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Green Banking Performance Evaluation Index and its Application in the Indian Banking Sector

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ABSTRACT

The study aims to propose an index that can be used to measure green performance of banks. The study explores the green performance of 40 Indian banks for 10 years using the proposed index. Further, it compares the Green Banking Performance of Indian banks (both public and private). The index is developed using Content Analysis and Equal Weighted Scoring Approach. Independent t–test is used to compare Green Banking performance of public and private banks. The proposed index is named Green Banking Performance Evaluation Index (GBPEX). It has 99 variables, 14 sub-dimensions, and 6 dimensions. Top three performers are Yes Bank Limited, IndusInd Bank Limited and HDFC Bank Limited. During the study period, overall, public sector scored better in 7 years than its counterpart; however, individually private banks performed best each year. Results indicate that statistically material distinction doesn't exist between Green Banking performances of both sectors of banks. As far as the authors are aware, this appears to be the first study in the literature wherein an index is proposed for measuring Green Banking performance. The study's outputs stand significant for banks as it offers a Green Banking performance measuring tool and a Green Banking performance scorecard for the Indian banks.

1. Introduction

Sustainable development and environmental conservation are the two recognized pillars of reducing damages inflicted by mankind on Earth (Institute for Development and Research in Banking Technology, 2013). It is important that the financial community, including the banking sector to make sure that their investment and lending decisions are made after environmental screening and risk assessment are done

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(Lindenberg & Volz, 2016). As such, environmental performance of financial institutions is crucial in protecting the environment and in reaching sustainable development goals (Liu, 2024).

Green Banking can be understood as the promotion of environment-friendly practices that help banks to manage environmental risks and reduce carbon footprint (State Bank of Pakistan, 2017). Banks embracing Green Banking practices have the opportunity to appeal to eco-minded customers and investors who are seeking to harmonize their values with their financial decisions (Jain & Sharma, 2023).

Green Banking stands at a dissimilar level in different nations. The reason behind the differing amount of progress is that banks residing in different nations adopt different Green Banking initiatives, and try to adhere to varied Green Banking policies. This makes it hard to quantify and relate the efforts of banks across the globe towards the environment. The present study thus tries to develop an instrument to address the above gap by offering an index that measures environmental performance of the banking community. Also growing relevance of sustainability concerns in the banking community necessitates an extensive study of performance measurement of banks about their green activities. Keeping in view the following, the present research evaluates the green/ environmental performance of the Indian banking sector. This study contributes to emergent literature by offering a tool for measuring green performance of banks and gives important insights into the green performance of Indian banks.

2. Theoretical Background and Research Gap

In the process of the world going green, banks are in charge of promoting green transformation and hence their performance in the environmental front becomes important (Lapinskiene & Danileviciene, 2023). Green performance of a bank can be understood as the effect of a bank's operations on natural environment (Aslam & Jawaid, 2022). In global context, individual guidelines on Green Banking have been framed by various nations like Green Credit Guidelines introduced by The China Banking Regulatory Commission (The China Banking Regulatory Commission, 2012); Directive for managing Environmental and Social risks by State Bank of Vietnam (State Bank of Vietnam, 2015); Green Banking guidelines by State Bank of Pakistan (State Bank of Pakistan, 2017), etc. Individual researchers have also developed models for banks of their own nations like Rimi (2016) proposed Green HRM model for the banks in Bangladesh. However, no standardized Green Banking performance measuring tool exists that can be used globally. Absence of a standardized reporting guideline has caused variation in disclosures by banks about their Green Banking activities worlwide (Hossain *et al.,* 2016). This calls for the need to develop a tool that can measure green performance of banks and can be used globally.

Measuring the green performance of banks is very essential. Few studies have been found which have measured and compared green performance of banks like the study conducted by Leonard (2014) that compared the green performance of Connecticut and New York Green banks. Similar study is conducted for

banks in Bangladesh (Rahman & Barua, 2016). In Indian context, only one study is spotted where they used a case study approach to explore annual reports of 9 Indian banks about their Green Banking initiatives.

But no study could be found that has measured Green Banking performance of Indian banks. Sarma & Roy (2021) stated that the least explored dimension in Green Banking literature is "Green Performance of Banks" (only 3% of total studies). Rationale behind the scanty number of research articles on the dimension "Green Performance of Banks" is that there exists no yardstick against which banks can measure their green performance. This study tries to fill up the above research gaps by focusing on developing a tool for measuring Green Banking performance and thereby examining the Green Banking performance of Indian banks.

3. Research Objectives

The study aims to:

a. Propose an index to assess Green Banking performance.
b. Find out the highest scoring and lowest scoring Indian Banks with respect to Green Banking.
c. Conduct a comparative analysis of green performance among India's public and private banking sectors.

4. Materials, Methods and Approach

This section details out the methodology used in the study, including sampling, data sources and data analysis.

Objective A

Data Sources: In the first objective for creating the index, literatures across 19 different portals accessible to the authors are surveyed using keywords that would help locate studies on Green Banking performance. The keywords used are:

i. **Research Papers:** Green Banking Index, Green Bank Index, Green Banking Performance Index, Green Bank Performance Index, Green Banking Disclosure Index, Green Bank Disclosure Index, Green Performance of Banks, Green Banking Framework, Green Bank Framework, Green Banking Performance, Green Bank Performance, and Environmental performance of banks.
ii. **Reports and Projects:** Green Banking Guideline, Green Banking Regulations, Green Banking Framework, Green Banking Policies, Green Banking and Name of the nation, Green Bank and name of the nation, Green Banking, and name of a group of nations, Green Bank and name of a group of nations.

A total number of 24 articles were found in various portals as tabulated in Table 1.

Data Analysis: Content Analysis is used to identify and categorize the dimensions, sub-dimensions, and variables from the available literatures. The content analysis technique is a method of codifying the text of a piece of writing into various groups (or categories) based on a chosen criterion (Weber, 1988). In this study, from the 24 relevant literatures using the content analysis technique, the variables and sub-dimensions are spotted.

Table 1: Articles per Portal

Portals	Number of Articles		Total
	Paper	Reports	
Emerald	1	0	1
Springer	1	0	1
SSRN.com	0	1	1
Google Scholar	5	16	20
Total	8	17	24

Source: Authors' compilation

Objectives B and C

Time Period Chosen: The period chosen for analysing the green performance of Indian banks is 10 years starting from 2009-2010 to 2018-2019. The time frame was chosen considering the SEBI's guideline on Business Responsibility Report (BRR) which was introduced in 2012 from when, for the first time banks started reporting on their environmental activities (SEBI, 2012). Prior to that for 3 years, that is from 2009-2010 to 2011-2012 there was no regulation on sustainability. From 2012-2013 to 2014-2015, BRR reporting was made mandatory for 100 companies based on market capitalization and from 2015-2016 onwards, the regulation was made mandatory for the top 500 companies in India (Sustainability Reporting Standards Board, 2024). Thus, an attempt is made to capture the performance of banks starting from the period without any sustainability regulation to a time period when the scope of the regulation was widened.

Sampling: Judgemental Sampling Technique is used to choose the sample banks. The sample includes Indian public sector banks and private sector banks that are registered before 31st March 2009 (considering the time period chosen for the study) and whose annual reports are available online for the selected period. Table 2 states the sample banks for the study.

Data Sources: Data about environmental activities of banks are collected from their annual reports. Annual Report is a vital document for a corporation and they help a commercial bank in communicating financial and non-financial information to the stakeholders (Hawashe, 2015). There are 40 banks, and their green performance was analyzed for 10 years, and hence a total of 400 annual reports were examined thoroughly for the study.

Data Analysis: For the purpose of collecting data, research instrument used is Content analysis. Content analysis can be understood as a method for deriving appropriate inferences from texts by codifying the texts

and for spotting trends over a long period of time (Krippendorff, 2004; Berelson, 1952). Index method of Content Analysis is used which helps to checks for the presence or absence of information using particular words, in this case, it helps to locate the items of the index in the annual reports of banks (Haniffa & Cooke, 2005).

Table 2: Banks Chosen for the Study

Public Banks	Public Banks	Private Banks	Private Banks
SBI and its Associate Banks	Indian Bank	Axis Bank Ltd.	Karnataka Bank Ltd
Allahabad Bank	Indian Overseas Bank	Catholic Syrian Bank Ltd	Karur Vysya Bank Ltd
Andhra Bank	Oriental Bank of Commerce	City Union Bank Ltd.	Kotak Mahindra Bank Ltd
Bank of Baroda	Punjab National Bank	DCB Bank Ltd	Lakshmi Vilas Bank Ltd
Bank of India	Punjab & Sind Bank	Dhanlaxmi Bank Ltd	Nainital Bank Limited
Bank of Maharashtra	Syndicate Bank	Federal Bank Ltd	RBL Bank Ltd
Canara Bank	Union Bank	HDFC Bank Ltd	South Indian Bank Ltd
Central Bank of India	United Bank of India	ICICI Bank Ltd	Tamilnad Mercantile Bank Ltd
Corporation Bank	UCO Bank	IndusInd Bank Ltd	Yes Bank Ltd
Dena Bank	Vijaya Bank	Jammu & Kashmir Bank Ltd.	
IDBI Bank Ltd			

Source: Authors' compilation

For comparing the green performance between public sector banks and private sector banks, Two Sample t-test is used. The following hypothesis is put to test in this study:

H_a: Mean GBPEX scores do not differ significantly across public and private sector banks

5. Formation of the Index

Index formation is discussed in 3 parts, the first part involves formation of the sub-dimensions and dimensions, second part involves identifying the variables and the third part involves scoring the index.

The variables of the proposed index, Green Banking Performance Evaluation Index (GBPEX) measure different aspects of Green Banking. The identified variables are allocated to different sub-dimensions based on conceptual similarity and functional relationship. The sub-dimensions are identified from existing literatures. The sub-dimensions are further allocated to broader dimensions to ensure clarity in the index. The proposed index, GBPEX is exhaustive, compared to Green Banking Disclosure Index (GBDI) of Bangladesh, the only other index found in existing literature on Green Banking. GBPEX has defined dimensions, and sub-dimensions, unlike GBDI and additionally has 77 new variables as compared to GBDI. The present study considers all past works of literature available and accessible online to the authors to develop the index. Thus, the proposed index is robust, theoretically grounded and contextually relevant for assessing Green Banking performance.

5.1. Sub-Dimensions Identification and Formation of Dimensions

The process of identifying sub-dimensions starts with reading the 24 literatures (as mentioned in Table 1) and then clubbing sub-dimensions having similar nature under one category. The sub-dimensions are an elaborative categorization of bank's environmental practices.

First sub-dimension 'Green Finance and Investments' mainly cover banks' green lending decisions and green financial products. The second sub-dimension involves measuring the green initiatives, maintaining accounts, budgeting and auditing all the green initiatives of a bank. This sub-dimension is hence named 'Accounting of Green Initiatives'. The third sub-dimension relates to the collection and management of data, reporting of green initiatives and disclosure of information in various bank reports/websites, or any other medium. This sub-dimension is titled 'Disclosure and Reporting Practices'. The fourth sub-dimension 'Green marketing and Green CSR' incorporates the bank's interaction with the society about their green image, green CSR (Green Corporate Social Responsibility), and their association with environment-oriented NGOs, etc. The next sub-dimension is titled 'Capacity Building of Stakeholders'. It involves initiatives of banks that educate their employees about Green Banking, create social awareness among different stakeholder groups using seminars, workshops, conferences, etc. The sixth sub-dimension 'Green Awards and Recognition' refers to green rewards, certificates, or any other recognition if received by the bank or any other stakeholder(s) to whom the bank is closely attached, for their environment-friendly activities. The seventh sub-dimension is 'Recruitment and Responsibility'. This dimension is all about how human resources of a bank are recruited, trained, directed, motivated, and evaluated so that they all act environment-friendly. The eighth sub-dimension is 'Office for Green Banking'. This sub-dimension caters to the setup required in the operations of a bank for managing green activities of banks like a separate department or a committee. The ninth sub-dimension 'Paperless Mode of Operations' covers all activities that are done without using paper like electronic transactions, digital payment modes, and other technologies that help cut the use of paper. The tenth sub-dimension 'Green Building and Infrastructure' embraces those green initiatives of banks which are related to making the physical infrastructure of bank environment–friendly like green branches, etc. The eleventh sub-dimension 'Resource Usage and Measurement' focuses on energy savings of banks, optimum utilisations of resources in banks and minimizations of wastage in bank premises. The twelfth sub-dimension 'Planning and Policies' includes guideline, policy, strategy, rules, regulations, or any other legislation being made at the level of an individual bank about Green Banking. The thirteenth sub-dimension 'Green Supervision and Inspection' covers initiatives of banks wherein it evaluates its clients, and customers about their compliance with environmental regulations, and requirements. The last and the fourteenth sub-dimension titled 'Environmental Risk Management' discuss the risks faced by the banks against the environment. It involves environment risk management strategies, creating environmental risks checklists, monitoring of environmental risks continuously, etc.

After identification of the sub-dimensions, the sub-dimensions are clubbed together into some common categories to form the dimensions. The categorizations of the different sub-dimensions into dimensions, along with the literatures from which the sub dimensions are taken are tabulated below:

Table 3: Framework Showing Six Dimensions and their Sub-Dimensions

Name of Dimension	Name of Sub – Dimension	Literatures
D_1: Accounting and Finance	SD_1: Green Finance and Investments	Julia & Kassim (2019); Lindenberg & Volz (2016); Bangladesh Bank (2013); Bergooa & Sims (2018); Institute for Development and Research in Banking Technology (2013); United Nations Environment Programme (2016); Alexander (2016); The China Banking Regulatory Commission (2012)
	SD_2: Accounting of Green Activities	Lindenberg & Volz (2016); Institute for Development and Research in Banking Technology (2013); United Nations Environment Programme (2016); Alexander (2016); State Bank of Pakistan (2017); Bergooa & Sims (2018)
	SD_3: Disclosure and Reporting Practices	The China Banking Regulatory Commission (2012); Bangladesh Bank (2013); United Nations Environment Programme (2016); State Bank of Pakistan (2017)
D_2: Marketing, Awards, and Capacity Building	SD_4: Green Marketing and Green Corporate Social Responsibility	Julia & Kassim (2019); Bangladesh Bank (2013)
	SD_5: Capacity Building of Stakeholders	Julia & Kassim (2019); The China Banking Regulatory Commission (2012); Bangladesh Bank (2013); State Bank of Pakistan (2017); United Nations Environment Programme (2016); Bergooa & Sims (2018)
	SD_6: Green Awards and Recognition	Adhikary (2012)
D_3: Green Human Resource Management	SD_7: Recruitment and Responsibility	Rimi (2016); Lindenberg & Volz (2016); The China Banking Regulatory Commission (2012); State Bank of Pakistan (2017)
	SD_8: Office for Green Banking	Lindenberg & Volz (2016); The China Banking Regulatory Commission (2012); State Bank of Pakistan (2017)
D_4: Mode of operations	SD_9: Paperless Mode of Operations	Lindenberg & Volz (2016); Bangladesh Bank (2013); State Bank of Pakistan (2017); Institute for Development and Research in Banking Technology (2013)
	SD_{10}: Green Building and Infrastructure	Lindenberg & Volz (2016); Bangladesh Bank (2013); Institute for Development and Research in Banking Technology (2013); Bergooa & Sims (2018); State Bank of Pakistan (2017)
	SD_{11}: Resource Usage and Measurement	State Bank of Pakistan (2017); Lindenberg & Volz (2016); Bergooa & Sims (2018)
D_5: Planning, Policies, and Supervision	SD_{12}: Planning and Policies	Julia & Kassim (2019); The China Banking Regulatory Commission (2012); Bangladesh Bank (2013); Alexander (2016); United Nations Environment Programme (2016); Institute for Development and Research in Banking Technology (2013); Bangladesh Bank (2013)
	SD_{13}: Green Supervision and	The China Banking Regulatory Commission (2012); United Nations Environment Programme (2016); State Bank of

	Inspection	Pakistan (2017)
D_6: Risk Management	SD14: Environmental Risk Management	Julia & Kassim (2019); Lindenberg & Volz (2016); State Bank of Pakistan (2017); The China Banking Regulatory Commission (2012); Bangladesh Bank (2013)

Source: Authors' compilation

In table 3, D_1=Dimension 1, D_2= Dimension 2 …. D_6= Dimension 6; SD_1 = Sub-dimension 1, SD_2= Sub-dimension 2… SD_{14}= Sub-dimension 14

Table 3 denotes the six dimensions of the index and sub-dimensions allotted according to their nature. The dimensions are titled according to the sub-dimensions covered under it. Dimension 1 is named as 'Accounting and Finance' for covering three sub-dimensions related to financing of green initiatives of the banks, accounting of those green initiatives and lastly reporting and disclosing those green initiatives. Dimension 2 is named as 'Marketing, Awards, and Capacity Building' for covering the sub-dimensions related to marketing of green initiatives taken up by banks, building capacity of the stakeholders about Green Banking and lastly documenting the awards received for green initiatives. Dimension 3 is titled 'Green Human Resource Management' for covering those green initiatives of the banks that are directed towards human resource management of the banks, namely covering the following two sub-dimensions: recruitment done in an environment friendly manner and responsibility fixed for green initiatives, and the official set up required for establishing Green Banking in the organization. Dimension 4 is named 'Mode of Operations' covering the sub-dimensions in which banks imbibe green initiatives in their operations starting from the paperless mode of operations, the green building and the environment friendly infrastructure and lastly, the optimum utilization of resources of the banks. Dimension 5 is named 'Planning, Policies and Supervision' for covering those planning initiatives and policies framed for Green Banking and for supervision and inspection activities undertaken in the bank to look into the implementation of Green Banking. The last dimension 'Risk Management' covers those entire initiatives banks take up for managing the risks arising from environmental issues.

5.2. Variables Identification and Categorization

The variables identified from the 24 literatures are allocated to different sub-dimensions based on their characteristics. In the first step, a total of 230 variables is identified. Overlapping variables are identified and removed. Finally, a total of 99 variables is finalized for the index. The number of variables and sub-dimensions against each dimension is tabulated below (table 4), and the name of the variables is stated in the full index below in table 6.

Table 4 denotes the scores and the number of sub-dimensions against each of the dimensions. Dimension 1 has 3 sub-dimensions under it and a total of 29 variables under it. Dimension 2 has 3 sub-dimensions and 13 variables under it. Dimension 3 has 2 sub-dimensions and 10 variables under it. Dimension 4 has 3 sub-dimensions and a total of 26 variables under it. Dimension 5 has 2 sub-dimensions and 12 variables under it.

Dimension 6 has 1 sub-dimension and a total of 9 variables under it. Cumulatively, there are 6 dimensions, 14 sub-dimensions and 99 variables in the proposed index.

Table 4: Variables and Sub-Dimensions against each Dimension

Dimensions	Number of Sub-Dimensions	Number of Variables
D_1: Accounting and Finance	3	29
D_2: Marketing, Awards, and Capacity Building	3	13
D_3: Green HRM	2	10
D_4: Mode of Operations	3	26
D_5: Planning, Policies, and Supervision	2	12
D_6: Risk Management	1	9
Total	14	99

Source: Authors' compilation

5.3. Scoring Mechanism

An Equal Weighted Scoring Approach has been opted for the index which is named Green Banking Performance Evaluation Index (GBPEX). Simple weights are being assigned, that is if a particular variable is detected in a particular year, then a score of 1 is assigned and if the variable is not present, a score of 0 is assigned. The advantage of using an Equal Weighted Scoring Method is the ability to stay away from biases (Hawashe, 2015). This approach assumes that every variable of the index are equal and thus carries equal weightage. Sinc, Equal Weighted Scoring Approach assigns equal weightage to various items, it is more suitable for new concepts like Green Banking, that are still getting developed. The process for calculating scores for the GBPEX is diagrammatically presented below in figure 1:

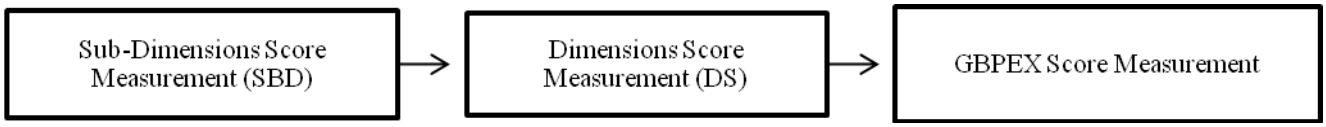


Figure 1: Scoring Process of the Index

Figure 1 depicts the process of calculating the scores in the index. It begins with calculating the scores of the sub-dimensions by spotting the variables in banks published yearly reports. After sub-dimensions are scored, they are cumulated together in order to find the scores of the 6 dimensions. The totals of scores of all the dimensions make the total GBPEX score for each bank in a year.

Calculation of Scores for GBPEX: Green Banking Performance Evaluation Index (GBPEX) is a cumulative score of all 6 dimensions. The formula for calculating the GBPEX score for each bank is stated below:

$$GBPEX = \sum_{i=1}^{6} D_i$$

Where, GBPEX= Green Banking Performance Evaluation Index score, D_i = Dimension Score, D_1= Score of Dimension 1 (Accounting and Finance), D_2= Score of Dimension 2 (Marketing, Awards and Capacity Building), D_3= Score of Dimension 3 (Green HRM), D_4= Score of Dimension 4 (Mode of Operations), D_5= Score of Dimensions 5 (Planning, Policies, and Supervision), D_6= Score of Dimension 6 (Risk Management)

Dimension Score Measurement: Each of the dimensions is a summation of the total scores of the sub-dimensions under it. The formulae for calculating the dimensions scores along with the sub-dimensions under each of the dimensions are defined below:

$$D_1 = \sum_{j=1}^{3} \text{SDj}$$

Where, D_1= Dimension 1 Score, SD_j= Sub-Dimensions scores, Sub Dimension 1 = Green Finance and Investments, Sub Dimension 2 = Accounting of Green Activities, Sub-Dimension 3= Disclosure and Reporting Practices

$$D_2 = \sum_{j=4}^{6} \text{SDj}$$

Where, D_2= Dimension 2 Score, SD_j= Sub-Dimensions Scores, Sub-Dimension 4= Green Marketing and Green Corporate Social Responsibility, Sub-Dimension 5= Capacity Building of Stakeholders, Sub-Dimension 6= Green Awards and Recognition

$$D_3 = \sum_{j=7}^{8} \text{SDj}$$

Where, D_3= Dimension 3 Score, SD_j= Sub-Dimensions Scores, Sub-Dimension 7= Recruitment, and Responsibility, Sub-Dimension 8= Office for Green Banking

$$D_4 = \sum_{j=9}^{11} \text{SDj}$$

Where, D_4= Dimension 4 Score, SD_j= Sub-Dimensions Scores, Sub-Dimension 9= Paperless Mode of Operations, Sub-Dimension 10= Green Building and Infrastructure, Sub-Dimension 11= Resource Usage and Measurement.

$$D_5 = \sum_{j=12}^{13} \text{SDj}$$

Where, D_5= Dimension 5 Score, SD_j= Sub-Dimension Scores, Sub-Dimension 12= Planning and Policies, Sub-Dimension 13= Green Supervision and Inspection.

$$D_6 = \sum_{j=14}^{14} \text{SDj}$$

Where, D_6= Dimension 6 Score, SD_j= Sub-Dimension Score, Sub-Dimension 14= Environmental Risk Management

Sub-dimension Score Measurement: There are 14 sub-dimensions. Each of the sub-dimensions will attain a maximum score subject to the number of variables allotted against each one of them. The 14 sub-dimensions and the maximum scores (Max Scores) that can be attained by any bank against each of the sub-dimensions are tabulated table 5.

Table 5: Maximum Scores of each of the Sub-Dimensions

Sub-Dimensions	Max Scores	Sub-Dimensions	Max Scores
SD_1 Green Finance and Investments	12	SD_8Office for Green Banking	4
SD_2 Accounting of Green Activities	10	SD_9Paperless Mode of Operations	11
SD_3 Disclosure and Reporting Practices	7	SD_{10}Green Building and Infrastructure	7
SD_4 Green Marketing and Green Corporate Social Responsibility	4	SD_{11} Resource Usage and Measurement	8
SD_5 Capacity Building of Stakeholders	5	SD_{12}Planning and Policies	6
SD_6 Green Awards and Recognition	4	SD_{13}Green Supervision and Inspection	6
SD_7Recruitment and Responsibility	6	SD_{14}Environmental Risk Management	9
Total			99

Source: Authors' compilation

The proposed index with the dimensions, sub-dimensions, and the variables along with the scores of the index is depicted in table 6.

Table 6: Green Banking Performance Evaluation Index (GBPEX)

Dimensions	Sub-Dimensions	Variables	Scores	
			Sub-Dimension	Dimension
D_1: Accounting and Finance	SD_1: Green Finance and Investments	V_1) Green Bonds V_2) Financing projects based on financial and environmental criteria or financing of eco-friendly projects. V_3) Establishment of a climate change fund V_4) Extending green credit to a broadening range of commercial sectors, such as clean energy, clean transport, green buildings, water, and sanitation V_5) Offering mutual funds that focus investment in 'green' companies V_6) Offer a special line of credit to help homeowners invest in energy-efficiency upgrades for their homes	12	29

		V_7) Provide services in the area of clean development mechanisms and carbon credit business V_8) Explore international funding options (like UN's Green Climate Fund) for investment in green projects and development of their Green Financing portfolio V_9) Agricultural clients financed for farming techniques based on lesser use of chemical fertilizers and pesticides, efficient water usage, drought resistant V_{10}) Encourage green credit innovation or develop investment products to attract investment in 'green' bank assets V_{11}) SMEs are financed for modern resource-efficient technologies as alternatives to traditional technologies V_{12}) Impact measurement of potential client's business on the environment before sanctioning financing facilities		
	SD_2: Accounting of Green Activities	V_{13}) Budget allocated annually for Green Banking practices V_{14}) Amount spent on different Green Banking activities V_{15}) Measure own carbon footprint V_{16}) Tracking flows of green credit or organize internal audit on green credit performances V_{17}) Conduct energy audits V_{18}) Assess environmental benefit and cost impact V_{19}) Conduct risk–return analysis V_{20}) Amount of paperless / card-based transaction. V_{21}) Credit/loan applications declined/approved after being environment and social risks evaluated V_{22}) Total outstanding value of credits/loans granted / on hold which has been evaluated on environment and social risks	10	
	SD_3: Disclosure and Reporting Practices	V_{23}) Use of separate pages for Green Banking reporting in annual report V_{24}) Reporting in standard format V_{25}) Utilize international platforms (like the Basel Committee, FSB, GRI, etc) for voluntary disclosure and information sharing V_{26}) Maintaining/developing a database on non-performing loans when the reason for the non-performance is environment-related V_{27}) Installation of systems for data collection and generation on Green Banking V_{28}) Senior management reports on Green Banking V_{29}) Banks publish independent Green Banking	7	

		reports/ web page		
D_2: Marketing, Awards, and Capacity Building	SD_4: Green Marketing and Green Corporate Social Responsibility	V_{30}) Bank's initiatives in building networks on environmental with green groups including government bodies and NGOs. V_{31}) Sponsoring facilities harmonious with the environment (for example restoring heritage buildings, beautifying cities or villages through tree plantation, community clean-ups, etc) V_{32}) Internalizing green marketing such as Plant a Tree, Save the Environment on the bank's letterhead and in other internal communication media V_{33}) Marketing green image of the bank.	4	13
	SD_5: Capacity Building of Stakeholders	V_{34}) Train employees regarding green movement V_{35}) Human Resource department involved in employee awareness development and training work on environmental issues V_{36}) Bank sensitized general public on environmental issues V_{37}) Clients and business houses are encouraged to comply with environmental regulations V_{38}) Public Relations department involved in awareness development among consumers and clients	5	
	SD_6: Green Awards and Recognition	V_{39}) Bank employees evaluated and recognized for performance in environmental management V_{40}) Bank awarded either for environmentally friendly activities or excellence in environmental reporting practices V_{41}) Bank's clients and value chain partners, employees winning awards for initiatives to preserve the natural environment V_{42}) Amount of rewards and recognition banks pay to clients for turning green	4	
D_3: Green HRM	SD_7: Recruitment and Responsibility	V_{43}) BODs approving environment-related policy/activities V_{44}) E-tendering in procurement V_{45}) Vendor selection based on the sustainability rating of their products, services, and operations V_{46}) Identify or appoint a senior manager /director to look after Green Banking activities including digital activities V_{47}) Setting up of a Department/ Committee/ Team for looking at the environmental activities of bank V_{48}) Appoint a Green Liaison officer for additional work in any department or function may be appointed to work towards Green Banking	6	10
	SD_8: Office for Green	V_{49}) Setting up of Green Banking office which collects and consolidates Green Banking information and provides the same to senior management and BODs	4	

	Banking	V_{50}) E-Recruitment/ Performance appraisal online V_{51}) Online Salary V_{52}) Setting up of a department to manage green credit-related work or a cross-function green credit committee		
D_4: Mode of Operations	SD_9: Paperless Mode of Operations	V_{53}) Virtual meeting through the use of video conferencing V_{54}) Email V_{55}) Online banking V_{56}) Automated teller machines V_{57}) Mobile banking V_{58}) Electronic banking: RTGS, NEFT, ECS/IMPS V_{59}) Offering credit cards co-branded with environmental charities V_{60}) E-statements V_{61}) Green Printing Guideline V_{62}) Plastic cards V_{63}) Green PIN	11	26
	SD_{10}: Green Building and Infrastructure	V_{64}) Deploy renewable energy-based equipment in non-green branches/offices to reduce reliance on fossil fuels/ grid electricity V_{65}) Setting up green branches / Green Banking unit / green buildings V_{66}) Solar power system for ATMs V_{67}) Greening Use of Laptops, Desktop Computers, and Servers V_{68}) Greening Data Centers V_{69}) Special logo and certification to green branches V_{70}) Arranging transport pool for the employees	7	
	SD_{11}: Resource Usage and Measurement	V_{71}) Clean energy capacity installed V_{72}) Energy savings V_{73}) Reduction of pollution and harmful emission by cutting down business travel or any other measure V_{74}) Recycling of materials V_{75}) Adopt techniques and plans to minimize inventory and wasted freight V_{76}) Develop annual resource consumption targets V_{77}) Introduce green office guide containing instruction circulated among employees V_{78}) Optimum use of the resource (like use eco-font to reduce the use of ink, use of scrap papers as notepads, use disposable glasses, automatic shutdown of computers etc)	8	
D_5: Planning, Policies, and Supervision	SD_{12}: Planning	V_{79}) Develop strategies and procedures in the following areas i.e., environmental risk management, green business facilitation, own impact reduction, climate change, preservation of the environment	6	12

	and Policies	V_{80}) Develop Green Banking policy V_{81}) Introduce sector-specific Green Banking policy V_{82}) Develop green lending guidelines V_{83}) Set green goals as the internal targets to reduce carbon footprint V_{84}) Develop administrative procedures and accountability mechanisms to see the implementation of Green Banking policy		
	SD_{13}: Green Supervision and Inspection	V_{85}) Develop an effective green credit performance evaluation system V_{86}) Monitoring clients' environmental initiatives such as an effluent treatment plant, recycling facilities, etc V_{87}) Monitoring and reporting environmental risks and performance V_{88}) Green Banking incorporated in the scope of compliance and routine internal controls V_{89}) Green Banking checklists developed and made part of internal audit reports V_{90}) Bank reviews borrowers' compliance with environmental requirements	6	
D_6: Risk Management	SD_{14}: Environmental Risk Management	V_{91}) Risk Management department report to the senior management about environmental risks V_{92}) Incorporate Environmental Risk in customer relationship management V_{93}) Develop Environment and social (E&S) risk management systems V_{94}) Develop E&S risk rating standard to assess and categorize clients' E&S risks V_{95}) Develop a list of clients with major E&S risks V_{96}) Incorporate environmental and climate change risk as part of the existing credit risk methodology prescribed to assess a prospective borrower V_{97}) Appoint officers, who have expertise in environmental risk assessment and management to serve as the Environmental Risk Managers of the bank V_{98}) Internal Environmental Risks manual/framework/plan V_{99}) Environmental Due-Diligence Procedures with Environmental Checklists and Sector-Specific Guidelines	9	9
Total Score			99	99

Source: Authors' Compilation

The index proposed for measuring Green Banking performance is titled "Green Banking Performance Evaluation Index" denoted by GBPEX. The index is an elaborative tool for measuring the green initiatives and practices adopted by a bank in a year. It has 99 variables, which are categorized into 14 different sub-

dimensions and the 14 sub-dimensions are broadly categorized into 6 different dimensions. The index is used and applied amongst the banks of India. In next section, Green Banking performances of Indian public and private banks are explored using information reported in their annual reports during the study period from 2009-2010 to 2018-2019.

6. Indian Banking Institutions' Green Banking Performance

Indian banking institutions 'green or environmental performance are assessed by scoring the banks for 10 years (2009-2010 to 2018-2019) using GBPEX. The results are shown in the table 7.

Table 7: Green Banking Performance Evaluation Score of Indian Banks

Banks	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019
Public Sector Banks										
SBI and its Associate Banks	26	27	27	36	39	37	45	50	56	59
Allahabad Bank	8	7	7	7	7	8	21	19	21	20
Andhra Bank	11	9	10	9	12	14	13	36	37	37
Bank of Baroda	18	22	20	36	46	51	32	28	32	33
Bank of India	11	12	14	28	34	25	25	29	30	29
Bank of Maharashtra	13	10	12	10	8	10	10	22	21	20
Canara Bank	8	6	6	27	30	34	34	37	41	34
Central Bank of India	10	8	8	17	16	14	13	23	25	24
Corporation Bank	16	12	13	11	11	10	15	37	39	37
Dena Bank	12	12	9	9	9	8	15	19	17	-
Indian Bank	7	8	9	16	34	26	38	36	32	32
Indian Overseas Bank	6	10	16	16	15	12	11	13	22	25
Oriental Bank of Commerce	9	10	10	13	12	15	6	36	35	31
Punjab National Bank	7	35	28	32	34	33	41	38	36	44
Punjab & Sind Bank	3	3	4	5	4	7	7	21	20	9
Syndicate Bank	15	19	16	17	15	29	28	30	33	29
Union Bank	8	11	11	28	31	30	28	31	30	36
United Bank of India	8	9	11	14	15	8	18	25	13	30
UCO Bank	7	8	7	13	13	13	11	31	33	31
Vijaya Bank	8	7	8	8	9	10	21	27	26	-
IDBI Bank Ltd	11	18	14	16	27	22	35	37	33	32
Private Sector Banks										
Axis Bank Ltd.	13	10	24	41	47	49	57	60	59	56
Catholic Syrian Bank Ltd	6	9	9	10	10	9	10	10	13	13
City Union Bank Ltd.	5	5	8	6	5	8	11	15	28	23
DCB Bank Ltd	7	4	9	8	8	10	16	22	20	21
Dhanlaxmi Bank Ltd	2	12	7	11	9	9	11	9	11	9
Federal Bank Ltd	6	7	13	11	12	15	16	20	22	24
HDFC Bank Ltd	12	22	16	42	57	47	59	51	59	64
ICICI Bank Ltd	27	15	26	21	27	34	35	38	35	50
IndusInd Bank Ltd	25	48	47	49	51	49	49	51	56	61
Jammu & Kashmir Bank Ltd	26	11	12	9	8	16	22	26	28	28
Karnataka Bank Ltd	2	1	2	8	7	12	8	26	23	26

Karur Vysya Bank Ltd	8	11	17	8	8	14	12	31	34	31
Kotak Mahindra Bank Ltd	11	19	15	36	40	41	39	30	40	40
Lakshmi Vilas Bank Ltd	7	6	7	5	6	6	10	9	14	12
Nainital Bank Ltd	1	3	6	6	7	7	10	10	10	11
RBL Bank Ltd	5	4	4	7	10	8	22	37	42	34
South Indian Bank Ltd	18	17	12	10	11	12	18	25	28	25
Tamilnad Mercantile Bank Ltd	8	9	9	13	6	10	10	13	13	11
Yes Bank Ltd	16	21	38	49	53	55	58	61	66	71

Source: Authors' compilation

Table 7 denotes individual Green Banking Performance Evaluation Score (GBPES) of the banks for 10 years. Based on the above table, the top scorer and bottom scorer in each of the years are tabulated in table 8.

Table 8: Year-Wise Highest Scorer and Lowest Scorer Banks

Years	Highest Scorer Bank	Lowest Scorer Bank
2009-2010	ICICI Bank Limited	Nainital Bank Limited
2010-2011	IndusInd Bank Limited	Karnataka Bank Limited
2011-2012	IndusInd Bank Limited	Karnataka Bank Limited
2012-2013	IndusInd Bank Limited, Yes Bank Limited	Lakshmi Vilas Bank Limited, Punjab and Sind Bank
2013-2014	HDFC Bank Limited	Punjab and Sind Bank
2014-2015	Yes Bank Limited	Lakshmi Vilas Bank Limited
2015-2016	HDFC Bank Limited	Oriental Bank of Commerce
2016-2017	Yes Bank Limited	Dhanlaxmi Bank and Lakshmi Vilas Bank Limited
2017-2018	Yes Bank Limited	Nainital Bank Limited
2018-2019	Yes Bank Limited	Punjab and Sind Bank and Dhanlaxmi Bank Limited

Source: Authors' compilation

It can be noted in table 8, in all the 10 years, private banks consistently had the highest scores. Also, private banks had the highest number of occurrences in the lowest score category. The private sector thus occupies the extreme places amongst the sample banks in the domain of Green Banking.

7. Green Banking Performance Comparison between Public and Private Sector Banks

For comparing performance between the sectors, firstly, total and average GBPEX scores of the sectors are compared over the period.

Table 9: Total GBPEX Scores

Years	Public Sector Banks	Private Sector Banks	Scored Better
2009-2010	222	205	Public
2010-2011	263	234	Public

2011-2012	260	281	Private
2012-2013	368	350	Public
2013-2014	421	382	Public
2014-2015	416	411	Public
2015-2016	467	473	Private
2016-2017	625	544	Public
2017-2018	632	601	Public
2018-2019	592	610	Private
Total Score	4267	4091	Public
Average Score	426.7	409.1	Public

Source: Authors' compilation

It is evident that in 10 years, public sector scored higher than private sector in 7 of the years. Also, the average score of public banks during the period higher than its counterpart. Sector-wise, public sector scored better than private sector banks.

Next, a scorecard is prepared (table 10) that contains banks' individual GBPEX scores and the corresponding ranks which are assigned based on those scores. Below, a Green Banking Performance Evaluation Scorecard for sample banks is prepared wherein best and lowest performers in Green Banking over the period of study are displayed.

Table 10: Green Banking Performance Scorecard of Indian Public and Private Banks

Bank Name	Scores	Rank	Bank Name	Scores	Rank
Yes Bank Limited	488	1	Karur Vysya Bank Ltd	174	21
IndusInd Bank Ltd	486	2	RBL Bank Ltd	173	22
HDFC Bank Ltd	429	3	UCO Bank	167	23
Axis Bank Ltd.	416	4	Central Bank of India	158	24
SBI and its Associate Banks	402	5	United Bank of India	151	25
Punjab National Bank	328	6	Federal Bank Ltd	146	26
Bank of Baroda	318	7	Indian Overseas Bank	146	26
Kotak Mahindra Bank Ltd	311	8	Bank of Maharashtra	136	27
ICICI Bank Ltd	308	9	DCB Bank Ltd	125	28
Canara Bank	257	10	Allahabad Bank	125	28
IDBI Bank	245	11	Vijaya Bank	124	29
Union Bank	244	12	Karnataka Bank Ltd	115	30
Indian Bank	238	13	City Union Bank Ltd	114	31
Bank of India	237	14	Dena Bank	110	32
Syndicate Bank	231	15	Tamilnad Mercantile Bank Ltd	102	33
Corporation Bank	201	16	Catholic Syrian Bank Ltd	99	34
Andhra Bank	188	17	Dhanlaxmi Bank Ltd	90	35
Jammu & Kashmir Bank Ltd.	186	18	Punjab & Sind Bank	83	36
Oriental Bank of Commerce	177	19	Lakshmi Vilas Bank Limited	82	37
South Indian Bank Limited	176	20	Nainital Bank Limited	71	38

Source: Authors' compilation

The above table reveals banks' ranks using the marks (scores) over the last 10 years (2009-2010 to 2018-2019). The top three rankers are Yes Bank Ltd, IndusInd Bank Ltd, and HDFC Bank Ltd, all of which are private banks. The last two ranks are secured by Nainital Bank Ltd and Lakshmi Vilas Bank Ltd, both of

which are private sector banks. The third last rank is secured by a public sector bank, Punjab and Sind Bank. This finding is similar to the findings of table 8.

Thus, from table 8, 9 and 10, it can be concluded that sector wise public sector scored higher than private sector, but individually, private banks topped each year.

The last comparison is done to find out whether mean GBPEX differs significantly across public and private sector banks, and for the same the hypothesis analyzed is:

H_a: Mean GBPEX scores do not differ significantly across public and private sector banks

Table 11: T-test Results of Green Banking Performance

Group Statistics			
	Nature	N	Mean
Average Score	Public Banks	21	20.43
	Private Banks	19	21.53
Key Findings: t-test			
	Levene's Test: Equality of Variances		Sig value
Equal variances assumed	9.330	.004	.76
Equal variances not assumed			.77

Source: Authors' compilation

The null hypothesis for Levene's test is rejected as the significance value of the test is .004 which is less than 0.05, as shown in table 11. The corresponding Sig value for the t-test is .77 (higher than 0.05), hence null hypothesis of t-test stands accepted. Mean GBPEX scores do not differ significantly across public and private sector banks.

8. Conclusion

This study develops an index for measuring green performance of banks and thereafter uses the index to measure Green performance of selected Indian banks.

The proposed index Green Banking Performance Evaluation Index (GBPEX) has three distinct parts. At the lowest level stands the variables, the next in the ladder are the sub-dimensions, and at the top of the ladder are the dimensions. There are 99 variables, which are allotted to 14 different sub-dimensions and the 14 sub-dimensions are clubbed into 6 different dimensions. A Green Banking Performance scorecard is prepared using the GBPEX. Ranks are assigned to each of the banks based on the total score secured in the 10 years. The top three ranks are occupied by Yes Bank Ltd, IndusInd Bank Ltd, and HDFC Bank Ltd, all of which are private banks. The last two ranks are also secured by Nainital Bank Ltd and Lakshmi Vilas Bank Ltd, both of which are private banks. It shows that the private sector occupies the extreme ranks in the case of

Green Banking Performance. However, overall sector wise, public sector's scores were more than the private sector in majority number of years (7 out of 10 years).

The study adds to the literature by addressing a significant gap of an index for measuring Green Banking performance. The index can be used by the banking sector for assessing their Green Banking performance. Banks adopting the index will have their distinct Green Banking Performance Evaluation Score (GBPES) and hence a distinct rank based on that score. This will, in turn help different nations to know Green Banking performance of various banks. The results offer practical implications for banking community, policymakers and other stakeholders, starting with the index that has been proposed which can be used by the banks for evaluating their Green Banking performance. It will act as a common base for the banks residing in different nations and belonging to different sectors (like public or private banks) for measuring Green Banking performance. Another contribution made by the study is documenting Green Banking performance of Indian banks which was a major gap in the Green Finance literature. The findings of the study will act as a report card for the Indian banks and will also help to know the performance of each of the sectors. This will act as a motivation for the banks to modify their performance. Using the findings of the study, financial regulators like the Reserve Bank of India, and the Indian Bank Association can decide to award the best Green Banking performer. This will encourage the Indian banks to take up more green initiatives every year.

The study's findings should be interpreted keeping in mind the gaps that could not filled up and which paves the way for future research on Green Banking. Since, our study covers the performance of only public and private banks of India, Green Banking performance of other banks like Cooperative banks; Regional Rural Banks, Payment banks remain unexplored. This may be looked at in the future by the researchers. Green Banking Performance is measured using the Index method of Content Analysis. However, there are other means like Volumetric method, which determines the performance based on the volume of information disclosed about Green Banking. However, this remains out of scope of the study and thus can be taken up by researchers in the future. Further, the study relies on secondary data disclosed by banks, which might not give complete picture of the banks. Analysing the Green Banking performance using both primary and secondary data would give a more comprehensive and exhaustive result. This may be looked at in the future.

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