The effect of financial technology on sustainability performance: Mediating role of green finance

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ARTICLE INFO	ABSTRACT
	Purpose-This study aims to determine the effect of the adoption of financial technology on sustainability performance through green finance as a mediating variable. In order to achieve sustainable performance in the banking industry, the adoption of financial technology as a support is necessary. In addition to adopting financial technology, the role of green finance is also considered important in supporting sustainable performance in the banking industry. **Methodology-**This study's sample consisted of 110 employees working at rural banks in Central Java, Indonesia. The questionnaires were physically distributed and filled out directly by employees. The data collected from the respondents was then tabulated and processed using Smart PLS. **Findings-**This study proves the partial influence of financial technology adoption on sustainability performance and green finance. Green finance has also been proven to have a positive effect on sustainability performance. In addition to its partial influence, green finance has also been proven to mediate the relationship between financial technology adoption and sustainability performance. **Research Limitations-**This study's limitations are the number of samples, which is still relatively minimal, and the scope of research objects, which is limited to a certain region. Therefore, the results of this study cannot be used as a basis for describing the answers of respondents and objects in other regions. **Novelty-**This research is expected to contribute to the banking industry so that companies can study and implement the adoption of financial technology and green finance. Implementing these two things has a positive impact on building or achieving a company's sustainability performance.

1. Introduction

In the digital era, people must be smart about utilizing technological developments' convenience and effectiveness. Digital innovations in various fields prove that people are participating in the development of the modern era (Ciriello et al., 2018). The 4.0 revolution,

which brings together technology and the internet, creates enormous opportunities in all fields (Lampropoulos et al., 2019). One of them is the evolution of the financial sector, which has given birth to an innovation called financial technology or fintech.

Fintech is a combination of innovative business models and technological solutions to facilitate financial services (Jin et al., 2019). Fintech has transformed conventional financial services and management, offering new ways of access, efficiency, and financial inclusion (Khan et al., 2022b). To retain their competitive advantage, financial institutions are slowly incorporating a range of technological innovations, including digital transformation, automation of payment processes, advancements in investment mechanisms, and enhancements to customer support (Pizzi et al., 2021). In recent years, there has been a significant global increase in the adoption of fintech (Jalal et al., 2023), including within Indonesia. The 2024 East Ventures Digital Competitiveness Index report states that Indonesia saw an increase in digital transactions compared to the prior year. This growth has also seen a rise in financial literacy and financial inclusion, which shows progress and awareness of digital financial services.

Recent advancements in fintech have drawn the interest of industry experts and scholars (Najaf et al., 2022). Fintech is acknowledged for its role in transforming the financial sector, as it leads the way in creating innovative financial products and services. As per Liu et al. (2021), this sector is among the most innovative and disruptive of contemporary times. The rapid evolution of fintech and its ability to introduce innovative solutions has positioned it as a major driver of transformation in finance, strengthening conventional practices and setting new standards for efficiency and innovation. The scope of finance has undergone a rapid evolution driven by the emergence and spread of fintech adoption (Croutzet & Dabbous, 2021). Fintech offers innovative solutions to various challenges in the financial sector, such as accessibility, efficiency, and transparency. By utilizing digital technology, fintech is able to reach segments of society that have not previously been served by financial institutions, thus contributing to financial inclusion.

On the other hand, the issue of sustainability is also increasingly a global concern. Increased awareness of environmental and social challenges has also increased interest in sustainability performance in various sectors, including the financial sector. Climate change, declining natural resources, and social injustice require all actors, including the financial sector, to adapt and find solutions to remain capable of sustainable performance (Allen & Craig, 2016). The intersection of fintech and sustainability performance has opened avenues for companies to weave environmental, social, and governance factors into their operational frameworks, investment strategies, and decision-making processes (Muganyi et al., 2021). Siddik et al. (2023) argue that companies that adopt fintech improve their sustainability performance by encouraging more significant involvement in economic efforts. Consequently, it is recommended for companies that embrace fintech to enhance their environmental protection efficiency by boosting their investment in eco-friendly initiatives, fostering innovative solutions that are kind to the environment, and optimizing resource utilization (Muganyi et al., 2021).

In particular, fintech is significant in advancing green finance. This makes it possible to create an effective financial channel for projects associated with renewable energy, sustainable infrastructure, and green technology (Wang et al., 2023). The importance of embracing fintech to promote green finance and improve environmental sustainability is further emphasized by empirical research (Wang et al., 2023). In addition, fintech aims to encourage environmental sustainability, which is an important part of green finance. In this context, green finance is recognized as one of the crucial pillars for achieving sustainability performance (Zheng et al., 2021). According to Madaleno et al. (2022), green finance encompasses all actions that promote investment in eco-friendly projects and technologies. Fintech adoption could bolster green finance. Fintech can facilitate access to capital for sustainable projects and foster innovation in the creation of more environmentally friendly products and services by offering an efficient and cost-effective platform.

Bank Perkreditan Rakyat (BPR) plays an important role in Indonesia's financial system. According to the Financial Services Authority (FSA), the banking industry needs to emphasize the importance of adopting fintech in the operational process (Wonglimpiyarat, 2017). FSA notes that although the performance of BPR is quite good, there are challenges that must be anticipated,

such as limited infrastructure and digital literacy, high implementation costs, data security, and competition with other fintech companies. BPRs support green finance by providing environmentally friendly business financing. This aligns with the initiatives of the Indonesian government to promote sustainable finance. Among the public, there is a lack of awareness and understanding of the importance of sustainable financing, which presents challenges for implementing green finance in BPRs. Moreover, there are technical difficulties involved in recognizing, quantifying, and documenting the environmental effects of projects that received funding.

BPRs foster green finance through the development of inventive financial services that bolster eco-friendly practices. Nevertheless, there are multiple major hindrances, including constrained human resources, insufficient investment in research and development, and regulatory and bureaucratic challenges (Khan et al., 2022a). The function of fintech in enhancing financial inclusion and operational efficiency within the financial sector has been underscored by numerous earlier investigations. Nevertheless, studies that focus on the connection between fintech adoption and green finance within the context of BPR in Indonesia, particularly in Jawa Tengah, are still limited. In addition, there has not been much research exploring how BPR face challenges in implementing green finance to improve sustainability performance. Therefore, this study attempts to fill the gap by exploring the relationship between fintech adoption and sustainable performance with green finance mediation in the context of rural banks, particularly in Jawa Tengah, Indonesia.

2. Literature Review and Hypothesis Development

Arner et al. (2020) demonstrate that the uptake of fintech can significantly influence sustainability performance. According to Ahmad et al. (2024), advancements in fintech like digital banking, blockchain technology, and AI-based financial services can enhance operational efficiency and transparency, resulting in sustainable performance. This technology enables enhanced resource management and reduces environmental impacts. Additionally, the adoption of fintech simplifies the process for investors to allocate resources to sustainable initiatives (Vergara & Agudo, 2021). This transformation promotes sustainability in environmental and socio-economic aspects, enhancing the community's financial inclusion and access to financial services (Ahmad et al., 2022). As stated by Gonzalez-Aguirre et al. (2021), organizations that adopt fintech typically experience enhanced access to funding sources for sustainable initiatives, including green investments. The research by Gonzalez-Aguirre et al. (2021) and Guang-Wen and Siddik (2023) reveal that fintech adoption has a positive effect on sustainability performance. **H$_1$: Fintech Adoption Has a Positive Effect on Sustainability Performance.**

The research carried out by Muganyi et al. (2021) shows that adopting fintech has a beneficial impact on the advancement of green finance. Nassiry (2019) underscores that embracing fintech can improve efficiency and other sustainable finance instruments. Fintech advancements enhance the growth and efficiency of green finance, contributing to the overall sustainable development goals Benzidia et al. (2021). The adoption of fintech can improve access to green finance. With the help of technology, the financial sector can take on a more proactive role in funding projects that promote green finance, thereby streamlining the funding process and lowering transaction costs. According to Hou et al. (2023), fintech is crucial for enhancing transparency and efficiency within the financial system, which in turn fosters green finance initiatives. Liu et al. (2022) explain the role of fintech in simplifying the process of screening businesses that adopt environmentally friendly practices, which in turn reduces the misallocation of financial resources. Yu et al. (2020) further show that fintech significantly boosts the uptake of sustainable environmental control technology. This can enhance public trust and the availability of funds, thereby amplifying the effects of green finance initiatives. **H$_2$: Fintech Adoption Has a Positive Effect on Green Finance.**

Green finance plays a significant role in enhancing sustainability performance by channeling financial resources toward projects and initiatives that yield positive environmental

and social outcomes (Khan et al., 2022b). Companies' heightened commitment to eco-friendly financial practices aligns with the enhancement of environmental sustainability. Chen et al. (2022) assert that enhancing green financial performance necessitates funding for a range of eco-friendly initiatives, including reducing energy use, employing sustainable technology, promoting sustainable development, and aiding waste recycling. This viewpoint aligns with that assertion. Current evidence supports the green financial impact substantially contributing to the positive environmental performance of companies (Guang-Wen & Siddik, 2023). **H₃: Green Finance Has a Positive Effect on Sustainability Performance.**

Studies examining the impact of fintech adoption on sustainable performance, with green finance as a mediating factor, are still scarce. Thus, this research examines the relationship between these variables in the banking sector, thereby filling a void in scholarly literature. Zhang et al. (2022) show that green finance is an essential intermediary linking sustainable banking practices with the sustainable performance of banking institutions. Moreover, prior studies have shown that green finance has a notable effect on sustainable performance (Zheng et al., 2021). Liu et al. (2022) state that fintech platforms are crucial for directing capital toward green finance opportunities, positively impacting sustainable performance. As noted by Yan et al. (2022), green finance enhances sustainability performance by channeling financial resources toward initiatives that yield positive environmental and social outcomes. Green finance contributes to the realization of environmental objectives while bolstering economic stability and social justice through the creation of eco-friendly jobs and promotion of inclusive growth (Muganyi et al., 2021). **H₄: Fintech Adoption Has a Positive Effect on Sustainability Performance through Green Finance.**

Figure 1 illustrates the framework of the research model, which shows the factors that influence tacit knowledge. These factors include contractual governance, relational governance, and supply chain technology, each of which has a positive effect on tacit technology.
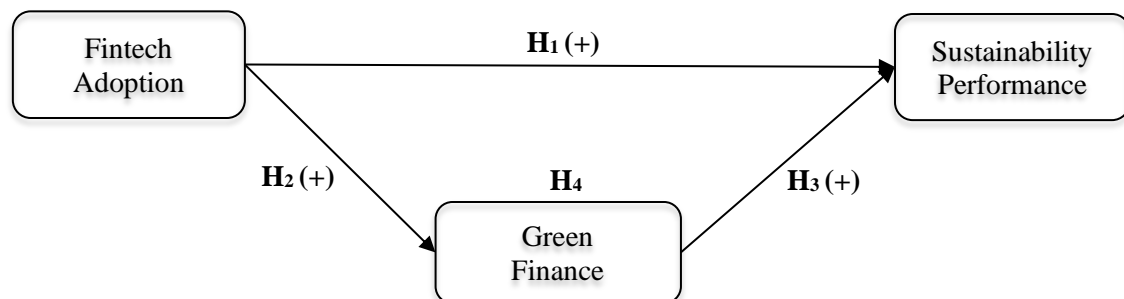

Figure 1. Research Model

3. Research Methodology

The population in this study were the employees of Bank Perkreditan Rakyat (BPR) in Jawa Tengah, Indonesia, with a sample size of 110 people. Sample selection using the purposive sampling method by determining several criteria for respondents. The criteria include a minimum age range of 20 years to 40 years, having knowledge and work experience of at least 1 year, and having experience participating in training programs or seminars on financial management. Google Forms was used to distribute questionnaires online to collect data. Each variable was represented by indicator items that were rated on a Likert scale. Eight indicator items are used to measure fintech adoption (FA) adapted from Siddik et al. (2023), sustainability performance (SP) with ten indicator items adapted from Joshi et al. (2024), and green finance (GF) with six indicator items adapted from Liu et al. (2020).

The research data is subsequently assessed for validity and reliability, as well as subjected to regression tests, utilizing Smart PLS software. To conduct a validity test, the loading factor value for each indicator item of each variable is analyzed. Hair et al. (2020) state that an indicator

item's validity is determined by whether the loading factor value exceeds 0.6. If it does not, the item is deemed invalid. A validation test is required if any invalid indicator items have been excluded from the data analysis. Once the validity test has been performed, the reliability test follows. The reliability of variables is evaluated using Cronbach's alpha and composite reliability values. A research variable is deemed reliable if Cronbach's alpha exceeds 0.6 and composite reliability is above 0.7, as indicated by Hair et al. (2020). The next step consists of conducting hypothesis testing to assess the acceptance or rejection of the formulated hypotheses. Each hypothesis's p-value serves as the foundation for regression testing. A hypothesis can be accepted if the p-value is lower than 0.05 (Hair et al., 2020).

4. Result and Discussion

Characteristics of Respondents

Table 1 shows the characteristics of the respondents. In general, the majority of the respondents were female, with 73 respondents (66.4%). The respondents were dominated by the age range of 26 - 30 years, namely 64 respondents (58.2%). Apart from the gender and age categories, the characteristics of the respondents can be seen based on education level and work experience. The highest level of respondent education is undergraduate, with as many as 40 respondents (36.4%), and the most work experience is 6 - 10 years with 43 respondents (39.1%).

Table 1. Characteristics of Respondents

Classification	Description	Frequency	
		Total	Percentage
Gender	Male	37	33.6
	Female	73	66.4
Age	20 – 25 years old	25	22.7
	26 – 30 years old	64	58.2
	31 – 40 years old	13	11.8
	> 40 years old	8	7.3
Education Level	Senior/Vocational High School	24	21.8
	Diploma	36	32.7
	Bachelor	40	36.4
	Postgraduate	10	9.1
Work Experience	< 2 Years	18	16.4
	2 – 5 Years	32	29.1
	6 – 10 Years	43	39.1
	> 10 Years	17	15.4

Validity Test

In Table 2, the loading factor values for each indicator item representing the research variables in the validity test are tabulated. The loading factor values of all indicator items for this research variable exceed 0.6, demonstrating their validity.

Table 2. Validity Test Result

Indicator	Fintech Adoption	Green Finance	Sustainability Performance
FA 1	0.899		
FA 2	0.862		
FA 3	0.892		
FA 4	0.786		
FA 5	0.936		
FA 6	0.871		
FA 7	0.902		
FA 8	0.819		
GF 1		0.617	
GF 2		0.905	
GF 3		0.787	

Indicator	Fintech Adoption	Green Finance	Sustainability Performance
GF 4		0.818	
GF 5		0.871	
GF 6		0.875	
SP 1			0.792
SP 2			0.769
SP 3			0.821
SP 4			0.870
SP 5			0.798
SP 6			0.881
SP 7			0.845
SP 8			0.857
SP 9			0.850
SP 10			0.821

Reliability Test

According to the results of the reliability test presented in Table 3, each research variable is reliable. This is clearly demonstrated by the Cronbach's alpha and composite reliability values for the variables of fintech adoption, green finance, and sustainability performance, all of which exceed 0.6 and 0.7.

Table 3. Reliability Test Result

Variable	Cronbach's Alpha	Composite Reliability
Fintech Adoption	0.955	0.962
Green Finance	0.924	0.941
Sustainability Performance	0.950	0.951

Hypothesis Test

The outcomes of the hypothesis test are shown in Table 4. Considering these results, all hypotheses from this study are validated as accepted. The fact that all hypotheses demonstrate a positive direction and that the p-value is below 0.05 serves as evidence for this. The adoption of fintech and green finance has been shown to positively impact sustainability performance. Green finance serves as a go-between for the connection between embracing fintech and sustainability performance.

Table 4. Hypothesis Test Result

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Value
Fintech Adoption → Sustainability Performance	0.762	0.762	0.057	13.455	0.000
Fintech Adoption → Green Finance	0.836	0.836	0.045	18.686	0.000
Green Finance → Sustainability Performance	0.562	0.567	0.111	5.064	0.000
Fintech Adoption → Green Finance → Sustainability Performance	0.470	0.475	0.103	4.567	0.000

Discussion
The Effect of Fintech Adoption on Sustainability Performance

Based on the examination of the initial hypothesis, it is suggested that adopting fintech has a positive effect on sustainability performance. The results are consistent with earlier studies conducted by Bayram et al. (2022) and Macchiavello and Siri (2022). The current level of sustainability is driving a wave of technological development and innovation (Rais et al., 2023; Atayah et al., 2024). Anshari et al. (2019) state that fintech serves a transformative function in tackling financial problems and inefficiencies in distribution. The incorporation of fintech to enhance access to financing sources for sustainable projects (Alsadoun & Alrobai, 2024). When

companies adopt fintech in an appropriate manner, they can enhance their sustainability performance. Conversely, companies that do not embrace fintech often exhibit less-than-optimal sustainability performance because of limited access to financial practices. Deng et al. (2019) emphasize that the relationship between fintech and sustainable development is shaped by the patterns of economic growth. Moreover, Yan et al. (2022) examine how green finance affects the relationship between fintech adoption and sustainability performance, highlighting the significance of integrating technology, innovation, and financial strategies for sustainable economic development.

The Effect of Fintech Adoption on Green Finance

The findings from the second hypothesis test show that adopting fintech positively impacts green finance. The results of this study align with those of Muganyi et al. (2021). Fintech is encouraged to facilitate the creation of green financial products, like green investments, through sustainable financial products (Pravin & Pandya, 2024). Companies that invest in green finance will encourage better sustainable performance in the long term. This is due to increased operational efficiency and reduced environmental costs (Y. Li & Lin, 2024). When companies implement the adoption of fintech, it has an impact on green finance because companies are able to encourage learning behaviour, facilitate learning spaces, and provide support for the green finance process. Peng and Zheng (2021) state that green finance can assist the government in optimizing sustainability resources by promoting the advancement of new energy technologies. Fintech can utilize green finance technologies such as blockchain, the Internet of Things, and big data to aid in achieving sustainable development goals (Nassiry, 2019).

The Effect of Green Finance on Sustainability Performance

The findings from testing the third hypothesis indicate that green finance positively influences sustainability performance. The findings of this study are consistent with those of Abuatwan (2023) research. Green finance initiatives such as sustainable project financing and environmentally friendly financial products improve environmental, social, and economic performance. Companies that implement green finance can increase customer trust and loyalty (Li et al., 2024). According to Wang et al. (2023), green finance influences sustainability performance by serving as a determinant of the sustainable development ratio, fostering interest in innovations related to environmentally friendly products and services, and thereby promoting pro-environmental behaviour. Companies' adoption of green finance will have a beneficial effect on sustainability performance, as it can promote learning behavior, establish environmental learning spaces, and aid the sustainability performance process. As per Chen et al. (2022), green finance refers to the funding of diverse eco-friendly projects like renewable energy, green industrial advancement, and waste management with the aim of enhancing sustainability performance within the banking sector. Zheng et al. (2021) state that green finance and its components positively influence sustainability performance in the banking sector.

The Effect of Fintech Adoption on Sustainability Performance through Green Finance

The results related to the fourth hypothesis suggest that the adoption of financial technology has a positive effect on sustainability performance, with green finance serving as a mediating factor. Zhang et al. (2022) demonstrate that green finance serves as a crucial intermediary connecting sustainable banking practices with the sustainable performance of banking institutions. In addition, earlier research has demonstrated that green finance significantly influences sustainable performance (Zheng et al., 2021). Liu et al. (2022) state that fintech platforms are vital for directing capital toward green finance opportunities, which improves sustainable performance. As noted by Yan et al. (2022), green finance enhances sustainability performance by channeling financial resources toward initiatives that yield positive environmental and social effects. As Muganyi et al. (2021) note, green finance contributes to the attainment of environmental objectives and the strengthening of economic stability and social justice through the creation of environmentally sustainable employment and the promotion of inclusive development.

5. Conclusion

The findings demonstrated that the four hypotheses were all accepted. It was found that the adoption of financial technology had a partially positive effect on sustainability performance and green finance. Research shows that green finance has a partially positive effect on sustainability performance and acts as a mediator between the use of financial technology and sustainability performance. This study is limited by the small number of samples and the fact that research objects are restricted to a specific region. Therefore, the results of this study cannot be used as a basis for describing the answers of respondents and objects in other regions. Therefore, subsequent research is expected to develop similar research by adding other variables as factors that can predict sustainable performance, increasing the number of samples, and expanding the area used as the object of research.

REFERENCES

Abuatwan, N. (2023). The impact of green finance on the sustainability performance of the banking sector in Palestine: The moderating role of female presence. *Economies*, *11*(10). https://doi.org/10.3390/economies11100247

Ahmad, M., Ahmed, Z., Gavurova, B., & Oláh, J. (2022). Financial risk, renewable energy technology budgets, and environmental sustainability: Is going green possible? *Frontiers in Environmental Science*, *10*. https://doi.org/10.3389/fenvs.2022.909190

Ahmad, Z., Khan, A. A., & Burki, A. K. (2024). Financial sustainability in emerging markets: The role of fintech, risk management, and operational efficiency. *Contemporary Journal of Social Science Review*, *2*(4), 339–353.

Allen, M. W., & Craig, C. A. (2016). Rethinking corporate social responsibility in the age of climate change: A communication perspective. *International Journal of Corporate Social Responsibility*, *1*(1). https://doi.org/10.1186/s40991-016-0002-8

Alsadoun, M., & Alrobai, F. S. (2024). Influence of fintech adoption on sustainable performance via mediation role of green finance and green innovation. *American Journal of Business Science Philosophy (AJBSP)*, *1*(1), 61–72. https://doi.org/10.70122/ajbsp.v1i1.13

Anshari, M., Almunawar, M. N., Lim, S. A., & Al-Mudimigh, A. (2019). Customer relationship management and big data enabled: Personalization & customization of services. *Applied Computing and Informatics, 15*(2). https://doi.org/10.1016/j.aci.2018.05.004

Arner, D. W., Buckley, R. P., Zetzsche, D. A., & Veidt, R. (2020). Sustainability, FinTech and financial inclusion. *European Business Organization Law Review*, *21*(1). https://doi.org/10.1007/s40804-020-00183-y

Atayah, O. F., Najaf, K., Ali, M. H., & Marashdeh, H. (2024). Sustainability, market performance and FinTech firms. *Meditari Accountancy Research*, *32*(2). https://doi.org/10.1108/MEDAR-08-2021-1405

Bayram, O., Talay, I., & Feridun, M. (2022). Can fintech promote sustainable finance? Policy lessons from the case of Turkey. *Sustainability (Switzerland)*, *14*(19). https://doi.org/10.3390/su141912414

Benzidia, S., Makaoui, N., & Bentahar, O. (2021). The impact of big data analytics and artificial intelligence on green supply chain process integration and hospital environmental performance. *Technological Forecasting and Social Change*, *165*. https://doi.org/10.1016/j.techfore.2020.120557

Chen, J., Siddik, A. B., Zheng, G. W., Masukujjaman, M., & Bekhzod, S. (2022). The effect of green banking practices on banks' environmental performance and green financing: An empirical study. *Energies*, *15*(4). https://doi.org/10.3390/en15041292

Ciriello, R. F., Richter, A., & Schwabe, G. (2018). Digital innovation. *Business & Information Systems Engineering*, *60*, 563–569. https://doi.org/10.1007/s12599-018-0559-8

Croutzet, A., & Dabbous, A. (2021). Do FinTech trigger renewable energy use? Evidence from OECD countries. *Renewable Energy*, *179*. https://doi.org/10.1016/j.renene.2021.07.144

Deng, X., Huang, Z., & Cheng, X. (2019). FinTech and sustainable development: Evidence from China based on P2P data. *Sustainability (Switzerland)*, *11*(22). https://doi.org/10.3390/su11226434

Gonzalez-Aguirre, J. A., Osorio-Oliveros, R., Rodríguez-Hernández, K. L., Lizárraga-Iturralde, J., Menendez, R. M., Ramírez-Mendoza, R. A., Ramírez-Moreno, M. A., & Lozoya-Santos, J. de J. (2021). Service robots: Trends and technology. *Applied Sciences (Switzerland), 11*(22). https://doi.org/10.3390/app112210702

Guang-Wen, Z., & Siddik, A. B. (2023). The effect of Fintech adoption on green finance and environmental performance of banking institutions during the COVID-19 pandemic: The role of green innovation. *Environmental Science and Pollution Research*, *30*(10). https://doi.org/10.1007/s11356-022-23956-z

Hair, J. F., Howard, M. C., & Nitzl, C. (2020). Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. *Journal of Business Research*, *109*. https://doi.org/10.1016/j.jbusres.2019.11.069

Hou, H., Zhu, Y., Wang, J., & Zhang, M. (2023). Will green financial policy help improve China's environmental quality? The role of digital finance and green technology innovation. *Environmental Science and Pollution Research*, *30*(4). https://doi.org/10.1007/s11356-022-22887-z

Jalal, A., Al Mubarak, M., & Durani, F. (2023). Financial technology (fintech). *Artificial Intelligence and Transforming Digital Marketing*, 525–536.

Jin, C. C., Seong, L. C., & Khin, A. A. (2019). Factors affecting the consumer acceptance towards fintech products and services in Malaysia. *International Journal of Asian Social Science*, *9*(1). https://doi.org/10.18488/journal.1.2019.91.59.65

Joshi, S., Sharma, M., Luthra, S., Garza-Reyes, J. A., & Anbanandam, R. (2024). An assessment framework to evaluate the critical success factors to quality 4.0 transition in developing countries: A case experience of sustainable performance of Indian manufacturers. *TQM Journal*, *36*(6). https://doi.org/10.1108/TQM-10-2023-0311

Khan, K. I., Mata, M. N., Martins, J. M., Nasir, A., Dantas, R. M., Correia, A. B., & Saghir, M. U. (2022a). Impediments of green finance adoption system: Linking economy and environment. *Emerging Science Journal*, *6*(2). https://doi.org/10.28991/ESJ-2022-06-02-02

Khan, S., Akbar, A., Nasim, I., Hedvičáková, M., & Bashir, F. (2022b). Green finance development and environmental sustainability: A panel data analysis. *Frontiers in Environmental Science*, *10*. https://doi.org/10.3389/fenvs.2022.1039705

Lampropoulos, G., Siakas, K., & Anastasiadis, T. (2019). Internet of things in the context of industry 4.0: An overview. *International Journal of Entrepreneurial Knowledge*, *7*(1). https://doi.org/10.2478/ijek-2019-0001

Li, L., Ma, X., Ma, S., & Gao, F. (2024). Role of green finance in regional heterogeneous green innovation: Evidence from China. *Humanities and Social Sciences Communications*, *11*(1), 1–13. https://doi.org/10.1057/s41599-024-03517-0

Li, Y., & Lin, A. (2024). Assessing the impact of green finance on financial performance in Chinese eco-friendly enterprise. *Heliyon*, *10*(7). https://doi.org/10.1016/j.heliyon.2024.e29075

Liu, J., Jiang, Y., Gan, S., He, L., & Zhang, Q. (2022). Can digital finance promote corporate green innovation? *Environmental Science and Pollution Research*, *29*(24). https://doi.org/10.1007/s11356-022-18667-4

Liu, N., Liu, C., Xia, Y., Ren, Y., & Liang, J. (2020). Examining the coordination between green finance and green economy aiming for sustainable development: A case study of China. *Sustainability (Switzerland)*, *12*(9). https://doi.org/10.3390/su12093717

Liu, Y., Saleem, S., Shabbir, R., Shabbir, M. S., Irshad, A., & Khan, S. (2021). The relationship between corporate social responsibility and financial performance: A moderate role of fintech technology. *Environmental Science and Pollution Research*, *28*(16). https://doi.org/10.1007/s11356-020-11822-9

Macchiavello, E., & Siri, M. (2022). Sustainable finance and fintech: Can technology contribute to achieving environmental goals? A preliminary assessment of "Green Fintech" and "Sustainable Digital Finance." *European Company and Financial Law Review*, *19*(1). https://doi.org/10.1515/ecfr-2022-0005

Madaleno, M., Dogan, E., & Taskin, D. (2022). A step forward on sustainability: The nexus of environmental responsibility, green technology, clean energy and green finance. *Energy Economics*, *109*. https://doi.org/10.1016/j.eneco.2022.105945

Muganyi, T., Yan, L., & Sun, H. ping. (2021). Green finance, fintech and environmental protection: Evidence from China. *Environmental Science and Ecotechnology*, *7*. https://doi.org/10.1016/j.ese.2021.100107

Najaf, K., Subramaniam, R. K., & Atayah, O. F. (2022). Understanding the implications of FinTech Peer-to-Peer (P2P) lending during the COVID-19 pandemic. *Journal of Sustainable Finance and Investment*, *12*(1). https://doi.org/10.1080/20430795.2021.1917225

Nassiry, D. (2019). The role of fintech in unlocking green finance: Policy Insights for Developing Countries. *Handbook of Green Finance, 883*.

Peng, J., & Zheng, Y. (2021). Does environmental policy promote energy efficiency? Evidence from China in the context of developing green finance. *Frontiers in Environmental Science*, *9*. https://doi.org/10.3389/fenvs.2021.733349

Pizzi, S., Corbo, L., & Caputo, A. (2021). Fintech and SMEs sustainable business models: Reflections and considerations for a circular economy. *Journal of Cleaner Production*, *281*. https://doi.org/10.1016/j.jclepro.2020.125217

Pravin, P., & Pandya, P. (2024). The role of fintech in sustainable finance: A systematic review. *Technology and Sustainable Innovation*, *4*.

Rais, M., Napoleon, G., & Noerlina. (2023). Systematic literature review of Fintech: Implementation to create sustainability in enterprise of developing countries. *AIP Conference Proceedings*, *2594*. https://doi.org/10.1063/5.0113919

Siddik, A. B., Yong, L., & Rahman, M. N. (2023). The role of Fintech in circular economy practices to improve sustainability performance: A two-staged SEM-ANN approach. *Environmental Science and Pollution Research*, *30*(49). https://doi.org/10.1007/s11356-023-25576-7

Vergara, C. C., & Agudo, L. F. (2021). Fintech and sustainability: Do they affect each other? In *Sustainability (Switzerland), 13*(13). https://doi.org/10.3390/su13137012

Wang, L., Ur Rehman, A., Xu, Z., Amjad, F., & Ur Rehman, S. (2023). Green corporate governance, green finance, and sustainable performance nexus in Chinese SMES: A mediation moderation model. *Sustainability (Switzerland)*, *15*(13). https://doi.org/10.3390/su15139914

Wonglimpiyarat, J. (2017). FinTech banking industry: A systemic approach. *Foresight*, *19*(6). https://doi.org/10.1108/FS-07-2017-0026

Yan, C., Siddik, A. B., Yong, L., Dong, Q., Zheng, G. W., & Rahman, M. N. (2022). A two-staged SEM-Artificial neural network approach to analyze the impact of fintech adoption on the sustainability performance of banking firms: The mediating effect of green finance and innovation. *Systems*, *10*(5). https://doi.org/10.3390/systems10050148

Yu, L., Zhao, D., Xue, Z., & Gao, Y. (2020). Research on the use of digital finance and the adoption of green control techniques by family farms in China. *Technology in Society*, *62*. https://doi.org/10.1016/j.techsoc.2020.101323

Zhang, X., Wang, Z., Zhong, X., Yang, S., & Siddik, A. B. (2022). Do green banking activities improve the banks' environmental performance? The mediating effect of green financing. *Sustainability (Switzerland)*, *14*(2). https://doi.org/10.3390/su14020989

Zheng, G. W., Siddik, A. B., Masukujjaman, M., & Fatema, N. (2021). Factors affecting the sustainability performance of financial institutions in Bangladesh: The role of green finance. *Sustainability (Switzerland)*, *13*(18). https://doi.org/10.3390/su131810165