Interdisciplinary Academic and Research Journal, 6 (2), March-April 2026
Old ISSN 2774-0374: New ISSN 2985-2749
Website: https://so03.tci-thaijo.org/index.php/IARJ/index
Article ID: e292256

Environmental Compliance and Enterprise Performance in China under RCEP: The Mediating Roles of Risk Management, Innovation, and Green Culture

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Received 06/08/2025 Revised 02/09/2025 Accepted 15/10/2025

Abstract

Background and Aims: In a global low-carbon and low-pollution economy, environmental compliance is a key concern and development goal for enterprises all over the world. This research aims to explore how Chinese enterprises can participate in and integrate into environmental compliance on the Regional Comprehensive Economic Partnership (RCEP) rules, and investigate the specific mechanisms through which environmental compliance management influences enterprise performance within the RCEP framework. We provide a comprehensive analysis of Chinese enterprises' environmental compliance, risk management, technological innovation, green culture, and enterprise performance under the framework of RCEP.

Methodology: We conduct this study on 50 major enterprises in China that are prone to causing pollution. We employ stratified random sampling to select 450 managers and staff from 50 enterprises. Then, the study employs the quantitative analysis using structural equation modelling (SEM) to analyze the effect of environmental compliance management in RCEP through risk management, technological innovation, and green culture that impact enterprise performance across the enterprises in China.

Results: Research results indicate that environmental compliance significantly enhances enterprise performance when integrated with risk management, technological innovation, and green culture. Environmental compliance model shows the relationship among the variables: Environmental compliance-> enterprise performance (β is 0.298 and $p < 0.000$); Environmental compliance-> risk management (β is 0.327 and $p < 0.000$); Environmental compliance-> technological innovation (β is 0.467 and $p < 0.000$); Environmental compliance-> green culture (β is 0.389 and $p < 0.000$). The findings highlight the pivotal role of environmental compliance as a strategic tool for competitiveness in international markets, offering crucial insights for both the Chinese government and enterprises.

Conclusion: The contribution of this paper is that the synergy between environmental compliance, risk management, technological innovation, and green culture creates the pathway

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to superior corporate performance and offers a competitive advantage for Chinese enterprises to improve the relationship between compliance with RCEP regulations and their business performance. Meanwhile, it also offers actionable insights for policymakers and business leaders.
Keywords: Environmental Compliance; Enterprise Performance; Sustainable Development; Technological Innovation; RCEP; Social Responsibility

Introduction

The global economy, led by the United States and the European Union, has made remarkable achievements, and it has re-entered the stage of rapid development. However, in the background of large-scale exploitation and use of oil, coal, and various raw materials, the contradiction between economic growth and the ecological environment is becoming more and more prominent. Destructive and aggressive production processes have produced serious ecological, energy, resource, high-carbon, and other comprehensive crises in many countries, and pose a risk of affecting the world economy, environment, and survival. Especially in the last 20 years, a series of greenhouse effects, such as global warming, smog weather, and glacier melting, have brought great challenges to the survival and development of the world (Kim, Lee, et al.,2004).

With the increasing pressure on global businesses, especially those in developing economies like China, to balance economic growth with environmental responsibility. Enterprises in China and other developing economies must fight on two fronts: "catching up in economic growth" and "conducting environmental governance simultaneously". Thus, it confronts a more prominent "dilemma of transition costs." Take China's traditional manufacturing industry as an example: On one hand, some enterprises still rely on energy-intensive and high-emission production models. To achieve the goal of "carbon neutrality," they need to invest huge sums of money in equipment upgrading and technological R&D On the other hand, the environmental protection industrial chain in developing economies is not yet fully mature. When enterprises bear the transition costs alone, they are prone to risks such as short-term profit decline and weakened market competitiveness.

The government's goal has changed to cultivate the awareness of green sustainable development of enterprises based on protecting the ecological environment, enhancing the initiative of enterprises to undertake social responsibility, and its compliance means have become more and more diversified (Qin and Li, 2023; Al-Qudah, Al-Okaily, and Alqudah,2022). Depending on International cooperation and alignment with standards, RCEP (Regional Comprehensive Economic Partnership) will promote trade and investment cooperation between China and other

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member countries, which may increase interactions between Chinese enterprises and multinational companies (Sun, 2024; Wang and Miao,2024; Liu and Lee,2025; Jiang, 2023).

In this case, China actively complies with international regulations, including environmental standards, to ensure the competitiveness of its products and services in the international market and bring more trade and investment opportunities, which may increase the demand for resources and environmental pressure (Zhang et al., 2024). RCEP may bring more cooperation opportunities in green technology and environmental industries for China, which is beneficial for China's green development and addressing environmental challenges (Liu and Lee, 2023). China could attract more green investment and technology transfer by strengthening environmental compliance, promoting economic transformation, and upgrading (Xu et al.,2024; Gao and Xia, 2024).

Therefore, in the context of RCEP, China's implementation of environmental compliance need to pay more attention to the alignment of international standards with domestic regulations, balancing economic growth with environmental protection, and seizing the opportunities for green development to achieve a win-win situation for both the economy and the environment (Yang and Li, 2022; Yin et al., 2023; Jia, et al., 2022; Zafarullah and Mehnaz, 2025).

Since its inception, RCEP has attracted strong attention from scholars around the world, with diverse research perspectives and fruitful results. At present, RCEP studies mainly focus on analyzing the economic effects and influences of RCEP through quantitative and qualitative methods, and analyzing the political and strategic significance behind the establishment of RCEP and the strategic choices of each member state (Katon and Tu, 2023; Wei, 2024). Then, it discussed the future development prospects of RCEP, challenges, and countermeasures (He,2025; Iwasaki et al., 2025; Li et al., 2023).

Based on the above discussion, the main focus of researchers' attention is on analyzing how Chinese enterprises can comply with the relevant agreements and rules on environmental compliance under the RCEP framework. Many researchers are paying more attention to the macro impact of environmental compliance and economic behavior, as well as the development opportunities and challenges faced by Chinese enterprises. However, few studies have empirically investigated how environmental compliance management, as a strategic function, influences enterprise performance through mediating factors like green culture and technological innovation, specifically for Chinese enterprises within the RCEP framework. In specific studies, introducing mediating variables such as green culture and technological innovation is the key mechanism when discussing the impact of environmental compliance and enterprise performance.

Facing increasingly serious ecological and environmental problems, sustainable development has become the development model pursued by governments all over the world. Under the background of RCEP, the important problem faced by Chinese enterprises is to explore

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how to improve enterprise performance through intermediary variables, to effectively implement environmental compliance management activities to adapt to the reform of macro-institutional environmental compliance in RCEP member countries, which not only affects the realization of enterprise performance goals but also relates to the grand cause of sustainable development of enterprises.

So, the purpose of this study is to explore the impact of environmental compliance on the enterprise performance of Chinese enterprises to improve the competitiveness of enterprises in RCEP. The remainder of this paper is arranged as follows. In Section 2, we carry out the Literature Review. Section 3 discusses methodology and analyzes the details of the questionnaire in detail, including the survey object, method, purpose, etc. Section 4 discusses the results of the investigation, and some theoretical explanations are given by combining the relevant domains. Finally, section 5 presents conclusions and summarizes this work.

Literature Review

1. Environmental compliance for Chinese enterprises and RCEP

Many researchers study the relationship between enterprise environmental compliance and RCEP in the context of national or regional economies from a macro perspective by using quantitative models. Itakura (2015) used the computable general equilibrium model (CGE) to assess the potential economic impact of RCEP on ASEAN countries, and the results show that ASEAN countries will increase GDP, trade volume, and investment through trade liberalization and a large influx of investment. The GTAP (Global Trade Analysis) model was used to analyze the economic impact of South Korea's accession to RCEP (Lee, 2022; Li, Han, and Cho,2023). On the whole, it will promote GDP, trade welfare, import and export trade, and heavy industry and service industry with advantages, and have a certain impact on South Korea's sensitive agriculture and light industry. Some researchers elaborated on the strategic significance of the signing of RCEP from a global perspective, which is of great significance to the integrated development of multilateral trade and the suppression of trade protectionism (Kimura et al., 2022; He, 2025). Fan et al. (2022) discussed the interest game among RCEP member states and China's strategic choices, arguing that the huge trade scale is the cornerstone of stable relations between the two countries, and both China and RCEP can gain economic benefits from cooperation.

Due to the short time for the signing of RCEP, the future development trend is difficult to predict, and most scholars in various countries have a wait-and-see attitude towards the development prospects of RCEP (Guo and You, 2023; Bhardwaj et al., 2021; Zhong,2024; Pan,2024). Ravenhill (2016) believed there are alternative agreements available to RCEP members that may offer better opportunities than RCEP. However, RCEP's implementation flexibility clause

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allowed each country to determine the pace of reform, which will give RCEP a priority in future trade rules. The basis and dilemma of the reconstruction of the RCEP regional value chain were discussed, pointing out that the enhanced consensus of regional value chain cooperation (Guo et al., 2025; Zhang, 2024).

For Chinese enterprises, RCEP brings both opportunities and challenges. The agreement provides enterprises with a larger market with a combined GDP of over $2.6 trillion, creating new opportunities for Chinese enterprises to expand their businesses and increase exports. Environmental compliance is one of the important prerequisites for accessing the RCEP market. Scholars explore how Chinese enterprises can develop a green economy within the framework of RCEP. Using the GTAP model to quantitatively analyze the economic effects of RCEP on China, RCEP has a positive impact on the development of China's textile industry, based on the future development countermeasures of the Chinese textile industry (Zhou et al., 2024; Yang and Kumarasinghe, 2024). Jiang & Yu (2021) analyzed the RCEP and CPTPP from the perspective of China's dual-circular economy strategy, discussing the trade relations and differences between the two agreements. Ling & Lv (2022) had studied the impact of RCEP on China's manufacturing output and trade, using GTAP simulations to analyze the impact of the agreement. Fan et al. (2025) focused on the impact of green logistics performance on China's export trade with RCEP countries and stressed the importance of promoting green logistics cooperation within the region.

In the context of the RCEP, the implementation of environmental compliance for Chinese enterprises has far-reaching significance. Environmental compliance for Chinese enterprises is not only to address market access and regulatory requirements, but also the key to enhancing enterprise competitiveness, driving technological innovation, reducing legal risks, and improving operational costs and efficiency (Lin et al, 2011; Dong et al.,2020). Environmental compliance helps enterprises establish a green cultural image in international markets, expand cooperation opportunities, attract investment, increase employee satisfaction, and respond to global sustainability trends. By effectively implementing environmental compliance, Chinese enterprises can achieve long-term sustainable development and a competitive advantage in the global market. Obviously, most studies on the relationship between environmental compliance and enterprise economic performance are conducted from a macro perspective. Regarding specific impact mechanisms, there still exists a "black box effect," and the influence of relevant factors remains ambiguous.

2. The relationship between environmental compliance and risk management, technological innovation, green culture, and enterprise performance

Environmental compliance and risk management are closely related, and they are regarded as the two "carriages" that drive the smooth implementation of the enterprise development

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strategy. Mbanyele et al. (2022) considered that environmental compliance and risk management are two crucial components in ensuring the sustainable development of industries and the protection of the environment. Risk management can provide the right direction for environmental compliance, and environmental compliance provides the necessary means and ways for enterprises to implement risk management. The two have different focuses and complement each other.

Environmental compliance can promote the technological innovation of enterprises. Porter et al. (1995) put forward the famous Porter Hypothesis, which holds that the environmental compliance policy can make enterprises recognize the current situation of inefficiency in resource utilization and environmental pollution treatment in their development, improve their environmental awareness, and provide a direction for their technological improvement. Bu et al. (2020) took the number of patent applications of enterprises as an explanatory variable. The empirical results show that the more patent applications of enterprises, the higher the environmental compliance intensity of the corresponding enterprises, and the two are significantly positively correlated. However, some scholars hold a negative attitude towards environmental compliance, promoting technological innovation. Slater & Angel (2000) believed that environmental compliance, as a policy means to control and control enterprise pollution, often transforms the negative externalities of environmental pollution into additional costs of enterprises. Kneller & Manderson (2012) took the manufacturing industry in Britain as the research object and found that after the government implemented the environmental compliance policy, the innovation activities of enterprises decreased. Liu et al. (2021) embedded environmental compliance factor and compliance cost factor into the M-O monopolistic competition and multi-product firm model to construct a theoretical model applicable to environmental compliance and enterprise innovation. In addition, they constructed a new environmental compliance index using the random-effects Tobit model and the double hurdle model to empirically test the microdata from the Database of China Industrial Enterprises from 1998 to 2013.

Bréchet & Meunier (2014) took the survey results of more than 2,500 enterprises in Europe, showing that environmental compliance has uncertainty on the innovation activities of enterprises. For the relationship between green clean technology and environmental quality, they found that the relationship between environmental compliance policy and green innovation of enterprises is not monotonically linear. Wambwa et al. (2023) evaluated the use of environmental protection fund audits to ensure mining compliance in Zambia. They emphasized the importance of mine management regularly updating the environmental protection fund audit schedule, involving staff and communities to enhance environmental and social control.

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Environmental pollution, ecological destruction, and other issues have catalyzed people's reflection on how to protect the environment and realize the sustainable development of man and nature. That is to say, green culture influences the business behaviors and thoughts of the public. Roscoe et al. (2019) pointed out that enterprise green culture can be defined as the values, beliefs, and behaviors of all members of an enterprise towards the natural environment. Others believed that enterprise green culture refers to the enterprise values and business philosophy gradually formed by enterprises and employees in the production, operation, and management, which are recognized and followed by everyone, have enterprise characteristics, and protect the ecological environment and make full use of resources.

Most of the research directly discusses its impact on green culture rather than environmental performance. Joseph et al. (2023) highlighted the need for companies to strengthen the role of environmental commitment to improve environmental sustainability, and they mention practical implications both for managers of organizations that are responsible for meeting the objectives of sustainable development, specifically in the environmental field, and for policymakers and authorities that guide environmental policies. Anusha and Lavanya (2025) suggested that a strong green organizational climate fosters a culture of sustainability, leading to enhanced innovation, regulatory compliance, cost savings, and stakeholder trust. They concluded by emphasizing the need for organizations to develop structured green policies and leadership initiatives to optimize both environmental impact and business success.

Wang and Liu (2014) investigated the relationship between total factor productivity and environmental compliance by establishing mathematical models using data from Chinese industrial enterprises. They found that when environmental compliance is weak, enterprises lack sufficient motivation to engage in R&D and innovation. Wei & Yu (2021) assessed the benefits of semi-inclusive regional economic agreements, including RCEP, from the perspective of global value chains, indicating that China would benefit from these agreements. Some studies examined the impact of the RCEP on the textile and apparel industry within its member nations. They tried to understand the implications of RCEP on trade dynamics, innovation chains, and industrial integration in the textile sector. China emerges as a key player, experiencing substantial growth in textile exports to RCEP nations, particularly driven by tariff reduction initiatives (2024).

3. The Mediating Effect for environmental compliance and enterprise performance

The mediating effects of technological innovation, green culture, and risk management on the environmental compliance and business performance of enterprises have attracted much attention from researchers. Kamphaengdee et al. (2025) explored the influence of entrepreneurial potential and business management on the southern Thailand community enterprise performance. Zhang et al. (2025) found the impact of green technological innovation on green

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innovation performance and the mediating role of green knowledge management in the south-eastern region of China. For Malaysian manufacturing enterprises, the literature has explored the relationships among green human resource management, green culture, green innovation, and the environmental performance of the enterprises (Fang et al., 2022). Meanwhile, the mediating role of green culture and green innovation between green human resource management and environmental performance was also discussed. Lalaeng & Hongsakul (2024) studied the influencing paths of the performance of small and medium-sized enterprises in the Thai textile manufacturing industry, and explored the structural relationship among creative economy, dynamic capabilities, and competitive advantages. They found that innovation ability has a positive impact on the performance of enterprises. Based on these research papers, the mediating effects of enterprise efficiency, green culture, and technological innovation were discussed. They discovered a new relationship and provided specific research directions.

From the point of view of the above literature, the analysis here displayed is due to the following challenges:

(1) Environmental compliance is a key concern and development project for enterprises all over the world. At the international level, sustainable development has become a major trend in economic development, and environmental compliance is increasing day by day. The improvement of environmental compliance has a comprehensive impact on human production activities, especially on the production efficiency and investment activities of enterprises. It can be seen that under the increasingly perfect international environmental compliance requirements, the effective construction and implementation of environmental compliance management has become a problem that any enterprise in the world must face and solve, which is an inherent logical requirement and an inevitable outcome of the times.

(2) This is a complex issue. On the one hand, its multidimensional nature has three dimensions (economic, social, and environmental). And on the other hand, because it affects the good development relationship between national and national and national and regional economies. Environmental compliance can provide strong support for Chinese companies to do business with RCEP countries.

(3) The framework construction of the evaluation system for enterprise environmental compliance can help Chinese enterprises avoid ecological environmental difficulties and business development risks in the RCEP regional development, improve the effectiveness of decision-making, and promote the rapid development of enterprises.

Taking Chinese enterprises as the target and environmental compliance as the starting point, this paper attempts to summarize existing studies and clarify the effects of enterprise risk management, technological innovation, and green culture. Furthermore, it builds an enterprise

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environmental compliance framework and provides rational policy suggestions for improving the performance of Chinese enterprises to facilitate their competitiveness of Chinese enterprises in the international market. The main contributions of this paper are as follows:

(1) We construct an evaluation system of Chinese enterprises' environmental compliance considering risk management, technological innovation, green culture, and enterprise performance.

(2) We provide a comprehensive analysis and employ the quantitative analysis from the microscopic angle for Chinese enterprises' environmental compliance to analyze the effect of environmental compliance management in RCEP.

(3) The approach of environmental compliance in RCEP for Chinese enterprises is explored, and the path analysis and the mediating variables among various factors of environmental compliance management are explained.

(4) The research explores that environmental compliance significantly enhances enterprise performance when integrated with risk management, technological innovation, and green culture.

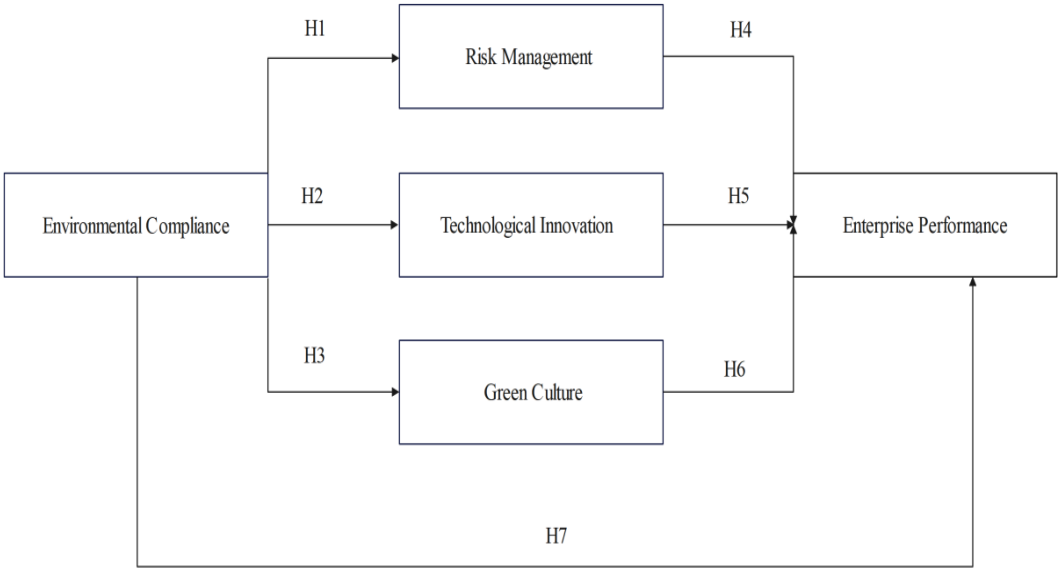


Figure 1 Conceptual Framework

Methodology

The theoretical foundation of this study is Porter's hypothesis, which asserts that well-designed environmental compliance can achieve a win-win situation for environmental governance and economic competitiveness by stimulating technological innovation. To find out how Chinese entrepreneurs perceive the concept of environmental compliance management and

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which of its activities they perform and consider important for the future functioning of RCEP, we looked for answers to 3 research questions (RQ):

RQ1: What is the effect of environmental compliance in RCEP through risk management, technological innovation, and green culture that impacts enterprise performance in China?

RQ2: What is the approach of environmental compliance in the enterprise of China towards enterprise performance in the context of RCEP?

RQ3: What is the best path of relationship from environmental compliance principles in RCEP to enterprise performance?

Through the above research questions and theoretical review, this study puts forward 7 hypotheses.

H1: Environmental compliance is positively related to the risk management of Chinese enterprises.

H2: Environmental compliance is positively related to the technological innovation of Chinese enterprises.

H3: Environmental compliance is positively related to the green culture of Chinese enterprises.

H4: Risk management of Chinese enterprises is positively related to enterprise performance.

H5: Technological innovation of Chinese enterprises is positively related to enterprise performance

H6: Green culture has a direct impact on the performance of Chinese enterprises.

H7: The environmental compliance of Chinese enterprises is positively related to enterprise performance.

In the field of management science, there are many research methods to verify the correlation between variables, such as correlation analysis, regression analysis, factor analysis, and so on. In view of the main characteristics and application conditions of these methods, the Structural Equation Model (SEM) is selected to test and analyze the samples. From the perspective of the advantages in latent variables, both "environmental compliance" and "enterprise efficiency" are essentially abstract concepts that cannot be directly observed (i.e., latent variables), and they need to be indirectly measured through multiple-dimensional manifest variables. SEM can establish the correlation between latent variables and manifest variables through the "measurement model". By using factor loading coefficients, it can select the core manifest variables, eliminate measurement errors, and integrate the manifest variables into the latent variable "environmental compliance", ensuring the comprehensiveness and accuracy of variable measurement.

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In this research, the SEM results help to quantify and clarify these causal relationships. The significant paths between environmental compliance and mediators (risk management, technological innovation, and green culture), as well as their effects on enterprise performance, provide empirical evidence of how compliance fosters both innovation and sustainability. By testing the strength and significance of these relationships, SEM can confirm that enterprises benefiting from environmental compliance adopt comprehensive risk management strategies, promote innovation, and cultivate a green culture—all contributing to enhanced performance within the RCEP context.

The data to verify the conceptual model are obtained through the questionnaire and the questionnaire survey method. After data acquisition, we mainly used SPSS 27.0 and AMOS 26.0 software to conduct descriptive statistics, correlation analysis, reliability and validity testing, and SEM analysis, to verify the proposed hypothesis and provide empirical support for the proposed theory.

Research design and questionnaire

1. Variable description

First of all, the variables studied should be named alphabetically. The environmental compliance variable is named EC; the Risk management variable is named RM; the Technological innovation variable is named TI; the Green culture variable is named GC; and the Enterprise performance variable is named EP.

Second, the measurement items of the observed variables are named alphabetically.

Environmental compliance is subdivided into three dimensions: government regulation, market incentive, and voluntary disclosure. The measurement items of government regulation for environmental compliance variables are named EC01, EC02, EC03, EC04, and EC05, respectively. The market incentive measurement items of environmental compliance variables were named EC06, EC07, EC08, EC09, and EC10, respectively. The voluntary disclosure of environmental compliance variables is named EC11, EC12, EC13, and EC14.

Risk management is subdivided into three dimensions: enterprise culture, staff quality, and internal environment. Therefore, the measurement items of the enterprise culture of risk management variables are named RM01, RM02, and RM03, respectively. The staff quality measurement items of risk management variables were named RM04, RM05, RM06, RM07, and RM08, respectively. The measurement items of the internal environment part of risk management variables are named RM09, RM10, RM11, RM12, and RM13.

Technological innovation is subdivided into three dimensions: investment ability, research and development ability, and support ability. Therefore, the measurement items of investment ability are named as TI01 and TI02, respectively. The measurement items of R&D capability are

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named as TI03, TI04, and TI05, respectively. The measurement items of supporting ability are called TI06 and TI07.

Green culture variables are named GC01, GC02, GC03, GC04, GC05, GC06, GC07, and GC08.

Enterprise performance variables are named EP01, EP02, EP03, EP04, EP05, and EP06.

Finally, according to the code and the corresponding digital information, the input computer is used for data analysis preparation. All coding and notation instructions are placed.

2. Questionnaire design

This paper sets the empirical survey objects as the enterprises with large pollution in China's iron and steel, aluminum mining, machinery, chemical industry, and other industries. And the investigation objects are senior and middle managers and ordinary employees of these enterprises. The selection of such enterprises as sample enterprises mainly takes into account the following factors: First, compared with other industries, polluting industries, as the key industries of environmental compliance, are more sensitive when dealing with environmental compliance policies, and they are more strongly affected by policy changes in both breadth and depth. Secondly, enterprises in polluting industries are also the backbone of China's rapid development. Compared with other industries, polluting industries cover more types of enterprises and account for a larger proportion of all enterprises in China. Finally, due to the production and operation characteristics of such enterprises with "high pollution, high consumption, and high emission", although they have made great contributions to China's economic development, they have also caused a non-negligible impact on the ecological environment. The selection of such enterprises as sample research is representative.

Taking into account the actual situation of Chinese enterprises and the requirements of research, the questionnaire design method is based on the questionnaire design method proposed by Saunders et al. (2004) and Joseph et al. (2023). First, mature questionnaire items used in previous studies are adopted to form a questionnaire. Second, modify some items in the existing questionnaire; Third, design the questionnaire items by yourself.

By surveying them, it is possible to gain an in-depth understanding of the practical application of compliance policies within these areas. Their insights can help assess the relationship between environmental compliance and risk management, technological innovation, green culture, and how these factors affect business performance.

Therefore, this study adopts the five-level scale proposed by American psychologist Likert to measure. We set it on a score scale of 5. Where 1 means "strongly disagree", 2 means "disagree", 3 means "Neutral", 4 means "agree", and 5 means "strongly agree". We calculated

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Cronbach's alpha and descriptive statistics and used the chi-square test to detect dependencies between variables.

3. Sampling method

The questionnaire design takes into account the characteristics of the survey objects, the survey method, the survey time, and other factors. In order to ensure the effectiveness and reliability of the questionnaire, this study extensively includes 5 senior management researchers, 3 doctoral students, 3 master's students, 5 enterprise executives, and 5 government managers, and sets up a questionnaire design and research group. The more mature scale is analyzed and adjusted by experts according to the research context of this paper. Then, questionnaire sample design and preliminary investigation were carried out, focusing on environmental compliance, risk management, technological innovation, green culture, enterprise performance, and other issues, so as to improve the closeness between questions and actual conditions, enterprise operations, and government management. The overall sample quantity (formal survey) was set at 450, and the test samples (preliminary survey) were 50. Finally, the research team hired an external think tank to evaluate and refine the content, structure, language, operability, feasibility, accuracy, and other aspects of the questionnaire, and finally designed a practical scale based on the adjustment of the questionnaire to form a formal questionnaire.

We adopted the method of stratified random sampling to conduct a survey on 50 Chinese enterprises through channels such as online questionnaire filling, email responses, and telephone interviews. During the survey, 450 questionnaires were distributed. 50 senior administrators were surveyed offline and interviewed. 400 staff were distributed online for ordinary employees using stratified random sampling, and 356 staff were recycled. It meets the requirements of the structural equation in terms of quantity. The respondents of this questionnaire come from Chinese enterprises. They are usually responsible for formulating and implementing enterprise compliance policies, and have strategic decision-making power over environmental compliance, risk management, technological innovation, green culture, and other aspects of enterprises. More information is included in the questionnaire.

A survey is administered to Chinese enterprises participating in the RCEP framework. The survey captures information on how environmental compliance is integrated into their operations, technologies adopted for compliance, and performance outcomes. In the process of hypothesis verification, by collecting opinions from people at different levels and enterprises with different backgrounds, we can understand the relevance of the hypotheses proposed in the paper: that is, we can comprehensively understand the relationship between environmental compliance, risk management, technological innovation, green culture, and enterprise performance, and verify the

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Interdisciplinary Academic and Research Journal, 6 (2), March-April 2026
Old ISSN 2774-0374: New ISSN 2985-2749
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Article ID: e292256

hypotheses in the paper. To address this issue, we conducted research to obtain relevant information through a questionnaire. Descriptive statistics, correlation analysis, and regression analysis were performed to examine the relationships for environmental compliance of the variables, and the study included factor analysis to identify underlying constructs and dimensions. The sample questionnaire was adapted to include basic demographic information. Next, we will proceed to data collection, initial data cleaning, reliability and validity tests, and SEM analysis.

Results

1. Distribution test of measurement items

To provide insight into the general quantitative characteristics of the sample enterprises, we conducted descriptive statistical analyses. These analyses offer an overview of key variables by summarizing their maximum, minimum, mean values, and standard deviations. This serves as a foundation for subsequent inferential analyses. Using SPSS 27.0 analysis, the descriptive statistics of the measurement items of observed variables are shown in Table 1.

Table 1 Descriptive statistics of measurement items.

No. of Items	Sample size	Minimum value	Maximum value	Mean value	Standard deviation
EC01	406	1	5	3.7759	1.18905
EC02	406	1	5	3.7266	1.16179
EC03	406	1	5	3.7537	1.22663
EC04	406	1	5	3.8202	1.14382
EC05	406	1	5	3.8325	1.16599
EC06	406	1	5	3.7537	1.16679
EC07	406	1	5	3.8276	1.16739
EC08	406	1	5	3.7759	1.22384
EC09	406	1	5	3.8103	1.20382
EC10	406	1	5	3.5522	1.12780
EC11	406	1	5	3.7635	1.21848

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No. of Items	Sample size	Minimum value	Maximum value	Mean value	Standard deviation
EC12	406	1	5	3.8054	1.17340
EC13	406	1	5	3.8128	1.20059
EC14	406	1	5	3.7709	1.23498
RM01	406	1	5	3.9581	1.09351
RM02	406	1	5	4.0246	1.07238
RM03	406	1	5	3.9729	1.09624
RM04	406	1	5	3.9704	1.08826
RM05	406	1	5	3.9852	1.04929
RM06	406	1	5	3.9704	1.07915
RM07	406	1	5	3.9778	1.05296
RM08	406	1	5	3.9901	1.02796
RM09	406	1	5	3.8941	1.07777
RM10	406	1	5	3.9729	1.10073
RM11	406	1	5	4.0394	1.08567
RM12	406	1	5	4.0394	0.98303
RM13	406	1	5	3.9778	1.04799
TI01	406	1	5	3.8842	1.17543
TI02	406	1	5	3.7980	1.16687
TI03	406	1	5	3.8818	1.16780
TI04	406	1	5	3.8103	1.16999

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No. of Items	Sample size	Minimum value	Maximum value	Mean value	Standard deviation
TI05	406	1	5	3.9261	1.15233
TI06	406	1	5	3.8300	1.15392
TI07	406	1	5	3.9113	1.09861
GC01	406	1	5	3.4754	1.32893
GC02	406	1	5	3.5739	1.32896
GC03	406	1	5	3.5567	1.32981
GC04	406	1	5	3.5813	1.29845
GC05	406	1	5	3.5690	1.29726
GC06	406	1	5	3.5690	1.31428
GC07	406	1	5	3.5443	1.29644
GC08	406	1	5	3.5862	1.28667
EP01	406	1	5	3.7291	1.22141
EP02	406	1	5	3.8030	1.18451
EP03	406	1	5	3.7586	1.17205
EP04	406	1	5	3.7438	1.19811
EP05	406	1	5	3.8202	1.22512
EP06	406	1	5	3.7586	1.20528

According to the descriptive statistics of variables, the mean distribution of each variable ranges from 3.4754 to 4.0394, and the standard deviation ranges from 0.98303 to 1.23498. The data suggests that the surveyed enterprises generally acknowledge the importance of environmental compliance, reflecting positively on enterprise performance. This consensus

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underscores the significant role that regulatory adherence plays in shaping organizational outcomes.

The understanding of data distribution characteristics is an important reference for selecting models, selecting statistical analysis methods, and guiding research conclusions. Before analyzing the data collected by the survey, it is necessary to test the randomness of the collected data for normal distribution. As for the standard of the sample normal distribution test, the skewness coefficient (S) and kurtosis coefficient (K) of the sample data can be observed. Skewness is expressed as the "skewness coefficient (S)" by calculating the relative positional relationships between the mean, median, and mode of the data, or the degree of dispersion on both sides of the distribution. The magnitude of its value directly reflects the "severity of the distribution's asymmetry," while its sign indicates the direction of skewness. Kurtosis is used to quantify the "sharpness of the distribution's peak" and the "concentration of extreme values (tail data)" in a data distribution. It addresses the questions of "whether data is concentrated around the mean and whether there are many extreme values," and it is also a key indicator for determining whether a distribution is close to normal. According to the theorem of statistics, when the absolute value of the statistical S coefficient or K coefficient is less than 2, the data can be considered to pass the normality test. That is, the sample data conforms to the normal distribution characteristics.

Shown in Table 2, the test results for kurtosis and skewness confirm that the data approximate a normal distribution, with all absolute values falling below the critical threshold of 2. This suggests that the data is well-suited for further parametric analysis, including regression analysis. The K value and the S value of environmental compliance, risk management, technological innovation, green culture, and enterprise performance are less than 2, which confirms that the survey samples pass the normal distribution test.

Table 2 Skewness and Kurtosis coefficients of the measurement items

No. of Items	Sample size	Skewness	Kurtosis
EC01	406	-0.950	0.135
EC02	406	-0.801	-0.128
EC03	406	-0.876	-0.144
EC04	406	-0.986	0.351
EC05	406	-0.985	0.231
EC06	406	-0.916	0.141
EC07	406	-0.943	0.126
EC08	406	-0.872	-0.157
EC09	406	-0.972	0.124

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No. of Items	Sample size	Skewness	Kurtosis
EC10	406	-0.827	-0.077
EC11	406	-0.856	-0.159
EC12	406	-0.907	0.068
EC13	406	-0.900	-0.020
EC14	406	-0.893	-0.098
RM01	406	-1.124	0.758
RM02	406	-1.184	0.969
RM03	406	-1.167	0.951
RM04	406	-1.096	0.669
RM05	406	-1.156	1.008
RM06	406	-1.161	0.888
RM07	406	-1.092	0.810
RM08	406	-1.063	0.778
RM09	406	-1.037	0.666
RM10	406	-1.174	0.932
RM11	406	-1.067	0.521
RM12	406	-1.035	0.860
RM13	406	-1.081	0.774
TI01	406	-0.947	0.087
TI02	406	-0.941	0.197
TI03	406	-0.984	0.175
TI04	406	-0.909	0.064
TI05	406	-1.052	0.364
TI06	406	-0.895	0.094
TI07	406	-0.924	0.167
GC01	406	-0.622	-0.718
GC02	406	-0.693	-0.645
GC03	406	-0.692	-0.641
GC04	406	-0.615	-0.735
GC05	406	-0.715	-0.557
GC06	406	-0.682	-0.626
GC07	406	-0.720	-0.535
GC08	406	-0.730	-0.512
EP01	406	-0.826	-0.243

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No. of Items	Sample size	Skewness	Kurtosis
EP02	406	-0.841	-0.095
EP03	406	-0.788	-0.188
EP04	406	-0.855	-0.076
EP05	406	-0.908	-0.131
EP06	406	-0.905	0.004

2. Correlation analysis among variables

Correlation analysis is the main method to study the close relationship between variables, which is mainly used to test the correlation and tightness of each variable. Through the correlation analysis of variables, we can judge whether there is mutual influence between variables. Since the latent variables used in this paper are all continuous variables with normal distribution and a linear trend among variables, SPSS 27.0 and the Pearson method are used for correlation analysis, and the correlation analysis results are shown in Table 3.

Table 3 Pearson correlation coefficient matrix

Items	EC	RM	TI	GC	EP
EC	1	0.302**	0.420**	0.297**	0.418**
RM	0.302**	1	0.282**	0.197**	0.370**
TI	0.420**	0.282**	1	0.229**	0.356**
GC	0.297**	0.197**	0.229**	1	0.330**
EP	0.418**	0.370**	0.356**	0.330**	1

Note: ** At level $p<0.01$ (two-tailed), the correlation was significant.

In correlation analysis, the significance level is often used to determine whether the correlation coefficient is statistically significant. In general, a correlation is considered significant when the P-value is less than the preset significance level (usually 0.05 or 0.01). As can be seen from the Pearson correlation coefficient matrix in Table 2, all variables of environmental compliance, risk management, technological innovation, green culture, and enterprise performance have relevant characteristics and significant correlation. The Pearson correlation coefficient matrix provides the necessary preliminary evidence for SEM and supports the assumed relationship between variables in the model.

3. Confirmatory factor analysis (CFA)

In this section, confirmatory factor analysis is performed on the observable variables in the AMOS program (environmental compliance, risk management, technological innovation, green

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culture, and business performance). In the analysis, we calculate CFA fitness, standard regression weights, and construction confidence for each factor load. The basic tools used in this study were tested for validity and reliability by experts. After the data is collected, it is analyzed using CFA elements. The 406 samples were accounted for in the following five latent variables.

In a general way, the factor loading value is the correlation coefficient between the observed variable and the latent variable, which usually ranges from -1 to 1. The closer its absolute value is to 1, the stronger the correlation.

Table 4 Factor loading of environmental compliance in the measurement model

Variable		Item		Estimate
Government Regulation (GOVREG)	EC01	<---	GOVREGM	0.765
	EC02	<---	GOVREGM	0.750
	EC03	<---	GOVREGM	0.772
	EC04	<---	GOVREGM	0.703
	EC05	<---	GOVREGM	0.706
Market Incentive (MARINC)	EC06	<---	MARINCM	0.711
	EC07	<---	MARINCM	0.734
	EC08	<---	MARINCM	0.726
	EC09	<---	MARINCM	0.729
	EC10	<---	MARINCM	0.711
Voluntary Disclosure (VOLDIS)	EC11	<---	VOLDISM	0.755
	EC12	<---	VOLDISM	0.743
	EC13	<---	VOLDISM	0.741
	EC14	<---	VOLDISM	0.719

Shown in Table 4, the factor load value of environmental compliance has three variables, namely (1) government regulation, (2) market incentives, and (3) voluntary disclosure. The items in this dimension all have factor loading values (standard estimated regression weights) greater than 0.5, which indicates that the environmental compliance model has reached the estimated value.

Table 5 Factor loading of risk management in measurement model

Variable		Item		Estimate
Enterprise Culture	RM01	<---	ENTCULM	0.754
	RM02	<---	ENTCULM	0.731

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Article ID: e292256

Variable		Item		Estimate
(ENTCUL)	RM03	<---	ENTCULM	0.664
Staff Quality (STAQUA)	RM04	<---	STAQUAM	0.735
	RM05	<---	STAQUAM	0.698
	RM06	<---	STAQUAM	0.731
	RM07	<---	STAQUAM	0.690
	RM08	<---	STAQUAM	0.702
Internal Environment (INTENV)	RM09	<---	INTENVM	0.719
	RM10	<---	INTENVM	0.674
	RM11	<---	INTENVM	0.681
	RM12	<---	INTENVM	0.602
	RM13	<---	INTENVM	0.701

As seen from Table 4, the factor load value of risk management has three variables, which are (1) enterprise culture, (2) staff quality, (3) internal environment. The items in this dimension all have factor loading values (standard estimated regression weights) greater than 0.5, which indicates that the risk management model has reached the estimated value.

Table 6 Factor loading of technological innovation in the measurement model.

Variable		Item		Estimate
Input Capacity (INPCAP)	TI01	<---	INPCAPM	0.733
	TI02	<---	INPCAPM	0.725
R &D Capability (RDCAP)	TI03	<---	RDCAPM	0.733
	TI04	<---	RDCAPM	0.702
	TI05	<---	RDCAPM	0.715
Support Capability (SUPCAP)	TI06	<---	SUPCAPM	0.714
	TI07	<---	SUPCAPM	0.698

Presented in Table 6, the factor load value of technological innovation has three variables, namely (1) Input Capability, (2) R &D Capability, and (3) Support Capability. All items in this dimension have factor loading values greater than 0.5 (standard estimated regression weights), which indicates that the technological innovation model has reached the estimated value.

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Table 7 Factor loading of green culture in the measurement model.

Variable	Item			Estimate
Green Culture (GRCU)	GC01	<---	GRCUTOM	0.762
	GC02	<---	GRCUTOM	0.758
	GC03	<---	GRCUTOM	0.801
	GC04	<---	GRCUTOM	0.781
	GC05	<---	GRCUTOM	0.795
	GC06	<---	GRCUTOM	0.815
	GC07	<---	GRCUTOM	0.756
	GC08	<---	GRCUTOM	0.775

It can be seen from Table 7 that all items in the green culture dimension have factor loading values (standard estimated regression weights) greater than 0.5, which indicates that the green culture model has reached the estimated value.

Table 8 Factor loading of enterprise performance in the measurement model.

Variable	Item			Estimate
Enterprise Performance (ENPE)	EP01	<---	ENPETOM	0.795
	EP02	<---	ENPETOM	0.704
	EP03	<---	ENPETOM	0.752
	EP04	<---	ENPETOM	0.735
	EP05	<---	ENPETOM	0.760
	EP06	<---	ENPETOM	0.748

It can be seen from Table 8 that the factor load values (standard estimated regression weights) of items in the enterprise performance dimension are greater than 0.5, indicating that the enterprise performance model has reached the estimated value.

4. Structural equation modeling

The analysis was categorized into three groups: structure, path analysis, and the separation of the independent variable (Environmental compliance). The equation in the model explained all the relationships. The level of the number classified to was indicated. Then we employed the analysis that fits with the model. Results in the tables provided the information on path coefficients (standardized regression weights), p-value (testing significance), R2 (the squared

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multiple correlations), endogenous construct, and exogenous variables. Finally, the paths with statistical significance with each model will be presented.

Table 9 Model fit intercept (N=406).

	Model Fit Indices	Threshold Range	Observed Values
Tested Model	CMIN/DF (χ2/df)	below 5.00	1.080
	IFI	above 0.90	0.992
	GFI	above 0.70	0.897
	CFI	above 0.90	0.992
	RMSEA	below 0.08	0.014
	PNFI	almost 1	0.849
	PCFI	almost 1	0.934

In the structural equation modeling analysis, key fit indices, including CMIN/DF, IFI, GFI, CFI, and RMSEA, met the requisite thresholds, indicating a good fit between the model and the data. According to Table 9, CMIN/DF was well within the acceptable range at 1.080 (below 5.00), and RMSEA is 0.014(below 0.08), affirming the model's overall suitability. Chi-square and χ2 test results show that there is no significant deviation in the relationship model between environmental compliance, risk management, technological innovation, green culture, and firm performance, indicating that the assumed relationship between these variables is statistically reasonable. The value of CFI in the model is close to 1, indicating that the constructed model is reasonable in reflecting the relationship between environmental compliance, risk management, technological innovation, green culture, and enterprise performance, and the fitting degree is significantly improved compared with the independent model. The RMSEA value of the model is 0.014 (lower than 0.05), indicating that the model has a small error in reflecting the relationship between these variables, which is a very good model fit. Therefore, it can be shown that both independent variables (environmental compliance) and intermediary variables (such as risk management, technological innovation, and green culture) have a significant impact on Chinese enterprise performance.

Thus, the structural equation model demonstrates an excellent fit with the theoretical framework, validating the hypothesized relationships between environmental compliance, risk management, technological innovation, green culture, and enterprise performance. All values met the criteria, which indicated that the structural equations of the generated models had a very good fit (Table 9). This met the fit measurement criteria as required.

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The method of path coefficients was used in the structural equation model shown in Figure 2. The p-value and R2 appear as indicated in Table 9. This can clarify the path of the impact of the variable in the model as follows:

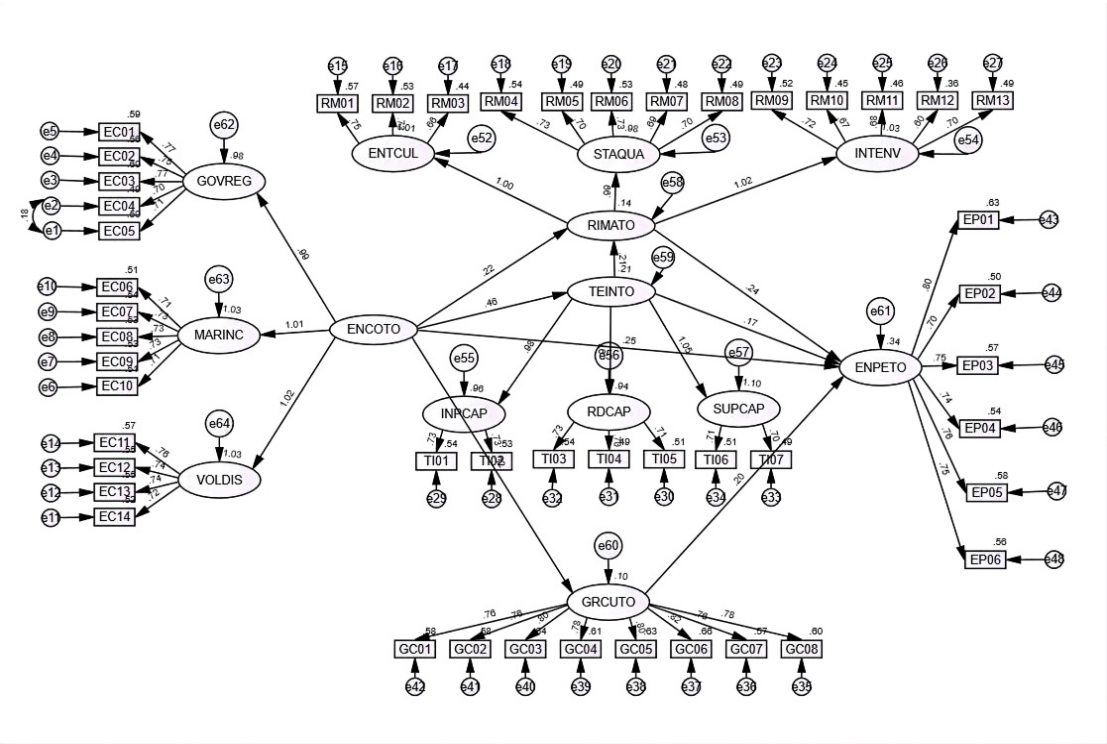


Figure 2 Modified structural equation model.

The path coefficient of Environmental compliance was calculated as the model's estimated value(β). The data analysis for the Environmental compliance model shows a positive relationship among the variables. The research accepts the hypotheses of H1, H2, H3, H4, H6 and H7. The p-value is 0.00, which has less significance than ***.001. It shows that the correlation between the above variables has a very significant causal relationship. H5 p-value is 0.003($p < 0.01$). It shows that there is a relatively significant causal relationship between technological innovation and enterprise performance variables. Next, we analyze all hypotheses according to Table 10.

Table 10 Hypothesis test.

Hypotheses	Estimate (β)	S.E.	t-value	p-value	Result
H1: ENCO ---> RIMA	0.327	0.056	5.864	***	supported
H2: ENCO ---> TEIN	0.467	0.060	7.725	***	supported
H3: ENCO --->GRCU	0.389	0.067	5.825	***	supported

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Hypotheses	Estimate (β)	S.E.	t-value	p-value	Result
H4: RIMA --->ENPE	0.277	0.061	4.565	***	supported
H5: TEIN --->ENPE	0.198	0.067	2.971	0.003	supported
H6: GRCU ---> ENPE	0.193	0.049	3.959	***	supported
H7: ENCO ---> ENPE	0.298	0.069	4.291	***	supported

Note: *p < 0.05, **p < 0.01, ***p < 0.001

Next, we determine the acceptance status of the Hypotheses based on the analysis of the above results.

Hypothesis 1 accepted. This hypothesis explains that Environmental compliance management can contribute to managing the risk management of Chinese enterprises. Environmental compliance has significance on risk management (path coefficient is indicated at 0.327, t-value = 5.864, and P ≤ 0.000). It is the model used to study the relationship between the parts that have significance on environmental compliance and to forecast the results of the risk management of Chinese enterprises.

Hypothesis 2 accepted. This hypothesis explains that Environmental compliance management can contribute to arranging the technological innovation of Chinese enterprises. Environmental compliance has significance on technological innovation (path coefficient is indicated at 0.467, t-value = 7.725, and P ≤ 0.000). It is the model used to study the relationship between the parts that have significance on environmental compliance and to forecast the result of the technological innovation of Chinese enterprises.

Hypothesis 3 accepted. This hypothesis explains that Environmental compliance management can contribute to arranging the green culture in Chinese enterprises. Environmental compliance has significance on green culture (path coefficient is indicated at 0.389, t-value = 5.825, and P ≤ 0.000). It is the model used to study the relationship between the parts that have significance on environmental compliance and to forecast the results of the green culture of Chinese enterprises.

Hypothesis 4 accepted. This hypothesis explains that Risk management of Chinese enterprises can contribute to improving enterprise performance. Risk management has significance on enterprise performance (path coefficient is indicated at 0.277, t-value =4.565, and P ≤ 0.000). It is the model used to study the relationship between the parts that have significance on the Risk management and to forecast the result of the enterprise performance.

Hypothesis 5 accepted. This hypothesis explains that Technological innovation of Chinese enterprises can contribute to improving enterprise performance. Technological innovation has

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Interdisciplinary Academic and Research Journal, 6 (2), March-April 2026
Old ISSN 2774-0374: New ISSN 2985-2749
Website: https://so03.tci-thaijo.org/index.php/IARJ/index
Article ID: e292256

significance on enterprise performance (path coefficient is indicated at 0.198, t-value = 2.971, and P=0.003). It is the model used to study the relationship between the parts that have significance on Technological innovation and forecast the result of the enterprise performance.

Hypothesis 6 accepted. Green culture can contribute to improving the enterprise's performance. Green culture has significance on enterprise performance (path coefficient is indicated at 0.193, t-value =3.959, and P ≤ 0.000). It is the model used to study the relationship between the parts that have significance on the green culture and to forecast the result of the enterprise performance.

Hypothesis 7 accepted. Environmental compliance management can contribute to arranging the enterprise performance. Environmental compliance has significance on enterprise performance (path coefficient is indicated at 0.298, t-value =4.291, and P ≤ 0.000). It is the model used to study the relationship between the parts that have significance on the Environmental compliance and forecast the result of the enterprise performance.

Table 11 Squared multiple correlation value.

Item	Variable	W^2
Environmental Compliance	Government Regulation (GOVREG)	0.982
	Market Incentive (MARINC)	0.928
	Voluntary Disclosure (VOLDIS)	0.932
Risk Management		0.104
	Enterprise Culture (ENTCUL)	0.909
	Staff Quality (STAQUA)	0.977
	Internal Environment (INTENV)	0.935
Technological Innovation		0.212
	Input Capacity (INPCAP)	0.958
	R &D Capability (RDCAP)	0.935
	Support Capability (SUPCAP)	0.910
Green Culture	Green Culture (GRCU)	0.101
Enterprise Performance	Enterprise Performance (ENPE)	0.342

In Table 11, the results show that the values of the environmental compliance management variables have a direct change in the subdimension, which are 98.2% (GOVREG), 92.8% (MARINC), and 93.2 %(VOLDIS). The squared multiple correlation value (R2) for risk management was 10.4%, and the direct effect of internal variables on latent variables was 90.9% (ENTCUL), 97.7%

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(STAQUA), and 93.5% (INTENV). The square multiple correlation value (R2) for technological innovation is 21.2%, and the direct influence of internal variables on latent variables is 95.8% (INPCAP), 93.5% (RDCAP), and 91.0% (SUPCAP). The study shows that the effect value of the green culture variable was 10.1%, and the effect value of the enterprise performance variable was 34.2%.

In Figure 3, R2 of 0.342 for Enterprise Performance means that 34.2% of the variance in Enterprise Performance is explained by Environmental Compliance, Risk Management, Technological Innovation, and Green Culture. 10.4% for Risk Management, 21.2% for Technological Innovation, 10.1% for Green Culture, and 29.8% for Enterprise Performance interacted with each other and formed new Enterprise Performance. From this analysis, Enterprise Performance and Technological Innovation have a greater impact on new enterprise performance.

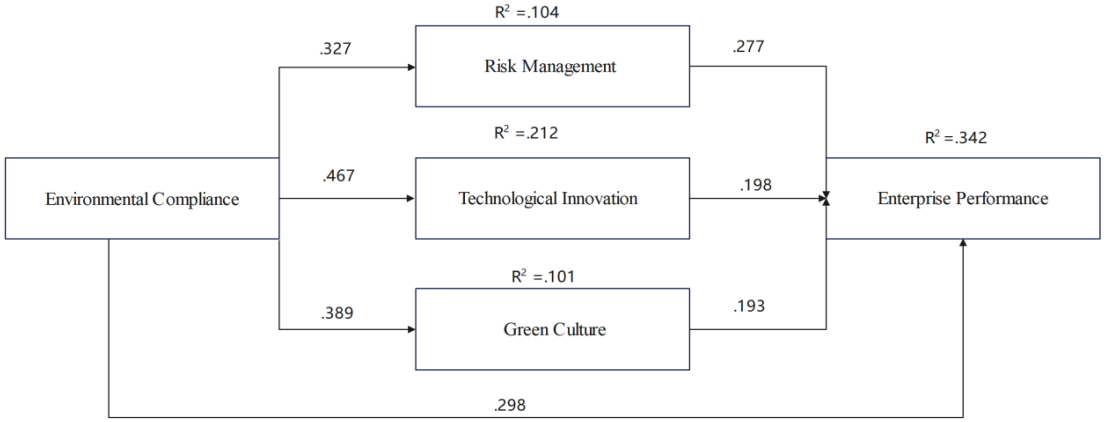


Figure 3 Output of the mediating effect (path analysis).

The findings are shown in the model that relates Environmental compliance, Risk management, Technological innovation, Green culture, and Enterprise performance in China. The causal relations among the variables will be apparent. According to Figure 4, the path of coefficients can be witnessed as the direct impacts between the variables indicated in the research framework.

Discussion

The discussion on green technological innovation, green innovation performance, and corporate benefits, along with the outcomes related to environmental compliance, has been extensively explored by scholars (Zhang et al., 2025; Lin & Yang, 2021; Ai et al.,2020). Our research builds upon previous studies, taking into account the relationships between environmental compliance, risk management, technological innovation, green culture, and enterprise

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performance. This study presents the result of comprehensive environmental compliance management mode. The quantitative method in the structural equation model (SEM) presented the hypothesis testing using confirmatory factor analysis to determine the construct validity before testing. Then the finding showed the relationship among variables by path analysis to qualify the fit index of the structure. We verify the impact of environmental compliance on risk management, technological innovation, green culture and corporate performance of Chinese enterprises in the context of RCEP. Research results show that environmental compliance is not only a legal responsibility of enterprises, but also an important driving force to promote sustainable development of enterprises. The results provide strong empirical support for the hypothesized relationships between environmental compliance and key organizational variables, including risk management, technological innovation, and green culture. According to Porter's Hypothesis, environmental compliance drives technological innovation, which argues that proper environmental regulation can lead to innovation and competitive advantage. Through the intermediary role of risk management, technological innovation, and green culture, enterprises can achieve more robust long-term performance under the framework of global economic cooperation, providing a theoretical basis for Chinese enterprises to formulate sustainable development strategies under the RCEP framework.

Recommendation

According to the research results, some suggestions are given as follows.

For the Chinese government, the government plays a critical role in supporting enterprises to meet environmental standards by providing clear regulatory frameworks. Without such guidance, companies may struggle to adapt to the stricter environmental standards imposed by RCEP, leading to non-compliance risks, legal challenges, and market exclusion.

1) Strengthen Environmental compliance and Support. Our research has revealed that environmental compliance is positively related to risk management, technological innovation, green culture, and enterprise performance. By doing so, it would not only help domestic enterprises comply but also provide a clear road map for long-term environmental and economic sustainability.

2) Provide Financial and Technological Support. Our study finds that enterprise performance is closely related to technological innovation, particularly green technology. To help enterprises transition to environmentally compliant operations, the government should (a) invest in R&D grants that support the development of green technologies. (b) Encourage the adoption of clean energy technologies by offering low-interest loans or subsidies. Or offer tax credits for certified eco-friendly investments. (c) Create technology-sharing platforms where enterprises can

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collaborate and access innovations that support environmental compliance and sustainable growth.

For Chinese enterprises, those that implement risk management and embrace technological innovation to meet environmental regulations can reduce compliance risks and operational costs. Green technologies, especially those that promote energy efficiency and waste reduction, not only help in meeting environmental standards but also boost long-term profitability by enhancing operational efficiency.

1) Develop Robust Environmental Risk Management Systems. The enterprises should implement comprehensive environmental risk management systems that assess the potential impact of their operations on the environment. This includes conducting regular environmental audits, adhering to international environmental laws, and preparing contingency plans to mitigate risks. By doing so, companies can prevent non-compliance, avoid costly penalties, and protect their reputation.

2) Proactively Invest in Technological Innovation. To remain competitive under RCEP, Chinese enterprises must prioritize investments in green technologies. By adopting cleaner production methods, energy-efficient systems, and sustainable supply chain practices, companies can reduce the long-term costs associated with environmental compliance and improve their overall competitiveness.

3) Foster a Green Culture: Enterprises should focus on cultivating a green enterprise culture that encourages employees to take part in sustainability initiatives. Providing training on environmental compliance and green practices can help align employees with the company's sustainability goals, leading to improved performance and more effective compliance.

Although this study provides a wealth of insights, there are still many unresolved issues and research gaps that point the way for future research, such as expanding the research scope: multinational comparison and transnational research; the long-term impact of environmental compliance on the sustainable development ability of enterprises; and the balance between globalization and sinicization under the RCEP framework.

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