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# Exploring The Role of Digital Transformation in Promoting Green Banking Via Environmental, Social, And Governance (ESG) Factors

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**Abstract**

This paper is an investigation of the paramount linking of environmental, social, and governance (ESG) factors and the implementation of green banking activities in the financial sector. As sustainability has been made a priority around the world, banks are incorporating the consideration of ESG in their operations to tackle the burning issues like climatic change, conservation of resources and social equity. The study narrows down and discusses how the environment determines its effect, how social aspects affect the same, and how governance structures contribute towards sustainable banking behaviour. The relationships between ESG factors and green banking adoption were analysed using a comprehensive methodology which entailed the data collection through survey and interviews, and document analysis and Structural Equation modelling (SEM). The results show that environmental factors are the strongest drivers with social and governance factors in the second and third position respectively, but with a unique but interrelated role in promoting green banking practises. These findings are consistent with the available literature, which puts more emphasis on holistic approach to integration of ESG in order to attain sustainability. The research helps to the body of knowledge that exists in regard to green banking and it makes meaningful implications to the policymakers, financial institutions and the stakeholders to develop sustainable development by practising responsible banking. It also gives a basis to the future study to examine the region-specific dynamics, technological advancements, and sustainability results in the banking industry.

**Keywords –** ESG Integration, Green Banking Practices, Digital Transformation

## Introduction

The concept of sustainability has become one of the most important in the contemporary world and globally, as it deals with the necessity of a moderated attitude towards economical development, ecology, and social justice. It highlights the wise exploitation of resources in order to satisfy the current demands without affecting the capacity of future generation to satisfy theirs. Sustainability is no longer a narrow term to the environment issues; it also

includes the social well-being and government structures that promote ethical and just business activities in the industries. With environmental degradation, climate change, and scarcity of resources being major challenges, sustainability has become a global concern with transformative effects in the policies, practises, and expectations of the stakeholders. The global business and industries are currently being encouraged to embrace green practises and show responsibility to their environment, societal and economic effects.

In that regard, the significance of the financial sector cannot be underrated. Banks and other financial institutions are in a unique position to control sustainability in directing their investments and resources at environmentally and socially responsible projects. The growing focus of the world on sustainability has made environmental, social, and governance (ESG) issues central in the debate on defining business and operational practise. The ESG considerations are a systematic direction of evaluation of the effects of the business operations, which are aimed at enhancing long-term stability and compatibility with the global sustainability objectives. Since the financial sector is instrumental in resource distribution and the prosperity of the economy, incorporating the concepts of ESG into the work of banks is one of the main areas of concern (Hidayat, 2018).

Green banking is a sustainability concept that has emerged as an important strategy in ensuring that financial operations are aligned to the environmental and social goals. Green banking aims to achieve the balance between economic performance and sustainable outcomes by overcoming issues like climate change, resource conservation and social equity. It embodies a paradigm change in the banking behaviour as it is no longer focused on its profit-based models, but it becomes more holistic and puts the aspects of environmental conservation, building the community, and ethical governance in its first priorities. This increased focus on green banking underscores the financial industry, as the essential driver of sustainability, a redefiner of the conventional banking system, and an actor in building a sustainable world economy (Gunawan et al., 2022).

This research aims at analysing the correlation between the environment, social and governance (ESG) and the implementation of green banking practises. In particular, it will examine the relationship between environmental determinants and the adoption of green banking, examine the role of the social aspects in the promotion of the adoption of green banking, as well as examine how governance systems can promote the adoption of sustainable banking. These interrelated purposes aim at giving a holistic picture of the key impetuses in the formation of green banking and what it means to the sustainability of the financial sphere.

**Review of literature**

Gonzalez-Ruiz et al. (2024) use bibliometric and scientometric research to define the most important trends and contributors in the field of ESG banking research. They stress the interdisciplinary character of ESG and focus on such aspects as the connexion between ESG and financial performance, geographical variations in integration, and implications of credit risks. The work by Kolk and Perego (2014) provides to the theoretical thought process as it addresses the topic of sustainable bonuses and how they can be used as a tool of corporate

responsibility, whereas Li et al. (2021) discusses the nature of green energy mismatch and its effects on economic growth in China and suggests frameworks that may be used to implement sustainable banking practises. Collectively, these articles highlight the necessity of theoretical and empirical improvements in the concept of ESG integration in the banking industry.

Raval (2024) discusses the concept of the ESG principles and regulations within the banking industry, noting that compliance, transparent reporting, and risk management are some of the challenges. Bose et al. (2018) also put much focus on the aspect of governance factors, which provide the institutional and regulatory factors of determining green banking disclosures and enhancing accountability. Gunawan et al. (2022) point out the ways in which the mechanism of governance factors influences the effectiveness of green banking disclosures in the process of sustainability. Overall, these studies must claim that efficient governance factors frameworks play a crucial role in incorporating the ESG principles in an effective and efficient way and aligning it with the greater sustainability goals.

Chernykh et al. (2024) pay attention to such ESG financing instruments as green bonds and sustainability-linked loans and evaluate their efficiency in the development of the regional infrastructure. The way these initiatives have been used in Indonesia to promote renewable energy and conservation of biodiversity is described by Hidayat (2018) as an example of using green banking. These works show that ESG financing instruments can make a considerable contribution to sustainable regional development in addition to enabling regulatory environmental conditions favourable ment and stakeholder awareness.

Zeb (2024) focuses on how the ESG activities affect the operational efficiency of the Islamic and conventional banks. The paper indicates that the impacts of ESG initiatives are unique because of various operational structures and regulatory standards. Mangla, Goel, and Gupta (2015) address the topic of green banking in India and its opportunities to facilitate sustainability despite the established challenges. These works give information about the effects of ESG on efficiency and performance of different banking models and regions.

Pawar and Munuswamy (2022) examine how green banking efforts affect customer retention, and trust, awareness, and satisfaction are the main variables. Dhingra and Mittal (2014) and Gon and Mititelu (2016) also discuss the topic of CSR in Indian banks and its influence on the relationships with the stakeholders and sustainability. Collectively, these research works demonstrate the need to align green banking operations to customer and societal expectations in order to attain customer and sustainable development.

Paluszak and Wiśniewska-Paluszak (2016) discuss the role of green banking in facilitating sustainability in the industrial networks, with the analysis of its mechanisms that foster responsible actions of stakeholders. Johnson et al. (2020) build on it by simulating the effects of environmental factors mental challenges on the economy on an international scale, and how green banking can respond to the issue of resource depletion and climate change. These papers demonstrate how green banking works on the boundary between industrial and global sustainability.

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Rubel et al. (2021) examine the effects of green human resource management (HRM) practises on the implementation of sustainable behaviours by employees with a focus on green knowledge sharing as a mediator. Zahra and Ayub (2022) study how the green intellectual capital influences green banking, and how the competitive pressure influences this relationship. These studies emphasise the practise of internal organisational practises in the sustainability-oriented behaviours and practises. Depending on the past researches and theoretical premises, the following hypotheses were suggested:

***$H_{a1}$:*** *There is significant impact of environmental factors, mental factors and the adoption of green Banking Practices*

***$H_{a2}$:*** *Social factors significantly influence the adoption and implementation of green Banking Practices.*

***$H_{a3}$:*** *There is significant association between governance factors and green Banking Practices.*

**Research Methodology**

The purpose of the study was to investigate the way the environmental factors (mental, social and governance factors (ESG) factors) relate to the adoption of green banking practises. In a bid to do this, a thorough research approach was used that included aspects such as, sample size, demographics of participants, methods of data collection and tools of analysis. This study involved the use of 300 observations of heterogeneous sample population in the banking industry. Banking officials, stakeholders, and key personnel, including the Chief Sustainability Officer (CSO), Corporate Affairs Director, Head of Risk Management, Head of Compliance, and Head of Human Resources, were also included in the participants. It was done through this diversification representation giving a comprehensive understanding of the different roles and perspectives, making the study more valid and generalizable.

The researcher used a quantitative design, which aimed to measure the connexions between the independent variables (ESG factors) and the dependent variable (green banking practises). The period of data collection was between July 15, 2024, and September 13, 2024, based on surveys and interviews and the analysis of documents. The surveys were sent to the identified participants, and the personnel such as the CSO and Corporate Affairs Director were interviewed specifically. Also, the corresponding documents, reports, and policies regarding the green banking practises were revised to give context and back-up the findings.

Structural Equation Modelling (SEM) was employed to analyse the collected data, which made it possible to investigate the connexion between ESG factors and the green banking practises in more detail. This method was very informative as it provided some understanding of the dynamics and mechanisms that affect the adoption of sustainable practises in the banking industry.

**Table-1 Models Info**

| | |
|---|---|
| Estimation Method | ML |
| Optimization Method | NLMINB |
| Number of observations | 250 |

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| | |
|---|---|
| Free parameters | 72 |
| Standard errors | Standard |
| Scaled test | None |
| Converged | TRUE |
| Iterations | 65 |
| Model | Adoption=~CEASS1+CEASS2+CEASS3+CEASS4+CEASS5+ CEASS6+CEASS7+CEASS8 |
| | Satisfaction =~CS1+CS2+CS3+CS4+CS5+CS6+CS7+CS8 |
| | Service Quality=~SERQ1+SERQ2+SERQ3+SERQ4+SERQ5+SERQ6+ SERQ7 |
| | Satisfaction ~Adoption of green banking practices |
| | Service Quality~Adoption of green banking practices |

The crucial information about the structural equation model (SEM) applied in the research is presented in Table-1, indicating that the model was estimated with the use of the Maximum Likelihood (ML) algorithm and optimised with the help of the NLMINB algorithm, which is appropriate with complex models that may need stable convergence. The data involves 250 observations and the model has 72 free parameters, which means it is a moderately complex structure with various latent variables and paths. The default (standard) method was used to compute the standard errors and no scaled test statistic was used. The model was able to converge after 65 iterations and this indicated that the estimation process had reached a stable and realistic solution. The given measurement model presents Adoption as a latent construct that has to be measured using eight indicators (CEASS1–CEASS8), Satisfaction as another latent construct measured using eight items (CS1–CS8), and Service Quality measured using seven (SERQ1–SERQ7). The structural model also states that Adoption of green banking practises predicts Satisfaction, and Service Quality is another modelled outcome that relates on Adoption. On the whole, this table summarises the estimation conditions of the model, the complexity, the success of the convergence, and the entire framework of latent constructs and the path of causation employed to explore the impact of green banking adoption on customer satisfaction and quality of service.

**Table-2 Model tests**

| **Label** | **$X^2$** | **df** | **p** |
|---|---|---|---|
| User Model | 2848 | 227 | <.001 |
| Baseline Model | 3646 | 253 | <.001 |

Table-2 shows the findings of the chi-square model tests, between the user-specified structural model and the baseline (independence) model to determine the overall model fit. The User Model exudes a chi-square (X 2 ) of 2848 with a degree of freedom of 227 and a significance level of p =.001, which means that the difference between the model-implied covariance matrix and the given data is statistically significant; though in SEM chi-square significance is often significant in large or complex models and does not necessarily mean

poor fit. The Baseline Model that presupposes the absence of relationships between variables gives a significantly higher chi-square value of 3646 with 253 degrees of freedom, also significant at $p < .001$. The fact that the chi-square value of the User Model is significantly less than the chi-square value of the Baseline Model gives reason to believe that the given model is more effective in explaining the data than the model that does not assume any relationships. On the whole, despite the important chi-square values that should have indicated a certain amount of misfit, the relative improvement of the Baseline Model would indicate that the User Model would offer a more meaningful and organised model of the underlying data relationships.

**Table-3 Fit indices**

| | | 95% Confidence Intervals | | |
|---|---|---|---|---|
| **SRMR** | **RMSEA** | **Lower** | **Upper** | **RMSEA p** |
| 0.166 | 0.214 | 0.207 | 0.222 | <.001 |

Table-3 shows some important model fit indices that determine the representation of the proposed structural model on the observed data. Standardised root mean square residual is at 0.166, which exceeds the widely accepted value of 0.08 and thus indicates that the standardised difference between the observed and predicted correlations is quite high and there is a poor fit. RMSEA = 0.214 and this value has a 95% confidence interval of 0.207 to 0.222, a very large value compared to a value of 0.05 to 0.08 which is the typical range of well-fitting models. The value of RMSEA and its confidence interval are high and close to each other, which means that there is no trend of misfit at the possible population values. Also, the p-value of the RMSEA (<.001) which tests the hypothesis that RMSEA 0.05 or below is very significant, that is, the model is not a close fit. All these fit indices together demonstrate that the model has a high degree of deviation of the perfect fit norms, which indicate that the described model is not fitting the data satisfactorily and is possible to revise or re-specify.

**Table-4 User model versus baseline model**

| | Model |
|---|---|
| Comparative Fit Index (CFI) | 0.227 |
| Tucker-Lewis Index (TLI) | 0.139 |
| Bentler-Bonett Non-normed Fit Index (NNFI) | 0.139 |
| Relative Noncentrality Index (RNI) | 0.227 |
| Bentler-Bonett Normed Fit Index (NFI) | 0.219 |
| Bollen's Relative Fit Index (RFI) | 0.129 |
| Bollen's Incremental Fit Index (IFI) | 0.233 |
| Parsimony Normed Fit Index (PNFI) | 0.196 |

Table-4 evaluates the user-specified model against the baseline model on a number of incremental fit indices, all of which are indicative of the extent to which the proposed model fits the data better than a null model where all the variables have no relationship. The Comparative Fit Index (CFI = 0.227) and Relative Noncentrality Index (RNI = 0.227)

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represent pathetic improvement compared with the baseline model, which is way below the acceptable level of 0.90. Equally, the Tucker-Lewis Index (TLLI = 0.139) and the same Bentler-Bonett Non-normed Fit Index (NNFI = 0.139) are severe model misfit values with values near 1 representing good fit and values below 0.80 representing considerable inadequacy. The Normed Fit Index (NFI = 0.219) and the Relative Fit Index used by Bollen (RFI = 0.129) is also significantly lower than it ought to be, which once again indicates that the model is not significantly better than the null model. The Bollen Incremental Fit Index (IFI = 0.233) is also very low, indicating that the model provides a very small incremental explanatory power. Lastly, Parsimony Normed Fit Index (PNFI = 0.196) is also extremely low, meaning that even a complexity-adjusted evaluation of the model is unsatisfactory. In general, all incremental fit indices are consistent and reveal that user model is significantly underperforming compared to the baseline model with very negligible improvement and that the model structure needs to be revised significantly in order to improve theoretical and statistical fit.

**Table-5 Parameters estimates**

| | | | | 95% Confidence Intervals | | | | |
|---|---|---|---|---|---|---|---|---|
| **Dep** | **Pred** | **Estimate** | **SE** | **Lower** | **Upper** | **β** | **z** | **p** |
| Satisfaction | Adoption of green banking practices | 1.556 | 0.327 | 0.916 | 2.20 | 1.006 | 4.76 | <.001 |
| Service Quality | Adoption of green banking practices | 0.861 | 0.218 | 0.434 | 1.29 | 0.592 | 3.95 | <.001 |

Table-5 indicates the parameter estimates with the direct impact of Adoption of green banking practises on two dependent variables, namely, Satisfaction and Service Quality and both of these relationships are statistically significant. The relationship between Adoption and Satisfaction is significant with a value of 1.556 (SE= 0.327) and the 95% conjecture range (0.916 to 2.200) is not zero hence reliable. The coefficient 1.006 is standardised which indicates significant impact and the z-value of 4.76 and p =.001 indicates that the impact is very substantial. Likewise, Service Quality also increases significantly with adoption that has an estimation of 0.861 (SE = 0.218) and confidence interval of 0.434-1.290. The standardised coefficient 0.592 indicates an average-strong positive effect, which is additionally justified by the z -value of 3.95 and p less than 0.001. All in all, the table has made it clear that the greater the green practises of the banking have been adopted, the higher the level of customer satisfaction and perceptions of service quality are, and both of the phenomena are statistically and meaningfully significant.

**Table-6 Measurement model**

| | 95% Confidence Intervals | |
|---|---|---|

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| Latent | Observed | Estimate | SE | Lower | Upper | β | z | p |
|---|---|---|---|---|---|---|---|---|
| Adoption of green banking practices | CEASS1 | 1.0000 | 0.000 | 1.0000 | 1.000 | 0.3977 | | |
| | CEASS2 | 0.5373 | 0.224 | 0.0983 | 0.976 | 0.1787 | 2.399 | 0.016 |
| | CEASS3 | 0.5992 | 0.234 | 0.1412 | 1.057 | 0.1930 | 2.564 | 0.010 |
| | CEASS4 | 0.2514 | 0.198 | -0.1365 | 0.639 | 0.0901 | 1.270 | 0.204 |
| | CEASS5 | -0.0420 | 0.175 | -0.3856 | 0.302 | -0.0167 | -0.240 | 0.811 |
| | CEASS6 | 0.7539 | 0.207 | 0.3483 | 1.160 | 0.3011 | 3.643 | <.001 |
| | CEASS7 | 0.9845 | 0.225 | 0.5438 | 1.425 | 0.3999 | 4.379 | <.001 |
| | CEASS8 | 2.1328 | 0.387 | 1.3735 | 2.892 | 0.6674 | 5.505 | <.001 |
| Satisfaction | CS1 | 1.0000 | 0.000 | 1.0000 | 1.000 | 0.4836 | | |
| | CS2 | 0.3478 | 0.105 | 0.1429 | 0.553 | 0.1918 | 3.326 | <.001 |
| | CS3 | 0.2663 | 0.111 | 0.0478 | 0.485 | 0.1347 | 2.389 | 0.017 |
| | CS4 | 0.1106 | 0.104 | -0.0931 | 0.314 | 0.0589 | 1.064 | 0.287 |
| | CS5 | -0.0272 | 0.101 | -0.2248 | 0.170 | -0.0149 | -0.269 | 0.788 |
| | CS6 | 0.5339 | 0.109 | 0.3205 | 0.747 | 0.2997 | 4.905 | <.001 |
| | CS7 | 1.2165 | 0.151 | 0.9203 | 1.513 | 0.6257 | 8.050 | <.001 |
| | CS8 | 1.3575 | 0.162 | 1.0406 | 1.674 | 0.6831 | 8.396 | <.001 |
| Service Quality | SERQ1 | 1.0000 | 0.000 | 1.0000 | 1.000 | 0.4776 | | |
| | SERQ2 | 0.4943 | 0.135 | 0.2296 | 0.759 | 0.2532 | 3.660 | <.001 |
| | SERQ3 | 0.7335 | 0.156 | 0.4279 | 1.039 | 0.3431 | 4.704 | <.001 |
| | SERQ4 | 1.0058 | 0.164 | 0.6837 | 1.328 | 0.4976 | 6.121 | <.001 |
| | SERQ5 | 0.8012 | 0.155 | 0.4967 | 1.106 | 0.3872 | 5.156 | <.001 |
| | SERQ6 | 0.8166 | 0.143 | 0.5362 | 1.097 | 0.4470 | 5.707 | <.001 |
| | SERQ7 | 1.5587 | 0.200 | 1.1658 | 1.952 | 0.7926 | 7.775 | <.001 |

The results of the measurement model are provided in table-6 which demonstrates the degree of loading of each observed item to its corresponding latent construct- Adoption of green banking practises, Satisfaction, and Service Quality by loading factors, standard errors, confidence intervals, standardised coefficients (2), and level of significance. In the case of Adoption construct, the reference indicator is CEASS1 (loading = 1.00) and some of the items load significantly, including CEASS2 ( = 0.178, p = 0.016), CEASS3 ( = 0.193, p = 0.010), CEASS6 ( = 0.301, p < .001), CEASS7 ( = 0.399, p <.001), and CEASS8 ( = 0.667, p < In the case of Satisfaction factor, CS1 is the fixed reference indicator and CS2 ( 0.192, p < 0.001), CS3 ( 0.135, p = 0.017), CS6 ( 0.300, p < 0.001), CS7 ( 0.626, p < 0.001), and CS8 ( 0.683, p < 0.001) have significant and strong loadings and they are reliable in gauging satisfaction whereas In the case of Service Quality construct, SERQ1 is the reference item and the other indicators (SERQ2- SERQ7) all share strong and statistically significant loading (0.253-0.793 all p <.001) which means that the measurement properties of this latent variable are measured well. Comprehensively, the table indicates that the majority of items are significant and meaningful measures of their intended constructs, and the item of Service Quality has the highest and most consistent factor loadings, Satisfaction has largely strong

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factor loading items with few weak items, and the Adoption items are mixed with strong and weak items.

**Table-7 Variances and Covariances**

| | | | | 95% Confidence Intervals | | | | |
|---|---|---|---|---|---|---|---|---|
| **Variable 1** | **Variable 2** | **Estimate** | **SE** | **Lower** | **Upper** | **β** | **z** | **p** |
| CEASS1 | CEASS1 | 1.15226 | 0.1079 | 0.9407 | 1.364 | 0.8419 | 10.6748 | <.001 |
| CEASS2 | CEASS2 | 1.89397 | 0.1703 | 1.5601 | 2.228 | 0.9681 | 11.1200 | <.001 |
| CEASS3 | CEASS3 | 2.00890 | 0.1809 | 1.6544 | 2.363 | 0.9628 | 11.1053 | <.001 |
| CEASS4 | CEASS4 | 1.67121 | 0.1494 | 1.3783 | 1.964 | 0.9919 | 11.1825 | <.001 |
| CEASS5 | CEASS5 | 1.36833 | 0.1222 | 1.1289 | 1.608 | 0.9997 | 11.2020 | <.001 |
| CEASS6 | CEASS6 | 1.23425 | 0.1128 | 1.0131 | 1.455 | 0.9094 | 10.9399 | <.001 |
| CEASS7 | CEASS7 | 1.10186 | 0.1033 | 0.8994 | 1.304 | 0.8401 | 10.6667 | <.001 |
| CEASS8 | CEASS8 | 1.22600 | 0.1540 | 0.9242 | 1.528 | 0.5546 | 7.9633 | <.001 |
| CS1 | CS1 | 1.69418 | 0.1466 | 1.4069 | 1.981 | 0.7661 | 11.5572 | <.001 |
| CS2 | CS2 | 1.63906 | 0.1451 | 1.3547 | 1.923 | 0.9632 | 11.2962 | <.001 |
| CS3 | CS3 | 1.98536 | 0.1765 | 1.6395 | 2.331 | 0.9819 | 11.2499 | <.001 |
| CS4 | CS4 | 1.81612 | 0.1620 | 1.4986 | 2.134 | 0.9965 | 11.2119 | <.001 |
| CS5 | CS5 | 1.72908 | 0.1543 | 1.4266 | 2.032 | 0.9998 | 11.2033 | <.001 |
| CS6 | CS6 | 1.49376 | 0.1309 | 1.2372 | 1.750 | 0.9102 | 11.4128 | <.001 |
| CS7 | CS7 | 1.18999 | 0.1058 | 0.9826 | 1.397 | 0.6085 | 11.2472 | <.001 |
| CS8 | CS8 | 1.08959 | 0.1002 | 0.8931 | 1.286 | 0.5334 | 10.8699 | <.001 |
| SERQ1 | SERQ1 | 1.55224 | 0.1411 | 1.2757 | 1.829 | 0.7719 | 11.0001 | <.001 |
| SERQ2 | SERQ2 | 1.63586 | 0.1465 | 1.3487 | 1.923 | 0.9359 | 11.1670 | <.001 |
| SERQ3 | SERQ3 | 1.84900 | 0.1662 | 1.5233 | 2.175 | 0.8823 | 11.1269 | <.001 |
| SERQ4 | SERQ4 | 1.41005 | 0.1285 | 1.1581 | 1.662 | 0.7524 | 10.9691 | <.001 |
| SERQ5 | SERQ5 | 1.66907 | 0.1504 | 1.3743 | 1.964 | 0.8500 | 11.0970 | <.001 |
| SERQ6 | SERQ6 | 1.22479 | 0.1109 | 1.0073 | 1.442 | 0.8002 | 11.0398 | <.001 |
| SERQ7 | SERQ7 | 0.65946 | 0.0758 | 0.5108 | 0.808 | 0.3718 | 8.6966 | <.001 |
| Adoption of green banking practices | Adoption of green banking practices | 0.21645 | 0.0736 | 0.0722 | 0.361 | 1.0000 | 2.9401 | 0.003 |
| Satisfaction | Satisfaction | -0.00652 | 0.0664 | -0.1366 | 0.124 | -0.0126 | -0.0982 | 0.922 |
| Service Quality | Service Quality | 0.29815 | 0.0853 | 0.1309 | 0.465 | 0.6500 | 3.4937 | <.001 |
| Satisfaction | Service | 0.28262 | 0.0665 | 0.1522 | 0.413 | 6.4103 | 4.2471 | <.001 |

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Table-7 shows the variances and covariances of all observed and latent variables within the model and offers an idea of the magnitude of specific amounts of variance possessed by each indicator and the extent of common variance between major latent constructs. All the items observed under Adoption of green banking practises (CEASS1 to CEASS8) are significantly varying (p <. 001), estimates range between 1.10 and 2.01, which means that each of these items has high standalone variance, and standardised values ( β ) are also high, which proves that these measures are highly reliable. Likewise, the Satisfaction (CS1 (CS8) items have rather high variances (mostly 0.75 and greater), which is the evidence of consistency in the item performance, and the Service Quality (SERQ1 (SERQ7) items also have high and significant variances, which indicates strong measurement accuracy. The variance estimates of the latent constructs indicate that Adoption has significant variance being 0.216 (p =.003) and Satisfaction has a nonsignificant and close-to-zero variance estimate ( -0.0065, p =.922) indicating that there is significant variability in the underlying construct of Adoption but there is no significant variability in the underlying construct of Satisfaction. Service Quality on the contrary presents a high and significant variance of 0.298 (p < .001) which is healthy variability. Lastly, the covariance of Satisfaction and Service Quality is also substantial ( Estimate = 0.283, p < .001), meaning that there is a strong significant positive relationship between the two latent constructs, which is as expected according to theoretical assumptions that improved service quality is likely to promote customer satisfaction.

**Table-8 Intercepts**

| | | | 95% Confidence Intervals | | | |
|---|---|---|---|---|---|---|
| **Variable** | **Intercept** | **SE** | **Lower** | **Upper** | **z** | **p** |
| CEASS1 | 3.853 | 0.074 | 3.708 | 3.997 | 52.171 | <.001 |
| CEASS2 | 3.418 | 0.088 | 3.245 | 3.591 | 38.718 | <.001 |
| CEASS3 | 3.032 | 0.091 | 2.853 | 3.211 | 33.253 | <.001 |
| CEASS4 | 3.586 | 0.082 | 3.425 | 3.746 | 43.764 | <.001 |
| CEASS5 | 3.853 | 0.074 | 3.708 | 3.997 | 52.172 | <.001 |
| CEASS6 | 3.964 | 0.074 | 3.820 | 4.108 | 53.908 | <.001 |
| CEASS7 | 3.944 | 0.072 | 3.803 | 4.086 | 54.562 | <.001 |
| CEASS8 | 3.677 | 0.094 | 3.493 | 3.861 | 39.184 | <.001 |
| CS1 | 3.582 | 0.094 | 3.398 | 3.766 | 38.158 | <.001 |
| CS2 | 3.733 | 0.082 | 3.572 | 3.894 | 45.339 | <.001 |
| CS3 | 3.430 | 0.090 | 3.254 | 3.606 | 38.218 | <.001 |
| CS4 | 3.805 | 0.085 | 3.638 | 3.972 | 44.652 | <.001 |
| CS5 | 3.892 | 0.083 | 3.730 | 4.055 | 46.892 | <.001 |
| CS6 | 3.984 | 0.081 | 3.826 | 4.143 | 49.270 | <.001 |

| | | | | | | |
|---|---|---|---|---|---|---|
| CS7 | 3.653 | 0.088 | 3.480 | 3.826 | 41.390 | <.001 |
| CS8 | 3.506 | 0.090 | 3.329 | 3.683 | 38.863 | <.001 |
| SERQ1 | 3.590 | 0.090 | 3.414 | 3.765 | 40.104 | <.001 |
| SERQ2 | 3.590 | 0.083 | 3.426 | 3.753 | 43.015 | <.001 |
| SERQ3 | 3.199 | 0.091 | 3.020 | 3.378 | 35.011 | <.001 |
| SERQ4 | 3.462 | 0.086 | 3.293 | 3.632 | 40.067 | <.001 |
| SERQ5 | 3.347 | 0.088 | 3.173 | 3.520 | 37.838 | <.001 |
| SERQ6 | 3.813 | 0.078 | 3.660 | 3.966 | 48.824 | <.001 |
| SERQ7 | 3.578 | 0.084 | 3.413 | 3.742 | 42.558 | <.001 |
| Adoption of green banking practices | 0.000 | 0.000 | 0.000 | 0.000 | | |
| Satisfaction | 0.000 | 0.000 | 0.000 | 0.000 | | |
| Service Quality | 0.000 | 0.000 | 0.000 | 0.000 | | |

Table-8 shows the intercepts of all the observed indicators of the three latent constructs of Adoption of Green Banking Practises (CEASS items), Satisfaction (CS items), Service Quality (SERQ items) and the level of base or average responses when the latent factors are left to take a zero value. The results of all the observed variables indicate statistically significant intercepts (z = 0.001), and z-values are between 33 and 54, which proves that every item has a strong and significant starting point in the measurement model. The CEASS items (3.03 to 3.96) denote that the respondents are mainly moderately in agreement with green banking practise items before the latent factor is considered. Likewise, the Satisfaction items (3.43 to 3.98) demonstrate that the perceptions of satisfaction were fairly high and steady at all eight indicators. The intercepts of the Service Quality items are also strong (3.20 to 3.81), which implies that the respondents have the positive image of service quality at the baseline. The confidence intervals of all items are small, which means that all estimates are accurate. Latent variables, Adoption of green banking practises, Satisfaction and Service Quality on the other hand are set at zero intercepts as is the norm in SEM identification so that any measurement and structural relationship can be meaningfully interpreted. In general, this group of results can be interpreted as high baseline values of all measured indicators, high accuracy of estimates, and good model stability

**Figure-1 Path diagrams**

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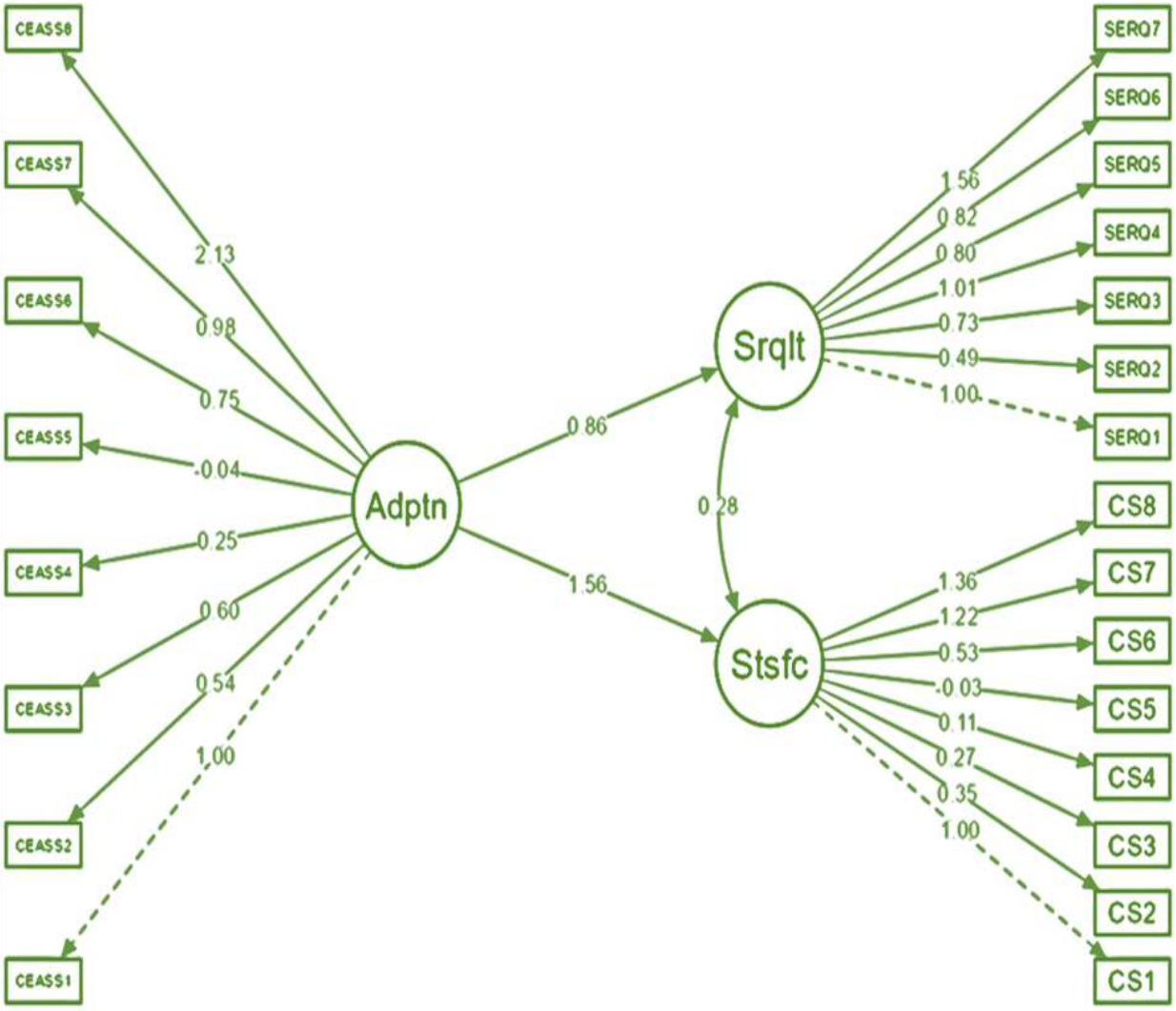


**Discussion and conclusion**

The research sought to investigate the connexion between the adoption of green banking practises and the environmental, social, and governance (ESG) factors. In particular, it attempted to examine the effects of environmental condition on green banking, explore the role of social aspects and examine the relationship between governance aspects and sustainable banking operations. The research results showed that all three dimensions of ESG had a significant impact on green banking practises though some had a stronger effect and attention.

Environmental factors were the most crucial dimension which impacted on adoption of green banking. The results showed that banks that considered environmental concerns like lessening carbon emission, funding renewable energy initiatives and pursuing environmentally friendly policies had higher levels of commitment to sustainable banking. These findings were consistent with the past research, including the approaches of Hidayat (2018), which revealed the significance of environmental stewardship in facilitating green

banking practises, as well as Gunawan et al. (2022), which noted the relevance of environmental disclosures in enhancing sustainability in the banking industry.

The social factors were also critical as far as adoption and implementation of green banking practises are concerned. Banking institutions that were proactive in terms of financial inclusion promotion, community developmental projects and working towards social problems by promoting responsible banking behaviours were observed to align their strategies with the goals of the green banking. These results supported the research of Dhingra and Mittal (2014), who identified the role of social responsibility in Indian banking industry, and Pawar and Munuswamy (2022), who wrote about the impact of the customer trust and satisfaction to the green banking activities.

The governance factors were discovered to modify the green banking practises significantly albeit with a weaker impact. The framework of effective governance through transparency, accountability and ethical decision making helped to integrate the ESG principles into the banking operations. Such results were aligned with the works of Bose et al. (2018), who discussed the effectiveness of the system of governance in improving green banking disclosures, and Raval (2024), who emphasised the significance of governance systems in ensuring the banking operations are consistent with sustainability objectives.

The authors found that environmental factors were the key factor driving adoption of green banking and it was highly necessary that banks should consider environmental stewardship as a core strategy to enhance their sustainability agenda. This was filled in with social factors, which highlighted the need to work with societies, solve social problems in society, and ensure that there is an inclusive development using responsible financial channels. Although the governance factors were fundamental, they were an enabler, which guaranteed accountability and the culture of sustainability in the banking sector. Together, it was found in the study that ESG factors are interrelated in the formation of sustainable banking practises, and that a holistic approach is required to ensure that the ESG factors have the greatest impact.

These results align with those obtained in the previous studies, which underpin the rising significance of the ESG integration in banking. As indicated by Kolk and Perego (2014), Li et al. (2021), and others, meeting environmental and social issues, supported by effective governance systems, is paramount to meeting sustainable development goals. This research paper has a contribution to the literature by giving empirical evidence on how ESG aspects have an impact on green banking practises and presents practical suggestions to policy makers and banking organisations in an effort to create sustainability in the financial industry.

**Study implication**

The results of the study have great implications to the policymakers, banking institutions, stakeholders, and researchers because they bring forth the importance of the inclusion of ESG factors in spearheading the green banking practises. The policymakers are urged to create strong regulatory frameworks and incentives to create environmental stewardship, social responsibility, and good governance in the banking industry and mandatory ESG disclosures to promote transparency and accountability. To propel sustainability goals among the banking

institutions, these institutions should emphasise incorporation of ESG considerations into their strategic decision-making, investing in technologies that are sustainable, support financial inclusivity, and implement ethical and transparent governance frameworks to drive sustainability agenda. To investors and other stakeholders, the research highlights the need to give credit to the banks with good ESG practises by making informed decisions and engaging to promote a culture of accountability and sustainability. These findings can be used to investigate region-specific processes and long-term effects, whereas educational institutions can equip future leaders with the knowledge of ESG principles incorporated into curriculum design. Finally, the paper highlights the importance of the collaborative approach of all stakeholders in order to pursue environmental conservation, social equity, and economic resilience using sustainable banking practises.

**Future scope of the study**

The research provides the future research with opportunities to explore additional grounds of green banking in relation to environmental, social, and governance (ESG) measures. Future research may address region-specific dynamics in order to comprehend how differences in culture, economic, and regulatory factors affect the process of integrating ESG factors in various banking systems. To determine the long-term effect of ESG-oriented practises on the financial performance and sustainability results, longitudinal research could be considered. Also, to see how emerging technologies, including those based on blockchain and artificial intelligence, can improve ESG compliance and green banking initiatives may yield innovative information. The comparative research of all sectors except banking could indicate ways that the ESG principles may be integrated into other sectors to achieve larger and more sustainable objectives. The perception of customers and their behavioural reactions to ESG initiatives may also be studied in future research, providing a more detailed picture of the stakeholder involvement. Besides, it is possible to enlarge the research by including macroeconomic factors, including economic growth or regulatory changes, to determine their effect on adopting green banking practises. The directions will not only add value to the current body of knowledge but will also offer practical measures to stakeholders who would like to promote sustainable financial systems.

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