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# The Role of Circular Economy Practices between Green Supply Chain Management and Green Service Behavior: Evidence from an Emerging Nation

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***Abstract***

*Circular economy (CE) practices play a significant role in green supply chain management (GSCM) and green service behavior (GSB), that are increasingly recognized as pivotal in fostering sustainable business operations, particularly within the banking sector of emerging economies like Bangladesh. This study investigates the mediating role of CE between the influence of GSCM on green service behaviors among employees in the commercial banking industry, focusing on both in-role and extra-role behaviors. A sample of 395 frontline employees from various private commercial banking institutions in Bangladesh, participated in face-to-face surveys. Structural Equation Modeling (SEM) was employed to analyze data, confirming robust measurement and structural models. The results demonstrate significant positive effects of GSCM on green service behaviors, both in-role and extra-role, mediated by CE. Specifically, CE enhances the relationship between GSCM initiatives and voluntary environmentally friendly actions among bank employees. These findings contribute to a deeper understanding of how sustainable practices can be effectively integrated into organizational strategies to promote green behaviors, offering practical insights for enhancing environmental sustainability in the banking sector.*

***Keywords:*** *Circular Economy, Green Supply Chain Management, Green Service Behavior, Green Banking.*

## Introduction

The term, green supply chain management (GSCM) has become a critical strategy for organizations striving to achieve a balance between environmental concern and financial

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performance as well (Mustafi et. al., 2024; Mollah et. al., 2024a). In terms of service industry, on the other hand, the commercial banking sector, often perceived as having a low environmental impact, is increasingly recognizing the importance of adopting green practices. Despite the growing recognition of green banking as a vital component of sustainable business practices, there remains a lack of comprehensive understanding regarding how GSCM influences employee behaviors that contribute to environmental sustainability, which has been indicated by Amin & Oláh (2024) and Amin et. al. (2024). Specifically, the banking sector in Bangladesh has yet to fully explore how GSCM can drive green service behaviors among employees, both in their formal job roles (in-role) and beyond (extra-role).

However, the present study found that prior studies based on GSCM was extensively focusing on the benefits of manufacturing sector and other production sectors (Yang et al., 2023; Kamarudin et al., 2023); whereas there is a notable gap has been indicated to explore the impact of GSCM focusing on the service sector (Islam et al., 2023; Islam et al., 2018), particularly in the banking industry. This gap shows the weaknesses to the ability of the banking industry to effectively implement green initiatives and capitalize on the potential benefits of enhanced employee engagement in sustainability efforts (Tirno et al., 2020). Additionally, the mediating role of CEP in the relationship between GSCM and employee green service behaviors remains underexplored according to Gazi et al. (2024b) and Gazi et al. (2025b), particularly within the banking sector of developing countries like Bangladesh (Amin & Oláh, 2024; Danvers et al., 2023; Ul-Durar et al., 2023).

The present study additionally indicates that literature has primarily focused on the direct effects of GSCM on organizational performance metrics, i.e., cost savings, operational efficiency, and other environmental impacts (Hidayat et al., 2022; Zhu, 2022, Kassim et. al., 2024). However, less attention has been given to how GSCM influences intangible outcomes, such as employee green service behaviors, through the adoption of CE practices. Additionally, CE practices also indicate the reuse of resources and energy for the company even if it is a service provider. Notably, empirical evidence from the banking sector in Bangladesh is sparse, despite its rapid growth and significant role in the nation's sustainable development goals. To fill these gaps, this research examines the commercial banking organizations of Bangladesh, and how GSCM affects green service behavior using the mediating function of the circular economy. The findings of this study will shed light on the complex relationship between these important factors and provide practical recommendations for how organizations might improve their procedures in similar circumstances. The following constitute the research questions proposed by the present study:

***RQ1:*** How does green supply chain management (GSCM) influence green in-role and extra-role service behaviors among bank employees in Bangladesh?

***RQ2:*** What is the mediating effect of the circular economy (CE) on the relationship between GSCM and green service behaviors?

***RQ3:*** How do the perceptions of frontline bank employees in Bangladesh reflect the impact of GSCM and CE on their green service behaviors?

The purpose of this study is to examine the influence of GSCM on green service behaviors through the mediating effect of CE. To investigate these relationships, this study collects the perceptions of 395 frontline employees from the banking industry in Bangladesh. By employing quantitative analysis, this research intends to provide some robust insights into the direct and

indirect effects of GSCM on green in-role and extra-role service behaviors. The findings reveal a significant positive influence of GSCM on green service behaviors and CE, highlighting the critical mediating role of CE in this relationship. This study extends the existing body of knowledge on GSCM by elucidating its impact on employee behaviors in the banking sector, thereby offering practical implications for enhancing green service behaviors among employees.

The study demonstrates that GSCM can effectively influence employees' green service behaviors through CE, suggesting that banking management must actively promote and integrate green practices within their operations. By fostering a culture of sustainability and providing appropriate, green-concerned resource support, banks can enhance employee engagement in green initiatives, ultimately contributing to the broader goal of environmental sustainability. These insights are particularly valuable for private commercial banking organizations in Bangladesh, although the findings may offer guidance for similar institutions in other contexts. In support of the present study concept, previously Karim et. al. (2023a) and Hosain et. al. (2024a) investigated the seeking to improve organizational green service behaviors.

## Literature Review

### Empirical Studies

### Green Supply Chain Management

GSCM is a crucial strategy for organizations aiming to achieve a balance between environmental, social, and financial sustainability. In a similar study, Yang et al. (2023) investigated how firm earnings are affected by GSCM at various phases of the diffusion process. They evaluate how operational procedures, corporate plans, and green efforts impact the efficacy of GSCM. The study finds that financial benefits to enterprises increase during the development stage and drop during the preparation stage, which was also corroborated by Ullah et. al. (2024). However, green activities such as differentiation strategy and process standardization positively impact GSCM dissemination throughout the preparatory phase. The present study indicates that the weaknesses of GSCM can be solved or improved, and long-term benefits can be attained in context of financial and environmental performance. Additionally, these benefits can be realized by implementing the appropriate service-focused green initiatives, operational procedures, and business strategies.

Notably, the main objective of GSCM is to reduce industrial hazards and production in a more environmentally friendly way that removes the environmental impacts on the ecology. Ultimately, this process entails lessening waste, re-producing, and reusing resources that also boost the value creation and integration process in a ecologically friendly way into the existing supply chain system. Pertinently, Kamarudin et al. (2023) highlighted some additional benefits of GSCM, including improvement of asset performance, reducing wastage generation and manufacturing costs, innovation, reuse of raw materials, higher profitability, and an intention to added values for the end users. In a similar vein, Zhu (2022) emphasized the advantages of environmentally friendly circular production systems for businesses that support manages in their supply chains activities with a maximum eco-concern process. The study of Zhu (2022) additionally highlighted the significance of addressing problems that increase the productive output levels and ensuring sustainable circular practices.

In terms of green practices, Amin & Rubel (2020), Gazi et al. (2024a), and Gazi et al. (2024c) suggested effective training implementation for green activities has a favorable impact on both society and the environment and is essential for productive customer relations and teamwork,

which is enhanced provided that green practices are involved in the training process. Other scholars also supported this argument (for example, Gazi et al., 2024d; Ismael et al., 2025). Resolving the deficiency of environmentally friendly production process was further discussed by Mohaimen et al. (2025); where they advocated that GSCM can boost client happiness and enhance the sustainability in terms of service sector. GSCM is a tactic to solve environmental problems brought on by industrial activity and stakeholder demand (Shahneaz et al., 2020; Hidayat et al., 2022). It involves integrating eco-friendly procedures into supply networks. Although sustainability awareness has grown as manufacturing shifts to Asia, there is a lack of research on how GSCM affects employee green-concerned behavior, which ultimately lead to company success, particularly in Southeast Asia. Previous research has focused more on measurable metrics, including environmental, operational, and economic success, with less attention to intangible outcomes (Hasan et al., 2025; Gazi et al., 2025a; Islam et al., 2024a). Thus, further investigation is required to explore how GSCM is implemented and its impact on green service in the service organizations.

As per the studies conducted by Al Amin et al. (2024a), Chowdhury et al., (2024), Dey et al. (2021), and Hasan et al. (2023), their findings have collectively indicated that while technology innovation and governance negatively impact natural resources (NR), economic variables, environmental elements, and green activities have a positive impact. Technological advancements that promote the growth of non-natural resources may lead to a decline in the demand for natural resources and rental income (Hosain et al., 2025a; Hosain et al., 2025b; Al Amin et al., 2024b; Azad et al., 2023). Pertinently, Karim et al. (2024) also explained that large upfront expenses associated with technological innovation may result in lower infrastructure and natural resource investments. On the other hand, some scholars indicated the technology adaptation, IT use, technological advancement, and technological benefits to attain best service behavior (for example, Amin & Islam, 2009; Islam & Amin, 2011; Amin et al., 2012; Azad et al., 2012; Shahneaz et al., 2013; Hoque et al., 2015; Mollah et al., 2024c; Mollah et al., 2025a; Mollah et al., 2025b). Policymakers should adopt specific policies aligned with circular economy (CE) to attain a sustainable supply chain system. They can examine their economic, environmental, social, and governance policies from an integrated perspective, albeit at the expense of natural resources under the process of sustainability.

**Circular Economy**

Any business which is concerned about being green and efficient with its resources must adhere to the principles of the circular economy; in short, CE. The importance of cooperation in promoting circularity has been highlighted by prior research (for example, Amin et al., 2025; Amin et al., 2024; Islam et al., 2024b; Rabbi & Amin, 2024), which underlines the function of intermediates and multilevel collaboration in moving from a linear to a CE. A more sustainable future is what the CE concept is all about. But how well businesses work together to achieve these objectives remains largely unknown. Previously, Danvers et al. (2023) indicated this gap by offering a thorough analysis of circularity and collaboration. Their research presented a novel approach to conceptualize collaboration and circularity, differentiating CE solutions at three stages of the product lifecycle, based on a thorough literature evaluation of 66 scientific papers. It also examines how multilevel cooperation can facilitate the transition from a linear economy to a circular economy, emphasizing the importance of intermediaries as major catalysts.

Notably, organizational learning, stakeholder orientation, and entrepreneurial orientation are key drivers for successful CE implementation, underscoring the importance of environmental

innovation in driving circular economy activities (Saha et al., 2016). In the post-pandemic age, Ul-Durar et al. (2023) investigates the connection between environmental innovation (EI) and the CE. They explored the factors influencing EI in the knowledge environment that underpins CE implementation using a methodical literature review approach. The results indicate that while a relationship with EI is necessary for transformation toward CE, effective growth hinges on the utilization of knowledge resources and orientation dynamics (such as stakeholders, organizational culture, and entrepreneurial intention). The study suggested that a viable substitute for thriving CE and attaining sustainability in regional and international corporate operations might be the CE practices. Since the CE closes energy and material loops and creates value, it is essential to the EU's sustainable development (Ahmed et al., 2025; Gazi et al., 2024e).

However, by selecting the ideal requirements, Kafel & Nowicki (2022) seek to forecast small and medium-sized companies' (SMEs) most efficient CE operations at the macro level. According to the results of a two-stage Delphi research, SMEs require a more circular management system. Two sub-requirements of ISO 14001 were considered: communication and the extent of the CE system. Managerial reviews and internal audits require more research. Reducing the number of raw materials used, encouraging carbon neutrality, and closing the material loop are the most challenging objectives for SMEs. Heras-Saizarbitoria et al. (2023) use a global dataset of sustainability reports from 1367 organizations to assess how businesses disclose information about their CE operations. The study concludes that CE is applied flimsily and reduction statistically, mentioning only 16% of incidents, most of which are connected to traditional methods like recycling and waste management. Fundamental techniques such as reduction, reuse, and remanufacturing are seldom considered. The paper makes recommendations for further study and practical applications for stakeholders, managers, and public policymakers.

The present study indicates that a CE is an international socioeconomic development concept that focuses on conserving resources and lessening its negative effects on the environment. By reducing the movement of resources and energy throughout the economy, it seeks to increase efficiency. Reducing resource wastage and modifying business models are necessary for effective adoption. Actions to foster sustainable development, guarantee sustainable prosperity, and boost innovation are all included in CE. Similarly, Smol & Marcinek (2023) examined the features of the CE model, including its origins, economic impact, and instances of organizations that promote CE implementation in Poland, to implement creative environmental and social solutions in the EU. Overall, embracing the CE model involves reshaping business models, minimizing resource wastage, and fostering innovation for sustainable prosperity.

**Green Service Behavior**

As a dimension of green service behavior (GSB), green extra-role service behavior in organizations refers to employees' voluntary actions that go beyond their formal job requirements to contribute to environmental sustainability. Studies have shown that green HRM practices play a crucial role in influencing employees' extra-role green behaviors, such as behaviors related to employees sharing their knowledge (Gazi et al., 2024f), organizational citizenship behavior (Amin et al., 2019a), and innovative work behavior (Chowdhury et al., 2025; Tanchi et al., 2025; Karim et al., 2023b). In addition, it has been brought to light that green commitment acts as a mediator between green workforce management practices and the in-role and extra-role green service behavior of workers. This emphasizes the significance of encouraging green commitment to improve green behaviors inside firms (Amin et al., 2019b).

These findings underscore the significance of organizational initiatives and leadership styles in promoting employees' voluntary environmentally friendly actions beyond their formal job duties (Song et al., 2025).

Gazi et. al. (2024c) has investigated and established the relationship with organizational initiatives regarding corporate social responsibility and sustainable performance of the environment. The study collected data from the employees who were working in different capacity for several small and medium sized enterprises (SMEs) in Bangladesh to represent their perceptions. The findings of the study indicated that the initiatives related to CSR left a significant impact on the performance of green environmental practices. To quite an extent, green capability and transformational leadership served as the mediators in the above-mentioned relationship. The findings demonstrate that CE has a favorable effect on green behavior both inside and outside of roles, with green role modeling acting as a mediator in the link between GSCM and environmental performance. Employees' views of CSR can lessen the impact of the mediating relationship when green role modeling is used. Based on the findings, businesses ought to endorse managers' green concern and establish CSR policies to promote green behavior both inside and outside of work that contribute to sustainability, environmental protection, and social progress.

The relationship between organizational citizenship behavior for the environment (OCBE) and green human resources management (GHRM) practices is examined by Sarmad et al. (2023), with a focus on the mediating role of green absorptive ability. A paper-pencil survey was used to gather data from 170 middle-tier officers in Pakistan's cement sector. The association between GHRM practices and OCBE was found to be strongly influenced, with green absorptive capacity acting as a partial mediating factor. Islam et al. (2020) investigated how people's green in-role and extra-role actions in manufacturing businesses are affected by ethical leadership. Data was provided by 645 MBA executive students with at least a year of experience. The results demonstrated that green HRM practices, as well as in-role and extra-role green behaviors, were significantly impacted by ethical leadership. The association between both kinds of green behaviors and ethical leadership was mediated by green HRM practices.

Moreover, the relationship between green HRM practices and both kinds of green behaviors was reinforced by individual green values. The United Nations' sustainable development goals are aided by this research. Khalid et al. (2022) examine the factors influencing employee green behavior, including attitudes toward going green, subjective norms, and perceived behavioral control, as well as the moderating effect of perceived organizational support. Structural equation modeling was utilized to collect and analyze data from 720 managers and employees. The findings demonstrated that while perceived organizational support amplifies the beneficial impact of green behavioral intention, employee green attitude, subjective norms, and perceived behavioral control all have an indirect impact on green behavior. In summary, various organizational initiatives (Yu et al., 2024) and leadership styles significantly influence green extra-role service behavior in organizations. Green workforce management, environmental-concerned leadership, green leadership, and perceived organizational support all play critical roles in fostering employees' voluntary environmentally friendly actions beyond their formal job duties.

Green in-role service behavior within organizations encompasses employees' actions that are environmentally friendly and directly related to their job responsibilities. Research has shown that environmentally specific GSB is instrumental in fostering green in-role behaviors among

employees (Elshaer et al., 2023). Additionally, the authors examined green-crafting activities and employees' perceptions of meaningful work to explore the impact of ecologically specific servant leadership on brand citizenship behavior. Utilizing data from a survey of 319 hotel employees, the study tested a dual-moderated mediation model. The findings revealed that servant leadership with an environmental focus significantly enhances employees' perceptions of meaningful work and their green-crafting behaviors. Employee-perceived meaningful work mediates the relationship between green-crafting behavior and servant leadership, while servant leadership itself acts as a mediator between these variables. These results suggest that managers and organizations aiming to bolster sustainability and brand citizenship behavior should heed these insights. The study underscores the pivotal role of servant leadership in promoting meaningful work (Rahman et al., 2025; Rahman et al., 2024) and green-crafting behaviors, both of which influence brand citizenship behavior.

The present study argues that GSCM encourages green-crafting behavior and fosters employee-perceived meaningful work, thereby impacting employee green-concerned behavior. Similarly, Elshaer et al. (2023) highlighted the critical role of environment-focused leadership in advancing sustainability initiatives within organizations. Moreover, other similar studies are also found in various related fields, such as perceived green HRM practices and green commitment (Amin & Salehin, 2021), the relationship between environmental HRM and employees' in-role green service behavior, challenges and importance of organizational green policies and practices in shaping environmentally friendly actions at work (Hosain et al., 2024b). Additionally, environment-focused leadership has been found to significantly enhance employees' voluntary green behavior, with psychological empowerment acting as an influencing factor (Hassan et. al., 2025; Rabbi et. al., 2024). This underscores the importance of empowering employees to make environmentally conscious decisions within their roles (Ashraf et al., 2022).

**Research Framework and Formulation of Hypotheses**

Research on GSCM and CE highlights their crucial roles in achieving sustainability and resource efficiency. GSCM balances environmental and financial performance, with green initiatives mitigating short-term drawbacks and enhancing long-term benefits (Yang et al., 2023; Kamarudin et al., 2023; Zhu, 2022; Hidayat et al., 2022). CE focuses on collaboration, innovation, and efficient resource use, emphasizing the importance of multilevel cooperation and stakeholder orientation for sustainable development (Danvers et al., 2023; Ul-Durar et al., 2023; Kafel & Nowicki, 2022; Heras-Saizarbitoria et al., 2023; Smol & Marcinek, 2023). Additionally, green service behavior in organizations is an environmentally specific employee behavior, underscores the impact of organizational initiatives and leadership styles in promoting voluntary environmentally friendly actions among employees (Sarmad et al., 2023; Islam et al., 2020; Khalid et al., 2022; Elshaer et al., 2023; Ashraf et al., 2022). These studies collectively emphasize the integration of sustainable practices into supply chains, business models, and organizational behaviors to address environmental challenges and enhance overall performance. Therefore, this research proposes the hypotheses below:

***H1:*** *The adoption of CE practices has an influence on green extra-role service behavior (GERS) among employees.*

***H2:*** *The CE practices positively impact green in-role service behavior (GIRS) among employees.*

***H3:*** *Green supply chain management (GSCM) positively influences the adoption of CE practices*

within organizations.

***H4:*** *GSCM positively affects green extra-role service behavior (GERS) among employees.*

***H5:*** *GSCM positively impacts green in-role service behavior (GIRS) among employees*

***H6a:*** *GSCM positively influences the adoption of CE practices, which mediate the relationship between GSCM and green extra-role service behavior (GERS) among employees.*

***H6b:*** *GSCM positively influences the adoption of CE practices, which mediate the relationship between GSCM and green in-role service behavior (GIRS) among employees.*

The connections among GSCM, CE, and Green Service Behavior (GSB) in Bangladesh's private commercial banking sector may be more clearly identified with the use of this complete framework, which is based on well-established theories and empirical data. Based on these development of hypotheses, the researchers of this study developed the research model shown in the following Figure 1, which provides a conceptual framework for the investigation:

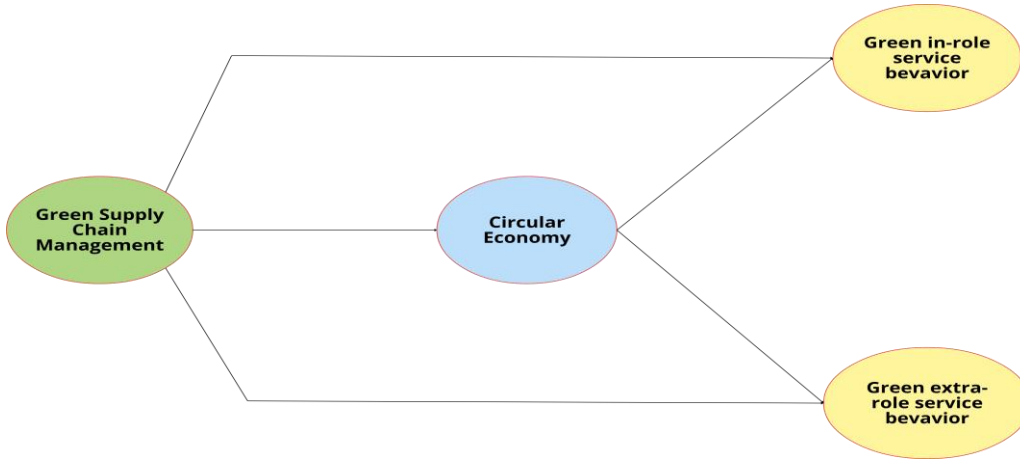


Figure 1. Conceptual Framework

## Methodology

Prior research in the area for each variable was considered while developing assessing scales for this study. Sustainability and efficient use of resources are two goals that GSCM and CE research has shown to be vital in attaining. With the mediating role of CE, GSCM can attain green service behavior (GSB), where GSB has two separate dimensions, i.e., green in-role service behavior (GIRS) and green in-role service behavior (GIRS) (Yang et al., 2023; Kamarudin et al., 2023; Zhu, 2022; Hidayat et al., 2022). CE focuses on collaboration, innovation, and efficient resource use, emphasizing the importance of multilevel cooperation and stakeholder orientation for sustainable development (Danvers et al., 2023; Ul-Durar et al., 2023; Kafel & Nowicki, 2022; Heras-Saizarbitoria et al., 2023; Smol & Marcinek, 2023). Additionally, GSB in organizations, emphasizing the importance of organizational policies and practices, underscores the impact of organizational initiatives and leadership styles in promoting voluntary environmentally friendly actions among employees (Sarmad et al., 2023; Islam et al., 2020; Khalid et al., 2022; Elshaer et al., 2023; Ashraf et al., 2022). These studies collectively emphasize the integration of sustainable practices into supply chains, business models, and organizational behaviors to address environmental challenges and enhance overall performance.

**Sample Characteristics**

The demography of the respondents reveals a diverse profile. In terms of gender, the sample consists of 68% males (267 respondents) and 32% females (128 respondents), indicating a higher representation of males in the study. The age distribution shows that 32% of the respondents are below 30 years old (125 respondents), 34% are between 30-34 years old (134 respondents), 22% are aged 35-39 years (87 respondents), 8% fall within the 40-44 years range (32 respondents), and 4% are 45 years or older (17 respondents). Regarding educational qualifications, the majority hold a bachelor's degree (59%, 234 respondents), followed by those with a master's degree (33%, 132 respondents), and a smaller portion with a Doctorate or higher qualification (7%, 29 respondents). Job experiences data shows that 26% of respondents have less than 2 years of experience (102 respondents), 42% have 2-5 years of experience (167 respondents), 22% have 5-10 years of experience (87 respondents), and 10% have 10 years or more (39 respondents). Finally, the current job level distribution indicates that 28% are in lower-level positions (110 respondents), 56% are in mid-level positions (223 respondents), and 16% are in top-level positions (62 respondents).

| Variables | Categories | Frequency | Percentage |
|---|---|---|---|
| **Gender** | Male | 267 | 68% |
| | Female | 128 | 32% |
| **Age** | Below 30 years | 125 | 32% |
| | 30-34 years | 134 | 34% |
| | 35-39 years | 87 | 22% |
| | 40-44 years | 32 | 8% |
| | 45 years or More | 17 | 4% |
| **Educational Qualification** | Bachelor's degree | 234 | 59% |
| | Master's degree | 132 | 33% |
| | Higher Degree (for example PhD) | 29 | 7% |
| **Job Experience** | Less than 2 years | 102 | 26% |
| | 2 to 5 years | 167 | 42% |
| | 5 to 10 years | 87 | 22% |
| | More than 10 years | 39 | 10% |
| **Current Job Level** | Lower Level | 110 | 28% |
| | Mid-Level | 223 | 56% |
| | Top Level | 62 | 16% |

Table 1: Characteristics of Respondents

Source: Author's Own Creation

**Sample Size**

There is a considerable concentration of commercial banks in whole over all the big cities of Bangladesh, where 395 replies were obtained using in-person data gathering procedures. According to Kline (2023) and Uzir et al. (2025) a minimum of 100 observations are needed for analysis in structural equation modeling (SEM), and a minimum of 200 observations are required for accurate estimates. Both criteria are satisfied by the study's sample size, which guarantees solid and trustworthy findings.

**Data Collection**

Researchers in this research used a rigorous technique to gather data by surveying people in the commercial banking sector of Bangladesh's workforce in person. Consistent data collecting processes were ensured by having trained interviewers deliver the surveys in person. The sampling strategy's overarching goal was to collect responses from a cross-section of these financial firms, reflecting the diversity of their employees and customers. The richness and quality of the data were further enhanced by the in-person survey approach, which allowed for comprehensive explanations and deeper insights into respondents' opinions. Direct communication also helped build connection and trust with the respondents, which might have increased the number of responses and made sure the data was accurate.

## Results

### Measurement Model

In structural equation modeling (SEM), building a measurement model ensures the validity and reliability of the data. Pertinantly, as seen in Figure 1, the conceptual framework incorporates four latent variables, all of which are rather complex and call for a multi-dimensional approach to fully comprehend them. So, to measure each latent variable in the conceptual model, a large number of observed objects have been used. Table 2 provides an exhaustive list of all measurement items along with reliability evaluations for each.

| Constructs | Item Code | Loading | CR | AVE | Cronbach's Alpha |
|---|---|---|---|---|---|
| Circular Economy (CE) | CE1 | 0.825 | 0.931 | 0.707 | 0.931 |
| | CE2 | 0.847 | | | |
| | CE3 | 0.844 | | | |
| | CE4 | 0.837 | | | |
| | CE5 | 0.860 | | | |
| | CE6 | 0.830 | | | |
| | CE7 | 0.841 | | | |
| Green extra-role service behavior (GERS) | GERS1 | 0.734 | 0.902 | 0.667 | 0.900 |
| | GERS2 | 0.844 | | | |
| | GERS3 | 0.842 | | | |
| | GERS4 | 0.847 | | | |
| | GERS5 | 0.802 | | | |
| | GERS6 | 0.826 | | | |
| Green in-role service behavior (GIRS) | GIRS1 | 0.821 | 0.918 | 0.707 | 0.917 |
| | GIRS2 | 0.865 | | | |
| | GIRS3 | 0.869 | | | |
| | GIRS4 | 0.831 | | | |
| | GIRS5 | 0.837 | | | |
| | GIRS6 | 0.820 | | | |
| Green Supply Chain Management (GSCM) | GSCM1 | 0.894 | 0.937 | 0.720 | 0.935 |
| | GSCM2 | 0.879 | | | |
| | GSCM3 | 0.867 | | | |

| | | | | | |
|---|---|---|---|---|---|
| | GSCM4 | 0.816 | | | |
| | GSCM5 | 0.854 | | | |
| | GSCM6 | 0.852 | | | |
| | GSCM7 | 0.773 | | | |

Table 2: Results From the Measurement Model

Source: Author's Own Creation

**Normality Check**

As a statistical technique, the skewness and kurtosis test may be used to find out whether a sample is representative of a normally distributed population. This example deviates from the predefined significance threshold of 0.05, since the calculated p-value (Prob > $x^2$ = 0.0000) is less than that. Because of this, we may conclude that the sample does not follow the expected normal distribution. Therefore, future statistical studies that depend on the assumption of multivariate normality should be approached with care.

The choice to use structural equation modeling (SEM) was taken even though the data did not follow a normal distribution. The versatility and strength of the analytical framework are guaranteed by SEM's ability to handle different kinds of data and their distributions, as pointed out by Kline (2023) and Rahaman et al. (2025).

**Descriptive Analysis**

**Common Method Bias**

This research used the complete collinearity test in addition to the Harman single factor test to reduce the impact of common method bias (CMB). Because of its widespread use in previous studies, the Harman single factor test was chosen because of its well-deserved reputation for being both simple and effective in identifying CMB (Podsakoff et al., 2003; Gazi et al., 2025d). Furthermore, the complete collinearity test was used because of its reputation for detecting CMB with utmost robustness, especially when applied to PLS-SEM (Kock, 2015; Gazi et al., 2025c). The authors found that all latent variables had VIF values less than 4 using this technique. Due to the low collinearity problems shown by VIF values less than 4, this finding shows that CMB did not substantially alter the model. (Hoffmann, 2015, Gazi et al., 2025e).

**Measurement Model Evaluation**

This research used a Confirmatory Factor Analysis (CFA) to assess the convergent and discriminant validity of four constructs: Green Supply Chain Management (GSCM), Green Extra-role Service Behavior (GERS), Green In-role Service Behavior (GIRS), and the Circular Economy (CE). Because of their strong inter-item correlations (>0.5) and high composite reliability (>0.800), these constructs were considered reflective. Computed reliability values for the CFA went beyond the suggested cutoff of 0.7, as shown in Table 2, indicating acceptable results with reliability and validity. According to Hair et al. (2019), there was good convergent validity since the item loadings regularly above 0.75 and the AVE for all variables exceeded the standard criterion of 0.5. Several indices demonstrate a good match to the measurement model. In particular, the R-square values show that CE has a significant amount of explanatory power with 0.674 (adjusted R-square = 0.673), GERS has 0.792 (adjusted R-square = 0.791), and GIRS has 0.671 (adjusted R-square = 0.669). Bentler and Bonett (1980) recommended a cutoff for excellent fit, and the NFI (0.847) is higher than that, with values closer to 1 suggesting better fit.

It is confirmed that the model is adequate according to Hu and Bentler (1999) as the SRMR (0.050) is lower than the suggested threshold of 0.08. Together, these results prove that the model accurately predicted the outcomes. The PLS generated model of this study is graphically shown in Figure 2.

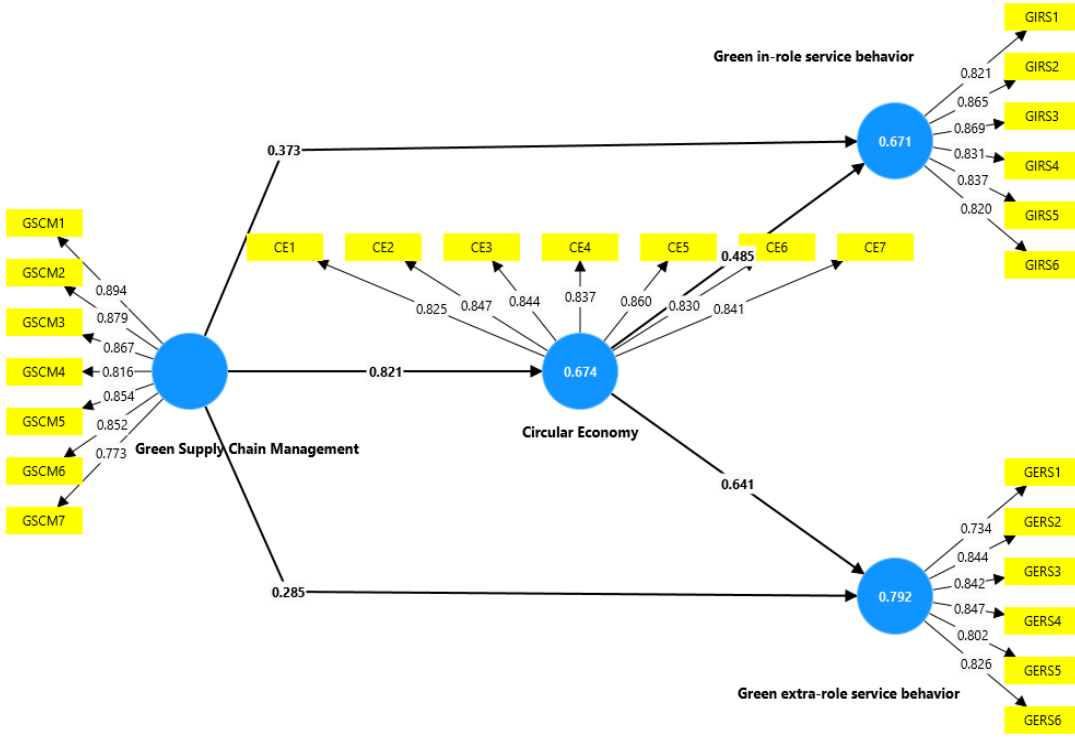


Figure 2. The Estimated Structural Equation Model

**Divergent or Discriminant Validity**

To validate discriminant validity, this research used two well-established methods: the HTMT ratio and the Fornell-Larcker criteria. The square root of each construct's AVE should be greater than the correlation coefficients, as per the Fornell-Larcker criteria (Fornell & Larcker, 1981). Besides, Hessler et al. (2015) indicated that the HTMT ratio, which is regarded as the gold standard for DV evaluation—every latent construct must have an HTMT value lower than 0.90.

The results of the DV evaluation using these approaches are shown in Tables 3 and 4, which show that the latent variables in this research are satisfactorily distinguished. The study's results are more trustworthy since these thorough analyses guarantee the constructs used are resilient and valid.

| | CE | GERS | GIRS | GSCM |
|---|---|---|---|---|
| **CE** | 0.841 | | | |
| **GERS** | 0.875 | 0.817 | | |
| **GIRS** | 0.791 | 0.798 | 0.841 | |
| **GSCM** | 0.821 | 0.811 | 0.771 | 0.849 |

Table 3: Discriminant Validity- Fornell-Larcker Criterion

| | CE | GERS | GIRS | GSCM |
|---|---|---|---|---|
| **CE** | | | | |
| **GERS** | **0.953** | | | |
| **GIRS** | **0.854** | **0.878** | | |
| **GSCM** | **0.878** | **0.883** | **0.830** | |

Table 4: Discriminant Validity- Heterotrait-Monotrait Ratio (HTMT) – Matrix

**Structural Model Evaluation**

Considerations such as VIF, $R^2$, structural path importance, and path coefficient magnitude were used by the writers in their assessment of the structural model. We used VIF to look for multicollinearity, and because the values of all the paths were less than 4, we didn't find any major problems. Using bootstrapping with 5000 subsamples, they were able to ascertain if the route coefficients were statistically significant.

The findings of the hypothesis testing provide a thorough understanding of the interrelationships among the study's many components. Multiple statistical measures are used to assess the strength and significance of the correlations between each construct in each hypothesis. These metrics are used to measure the support for each hypothesis.

**Hypothesis 1 (H1): CE → GERS**

H1 tests whether the Circular Economy (CE) positively affects Green Extra-Role Service Behavior (GERS). The positive path coefficient and a high t-statistic indicate a strong positive relationship. The p-value of 0.000 confirms that this relationship is statistically significant. Additionally, the confidence interval being entirely positive supports the hypothesis. Thus, H1 is supported, showing that CE significantly enhances GERS.

**Hypothesis 2 (H2): CE → GIRS**

H2 examines the impact of the Circular Economy (CE) on Green In-Role Service Behavior (GIRS). The results show a positive path coefficient, a significant t-statistic, and a p-value of 0.000, indicating a statistically significant positive effect. The confidence interval is positive, further supporting the hypothesis. Therefore, H2 is supported, indicating that CE significantly influences GIRS.

**Hypothesis 3 (H3): GSCM → CE**

H3 assesses whether Green Supply Chain Management (GSCM) influences the Circular Economy (CE). The positive path, coefficient and extremely high t-statistics suggest a very strong positive relationship. The p-value of 0.000 confirms statistical significance, and the positive confidence interval supports this relationship. Thus, H3 is supported, demonstrating that GSCM significantly promotes CE.

**Hypothesis 4 (H4): GSCM → GERS**

H4 investigates the effect of Green Supply Chain Management (GSCM) on Green Extra-Role

Service Behavior (GERS). The positive path coefficient, significant t-statistics, and p-value of 0.000 indicate a statistically significant positive effect. The positive confidence interval further supports the hypothesis. Therefore, H4 is supported, showing that GSCM significantly enhances GERS.

**Hypothesis 5 (H5): GSCM → GIRS**

H5 examines the impact of Green Supply Chain Management (GSCM) on Green In-Role Service Behavior (GIRS). The positive path coefficient, significant t-statistic, and p-value of 0.000 indicate a statistically significant positive relationship. The positive confidence interval supports the hypothesis. Thus, H5 is supported, indicating that GSCM significantly influences GIRS.

| **Hypotheses** | **Paths** | **SD** | **T statistics** | **P values** | **Bias-corrected confidence interval** | **Supported** |
|---|---|---|---|---|---|---|
| H1 | CE → GERS | 0.061 | 10.622 | 0.000 | 0.512, 0.747 | Yes |
| H2 | CE → GIRS | 0.077 | 6.331 | 0.000 | 0.328, 0.627 | Yes |
| H3 | GSCM → CE | 0.029 | 27.904 | 0.000 | 0.751, 0.870 | Yes |
| H4 | GSCM → GERS | 0.061 | 4.643 | 0.000 | 0.174, 0.412 | Yes |
| H5 | GSCM → GIRS | 0.074 | 5.047 | 0.000 | 0.235, 0.527 | Yes |

Table 5: Results From Hypotheses Test

This research examined how GSCM, CE, and GSB are interconnected among each other.

**Hypothesis 6a (H6a): GSCM → CE → GERS**

H6a tests the mediating effect of Circular Economy (CE) in the relationship between Green Supply Chain Management (GSCM) and Green Extra-Role Service Behavior (GERS). The positive path coefficient of 0.045 indicates a positive mediated effect. The t-statistics of 11.756 are significantly higher than the common threshold of 1.96, indicating that the hypothesis is accepted or significant. The bias-corrected confidence interval (0.436, 0.610) does not include zero, further supporting the positive mediated relationship. Therefore, H6a is supported, demonstrating that CE significantly mediates the effect of GSCM on GERS.

**Hypothesis 6b (H6b): GSCM → CE → GIRS**

H6b examines the mediating effect of CE in the relationship between GSCM and Green in-role service behavior (GIRS). The positive path coefficient of 0.063 indicates a positive mediated

effect. The t-statistics of 6.347 are significantly greater than 1.96, indicating the relationship is statistically significant. This result's bias-corrected confidence interval (0.276, 0.522) is entirely positive, further supporting the positive mediated relationship. Thus, H6b is supported, showing that CE significantly mediates the effect of GSCM on GIRS.

| **Hypotheses** | **Paths** | **SD** | **T statistics** | **P values** | **Bias-corrected confidence interval** | **Supported** |
|---|---|---|---|---|---|---|
| **H6a** | GSCM → CE → GERS | 0.045 | 11.756 | 0.000 | 0.436, 0.610 | Yes |
| **H6b** | GSCM → CE → GIRS | 0.063 | 6.347 | 0.000 | 0.276, 0.522 | Yes |

Table 5: Specific Indirect Effect

## Discussion

This study contributes significantly to the literature on sustainable management by confirming the crucial role of GSCM and CE practices in shaping GSB among employees. Building on established research demonstrating that GSCM enhances organizational sustainability and financial performance by integrating environmentally friendly practices (Yang et al., 2023; Kamarudin et al., 2023), our findings provide robust empirical support for the hypotheses linking CE practices to heightened levels of both Green Extra-Role Service Behavior (GERS) and Green In-Role Service Behavior (GIRS). These results are consistent with broader scholarly discussions emphasizing CE's capacity to drive resource efficiency and collaboration across various organizational levels (Danvers et al., 2023; Ul-Durar et al., 2023). Moreover, our mediation analyses reveal nuanced pathways through which CE adoption mediates the relationship between GSCM and GERS/GIRS. This underscores the intricate interplay between sustainable supply chain strategies and employee engagement in environmentally responsible behaviors (Elshaer et al., 2023). By illuminating these dynamics, our study not only advances theoretical understanding but also provides practical insights into how organizations can effectively leverage sustainable practices as illustrated by Mahmud et. al. (2023) and Mollah et al. (2024b) to foster a culture of environmental stewardship among employees. This dual benefit—enhancing ecological outcomes while fortifying organizational resilience and performance—is increasingly critical in today's global business landscape, where sustainability imperatives are integral to long-term success and societal relevance. Furthermore, our findings suggest avenues for future research, including exploring the differential impacts of specific GSCM and CE practices on various dimensions of Green Service Behavior and investigating the contextual factors such as industry characteristics and organizational culture represented by Qing et al. (2023) moderates these relationships. Such inquiries can deepen our understanding of the mechanisms through which sustainability initiatives translate into tangible behavioral outcomes within diverse organizational settings. Overall, this study underscores the transformative potential of integrating sustainability into core business strategies, paving the

way for enhanced environmental stewardship and competitive advantage in the pursuit of sustainable development goals.

## Conclusion and Practical Implication

In conclusion, this study illustrates the significant potential of integrating GSCM and CE practices within the commercial banking industry to foster sustainable outcomes. Our findings demonstrate that adopting these sustainable management strategies can positively influence Green Service Behavior among bank employees, including both GERS and GIRS. This indicates a shift towards environmental stewardship within banking operations, driven by a commitment to enhancing environmental performance while maintaining financial stability and customer trust. The synergy between GSCM and CE not only promotes operational efficiency and cost savings but also enhances the reputation of banks as responsible corporate citizens.

These findings carry significant practical implications for commercial banks aiming to integrate sustainability into their business models. Firstly, banks should prioritize the adoption of GSCM principles by promoting sustainable procurement practices, reducing paper waste through digitalization, and investing in energy-efficient technologies for their facilities, instances of which have previously been found in the studies of Rahaman et al. (2023). Secondly, embracing CE practices involves promoting the recycling of materials, offering sustainable finance solutions to clients, and supporting green initiatives in communities served. Thirdly, banks can enhance employee engagement and commitment to sustainability through comprehensive training programs on environmental issues and integrating sustainability metrics into performance evaluations. Practically, policymakers should encourage sustainable banking practices through regulatory frameworks that incentivize green investments, provide tax incentives for sustainable projects, and require banks to disclose their environmental impacts and sustainability efforts. By aligning with global sustainability goals and enhancing their green credentials, commercial banks can strengthen customer loyalty, attract socially responsible investors, and mitigate environmental risks while contributing positively to society's broader sustainability agenda. Ultimately, integrating GSCM and CE practices positions banks as leaders in sustainability, driving long-term profitability and resilience in a competitive financial services landscape increasingly focused on environmental responsibility.

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