

ESG performance and debt financing costs: Evidence from Chinese real estate companies

Duan Yingying, Mohd Wira Mohd Shafiei* , Radzi bin Ismail 

*School of Housing, Building and Planning, Universiti Sains Malaysia,
11600, Penang, Malaysia*



ARTICLE INFO	ABSTRACT
<i>Article history:</i> Received March 28, 2026 Received in revised form April 18, 2026 Accepted July 20, 2026 Available online September 01, 2026 <i>Keywords:</i> Debt financing costs ESG performance Media attention Real estate companies *Corresponding author: Mohd Wira Mohd Shafiei School of Housing, Building and Planning, Universiti Sains Malaysia Email: wira@usm.my ORCID: https://orcid.org/0009-0005-9307-4141	<i>Environmental, Social, and Governance (ESG) performance has become a crucial metric for assessing corporate sustainability. Against the backdrop of China's urban transformation and green development agenda, ESG performance may exert a critical influence on the financing environment for real estate enterprises, key participants in urban construction and renewal. This study examines the relationship between ESG performance and debt financing costs for Chinese real estate firms, further investigating the moderating role of media attention. This empirical analysis examines data from Chinese A-share listed real estate companies between 2009 and 2022. After excluding samples with severe data missingness and considering the availability of CSI ESG data, a valid sample of 899 observations from 110 companies was obtained. A fixed-effects panel model was employed to investigate the relationship between overall ESG performance and debt financing costs. Results indicate that the ESG performance of listed real estate companies significantly influences debt financing costs, with media attention acting as a moderator.</i>

Introduction

Against the backdrop of urban renewal and sustainable urban development, real estate enterprises, as key players in urban spatial production and stock transformation, are increasingly scrutinized for their green transition capabilities. ESG, serving as a vital framework for measuring corporate environmental, social responsibility, and governance performance, emphasizes comprehensive corporate outcomes in energy conservation, emissions reduction, resource utilization, stakeholder coordination, and governance structure refinement (Boston Consulting Group 2020). It stands as a critical evaluation system driving enterprises toward green operations and long-term sustainable development. Corporate ESG performance reflects not only the fulfillment of environmental and social responsibilities but also governance

transparency and risk management capabilities (Mansouri and Momtaz 2022).

Urban renewal projects typically feature large investment scales, extended timelines, and stringent green standards, imposing heightened demands on corporate capital strength and risk control (China Real Estate Information Corporation 2024). Real estate firms' long-term reliance on debt financing means that borrowing costs directly impact their capacity to engage in high-quality urban renewal and green building retrofits. Therefore, examining how ESG performance influences corporate debt financing costs is crucial for understanding the financial support mechanisms for real estate enterprises in urban green transitions.

Simultaneously, media, as a vital external oversight force within urban governance systems, shapes corporate behavior through information disclosure, public scrutiny, and reputation

mechanisms (KPMG 2022). This reduces information asymmetry and enhances capital markets' ability to recognize sustainable corporate practices. Against a backdrop of rising public attention, media scrutiny may amplify the impact of ESG performance on financing costs.

Existing research has yet to reach a consensus on the relationship between ESG and corporate financing costs. Particularly within the Chinese real estate sector, empirical studies integrating the context of urban renewal and media oversight mechanisms remain limited. Consequently, this paper systematically examines the relationship among ESG performance, media attention, and debt financing costs for Chinese real estate enterprises from the perspective of sustainable urban development.

Methods

This study selected listed companies in China's A-share real estate sector from 2009 to 2022 as its research subjects. Due to difficulties in obtaining financial statement data, ESG report data, and social responsibility data for some listed companies, the sample was adjusted by excluding ST stocks and cases with missing data. Ultimately, 110 A-share real estate companies were retained, yielding a total of 899 samples. Considering ESG data availability and aligning with key indicators emphasized in Chinese ESG research reports, this study utilized data extracted from the China Huazheng ESG Rating Report. Financial data indicators were sourced from the Wind Financial Database and the CSMAR Database (China Stock Market and Accounting Research Database). This study utilizes the CRNDS (Chinese Research Data Services)

database of financial news on Chinese listed companies to measure media attention (Media) by counting the number of newspaper and online news reports for each sample company annually. Due to the absence of ESG scores for certain years in some companies, this research employs unbalanced panel data. After a series of tests, the individual-time dual fixed-effects model was ultimately selected.

Variables measurement

This paper treats corporate ESG performance as the independent variable. The Shanghai Huazheng ESG evaluation framework draws upon mature international rating systems while adapting to China's market realities. It incorporates over 130 underlying indicators across environmental, social, and governance dimensions, making it more aligned with China's market conditions. Compared to ESG data from other Chinese rating agencies, Huazheng ESG ratings feature higher update frequency, enabling timely adjustments following major corporate incidents to better reflect actual ESG performance. Beyond referencing mainstream international ESG frameworks, Huazheng Index incorporates locally relevant indicators with Chinese characteristics, such as poverty alleviation, rural revitalization, and regulatory penalties.

Therefore, this study utilizes Huazheng ESG rating data from the Wind database to measure corporate ESG performance. Following the methodology of Ma Xili (2019) and Gao Jieying et al. (2021), ESG ratings are assigned values ranging from 1 (C) to 9 (AAA). These values are then log-transformed to derive the final ESG score. Specific assignment rules are detailed in table 1.

Table 1. Huazheng ESG rating assignment rules

ESG Ratings	C	CC	CCC	B	BB	BBB	A	AA	AAA
Assignment	1	2	3	4	5	6	7	8	9

According to research by Fang and Peress (2009), media coverage of corporate information affects investors regardless of the volume or authenticity of such coverage. This paper utilizes the CRNDS China Listed Companies Financial News Database to select the annual number of newspaper and online news reports on sample companies as the metric for media attention (MEDIA). Media attention is measured using the logarithm of the total number of media reports

plus one. The calculation of the dependent variable debt financing costs, as well as the selection and measurement criteria of the control variables, are detailed in the appendix.

Empirical models

$$Cost_{i,t} = \alpha_0 + \alpha_1 ESG_{i,t} + \alpha_2 Controls + \Sigma Year + \Sigma Ind + \varepsilon_{i,t}$$

$$Cost_{i,t} = \alpha_0 + \alpha_1 ESG_{i,t} + \alpha_2 Media + \alpha_3 ESG_{i,t} \times Media + \alpha_4 Controls + \Sigma Year + \Sigma Ind + \varepsilon_{i,t}$$

Results and discussion

Since the data sample selected for this paper is unbalanced short-panel data, random effects and endogeneity issues may exist in the model. Therefore, prior to formal regression analysis, this paper conducted the BP test and Hausman test. Ultimately, it was determined to employ a fixed-effects model for estimation, controlling for both individual and time effects, and using cluster-robust standard errors to address heteroskedasticity.

The table below presents regression results with and without control variables (Column 1 and Column 2, respectively). Findings indicate that the ESG performance of Chinese real estate A-share listed companies negatively impacts debt financing costs at the 5% significance level. This suggests that higher ESG scores correlate with lower debt financing costs.

ESG overall performance and cost of debt capital

Table 2. Regression results on ESG performance and debt financing costs

Variables	(1) Cost	(2) Cost
lnESGaverage	-0.012** (-2.14)	-0.010** (-2.41)
IndDirectorRatio		0.000 (0.88)
Size		-0.002 (-0.55)
Lev		-0.029*** (-2.64)
Liquid		-0.004*** (-4.58)
Cashflow		0.001 (0.25)
AssetGrowth		-0.005*** (-3.07)
BM		-0.009** (-2.14)
FL		0.004*** (2.86)
DLCR		0.032*** (5.72)
Shrer1		-0.000** (-2.26)
Constant	0.027*** (3.05)	0.082 (1.41)
Observations	920	899
Number of codes	110	110
Prob>F	0	0
Adj. R-squared	0.0617	0.216
Year	YES	YES
Individual	YES	YES

Note: ***, ** and * indicates significant at 1%, 5% and 10% level of significance based on t-statistics

Regarding the relationship between real estate companies' ESG performance and debt financing costs, this paper suggests examining it from the following three perspectives:

First, Strong ESG performance enhances a company's risk management capabilities. This improved risk management strengthens financial stability, alleviating creditors' concerns about the company's debt repayment capacity and thereby reducing debt financing costs. On the environmental front, robust ESG practices mitigate environmental risks such as pollution fines or regulatory compliance risks. This helps lessen the impact of external environmental changes on business operations. Socially, prioritizing corporate responsibility and employee welfare improves relationships with staff, customers, and communities, thereby mitigating social risks. Governance-wise, robust governance structures and transparency bolster credibility, reducing shareholder and creditor distrust in management and easing governance risks.

Second, companies with strong ESG performance typically attract more long-term investors and socially responsible investors. Financial instruments such as socially responsible investment (SRI) and green bonds are increasingly favored by the market, with many investors preferring to fund enterprises that meet ESG standards. In terms of institutional investor and fund allocation, companies with high ESG ratings often secure financing at lower costs.

Third, ESG enhances real estate companies' capacity to participate in green urban development and urban renewal projects by reducing financing constraints. Urban renewal projects typically feature large investment scales, extended construction cycles, and slow capital recovery. During the green retrofitting and low-carbon upgrades of existing communities, initiatives often involve energy-saving renovations, green building materials, and smart infrastructure upgrades. These require significantly higher upfront capital investments than traditional development projects, making financing costs a key factor limiting real estate firms' participation in high-standard urban renewal initiatives. Superior ESG performance enhances a company's credibility and risk transparency in capital markets, reducing creditor risk premiums and thereby easing financing constraints. This implies that enterprises with stronger ESG credentials are better positioned to

participate in green urban renewal projects at lower capital costs, undertaking higher standards of energy conservation, emissions reduction, and environmental stewardship. Real estate companies' ESG performance indirectly influences the quality of urban renewal and the pace of green transformation through financing channels. From the perspective of sustainable urban development, strengthening ESG practices among real estate firms represents a crucial institutional pathway to elevate the greening standards of urban renewal.

Regarding the introduction of control variables, the sign and significance level of the dependent variable in the regression model remained unchanged. However, the regression coefficient shifted from -0.012 to -0.010. This indicates that incorporating control variables strengthened the impact of ESG performance on debt financing costs, confirming the validity and effectiveness of including these variables in this study. The following will focus on discussing three key indicators: financial risk (Lev), liquidity ratio (Liquid), and asset growth rate.

Financial risk (Lev) exerts a negative impact on debt financing costs at the 1% significance level, meaning higher financial risk correlates with lower debt financing costs. On one hand, this unique pattern stems from the distinct characteristics of real estate enterprises. These companies require substantial debt financing to support capital expenditures such as land acquisition, development, and construction, typically resulting in high debt-to-asset ratios. A high debt-to-asset ratio in real estate firms, to some extent, signifies stable long-term debt sources or a relatively stable debt structure, which conversely provides creditors with a certain sense of security. This stability may reduce debt financing costs as creditors have more stable expectations regarding the firm's debt repayment capacity. On the other hand, strong ESG performance can play a mitigating role, reducing the risk premium associated with high debt levels. Companies with strong ESG credentials typically exhibit greater transparency, better governance structures, and lower operational risks. Consequently, creditors may still perceive lower default risk in such firms despite their high debt ratios. In this scenario, elevated debt levels and robust ESG performance complement each other, resulting in relatively lower overall debt financing costs.

The current ratio (Liquid) exerts a negative impact on debt financing costs at the 1% significance level. The current ratio reflects the strength of a company's short-term debt repayment capability; enterprises with higher current ratios typically face lower debt financing costs. In the real estate sector, particularly for highly capital-intensive enterprises, debt capital providers often place significant emphasis on a company's liquidity and short-term debt repayment capacity. A high current ratio in real estate firms indicates ample liquid assets to support short-term debt repayment needs. This demonstration of financial stability enhances creditors' confidence in the company, leading to lower debt financing costs. Conversely, a low current ratio signals weaker short-term solvency, prompting creditors to perceive higher risk and demand elevated debt costs as a risk premium.

Asset growth rates at the 1% level exert a negative impact on debt financing costs. Companies with higher asset growth rates typically indicate expanding operational scale and greater potential for future profitability. Asset expansion is often associated with enhanced corporate profitability and improved cash flow, which elevates creditors' expectations regarding future debt repayment capacity, thereby reducing debt financing costs. Within the real estate sector, corporate asset growth is frequently tied to factors such as land reserves and project development. A high asset growth rate indicates that a company possesses robust financing channels and capital support, enabling it to smoothly advance initiatives like land development, property construction, and acquisitions. This not only increases assets but also enhances the company's market competitiveness. Investors and creditors may perceive these enterprises as capable of delivering higher returns, making them willing to offer lower financing rates.

Moderation effects

Table 3 presents the results of the moderation effect analysis. Column (1) shows the regression results without considering the moderation effect, while Column (2) presents the regression results incorporating the moderation effect. When the coefficients of the interaction term and the primary independent variable move in the same direction, it indicates that the moderator variable strengthens the influence of the independent variable on the dependent variable. In Column (2), the regression coefficient for the impact of

ESG performance on debt financing costs is -2.46, significant at the 5% level. Additionally, the interaction term coefficient (ESG $\times$ Media) is -2.24, significant at the 5% level. This result indicates that media attention intensifies the effect of ESG performance on debt financing costs.

Table 3. Moderation effect regression results

Variables	(1)	(2)
	Cost	Cost
lnESGaverage	-0.010** (-2.41)	-0.010** (-2.46)
c_lnMedia		0.001 (0.83)
interact		-0.001** (-2.24)
IndDirectorRatio	0.000 (0.88)	0.000 (0.71)
Size	-0.002 (-0.55)	-0.002 (-0.70)
Lev	-0.029*** (-2.64)	-0.031*** (-2.77)
Liquid	-0.004*** (-4.58)	-0.004*** (-4.76)
Cashflow	0.001 (0.25)	0.001 (0.31)
AssetGrowth	-0.005*** (-3.07)	-0.005*** (-2.94)
BM	-0.009** (-2.14)	-0.008* (-1.96)
FL	0.004*** (2.86)	0.004*** (2.87)
DLCR	0.032*** (5.72)	0.034*** (5.81)
Shrcr1	-0.000** (-2.26)	-0.000** (-2.22)
Constant	0.082 (1.41)	0.092 (1.60)
Observations	899	899
Number of codes	110	110
Prob>F	0	0
Adj. R-squared	0.216	0.225
Year	YES	YES
Individual	YES	YES

Robustness tests

This study addresses potential endogeneity issues and tests the robustness of results by lagging the independent variable by one period. As shown in [table 4](#), the regression coefficients remain significant and are even more robust at the 1% level. This not only confirms the stability of the findings but also suggests that the impact of firm characteristics on financing costs may be

better captured with a time lag. This aligns with the theoretical expectation that debt financing decisions typically reflect past financial conditions.

Table 4. Robustness test results

Variables	(1)	(2)
	Cost	Cost
laglnESGaverage	-0.002*** (-2.79)	-0.002*** (-2.94)
c_lnMedia		0.002* (1.76)
interact		-0.002** (-2.44)
IndDirectorRatio	0.000 (0.50)	0.000 (0.18)
Size	0.002 (0.85)	0.001 (0.50)
Lev	-0.025** (-2.04)	-0.027** (-2.29)
Liquid	-0.004*** (-3.94)	-0.004*** (-4.12)
Cashflow	-0.001 (-0.10)	-0.002 (-0.38)
AssetGrowth	-0.008*** (-4.25)	-0.009*** (-4.40)
BM	-0.012*** (-2.67)	-0.009** (-2.00)
FL	0.002 (1.58)	0.002 (1.62)
DLCR	0.033*** (4.95)	0.034*** (5.25)
Shrcr1	-0.000*** (-3.55)	-0.000*** (-3.38)
Constant	-0.006 (-0.12)	0.015 (0.29)
Observations	707	707
Number of codes	103	103
Prob>F	0	0
Adj. R-squared	0.229	0.249
Year FE	YES	YES
Individual FE	YES	YES

Conclusions

Although the relationship between ESG performance and capital costs has been extensively discussed across various market contexts, empirical research examining this relationship within China's real estate sector, particularly when considering urban transformation and incorporating media attention as a moderating variable, remains relatively scarce. Given the pivotal role real estate enterprises play in urban spatial production and renewal processes, this study conducts further

exploration using data from China's listed real estate companies to uncover the intrinsic link between corporate sustainability capabilities and financing constraints.

Empirical results indicate that under a fixed effects (FE) model, real estate firms exhibit a significant negative relationship between ESG performance and debt financing costs higher ESG scores correlate with lower debt financing expenses. This finding holds important implications from an urban planning and renewal perspective. Current urban renewal projects are characterized by capital-intensive nature, extended timelines, and increasingly stringent green renovation standards, making financing costs a critical constraint affecting real estate firms' participation in high-quality urban renewal and green construction. By enhancing ESG performance through optimized environmental outcomes, fulfilled social responsibilities, and improved corporate governance structures, enterprises not only strengthen information transparency and risk management capabilities but also elevate capital markets' recognition of their sustainable operational capacity. This reduces creditor risk premiums and alleviates financing pressures. Consequently, real estate firms with higher ESG standards are better positioned to engage in green building development and low-carbon retrofits of existing

communities at lower capital costs, thereby providing more stable financial support for urban sustainability.

Furthermore, in analyzing the moderating role of media attention, this study finds that media coverage significantly amplifies the negative impact of ESG performance on debt financing costs. Higher media attention intensifies the effect of ESG performance on financing costs. From an urban governance perspective, media, as a vital component of public oversight mechanisms, enhances the transparency of real estate enterprises' operational practices and strengthens external supervision, thereby improving capital markets' ability to identify sustainable corporate development.

Therefore, in environments characterized by more comprehensive information disclosure and improved social oversight, ESG performance is more readily translated into financing advantages. This finding suggests that enhancing information governance and public oversight at the city level can amplify the positive impact of corporate sustainability practices on financing conditions, thereby institutionally supporting urban renewal and green transition processes.

Appendix

Variable type	Variable name	Abbreviation	Definition
Independent Variable	ESG Performance	InESG	ln (HuaZheng ESG Index Rating Score)
Dependent Variable	Cost of Debt Capital	Cost	(Interest Expense + Handling Fees + Other Financial Expenses) / Total Liabilities
Moderator	Media Attention	Media	Logarithm of the total number of media reports + 1
	Independent Directors Ratio	IndDirectorRatio	Independent directors divided by number of directors
	Firm size	Size	Natural logarithm of annual total assets
	Financial risk	Lev	Total debt divided by total assets
	Current ratio	Liquid	Current assets / Current liabilities
	Cash flow ratio	Cashflow	Net cash flows from operating activities / total assets
	Total asset growth rate	AssetGrowth	(Total assets for the current year) / (Total assets for the previous year) - 1
	Book-to-Market ratio	BM	Book value / Total market value
	Financial Leverage	FL	(Net profit + income tax expense + finance costs) / (Net profit + income tax expense)
	Long-term capital debt ratio	DLCR	Non-current liabilities / (Owners' equity + non-current liabilities)
	Shareholding ratio of the largest shareholder	Shrcr1	Number of shares held by the largest shareholder / Total number of shares

Year	Year	Dummy variable
Individual	Individual	Dummy variable

References

- Ajinkya, B., Sanjeev, B., and Partha, S. 2005. "The association between outside directors institutional, investors and the properties of management earnings forecasts." *Journal of Accounting Research* 43(3): 343–376
- Arevalo, J.A. and Arevind, D. 2017. "Strategic Outcomes in Voluntary CSR: Reporting Economic and Reputational Benefits in Principles-Based Initiatives." *Journal of Business Ethics* 144: 201–217.
- Bai, Y.W., 2021. "Study on the relationship between corporate ESG and cost of equity capital." *MA Dissertation, East China Normal University*.
- Baloria, V.P. and Heese, J. 2018. "The effects of media slant on firm behavior." *Financial Economic* 129: 184–202.
- Benlemlih, M. 2018. "Corporate social responsibility and firm financial risk reduction: On the moderating role of the legal environment." *Journal of Business Finance & Accounting* 44: 1137–1166.
- Boston Consulting Group. 2020. China ESG Investment Development Report. <https://webassets.bcg.com/5e/f7/6a16f19a471fa97e3ca239c72c59/china-esg-investing-report.pdf>
- Chen, Y. et al. 2023. "Effect of ESG performance on the equity capital costs: Evidence from China." *International Review of Economics & Finance* 83: 348–364.
- Chen, Z., and Xie, G. 2022. "ESG disclosure and financial performance: Moderating role of ESG investors." *International Review of Financial Analysis* 83: 102291.
- Chen, A.Q. 2022. "ESG Performance, Media Attention and Cost of Equity Financing - An Example of Listed Companies in High Carbon Industries." *MA Dissertation, Guangdong University of Finance and Economics*.
- China Real Estate Information Corporation. 2024. *China Real Estate Industry Summary and Outlook*. DOI:10.20163/j.cnki.11-3651/f.2024.06.006
- Cho, Y. 2022. "ESG and Firm Performance: Focusing on the Environmental Strategy." *Sustainability* 14(13): 7857.
- Dyck, A. et al. 2019. "Do institutional investors drive corporate social responsibility? international evidence." *Journal of Financial Economics* 131(3): 693–714.
- Elizabeth S., H. 2018. "Responsible investment and ESG: an economic geography." Phd thesis. University of Oxford.
- El Ghoul, S., Guedhami, O., Kim, H., et al. 2018. "Corporate environmental responsibility and the cost of capital: International evidence." *Journal of Business Ethics*. 149.
- El Ghoul, S., Guedhami, O., Kwok, C. C. Y., and Mishra, D. 2011. "Does corporate social responsibility affect the cost of capital?" *Journal of Banking & Finance*. 35.
- Fama, E.F. et al. 1992. "The Cross-Section of Expected Stock Returns." *Financial*. 47: 427–465.
- Gao, J.Y. et al. 2021. "Can ESG performance improve corporate investment efficiency?" *Securities Market Herald* (11): 24–34,72
- Gholami, A. 2022. "Corporate environmental, social and governance (ESG) performance disclosure and company's capital cost, idiosyncratic risk and market value." Phd thesis. University of Southern Queensland.
- Ghoul S E, Guedhami O, Nash R, et al. 2019. "New Evidence on the Role of the Media in Corporate Social Responsibility." *Journal of Business Ethics* 154(4): 1–29.
- Hail, I. & Leuz, C. 2006. "International differences in the cost of equity capital: Do legal institutions and securities regulation matter?" *Journal of Accounting Research*, 44: 485–531.
- Hassan, O.A.G. & Romilly, P. 2018. "Relations between corporate economic performance, environmental disclosure and greenhouse gas emissions: New insights." *Business strategy and the environment* 27: 893–909.
- Johnson, R. 2020. "The link between environmental, social and corporate governance disclosure and the cost of capital

- in South Africa." *Journal of Economic and Financial Sciences* 13: e1-e12.
- Kassinis, G. et al. 2016. "Gender and environmental sustainability: a longitudinal analysis." *Corporate Social Responsibility and Environment Management* 23: 399–412.
- KPMG.(2022). *Companies increasingly acknowledging ESG issues as risk areas*. <https://kpmg.com/xx/en/home/insights/2022/09/survey-of-sustainability-reporting-2022/esg.html>.
- Liu, M. et al. 2023. "Public perceptions of environmental, social, and governance (ESG) based on social media data: Evidence from China." *Journal of Cleaner Production* 387: 135840.
- Li, Y., Gong, M., Zhang, X.Y. and Kou, L. 2018. "The impact of environmental, social, and governance disclosure on firm value: The role of CEO power." *The British Accounting Review* 50: 60-75.
- Mansouri, Sasan, and Paul P. Momtaz. 2022. "Financing Sustainable Entrepreneurship: ESG Measurement, Valuation, and Performance." *Journal of Business Venturing* 37 (6): 106258. <https://doi.org/10.1016/j.jbusvent.2022.106258>.
- Matthews, L. 2019. "Innovation disclosure and the cost of capital: UK-based evidence." PhD thesis. University of Reading
- Merton, R.C. 1987. "A simple model of capital market equilibrium with incomplete information." *The Journal of Finance* 42: 483-510.
- Miller, M., Modigliani, F. 1958. "The Cost of Capital, Corporation Finance, and the Theory of Investment." *American Economic Review* 261 – 297.
- Modigliani, F., Miller, M. H. 1963. "Corporate Income Taxes and the Cost of Capital: A Correction." *The American Economic Review* 53(3).
- Schiemann, F., and Tietmeyer, R. 2022. "ESG controversies, ESG disclosure and analyst forecast accuracy." *International Review of Financial Analysis* 84: 102373.
- Sharfman, M. P., and Fernando, C. S. 2008. "Environmental risk management and the cost of capital." *Strategic Management Journal* 29: 569–592.
- Tang, H. 2022. "ESG performance, investors' heterogeneous beliefs, and cost of equity capital in China." *Frontiers in Environmental Science* 10. doi:10.3389/fenvs.2022.992559.
- Trinks, A., Ibikunle, G., Mulder, M., and Scholtens, B. 2017. "Greenhouse gas emissions intensity and the cost of capital. University of Groningen." *Research Institute SOM (Systems, Organisations and Management)* 17017-EEF.
- Tzouvans,P., et al. 2020. "Environmental disclosure and idiosyncratic risk in the European manufacturing sector." *Energy economics* 87: 104715.
- Wu, X., et al. 2021. "Does media attention have a supervisory effect on major shareholders' illegal reduction?" *Foreign Economy Management* 43: 86–103.
- Zhao, L.and Zhang, L. 2020. "The influence of media attention on green technology innovation of enterprises: The regulatory role of marketization level." *Management Review*, 32: 132–141.

Author(s) contribution

Duan Yingying contributed to the research concepts preparation, methodologies, investigations, data analysis, visualization, articles drafting and revisions.

Mohd Wira Mohd Shafiei contribute to the research concepts preparation and literature reviews, data analysis, of article drafts preparation and validation.

Radzi Bin Ismail contribute to methodology, supervision, and validation.