Inzinerine Ekonomika-Engineering Economics, 2023, 34(1), 17–31

The Impact of Green Investment, Eco-Innovation, and Financial Inclusion on Sustainable Development: Evidence from China

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crossref http://dx.doi.org/10.5755/j01.ee.34.1.32159

Recently, sustainable development is demanded to be a compulsory requirement by international communities due to environmental and economic instability, hence, encouraging scholars to explore various approaches through which countries could achieve it. In this lieu, the present article explores the concept of green investment, eco-innovation, and financial inclusion and their effectiveness on sustainable development in the context of China. The article has extracted the data from secondary sources like Organization for Economic Co-operation and Development (OECD), Bloomberg, and World Development Indicators (WDI) from 1991 to 2020. The study has applied the Bayesian Auto-regressive Distributed Lags (BARDL) model to check the association between the understudy constructs. The results exposed that the green investment, eco-innovation index, R&D expenditures, commercial bank branches, commercial bank depositors, and commercial bank borrowers have a positive and significant linkage with sustainable development (human development index) in China. The study guides policymakers in developing policies to enhance sustainable development using green investment, eco-innovation, and financial inclusion.

Keywords: *Green Investment; Eco-Innovation; Research and Development Expenditures; Financial Inclusion; Sustainable Development; Human Development Index.*

Introduction

In the international market, consistent competition among economies can be observed lately. Where the countries are competing against each other concerning economic growth, on the other hand, they are also needed to gain higher sustainability to address climate changes and show concern for well-being at international platform. It is necessary as it fulfills the SD goals which articulate that the countries are needed to show progress in terms of economic growth without compromising the quality of the environment and social well-being. Hence, to achieve SD human, natural and physical capital needs preservation. It is argued that the idea of human development has always been to increase people's options, improve their well-being, and increase the variety of their lives. Over the past 40 years, UNDP has observed and aided China's remarkable growth (Paraschiv *et al.,* 2021; Moslehpour *et al.,* 2022b; Zhang, Morse, & Ma, 2019). Since it was the first organization to advance the idea of human development, UNDP has continued to add important new components to the HDI, such as gender and multidimensional poverty. In addition to supporting specific projects, UNDP will continue to support China's strategic vision of "human-oriented development" by offering advice on how to address issues such as the challenges of an aging society, maintaining ecological balance, reducing inequality, the fourth industrial revolution, the impact of artificial intelligence, etc. from a human development perspective. China has become the world manufacturing factory. China is the world's fastest-growing economy. The entire globe is looking toward China with a view of the business. China has paid special focus to its human development. As human development is the key to the betterment of the country (Hung, 2021; Moslehpour *et al.,* 2022a Sarwar, Ming & Husnain, 2020).

Since its inception in 1949, and particularly since the start of the Reform and Opening Up, China has made great advancements in human development. In 1978, China's Human Development Index (HDI) score was 0.410 whereas the same was 0.752 in 2017 (Anwar *et al.,* 2021; Long *et al.,* 2020; Zhao *et al.,* 2021). Since the UNDP started examining global HDI trends in 1990, just one nation has jumped from the low human development category to the high human development category. Due to the adoption of extensive basic health care and education, China already had higher social indices at the start of its Reform and Opening Up phase than the average low-income country. Rapid economic growth brought about by the changes that started in 1978 accelerated the improvement of social indices. The government moved its attention to addressing scarcities in other areas, combining social and ecological development, in 2000, marking the end of the age of economic scarcity (Niaz, 2021; Tan *et al.,* 2021; Yu & Wu, 2018). By 2020, the target date stated in 2002, a society that is "all over moderately wealthy" would have been attained. However, beyond 2020, there will still be difficult obstacles to overcome in order to achieve the 2030 Agenda and the Sustainable Development Goals (SDGs), such as environmental pollution, regional disparities, environmental deterioration, and inequality. Increased public expectations for a better living, slower economic growth, and demographic issues brought on by an aging population, and growing foreign tensions are all factors making it more difficult to navigate China's next phase of development. The human development index of China is given in Figure 1.

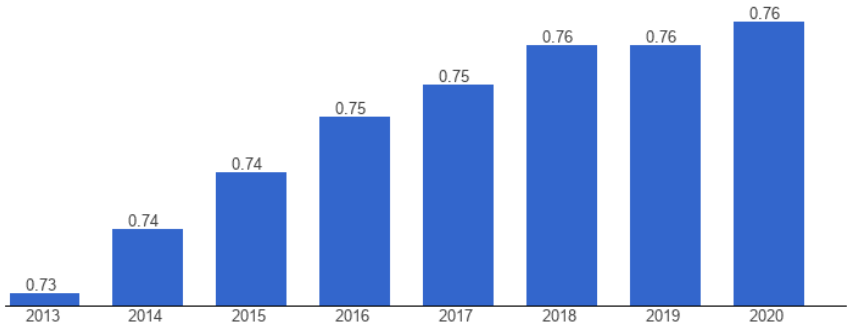

Figure 1. Human development index of China (*Source: WDI*)

The present article also aims to fulfill the gaps that are being identified in the existing body of knowledge, like 1) the government all around the globe ensuring maximum efforts to uplift the standard of their human resource. The countries invest more and more in their education to get their people educated and skilled. Thus, human resources development is the key to the country's prosperity. Although sustainable human development researched although but still not reached its peak in the case of China as there are a number of its aspects are need to be explored, 2) Pizzi, Caputo, Corvino, and Venturelli (2020), explored the association of sustainable development and management, however, the said article attempts to check the effect of sustainable development with green investment, eco-innovation, R&D expenditures, number of bank loan branches and number of deposit accounts particularly in China updated data set set, 3) the expression is consisted of sustainable development, green investment, eco-innovation, R&D expenditures, number of bank loan branches, number of deposit accounts and number of loan accounts particularly in China is not evaluated before with updated data set, 4) Hysa, Kruja, Rehman, and Laurenti (2020), investigated the relationship between SD and EG, however, the current article will evaluate the connection of sustainable human development with green investment, innovation and financial inclusion like number of banks, loans in China with fresh data set, 5) Grosseck, Țîru, and Bran (2019), investigated relationship between sustainable development and the education, whereas the present study will check the sustainable development association with eco-innovation, green investment and financial inclusion in China with the fresh data set, 6) Sarwar, Streimikiene, Waheed, and Mighri (2021), investigated the sustainable development from carbon emission and health growth perspective, whereas the study will investigate green investment, eco-innovation as well as financial inclusion like number of accounts, loan. The study also contributes from a theoretical as well as practical perspective like 1) promotes the significance of sustainable human development, green investment, and financial inclusion in China, and 2) it will help the public and private sectors to review and restructure their policies with the view to bring stability in the human development in China.

The study is conducted by following five phases. The introductory phase captures the essence of the study where gaps and significance are being highlighted in detail. The following phase reviews the literature and sheds light on chosen constructs and their relationships. The methodology phase involves the data collection methods and techniques. The fourth phase highlights the findings of the study. Finally, the last phase covers the discussion part where results are compared with prior literature. Also, the limitations and recommendations are discussed which helps future researchers to study further.

Literature Review

In order to enhance an organization's environmental performance, the effects of HRM operations on the environment should be taken into account throughout the adoption and maintenance of an environmental management system (Korzeb & Samaniego-Medina, 2019; Sadiq *et al.,* 2022b; Zaman, Atawnah, Haseeb, Nadeem, & Irfan, 2021). Entrepreneurs will not only be more accessible thanks to GHRM, but they will also be more environmentally aware. Customers and investors are more likely to buy from companies that reduce their GHG emissions because of the positive impact it has on their bottom line. Studies on human resource management by Xue, Boadu, and Xie (2019) have often focused on a small number of specific practices rather than a wide range of actions. Additionally, a few studies have shown that implementing GHRM standards simultaneously may be more beneficial to the company's performance and the environment. Recent research has been conducted on bundle performance and GHRM practices. With the help of RBV, it is possible to distinguish the resources of different companies (Aguilera-Caracuel & Ortiz-de-Mandojana, 2013; Sadiq *et al.,* 2022a). The economic performance (Ec.P.) and efficiency of a corporation can be improved by the application of GHRM strategies, which can improve a company's operational efficiency over time. Moreover, Y.-S. Chen and Chang (2018) believe that green workplace practices can promote financial success by enhancing employee involvement and competence. To attract environmentally conscious job candidates, an employer's ability to display environmental awareness in the hiring process or even just in the interview phase is important (Y. S. Chen, Chang, Lin, Lai & Wang, 2016; Sadiq *et al.,* 2021). Firm profits can be increased by encouraging employees to pursue their personal interests and hobbies, which in turn boosts employee productivity and motivation. Accordingly, Y.-S. Chen and Chang (2018) argue that more sustainable business culture can achieve both increased productivity and lower expenses. Eco-

friendly enterprises have higher sales and lower costs, according to the study's findings. From another perspective, taking on environmental issues has various benefits, two of which are improved connections with stakeholders and increased loyalty among employees. Additionally, a higher feeling of social responsibility in the workforce has been found to be an additional advantage. Customers are more satisfied, employees are more productive, and society benefits from more innovative products, according to research by Xue et al. (2019). According to Aguilera-Caracuel and Ortiz-de-Mandojana (2013) GHRM's performance was boosted in 2019 by corporations that invested in social activities. As a safety precaution, programs like this one are in place. Green initiatives can be used as a reporting tool to help manufacturing companies become more environmentally friendly. Furthermore, when a company's social responsibility (SP) activities include actions that benefit both the company's internal community (its employees) and the community at large, they are most effective (its vendors and consumers). According to a research study, GHRM practices have also been demonstrated to increase employee well-being and protect the environment. According to Qiu, Hu, and Wang (2020), when GHRM policies and practices are implemented, employees' health and well-being improve.

The world is changed at a rapid pace over the past few decades. The main reason of this rapid change is due to globalization. The world is witnessing road changes in the form of innovations. These innovations have strongly influenced humans, Accordingly, Ilic, Petrovic, and Djukic (2022), proposed that there appears to be a connection between green purchasing (GP) and partnering with customers in regard to environmental effects or environmental performance. Environmental cooperation (EC) and green procurement (GP) have the potential to enable industrial companies to influence the adoption of sustainable practices throughout their supply chains, thus improving the environmental performance of these companies. EC stands for environmental cooperation, and GP stands for green procurement (EP). According to the results of the inquiry, this is something that can be accomplished (Karman, Kijek & Kijek, 2020). Because of this, a company may be able to lessen its impact on the environment by keeping an eye on and directing the actions of its suppliers. Moreover, the implementation of EI, which puts an emphasis on saving resources throughout the manufacturing process, makes it possible to lower production costs and increase output at the same time. Furthermore, Loucanova, Olsiakova, and Stofkova (2022b) proposed that ECO has the ability to reduce waste while simultaneously enhancing material efficiency. Moreover, Walton, Zhang, and O'Kane (2020) proposed that there are now more opportunities to sell in foreign markets. This shows that operating in a way that is good for the environment can save a lot of money. According to this view, acts that are responsible for the environment can be advantageous not just to local communities but also to corporations. It has been established that industrial processes that are environmentally responsible are advantageous not only to the health of workers but also to the environment and society as a whole. According to the findings of Mehmood (2022), there are two ways in which businesses can make a beneficial contribution to the general well-being of society: one is through the protection of consumers, and the other is through the openness of markets. One of the most important factors that will decide how successful a firm is will be its capacity to successfully incorporate EI into its business processes (Atkociuniene & Siudikiene, 2021; Chien *et al.,* 2021; Swetha, 2020). On the other hand, the efficacy of EI programs has been proven through their ability to increase consumer loyalty, enhance corporate identities, provide equal chances to all employees, and raise the bar for ethical and safety standards (Chien *et al.,* 2022; Loučanova *et al.,* 2022b; Swetha, 2020). Even though there isn't much proof to back up the assertion, there is still a chance that implementing eco-friendly business practices may result in improved brand identity and loyalty among customers.

The prosperity of any country is strongly based on the economic conditions of the country. The betterment in the economic conditions will uplift the standard of living of the country's people. The financial section is the key towards the betterment of the human development of the country in terms of jobs. Accordingly, Le, Chuc, and Taghizadeh-Hesary (2019) divide middle-income countries into three groups: "stuck intermediate civilizations," "graduating middle-income societies," and "developing middle markets." The study proposed that financial inclusion is a key part of improving industrial performance. Further, Yang and Zhang (2020) checked the link between the economic growth of a country and the value of its stock market. Moreover, Yin, Xu, Chen and Peng (2019) worked on China as a sample of high-income countries to look at the relationships between cash advances, productivity growth, and ecological equity. They find a positive link between social progress, banking sector expansion, and productivity growth. Subsequently, Galvez-Sanchez, Lara-Rubio, Verdú-Jover, and Meseguer-Sanchez (2021), investigated how bank planning affects sustainable development in 42 developing countries, and found that there is a positive correlation. Moreover, the results of past studies have been contradictory and different. Furthermore, Aduda and Kalunda (2019), checked how financial growth affects ecosystems and tries to find a link between the two. Nurohman, Kusuma, and Narulitasari (2021) use data from China to show that there is a negative relationship between financial inclusion and greenhouse gas emissions. This is because the growth of the financial sector makes it possible for businesses to adopt practices that are good for the environment. Similarly, Siano, Raimi, Palazzo, and Panait (2020) proposed that financial inclusion could make remittances have a bigger effect on economic growth. Moreover, Arun and Kamath (2019) Investigated that economic growth can help green development by giving businesses access to new technologies that use less energy. For example, F. W. Chen, Feng, and Wang (2018) checked how economic growth affects renewable energy sources and found that it is too expensive to develop new ones. So, countries that have achieved financial inclusion can create resources that are good for the environment and good for the economy. Additionally, Ozturk and Ullah (2022) investigated that the accessibility, depth, efficiency, and overall development of financial institutions have a large positive effect on economic growth. Throughout these conversations, it was made clear that capital, labor, energy use, and free trade

all contribute to economic growth. Also, financial inclusion has a bigger effect on the economy in countries with low incomes and that have just joined the EU than in countries with high incomes and that have been in the EU for a long time. Furthermore, financial inclusion has become an important part of China's financial reform for growing the economy (Arun & Kamath, 2019; Braslauskas, 2020; Liu *et al.,* 2021). The goal of our new database is to find economic, institutional, and government signs of an impending economic disaster. Special attention is paid to how well the administrative framework lets financial markets be set up quickly, which is needed to lessen the effects of shocks (Arner, Buckley, Zetzsche, & Veidt, 2020; Liu *et al.,* 2022a; Yousaf *et al.,* 2021). When it comes to financial inclusion, it is important to make sure that everyone has access to the right financial sector. This means giving low-income families and far-flung communities equal access to investing and other financial tools that were not available before (Aduda & Kalunda, 2019; Machdar, 2020; Mitic *et al.,* 2020; Moslehpour *et al.,* 2021). FI indicators include regional problems for investment bankers, structured wealth leagues, and total term deposits. Financial intermediaries (FIs) need to expand their service areas and get rid of economic and social exclusion in order to grow.

The boosting economic efficiency while simultaneously lowering that sector's destructive influence on the environment is possible through the implementation of financial inclusion (Ainou, Ali & Sadiq, 2022). Consumers who have even a fundamental understanding of economics can save money while doing their part to protect the environment by making environmentally responsible purchases. If the goals that the economy has set for renewable energy sources are realized, there is a good chance that people will be encouraged to spend more money on environmentally friendly goods and services in the not-too-distant future (Liaqat, Gao, Rehman, Lakner, & Olah, 2022; Liu *et al.,* 2022b; Mikelsone *et al.*, 2020; Wu *et al*., 2015). In the long run, economic success motivates businesses to invest in environmentally friendly products, which encourages consumers to continue purchasing things that continue to meet their demands over time. This cycle continues until the economy is no longer successful. According to Menyelim, Babajide, Omankhanlen, and Ehikioya (2021) and Rasool, Samma, Wang, Zhao and Zhang (2019) research, investments in easily accessible businesses have a direct bearing on entrepreneurial endeavors, the production of new jobs, and overall economic expansion. Long-term success can be achieved through cultivating a culture that prioritizes sustained expansion, maximization of available resources, and continued technological innovation (Fan & Zhang, 2017; Tiberius, Schwarzer & Roig-Dobón, 2021). According to Aduda and Kalunda (2019), more economic revolutions are possible if firms adopt methods that are more likely to be successful. Improvements were made to the apparatus and the technology, for instance. Comprehensive economics can assist businesses in securing financial aid for R & D expenditures and capital investments, in addition to encouraging businesses to embrace digital transformation. Several authors (Gupte, Venkataramani & Gupta, 2019; Sell, 2020; Streimikiene & Akberdina, 2021), Environmental performance has been enhanced, while efficiency in greener energy and resource systems has been boosted. Additionally, energy demand has been changed to make use of new fuels, which has led to an increase in environmental performance (Aduda & Kalunda, 2019; Korzeb & Samaniego-Medina, 2019; Li *et al.,* 2021; Seddighi & Mathew, 2020). Similarly, Gupte et al. (2019) say that more businesses will use renewable energy sources if they can get the money to do so. For instance, the overall productivity of a system can be dissected into its component pieces, such as the productivity of the system's labor force or its environmental performance, all of which contribute to the overall efficiency of the system (Jarlstrom, Saru, & Vanhala, 2018; Jermsittiparsert, 2021). With the help of element efficiencies (Aduda & Kalunda, 2019; Y. S. Chen & Chang, 2018; Wirsbinna & Grega, 2021), it is possible to figure out which control signals have the biggest impact on the environment and regional economic productivity through banking services. According to the findings of studies, the production of energy and the environment both gain from financial inclusion. There is a strong connection between the availability of financial resources and the consumption of energy (Lan *et al.*, 2022; Menyelim *et al.*, 2021). Because we are moving away from conventional forms of energy production, there is a possibility that our population may grow (Y. S. Chen & Chang, 2018; Y. S. Chen *et al*., 2016; Hartani, Haron & Tajuddin, 2021; Joia & Cordeiro, 2021). The development of new jobs is directly correlated to an increase in the utilization of renewable energy sources. Their findings suggest that a more equitable distribution of wealth could have a beneficial effect on the natural world. Utilization of the STIRPAT model was seen (Menyelim *et al.*, 2021; Ojogiwa, 2021; Wang & He, 2020). Businesses that use fewer resources and generate less pollution are urged to continue operating in this manner as a direct outcome of inclusive banking. As part of their overall business plan, green-finance institutions must lower the cost of deposit insurance (Jarlstrom *et al.,* 2018; Korzeb & Samaniego-Medina, 2019; Shibli *et al.,* 2021).

Data and Material

The article investigates the impact of green investment, eco-innovation index, R&D expenditures, commercial bank branches, commercial bank depositors, and commercial bank borrowers on sustainable development in China. The article has extracted the data from secondary sources like OECD, Bloomberg, and WDI from 1991 to 2020. The study has established the equation with understudy constructs given as under:

$$SD_{it} = \alpha_0 + \beta_1 GI_{it} + \beta_2 ECI_{it} + \beta_3 RDE_{it} + \beta_4 CBB_{it} + \beta_5 DCB_{it} + \beta_6 BCB_{it} + e_{it} \quad (1)$$

Where;

SD = Sustainable Development
t = Time Period
i = Countries
GI = Green Investment
ECI = Eco-innovation Index
RDE = Research and Development Expenditures
CBB = Commercial Bank Branches
DCB = = Depositors with Commercial Banks
BCB = Borrowers with Commercial Banks

The chosen variables with measurements are mentioned in Table 1.

Table 1

Measurements of Variables

S#	Variables	Measurement	Sources
01	Sustainable Development	Human Development Index	WDI
02	Green Investment	Green investment (% of GDP)	Bloomberg
03	Eco-innovation	Eco-innovation index	OECD
04	Financial Inclusion	Research and development expenditures (% of GDP)	WDI
		Commercial bank branches (per 100,000 adults)	WDI
		Depositors with commercial banks (per 1,000 adults)	WDI
		Borrowers from commercial banks (per 1,000 adults)	WDI

Research Methods

The paper has employed descriptive statistics that show the details of the variables used in the study. Moreover, the paper also applied descriptive statistics with respect to years to check the year-wise details of the variables used in the study. In addition, the paper has also applied the correlation matrix to examine the directional nexus among variables. Moreover, the paper has also applied the Augmented Dickey-Fuller (ADF) test and Phillips–Perron (PP) tests to investigate the unit root. The equation for the tests is given below:

$$d(Y_t) = \alpha_0 + \beta t + \Upsilon Y_{t-1} + d(Y_t(-1)) + \varepsilon_t \quad (2)$$

In addition, the paper has also applied the (Westerlund & Edgerton, 2008) approach to check the co-integration. The null hypothesis related to this approach is that there are no co-integration exits and vice versa. The equations for the approach are given below:

$$\mathrm{LM}_{\varphi}(\mathrm{i}) = \mathrm{T}\widehat{\varphi}_{\mathrm{i}}\,(\hat{\mathrm{r}}_{\mathrm{i}}/\widehat{\sigma}_{\mathrm{i}}) \quad (3)$$

$$\mathrm{LM}_{\tau}(\mathrm{i}) = \widehat{\varphi}_{\mathrm{i}}/\mathrm{SE}(\widehat{\varphi}_{\mathrm{i}}) \quad (4)$$

Equations 3 and 4, $\hat{\varphi}_i$ presents the estimate against $\hat{\sigma_i}$ standard error. Moreover, $r^{\hat{2}}{}_i$ presents its long-run calculated variance of $_{it}$. Furthermore, $\varphi i\ (L) = 1 - \sum \varphi_{ij} L^j$ presents a scalar polynomial with L lag length. Finally, the ρ_i presents the factor loading parameters vector.

The paper has also applied the ARDL approach because some variables have no unit root at I(0), and others have no unit root at I(1). It also controls the effects of autocorrelation (Kamarudin et al., 2021; Zaidi & Saidi, 2018). The equation for the ARDL approach is given as under:

$$\Delta SD_t = \alpha_0 + \sum\delta_1\Delta SD_{t-1} + \sum\delta_2\Delta GI_{t-1} + \sum\delta_3\Delta ECI_{t-1} + \sum\delta_4\Delta RDE_{t-1} + \sum\delta_5\Delta CBB_{t-1} + \sum\delta_6\Delta DCB_{t-1} + \sum\delta_7\Delta BCB_{t-1} + \varphi_1 SD_{t-1} + \varphi_2 GI_{t-1} + \varphi_3 ECI_{t-1} + \varphi_4 RDE_{t-1} + \varphi_5 CBB_{t-1} + \varphi_6 DCB_{t-1} + \varphi_7 BCB_{t-1} + \varepsilon_t \quad (5)$$

The paper also employed the Bayesian inference analysis that expected the valuation parameters are random. In contrast, the experiential data is fixed. Hence it works on the basis of Bayes's rule regarding the initial distribution results using subsequent information related to the model parameters from experiential data (Huang, Chien & Sadiq, 2021c; Matuszewska-Pierzynka, 2021; Salakpi *et al.,* 2021). Therefore, the assessed model for Bayesian is given as under:

$$Y_t \sim N + \beta^T X_t, \delta^2 I \quad (6)$$

In equation (6) Y_t is the sustainable development drawn from Gaussian distribution. In contrast, the X_t is the matrix of predictors. Moreover, β^T presents the rearranged weight matrix while δ^2 shows the variance, and I present the identity matrix. The previous distribution shows the pre-existing data regarding the parameters obtained from expert knowledge. Hence, the assessed coefficients from the ordinary least square (OLS) approach could deliver weak outcomes before Bayesian analysis. (Huang, Sadiq & Chien, 2021b; Meirun, Mihardjo, Haseeb, Khan, & Jermsittiparsert, 2021). Thus, researchers highly suggest that estimates from OLS regression be adopted to set the starting information of the Bayesian model with the assumption of normal distribution (Huang, Sadiq & Chien, 2021a; Ngoc & Awan, 2022). The posterior distribution is assessed as under:

$$P(\beta/Y_t, X_t) = \frac{\mathrm{P}(Y_t/\beta, X_t) * \mathrm{P}(\beta/X_t)}{\mathrm{P}(Y_t/X_t)} \quad (7)$$

In equation (7), $\mathrm{P}(Y_t/\beta, X_t)$ presents the likelihood of the data. In contrast, $\mathrm{P}(\beta/X_t)$ presents the prior probability data of model parameters and $\mathrm{P}(Y_t/X_t)$ presents the normalization constant. Moreover, the "adaptive random-walk Metropolis-Hastings algorithm" is also used to avoid spurious convergence and confirm the effects of green investment, eco-innovation, and financial inclusion on sustainable development.

Research Findings

The paper has employed descriptive statistics that show the details of the variables used in the study. The study outcomes exposed that the SD mean value was 0.611 percent, GI mean value was 3.389 percent, ECI average value was 91.201 percent, and RDE mean value was 1.307 percent. In addition, the study outcomes also exposed that the CBB mean value was 6.883 per 100,000 adults, the DCB mean value was 9.934 per 1000 adults, and the BCB average value was 205.159 per 1000 adults. These results are mentioned in Table 2.

Table 2

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
SD	30	0.611	0.108	0.445	0.770
GI	30	3.389	1.341	1.139	6.187
ECI	30	91.201	22.841	41.879	128.109
RDE	30	1.307	0.678	0.194	2.401
CBB	30	6.883	1.344	4.677	8.880
DCB	30	9.934	10.396	1.276	36.450
BCB	30	205.159	141.290	88.783	535.920

Moreover, the paper also applied descriptive statistics with respect to years to check the year-wise details of the variables used in the study. The outcomes indicated that the highest value of SD was in 2020, GI was in 1993, and ECI, RDE, CBB, DCB, and BCB were in 2020. In contrast, the outcomes indicated the lowest value of SD, GI, ECI, RDE, CBB, DCB, and BCB was in 1991. These results are mentioned in Table 3.

Table 3

Descriptive Statistics (Years)

	SD	GI	ECI	RDE	CBB	DCB	BCB
1991	0.445	1.139	41.879	0.194	4.677	1.276	88.783
1992	0.451	2.613	44.540	0.271	4.829	1.288	89.918
1993	0.462	6.187	51.047	0.347	4.981	1.298	92.819
1994	0.471	5.987	63.429	0.424	5.133	1.308	94.298
1995	0.479	4.880	74.080	0.501	5.286	1.319	95.929
1996	0.491	4.652	80.238	0.563	5.438	1.328	97.951
1997	0.499	4.725	82.474	0.639	5.590	1.340	99.818
1998	0.521	4.436	81.836	0.647	5.742	1.352	100.873
1999	0.541	3.749	80.689	0.750	5.894	1.398	101.273
2000	0.542	3.475	80.970	0.893	6.046	1.480	102.109
2001	0.553	3.513	81.552	0.940	6.199	2.320	102.836
2002	0.565	3.609	80.955	1.058	6.351	3.160	103.563
2003	0.576	3.487	81.868	1.120	6.503	4.000	104.291
2004	0.588	3.484	84.999	1.215	6.655	4.840	105.018
2005	0.599	4.554	86.509	1.308	6.807	5.680	105.745
2006	0.611	4.509	87.936	1.369	6.959	6.520	124.810
2007	0.622	4.401	92.172	1.374	7.112	7.360	149.180
2008	0.633	3.734	97.633	1.446	7.264	8.160	173.550
2009	0.645	2.569	96.922	1.665	7.416	9.110	197.920
2010	0.656	4.004	100.000	1.714	7.568	10.350	222.290
2011	0.668	3.709	105.554	1.780	7.720	11.820	246.660
2012	0.679	2.827	108.319	1.912	7.760	13.300	272.990
2013	0.731	3.040	111.158	1.998	7.830	15.000	293.330
2014	0.739	2.559	113.294	2.022	8.060	17.050	318.030
2015	0.744	2.192	114.922	2.057	8.530	19.330	345.990
2016	0.755	1.556	117.221	2.100	8.810	22.250	385.080
2017	0.757	1.349	119.088	2.116	8.810	25.550	427.960
2018	0.768	1.694	121.559	2.141	8.880	29.180	470.930
2019	0.769	1.311	125.083	2.245	8.860	33.210	504.900
2020	0.770	1.723	128.109	2.401	8.790	36.450	535.920

In addition, the paper has also applied the correlation matrix to examine the directional nexus among variables. The results exposed that the green investment, eco-innovation index, R&D expenditures, commercial bank branches, commercial bank depositors, and commercial bank borrowers have a positive and significant linkage with sustainable development (human development index) in China. These results are mentioned in Table 4.

Table 4

Matrix of Correlations

Variables	SD	GI	ECI	RDE	CBB	DCB	BCB
SD	1.000						
GI	0.634	1.000					
ECI	0.958	-0.518	1.000				
RDE	0.992	-0.600	0.958	1.000			
CBB	0.994	-0.620	0.961	0.991	1.000		
DCB	0.902	-0.700	0.858	0.884	0.898	1.000	
BCB	0.901	-0.707	0.862	0.878	0.893	0.992	1.000

Moreover, the paper has also applied the ADF and PP tests to investigate the unit root. The results indicated that the SD, GI, DCB, and BCB are stationary at a level while ECI, RDE, and CBB are stationary at first difference. These results are mentioned in Table 5.

Table 5

Unit Root Test

	ADF		PP	
Series	Level	First difference	Level	First difference
SD	-4.029***	------	-4.443***	------
GI	-3.118***	------	-3.281***	------
ECI	------	-2.282***	------	-5.893***
RDE	------	-3.119***	------	-3.114***
CBB	------	-5.872***	------	-4.920***
DCB	-4.773***	------	-3.892***	------
BCB	-5.044***	------	-3.221***	------

In addition, the paper has also applied the (Westerlund & Edgerton, 2008) approach to check the co-integration. The outcomes indicated that the p-values are not bigger than 0.05, and the t-values are not less than 1.96. These outcomes indicated that co-integration exists. These results are mentioned in Table 6.

Table 6

Co-Integration Test Results

Model	No Shift		Mean Shift		Regime Shift	
	Test Stat	p-value	Test Stat	p-value	Test Stat	p-value
LMτ	-5.908	0.000	-4.252	0.000	-4.772	0.000
LMφ	-3.277	0.000	-3.120	0.000	-3.192	0.000

The results exposed that the green investment, eco-innovation index, R&D expenditures, commercial bank branches, commercial bank depositors, and commercial bank borrowers have a positive and significant linkage with the human development index in the short run. The R square value indicated that 61.7 percent of changes in SD are due to ECI, RDE, CBB, GI, DCB, and BCB. These results are mentioned in Table 7.

Table 7

Short-Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GI)	1.673	0.491	3.407	0.000
D(ECI)	1.002	0.322	3.112	0.001
D(RDE)	2.019	1.030	1.960	0.047
D(CBB)	0.372	0.165	2.255	0.032
D(DCB)	0.762	0.276	2.761	0.018
D(BCB)	1.992	0.761	2.618	0.021
CointEq(-1)*	-1.342	0.428	-3.136	0.000
R-squared	0.617	Mean dependent var		-0.050
Adjusted R-squared	0.598	S.D. dependent var		2.232

The results exposed that the green investment, eco-innovation index, R&D expenditures, commercial bank branches, commercial bank depositors, and commercial bank borrowers have a positive and significant linkage with sustainable development in the long run. These results are mentioned in Table 8.

Table 8

Long-Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GI	1.977	0.376	5.258	0.000
ECI	2.198	1.001	2.196	0.031
RDE	0.372	0.171	2.175	0.033
CBB	1.255	0.362	3.467	0.002
DCB	2.871	1.104	2.601	0.014
BCB	0.273	0.026	10.500	0.000
C	0.564	0.193	2.922	0.011

Finally, the 0.383 acceptance rate is larger than the 0.234 optimal acceptance rate. In contrast, the standard deviations of the parameters are very small, and the Monte Carlo chain standard errors (MCSE) are near to one. Hence, Bayesian inference is valid. These results are mentioned in Table 9.

Table 9

Bayesian Analysis Results

Variables	Mean	Std. Dev.	MCSE	Prob. of mean > 0	Interval
GI	3.192	0.430	0.064	0.912	0.235, 1.102
ECI	5.433	0.273	0.079	1	0.907, 1.091
RDE	5.128	0.264	0.047	1	1.655, 2.872
CBB	7.233	0.763	0.083	1	0.543, 2.876
DCB	2.121	0.340	0.062	0.812	0.276, 2.183
BCB	8.122	0.290	0.057	1	0.225, 1.656
Intercept	-52.332	6.562	0.413	1	1.288, 2.108
e.ME Sigma2	0.673	0.442	0.023		1.012, 3.665

Acceptance rate = 0.382

Discussions

The results revealed that green investment has a positive linkage with sustainable development. These results are in line with Indriastuti and Chariri (2021), which show that in many economies, investment is encouraged to be made for green projects like managing the production of clean food, encouraging renewable energy consumption and production, forestation, clean land management, and waste management, and recycling, etc. The accomplishment of these green projects cleans the natural resources which are under the use of humans. Hence, it improves the health of human beings and makes them active in performing their undertaking. So, green investment leads to sustainable development. These results also agree with Yoshino, Taghizadeh-Hesary, and Otsuka (2021), which test the role of green investment in sustainable development. This study states that economies, while making growth may cause many environmental issues like emission of harmful gases, toxic wastes, and dirty water, which can damage human health. When economies make green investments along with growth, environmental issues can be controlled, human capital can be sustained, and sustainable development is achieved. The results are also supported by Ali et al. (2022), which posit that the investment in green undertakings like renewable energy consumption, recycling, and waste management, helps reduce the pollution from organizational processes. This ensures a clean work environment for the employees. The maintenance of health workers within the economy ensures sustainable development.

The results showed that eco-innovation has a positive linkage with sustainable development. These results are in line with Loia and Adinolfi (2021), which show that emerging economies do not rely only on traditional ways of business, but they prefer innovation with the passage of time. If the innovation in the business processes is made with the consideration of environmental responsibilities, the adverse environmental impacts of the businesses can be controlled, and natural resource quality is maintained. Human beings with a sustainable environment and good quality natural resources can have sustainable development. These results also agree with Lee, Wu, and Tseng (2018), which examine the role of eco-innovation in sustainable development. This study states that eco-innovation is made in business organizations. It may be in the form of transition to renewable energy, use of energy-efficient technologies, waste management, cleanliness of the water, etc. This assures a clean environment for the stakeholders where they can easily breathe, and with good health, their labor or managerial productivity increases. So, eco-innovation sustains the country's development. The results are also supported by Loucanova, Olsiakova, and Stofkova (2022a), which posits that eco-innovation includes the adoption of environmentally friendly resources, sustainability technologies, and eco-friendly allocation of resources so that eco-friendly goods and services can be produced. These eco-innovation practices overcome environmental pollution and enhance human well-being leading to sustainable development.

The results indicated that R&D expenditures have a positive linkage with sustainable development. These results are in line with Park (2018), which implies that the increasing tendency of R&D adoption of individual businesses within the economy creates awareness of the environmental concerns, their causes, their impacts on human well-being and country development, and the ways how environmental concerns can be removed. With the decrease in environmental concerns as the result of R&D, natural resources, food products, and quality environment can be saved for human well-being. So, R&D expenditures enhance sustainable development. These results also agree with Mempel-Sniezyk and Hlavacek (2021), which test the role of R&D expenditures in sustainable development. This study states that many technological advancements have long been made. Some of these advancements are ecological-friendly, but few people have the knowledge and implement them. The increase in R&D helps implement these technologies, which sustain human well-being. The results are also supported by Sasikala, Jeong, Yun, and Kim (2019), which posit that R&D promotes ecological-friendly innovation in the economy. Consequently, the impacts of economic activities like manufacturing, energy generation, construction, tourism, transportation, etc., on natural living and non-living resources can be reduced. So, humans cannot improve their well-being.

The results revealed that a commercial bank branch has a positive linkage with sustainable development. These results are in line with Halkos and Gkampoura (2021), which show that the undertakings of businesses for the use of heavy machines, chemicals, transportation, and non-renewable energy create environmental pollution. For ecological-friendly projects, money for investment is required. The increase in the number of bank branches enhances the investment capacity and improves environmental performance. The improved health of a country's inhabitants leads to the country's sustainable

development. These results also agree with Zabala Aguayo and Slusarczyk (2020), which analyze the impacts of a number of bank branches on sustainable development. This study posits that human beings for high well-being, including health and economic progress, depend on environmental sustainability. The increasing number of bank branches enhances green finances within the country and, therefore, ensures environmental sustainability.

The results indicated that commercial bank depositors have a positive linkage with sustainable development. These results are in line with Adegbite and Machethe (2020), which posits that the increase in bank accounts means there is high economic growth and business transactions are huge in number. Consequently, enhanced financial performance develops sustainable developmental activities for improving human well-being are being carried out in the country. Thus, with the increase in bank accounts, sustainable development increases. These results also match with Gangi, Meles, D'Angelo, and Daniele (2019), which checks the role of bank accounts in achieving sustainable development. This study states that in a country where the number of individual bank accounts is increasing, many opportunities come into existence for human well-being like employment opportunities, health protection, availability of basic needs of life, and high economic welfare. The results are also supported by Campagnolo et al. (2018), which also claim that with the increase in diverse bank accounts, the money circulation in the market increases. Consequently, the investment level rises. Green investment, along with economic investment, improves human welfare and enhances sustainable development.

The results revealed that commercial bank borrowers have a positive linkage with sustainable development. These results are in line with Dahiya and Kumar (2020), which show that the facility of loans improves the ability of business organizations to make an investment not only in economic activities but in sustainable activities like socially desirable and environmentally friendly activities. The undertaking of these activities improves the welfare of stakeholders like employees, customers, suppliers, and the general public. The increasing welfare of stakeholders contributes to sustainable development. These results also agree with Nguyen et al. (2020), which is about the loan accounts' role in sustainable development. This study proclaims that humans' economic activities because of the use of energy, technologies, and other resources for infrastructure, operational activities, manufacturing, construction, fertilization, and transportation, are feared to spread environmental pollution. The increase in the loan accounts enhances the financial capacity and investment for green change that is close to sustainable human development. The results are also supported by Baidoo, Yusif, and Ayesu (2020), which posit that in economies where the financial institutions pay attention to increasing loan accounts, green innovation activities increase within the country. Hence, sustainable development can be achieved.

Implications

The current study carries theoretical as well as empirical implications. This is a significant guideline for authors who are interested in writing on the same subject as it makes a significant contribution to literature. The study examines the influences of green investment, eco-innovation, R&D expenditures, and the number of bank branches, bank accounts, and loan accounts on sustainable development. In the previously conducted literature, only many studies have analyzed the role of green investment, eco-innovation, and R&D expenditures in sustainable development, and some studies have also examined the impacts of bank branches, bank accounts, and loan accounts on sustainable development. But, this is the current study's literary contribution in that it examines these factors' nexus through the same research and with equal significance. A little research has been done about the nexus of variables like green investment, eco-innovation, R&D expenditures, the number of bank branches, bank accounts, and loan accounts, and sustainable development in China. The current study removes the literary gap by analyzing the relationship among these factors in the context of China.

This study is highly significant to the countries such as China which are populous and economically growing but have some threats to humans' health and their social and economic well-being. The study guides policymakers in developing policies to enhance sustainable development using green investment, eco-innovation, and financial inclusion. The study presents guidelines on how to attain sustainable development. It guides the economists and financial institutions that they must only serve economic objectives but must encourage green investment for achieving sustainable development. It also guides scientists, government, and economists to promote eco-innovation in different economic fields like energy generation, mining, minerals processing, manufacturing, construction, transportation, tourism, and medical. These will remove the socially unfavorable and environment damaging influences of these economic fields. They must also take initiatives for R&D within the economy as R&D is the instrument to attain sustainable development. The article also guides that there must be made financial development and increases in the number of bank branches across the regions within the country so that the sustainable development of the country can be achieved. Moreover, the study suggests that financial improvement through the increase in the number of bank accounts can lead the economy towards sustainable development. The study conveys that policymakers must encourage loan accounts so that green finance can be increased and sustainable development can be achieved.

Conclusion

The study intended to evaluate the effectiveness of green investment, eco-innovation, and R&D expenditures on sustainable development. It was also to check the role of financial development like the number of bank branches, bank accounts, and loan accounts in achieving sustainable development. The obtained results concluded that green investment, eco-innovation, R&D expenditures, and the number of bank branches, bank accounts, and loan accounts have a positive linkage with sustainable development. It explains that the investment in green undertakings like renewable energy consumption, recycling, and waste management, helps reduce pollution emissions and maintains the stakeholders' well-being. So, it ensures

sustainable development. The eco-innovation in the criteria of energy, technologies, resources, products, services, etc., provides a clean environment. With the guarantee of human health and well-being, their labor or managerial productivity increases, and country development can be sustainable. This assures a clean environment for the stakeholders where they can easily breathe, and with good health, their labor or managerial productivity increases. Moreover, the study states that when the economy makes heavy expenditures on R&D, environmental awareness develops, and eco-friendly initiatives are undertaken. This improves the social and environmental performance of economic units leading to sustainable economic development. The results indicated that human well-being, like health, active functioning, economic progress, etc., is based on environmental sustainability. The increasing bank branches encourage green finances within the country, developing environmental sustainability and sustainable economic development. The increase in the number of bank accounts, with the financial development, encourages the investment in sustainability activities leading to sustainable development. The increasing loan accounts encourage loans for social and environmentally friendly projects, which ensures human welfare. This leads to the country's sustainable development.

The present study contains some limitations along with theoretical success. These limitations are thought to be removed in further studies by the author. The current study examines sustainability development with the criteria of green investment, eco-innovation, R&D, bank branches, bank accounts, and loan accounts. The other drivers like organizational culture, government support, geographical characteristics, etc., also contribute to sustainable development, but these criteria have not been considered in the present study. So, the study scope is limited, hence, recommended that scholars must also check sustainable development from these points of view. Moreover, sustainable development is a broader concept. The current study is based on empirical data from a single economy like China. China's geographical, economic, and financial conditions are different from those of others. That is why the study that is about sustainable development on the criteria including green investment, eco-innovation, R&D expenditures, and the number of bank branches, bank accounts, and loan accounts, cannot be general. Future authors must examine and analyze the factors and their relationship in the contexts of multiple economies.

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The article has been reviewed.

Received in August 2022; accepted in October 2022.