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# Green Silk Road: How Stakeholders Shape the ESG Footprint of Chinese International Contractors


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# Introduction

# Global Sustainability Trends

## ESG Surge

In the era of globalization, ESG (Environmental, Social, and Governance) has emerged as a key indicator for assessing a company's sustainable development (Cheng et al., 2025). Improving ESG performance not only enhances the company's international reputation and brand value but also significantly impacts the overall social environment of host countries (Jiang et al., 2024).

## “Belt and Road” Green Transition

Chinese contractors undertake over 80% of infrastructure projects along the "Belt and Road". Their ESG performance directly impacts project sustainability and regional ecological security. The Green Silk Road initiative requires companies to incorporate carbon neutrality goals throughout the entire lifecycle of overseas projects.

# Research Gaps & Value

## Theoretical Gap Identification

Existing literature often focuses on single-dimensional analysis, lacking systematic research on the synergistic effects of internal and external stakeholders. This study constructs an integrated model to reveal the complex paths through which diverse stakeholders like employees, customers, and governments influence ESG performance.

## Practical Guidance Significance

Provides a stakeholder management framework for multinational engineering companies to balance economic goals with social responsibility. Research findings can be translated into ESG rating enhancement strategies to strengthen international market competitiveness.

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# Research foundation and hypotheses development

## Internal Stakeholder Mechanisms

Employees, as key internal stakeholders, are crucial to a corporation's CSR practices (Ahmad et al., 2024). Their participation and commitment can significantly shape the company's social responsibility practices. Active employee engagement in CSR activities can boost dedication and passion, thereby improving work efficiency and innovation, and supporting the corporation in meeting its CSR goals (Shahzadi et al., 2024). Employee participation in CSR is clearly essential for the corporation's ongoing improvement across environmental, social, and governance dimensions, critical for its long-term sustainable development. Based on this analysis, the study proposes the following research hypotheses:

H1:Employee participation in CSR has a positive effect on CSR practices.

# Stakeholder Theory Framework

## External Stakeholder Influence Paths

**Customers** demand that contractors offer products and services ensuring quality, safety, and compliance with international standards, along with transparent and comprehensive service information (Kim et al., 2020).

**Partners**, particularly large multinationals and international organizations, often mandate that CICs adhere to specific environmental and social standards. This encourages contractors to adopt stringent supply chain management standards and collaborate with partners to advance sustainable development, fostering mutual benefits in environmental and community spheres (Xu et al., 2023).

**Governments** enforce compliance with environmental, labor, and safety regulations through legislative and regulatory means (Zhu, 2021). Regulatory bodies monitor contractor performance to ensure projects adhere to quality, schedule, and cost standards (Xu et al., 2020).

The influence of **local communities** on contractors merits attention. Effective communication with communities is essential for fostering corporate-community relationships (Poets et al., 2023). CICs must adhere to local laws, regulations, and business norms, utilize local resources responsibly, and pursue mutual development with host nations. Localization represents both a management strategy and a social responsibility for corporations.

H2: Customer expectations has a positive effect on CSR practices.
H3: Partner expectations has a positive effect on CSR practices.
H4: Government regulations has a positive effect on CSR practices.
H5: Local community pressure has a positive effect on CSR practices.

# Stakeholder Theory Framework

## CSR practices and ESG performance

CSR denotes the commitment by corporations to balance environmental, societal, and stakeholder concerns with economic objectives (Mochales and Blanch, 2022). Corporations that embrace social responsibility can lessen environmental harm by implementing energy conservation, reducing emissions, utilizing clean energy, adopting sustainable materials, and improving resource efficiency (Fukuda and Ouchida, 2020). Such initiatives enhance corporate image and diminish environmental risks and costs, consequently improving ESG performance (Huang et al., 2024). CICs also implement these measures to reduce environmental impacts in host countries. This approach boosts brand loyalty and draws additional international customers and partners. These positive social impacts also augment a company's ESG performance (Figueira et al., 2023). This sound governance structure bolsters the confidence of investors and regulatory bodies, positively impacting their ESG performance. Based on the above analysis, this study proposes the following research hypotheses:

H6: CSR practices have a positive effect on firm ESG performance.

# Stakeholder Theory Framework

The Stakeholder Theory and the Resource-Based View (RBV) provide a solid theoretical basis for this study, highlighting the importance of unique corporate resources in determining ESG performance. Stakeholder Theory posits that corporations must continuously monitor and respond to stakeholder (employees, customers, partners, governments, and local communities) needs to navigate developmental changes (Kowalczyk and Kucharska, 2020). The RBV theory asserts that leveraging unique resources and capabilities (employees, customers, partners, governments, and local communities) can confer a competitive edge and enhance the performance of corporations (Wu et al., 2023). These perspectives are crucial for elucidating the influence of stakeholders on corporate ESG performance.

This study develops a theoretical model grounded in Stakeholder theory and the RBV theory, depicted in Figure 1, to investigate the impact of stakeholders' unique resources and capabilities on corporate ESG performance.

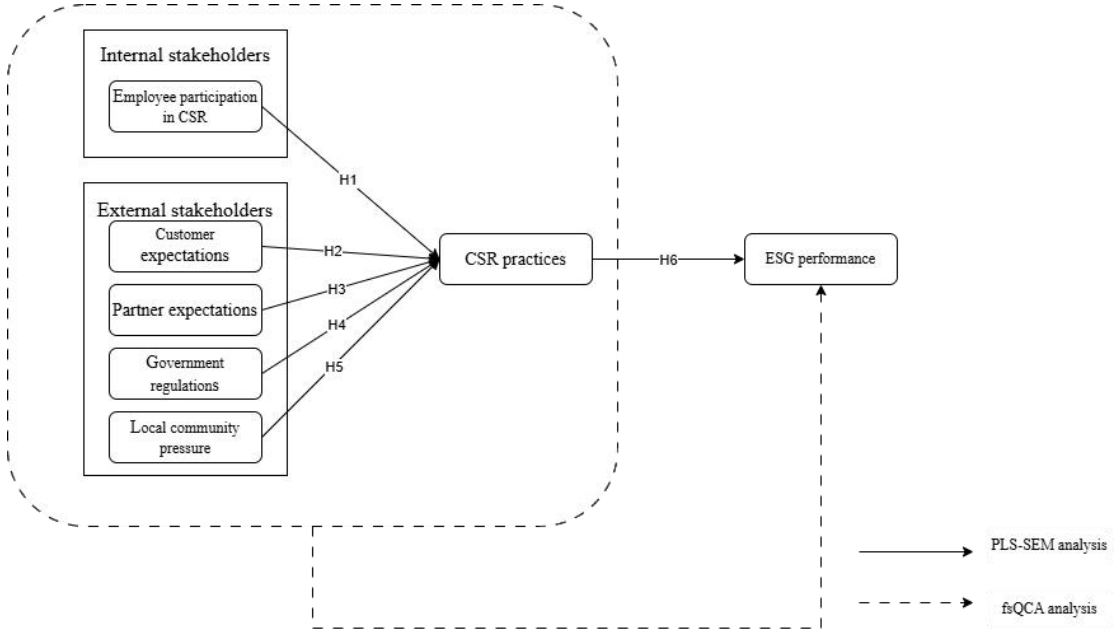


Fig. 1. Research model & Configuration model.

# 03 Methodology

# Sampling and data collection

To align constructs and measurement tools with the research background and enhance study accuracy (Dubey et al., 2018), this paper employed a rigorous methodology for instrument development and validation, adhering to a three-step process (Soh and Wong, 2021). Ultimately, 421 questionnaires were collected, yielding 351 valid responses after discarding those with missing data, omissions, or incorrect entries, achieving a validity rate of 83.37%. Table 1 presents the demographic profile of the respondents.

Table 1 Sample characteristics.

| Category | | Frequency | Percentage (%) |
|---|---|---|---|
| Gender | Male | 312 | 88.89 |
| | Female | 39 | 11.11 |
| Education | Specialist and below | 54 | 15.38 |
| | Undergraduate degree | 263 | 74.93 |
| | Postgraduate degree | 33 | 9.40 |
| | Master degree | 1 | 0.29 |
| Country situation | Host country | 22 | 6.27 |
| | Home country | 313 | 89.17 |
| | Third country | 16 | 4.56 |
| Business/Project Type | Transportation | 119 | 33.90 |
| | General building | 190 | 54.13 |
| | Petroleum | 2 | 0.58 |
| | Power | 11 | 3.13 |
| | Industrial process /Manufacturing | 20 | 5.69 |
| | Water supply | 6 | 1.70 |
| | Sewerage/Solid waste | 1 | 0.29 |
| | Telecommunications | 2 | 0.58 |
| Region | Africa | 211 | 60.11 |
| | Asia / Australia | 98 | 27.92 |
| | Europe | 26 | 7.41 |
| | Middle East | 9 | 2.56 |
| | Latin / Caribbean | 5 | 1.42 |
| | Canada | 2 | 0.58 |
| Total | | 351 | 100 |

# Analysis Method Selection

## PLS-SEM Modeling

Uses Smart-PLS 3.0 for path analysis, with the model's $R^2$ value reaching 0.545 and $Q^2$ value of 0.301 indicating good predictive relevance. The maximum VIF value is 3.078, eliminating multicollinearity concerns.

## fsQCA Supplementary Analysis

To deepen our understanding of causal relationships in various contexts and to identify the factor configurations affecting ESG performance, we used fsQCA as a complementary method to PLS-SEM analysis. This method enables us to discover various causal condition configurations and their effects on ESG performance. It provides insights into the factors and their combinations that influence ESG performance.

# 04 Results

# Results of PLS-SEM

## Assessment of the measurement model

- All constructs have Cronbach's α>0.7, composite reliability CR>0.8, and average variance extracted AVE>0.5. Discriminant validity tests show that the square root of AVE on the diagonal is greater than correlation coefficients.
- Harman's single-factor test shows the first factor explains 34.472% of the variance, below the 40% critical value. Non-response bias tests show no significant differences between the top and bottom 50% of samples (p>0.05).

# Results of PLS-SEM

## Assessment of the structural model

To evaluate the significance of the hypothesized relationships, a bias-corrected bootstrap procedure with 5,000 resamples and 95% confidence intervals was utilized (Hair et al., 2022). Findings (Table 6, Fig. 2) indicate positive impacts on CSR practices from employee participation in CSR ($\beta$=0.298, $p<0.001$), customer expectations ($\beta$=0.228, $p<0.001$) have a positive impact on CSR practices, partner expectations ($\beta$=0.236, $p<0.001$) have a positive impact on CSR practices, government regulations ($\beta$=0.121, $p<0.05$) have a positive impact on CSR practices, and CSR practices ($\beta$=0.738, $p<0.001$) positively affect ESG performance. Conversely, local community pressure ($\beta$=0.075, $p<0.001$) shows no effect on CSR practices. Thus, Therefore, hypotheses H1, H2, H3, H4, and H6 are supported. For hypotheses H7, H8, H9, and H10, the indirect effects of employee participation in CSR on ESG performance, mediated by CSR practices, are significant ($\beta$=0.220, $p<0.001$), and the bootstrap confidence interval is above zero (0.140-0.284).

Table 6. Results of hypotheses testing.

| No. | Relationship | β | SD | t-Value | p-Value | 95CI | Result |
|---|---|---|---|---|---|---|---|
| H1 | EP → CSR practices | 0.298*** | 0.048 | 6.224 | 0.000 | [0.195-0.387] | Yse |
| H2 | CE → CSR practices | 0.228*** | 0.050 | 4.551 | 0.000 | [0.131-0.332] | Yse |
| H3 | PE → CSR practices | 0.236*** | 0.050 | 4.764 | 0.000 | [0.145-0.330] | Yse |
| H4 | GR → CSR practices | 0.121* | 0.059 | 2.035 | 0.042 | [0.003-0.232] | Yse |
| H5 | LC → CSR practices | 0.075 | 0.057 | 1.297 | 0.195 | [-0.031-0.174] | No |
| H6 | CSR practices → ES | 0.738*** | 0.026 | 27.887 | 0.000 | [0.684-0.788] | Yse |
| H7 | EP → CSR practices → ES | 0.220*** | 0.037 | 5.955 | 0.000 | [0.140-0.284] | Yse |
| H8 | CE → CSR practices → ES | 0.168*** | 0.037 | 4.583 | 0.000 | [0.100-0.245] | Yse |
| H9 | PE → CSR practices→ ES | 0.174*** | 0.038 | 4.603 | 0.000 | [0.105-0.246] | Yse |
| H10 | GR → CSR practices→ ES | 0.089* | 0.044 | 2.028 | 0.043 | [0.002-0.172] | Yse |
| H11 | LC → CSR practices→ ES | 0.055 | 0.043 | 1.281 | 0.201 | [-0.022-0.139] | No |

# Results of PLS-SEM

## Assessment of the structural model

The indirect effect of customer expectations on ESG performance through CSR practices is significant (β=0.168, p<0.001), and the bootstrap confidence interval is above zero (0.100-0.245). The indirect effect of partner expectations on ESG performance through CSR practices is significant (β=0.174, p<0.001), and the bootstrap confidence interval is above zero (0.105-0.246). The indirect effect of government regulations on ESG performance, mediated by CSR practices, is significant (β=0.089, p<0.05), and the bootstrap confidence interval is above zero (0.002-0.172). In contrast, the indirect effect of local community pressure on ESG performance, mediated by CSR practices, does not reach significance ( β=0.055, p>0.05), failing to support H11.

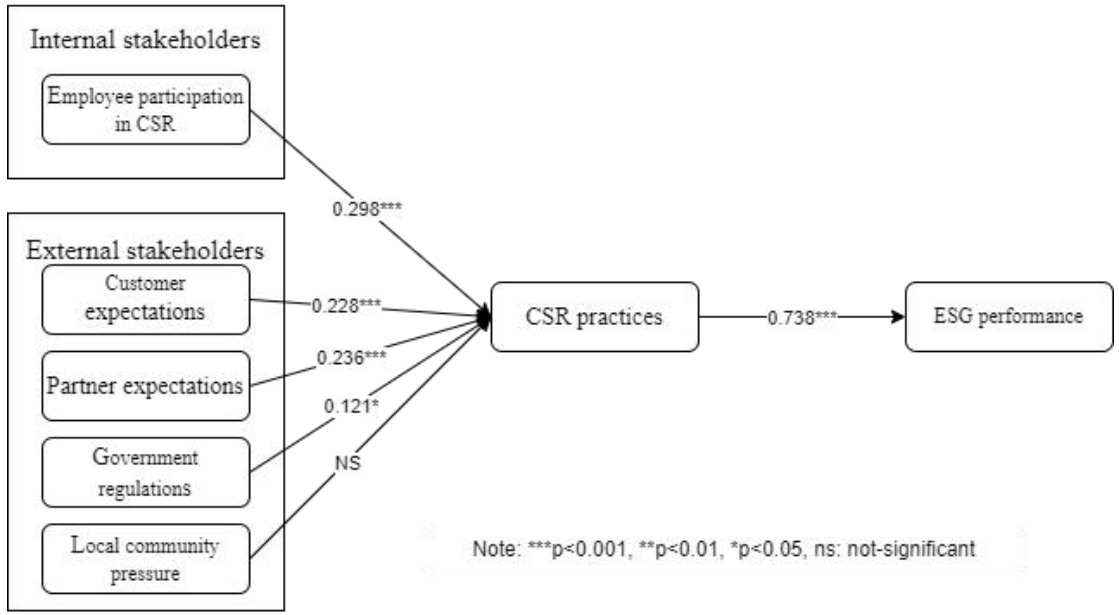


Fig. 2. PLS-SEM results.

# Results of fsQCA

## Calibration procedure

We subsequently utilized fsQCA to assess the synergistic effects of multiple factors on outcomes. As per the fsQCA user's guide (Chuah et al., 2021), data calibration, truth table construction, and causal condition analysis are essential steps in the data analysis process. In the initial step, we converted raw data into fuzzy sets, aligning Likert scale values with full membership (fuzzy score = 0.95), crossover points (fuzzy score = 0.50), and full non-membership (fuzzy score = 0.05) as per Kallmuenzer et al. (2019).

Table 7 Calibration positioning points of case variables.

| | Variables | | | | | | |
|---|---|---|---|---|---|---|---|
| | EP | CE | PE | GR | LC | CSR practices | ES |
| Full membership | 4.251 | 4.334 | 4.334 | 4.167 | 4.001 | 4.429 | 4.176 |
| Cross-over anchors | 3.251 | 3.334 | 3.334 | 3.001 | 3.001 | 3.739 | 3.351 |
| Full non-membership | 2.251 | 2.167 | 2.334 | 2.001 | 1.667 | 2.566 | 2.567 |

# Results of fsQCA

## Analysis of necessary conditions

The second stage of fsQCA is Necessary Condition Analysis (NCA), which explores whether there are preconditions for the generation of dependent variables (Dahms, 2019; Yang et al., 2022). A condition is deemed necessary if the agreement exceeds 0.90 (Ciampi et al., 2021). Table 8 shows the conditions required for the absence of ESG performance.

Table 8 Analysis of necessary conditions.

| Conditional variable | High-level ESG | | Conditional variable | High-level ESG | |
|---|---|---|---|---|---|
| | Consistency | Coverage | | Consistency | Coverage |
| EP | 0.774 | 0.792 | GR | 0.826 | 0.743 |
| ~EP | 0.523 | 0.558 | ~GR | 0.470 | 0.584 |
| CE | 0.806 | 0.762 | LC | 0.708 | 0.818 |
| ~CE | 0.474 | 0.553 | ~LC | 0.598 | 0.570 |
| PE | 0.813 | 0.792 | CSR practices | 0.847 | 0.841 |
| ~PE | 0.497 | 0.559 | ~CSR practices | 0.478 | 0.527 |

# Results of fsQCA

## Analysis of sufficient conditions

The subsequent step involves constructing a truth table to identify various combinations of causal conditions sufficient for high corporate social performance, using a consistency cutoff of 0.8 and a case threshold of 2. Ultimately, standard analysis is conducted to derive complex, parsimonious, and intermediate solutions. Analysis of the parsimonious and intermediate solutions reveals causal patterns associated with high corporate social performance.

Table 9 Sufficiency analysis of conditional configuration.

| | Configurations | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| EP | ○ | • | | ○ |
| CE | • | ○ | | |
| PE | ○ | ○ | ○ | |
| GR | ○ | | • | ○ |
| LC | • | ⊗ | ○ | • |
| CSR practices | | • | • | • |
| Raw coverage | 0.609 | 0.700 | 0.724 | 0.628 |
| Unique coverage | 0.047 | 0.052 | 0.031 | 0.003 |
| Consistency | 0.899 | 0.903 | 0.885 | 0.921 |
| Solution coverage | 0.857 | | | |
| Solution consistency | 0.847 | | | |

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# Discussion

# Theoretical Contribution

- Our study adopts a multi-theoretical approach, integrating stakeholder theory and the RBV theory, to examine how internal and external stakeholders influence the ESG performance of CICs. We reveal which stakeholders' needs can be met through CSR practices to enhance a company's ESG performance and explore the pathways to achieve these goals. The findings not only deepen our understanding of the interplay between stakeholders, CSR practices, and ESG performance but also offer new perspectives for both the academic community and industry professionals.

- By examining the impact of individual stakeholders and various stakeholder combinations on ESG performance, our study fills gaps left by previous research. Our research is also deeply rooted in China's unique context, emphasizing the distinctive and significant contributions of Chinese practices to the ESG domain. Under the Belt and Road Initiative and the Green Silk Road framework, CICs have taken on extensive business operations in the regions along these routes (Chen et al., 2025). The ESG practices of these companies have far-reaching effects, influencing not only their own sustainable development but also the local socio-economic and environmental landscape (Wang and Cheng, 2024). Through a detailed analysis of these practices, we have uncovered the unique role of stakeholder factors in this context, offering fresh insights into the role of CICs in global sustainable development.

# Practical implications

- Establish an ESG training system and incorporate sustainable development indicators into performance evaluations. Implement employee participation decision-making mechanisms, set up green innovation reward funds, and stimulate grassroots environmental improvement proposals.

- Develop customer ESG demand response systems and establish supply chain sustainable development alliances.

- Appoint community communication specialists, implement "project-community" benefit-sharing plans, and integrate social responsibility into project design stages.

- Strengthening collaboration with governments and partners is vital. CICs should actively collaborate with governments and regulatory bodies to ensure that their ESG practices comply with relevant policies and regulations. For example, CICs could participate in government-organized sustainable development projects, share best practices, and contribute to the establishment of industry standards.

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# Thank you all for your valuable time and interest.


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