

Perceived Fossil Fuel Financing Practices and Environmental Sustainability Outcomes Among Bank Employees in Assam: The Moderating Role of Institutional Quality

Sarmistha Das¹, Bidyut Jyoti Bhattacharjee²

¹Department of Commerce, Gauhati University, Guwahati, Assam, India, ²Department of Accountancy, BH College, Barpeta, Assam, India. *Corresponding Author's Email: dsarmistha703@gmail.com

Abstract

This study examines the relationship between Perceived Fossil Fuel Financing Practices (PFFP) and Perceived Environmental Sustainability Outcomes (PESO) among private-sector bank employees in Assam, India, while assessing the direct and moderating role of Perceived Institutional Quality (PIQ). A quantitative, cross-sectional research design was employed using data collected from 100 private-sector bank employees through a structured questionnaire. Climate Risk Awareness (CRA) and Organisational Factors (OF) were incorporated as control variables. The hypothesised relationships were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM). The measurement model demonstrated satisfactory reliability, convergent validity, and discriminant validity. The structural model explained 45.8% of the variance in PESO. The results revealed that PFFP had a significant negative association with PESO ($\beta = -0.298$, $p < 0.001$), supporting H1. In contrast, PIQ showed a positive but statistically non-significant association with PESO ($\beta = 0.180$, $p = 0.134$), while the interaction between PFFP and PIQ was also non-significant ($\beta = 0.080$, $p = 0.276$); hence, H2 and H3 were not supported. CRA and OF exhibited significant positive associations with PESO. The study contributes to sustainable-banking literature by shifting attention from predominantly studied green banking practices toward employees' perceptions of carbon-intensive financing and by providing evidence from the comparatively underexplored Northeast Indian banking context. The findings highlight the relevance of financing practices and internal organisational conditions in shaping perceived environmental sustainability outcomes.

Keywords: Climate Risk Awareness, Environmental Sustainability, Fossil Fuel Financing, Institutional Quality, PLS-SEM, Sustainable Banking.

Introduction

Financial institutions are important in the transition to a low-carbon economy because the allocation of financial resources through their lending, investment and underwriting decisions affects the allocation of financial resources across economic activities. Green banking has thus become a way of integrating environmental concerns into banking activities, lending policies and financial products, so as to minimize environmental impacts and promote sustainable development (1, 2). While the direct environmental impact of banks can be relatively low compared to the environmental impact of carbon-intensive industries, the indirect environmental impact of banks through their financing decisions can be significant (3). While there has been growing focus on environmental, social and governance principles and climate-risk management and sustainable finance, significant financial resources

are still being directed towards fossil-fuel-related activities (4). The promotion of green financial products, however, does not necessarily mean a decrease in financing for carbon-intensive activities (5). Important relationships between banking practices and environmental outcomes have been established in previous studies. Green banking practices, employee green behaviour and top management commitment were important in accounting for environmental performance based on responses received from 460 banking employees in Delhi NCR (6). Indian employee-based studies, however, have largely concentrated on the positive aspects of sustainable banking such as green banking, green finance and employee green behaviour, with comparatively less attention paid to the perceptions of the employees regarding the continuation of carbon-intensive financing (7). Secondary financial data, like syndicated loan

This is an Open Access article distributed under the terms of the Creative Commons Attribution CC BY license (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted reuse, distribution, and reproduction in any medium, provided the original work is properly cited.

(Received 21st July 2026; Accepted 11th October 2026; Published 27th October 2026)

databases and bank disclosures, have also been the primary source of research on fossil-fuel financing. For instance, past study discovered that banks seemed to be factoring climate risks into their loan pricing (8), but significant lending to fossil-fuel companies persisted. This evidence can be useful for understanding real financing patterns, but it does not give much insight into what employees as internal stakeholders think about the financing patterns. The link between financing practices and sustainability can also be affected by institutional conditions (9). New Institutional Economics focuses on the importance of formal rules, regulatory structures and enforcement mechanisms in influencing the behaviour of organisations (10). The empirical evidence shows that good institutional quality can help to support sustainable development and improve the effectiveness of green finance (11). Specifically, institutional quality can enhance accountability, regulatory implementation and financial resource allocation for sustainable activities. But the current research mainly focuses on the country or macroeconomic level of institutional quality (12). The link between employees' perception of the quality of the regulatory environment, its enforcement and accountability and their perception of the environmental sustainability outcomes of banks is relatively less understood. Furthermore, while the positive impact of green finance on sustainable development has been demonstrated (13), its potential to reduce the negative relationship between perceived fossil-fuel financing and perceived environmental sustainability outcomes has been under-researched.

These restrictions highlight a number of interrelated research gaps.

- a) First, research on fossil-fuel financing focuses mainly on objective measures of volumes, pricing and climate-related financial risks, and the perceptions of internal stakeholders are relatively under-researched.
- b) Second, Indian employee-based banking research focuses primarily on good practices for the environment and not on the competing sustainability signal that can be sent by the continued financing of carbon-intensive operations.

- c) Third, the direct and moderating effects of perceived institutional quality on this employee-level relationship are not clear.

- d) Lastly, there is a lack of empirical evidence from Assam and the broader banking landscape in Northeast India.

Stakeholder Theory offers a justification for doing so, as employees are key internal stakeholders who are affected by organisational policies, practices and communication (14). Importantly, employee perceptions should not be taken as objective bank-level financing or environmental performance. Therefore, Perceived Fossil Fuel Financing Practices (PFFP) and Perceived Environmental Sustainability Outcomes (PESO) are not actual volumes of financing or environmental outcomes, but rather perceptions of the respondents. In this study, environmental sustainability outcomes are examined from a perspective of employee perceptions, instead of as an objective measure of environmental performance. PESO should not be viewed as a measure of emissions reduction, environmental impact or bank-level sustainability performance, but rather as the employees' perception of the outcomes of their bank's environmental sustainability efforts. Likewise, Perceived Fossil Fuel Financing Practices (PFFP) measure employees' perceptions of their bank's fossil-fuel financing, not the amount of fossil-fuel loans or verified fossil-fuel financing exposure.

In this context, the overall objective of the study is to study the relationship between PFFP and PESO among the employees of private sector banks in Assam and to evaluate the effect of Perceived Institutional Quality (PIQ) on the relationship between PFFP and PESO. Specifically, the study investigates whether PFFP hurts PESO (H1), if PIQ has a positive effect on PESO (H2), and if the negative relationship between PFFP and PESO is weaker at higher levels of PIQ (H3). Control variables include Climate Risk Awareness and Organisational Factors.

The study is novel in three ways.

- a) First, it focuses on the negative side of carbon-intensive financing, rather than the positive aspects that have been studied so far in green banking.
- b) Second, it brings together fossil-fuel financing and the quality of institutions in a moderated employee-level framework, thus extending the institutional arguments in the realm of green

finance to the potential negative sustainability impacts of fossil-fuel financing.

- c) Third, it offers an employee-centred view from Assam, offering evidence from a relatively under-researched banking context in the Northeast of India.

The conceptual framework in Figure 1 positions PFFP as the principal predictor of PESO and PIQ as both a direct predictor and moderator. CRA and OF are included as control variables. H1 proposes a negative PFFP-PESO relationship, H2 a positive

PIQ-PESO relationship, and H3 that higher PIQ weakens the negative PFFP-PESO relationship.

The framework draws on Signaling Theory, Stakeholder Theory and New Institutional Economics. Financing decisions may signal a bank's environmental priorities; employees are treated as relevant internal stakeholders; and regulatory quality, enforcement and accountability provide the institutional conditions within which financing behaviour occurs (15).

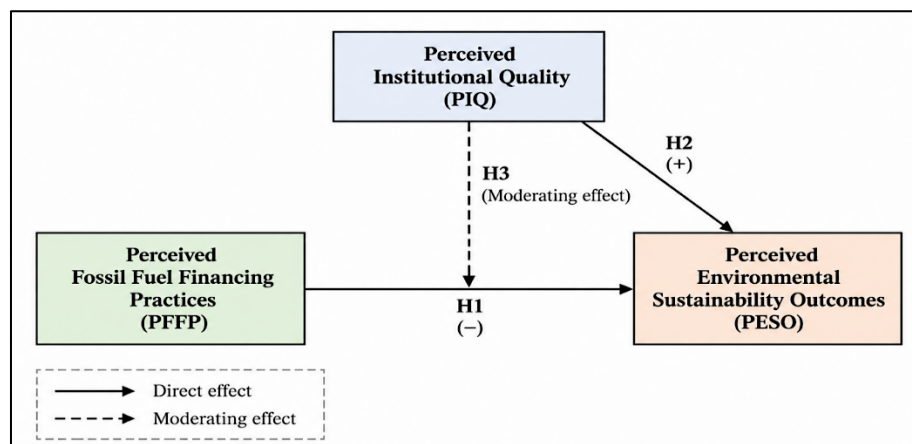


Figure 1: Research Model

Note: PFFP = Perceived Fossil Fuel Financing Practices, PIQ = Perceived Institutional Quality, PESO = Perceived Environmental Sustainability Outcomes, CRA = Climate Risk Awareness, OF = Organisational Factors.

Methodology

The study employed a quantitative, cross-sectional, and explanatory research design. The research process was conducted sequentially. The conceptual framework and hypotheses were formulated based on literature and theoretical background. Second, the study operationalised the constructs of the study (Perceived Fossil Fuel Financing Practices (PFFP), Perceived Institutional Quality (PIQ), Perceived Environmental Sustainability Outcomes (PESO), Climate Risk Awareness (CRA), and Organisational Factors (OF) using a structured questionnaire. The measurement items were developed for the present study based on an extensive review of the relevant literature and the conceptual definitions of the respective constructs. Rather than being directly adopted from a single previously validated scale, the items were formulated by drawing on concepts, dimensions, and measures identified in earlier studies and were contextualised to the banking and sustainable-finance setting. Therefore, the instrument is treated as a literature-informed, study-specific questionnaire. Third,

purposive sampling was done to approach eligible private sector bank employees of Assam and data collection was done by cross sectional survey. Fourth, collected responses were pre-segmented and coded for statistical analysis. Data were analyzed using IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp., Armonk, NY, USA), for descriptive statistics and the assessment of common method bias. SmartPLS 4 (SmartPLS GmbH, Oststeinbek, Germany) was used to assess the measurement model, including indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. Finally, the structural model was assessed with the collinearity diagnostics, coefficient of determination (R^2), effect size (f^2), path coefficients and bootstrapping to test H1-H3, including the moderating influence of PIQ on the relationship between PFFP and PESO. Perceived Environmental Sustainability Outcomes (PESO) were assessed as the perception of the environmental sustainability outcomes that are linked to the activities of their banks. The construct is thus a subjective rather

than objective indicator of environmental performance. PESO was not measured using any bank-level information regarding carbon emissions, bank-financed emissions, energy use, environmental ratings or other independently verified environmental metrics. Therefore, in the empirical analysis, the term PESO will be used specifically to refer to perceived environmental sustainability outcomes.

Participants of the Study

The study was conducted in Assam, Northeast India, geographically located approximately between 24°N–28°N latitude and 90°E–96°E longitude. The study covered employees of private-sector banks with branch operations across Assam, including HDFC Bank, ICICI Bank, Axis Bank, IndusInd Bank, Kotak Mahindra Bank, IDFC First Bank, Federal Bank, South Indian Bank, and RBL Bank. As respondents were recruited from multiple banking locations across the state rather than from a single research site, the geographical coordinate range of Assam is reported to represent the overall study area. Eligible respondents are current employees of these institutions, aged 18 or above. Since the study examines employees' perceptions of fossil-fuel financing and sustainability-related banking practices, attention was given to respondents' professional familiarity with relevant banking activities. The questionnaire included a screening/profile item concerning respondents' visibility into corporate lending decisions. The sampling frame covers branch employees across Assam's principal banking centres, with anticipated concentration in Guwahati as the region's financial hub, supplemented by respondents from district towns including Dibrugarh, Silchar, Jorhat, Tezpur, and Nagaon, to avoid the sample being disproportionately drawn from a single city.

Purposive (judgmental) sampling is employed, given the absence of a complete, publicly available list of individual private-bank employees in Assam from which to draw a random sample. Employees were approached through direct personal contact and email communication. Sampling is deliberately weighted toward roles with plausible exposure to lending and sustainability decisions Branch Operations, Compliance, Credit/Loans, Finance/Accounts, Relationship Management, Risk

Management rather than treating all roles as equally informative respondents, since large fossil fuel financing decisions are typically made at the institutional/corporate banking level rather than the branch level.

Data Collection Procedures

A total of 120 questionnaires were administered during the data-collection process. Following screening for completeness and eligibility, 20 questionnaires were excluded because they were incomplete or did not satisfy the eligibility criteria, resulting in 100 usable responses for the final analysis. Thus, the usable response rate was 83.33% ($100/120 \times 100$), which comfortably exceeds the 10-times rule of thumb for PLS-SEM given the model's maximum of five predictors pointing at PESO. Data are collected via a structured, self-administered questionnaire comprising six sections:

Section A: screening and respondent profile, including role, experience, and visibility into corporate lending decisions;

Section B: Perceived Fossil Fuel Financing Practices (5 items);

Section C: Perceived Institutional Quality (5 items);

Section D: Perceived Environmental Sustainability Outcomes (6 items);

Section E: Climate Risk Awareness (4 items, control variable); and

Section F: Organisational Factors (3 items, control variable).

Sections B through F use a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

Data were analyzed using IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp., Armonk, NY, USA), for descriptive statistics and the assessment of common method bias. SmartPLS 4 (SmartPLS GmbH, Oststeinbek, Germany) was used to assess the measurement model, including indicator reliability, internal consistency reliability, convergent validity, and discriminant validity.

Table 1 summarises the demographic and professional profile of the 100 respondents. The sample includes male and female employees across different age groups, banking functions, and levels of work experience. Credit/Loans, Risk Management, Branch Operations, and Relationship Management are represented among the principal functional roles.

Table 1: Respondent Profile

Variables	Groups	Frequency	Percentage
Gender	Male	54	54.0
	Female	46	46.0
	Total	100	100.0
Age	25-34 years	45	45.0
	35-44 years	32	32.0
	45-55 years	17	17.0
	Above 55 years	6	6.0
	Total	100	100.0
Designation	Branch Operations	30	30.0
	Compliance	9	9.0
	Credit/Loans	21	21.0
	Finance/Accounts	8	8.0
	Relationship Management	13	13.0
	Risk Management	19	19.0
	Total	100	100.0
Work Experiences	Less than 2 years	12	12.0
	2-5 years	25	25.0
	6-10 years	30	30.0
	11-15 years	21	21.0
	More than 15 years	12	12.0
	Total	100	100.0

Table 2 presents the descriptive statistics for the retained indicators of PFFP, PIQ, PESO, CRA, and OF. Mean values generally fall between 3.11 and 3.58, indicating moderate agreement across the

measured items. The standard deviations indicate sufficient response variation for subsequent multivariate analysis.

Table 2: Descriptive Statistics

Construct	N	Mean	Standard Deviation
PFFP1	100	3.24	0.955
PFFP2	100	3.11	0.994
PFFP3	100	3.26	1.031
PFFP4	100	3.15	1.029
PFFP5	100	3.24	1.055
PIQ1	100	3.39	0.942
PIQ2	100	3.42	0.901
PIQ3	100	3.37	0.906
PIQ4	100	3.41	0.911
PIQ5	100	3.49	0.87
PESO1	100	3.29	0.891
PESO2	100	3.37	0.812
PESO3	100	3.43	0.795
PESO4	100	3.36	0.823
PESO5	100	3.43	0.782
PESO6	100	3.39	0.827
CRA1	100	3.58	0.819
CRA2	100	3.52	0.847
CRA3	100	3.56	0.925
CRA4	100	3.55	0.821
OF1	100	3.32	0.931
OF2	100	3.38	0.919
OF3	100	3.4	0.91
Valid N (listwise)	100		

Note: PFFP = Perceived Fossil Fuel Financing Practices, PIQ = Perceived Institutional Quality, PESO = Perceived Environmental Sustainability Outcomes, CRA = Climate Risk Awareness, OF = Organisational Factors.

Results

Table 3 reports indicator reliability and indicator-level collinearity for the five reflective constructs. The outer loadings vary between 0.735 and 0.905, with all being statistically significant ($t = 9.275$ - 47.652). The value of the indicators' VIF ranges

between 1.695 and 3.498, and while PFFP2 (3.122) and PFFP4 (3.498) are above the conservative threshold of 3, they are still below 5. The retained indicators are therefore reliable and do not suffer from problematic indicator-level collinearity.

Table 3: Outer Loadings and Indicator VIF

Construct	B	Standard deviation	T statistics	VIF
CRA1 <- CRA	0.792	0.085	9.373	1.846
CRA2 <- CRA	0.831	0.046	18.194	1.710
CRA3 <- CRA	0.798	0.053	15.161	1.738
CRA4 <- CRA	0.854	0.058	14.725	2.087
OF1 <- OF	0.843	0.034	24.969	1.755
OF2 <- OF	0.861	0.027	31.671	2.018
OF3 <- OF	0.893	0.019	47.652	2.102
PESO1 <- PESO	0.792	0.042	18.943	1.902
PESO2 <- PESO	0.838	0.032	26.445	2.288
PESO3 <- PESO	0.735	0.051	14.341	1.695
PESO4 <- PESO	0.763	0.053	14.358	1.809
PESO5 <- PESO	0.777	0.049	15.687	1.819
PESO6 <- PESO	0.787	0.039	20.011	1.898
PFFP1 <- PFFP	0.838	0.090	9.275	2.475
PFFP2 <- PFFP	0.873	0.077	11.409	3.122
PFFP3 <- PFFP	0.873	0.068	12.803	2.707
PFFP4 <- PFFP	0.905	0.067	13.536	3.498
PFFP5 <- PFFP	0.851	0.078	10.915	2.437
PIQ1 <- PIQ	0.839	0.036	23.571	2.405
PIQ2 <- PIQ	0.860	0.028	30.678	2.446
PIQ3 <- PIQ	0.846	0.027	31.092	2.230
PIQ4 <- PIQ	0.783	0.049	16.116	1.874
PIQ5 <- PIQ	0.835	0.043	19.371	2.476

Note: PFFP = Perceived Fossil Fuel Financing Practices, PIQ = Perceived Institutional Quality, PESO = Perceived Environmental Sustainability Outcomes, CRA = Climate Risk Awareness, OF = Organisational Factors.

Table 4 shows that the internal consistency reliability for the items ranged from 0.833 to 0.919, the rho_A ranged from 0.841 to 0.930 and the composite reliability (rho_C) ranged from 0.891 to 0.939. All values were above the recommended

value of 0.70. Convergent validity was also confirmed as the average variance extracted (AVE) values were between 0.613 and 0.754, which is above the minimum value of 0.50.

Table 4: Reliability Statistics

Construct	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average Variance Extracted (AVE)
CRA	0.838	0.853	0.891	0.671
OF	0.833	0.841	0.900	0.749
PESO	0.873	0.877	0.905	0.613
PFFP	0.919	0.930	0.939	0.754
PIQ	0.890	0.905	0.919	0.694

Note: PFFP = Perceived Fossil Fuel Financing Practices, PIQ = Perceived Institutional Quality, PESO = Perceived Environmental Sustainability Outcomes, CRA = Climate Risk Awareness, OF = Organisational Factors.

The heterotrait-monotrait ratio (HTMT) was used to test discriminant validity as shown in Table 5. The values of the HTMT were between 0.087 and 0.702, which is below the conservative value of 0.85. In addition, none of the 95% bootstrapped

HTMT confidence intervals included the value of 1.00. These results corroborate good discriminant validity between PFFP, PIQ, PESO, CRA and OF. Overall, the results indicate acceptable reliability and validity of the final measurement model, which

can be used for further analysis of the structural model. Common method bias is a potential limitation of the study because PFFP, PIQ, CRA, OF and PESO were all measured with the same self-administered questionnaire and administered to the same respondents. This can be due to the consistency of the answers given by the respondents, the social desirability of the answers or the general perception of the respondents about their organisations, which can affect the estimated relationships between constructs. In order to

address this concern, Harman's single factor test was performed with Principal Axis Factoring. The results indicated that the variance explained by a single factor was 28.006%, which is less than the 50% criterion. This indicates that none of the factors was predominant in the responses. But Harman's test is only a preliminary diagnostic test and does not prove that there is no common method bias. Hence, the estimated relationships should be treated with proper caution.

Table 5: Heterotrait-Monotrait Ratio (HTMT)

Construct	Original Sample (O)	Sample Mean (M)	2.50 %	97.50 %
OF <-> CRA	0.215	0.237	0.101	0.415
PESO <-> CRA	0.424	0.433	0.246	0.629
PESO <-> OF	0.623	0.624	0.484	0.748
PFFP <-> CRA	0.114	0.167	0.099	0.265
PFFP <-> OF	0.087	0.153	0.071	0.294
PFFP <-> PESO	0.269	0.279	0.137	0.446
PIQ <-> CRA	0.442	0.448	0.280	0.609
PIQ <-> OF	0.702	0.703	0.546	0.837
PIQ <-> PESO	0.490	0.494	0.302	0.665
PIQ <-> PFFP	0.286	0.294	0.142	0.473

Note: PFFP = Perceived Fossil Fuel Financing Practices, PIQ = Perceived Institutional Quality, PESO = Perceived Environmental Sustainability Outcomes, CRA = Climate Risk Awareness, OF = Organisational Factors, % = Percentage.

Table 6 shows correlations ranging from -0.242 to 0.613. PESO correlates positively with CRA ($r = 0.369$), OF ($r = 0.539$) and PIQ ($r = 0.448$), and negatively with PFFP ($r = -0.242$). The interaction term has weak correlations with PESO ($r = 0.090$),

PFFP ($r = 0.010$) and PIQ ($r = 0.131$). No correlation is excessively high. Discriminant validity is assessed separately through HTMT, while structural collinearity should be evaluated using inner VIF values.

Table 6: Correlations of Latent Variables

Variables	CRA	OF	PESO	PFFP	PIQ	PIQ x PFFP
CRA	1	0.183	0.369	-0.023	0.387	-0.123
OF	0.183	1	0.539	0.041	0.613	0.045
PESO	0.369	0.539	1	-0.242	0.448	0.09
PFFP	-0.023	0.041	-0.242	1	0.248	0.01
PIQ	0.387	0.613	0.448	0.248	1	0.131
PIQ x PFFP	-0.123	0.045	0.09	0.01	0.131	1

Note: PFFP = Perceived Fossil Fuel Financing Practices, PIQ = Perceived Institutional Quality, PESO = Perceived Environmental Sustainability Outcomes, CRA = Climate Risk Awareness, OF = Organisational Factors.

Table 7: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.840
Bartlett's Test of Sphericity	Approx. Chi-Square	1386.791
	df	253
	Sig.	0.000

Note: PFFP = Perceived Fossil Fuel Financing Practices, PIQ = Perceived Institutional Quality, PESO = Perceived Environmental Sustainability Outcomes, CRA = Climate Risk Awareness, OF = Organisational Factors, df = Degree of Freedom.

Table 7 presents Kaiser-Meyer-Olkin and Bartlett's Test results for the 23 retained items. Because all constructs were measured through the same self-administered questionnaire, common method bias was assessed using Harman's single-factor

diagnostic on the 23 retained items. The KMO value was 0.840, and Bartlett's test was significant (chi-square = 1386.791, $df = 253$, $p < 0.001$), supporting factorability. A one-factor Principal Axis Factoring solution explained 28.006% of total variance,

below the commonly used 50% heuristic. Thus, no dominant single common factor was detected, although Harman's test is only a preliminary diagnostic and cannot establish the complete absence of common method bias.

Table 8 presents Harman's single-factor results for the 23 retained items. The first extracted factor

explains 28.006% of the total variance, which is below the commonly used 50% heuristic. This result suggests that no single factor dominates the covariance among the measured items, although common method bias cannot be ruled out completely.

Table 8: Harman's Single-factor

Factor	Total Variance Explained					
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.050	30.651	30.651	6.441	28.006	28.006
2	4.550	19.783	50.435			
3	2.294	9.973	60.407			
4	1.427	6.204	66.612			
5	0.972	4.228	70.840			
6	0.708	3.080	73.920			
7	0.651	2.830	76.749			
8	0.560	2.435	79.184			
9	0.529	2.298	81.482			
10	0.519	2.255	83.737			
11	0.469	2.039	85.776			
12	0.430	1.869	87.645			
13	0.416	1.810	89.455			
14	0.374	1.627	91.082			
15	0.366	1.592	92.674			
16	0.295	1.284	93.957			
17	0.276	1.202	95.159			
18	0.252	1.098	96.257			
19	0.233	1.013	97.270			
20	0.197	0.856	98.127			
21	0.179	0.777	98.904			
22	0.138	0.599	99.502			
23	0.114	0.498	100.000			

Note: Extraction Method = Principal Axis Factoring.

The structural model was first evaluated in terms of explanatory power, effect sizes and statistical significance of the path coefficients estimated. In addition to the main variables of the model (PFFP and PIQ), the control variables of the model were CRA and OF, and the interaction term PFFP × PIQ was used to examine the moderating effect of institutional quality. This specification is in line with the conceptual framework, where PIQ is

suggested to function as an independent predictor and as a moderator of the PFFP–PESO association. Table 9 reports the coefficient of determination for PESO. The model explains 45.8% of the variance in PESO ($R^2 = 0.458$), with an adjusted R^2 of 0.429. This indicates meaningful in-sample explanatory power for the combined effects of PFFP, PIQ, CRA, OF, and the PFFP × PIQ interaction.

Table 9: Coefficient of Determination

Endogenous construct	R-square	R-square adjusted
PESO	0.458	0.429

Note: PESO = Perceived Environmental Sustainability Outcomes.

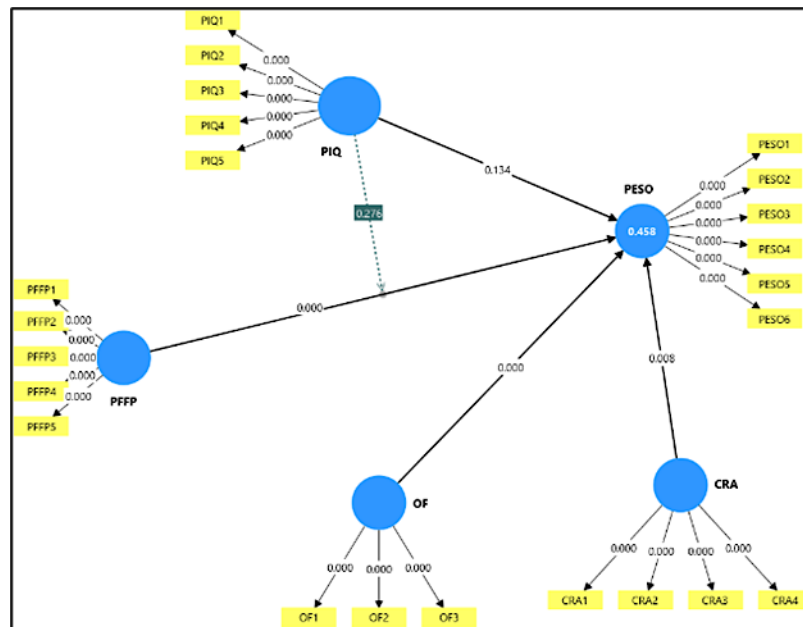


Figure 2: Path diagram (Adapted from SmartPLS 4, GmbH, Oststeinbek, Germany)

Note: PFFP = Perceived Fossil Fuel Financing Practices, PIQ = Perceived Institutional Quality, PESO = Perceived Environmental Sustainability Outcomes, CRA = Climate Risk Awareness, OF = Organisational Factors.

The model explains 45.8% of the variance in PESO ($R^2 = 0.458$; adjusted $R^2 = 0.429$), indicating meaningful explanatory power from PFFP, PIQ, CRA, OF and the PFFP $\times$ PIQ interaction.

Figure 2 presents the estimated PLS-SEM path model. The diagram displays the structural relationships among PFFP, PIQ, PESO, CRA, and OF, together with the interaction term used to test

moderation. The corresponding path coefficients and significance tests are reported in Table 10.

Table 10 reports the estimated structural path coefficients, standard deviations, t-statistics, p-values, and effect sizes. PFFP has a significant negative association with PESO, whereas the direct PIQ effect and PIQ $\times$ PFFP interaction is not statistically significant. CRA and OF show significant positive associations with PESO.

Table 10: Path Coefficients

Relationship	β	SD	t	p	f^2	Interpretation
CRA $\rightarrow$ PESO	0.230	0.086	2.662	0.008	0.077	Significant positive
OF $\rightarrow$ PESO	0.395	0.106	3.744	0.000	0.174	Significant positive
PFFP $\rightarrow$ PESO	-0.298	0.071	4.196	0.000	0.147	Significant negative
PIQ $\rightarrow$ PESO	0.180	0.120	1.499	0.134	0.028	Positive, not significant
PIQ $\times$ PFFP $\rightarrow$ PESO	0.080	0.073	1.088	0.276	0.011	Moderation not significant

Note: PFFP = Perceived Fossil Fuel Financing Practices, PIQ = Perceived Institutional Quality, PESO = Perceived Environmental Sustainability Outcomes, CRA = Climate Risk Awareness, OF = Organisational Factors, SD = standard Deviation, t = t-value, p = p-value.

Table 11 reports the PLS_predict Assessment of Perceived Environmental Sustainability Outcomes. PFFP has a significant negative association with PESO ($\beta = -0.298$, $t = 4.196$, $p < 0.001$; $f^2 = 0.147$). PIQ is positive but non-significant ($\beta = 0.180$, $t = 1.499$, $p = 0.134$; $f^2 = 0.028$), and the PIQ $\times$ PFFP interaction is also non-significant ($\beta = 0.080$, $t = 1.088$, $p = 0.276$; $f^2 = 0.011$). CRA ($\beta = 0.230$, $p = 0.008$; $f^2 = 0.077$) and OF ($\beta = 0.395$, $p < 0.001$; $f^2 = 0.174$) are significant positive controls. Accordingly, H1 is supported, whereas H2 and H3 are not supported.

In addition to assessing the explanatory power of the structural model, PLSpredict was employed to examine its out-of-sample predictive performance. As shown in Table 11, Q^2 predict values for all six PESO indicators were positive, ranging from 0.163 to 0.273, indicating predictive relevance for the endogenous construct indicators. For instance, the PLS-SEM RMSEs ranged from 0.698 to 0.765, whereas the Root Mean Square Errors of the Linear Model benchmark ranged from 0.754 to 0.842. Likewise, the PLS-SEM Mean Absolute Error values varied between 0.552 and 0.603, while the Linear Model benchmark values varied between 0.607

and 0.673. Together, these findings show the structural model also has out-of-sample predictive relevance for PESO and that it performs relatively

well across the six indicators compared to the linear-model benchmark.

Table 11: PLS_Predict Assessment of Perceived Environmental Sustainability Outcomes

Indicator	Q ² predict	PLS-SEM RMSE	PLS-SEM MAE	LM RMSE	LM MAE
PESO1	0.273	0.765	0.598	0.839	0.666
PESO2	0.267	0.700	0.552	0.789	0.619
PESO3	0.174	0.726	0.603	0.794	0.667
PESO4	0.163	0.759	0.602	0.842	0.673
PESO5	0.212	0.698	0.564	0.754	0.607
PESO6	0.248	0.723	0.571	0.805	0.647

Note: PFFP = Perceived Fossil Fuel Financing Practices, PIQ = Perceived Institutional Quality, PESO = Perceived Environmental Sustainability Outcomes, CRA = Climate Risk Awareness, OF = Organisational Factors, RMSE = Root Mean Square Error, MAE = Mean Absolute Error, LM = Linear Model benchmark.

Discussion

The results should be interpreted at the perceptual level of environmental performance, not the objective level. PFFP does not report on the actual amount of fossil fuels being financed, and PESO does not reflect actual environmental performance. Rather, both constructs reflect employees' perceptions of their banks' financing practices and environmental sustainability outcomes. Employees who perceived greater involvement of their banks in fossil-fuel financing

also reported less favourable perceptions of environmental sustainability outcomes. It should not be taken as proof that the sampled banks are objectively worse environmental performers.

Table 12 summarises the hypothesis-testing results. H1 is supported because PFFP has a statistically significant negative association with PESO. H2 and H3 are not supported because neither the direct effect of PIQ nor the PIQ × PFFP interaction reaches statistical significance.

Table 12: Hypothesis Testing

Hypothesis	Relationship	β	t	p	Decision
H1	PFFP → PESO	-0.298	4.196	<0.001	Supported
H2	PIQ → PESO	0.180	1.499	0.134	Not supported
H3	PIQ × PFFP → PESO	0.080	1.088	0.276	Not supported

Note: PFFP = Perceived Fossil Fuel Financing Practices, PIQ = Perceived Institutional Quality, PESO = Perceived Environmental Sustainability Outcomes, CRA = Climate Risk Awareness, OF = Organisational Factors, t = t-value, p = p-value.

H1 suggested that PFFP negatively influences PESO. The results support H1, as PFFP had a significant negative effect on PESO ($\beta = -0.298$, $t = 4.196$, $p < 0.001$). That is, workers with more negative perceptions of their banks' fossil fuel financing report worse perceptions of their banks' environmental sustainability results. This is in line with earlier studies which found that bank financing decisions are significantly related to environmental performance and climate-related issues (16, 17). For Signaling Theory (18), ongoing financing of carbon-intensive activities could be a signal to employees that the bank's core financing decisions are not fully in line with its environmental commitments. Therefore, despite the implementation of green banking programs by banks, continued fossil fuel financing could generate mixed messages about banks' sustainability agenda.

The discovery also builds on the existing green banking literature based on employees. Previous research has primarily focused on positive sustainability practices like green banking, green finance, management commitment and employee green behaviour (19). This study provides another lens on the issue of carbon-intensive financing, as it explores employees' perceptions of carbon financing. The outcome must be interpreted as a relationship between employee perceptions, however. PFFP is not a measure of independent fossil fuel lending, and PESO is not a true indicator of banks' environmental performance (20). Thus, the results are not conclusive proof that specific banks are causing worse environmental results.

H2 proposed that perceived institutional quality (PIQ) has a positive effect on PESO. The coefficient was positive ($\beta = 0.180$), but not statistically significant ($t = 1.499$, $p = 0.134$). Thus, support for

H2 was not given. The quality of institutions has been found to have positive effects on sustainable development and the effectiveness of green finance in the past (21). The results of this study, however, are derived from employee perceptions of regulatory quality, enforcement and accountability, while the results reported in the literature are largely based on country-level institutional measures. The lack of a significant result may be due to this difference in level of measurement. The results thus indicate that macro-level institutional effects are not necessarily assumed to be the same at the employee-perception level (22).

H3 suggested that the negative effect of fossil fuel financing is being mitigated by PIQ. The interaction coefficient was positive but not significant ($\beta = 0.080$, $t = 1.088$, $p = 0.276$), and had a very small effect size ($f^2 = 0.011$). So, H3 was not supported. The positive coefficient is in the hypothesised direction, but there is not enough evidence to support the hypothesis that institutional quality moderates the negative PFFP–PESO relationship. This is in contrast to evidence that indicates that institutional quality can enhance the role of green finance in sustainable development (23). It is possible that strong institutions can enable sustainable finance without altering the negative perceptions of continued carbon-intensive financing amongst employees (24). Future studies may focus on institutional mechanisms instead of institutional quality as a general concept, for example, climate-disclosure requirements, environmental lending standards, supervisory practices and climate-risk regulation.

The control variables offer some additional information. CRA was positively correlated with PESO ($\beta = 0.230$, $p = 0.008$) and OF was even more strongly correlated with PESO ($\beta = 0.395$, $p < 0.001$). The findings indicate that the perception of environmental sustainability outcomes is related not only to financing practices, but also to awareness of climate risks and organisational conditions. This is consistent with the general sustainable-banking literature that indicates that organizational and employee-related aspects can be linked to environmental outcomes, in addition to formal green banking practices (25). A recent study of employees in India has also shown the importance of employee and organizational factors in the context of banks' environmental performance (26, 27).

In general, the findings do not fully support the proposed theoretical relationships. The strong negative association between PFFP and PESO reinforces the importance of financing practices in relation to employees' sustainability perceptions, and the nonsignificant PIQ and interaction effects highlight the need to be careful in assuming that better perceived institutional conditions lead to better perceived sustainability outcomes or buffer the perceived impacts of fossil-fuel financing (28). The results should thus be understood perceptually. Future research could combine employee responses with objective measures like fossil-fuel lending exposure, financed emissions, climate-related disclosures, and bank-level ESG measures to assess whether the perceptual relationships found here align with actual environmental and financing results. In general, the results indicate that Signaling Theory is applicable as perceived carbon-intensive financing is correlated with less favourable perceptions of environmental sustainability (29). They also help to illustrate the importance of employees' perceptions of banks' financing and sustainability practices in an employee-centred application of Stakeholder Theory (30). Concurrently, the results validate the hypothesized role of institutional quality, which was neither a strong predictor nor a moderator in this sample. The promotion of green products should therefore be accompanied by the management and communication of the banks' carbon exposure from financing activities from a practical point of view (31). Environmental lending policies, climate-risk training, transition-risk procedures and organisational support can assist in better aligning financing practices with sustainability goals (32). The non-significant results for the PIQ should not be interpreted as evidence that regulation is not important; it simply means that a significant direct or moderating effect was not found in the current sample.

Conclusion

This study aimed to understand the relationship between perceived fossil fuel financing practices and perceived environmental sustainability outcomes among private-sector bank employees in Assam and the direct effect of perceived institutional quality or the moderating effect of perceived institutional quality on

this relationship. The results thus suggest that, when looking at institutional quality and sustainability outcomes from the perspective of employee perceptions, such macro-level institutional relationships should not be taken for granted. Overall, this study contributes to the sustainable-banking literature in two ways. First, it explores the under-researched carbon side of bank financing, and second, it brings employees as internal stakeholders into the fold for the relationship between financing practices and sustainable outcomes. There are several limitations of the study. While employee perceptions are important internal-stakeholder data, they do not necessarily reflect actual bank-level financing or environmental performance. Future studies might then integrate data on fossil-fuel lending, financed emissions, climate disclosures, ESG indicators, and other objective environmental-performance indicators from the banks with employee survey data. Another restriction relates to the reliance on one source of data. All constructs were assessed using a self-reported questionnaire at a single time point. As a result, the observed relationships could be partially due to common response tendencies and not to the independent relationships between financing practices, institutional conditions and sustainability outcomes. While Harman's single factor test did not uncover any common factor, common method bias cannot be ruled out completely. Future research could include employee surveys on sustainability reporting, climate disclosure and bank-level lending information. Third, the sample of employees of the private sector banks in Assam is limited, which reduces its generalisability. Multi-state comparisons and public sector, private sector, cooperative and foreign banks could thus be included in future studies. Finally, future studies could further break down PIQ into regulatory quality, enforcement effectiveness, accountability, and climate-specific regulatory pressure. This could be especially relevant as country-level studies have shown institutional quality to be associated with the effectiveness of green finance, while the overall measure of the employees' perceptions of institutional quality had no direct or moderating impact. Lastly, although included as controls, CRA and OF were significant predictors. Future studies could expand their roles and

examine if organisational factors are intervening between the institutional influence and the interpretation of fossil-fuel financing or if fossil-fuel financing awareness is influencing organisational factors.

Abbreviations

CRA: Climate Risk Awareness, HTMT: Heterotrait-Monotrait Ratio, OF: Organisational Factors, PESO: Perceived Environmental Sustainability Outcomes, PFFP: Perceived Fossil Fuel Financing Practices, PIQ: Perceived Institutional Quality, PLS-SEM: Partial Least Squares Structural Equation Modelling, VIF: Variance Inflation Factor.

Acknowledgement

The authors acknowledge the respondents who voluntarily participated in the study.

Author Contributions

Sarmistha Das: Conceptualisation, Methodology, Data Collection, Formal Analysis, Writing - Original Draft, Bidyut Jyoti Bhattacharjee: Supervision, Validation, Writing - Review and Editing. All authors have read and approved the final manuscript.

Conflict of Interest

The authors declare no competing interests.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to appropriate confidentiality considerations.

Declaration of Artificial Intelligence (AI) Assistance

Generative artificial intelligence tools were used for language refinement, grammatical improvement, and assistance with manuscript organisation during preparation and revision. The authors independently reviewed, verified, and revised the AI-assisted content and take full responsibility for the accuracy, integrity, interpretation, and final content of the manuscript. AI tools were not listed as authors and were not used as substitutes for the authors' scholarly judgement.

Ethics Approval

Formal ethics review board clearance was not obtained for this study. The research involved a voluntary, non-interventional questionnaire

survey of adult private-sector bank employees. Participation was voluntary, confidentiality and anonymity were maintained, and no sensitive personal, medical, or personally identifiable information is reported in the manuscript.

Funding

The authors declare that no funding was received for this research.

References

- Ruzzenenti F, Hubacek K, Gabbi G. In the fight against climate change, did the financial sector cut secular ties with the oil industry or merely camouflage them? *Cleaner Production Letters*. 2023;4:100040. doi:10.1016/j.clpl.2023.100040
- Thapliyal K, Gupta C, Jindal P, Mishra AK. Measuring the impact of green banking practices on banks' environmental performance and sources of green financing: a study on Indian banks. *Discover Sustainability*. 2025;6(1). doi:10.1007/s43621-024-00678-5
- Sethi L, Behera B, Sethi N. Do green finance, green technology innovation, and institutional quality help achieve environmental sustainability? Evidence from the developing economies. *Sustainable Development*. 2023;32(3):2709–2723. doi:10.1002/sd.2811
- Demetriades E, Politsidis PN. Bank lending to fossil fuel firms. *Journal of Financial Stability*. 2025;76:101349. doi:10.1016/j.jfs.2024.101349
- Harris WL, Wonglimpiyarat J. The United Nations Sustainable Development Goal 13: Climate action and efforts of UK banks toward a low-carbon economy? *International Journal of Innovation and Technology Management*. 2024;21(07). doi:10.1142/s0219877024500536
- Aracil E, Nájera-Sánchez J, Forcadell FJ. Sustainable banking: A literature review and integrative framework. *Finance Research Letters*. 2021;42:101932. doi:10.1016/j.frl.2021.101932
- Thornton J. Sustainable finance and the banks. *Economia Internazionale / International Economics*. 2025;78(2):179–208. doi:10.65644/eie.078.02.0179
- Reghezza A, Altunbaş, Y, D'Acri CR, Marqués-Ibáñez D, Spaggiari M. Do banks fuel climate change. *RePEc: Research Papers in Economics*. 2021. doi:10.2866/825242
- Dhiman K, Jain N. Green banking practices and environmental performance: unravelling the mechanisms through moderation and mediation. *Information Discovery and Delivery*. 2026;1–14. doi:10.1108/idd-04-2025-0094
- North DC. Institutions, institutional change and economic performance. In Cambridge University Press. 1990. doi:10.1017/cbo9780511808678
- Freeman RE, McVea J. A stakeholder approach to strategic management. *SSRN Electronic Journal*. 2001. doi:10.2139/ssrn.263511
- Sun X, Meng Z, Zhang X, Wu J. The role of institutional quality in the nexus between green financing and sustainable development. *Research in International Business and Finance*. 2024;73:102531. doi:10.1016/j.ribaf.2024.102531
- Othman AHA. Carbon Footprints of Bank Loans and Economic Activities' Carbon Dioxide Emissions: Insights from Advanced Economics. *Research Square*. 2023. doi:10.21203/rs.3.rs-3035490/v1
- Wu Q, Bianchi E. Can innovation and institutional quality unlock green finance potential? Lessons from the OECD 'S Path to Sustainable Development. *Sustainable Development*. 2026;34(4):5785–5816. doi:10.1002/sd.70648
- Brüggemann T, Lueg R. Bank Responses to Physical and Transition Risks in lending: A Diagnostic framework from a Systematic Literature review. *Business Strategy and the Environment*. 2025;35(1):195–212. doi:10.1002/bse.70176
- Mursalov M. Regulation of Banking Activities is an Important Tool for Stimulating Green Investments: Case by Selected Upper Middle-Income Countries. *Financial and Credit Activity Problems of Theory and Practice*. 2025;5(64):11–24. doi:10.55643/fcaptp.5.64.2025.4877
- Chandran R, Chandran MCS, Achuthan K, Sahib PR. Theoretical perspectives on green banking adoption in India: regulatory uncertainty, institutional barriers, and policy solutions. *Discover Sustainability*. 2025;6(581). doi:10.1007/s43621-025-01406-3
- Spence M. Job market signaling. *The Quarterly Journal of Economics*. 1973;87(3):355–374. doi:10.2307/1882010
- Li S, Pan Z. Climate transition risk and bank performance: Evidence from China. *Journal of Environmental Management*. 2022;323:116275. doi:10.1016/j.jenvman.2022.116275
- Hummel K, Laun U, Krauss A. Management of environmental and social risks and topics in the banking sector - An empirical investigation. *The British Accounting Review*. 2020;53(1):100921. doi:10.1016/j.bar.2020.100921
- Fichera L, Galletta S, Mazzù S. Climate Transition challenges: Exploring credit portfolio misalignment in European banks. *Business Strategy and the Environment*. 2025;34(8):10118–10130. doi:10.1002/bse.70128
- Kleimeier S, Viehs M. Pricing carbon risk: Investor preferences or risk mitigation? *Economics Letters*. 2021;205:109936. doi:10.1016/j.econlet.2021.109936
- Muchiri MK, Erdei-Gally SK, Fekete-Farkas M. Green Banking Practices, Opportunities, and Challenges for Banks: A Systematic Review. *Climate*. 2025;13(5):102. doi:10.3390/cli13050102
- Upadhyay R, Kurmi MK. Green Banking in India: A Step Towards Sustainable Development. *International Journal of Multidisciplinary Research in Arts, Science and Technology*. 2025;3(8):201–213. doi:10.61778/ijmrast.v3i8.166

25. Ohri BK, Devi P. Green Banking in India: Examining Drivers, Practices, and Environmental Performance in Banking Sector. Zenodo. 2026;5(2). doi:10.5281/zenodo.18851051
26. Gan J. New insights into how green innovation, renewable energy, and institutional quality shape environmental sustainability in emerging economies. *Frontiers in Environmental Science*. 2025;13. doi:10.3389/fenvs.2025.1525281
27. Dinu V, Dragoş CM, Mare C, Dragoş SL, Mare R. Economic and institutional determinants of environmental health and sustainability: Spatial and nonlinear effects for a panel of worldwide countries. *Oeconomia Copernicana*. 2024;15(1):195–227. doi:10.24136/oc.2915
28. Perera V, Nanayakkara M, Maduraraperuma W. Green Finance, Policy Uncertainty, and Corporate Environmental Performance: Institutional Pathways in Developed Markets. *F1000Research*. 2026;15:805. doi:10.12688/f1000research.179271.1
29. Gao X, Fan M. The role of quality institutions and technological innovations in environmental sustainability: Panel data analysis of BRI countries. *PLoS ONE*. 2023;18(6):e0287543. doi:10.1371/journal.pone.0287543
30. Martini F, Sautner Z, Steffen S, Theunisz C. Climate Transition Risks of Banks: Evidence from Syndicated Loan Books. *SSRN Electronic Journal*. 2023;23-66. doi:10.2139/ssrn.4551735
31. Phu Do TT, Hong HTH, Thi D. Green finance, natural resources, and environmental quality in Asia: the moderating role of institutional quality. *International Journal of Sustainable Energy*. 2025;44(1);2553082. doi:10.1080/14786451.2025.2553082
32. Rickman J, Falkenberg M, Kothari S, Larosa F, Grubb M, Ameli N. The challenge of phasing out fossil fuel finance in the banking sector. *Nature Communications*. 2024;15(7881). doi:10.1038/s41467-024-51662-6

How to Cite: Das S, Bhattacharjee BJ. Perceived Fossil Fuel Financing Practices and Environmental Sustainability Outcomes Among Bank Employees in Assam: The Moderating Role of Institutional Quality. *Int Res J Multidiscip Scope*. 2026;7(4):1817-1830. DOI: 10.47857/irjms.2026.v07i04.014460