MEASURING THE SUSTAINABLE DEVELOPMENT OF INDUSTRIAL COMMERCIAL BANK OF CHINA – USING PRINCIPLE COMPONENT METHOD

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Abstract

This study endeavors to build a conceptual framework for sustainable development in the banking sector. It tried to explain and measure the environmental, social, and economic factors of China's Industrial, commercial bank (ICBC). We have employed the Principle Component Analysis or PCA Method for measuring the impacts of sustainable development. The roger and carter model successfully created a framework than an index to measure the bank's sustainable performance. The bank CSR report has taken the essential criteria for measuring the sustainability indicators; hence the data is standardized. During the investigation, it has been found that growing green credits could cut the CO_2 emissions and other fossil fuels (combine gases index named as emission index). The implication of the roger and carter model is feasible and well-fitted for measuring the bank's sustainable development in the case of ICBC. However, there is still a problem from the environmental perspective while quantifying the inter-factor data (discussed in the paper); thus, we propose it by a single unit, known as an environmental index.

Keywords: Green Credit, Sustainability Index, PCA, Green Banking

1. Introduction

Industrialization around the globe has created the quest for rising needs and demands of the population, and it has become a key indicator for economic growth (Paluszak, 2016). Rapid economic growth turns out to threaten the natural environment, causes an ecological disorder that directly hits human well-being (Sun, 2017). In the last three decades, growing industrialization and natural disasters were directly or indirectly linked with climate changes, which created a debate among governments, environmentalists,

NGOs, and different regulatory organizations worldwide. As a result, various conferences, such as are Earth Summit and the United Nations Environmental program UNEP, were held (Wang Yao, 2017). Regulatory bodies in public and private sectors have started taking numerous initiatives for transforming into sustainable development (Weber, 2016). The overall increase in environmental challenges successfully seeks worldwide attention (Chiau-Ching Chena, 2012). Climate changes are stimulating to quantify sustainability (Li-zhong, 2011). After extensive literature review, we cannot find a reliable sustainability index that measures social, economic, and environmental factors in one dimension (ICBC, 2014-2017b). Therefore, this study endeavors to develop a sustainability index by using three subindexing social, economic, and environmental. Hence, a theory-based conceptual framework and using PCA and GSCM approach (Carter & Rogers, 2008; Sathaye et al, 2007). That takes part in further verification to enhance the different aspects of sustainability via indexing and further evaluate sustainability's impact on economic, social, and environmental factors. Hence these patterns of information are used in several reports e.g., ICBC is our case study based on (ICBC, 2014-2017a) reports. This article has endeavored to measure banks' sustainable performance via implicating (Carter & Rogers, 2008) framework in ICBC as a case. It has been

ISSN (Print): 2204-0595
ISSN (Online): 2203-1731

investigated that banks are more focusing on green credit and issue various green finance instruments such as green bonds, green loans, etc. After creating the index method, these transformations are verified and used the PCA method to ascertain the sub-indexes feasibility with (Carter & Rogers, 2008) framework.

The remaining parts of this study are organized as follows: Section 2 consists of a literature review; in section 3, we construct the sustainable framework for the banking industry. Section 4 discussed research methodology and expected empirical and theoretical analysis outcomes, and section 5 leads to the conclusion.

Literature Review

In recent years public showed great interest in environmental deterioration. Banks ultimately react towards these changes differently (Md. Ali Arshad Chowdhury, 2016). In the context of greening the environment, the British Institute of Management (BIM) in 1992 issued a report majorly defining the tips on having environmentally supported workplaces (Eissa Alreshidi, 2014). During the project implementation & operations, some authors quoted statements that post transactions are needed to be monitored (Michael, 1994) to have an ideal environmental risk management program (Bhardwaj, 2013). Meanwhile, investment (Jeucken & Bouma, 1999) that is taken into environmental sideeffects usually has a lower return rate. In contrast, the importance of sustainable banking was highlighted by (Sahoo, 2007) mainly to banking. In Banks, it may refer to the banking business dealing in specific fields that are aimed to encourage projections involved in overall external and internal emission reductions, lowering down these emissions via green financing technology & emission reduction projects (Sarita, 2012a).

Sustainable banking can be defined as; the Practices that support friendly environment banking in operational areas with stakeholders' interest. Therefore it could be further defined as "paperless banking" that allows online transactions in almost all activities—ensuring in-house activities, green decorations, consumption of energy, introducing green products to clients and paperless communication in the national and international arena. As Mediator between economic growth and environmental protection, banks can play a vital role via promoting environmentally sustainable & socially accountable institutions (Sarita, 2012a). Therefore the author has created the framework which could provide a comprehensive range picture of banks working for sustainable development adding environmental, social, and economic perspectives (C. R. Carter & D. S. Rogers, 2008). Additionally; In China, more often, sectors releasing high pollution face restrictions and remain insured, which is somewhat beneficial. It covers expenditure associated with pollution events such as clean up & fines, a loss in real estate value, expenses for medical & legal charges. It has the capability of providing an effective mechanism for long-term management risks. These risks may also include natural disasters that take place as a result of climate change (ZhangLiping, 2015). It has been noticed that over the past few decades, China showed great interest in green development, one of the aspects was the green potential that gives jobs in the industry with a slow reduction in environmental impact (Zheng, 2012). The financial institutions, i.e., banks, have shown tremendous seriousness towards environment-free lending, and interests have been steered towards corporate projects related to Pollution abetment, Promoting green efficiency development of renewable energy. It is further observed that banks remained not limited to providing environment-free products and helped create profit (Liu, 2012). Another reason for considerable investments in greening the environment could be significant scale revenues as "The Banker Database" issued ranking according to which among top five banks of the world "big four" banks of china were alone enlisted at the top. Simultaneously, JP Morgan Chase & Co. with Tier capital remained 5th for the Year 2018-2019 (Brian Caplen, 2019)1. On the other side, government interventions with the same motive to enhance green lending in

these banks demonstrate better outcomes for the future of china. China Banking Regulatory Council or CBRC and the Ministry of Environment (MOE) have worked for sustainable banking by issuing and ensuring the implementation of environment-supported policies in its 21 major banks in china (Yinjianbanfa, 2013). Another aspect is the combined effort of

China and the United Nations Environment Programme (UNEP). A sustainable financial system was designed to green the banking system & assure institutionally further the green industry in China. The aim was to check on Sevier's environmental pollution growth & challenges towards protecting the environment, benefiting ecological civilization, and green banking practices. The international institute of green finance, the central university of finance and economics (IIFG, CUFE), took initiatives by researching credit, bonds, insurance carbon-trading, information disclosure & risk assessment domestically and internationally (Wang Yao, 2017). In a broader context, green financing requires targeted policy, designing the statistical

ISSN (Print): 2204-0595
ISSN (Online): 2203-1731

evaluation, assessment & effective regulations (ZhangLiping, 2015). It raised the question of whether sustainability is measured quantitatively. What variables could be used to measure it, and how can these variables affect the bank's overall performance? This article also discussed the variables that may create a general framework for sustainable development in banks and replicates the (Carter & Rogers, 2008) modal for green banking. The Carter & Rogers framework consists of three major domains: environment, social, and economic are also discussed by various authors (Zheng, 2012) and (Sathaye et al, 2007). This perspective was found during research in CSR reports of the Chinese banks, for instance, ICBC.

1 The Banker Global Financial Intelligence Available at: www.thebanker.com/Top-1000

3. The theoretical framework of the sustainable development index

On a broader aspect, the externalities came up with pollution, and it covers not only implicit but explicit costs too. In China, More often, sectors releasing high pollution face restrictions and remain insured. It is somewhat beneficial as it covers expenditure associated with Pollution events such as clean-up & fines, a loss in real estate value, expenses for medical & legal charges. It has the capability of providing an effective mechanism for long-term management risks. These risks may also include natural disasters that take place as a result of climate change (ZhangLiping, 2015). This framework is a compilation of three major perspectives, which further lead us to quantify these perspectives into a sustainable development index. Below the figure, one provides the complete sketch of sustainable deve lopment in ICBC.

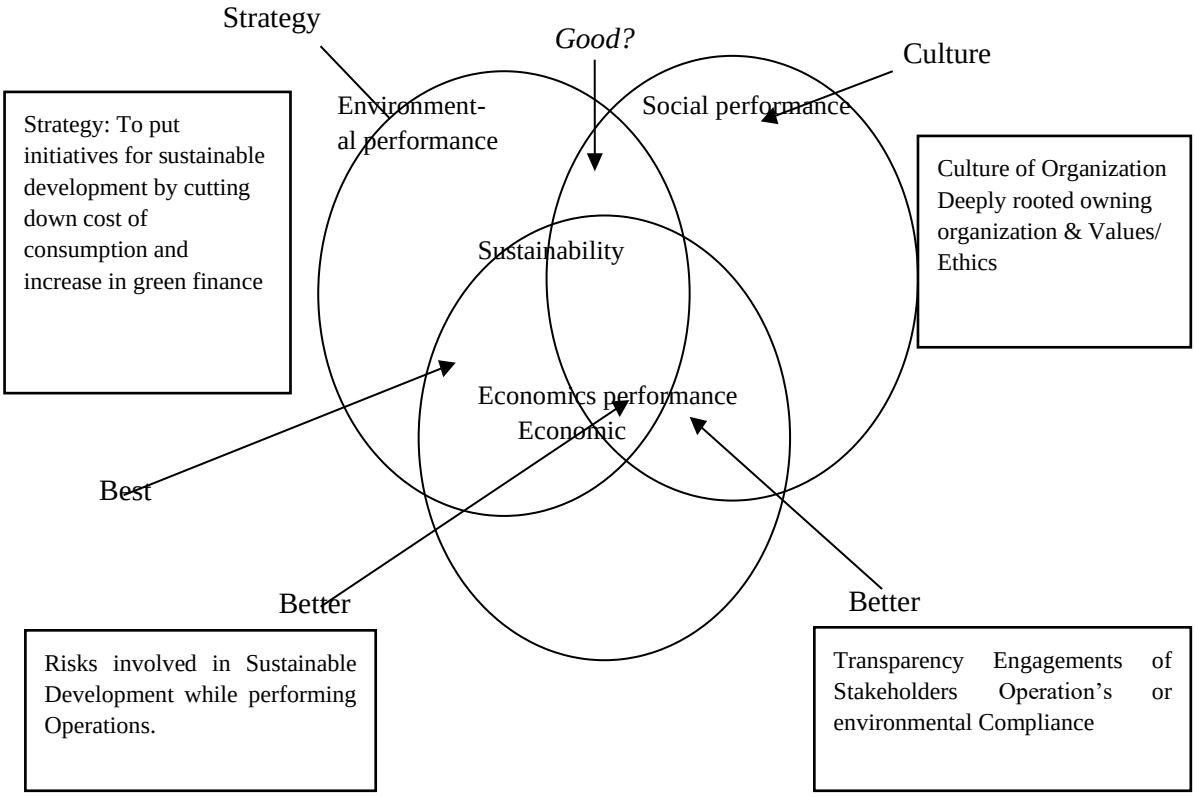

Figure 1: The Integration of Sustainable Development in ICBC's case Source: (Carter & Rogers, 2008)

ISSN (Print): 2204-0595
ISSN (Online): 2203-1731

While defining the three major perspectives to find an organization's sustainability concerning green supply chain (Carter & Rogers, 2008) put environmental, social, and economic perspective as a core value of the framework. On the other hand, while making the framework for sustainable development, their study has discussed certain elements which could affect the overall framework: these elements involved strategy, organizational culture, risks involved in performing tasks, and transparency. The industrial, commercial bank of China is found to be the most suited case when it comes to feasibility.

3.1.

3.2.The environmental perspective of sustainable banking

Several authors have emphasized that banks can assure green banking by cutting their expenses or expanding their green financing. In other words, in-house activities and green credit facilities (Sohel Mehedi, 2017). To have performed these activities in any organization active communication process is required, which we call in this paper "Intra factors and Inter factors." There are the general phenomena derived from "intrapersonal communication and interpersonal communication", These communications enable the institution to know whether these institutions are clear to their perspectives and the coordination between the departments (Mclean, 2010), (Sohel Mehedi, 2017) and (Neyati Ahuja, 2015) have referred to "In-house activities" of banks as tier-one or intra factors which reconsidered as the initial phase. It referred to internal matters of the bank: Reduction in the operation of the pollution or the use of CO2 emissions by different aspects such as a reduction in usage of photo state machines, sustainable water management system, use of electricity and gasoline, etc. it also includes awareness of employees regarding the green activities and active participation of employees, In general, In-house green management further consists of the role of ATMs and the 3R policy means to reuse, reduce and recycle (Sohel Mehedi, 2017). It talks about e-services such as internet banking, social media awareness, etc. In China's case, it's become more convenient to have social engagement through internet banking, e-payment, social media services like WeChat and Ali Pay, etc. (ICBC, 2014-2017a). Whereas the green crediting or green financing or Tier two (Inter factor) can be referred to as Green Credits allocations, the restricted finance towards enterprises releasing high energy, overuse of water, and high emissions. It helps create a better environment for society and appreciates the innovation that supports green technology. The clean development management CDM is one example of financing under energy management. ICBC used different ways to restrict enterprises with awareness & Preferential loan rates (A Part of Credit Policy) for

Green Credit Facility (ICBC, 20142017a), while green insurance refers to enhancing environmental risk management. It is simply an eco alternative that includes green-certified property or vehicles contain hybrid technology. According to Willis, China may have delayed the western-style insurance, but it adopted the transformed one (green insurance) early because the government asked for it (Koney Hoi, 2009). Simultaneously, the green bonds are structured as similar to typical conventional bonds; however, except states that the purpose of financing would fall under the green investments (Nykvist, 2020). The green venture capitalist considered part of green investment, bringing far-reaching environmental and social impact (Elena Antarciuc et al, 2018). Thus the framework is introduced to check external factors such as green credit financing, green bonds, green insurance, and green venture capital (ZhangLiping, 2015). Among these, all the Tier one and Tier two, *transparency* is required the most; hence, many banks have started working on it. Further environmental compliance is one of the critical aspects of environmentalrelated projections inside or outside the home (the company) (Carter & Rogers, 2008). The concept of environmental compliance and the technical audit has become the requirement to control and enhance the industries banks' supply chain to restrict or delay the loan procedure. It could be based on not having data disclosure from industries or keeping the old processes, causing, again and again, the disobedience of the environmental laws directed by the state or the local government (Feng Wang et al., 2019).

This article tried to find the significance of how banks are performing towards sustainability; hence it could be further evaluated by environmental social and economic valuation. Similarly index has been made for each to describe the bank performance in China for instance ICBC. From an environmental perspective, this has been argued that the bank is, both internally and externally, responsible for creating environmental pollution. Thus,

ISSN (Print): 2204-0595
ISSN (Online): 2203-1731

sustainable banking advocates environment-friendly practices at the bank by reducing the internal and external carbon footprints (Neyati Ahuja, 2015). These factors include *"in-house activities and green credit facility"* (Sohel Mehedi, 2017), which can be considered as tier one and tier two, respectively *(authors own elaboration)*. The variables for In-house activities or "Tier one" of the bank could be taken as energy conservation, water consumption, the use of gasoline & ebanking. While for a green credit facility or "Tier two," the green credit, green insurance, green bonds, and green projections (ZhangLiping, 2015). In ICBC, initiates the various camping for public awareness to save energy and reduce emissions. Paper-less banking is a good initiative, provision of renewable and traceable materials within office boundaries, and further introduction of the green product helped decrease per capita energy consumption, besides energysaving lights and water waste management system. (ICBC, 2014-2017a). On the other hand, ICBC, to have a contracted and approved examination of crediting policy. It adds the state policy's environmental compliance keeping the plan alive of ensured and effective controlled capital of loans to sectors with high energy consumption and pollution. Further, ICBC added the bonds and insurance in the green credits list via practical partook training sorted out by the controllers, such as training over green consumption and green bonds. The bank has improved green bonds guarantying to build inside and out the framework for green financial services. ICBC issued bonds of 1244 (RMB100 million) in FY16. It has executed green offices and empowered the new modal for decreased vitality discharged (ICBC, 2014-2017b).

3.2.1. Environmental Compliance

The environmental compliance to the particular integrated framework further talks about monitoring purposes environmental compliance. Therefore, it's necessary to keep in mind the committee for audit remains responsible for overlooking controls to detect and verify management fraud. The committee's role has been played by overseeing management's compliance with effective financing reporting (Auditors, 2009). Eskom compliance is more often understood as the conformity of laws, regulations, and standards relating to the environment. It also includes some other requirements such as site permits for an operation which, according to Eskom, environmental compliance remains risk and sustainable. Although basic requirements including Efficiency, Cost-effectiveness, Enforcement, Scalability, Change Management, Impact Analysis, Complexity, and Traceability (Marwane El Kharbili, 2008). These initial requirements help compliance creating Compliance Management. As a mandatory requirement for any business to regulate its rules and satisfy the mandatory requirements applied to meet domestic and international laws, compliance remains a key indicator. Second, sources of transparency that bring trust in clients and businesses the environmental compliance tells whether the policies and procedures are followed in the right directions. Given directions to public regulators or the bank itself, environmental compliances play a crucial role by assuring the environmental law and its implementations are on the right track. In other words, To create transparency in green activities on the use of Public or Private Body, the environmental compliance works as regulatory and monitory to the Policy and Procedures with the assurance of its implications.

World bank in 2016 issued an environmental audit report that helped further to put evidence for the argument reveals environmental laws and regulations to meet according to requirements of the world bank however with limitation to the only project supported with the targeted region (Ngegba, 2017). The author is convinced to put this idea into Banks. Ultimately, the bank's source of funding in any society & play a role as a mediator & being a mediator, transparency remains the critical element to create and restore the trust between stakeholders and the bank

itself. That was the reason to introduce technical audit, which is the solution to figure 1, supporting the argument towards transparent sustainability. Risks remained one of the critical aspects of finding expected losses and how any organization can come over with it while finding any opportunity (Lockwood, 2010). These risks could go even higher if precautions have not been taken (Feng Wei et al, 2016). The relevant risks could be avoided by control of banks over the company's supply chain, and this control could be via data disclosure PRTR Data (CITIindex, 2015-2018).

3.2.2. Technical audit

According to the environmental protection agency, the technical audit concept is defined as; the systematic examination of an internal or external project to demonstrate if the activity of data collection about results satisfies Project Quality Assurance & Project Plan or not? And whether implemented effectively & would it be applicable to attain a Q.A. project plan with data quality

ISSN (Print): 2204-0595
ISSN (Online): 2203-1731

goals (Dumitrescu, 2004)[1]. The technical audit helps in revising the policy implementations. Hence, it will companies regarding green technologies alongside innovation and green projection. Therefore the frameworks for environmental perspective in the creation of sustainable development are depicted in figure 2. In nutshell, bank at one side keeps its expenses cut to provide an efficient environment to its employees while providing green credit facilitation by increasing green crediting in industries to reduce emissions from banks. This mechanism helps to achieve the general phenomena of the environmental perspective of the bank towards sustainability.

3.2.3. Emissions reduction

Banks' ultimate motive has become the reduction of wastage created by industries via providing green loans provide an opportunity to verify whether the investment was on the right track and how far it gives benefits to the (Rehman, 2021). With an approach, China finds ways to reduce pollution via environmental compliance and restricted green loan policies, thus disclosing emission data (Bose, 2018). Bank's primary element remained to restrict companies it provided loans over the generation of fossils fuels (Ren, 2020). These emissions include CO2 (Baeumler, 2012), Coal (Glomsrød, 2005), COD emissions, Ammonia nitrogen, SO2, Nitrogen oxides (Yuan, 2020), and saving water (Z. Chen, et al.,, 2018)

Environmental Perspective of Sustainable Banking of ICBC

[1] The definition is based upon ISO's definition of "quality audit" as mentioned in Guidelines for Auditing Quality Systems - Auditing (ISO, 1994a).

ISSN (Print): 2204-0595
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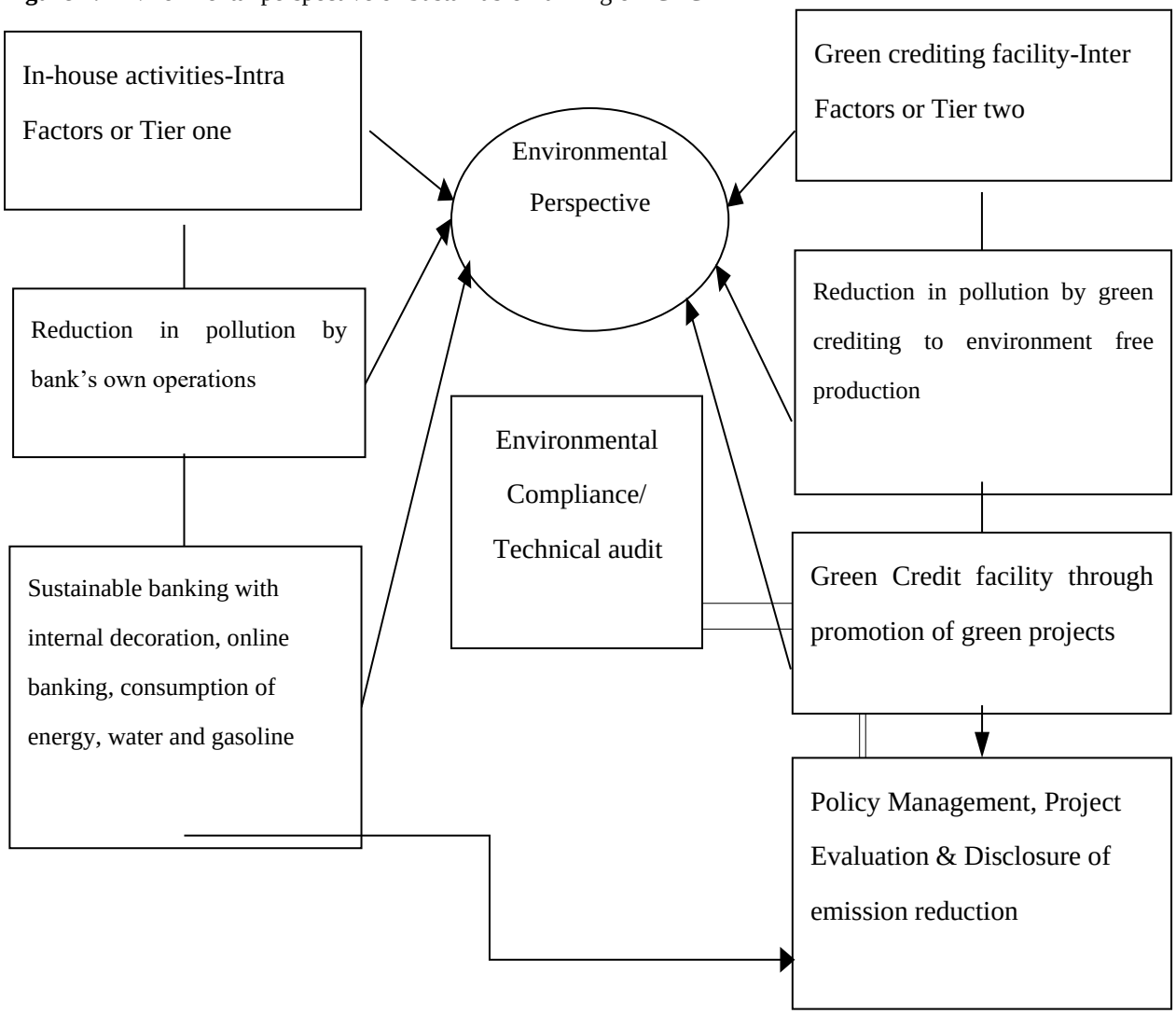
Figure 2: Environmental perspective of Sustainable Banking of ICBC



3.3. Social perspective of sustainable banking

For any organization, it is essential to know the social status of employees, includes Management commitment: How much effort is made to motivate employees, environmental systems control with availability, How much initiatives taken for environmental management, and the level of efforts made to increase awareness for sustainability among consumers (Benita M. Beamon, 1999), (Hervani, Helms, & Sarkis, 2005),. Customer satisfaction: Interest & satisfaction of customers from green products (Gunasekaran, Patel, & McGaughey, 2004), (Tunio F. H et al., 2020), (Markley & Davis, 2007) and (Kishore K. Pochampally, 2009). Employee development: employee satisfaction level, number of special programs & training related to green, and the number of conferences & fairs associated with Sustainable Development (Markley & Davis, 2007) (Kishore K. Pochampally, 2009). However, it is unfortunate that the social perspective for sustainability still requires more attention (Littig, 2005). However, authors have successfully applied different variables to check out social sustainability criteria, such as how much an employee is determined with their work (formal and informal). How much he or she is satisfied with its basic needs, trusted social security system equal opportunities for employees, social innovation, Burden concerning power distance (Littig, 2005). This case study finds a social aspect of banking in return to loans provided to SME's (Sarita, 2012a), social contribution of the bank (Lu, 2014), the total number of employees, employee diversity, training employee gets at avg per day (Islam, 2014; Wang, 2020) and donations made by banks (Bai, 2006).

3.4.The economic perspective of

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ISSN (Online): 2203-1731

sustainable banking

Industries are made for profit (Hambrick, 1983); if there is profit, there is an opportunity to grow (Jaffe, 1986), banks worldwide work for business, and businesses providing opportunities. These opportunities are taken into technological advancements (Jaffe, 1986). In this context, economic development remains the critical aspect for any organization to check the Chinese banks' performance (Pauluzzo, 2009). Authors have taken various variables, which includes loans (Meena, 2013), total assets of the banks
(Battiston, 2017), Bank Deposits
(Paluszak, 2016), Total Liabilities (Dewi, 2017), Owner equity (Li-zhong, 2011), Return of Asset and equity (Weber, 2016), and the net profit (Zhang et al., 2019).
Operating Income (S. a. D. Chen, J.L., , 2001),
Basic earnings per share RMB (Baker, 1988),
Dividend in cash (Wei, 2011), Total Tax Payment (Angus, 1998), NPL Balance (Tan,
2012), % Return on average total Assets (Sachs, 2001), % Return on weighted average equity (Zou, 2008), % NPL ratio (Cui, 2018), % Allowance to NPL (Mei, 2014), and %
Capital adequacy ratio (Said, 2011). Several Chinese authors (Sun, 2017) think that sustainable development is considered as a balance between environmental and economic fulfillment. (Monika Sestakova, 2012) Differentiate indicators have been used to determine banks' overall development (Eissa A. Al-Homaidi, 2018). This study also proposes the variables based on CSR reports of ICBC (ICBC, 2014-2017b).

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4. Sustainable Development Index and Sub-Indexing Analysis

Performance indicators remained a crucial part of the evaluation process. It gives a sense of managerial allocations in accords with the creation of policies. It further allows both Professional and layman to judge the policy's effectiveness. (Peter Lawrence, 2002) explains the component analysis factor and finds the various literature regarding socio-economic dimensions and regional integrations (Park, 2018a).

The internal and external exposure towards particular regional groupings consisted of trade agreements (DiCaprio, 2017), accurate data (Jolliffee, 1973) & to determine the weights dataset consisted of different variables in a composite index for development (SÁNCHEZ*, 2001). We have tried to measure the sustainable development of ICBC while keeping in mind the carter and roger modal that suggests three dimensions to create sustainability such as environmental, social, and economical. Further, we provide evidence from the data that confirms the modal's validity and the requirements. Hence the structure was created as follows;

Structure of Index & Data Used3 [3] (Peter Lawrence, 2002)

Component for Sustainable Dev. Index
Environmental Perspective4: Green Credit Financing 100 million, Total Power Consumption Kwh, Total Water Consumption, Natural Gas Consumption, Paper Consumption5 , and E-banking
Social Perspective: Small and micro-enterprise loan balance RMB100 million, Social contribution per share4 RMB1 yuan, Total number of employees (Person), % Proportion of female employee, %Proportion of employees ethnic groups Average training days per Person Day/person & Charitable donations RMB10 thousand.
Economic Perspective: Total assets RMB100 million, Total Loans & Advance to Customers RMB100 million, Customer Deposit RMB100 million, Operating Income RMB100 million, Net profit RMB100 million, Basic earnings per share RMB, Dividend in cash RMB100 million, Total Tax Payment RMB100 million, NPL Balance RMB100 million, % Return on average total Assets, % Return on weighted average equity, % NPL ratio, % Allowance to NPL, % Capital adequacy ratio, % Capital adequacy ratio6

The PCA Method arranges a new dataset of variables with a linear combination of the previous or original dataset (Robert S. Pomeroy, 1997). As Per the framework for Sustainable Development, the following Indicators from all three dimensions, such as Environmental, Social and Economic, were initially observed by ICBC (ICBC, 2014-2017a). Under the

Implications of the Studies, According to

ISSN (Print): 2204-0595
ISSN (Online): 2203-1731

(Abeyasekera, 2005) the Sustainable Development Index could be Measured as;

If; $Y_0 = X_1, Y_1, Z_1$

Here;

Y_0 = Sustainable Development Index,

X_I= Environmental Index,

Y_1= Social Index and

Z_1= Economic Index

It can be further derived as;

Sustainable Development Index = Environmental index + Social Index + Economic Index

or ;

Environmental Index,

$X_1= a_1X_1 + a_2X_2 + a_3X_3$ …… **X_P Eq-1**

Social Index,

Y1= a1Y1 + a2Y3 + a3Y3 ……**X_P Eq-2**

Economic Index,

Z1= a1Z1 + a3Z3 + a3Z3 …….. **X_P Eq-3**

Hence the PCA equation could be driven as;

ai's (i= 1,2, 3, …… ,p)

4 Environmental Index is dealt as single Unit due limitations of unavailability of Data mentioned in Theory.

Whereas the ai are the weights to determine the dataset

5 The data for variable is taken from win.d database (if required contact me with an email) 6 For any sought of data inquiry author can be contacted at obaid_ul_rehman@hotmail.com

Results and Discussion

By applying PCA to all three dimensions, we have got the following results in table one.

Table 1: eigenvalues for environmental indicator

Environmental indicators	**PC 1**	**PC 2**	**PC 3**
Green Credit Financing 100 millions	0.5606	0.0780	0.1064
Total Power Consumption (Kwh)	0.2502	-0.4552	-0.3982
Total Water Consumption (tone)	0.0413	-0.0954	0.9032
Natural Gas Consumption (tone)	0.5620	0.0491	-0.0089
Paper consumption	0.0557	0.8804	-0.1168
E-banking (%)	0.5500	-0.0046	0.0257

First, PCA is applied by the Stata software that is used to create the component factors PC1 PC2 and PC3, including eigenvalues. Green credit and E-banking showed a significant correlation, and other variables are slightly week in relation. On the other hands, the social indicators have also supported the cause in measuring the sustainable development of the bank results for factor component analysis towards social indicators could be seen in Table 3

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Table 2: eigenvalues for social indicators

Social indicators	PC 1	PC 2	PC 3
Small and micro enterprise loan balance RMB100 million	0.4570	0.0991	0.1556
Social contribution per share4 RMB1 Yuan	-0.4563	0.0249	0.1026
Total number of employees (Person)	-0.4416	0.3447	0.2509
Proportion of female employee %	0.0077	0.8901	-0.0896
Proportion of employees from ethnic groups %	0.4067	0.2714	0.1460
Average training days per Person Day/person	0.0038	-0.0692	0.9329
Charitable donations RMB10 thousand	0.4716	0.0027	0.0513

Component loading shows that the total number of employees and social contribution per share remained slightly pungent. While small and micro-enterprise loan balance was strongly correlated with charitable donations, other variables remained uncorrelated, i.e., Proportion to an employee from the ethnic group and the average training per day.

Table 3: eigenvalues for economic indicators

Economic indicators	PC 1	PC 2	PC 3
Total assets RMB100 million	0.3588	0.0768	-0.0393
Total loans and advances to customers RMB100 million	0.3591	0.0841	-0.0391
Customer deposits RMB100 million	0.3745	0.1188	-0.0876
Operation Income RMB100 million	0.0319	0.0284	0.5648
Net profit RMB100 million	0.3000	0.2669	0.0848
Basic earnings per share RMB	0.1689	0.5168	0.0318
Dividend in cash RMB100 million	-0.0896	0.4158	-0.1989
Total Tax Payment RMB100 million	-0.0367	-0.3983	-0.3928
NPL Balance RMB100 million	0.3167	-0.1155	-0.0048
Return on average total Assets %	-0.3545	0.0021	0.0511
Return on weighted average equity %	-0.3280	0.0740	0.0080
NPL ratio %	0.2413	-0.2752	0.0432
Allowance to NPL %	-0.2327	0.3151	-0.0035
Capital adequacy ratio1 %	-0.0611	-0.0545	0.6509
Core capital adequacy ratio1 %	0.1535	-0.3247	0.2000

ISSN (Print): 2204-0595
ISSN (Online): 2203-1731

According to the Component loading analysis, there is a strong relationship between customer deposits and total loans advanced and the bank's total assets. The core capital adequacy ratio remains strongly correlated to NPL ratio, return on average asset, and weighted avg. Equity also shows a strong correlation, while other variables also show clear significance to other variables. While measuring the sustainable development with the derived framework, this study added the final index value to generate the bank's sustainable development; thus, to measure the sustainability, we tried to find the eigenvector of the following indicators mentioned in Table 4. Thus we combine the equation 1,2 and 3.

Table 4: Sustainable Development Index derived from Environmental, Social and Economic factors of ICBC

Combining Equation 1, 2 & 3	**2014**	**2015**	**2016**	**2017**
Environmental Index	-2.358859	-.2003946	.5781537	1.9811
Social Index	-1.965932	-1.364344	.5482993	2.781976
Economic Index	-3.687419	-.8067107	1.299558	3.194572
Sustainable Dev. Index for ICBC	-.9177607	-.6369081	.2559638	1.298705

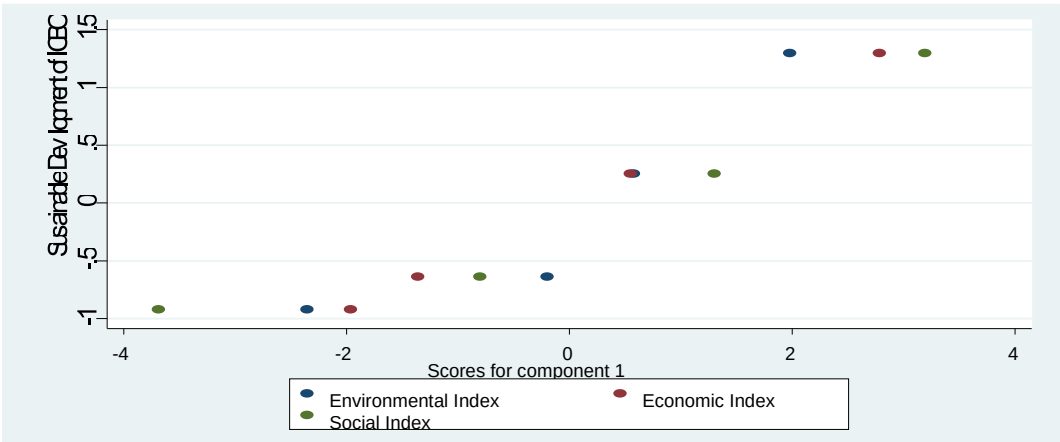
Whereas the combined equation for the all three dimensions data cross-sectional study index help generating the sustainable development index for ICBC from the Year 2014-17. These values show a positive correlation while plotting a scatter graph, thus providing the direction of feasibility and could help any company or firm verify its sustainability via applicable modal. We further check co-efficient and correlation to find whether they are correlated, and the findings can be seen in Table 5.

Table 5: Co-efficient of Co-relation

While checking the relationships, the graph has been plotted that verified the overall significant and positive correlation while the index for sustainable development of ICBC and the other three dimensions variables, i.e., environmental, social, and economic indicators.

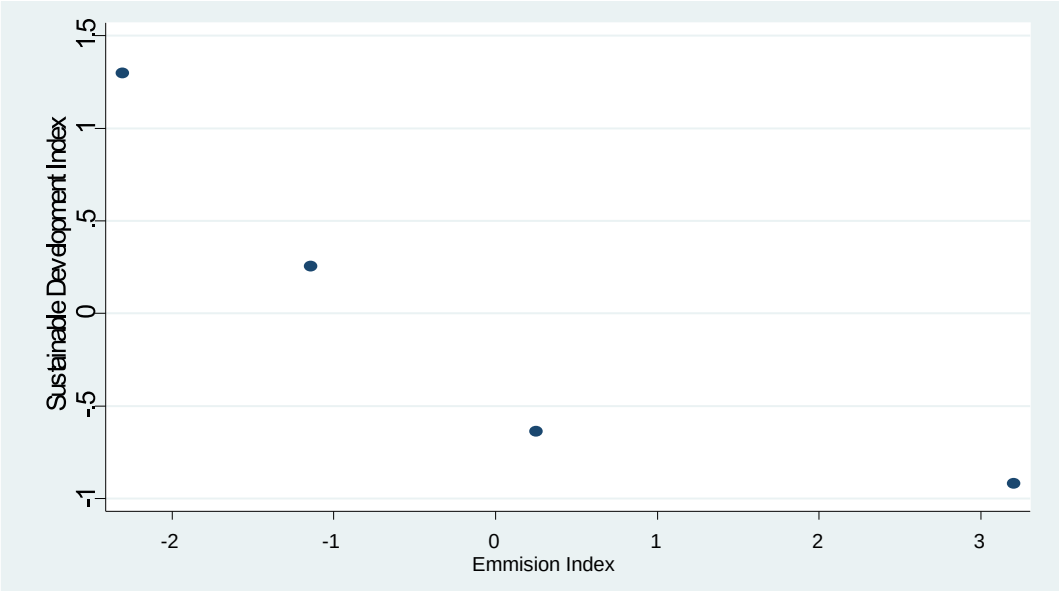
Co-efficient of Co-relation	**Economic Index**	**Environmental Index**	**Social Index**	**Sustainable Index**
Environmental Index	1			
Social Index	0.9216	1		
Economic Index	0.9927	0.9462	18	1
Sustainable Dev. Index	0.9216	0.9216	0.9462	1

Graph1: Graphical represent of all three major indexes about Sustainable Development index.



On the other hand, checking the sustainable index further via applying on emission index created, the results found to be negative but significant.

Graph 2: Reduction in CO2 Emissions after implementation of sustainable development policies



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1.

2. Reference

3. *This article is funded by national natural foundation of China (bjut).*

. Conclusion and Recommendation

Roger & Carter Modal for GSCM helped is feasible to determine the bank's sustainability, for instance, ICBC, the diverse integration shows the overall positive trend for sustainable development index and environmental, social, and economic index. The determinants further helped in understanding the need for risks and transparency along with innovation and green technology. Hence the concept of environmental compliance is introduced. However, to the environmental perspective at inter factors, we further require the data for green insurance, green capital venture, and green bonds trend of sustainable performance in ICBC). The other variables may help find the broader picture of sustainable development in banking & opens the door for research in transparent environmental finance. It also helps enhance the companies' supply chain linked with banks in terms of green tech finance and R&Ds at one side. On the other side, it would help other banks peruse the modal applied by ICBC to have valuable means of measuring sustainable development of the bank with its appropriate transactions in response to having transparency via internal and external operations affecting the overall emission reduction process.

4. Abeyasekera, S. (2005). *Chapter XVIII Multivariate methods for index construction*. Statistical Services Centre,: Reading, United Kingdom of Great
5. Britain and Northern Ireland.
6. Angus, M. (1998). Development Centre studies Chinese economic performance in the long run. *OECD publishing*.
7. Auditors, T. I. o. I. (2009). IPPF – Practice Guide, Internal Auditing & Fraud. In IPPF
8. (Ed.). global headquarters 247
9. Maitland Ave. Altamonte Springs.: The Institute of Internal Auditors.
10. Baeumler, A., Ijjasz-Vasquez, E. and Mehndiratta, S. eds.,. (2012). Sustainable low-carbon city development in China. In W. B. Publications. (Ed.).
11. Bai, C. E., Lu, J. and Tao, Z.,. (2006). Property rights protection and access to bank loans:

  ISSN (Print): 2204-0595
ISSN (Online): 2203-1731

Evidence from private enterprises in China. *Economics of transition, 14(4), pp.611-628.*
12. Baker, H. K. (1988). The Relationship between Industry Classification and Dividend Policy. *Southern Business Review, 14, 1-8.*
13. Battiston, S., Mandel, A., Monasterolo,
14. I., Schütze, F. and Visentin, G., . (2017). A climate stress-test of the financial system. . *Nature Climate Change, 7(4), pp.283-288.*
15. Benita M. Beamon. (1999). Designing the Green Supply Chain,. *Logistics Information Management,, Vol. 12, No. 4,* , 332-342,.
16. Bhardwaj, B. R. a. M., A.,. (2013). Green banking strategies: sustainability through corporate entrepreneurship. *Greener Journal of Business and Management Studies, 3(4), pp.180-193.*
17. Bose, S., Khan, H.Z., Rashid, A. and Islam, S.,. (2018). What drives green banking disclosure? An institutional and corporate governance perspective. *Asia*
18. *Pacific Journal of*
19. *Management, 35(2), pp.501527.*
20. Brian Caplen. (2019). Summary of the Top 1000 World Banks [Press release]
21. Carter & Rogers. (2008). A framework of sustainable supply chain management: moving toward new theory. *International Journal of Physical Distribution & Logistics Management, 38*(5), 360-387. doi:
22. 10.1108/09600030810882816
23. Carter, C. R., & Rogers, D. S. (2008). A framework of sustainable supply chain management: moving toward new theory. *International Journal of*
24. *Physical Distribution & Logistics Management, 38*(5),
25. 360-387. doi:
26. 10.1108/09600030810882816
27. Chen, S. a. D., J.L., . (2001). Operating income, residual income and EVA™: Which metric is more value relevant? *Journal of managerial issues,, pp.65-86.*
28. Chen, Z., et al.,. (2018). Green banking for environmental sustainability-present status and
29. future agenda: Experience from Bangladesh. *Asian Economic and Financial Review,, 8(5), p.571.*
30. Chiau-Ching Chena, H.-S. S. a., HuanJyh Shyur b,1, Kun-Shan Wuc. (2012). A business strategy selection of green supply chain management via an
31. analytic network process. *Computers and Mathematics with Applications 64 (2012)*
32. *2544–2557.*
33. CITIindex. (2015-2018). CITI Index. NRDC: NRDC.
34. Cui, Y., Geobey, S., Weber, O. and Lin, H.,. (2018). The impact of green lending on credit risk in China. *Sustainability, 10(6), p.2008.*
35. Dewi, I. G. A. A. O. a. D., I.G.A.A.P.,.
36. (2017). Corporate social responsibility, green banking, and going concern on banking company in Indonesia stock exchange. . *International journal of social sciences and humanities,, 1(3), pp.118-134.*
37. DiCaprio, A., Amelia U. Santos-
38. Paulino and Maria V. Soklova. .
39. (2017). "Regional Trade
40. Agreements, Integration and Development." *UNCTAD*
41. *Research Paper No. 1*.
42. Dumitrescu, M. I.-B. (2004).
43. INTERNAL AUDIT IN BANKING ORGANISATIONS (Vol.
44. BIATEC, Volume XII, 7/2004):
45. COMMERCIAL BANKING INTERNAL AUDIT IN
46. BANKING ORGANISATIONS.
47. Eissa A. Al-Homaidi, M. I. T., Najib H. S. Farhan & Faozi A. Almaqtari,. (2018). Bankspecific and macro-economic determinants of profitability of Indian commercial banks: A panel data approach. *Cogent Economics & Finance,*.
48. Eissa Alreshidi, M. M., Yacine Rezgui. (2014). *Exploring the Need for a BIM Governance Model: UK Construction Practitioners*.
49. Paper presented at the
50. Conference: Computing in Civil and Building
51. Engineering: At Florida USA. https://www.researchgate.net/publication/281270999_Exploring_the_Need_for_a_BIM_Governance_Model_UK_Construction_Practitioners'_Perceptions
52. Elena Antarciuc et al. (2018).

  ISSN (Print): 2204-0595
ISSN (Online): 2203-1731

53. Sustainable Venture Capital
54. Investments: An Enabler Investigation. *Sustainability mdpi*.
55. Feng Wang et al. (2019). Does Green Credit Policy Work in China?
56. The Correlation between Green
57. Credit and Corporate Environmental Information Disclosure Quality. *Sustainability 2019, 11, 733; doi:10.3390/su11030733*.
58. Feng Wei et al. (2016). *Study on Financial Credit Risk*
59. *Assessment of Green Supply Chain-Taking Guangxi Listed Enterprises as an Example*.
60. Paper presented at the 2016 2nd Asia-Pacific Management and Engineering Conference (APME 2016).
61. Glomsrød, S. a. T., W.,. (2005). Coal cleaning: a viable strategy for reduced carbon emissions and improved environment in China?. *Energy Policy, 33(4), pp.525-542*.
62. Gunasekaran, A., Patel, C., & McGaughey, R. E. (2004). A framework for supply chain performance measurement. *International Journal of Production Economics, 87*(3),
63. 333-347. doi:
64. 10.1016/j.ijpe.2003.08.003
65. Hambrick, D. C. (1983). High profit strategies in mature capital goods industries: A contingency approach. *Academy of Management journal, 26(4), pp.687-707*.
66. Hervani, A. A., Helms, M. M., & Sarkis, J. (2005). Performance measurement for green supply chain management. *Benchmarking: An International Journal, 12*(4),
67. 330-353. doi:
68. 10.1108/14635775106090l5
69. ICBC. (2014-2017a). ICBC CSR
a. Report, .
70. ICBC. (2014-2017b). ICBC
71. Sustainable report.
72. Islam, M. A., Yousuf, S., Hossain, K.F. and Islam, M.R.,. (2014). Green financing in Bangladesh: challenges and opportunities–a descriptive approach. *International Journal of green economics,, 8(1), pp.74-91*.
73. Jaffe, A. B. (1986). *Technological opportunity and spillovers of R&D: evidence from firms' patents, profits and market value.*
74. Jeucken, M. H. A., & Bouma, J. J. (1999). The Changing Environment of Banks. *Greener Management International, 1999*(27), 20-35.
75. doi:
76. 10.9774/GLEAF.3062.1999.au.
77. 00005
78. Jolliffee, I. T. (1973). Discarding
79. Variables in a Principal
80. Component Analysis. II: Real Data. *Journal of the Royal*
81. *Statistical Society. Series C (Applied Statistics), Vol. 22, No. 1(1973), pp. 21-31*.
82. Kishore K. Pochampally, S. N., Surendra M. Gupta. (2009). Eco-procurement strategies for environmentally conscious manufacturers,. *International Journal of Logistics Systems and Management (IJLSM),,*
83. *Vol. 5, No. 1/2, 2009*.
84. Koney Hoi. (2009). China Introduces Compulsory Green Insurance,.
85. *Willis*.
86. Li-zhong, S., Zhi-hua, X. and Ren-jie, Z.,. (2011). A Study on the
87. Correlation between Fair Value
88. Measurement and Investor's Decision: An Empirical Study on China's A-share Finance and Insurance Industry. *Journal of*
89. *Beijing Technology and Business University, (Social Science), p.04.*
90. Littig, B. a. G., E. (2005). 'Social sustainability: a catchword between political pragmatism
91. and social theory',. *International Journal of Sustainable*
92. *Development*. doi:
93. 10.1504/ijsd.2005.007375
94. Liu, X. Y., Jie & Qu, Sixiao & Wang, Leina & Shishime, Tomohiro & Bao, Cunkuan. (2012). Sustainable Production: Practices and Determinant
95. Factors of Green Supply Chain
96. Management of Chinese
97. Companies. *Business Strategy and the Environment., `21. 1 - 16. 10.1002/bse.705.* .
98. Lockwood, L. a. P., W.,. (2010). Sustainable growth and stock returns. *Journal of Financial Research, 33(4), pp.519-538.*
99. Lu, Y. a. A., I., . (2014). Stakeholders' power, corporate characteristics, and social and environmental disclosure: evidence from

  ISSN (Print): 2204-0595
ISSN (Online): 2203-1731

China. *Journal of Cleaner Production,, 64, pp.426-436.*
100. Markley, M. J., & Davis, L. (2007). Exploring future competitive advantage through sustainable supply chains. *International*
101. *Journal of Physical*
102. *Distribution & Logistics*
Management, 37(9), 763-774. doi:
103. 10.1108/09600030710840859
104. Marwane El Kharbili, S. S., Ivan Markovic, Elke Pulvermüller. (2008). Towards a Framework for Semantic Business Process Compliance
Management.
105. *Proceedings of GRCIS 2008*.
106. Mclean, S. (2010).
Business
107. *Communication for Success,*
108. *Chapter 16: Intrapersonal and*
109. *Interpersonal Business*
110. *Communication*: University of Minnesota Libraries
111. Publishing,.
112. Md. Ali Arshad Chowdhury, M. D. (2016). Green Banking practices in Bangladesh. *THE COST ANDMANAGEMENT,*
113. *VOLUME-44, NUMBER-2,*.
114. Meena, R. (2013). Green banking: As initiative for sustainable development. *Global Journal of Management and Business Studies,, 3(10), pp.1181-1186.*
115. Mei, C. A. I. a. H., Z.,. (2014).
116. ANALYSIS OF NON
117. PERFORMING LOAN AND CAPITAL ADEQUACY RATIO AMONG CHINESE
118. BANKS IN THE POSTREFORM PERIOD IN
119. CHINA. *Journal of Advanced Studies in Finance (De Gruyter Open), 5(2).*
120. Michael, R. (Producer). (1994). “At what Point can pollution be said to cause damage to the Environment?”, The Banker, January.
Retrieved from
121. https://pdfs.semanticscholar.org /6e1b/80a0faac55b0c46b9b8dc
122. 09ef6137fb859a9.pdf
123. Monika Sestakova. (2012). *Financial*
124. *Sector and Sustainable Economic Development*. Paper presented at the Management Challenges in the 21st
125. Century:2012 "Sustainability a Moving Target?", At:
126. Bratislava. .
127. https://www.researchgate.net/publication/323109220_Financial_Sector_and_Sustainable_Economic_Development
128. Neyati Ahuja. (2015). Green banking in India: A Review of
129. Literature. *International*
130. *Journal for Research in Management and Pharmacy,,*
131. *4*(1,).
132. Ngegba, E. K. (2017).
133. CONSTRUCTION OF
134. SATELLITE LABORATORY AT NYANZA HOSPITAL, ENVIRONMENTAL AUDIT
135. REPORT: The World Bank, Rwanda Biomedical Centre.
136. Nykvist, A. M. B.
(2020).
137. Understanding the role of green bonds in advancing sustainability. *JOURNAL OF SUSTAINABLE FINANCE & INVESTMENT*. doi:
138. https://doi.org/10.1080/204307
139. 95.2020.1724864
140. Paluszak, G. a. W.-P., J., . (2016). The role of green banking in a sustainable industrial network. *Bezpieczny Bank, (4 (65)), pp.75-95.*
141. Park, C.-Y., and Racquel Claveria.
142. (2018a). “Constructing the
143. Asia-Pacific Regional
144. Cooperation and Integration
145. Index: A Panel Approach.”
146. *ADB Economics Working*
147. *Paper Series No. 544*.
148. Pauluzzo, G. E. R. (2009). The Chinese Banking System:
149. Economic Performance and
150. Prospects for Future Development. *Transition Studies Review*. doi: DOI: 10.1007/s11300-009-0055-4 Peter Lawrence, J. M. a. C. S. (2002). The Water Poverty Index: an International Comparison. *Keele Economics Research Papers*.
151. Rehman, A., Ullah, I., Ullah, Z., Zeeshan, M., Hussain, A. and Rahman, H.U.,. (2021). Adoption of green banking practices and environmental performance in Pakistan: A demonstration of structural equation modelling. *Environment, Development and Sustainability, pp.1-21*.
152. Ren, X., Shao, Q. and Zhong, R.,. (2020). Nexus between green finance, non-fossil energy use, and carbon intensity: Empirical evidence from China

  ISSN (Print): 2204-0595
ISSN (Online): 2203-1731

based on a vector error correction model. *Journal of Cleaner Production, 277, p.122844.*
153. Robert S. Pomeroy, R. B. P., b Brenda M. Katon a & Canesio D. Predo. (1997). Evaluating factors contributing to the success of community based coastal resource management: the Central Visayas Region Project-1, Philippines. *Ocean and Coastal Management, vol. 36, Nos. 1-3, p. 24.*
154. Sachs, J. D. a. W., W.T.,. (2001). Understanding China's economic performance. *The Journal of Policy Reform, 4(1), pp.1-50.*
155. Sahoo, P. N., Bibhu. (2007). Green Banking in India. *The Indian Economic Journal, 55. 91-11. 10.1177/0019466220070306* Said, R. M. a. T., M.H.,. (2011). Performance and financial ratios of commercial banks in
156. Malaysia and China.
157. *International Review of Business Research Papers,*
158. *7(2), pp.157-169.*
159. SÁNCHEZ*, M. B. C. A. N. (2001).
160. Using Principal Components to
161. Produce an Economic and
162. Social Development Index: An
163. Application to Latin America
164. and the U.S. *(JELO57); Atlantic Econ. J., 29(3): pp. 311-329, Sept. 01., Vol.29*.
165. Sarita, B. (2012a). Green banking - The new strategic imperative,.
166. *International Journal of Marketing, Financial Services and Management Research,,*
167. *Volume : 2*(Issue : 2).
168. Sathaye et al. (2007). Sustainable Development and Mitigation Chapter 12. In M. M. H.
169. Opschoor (Ed.), *Climate*
170. *Change 2007: Working Group*
171. *III: Mitigation of Climate*
172. *Change*. Cambridge University
173. Press, Cambridge, United Kingdom and New York, NY, USA.
174. Sohel Mehedi, M. A. K. (2017).
175. GREEN BANKING: A CASE STUDY ON DUTCHBANGLA BANK LTD,. *Academy of Accounting and*
176. *Financial Studies Journal, 21*.
177. Sun, X., Liu, X., Li, F., Tao, Y. and
178. Song, Y.,. (2017).
179. Comprehensive evaluation of different scale cities' sustainable development for economy, society, and ecological infrastructure in China. *Journal of Cleaner Production, 163, pp.S329-S337.*
180. Tan, Y. a. F., C.,. (2012). Bank profitability and GDP growth in China: a note. *Journal of*
181. *Chinese Economic and Business Studies,, 10(3), pp.267-273.*
182. Wang, C., Hu, R. and Zhang, T.C.,. (2020). Corporate social responsibility in international hotel chains and its effects on local employees: Scale development and empirical testing in China. *International Journal of Hospitality*
183. *Management,, 90, p.102598.*
184. Wang Yao, W. Y. (2017).
185. ESTABLISHING CHINA'S GREEN FINANCIAL
186. SYSTEM: PROGRESS
187. REPORT, (I. o. CUFE, Trans.).
188. In L. T. Liu Qian, Cong Haitao,
189. Xu Yinshuo, Xia Hanwei, Chen
190. Chuanqi, Pan Dongyang,
191. Zhang Di (Ed.). China: central university of finance and economics.
192. Weber, O. (2016). The impact of green banking guidelines on the sustainability performance of banks: the Chinese case. *JSTOR.*
193. Wei, Z., Wu, S., Li, C. and Chen, W.,.
194. (2011). Family control, institutional environment and cash dividend policy: Evidence from China. *China Journal of Accounting Research, 4(1-2), pp.29-46.*
195. Yinjianbanfa. (2013). *Notes on the Green Credit Statistics*
196. *Information Disclosure*. China:
197. Retrieved from http://www.cbrc.gov.cn/chinese/files/2018/DD114DBE72084577BBB4392A38E65FFE.pdf.
198. Yuan, Q., Yang, D., Yang, F., Luken, R., Saieed, A. and Wang, K.,. (2020). Green industry development in China: An index based assessment from perspectives of both current performance and historical effort. *Journal of Cleaner Production,, 250, p.119457.*
199. Zhang et al. (2019). Green innovation and firm performance: Evidence from listed companies in China. *Resources, Conservation and Recycling, 144, pp.48-55.*
200. ZhangLiping, Z. (2015). A Framework for Green Finance: Making Clear Waters And Green Mountains China's Gold And
201. Silver *Green China's Financial*

  ISSN (Print): 2204-0595
ISSN (Online): 2203-1731

202. *System*: DEVELOPMENT RESEARCH CENTER OF THE STATE COUNCIL.
203. Zheng, W. (2012). *China's Climate Change Policies*. First published 2012 by Routledge, 2 Park Square, Milton Park,
204. Abingdon, Oxon OX14 4RN, Simultaneously published in the USA and Canada by
205. Routledge, 711 Third Avenue,
206. New York, NY 10017,
207. Routledge is an imprint of the Taylor & Francis Group, an informa business © 2012 Social Sciences Academic Press (SSAC), China.
208. Zou, H. a. A., M.B., . (2008). Corporate ownership, equity risk and returns in the People's Republic of China. *Journal of International Business Studies, 39(7), pp.1149-1168.*

1.

ISSN (Print): 2204-0595
ISSN (Online): 2203-1731