income taxes, and value-added taxes (Ahammad & Sujauddin, 2017; Roy et al., 2022a). The shipbreaking products industry significantly contributes to employment in Bangladesh, offering jobs to a large number of skilled and semi-skilled workers from all over the country. In 2015, approximately 20,500 metric tons of furniture, fittings, and other non-ferrous materials were recovered from shipbreaking operations, valued at about Taka 1.2 billion, equivalent to roughly US \$17 million, based on 2009-10 constant prices (Roy et al., 2022b; Sujauddin et al., 2015). Beyond the direct economic benefits that the Bangladesh shipbreaking industry contributes to its supply chain, numerous upstream activities service the industry and generate additional output and employment (Wójcik-Karpacz et al., 2023). Key upstream sectors include transport and construction services, oxygen plants, electricity and other utilities, machinery and equipment maintenance and repair services, as well as insurance, banking, and regulatory services. Moreover, the expenditure made by ship recycling workers also stimulates various economic activities and services, such as personal services, retail and real estate. These impacts are not confined solely to the local economy but extend across the entire country (Roy et al., 2022a).

2.4 Environmental Hazard

Extreme conditions or substances in the earth's ecosystem that could have an adverse impact on people and the things they value are known as environmental hazards. A material or circumstance that has an opportunity to harm the environment is also considered an environmental hazard (Chartres et al., 2019; Chowdhury et al., 2021; Wójcik-Karpacz et al., 2023). Environmental hazards can be biological, chemical, or physical agents resulting from human activity. Pesticides, heavy metals, and toxic waste are a few of these (S. M. Rahman et al., 2018b). Workers in the shipbreaking industry face harsh and hazardous conditions with limited facilities. In Bangladesh, the shipbreaking products industry is widely regarded as one of the most dangerous and risky workplaces. According to a study conducted in the shipbreaking yard of Sitakunda, approximately three out of every five workers described their working environment as "not good," while two out of every five considered it "very bad" (Wójcik-Karpacz et al., 2023). Shipbreaking is a challenging process due to the structural complexity of ships, which leads to numerous environmental, safety, and health hazards. Workers often face a lack of personal protective equipment and receive minimal, if any, training (Wójcik-Karpacz et al., 2023). The absence of sufficient safety controls, poorly monitored work operations, and the high risk of explosions combine to create extremely hazardous work environments in shipbreaking yards. Workers face significant challenges accessing healthcare services, and their living conditions are worsened by inadequate housing, welfare support, and sanitary facilities (S. M. Rahman et al., 2018b).

2.5 Product Features

A product feature refers to a particular function or attribute of a product that offers value to customers. It encompasses capabilities, performance improvements, or design elements. Product managers define and prioritize features during development (Tanha et al., 2021; Wójcik-Karpacz et al., 2023). On the other hand, product features are a discrete area of functionality within the product. While important, product features are only one aspect of what customers consider when buying. Dismantling or breaking down ships revitalizes the worldwide shipping sector by replacing aging ships and reusing or recycling up to 95% of their resources. In recent years, Bangladesh has established itself as a leading participant in the worldwide shipbreaking products industry (Wójcik-Karpacz et al., 2023). The goal of this research is to provide insights into the structure and functioning of the shipbreaking products industry in Bangladesh, with an emphasis on the origin, types, and lifetime of disassembled ships to enhance our understanding of Bangladesh's shipbreaking products industry (S. M. Rahman & Kim, 2020).

Shipbreaking products involve the process of breaking up ships to either salvage parts for resale or to extract raw materials, primarily scrap. This allows materials from the ship, particularly steel, to be recycled and repurposed into new products (Wójcik-Karpacz et al., 2023). The decommissioning process differs significantly between developed and third-world countries. In both circumstances, shipbreakers compete for the ship, with the highest bidder winning the contract. The shipbreaker then procures the ship from international brokers who trade in old ships. The price paid typically ranges around \$400 per tonne, with poorer environmental legislation resulting in higher prices (S. M. Rahman & Kim, 2020).

2.6 Laws and Regulations

Laws and regulations refer to the formal legal frameworks established by governments or authoritative bodies to control, guide, or influence the behavior of individuals, organizations, or industries. In 2011, the Government of Bangladesh introduced new national laws and policies aimed at improving workplace safety and health standards as well as environmental standards in shipbreaking yards (Ahasan et al., 2021; Wójcik-Karpacz et al., 2023). However, despite these efforts, significant challenges remain. Governance and enforcement of laws and policies are often lacking. These rules were also passed by the High Court in 2005 and 2007. According to these regulations, importers must obtain an Environmentally Clean Certificate from the Department of Environment (DoE) for the importation of any ship intended for breaking purposes. In the shipbreaking products industry, one of the most crucial legal frameworks is the Basel Convention, also known as the “Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal” (I. Alam et al., 2019; Wójcik-Karpacz et al., 2023). It is an international agreement that was created to reduce the transboundary movement of hazardous waste across national borders, with a focus on preventing the transfer of hazardous waste from developed to developing nations.

In Bangladesh, there is no legal regulatory framework specifically designed for monitoring the current environmental damage caused by shipbreaking. Although international regulations govern the global operations of the shipbreaking product industry, Bangladesh has not adopted any of these regulations or established comprehensive domestic laws to address related issues. The Government of Bangladesh has made efforts to develop regulatory guidelines for the shipbreaking industry. However, these initiatives are often criticized for being biased or insufficient to effectively address the industrial needs and environmental conservation priorities in the country (Tanha et al., 2022).

2.7 Hypothesis Development

2.7.1 Economic Benefits and Consumer Perception

The shipbreaking products industry plays a substantial role in Bangladesh's national economy. It contributes over BDT 5 billion annually through customs duties, income taxes, and value-added taxes, while generating approximately 25,000–40,000 full-time employment opportunities in management, technical, and support roles (Ahammad & Sujauddin, 2017). Beyond direct economic contributions, the industry supplies raw materials to approximately 500 private-sector re-rolling mills and 50 steel mills, enabling affordable production of construction materials used across both urban and rural Bangladesh (Hossain, 2010). Ship scrapping has also become an indispensable source of raw materials, generating annual output valued at approximately BDT 53.3 billion, or USD 770 million (Abdullah et al., 2023).

From a consumer behavior perspective, economic considerations including affordability, employment generation, and contributions to the national economy, are among the strongest determinants of product acceptance in sustainability-related industries (Currás-Pérez et al., 2018; Huang, 2023). When

consumers recognize the cost-effectiveness and economic utility of shipbreaking products, their perceptions are likely to be favorable. Accordingly, the following hypothesis is proposed:

H1: *Economic benefits have a positive and significant effect on consumers' perceptions toward shipbreaking products.*

2.7.2 Environmental Hazards and Consumer Perception

The shipbreaking industry in Bangladesh has attracted significant criticism on environmental and safety grounds. Approximately 90% of workers report experiencing some form of accidental injury (Uddin et al., 2024), while a study at the Sitakunda yard found that 60% of workers described working conditions as "not good" (Wójcik-Karpacz et al., 2023). Environmental pollution from hazardous materials, including toxic waste, heavy metals, and asbestos, released during dismantling operations, has raised concerns among environmentalists and NGOs (Barua et al., 2018). Inadequate coordination among agencies and poor worker training have been shown to contribute to the degradation of marine and coastal environments (Uddin et al., 2024).

Consumer perception theory suggests that perceived environmental risks can negatively affect product evaluations, particularly in contexts where environmental awareness is growing (Boesen et al., 2019; Zhang et al., 2018). Although Bangladeshi consumers may demonstrate less sensitivity to environmental concerns compared to consumers in developed markets, the potential for environmental hazard to dampen consumer trust and acceptance remains theoretically plausible. Therefore:

H2: *Environmental hazards have a significant and negative effect on consumers' perceptions toward shipbreaking products in Bangladesh.*

2.7.3 Product Features and Consumer Perception

Shipbreaking enables the recovery and recycling of up to 95% of a vessel's materials, producing a diverse range of products including steel scraps, furniture, electronic components, pipes, cables, and construction materials (Chowdhury et al., 2021; Wójcik-Karpacz et al., 2023). The quality of shipbreaking products is generally high, particularly for products derived from high-profile vessels, and pricing is perceived as reasonable relative to quality (Ha et al., 2020). The steel and other recyclable materials recovered have also been shown to contribute to multiple sectors — shipbuilding, furniture manufacturing, machinery, and construction — highlighting the functional versatility of these products (Hossain et al., 2016).

From a consumer behavior perspective, product attributes such as quality, durability, technological effectiveness, and pricing are well-established determinants of consumer perception (Ha et al., 2020; Sun et al., 2018). If shipbreaking products are perceived as offering acceptable quality at an adaptable price, consumer attitudes are expected to be more favorable. However, in contexts where economic necessity takes precedence, the relative importance of product features may vary. Thus:

H3: *Product features have a positive and significant influence on consumers' perceptions toward shipbreaking products in Bangladesh.*

2.7.4 Laws and Regulations and Consumer Perception

Bangladesh has developed several regulatory instruments governing the shipbreaking industry. In 2011, the Ministry of Environment and Forests issued shipbreaking guidelines for environmentally sound management, and the government formally recognized shipbreaking as an industry through the “Shipbreaking and Recycling Rules, 2011”. However, rules and regulations are rarely enforced in practice, and Bangladesh has yet to adopt comprehensive domestic legislation aligned with international frameworks such as the Basel Convention or the Hong Kong International Convention (Barua et al., 2018). Substantial domestic implementation challenges have also been shown to undermine regulatory effectiveness (Alam & Faruque, 2014).

Despite these enforcement gaps, the presence of a regulatory framework signals to consumers that products are subject to oversight, potentially enhancing trust and acceptance. Research on consumer behavior in product certification and regulatory contexts consistently finds that legal compliance positively influences consumer perception (Glogoveţan et al., 2022; Mohseni et al., 2018; Oladapo et al., 2022). When consumers perceive that shipbreaking practices are governed by laws and regulations, their levels of trust and acceptance are expected to increase. Accordingly:

H4: *Laws and regulations have a positive and significant effect on consumers' perceptions toward shipbreaking products in Bangladesh.*

2.7.5 The Role of Organizational Climate

Organizational climate refers to the shared perceptions of organizational policies, practices, and procedures that collectively shape behavior within institutions (Powell et al., 2021). In environmentally sensitive industries such as shipbreaking, a positive organizational climate, one characterized by transparency, ethical compliance, worker safety, and environmental responsibility, may serve as a bridge between operational factors and consumer-facing outcomes (Kuenzi et al., 2020). When consumers perceive that a shipbreaking organization maintains an ethical, compliant, and accountable internal environment, their trust in the product is likely to be reinforced.

Prior studies suggest that organizational climate mediates the relationship between management practices and consumer trust across several industries (Cheema et al., 2020; Kalteh et al., 2021; Shen & Zhang, 2019). Specifically, a climate that emphasizes safety, regulatory adherence, and sustainable practices is expected to translate internal organizational values into improved consumer perception. Based on this reasoning:

H5: *Organizational climate has a positive and significant effect on consumer perception.*

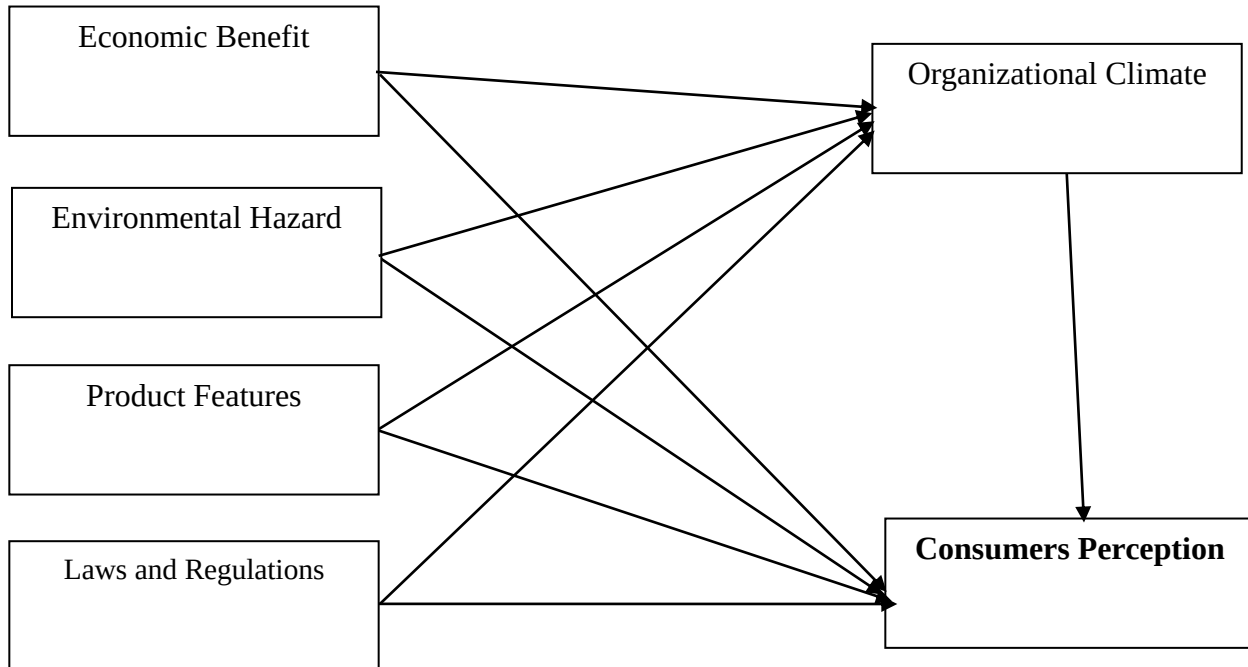
H6: *Organizational climate mediates the relationship between economic benefits and consumer perception.*

H7: *Organizational climate mediates the relationship between environmental hazards and consumer perception.*

H8: *Organizational climate mediates the relationship between product features and consumer perception.*

H9: *Organizational climate mediates the relationship between laws and regulations and consumer perception.*

Figure 1: The Conceptual Framework of the study



3 Methodology of the study

3.1 Research Design

This study adopted a descriptive research design with a quantitative approach to examine consumer perceptions of shipbreaking products in Bangladesh. A descriptive design was chosen as it helps to systematically describe the characteristics of a population or phenomenon being studied without influencing it (McDaniel & Gates, 2012). This approach enabled the researchers to quantify attitudes, opinions, and behaviors related to the economic, environmental, and regulatory aspects of shipbreaking products.

3.2 Sampling Technique and Data Collection

The study employed purposive sampling, a non-probability technique, to select participants who were aware of or had experience with shipbreaking products. This technique was chosen for its practicality, especially in reaching targeted respondents with relevant knowledge. Data were collected from 415 consumers residing in four major regions of Bangladesh—Chattagram, Cumilla, Dhaka, and Mymensingh—through a structured questionnaire. The questionnaire comprised two main sections: (i) demographic information and (ii) items related to study variables measured on a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

Although the Likert-type items used in this study are ordinal in nature, they were treated as approximately continuous for the purposes of PLS-SEM analysis, consistent with common practice in social science research employing five-point or wider scales (Norman, 2010; Sullivan & Artino, 2013). This treatment rests on the assumption that respondents perceive the intervals between adjacent scale points as approximately equal, and that the use of composite, multi-item reflective constructs — rather than single ordinal items — mitigates the distortion that ordinal-scale limitations can introduce into parametric estimation. Nonetheless, this represents a simplifying assumption rather than a formally tested property of the data, and the reliability and validity statistics reported below (Cronbach's Alpha, CR, AVE) should be interpreted with this assumption in mind. It should be explicitly noted that this study did not conduct non-parametric sensitivity analyses (e.g., re-estimating the model using ordinal-consistent PLS or polychoric correlations) to test whether results are robust to this assumption; this remains an unaddressed limitation of the current analysis.

3.3 Data Analysis Techniques

The study applied both descriptive and inferential statistics. Descriptive statistics (frequencies, percentages) were computed using SPSS version 25 to summarize demographic characteristics. To test the research model and hypotheses, Partial Least Squares Structural Equation Modeling (PLS-SEM) was conducted using SmartPLS version 4.0. This method was selected due to its robustness in handling complex models and smaller sample sizes. Reliability and validity of the constructs were assessed using Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE).

3.3.1 Justification for Using PLS-SEM Instead of Covariance-Based SEM (LISREL)

This study employed Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 4.0 rather than covariance-based SEM techniques such as LISREL or AMOS. The choice of PLS-SEM is justified based on several methodological considerations. First, the primary objective of this study is prediction and theory extension rather than strict theory confirmation, making PLS-SEM an appropriate analytical approach. Second, the conceptual framework incorporates multiple latent constructs and mediation relationships, which increases model complexity and favors variance-based SEM techniques.

Third, PLS-SEM is particularly suitable when data normality assumptions may not be fully satisfied and when the research focuses on maximizing explained variance (R^2) of endogenous constructs. Prior methodological literature suggests that PLS-SEM is robust for complex models and performs well with both medium and large sample sizes in social science research (Hair et al., 2019).

Finally, to ensure model adequacy, the present study evaluates convergent validity, discriminant validity, multicollinearity (VIF), effect size (f^2), and predictive relevance (Q^2), which collectively provide sufficient evidence of model reliability, validity, and robustness within the PLS-SEM framework.

3.3.2 Formal Specification of the Measurement and Structural Models

Following standard PLS-SEM notation (Hair et al., 2019), the model is expressed as follows:

$$x_i = \lambda_i \xi + \delta_i ,$$

where x_i is the vector of observed indicator scores for construct i , λ_i is the vector of outer loadings, ξ is the latent construct score, and δ_i is the vector of measurement error terms, assumed to have zero mean and be uncorrelated across constructs.

The structural (inner) model specifying the direct relationships among latent constructs is expressed as:

$$\eta = B \eta + \Gamma \xi + \zeta ,$$

where η is the vector of endogenous latent variables (Organizational Climate, OC; Consumers' Perception, CP), ξ is the vector of exogenous latent variables (Economic Benefit, EB; Environmental Hazard, EH; Product Features, PF; Laws and Regulations, LR), B is the matrix of path coefficients among endogenous constructs, Γ is the matrix of path coefficients from exogenous to endogenous constructs, and ζ is the vector of residual terms.

The direct structural paths hypothesized in this study are:

$$CP = \beta_1(EB) + \beta_2(EH) + \beta_3(PF) + \beta_4(LR) + \beta_5(OC) + \zeta_1 ,$$

$$OC = \gamma_1(EB) + \gamma_2(EH) + \gamma_3(PF) + \gamma_4(LR) + \zeta_2 .$$

The mediated (indirect) paths through Organizational Climate are expressed as:

$$\text{Indirect effect of EB on CP} = \gamma_1 \times \beta_5.$$

$$\text{Indirect effect of EH on CP} = \gamma_2 \times \beta_5.$$

$$\text{Indirect effect of PF on CP} = \gamma_3 \times \beta_5.$$

$$\text{Indirect effect of LR on CP} = \gamma_4 \times \beta_5.$$

Indicator loadings (λ), path coefficients (β , γ), and R^2 values for endogenous constructs are reported in Tables 3 and 7.

3.4 Common Method Bias and Robustness Checks

To assess the potential influence of common method bias, Harman's single-factor test was conducted. The first factor accounted for less than 50% of the total variance, indicating that common method bias is unlikely to represent a serious threat to the validity of the study's findings (Podsakoff et al., 2003). In addition, bootstrapping with 5,000 resamples was performed using SmartPLS 4.0 to evaluate the robustness of structural relationships. All path coefficients and indirect effects were evaluated based on bias-corrected confidence intervals, providing reliable estimates of both direct and mediated relationships (Hair et al., 2019).

3.5 Survey Instrument Development and Rationale

Despite the economic significance and widespread presence of shipbreaking and recycling products in Bangladesh, there remains a noticeable gap in empirical research focusing on consumer perceptions toward these products. A thorough review of the existing literature reveals a lack of comprehensive studies addressing the economic, environmental, and regulatory dimensions that shape such perceptions. This research gap has motivated the authors to undertake the present study.

To address this issue, a structured survey was conducted among 415 Bangladeshi consumers who are familiar with shipbreaking products. The survey employed closed-ended questions to capture insights into their attitudes and perceptions. In Bangladesh, shipbreaking and recycling industries contribute significantly to the livelihood of many small- and large-scale entrepreneurs. However, while consumers may recognize the economic benefits of these products, concerns such as environmental hazards, safety risks, and weak regulatory frameworks can negatively affect public perception.

The study, therefore, aims to explore the factors influencing consumer perceptions of shipbreaking products in the Bangladeshi context. The specific objectives are as follows: a) to identify key constructs that influence consumers' perceptions toward shipbreaking products, b) to develop and empirically test hypotheses based on these constructs, and c) to outline the theoretical and practical implications of the findings, particularly for policymakers and industry stakeholders seeking to improve public perception and promote sustainable practices within the shipbreaking sector in Bangladesh.

3.6 Participants

Table 1: Demographic profile of the respondents

Gender	Respondents (N=415)	Percentage (%)
Male	378	91.08
Female	37	8.92
Age (in years)		
16-20	28	6.74
21-30	255	61.45
31-40	78	18.80
40+	54	13.01

Monthly Income (in BDT)		
≤ 20000	236	56.87
20,000-40,000	145	34.94
40,000+	34	8.19

Table 1 presents the demographic characteristics of the 415 respondents surveyed across selected regions of Bangladesh. In terms of gender distribution, most of the respondents were male (91.08%), while only 8.92% were female. The age distribution reveals that the dominant age group was 21–30 years, comprising 61.45% of the sample, followed by respondents aged 31–40 years (18.80%), those above 40 years (13.01%), and the youngest group aged 16–20 years (6.74%). Regarding monthly income levels, more than half of the participants (56.87%) reported earning 20,000 BDT or less, while 34.94% had a monthly income between 20,000 and 40,000 BDT. Only a small proportion (8.19%) earned above 40,000 BDT. This demographic distribution reflects a youthful and predominantly male population with moderate income levels, which provides important context for understanding consumer perceptions of shipbreaking products in Bangladesh. Therefore, the findings should primarily be interpreted as reflecting male consumers' perceptions of shipbreaking products.

3.7 Description of the Variables

Table 2: Description of Variables and their Details

Variable Name	Details	Adapted form
Economic Benefit	<i>EB₁</i> A positive economic environment <i>EB₂</i> Contribution to the national economy <i>EB₃</i> Budget-friendly	Abdullah <i>et al.</i> (2023)
Environmental Hazard	<i>EH₁</i> Process of production is not environmentally friendly <i>EH₂</i> Lack of wastage disposal & treatment facilities <i>EH₃</i> Environmentally unsafe management	Chartres <i>et al.</i> (2019)
Product Features	<i>PF₁</i> Effective production technology <i>PF₂</i> Acceptable standard of quality <i>PF₃</i> Adaptable pricing	Li <i>et al.</i> (2024)
Laws & Regulations	<i>LR₁</i> is not strong enough <i>LR₂</i> Strict laws & regulations will more encourage for purchasing <i>LR₃</i> Proper enforcement of environmental and safety regulations increases confidence in shipbreaking products	Li <i>et al.</i> (2024)
Organizational Climate	<i>OC₁</i> The organization where shipbreaking products are sourced promotes a safe and healthy working environment. <i>OC₂</i> Employees in the shipbreaking sector are encouraged to follow environmentally responsible practices. <i>OC₃</i> There is a clear commitment within the organization to comply with environmental regulations and standards.	Schneider <i>et al.</i> (2013)
Consumers' Perception	<i>CP₁</i> Environment-friendly production process impacts positively on perception. <i>CP₂</i> Worker safety and strong laws also impact positive	Li <i>et al.</i> (2024)

	perception. CP₃ Adaptable pricing and standard product quality have an impact on positive perception	
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As illustrated in **Table 2**, the study used four constructs to examine consumers' perception towards shipbreaking products. Economic benefits include a positive economic environment, a contribution to our national economy, and being budget-friendly. The environmental hazard construct includes items measuring whether the production process is environmentally unfriendly, a lack of waste disposal and treatment facilities, environmentally unsafe management and disposal of hazardous wastes and materials. Product features include effective technology of production, an acceptable standard of quality, and adaptable pricing. The laws and regulations construct the captures perceptions that current regulations are not yet sufficiently strong, and that stricter regulations would further encourage purchasing.

4 Results & Interpretations

4.1 Measurement, Validity, and Reliability

Table 3: Measurement of Model Assessment

Constructs	Items	Loading	Alpha	CR	AVE	R ²	NFI	SRMR
Economic benefit	EB1	0.896	0.915	0.924	0.854		0.891	0.077
	EB2	0.941						
	EB3	0.936						
Environmental hazard	EH1	0.894	0.834	0.836	0.752			
	EH2	0.895						
	EH3	0.810						
Product features	PF1	0.716	0.696	0.705	0.624			
	PF2	0.825						
	PF3	0.823						
Laws and regulations	LR1	0.817	0.787	0.837	0.701			
	LR2	0.914						
	LR3	0.776						
Organizational Climate	OC1	0.812	0.801	0.821	0.642	0.432		
	OC2	0.762						
	OC3	0.811						
Consumers' perception	CP1	0.682	0.811	0.882	0.728	0.726		
	CP2	0.941						
	CP3	0.913						

Note. Model fit: NFI = 0.891 (threshold ≥ 0.90); SRMR = 0.077 (threshold < 0.08). * $p < .05$, ** $p < .01$, *** $p < .001$. AVE = Average Variance Extracted; CR = Composite Reliability; R² = explained variance of endogenous construct.

Table 3 summarizes the measurement, validity, and reliability of the study model. All constructs demonstrate strong reliability, with Cronbach's Alpha, Composite Reliability (CR), and Average

Variance Extracted (AVE) values exceeding recommended thresholds (AVE > 0.50, CR > 0.70, and loadings > 0.60) (Vinzi et al., 2010). The indicator loadings are satisfactory, confirming convergent validity. Organizational climate explains 43.2% (0.432) of the variance in the exogenous variables, while consumers' perception accounts for 72.6% (0.726), both indicating strong effects (Falk & Miller, 1992). Model fit is supported by an SRMR value of 0.077 and an NFI = 0.891, which is close to the recommended threshold of 0.90 and therefore indicates an acceptable model fit.

Table 4: Values of the Stone Geisser indicator (Q²) and Cohen's indicator (f²) of the model in the SEM

Constructs	VIF	Consumer Perception (f ²)	Organizational Climate (f ²)	Q ² predict
Economic Benefit	4.144	0.143	0.054	
Environmental Hazard	3.037	0.021	0.087	
Product Features	2.564	0.065	0.087	
Laws and Regulations	3.564	0.028	0.054	
Organizational Climate	3.564	0.235		
Consumers' Perception				0.922

Large effect > 0.34; Medium effect > 0.14; Small effect > 0.01 (Cohen, 1988)

Note. Q² predict is reported only for endogenous constructs. Organizational Climate: Q² = 0.235 Consumers' Perception: Q² = 0.922. Q² > 0 indicates predictive relevance (Chin, 1998). Large effect: f² > 0.35; Medium: f² > 0.15; Small: f² > 0.02 (Cohen, 1988).

Table 4 presents the Stone-Geisser (Q²) and Cohen's (f²) indicators, confirming the model's predictive relevance with Q² values exceeding zero (Chin, 1998). Predictive relevance values (Q²) were 0.235 for Organizational Climate and 0.922 for Consumers' Perception, indicating strong predictive relevance for both endogenous constructs. Effect size (f²) analysis reveals that economic benefit has a medium effect on consumers' perception, while environmental hazard, product features, and laws and regulations show small effects. Organizational climate also demonstrates a medium effect on consumers' perception. Conversely, economic benefit, environmental hazards, product features, and laws and regulations have small effects on organizational climate. These results support the model's acceptable fit and strong predictive power in the SEM framework.

While all VIF values remain below the conservative upper threshold of 5.0 (Hair et al., 2019), Economic Benefit (VIF = 4.144), Laws and Regulations (VIF = 3.564), and Organizational Climate (VIF = 3.564) exceed the more stringent threshold of 3.3 recommended by some PLS-SEM methodologists (Kock, 2015) as indicative of potential collinearity at the construct level. This suggests that estimates for these three paths should be interpreted with some caution, as elevated collinearity can inflate standard errors and destabilize path coefficients. Future studies should consider formal indicator-level collinearity diagnostics and, where warranted, construct-level remedies such as combining highly correlated indicators or applying ridge-type estimation.

4.2 Discriminant validity

4.2.1 Fornell-Larcker criterion Analysis

Table 5: Fornell-Larcker Criterion Analysis for Discriminant Validity

SL. NO.		1	2	3	4	5	6
1	Organizational Climate	0.800					
2	Consumers' Perception	0.712	0.853				
3	Economic Benefit	0.432	0.565	0.924			
4	Product Features	0.543	0.678	0.432	0.790		
5	Laws and Regulations	0.556	0.543	0.578	0.652	0.837	
6	Environmental Hazard	0.422	0.564	0.412	0.543	0.678	0.867

*The diagonal is the square root of the AVE (in bold) of the latent variables and indicates the highest in any column or row

Note: LV- Latent Variable

Table 5 presents the Fornell-Larcker criterion results, assessing discriminant validity through the square roots of AVE values on the diagonal. These values, ranging from 0.790 to 0.924, are greater than the corresponding inter-construct correlations, indicating strong discriminant validity (Fornell & Larcker, 1981). The findings confirm that each construct shares more variance with its indicators than with other constructs, validating the model's structure.

4.2.2 Heterotrait-Monotrait (HTMT) Analysis

Table 6: The Heterotrait-Monotrait (HTMT) Analysis for Discriminant Validity

SL. NO.		1	2	3	4	5	6
1	Organizational Climate						
2	Consumers' Perception	0.522					
3	Economic Benefit	0.523	0.654				
4	Product Features	0.412	0.567	0.543			
5	Laws and Regulations	0.356	0.456	0.453			
6	Environmental Hazard	0.487	0.345	0.423	0.587	0.675	

*Discriminant validity exists if the HTMT<0.85 (Henseler et al., 2015).

Table 6 presents the Heterotrait-Monotrait (HTMT) analysis, confirming discriminant validity with all HTMT values below the 0.85 threshold (Henseler et al., 2015). This indicates that each construct is distinct from the others, supporting the model's validity through cross-validation.

4.3 Hypothesis Testing Result (Direct and Indirect Effects)

The evaluation of hypotheses, accepting and rejecting them based on significant and insignificant relationships, is conducted through structural model analysis. The results of this analysis encompass paths, path coefficients, t-values, and p-values. A two-tailed t-test, with 5% level of significance, was employed to assess the hypotheses. Coefficients are considered statistically significant if the *p*-values are lower than the significance level of 5% (0.05).

Table 7: Results of Direct & Indirect Effect Hypotheses

Hypothesis	Assumptions	Coefficient	t-statistic	p-value	Decisions
H1	Economic Benefit > Consumer Perception	0.221***	4.957	0.000	Accepted
H2	Environmental Hazard > Consumer Perception	0.013	0.337	0.736	Rejected
H3	Product Features > Consumer Perception	0.034	1.047	0.295	Rejected
H4	Laws and Regulations > Consumer Perception	0.116*	2.200	0.028	Accepted
H5	Organizational Climate > Consumer Perception	0.321***	3.541	0.000	Accepted
H6	Economic Benefit > Organizational Climate > Consumer Perception	0.017	0.865	0.387	Rejected
H7	Environmental Hazard > Organizational Climate > Consumer Perception	0.028	0.646	0.651	Rejected
H8	Product Features > Organizational Climate > Consumer Perception	0.028	1.123	0.261	Rejected
H9	Laws and Regulations > Organizational Climate > Consumer Perception	0.017	0.785	0.432	Rejected

Note. **p* < .05; ***p* < .01; ****p* < .001.

Table 7 reports the outcomes of the direct and the mediated hypotheses. To obtain statistical t-values, SmartPLS 4.0 was utilized to conduct bootstrapping. The software used gave clear p-values, which were calculated based on the 95% confidence interval, which is a suitable limit usually used in social science research.

In the first hypothesis, it was assumed that economic benefit has a positive and significant effect on consumer perception. The findings reveal a positive and significant linkage between economic benefit and consumer perception ($\beta = 0.221^{***}$; $t = 4.957$, $p < 0.001$, see Table 7), confirming Hypothesis 1 (H1). In this way, shipbreaking products will be positively perceived by consumers, whereby they will understand the economic advantages that they bring, including affordability, employment creation, and national economic contribution. This finding aligns with previous studies (Currás-Pérez et al., 2018; Huang, 2023; Shin et al., 2023), which identify economic factors as among the strongest drivers.

Regarding the second hypothesis, it was assumed that environmental hazards have a significant negative effect on consumer perception. The findings reveal no significant linkage between environmental hazard and consumer perception ($\beta = 0.013$; $t = 0.337$, $p > 0.05$, see Table 7), and thus H2 is rejected. This non-significant path indicates that Bangladeshi consumers are neither positively nor negatively influenced by environmental concerns linked to shipbreaking. This could reflect limited environmental awareness

among consumers or the prioritization of economic necessity over ecological concerns. These findings contrast with prior work (Boesen et al., 2019; Brennan et al., 2021; Zhang et al., 2018).

Regarding the third hypothesis, it was assumed that product features have a positive and significant effect on consumer perception. The findings reveal no significant linkage between product features and consumer perception ($\beta = 0.034$; $t = 1.047$, $p > 0.05$, see Table 7), and thus H3 is rejected. This indicates that quality, durability, and aesthetic attributes do not significantly drive consumer attitudes in this context, suggesting that consumers place greater weight on economic considerations than on technical or design features of shipbreaking products. These findings stand in contrast to prior work (Brennan et al., 2021; Ha et al., 2020; Sun et al., 2018).

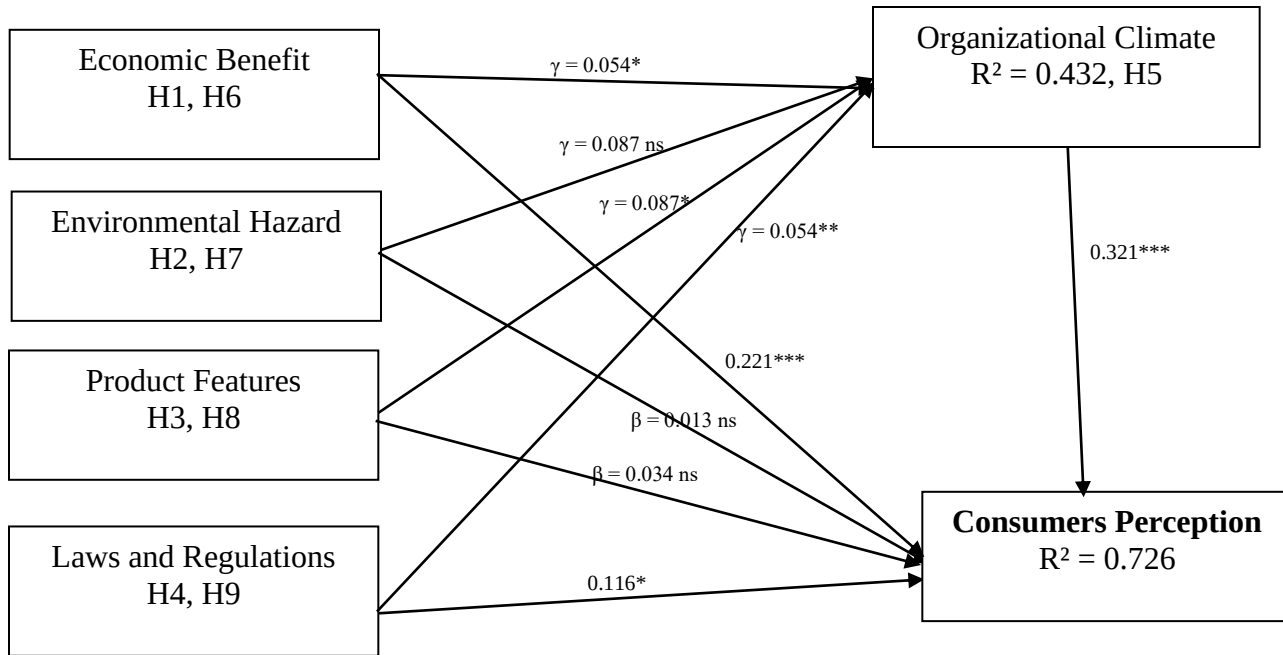
In the fourth hypothesis, it was predicted that there is a positive and significant linkage between laws and regulations and consumer perception. The findings reveal that a positive and significant linkage is found between laws and regulations with consumer perception ($\beta = 0.116^*$; $t = 2.200$, $p < 0.05$, see Table 7), which confirms the hypothesis (H4) four. This result is significant at the 5 % level, and this implies that legal frameworks and enforcement of these regulations have some impact on how consumers perceive such products. This finding is supported by prior research (Glogoveţan et al., 2022; Mohseni et al., 2018; Oladapo et al., 2022). When people understand that shipbreaking practices are regulated in accordance with regulations and rules, the levels of trust and acceptance elevate.

Moving to the fifth hypothesis, it was assumed that there is a positive and significant linkage between organizational climate and consumer perception. The findings reveal that a positive and significant linkage is sustained between organizational climate and consumer perception ($\beta = 0.321^{***}$; $t = 3.541$, $p < 0.001$, see Table 7), stating hypothesis five (H5) is accepted. This finding is supported by prior research (Cheema et al., 2020; Kuenzi et al., 2020; Shen & Zhang, 2019). There is a direct and powerful influence of organizational climate on consumer perception. An ethical, transparent, and positive internal organizational environment assures consumers that product quality is protected from external pressures and that the organization upholds responsible labor standards. This stresses the necessity of the internal culture and reputation of creating consumer opinion.

In the case of hypotheses six, seven, eight, and nine, it was predicted that organizational climate mediates the linkages between economic benefit, environmental hazard, product features, and laws and regulations, respectively, with consumer perception. For environmental hazard (H7), the findings reveal that organizational climate does not mediate the linkage with consumer perception ($\beta = 0.028$; $t = 0.646$, $p = 0.651$, see Table 7); hypothesis seven is therefore not confirmed. Although environmental hazards may have an impact on internal policies, the route through organizational climate to consumer perception does not bear much significance, again confirming that both the direct and indirect impacts of environmental concern hold little importance for consumers in this context. For the remaining three paths, recalculation of the specific indirect effects — following the product-of-paths specification in Section 3.3.2 — yields coefficients of 0.017 (H6, economic benefit), 0.028 (H8, product features), and 0.017 (H9, laws and regulations). These effect sizes are small in absolute terms, markedly smaller than

the values reported in the original analysis, and for the remaining mediation hypotheses (H6, H8, and H9), the indirect effects were found to be statistically insignificant ($p > 0.05$). Although the recalculated coefficients were mathematically consistent with the product-of-paths specification presented in Section 3.3.2, their magnitudes were very small ($\beta = 0.017$ – 0.028). Therefore, organizational climate does not significantly mediate the relationships between economic benefits, product features, laws and regulations, and consumer perception. Given the modest magnitude of the underlying γ paths from which they are derived (0.054 – 0.087), the substantive role of organizational climate as a mediator for economic, product, and regulatory factors — as distinct from its strong direct effect on consumer perception (H5, $\beta = 0.321$) — cannot be firmly established from the present results and warrants re-testing with a fresh dataset.

Figure 2: Structural model with standardized path coefficients and R^2 values



Legend

Significant path ($p < .05$)

Non-significant path ($p > .05$)

*** $p < .001$

** $p < .01$

* $p < .05$

ns not significant

β = direct path coefficient

γ = path to mediator

R^2 = explained variance

5 Discussions

The findings from the PLS-SEM analysis offer strong empirical support for several of the proposed hypotheses, shedding light on the factors influencing consumer perception of shipbreaking products in Bangladesh. Notably, economic benefit (H1) and compliance with laws and regulations (H4) were found to significantly and positively impact consumers' perceptions ($p < 0.05$), emphasizing the vital roles of

financial incentives and regulatory assurances in shaping favorable attitudes toward these products. In contrast, environmental hazards (H2) and product features (H3) did not exhibit significant direct effects, with p-values of 0.736 and 0.295, respectively, well above the 0.05 threshold. These results suggest that despite the known risks associated with shipbreaking, Bangladeshi consumers may be either unaware of environmental concerns or unwilling to prioritize them, prioritizing economic considerations instead. Similarly, the expected influence of product characteristics was not validated, indicating the need for deeper insights into which specific features matter most to consumers.

Moreover, the study confirmed the significance of organizational climate (H5) in shaping consumer perception, demonstrating its role as an important direct predictor of consumer attitudes toward shipbreaking products. However, the revised analysis did not provide evidence supporting its mediating role between the independent constructs and consumer perception. However, the indirect effects associated with H6, H7, H8, and H9 were not statistically significant. Accordingly, no empirical support was found for the mediating role of organizational climate in the proposed relationships.

Overall, these findings highlight the complexity of consumer attitudes in this context and suggest that while economic and regulatory factors play crucial roles, environmental and product-related concerns require further exploration. Future studies should delve deeper into consumer awareness and the specific features that can enhance product appeal in the shipbreaking industry of Bangladesh.

6 Conclusion, Implications, and Future Research

6.1 Conclusion

This study examined the factors shaping consumer perceptions of shipbreaking products in Bangladesh, focusing on economic benefits, environmental hazards, product features, compliance with laws and regulations, and the mediating role of organizational climate. The PLS-SEM analysis reveals that economic benefits and regulatory compliance significantly and positively influence consumer perceptions, underscoring the importance of financial value and legal assurance in building consumer trust. In contrast, environmental hazards and product features did not produce significant direct effects, suggesting that these dimensions may be less immediately salient to Bangladeshi consumers or that their influence is channeled indirectly through organizational climate.

The mediating role of organizational climate between economic benefits (H6), product features (H8), and laws and regulations (H9) and consumer perception yielded small effect sizes that could not be independently re-verified for statistical significance, and no significant mediation effect was observed for environmental hazards (H7). Organizational climate did, however, exert a strong and significant direct effect on consumer perception (H5), underscoring the importance of an organization's internal practices and ethical culture in shaping how consumers ultimately evaluate shipbreaking products, even where its indirect, mediating pathways remain unconfirmed. Overall, the study contributes a nuanced understanding of consumer behavior in an underexplored, economically significant, and environmentally sensitive industry and establishes a theoretical and empirical foundation for future inquiry.

6.2 Theoretical Implications

This study advances the application of the Theory of Planned Behavior (TPB) to consumer behavior in industrial by-product markets, demonstrating how attitudes (economic benefits), subjective norms (regulatory compliance), and perceived behavioral control (product features) operate in the context of an emerging-market industry. The strong direct role of organizational climate in shaping consumer perception, together with its theorized but not yet conclusively verified mediating pathways, offers a novel theoretical contribution, enriching the consumer behavior literature with an organizational-level construct that has been underutilized in industrial product studies. The finding that environmental hazards do not significantly affect consumer perception, contrary to theoretical expectations, challenges assumptions drawn from Western consumer behavior models and invites scholars to investigate the boundary conditions of environmental psychology in developing country contexts. Future theoretical work should explore the role of environmental literacy, social norms, and CSR communication in moderating this relationship.

6.3 Practical Implications

From a practical standpoint, the findings offer actionable guidance for industry stakeholders and policymakers. Policymakers should strengthen regulatory oversight and enforce environmental and safety standards to boost consumer trust. Introducing eco-certification programs, green labeling, and tax incentives for sustainable practices would further signal regulatory seriousness to consumers. For shipbreaking companies, marketing strategies should emphasize cost-effectiveness, regulatory compliance, and organizational responsibility. Transparent communication about sourcing, safety certifications, and environmental management practices can measurably improve public perception and market positioning. Public engagement efforts are equally critical. Educational campaigns should highlight the economic and environmental benefits of shipbreaking products, including resource reuse, affordability, and waste reduction, and CSR initiatives focused on worker safety and community investment can further enhance industry credibility. Finally, collaborative governance involving regulatory bodies, industry leaders, civil society, and academic institutions is essential to ensure that sustainable practices, evolving consumer expectations, and international standards are simultaneously addressed.

6.4 Limitations and Future Research Directions

This study acknowledges several limitations. First, the sample of 415 respondents, while adequate for PLS-SEM analysis, may not fully represent the diverse demographic and geographic landscape of Bangladeshi consumers. Future research should seek larger, more representative samples to improve generalizability. Second, the study is confined to four independent variables. Additional dimensions such as brand reputation, marketing effectiveness, consumer trust, and social norms may also significantly shape perceptions and should be incorporated in future studies. Third, the exclusively quantitative design, while appropriate for hypothesis testing, may overlook nuanced motivations and contextual insights. Integrating qualitative methods, such as interviews or focus groups with consumers

and industry workers, would enrich the findings. Fourth, socio-economic moderators such as age, income, and education level should be examined to understand whether perceptions vary systematically across demographic groups. Fifth, the cross-sectional design limits causal inference; future longitudinal or experimental designs are recommended to validate causal claims and track how consumer perception evolves as regulatory, environmental, and marketing conditions change in the shipbreaking sector. Sixth, the structural model assumes linear relationships among the latent constructs; non-linearity diagnostics (e.g., quadratic effect testing per Hui et al., 2017) were not conducted in the original analysis. This represents a methodological limitation, and future research should test potential non-linear or threshold effects among the constructs, particularly given the plausibility of diminishing or saturating effects for constructs such as economic benefit and perceived environmental hazard. Addressing these limitations will deepen scholarly understanding and support the long-term sustainable development of Bangladesh's shipbreaking industry. Seventh, the sample exhibits a pronounced gender imbalance, with male respondents comprising 91.08% ($n = 378$) of the total sample compared to 8.92% ($n = 37$) female respondents. Because purposive, non-probability sampling was used, this imbalance reflects the composition of the accessible respondent pool — likely shaped by the male-dominated nature of the shipbreaking and related industrial sectors in Bangladesh — rather than a deliberate sampling design. As a result, the reported path coefficients and consumer perception patterns should be interpreted as reflecting predominantly male consumer attitudes and may not generalize to the broader Bangladeshi consumer population, including female consumers, whose perceptions of environmental, regulatory, and economic dimensions of shipbreaking products may differ substantially. Future research should pursue stratified or quota sampling to achieve gender balance and test whether the structural relationships reported here hold across gender groups.

References

- Abdullah, A., Awal, Z. I., Alamgir, M. Z., Mia, M. J., Mim, F., & Dhar, U. K. (2023). A Review on Ship Recycling Industry in Bangladesh from Global Perspective. *Journal of Ocean and Coastal Economics*, 10(1), 4.
- Afrin, S., Sehreen, F., Polas, M. R. H., & Sharin, R. (2020). Corporate Social Responsibility (CSR) practices of financial institution in Bangladesh: the case of United Commercial Bank. *Journal of Sustainable Tourism and Entrepreneurship*, 2(2), 69-82.
- Ahammad, H., & Sujauddin, M. (2017). Contributions of ship recycling in Bangladesh: an economic assessment. *IMO-NORAD SENSREC Project, London, UK*, 78.
- Ahasan, S., Zaman, F. N., & Ahmed, T. (2021, August). Perspective of Circular Economy in Bangladesh: A Comprehensive Review Towards Ship Demolition Industry. In *4th European International Conference on Industrial Engineering and Operations Management, IEOM 2021* (pp. 2375-2385).
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211.
- Alam, I., Barua, S., Ishii, K., Mizutani, S., Hossain, M. M., Rahman, I. M., & Hasegawa, H. (2019). Assessment of health risks associated with potentially toxic element contamination of soil by end-of-life ship dismantling in Bangladesh. *Environmental Science and Pollution Research*, 26, 24162-24175
- Alam, S., & Faruque, A. (2014). Legal regulation of the shipbreaking industry in Bangladesh: The international regulatory framework and domestic implementation challenges. *Marine Policy*, 47, 46-56.
- Ananno, A. A., Masud, M. H., Dabnichki, P., Mahjabeen, M., & Chowdhury, S. A. (2021). Survey and analysis of consumers' behaviour for electronic waste management in Bangladesh. *Journal of Environmental Management*, 282, 111943.
- Barua, S., Rahman, I. M., Hossain, M. M., Begum, Z. A., Alam, I., Sawai, H., ... & Hasegawa, H. (2018). Environmental hazards associated with open-beach breaking of end-of-life ships: a review. *Environmental Science and Pollution Research*, 25, 30880-30893.
- Biswas, A., & Roy, M. (2015). Green products: An exploratory study on the consumer behaviour in emerging economies of the East. *Journal of Cleaner Production*, 87, 463-468.
- Boesen, S., Bey, N., & Niero, M. (2019). Environmental sustainability of liquid food packaging: is there a gap between Danish consumers' perception and learnings from life cycle assessment?. *Journal of cleaner production*, 210, 1193-1206.
- Brennan, L., Langley, S., Verghese, K., Lockrey, S., Ryder, M., Francis, C., ... & Hill, A. (2021). The role of packaging in fighting food waste: A systematised review of consumer perceptions of packaging. *Journal of cleaner production*, 281, 125276.
- Chartres, N., Bero, L. A., & Norris, S. L. (2019). A review of methods used for hazard identification and risk assessment of environmental hazards. *Environment international*, 123, 231-239.
- Cheema, S., Afsar, B., & Javed, F. (2020). Employees' corporate social responsibility perceptions and organizational citizenship behaviors for the environment: The mediating roles of organizational

- identification and environmental orientation fit. *Corporate Social Responsibility and Environmental Management*, 27(1), 9-21.
- Chin, W. W. (1998). The partial least squares approach to structural equation modeling. In G. A. Marcoulides (Ed.), *Modern Methods for Business Research* (pp. 295–336). Lawrence Erlbaum.
- Chowdhury, M. M. I., Othman, K. B., Khan, M. A., & Sulaiman, I. F. (2021, December). Occupational training and health-safety of bangladesh shipbreaking industry workers: An evaluative study. In *GARA E-conference* (Vol. 42).
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum.
- Currás-Pérez, R., Dolz-Dolz, C., Miquel-Romero, M. J., & Sánchez-García, I. (2018). How social, environmental, and economic CSR affects consumer-perceived value: Does perceived consumer effectiveness make a difference?. *Corporate Social Responsibility and Environmental Management*, 25(5), 733-747.
- Dey, A., Ejohwomu, O. A., & Chan, P. W. (2021). Sustainability challenges and enablers in resource recovery industries: A systematic review of the ship-recycling studies and future directions. *Journal of Cleaner Production*, 329, 129787.
- Ding, Z., Nie, W., & Wu, H. (2022). Investigating the connection between stakeholders' purchase intention and perceived value of construction and demolition waste recycled products. *Environment, Development and Sustainability*, 24(7), 9285-9303.
- Falk, R. F., & Miller, N. B. (1992). *A primer for soft modeling*. University of akron press.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39–50.
- Glogoveţan, A. I., Dabija, D. C., Fiore, M., & Pocol, C. B. (2022). Consumer perception and understanding of European Union quality schemes: A systematic literature review. *Sustainability*, 14(3), 1667.
- Ha, T. M., Shakur, S., & Do, K. H. P. (2020). Linkages among food safety risk perception, trust and information: Evidence from Hanoi consumers. *Food Control*, 110, 106965.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report results of PLS-SEM. *European Business Review*, 31(1), 2–24.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity. *Journal of the Academy of Marketing Science*, 43(1), 115–135.
- Hobfoll, S. E. (2011). Conservation of resources theory: Its implication for stress, health, and resilience. *The Oxford Handbook of Stress, Health, and Coping*, 127-147.
- Hossain, M. M. M. (2010). *Shipbreaking Activities: Threat to coastal environment, biodiversity and fishermen community in Chittagong, Bangladesh*. Publication Cell, Young Power in Social Action.
- Hossain, M. S., Fakhruddin, A. N. M., Chowdhury, M. A. Z., & Gan, S. H. (2016). Impact of shipbreaking activities on the coastal environment of Bangladesh and a management system for its sustainability. *Environmental science & policy*, 60, 84-94.

- Huang, M. Y. (2023). Effects of consumer perception, attitude, and purchase intention on the willingness to pay for green building housing products. *Journal of Housing and the Built Environment*, 38(3), 1559-1583.
- Hui, Y., Wong, W. K., Bai, Z., & Zhu, Z. Z. (2017). A new nonlinearity test to circumvent the limitation of Volterra expansion with application. *Journal of the Korean Statistical Society*, 46, 365-374.
- Islam, K., Polas, M. R. H., Parvin, K., & Akter, T. (2023). Decoding Demographics on Generation Z's Post-Pandemic Shopping Trends: E-Commerce Evolution 4.0, the Digital Shopper's Dilemma, and Tailoring Strategies. *International Journal of Business, Management and Economics*, 4(4), 360-380.
- Jahanshahi, A. A., Bhattacharjee, A., & Polas, M. R. H. (2023). The micro-foundations of sustainable entrepreneurship: the role of individuals' pro-social identity and organisational pro-social identity. *International Journal of Productivity and Quality Management*, 40(2), 149-170.
- Jaiswal, D., & Kant, R. (2018). Green purchasing behaviour: A conceptual framework and empirical investigation of Indian consumers. *Journal of Retailing and Consumer Services*, 41, 60-69.
- Kalteh, H. O., Mortazavi, S. B., Mohammadi, E., & Salesi, M. (2021). The relationship between safety culture and safety climate and safety performance: a systematic review. *International journal of occupational safety and ergonomics*, 27(1), 206-216.
- Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration (ijec)*, 11(4), 1-10.
- Kotler, P. (2001). *Marketing Management* (11th ed.). Prentice-Hall.
- Kuenzi, M., Mayer, D. M., & Greenbaum, R. L. (2020). Creating an ethical organizational environment: The relationship between ethical leadership, ethical organizational climate, and unethical behavior. *Personnel Psychology*, 73(1), 43-71.
- Kumar, P., & Polonsky, M. J. (2017). An analysis of the green consumption values in emerging markets. *Journal of Business Research*, 82, 230-239.
- Li, X., Wang, C., Li, D., Yang, D., Meng, F., & Huang, Y. (2024). Environmental Regulations, Green Marketing, and Consumers' Green Product Purchasing Intention: Evidence from China. *Sustainability*, 16(20), 8987.
- Maitra, B., Hossain, T., Chakraborty, M., & Ganguli, D. (2024). Impact of trade and investment on income surge in Bangladesh: Evidence from trade liberalization regime. *Journal of Public Affairs*, 24(2), e2922.
- Mannan, B., Rizvi, M. J., & Dai, Y. M. (2023). Does end-of-life ships research trends change in last three decades? A review for the future roadmap. *Journal of International Maritime Safety, Environmental Affairs, and Shipping*, 7(1), 2187603.
- McDaniel, C., & Gates, R. (2012). *Marketing Research* (9th ed.). Wiley.
- Mohseni, S., Jayashree, S., Rezaei, S., Kasim, A., & Okumus, F. (2018). Attracting tourists to travel companies' websites: the structural relationship between website brand, personal value, shopping experience, perceived risk and purchase intention. *Current Issues in Tourism*, 21(6), 616-645.

- Moslehpour, M., Pham, V. K., Wong, W. K., & Bilgiçli, İ. (2018). E-purchase intention of Taiwanese consumers: Sustainable mediation of perceived usefulness and perceived ease of use. *Sustainability*, 10(1), 234.
- Nga, L. P., & Tam, P. T. (2024). Managerial recommendations for enhancing green consumption behavior and sustainable consumption. *Emerg. Sci. J*, 8, 2245-2266.
- Norman, G. (2010). Likert scales, levels of measurement and the “laws” of statistics. *Advances in health sciences education*, 15(5), 625-632.
- Oladapo, I. A., Hamoudah, M. M., Alam, M. M., Olaopa, O. R., & Muda, R. (2022). Customers’ perceptions of FinTech adaptability in the Islamic banking sector: comparative study on Malaysia and Saudi Arabia. *Journal of Modelling in Management*, 17(4), 1241-1261.
- Olaleye, B. R. (2023). Influence of eco-product innovation and firm reputation on corporate social responsibility and competitive advantage: A mediation-moderation analysis. *Journal of Public Affairs*, 23(4), e2878.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879–903.
- Powell, B. J., Mettert, K. D., Dorsey, C. N., Weiner, B. J., Stanick, C. F., Lengnick-Hall, R., ... & Lewis, C. C. (2021). Measures of organizational culture, organizational climate, and implementation climate in behavioral health: A systematic review. *Implementation Research and Practice*, 2, 26334895211018862.
- Rahman, S. M., & Kim, J. (2020). Circular economy, proximity, and shipbreaking: A material flow and environmental impact analysis. *Journal of Cleaner Production*, 259, 120681.
- Rahman, S. M., Schelly, C., Mayer, A. L., & Norman, E. S. (2018b). Uncovering discursive framings of the Bangladesh shipbreaking industry. *Social Sciences*, 7(1), 14.
- Roy, H., Islam, M. S., Haque, S., & Riyad, M. H. (2022a). Electronic waste management scenario in Bangladesh: policies, recommendations, and case study at Dhaka and Chittagong for a sustainable solution. *Sustainable Technology and Entrepreneurship*, 1(3), 100025.
- Roy, H., Rahman, T. U., Suhan, M. B. K., Al-Mamun, M. R., Haque, S., & Islam, M. S. (2022b). A comprehensive review on hazardous aspects and management strategies of electronic waste: Bangladesh perspectives. *Heliyon*, 8(7).
- Safeer, A. A., Zhou, Y., Abrar, M., & Luo, F. (2022). Consumer perceptions of brand localness and globalness in emerging markets: A cross-cultural context. *Frontiers in Psychology*, 13, 919020.
- Schneider, B., Ehrhart, M. G., & Macey, W. H. (2013). Organizational climate and culture. *Annual review of psychology*, 64(1), 361-388.
- Shen, J., & Zhang, H. (2019). Socially responsible human resource management and employee support for external CSR: roles of organizational CSR climate and perceived CSR directed toward employees. *Journal of Business Ethics*, 156, 875-888.
- Shin, H. W., Yoon, S., Jung, S., & Fan, A. (2023). Risk or benefit? Economic and sociocultural impact of P2P accommodation on community resilience, consumer perception and behavioral intention. *International Journal of Contemporary Hospitality Management*, 35(4), 1448-1469.

- Sujauddin, M., Koide, R., Komatsu, T., Hossain, M. M., Tokoro, C., & Murakami, S. (2015). Characterization of shipbreaking industry in Bangladesh. *Journal of Material Cycles and Waste Management*, 17, 72-83.
- Sullivan, G. M., & Artino Jr, A. R. (2013). Analyzing and interpreting data from Likert-type scales. *Journal of graduate medical education*, 5(4), 541-542.
- Sun, H., Teh, P. L., & Linton, J. D. (2018). Impact of environmental knowledge and product quality on student attitude toward products with recycled/remanufactured content: Implications for environmental education and green manufacturing. *Business Strategy and the Environment*, 27(7), 935-945.
- Tanha, M., Castka, P., & Chowdhury, M. (2021). CSR in Bangladesh: the case of the shipbreaking industry. *Current Global Practices of Corporate Social Responsibility: In the Era of Sustainable Development Goals*, 821-839.
- Tanha, M., Michelson, G., Chowdhury, M., & Castka, P. (2022). Shipbreaking in Bangladesh: Organizational responses, ethics, and varieties of employee safety. *Journal of safety research*, 80, 14-26.
- Uddin, M. K., Nobi, M. N., & Islam, A. M. (2024). Environmental hazards and health rights of workers in shipbreaking in Bangladesh. *International Journal of Human Rights in Healthcare*, 17(3), 300-314.
- Udokporo, C. K., Anosike, A., Lim, M., Nadeem, S. P., Garza-Reyes, J. A., & Ogbuka, C. P. (2020). Impact of Lean, Agile and Green (LAG) on business competitiveness: An empirical study of fast moving consumer goods businesses. *Resources, Conservation and Recycling*, 156, 104714.
- Uzir, M. U. H., Hamid, A. B. A., Jerin, I., Latiff, A. S. A., & Thurasamy, R. (2021). Customer satisfaction and brand loyalty to electronic home appliances in Bangladesh: The contingent role of brand trust. *SN Business & Economics*, 1(6), 86.
- Vinzi, V. E., Chin, W. W., Henseler, J., & Wang, H. (2010). *Handbook of Partial Least Squares*. Springer.
- Wójcik-Karpacz, A., Karpacz, J., Brzeziński, P., Pietruszka-Ortyl, A., & Ziębicki, B. (2023). Barriers and drivers for changes in circular business models in a textile recycling sector: Results of qualitative empirical research. *Energies*, 16(1), 490.
- Zhang, X., Bai, X., & Shang, J. (2018). Is subsidized electric vehicles adoption sustainable: Consumers' perceptions and motivation toward incentive policies, environmental benefits, and risks. *Journal of Cleaner Production*, 192, 71-79.

Appendix

Measurement Scale

Economic Benefit (Abdullah *et al.*, 2023):

1. I believe shipbreaking products contribute positively to the national economy.
2. Using shipbreaking products provides good value for money.
3. Shipbreaking products are a budget-friendly option compared to other alternatives.

Environmental Hazard (Chartres *et al.*, 2019):

1. The production process of shipbreaking products is harmful to the environment.
2. There is a lack of proper waste disposal and treatment facilities in the shipbreaking industry.
3. Shipbreaking operations are managed in ways that pose risks to the environment.

Product Features (X. Li *et al.*, 2024):

1. Shipbreaking products are produced using effective and reliable technology.
2. The quality of shipbreaking products meets acceptable standards.
3. The pricing of shipbreaking products is reasonable and adaptable to my needs.

Laws & Regulations (X. Li *et al.*, 2024):

1. Current laws and regulations related to shipbreaking are not strong enough to ensure safety and sustainability.
2. Stricter laws and regulations would encourage me to consider purchasing shipbreaking products.
3. Proper enforcement of environmental and safety regulations increases my confidence in shipbreaking products.

Organizational Climate (Schneider *et al.*, 2013):

1. The organization where shipbreaking products are sourced promotes a safe and healthy working environment.
2. Employees in the shipbreaking sector are encouraged to follow environmentally responsible practices.

3. There is a clear commitment within the organization to comply with environmental regulations and standards.

Consumers' Perception (X. Li et al., 2024):

1. I perceive products made through environment-friendly production processes as more trustworthy and preferable.
2. I feel more confident purchasing products from companies that ensure worker safety and comply with strong laws and regulations.
3. I am more likely to have a positive perception of products that offer adaptable pricing and maintain acceptable quality standards.