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RESEARCH ARTICLE OPEN ACCESS

# The Dynamics of Community Development, Product Responsibility and Environmental Management Teams for Improving Emissions Performance

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**Received:** 10 October 2025 | **Revised:** 12 February 2026 | **Accepted:** 8 March 2026

**Keywords:** community development | dynamic capability | emissions performance | environmental management team | product responsibility

## ABSTRACT

This study investigates whether, under what conditions, and how community development—conceived as a form of engagement with secondary stakeholders—affects firms' emissions performance. Specifically, we examine the moderating role of Environmental Management Teams (EMTs) and the mediating role of product responsibility capability. Guided by instrumental stakeholder theory and the dynamic capabilities perspective, this study analyses secondary data from the Refinitiv database, covering 4414 manufacturing firms and 26,089 firm-year observations worldwide between 2016 and 2024. Using a fixed-effects regression model, our analysis reveals that community development enhances emissions performance both directly and indirectly through improved product responsibility. Unexpectedly, we find that the presence of EMTs negatively moderates the relationship between community development and emissions performance. These findings contribute to instrumental stakeholder theory by underscoring the strategic importance of community engagement. They also extend the dynamic capabilities perspective by identifying product responsibility as a capability that drives environmental improvement.

## 1 | Introduction

Over the past decade, manufacturing firms have faced increasing global pressure to improve their emissions performance and mitigate climate change (Giannarakis et al. 2017; Goworek et al. 2018; Hailemariam and Erdiaw-Kwasie 2023). Emissions performance broadly refers to the level of a firm's direct and indirect emissions, as well as its commitment to and effectiveness in reducing these emissions over time (Kyaw et al. 2022; Tanthanongsakkun et al. 2023). Achieving improvements in emissions performance is challenging and often requires the coordinated engagement of a broad set of stakeholders beyond firm boundaries (Graessler et al. 2024; Kirchherr et al. 2017).

Stakeholder contributions to emissions reduction have received considerable attention in the corporate social responsibility (CSR) literature, which conceptualises CSR as voluntary actions that go beyond legal requirements and short-term business interests to advance broader social and environmental goals (McWilliams and Siegel 2001; McWilliams et al. 2006; Mohy-ud-Din et al. 2025). However, prior research has predominantly focused on primary stakeholders, such as suppliers (Butt et al. 2025) and customers (Mostaghel and Chirumalla 2021), who are directly involved in value creation. In contrast, the role of secondary stakeholders—including local communities, NGOs and wider society, who may influence or be influenced by firm activities but are not essential for immediate organisational survival (Clarkson 1995, 107;

This study examines the impact of community development on firms' emissions performance. Using data from 4414 manufacturing firms (2016–2024) and guided by instrumental stakeholder theory and the dynamic capabilities perspective, we find that community development improves emissions performance directly and through enhanced product responsibility. However, Environmental Management Teams (EMTs) unexpectedly weaken this relationship.

Freeman et al. 2007)—remains relatively underexplored (Fan et al. 2025; Mies and Gold 2021).

Instrumental stakeholder theory posits that ethical and proactive stakeholder engagement can enhance firm performance by generating valuable resources and reducing relational risks (Jones 1995). From this perspective, secondary stakeholders such as local communities should be viewed not as peripheral actors but as strategic partners (Yuan et al. 2011) capable of contributing to competitive advantage (Jones et al. 2018). Through trust building and knowledge exchange, community development initiatives can create stakeholder-based resources (Fan et al. 2025) that support the design and implementation of effective environmental strategies. Community development therefore provides a pathway for firms to move beyond symbolic CSR practices (Perez-Batres et al. 2012) and to engage communities in a more strategic and outcome-oriented manner to improve emissions performance.

Community development represents a relational and long-term approach to CSR, centred on sustained engagement and capacity building within local communities (Fan et al. 2025; Luthin et al. 2023; McLennan and Banks 2019; Mies and Gold 2021). Such initiatives may include investments in greener sourcing, donations, educational programmes, ethical business practices and commitments to fair competition (Luthin et al. 2023; Mies and Gold 2021). Rather than isolated philanthropic actions, these initiatives constitute an embedded and strategic form of stakeholder engagement (Aguinis and Glavas 2013), with the potential to support improvements in emissions performance.

Emerging empirical evidence also points to a link between community development and emissions performance. For instance, Tata Steel has improved its direct and indirect emissions performance through a range of community development initiatives (Tata Steel 2025). These include deploying decentralised renewable energy solutions in rural communities and promoting circular economy practices through community-based scrap sourcing. The company has also implemented climate-resilient agricultural programmes that optimise farming practices and reduce methane and other emissions (Tata Steel 2025). Such initiatives help strengthen social licence and foster community cooperation (Henisz et al. 2014; Suchman 1995), thereby facilitating the implementation of environmental measures related to energy efficiency, waste management and emissions reduction. Building on this discussion, this study addresses the following research question:

**Research Question** 1. Does community development enhance firms' emissions performance?

Although some studies have shown that community development can produce positive outcomes in general (e.g., Fan et al. 2025), its effectiveness is not guaranteed and may depend on the presence of internal organisational factors that shape the outcomes of stakeholder engagement (Jones et al. 2018). For example, improving environmental performance often requires dedicated personnel and specialised expertise to engage with communities, incorporate insights from these communities and implement environmentally responsible policies and practices (Jabbour et al. 2019; Marrucci et al. 2021). Other studies emphasise that building environmental human capital is critical for embedding sustainability into core routines and decision-making processes (Cheffi et al. 2023). In this context, we examine whether the presence of an Environmental Management Team (EMT)—a dedicated team responsible for implementing environmental initiatives—enhances or diminishes the effectiveness of community development efforts. Our second research question is thus:

**Research Question** 2. Does the presence of an EMT moderate the relationship between community development and emissions performance?

While instrumental stakeholder theory (Jones 1995; Jones et al. 2018) has been widely applied to explain performance outcomes, scholars continue to call for deeper inquiry into how engagement with secondary stakeholders contributes to improved firm performance (Fan et al. 2025; Jones et al. 2018). Moreover, enhancing emissions performance requires substantial organisational transformation, underpinned by dynamic capabilities that enable firms to adapt to evolving environmental regulations and stakeholder expectations (Graessler et al. 2024; Mousavi and Bossink 2017). Accordingly, beyond the direct impact of community development on emissions performance, we propose that firms may need to develop internal dynamic capabilities to sense and seize information and knowledge obtained from communities, thereby improving their emissions performance. In particular, building on the dynamic capabilities perspective (Teece 2007), we investigate the mediating role of a relatively underexplored capability—product responsibility—in this relationship.

The importance of responsible production and green manufacturing (Liu et al. 2021), as well as green products (Dangelico 2016), has been emphasised in prior studies. In this research, we focus on a complementary aspect—product responsibility—which refers to a firm's ability to ensure product safety and quality while minimising negative environmental and social impacts (Chevrollier et al. 2024; Mies and Gold 2021). This encompasses activities such as conducting environmental and social impact assessments, adopting quality standards, ensuring consumer safety and safeguarding privacy (Padilla-Rivera et al. 2021). Scholars within the dynamic capabilities tradition argue that the interaction of resources and capabilities, such as community development and product responsibility, can generate synergistic effects on performance (Teece 2007). Following this line of reasoning, we pose our final research question:

**Research Question** 3. Does product responsibility mediate the relationship between community development and emissions performance?

To address these questions, we analyse data from 4414 manufacturing firms worldwide between 2016 and 2024, comprising 26,089 firm-year observations. This study makes several important contributions. First, it responds to recent calls to identify antecedents that help firms improve emissions performance (Arranz et al. 2023; Chevrollier et al. 2024). Second, it contributes to the CSR literature. While much of the existing literature has focused on primary stakeholders, comparatively little attention has been paid to secondary stakeholders (Fan et al. 2025).

Our research addresses this gap by emphasising the strategic role of communities in improving environmental outcomes (Lu et al. 2023). Additionally, we demonstrate that the presence of EMTs can influence the effectiveness of community engagement efforts. From a theoretical perspective, this study advances instrumental stakeholder theory (Jones 1995) and the dynamic capabilities perspective (Teece 2007) by investigating how collaboration with secondary stakeholders—and the development of a socially oriented capability—can enhance firms' emissions performance.

## 2 | Literature Review

### 2.1 | Instrumental Stakeholder Theory

Instrumental stakeholder theory extends stakeholder theory (Freeman 1984) by framing stakeholder management as a strategy not only for ethical responsibility but also for creating competitive advantage (Jones 1995). Rather than treating stakeholder engagement as purely normative, instrumental stakeholder theory highlights that fostering stakeholder relationships contributes directly to firm performance (Jones et al. 2018). Jones et al. (2018) clarify the mechanisms through which stakeholder relationships generate strategic benefits. These mechanisms include the following: (1) reciprocal cooperation, (2) knowledge sharing, (3) attracting high-quality stakeholders, (4) reducing transaction costs and (5) moral motivation. First, close relationships based on mutual trust facilitate reciprocal coordination (Weber et al. 2022), enabling firms to respond effectively to evolving market and societal conditions (Uzzi 1997). Second, trust-based relationships promote open knowledge sharing with stakeholders (Wang and Noe 2010), enhancing firms' learning and innovation capacity (Harrison et al. 2010). Third, firms known for strong stakeholder relationships tend to attract high-quality stakeholders (Tantalo and Priem 2016), who value collaboration over transactional engagements (Bridoux and Stoelhorst 2016). Fourth, these relationships reduce transaction costs by minimising the need for extensive contractual safeguards (Kessler and Leider 2012). Finally, moral motivation is strengthened as stakeholders reciprocate goodwill, demonstrating loyalty and discretionary effort in support of firm objectives (Hosmer 1994).

While instrumental stakeholder theory explains why developing close relationships with communities creates relational resources, it does not address how firms can dynamically manage and leverage these relationships. Therefore, following previous studies (Freeman et al. 2021; Singh et al. 2022), we combine instrumental stakeholder theory with the dynamic capabilities perspective.

### 2.2 | Dynamic Capability Perspective

Resource-based view (RBV) scholars argue that firms possessing valuable, rare, inimitable and non-substitutable resources can achieve competitive advantage and superior performance (Barney 1991, 2001). However, dynamic capability scholars contend that resources alone are insufficient in rapidly changing environments and must be complemented by dynamic capabilities that enable firms to adapt, renew and reconfigure their resource base (Teece 2007, 2014).

Dynamic capabilities are commonly conceptualised in terms of three interrelated activities: sensing, seizing and reconfiguring. Sensing capability refers to identifying, interpreting and shaping opportunities and threats in the external environment (Teece 2007). This involves activities such as environmental scanning, searching for new knowledge and exploring emerging possibilities (Baishya et al. 2025; Helfat and Martin 2015). Seizing pertains to mobilising and deploying resources to develop and deliver products or services that capture identified opportunities (O'reilly and Tushman 2008). Reconfiguring involves the continuous renewal, recombination and reorganisation of resources and structures to sustain competitive advantage (Teece 2012). Although sensing, seizing and reconfiguring are interrelated and can jointly enhance firm performance (Fainshmidt et al. 2019; Teece 2014), dynamic capabilities do not always require the simultaneous presence of all three elements (Helfat et al. 2007).

Dynamic capabilities are underpinned by micro-foundations, including specific skills, organisational processes, managerial policies, governance structures and decision-making rules that support sensing, seizing and reconfiguring activities (Teece 2007). By leveraging these capabilities, firms can proactively monitor their environments, develop appropriate innovations and target markets in ways that anticipate evolving customer needs (Teece 2012).

In this vein, product responsibility is considered a dynamic capability, as it facilitates both sensing and seizing opportunities (Teece 2007). It is underpinned by various micro-foundations (Luthin et al. 2023; Mies and Gold 2021), including product responsibility monitoring, quality management systems (QMS) and policies concerning customer health, safety and privacy (Padilla-Rivera et al. 2021; Preuss 2010; Sheehy 2019) (see Appendix A for definitions). Product responsibility monitoring serves as a micro-foundation that enables firms to gather information and assess the social and environmental impacts of their products on customers and society (José Tarí and Molina-Azorín 2010). This allows firms to sense emerging trends and demands related to social and environmental responsibilities. Subsequently, firms aim to seize these opportunities by implementing robust QMS and developing lean manufacturing processes (Molina-Azorín et al. 2009; Siva et al. 2016). Moreover, firms establish policies and practices that prioritise customer health and safety, respect privacy and enhance overall customer satisfaction (Mies and Gold 2021; Padilla-Rivera et al. 2021).

## 3 | Hypothesis Development

### 3.1 | Direct Impact of Community Development on Emissions Performance

Building on instrumental stakeholder theory (Jones 1995), we argue that community development can enhance emissions performance through five key mechanisms: (1) reciprocal cooperation, (2) knowledge sharing, (3) the attraction of high-quality stakeholders, (4) transaction cost reduction and (5) moral motivation (Jones et al. 2018).

First, community development fosters reciprocal cooperation between firms and local communities. Proactive engagement allows firms to better understand community expectations and anticipate potential pressures arising from unmet social or environmental concerns (Adomako et al. 2023; Goes et al. 2023). Addressing these expectations helps build trust-based relationships that facilitate cooperation and access to locally embedded resources (Bosse et al. 2009). Such cooperation enables the joint identification and implementation of environmental solutions, thereby supporting emissions reduction. For example, Unilever has combined emissions-reduction efforts with job creation in India by collaborating with the UNDP to support waste pickers, establish material recovery facilities, and promote household waste segregation (Unilever 2023).

Second, knowledge sharing represents a critical pathway through which community engagement can improve environmental outcomes (Jones et al. 2018). Communities directly exposed to waste and pollution often possess context-specific knowledge about recycling, resource use, and local environmental challenges (Atasu et al. 2021). Firms that maintain strong community relationships can access this knowledge and diffuse environmental practices by acting as intermediaries, educators and collaborators (Knickmeyer 2020). For example, Danone works with smallholder dairy farmers by providing training, micro-financing and access to clean energy and efficient technologies, thereby contributing to methane reduction across its supply chain (Danone 2023, 2025).

Third, sustained community investment can help firms attract high-quality stakeholders. Demonstrated commitment to community welfare signals credibility and reliability, which can draw partners such as NGOs, governments and responsible investors (Bridoux and Stoelhorst 2016; Jones et al. 2018). These stakeholders often provide technical expertise, financial support and institutional backing that facilitate the development and implementation of emissions-reduction initiatives (Gibson 2022). Interface's long-standing collaboration with the Zoological Society of London and Aquafil to recycle discarded fishing nets into sustainable carpet materials illustrates how such partnerships can translate into measurable environmental gains (Ellis 2021).

Fourth, community engagement can reduce transaction costs. By demonstrating fairness, ethical conduct and anti-corruption practices, firms build reputational capital and legitimacy (Gordon and Miyake 2001; Waheed and Zhang 2022). This legitimacy lowers monitoring, negotiation and enforcement costs in stakeholder relationships (Berrone et al. 2017), freeing up resources that can be redirected toward environmental investments.

Finally, community development can stimulate moral motivation among stakeholders. When firms are perceived as socially responsible and committed to local welfare, communities are more willing to voluntarily support firm initiatives (Henisz et al. 2014; Suchman 1995). This moral support can translate into behavioural changes—such as participation in recycling or conservation programmes—that contribute directly to emissions reduction. Coca-Cola's collaboration with 'Keep America Beautiful' to install public recycling bins demonstrates how legitimacy and community goodwill can mobilise collective environmental action (Stamford 2019). These mechanisms illustrate how community development can generate relational, informational and motivational resources that ultimately support improvements in emissions performance. Accordingly, we propose:

**Hypothesis 1.** *Community development positively contributes to firms' emissions performance.*

### 3.2 | The Moderating Role of EMTs in the Relationship Between Community Development and Emissions Performance

EMTs can be defined as dedicated organisational teams responsible for designing, implementing and overseeing environmental initiatives. In this research, we argue that EMTs shape how community development translates into emissions performance by influencing the organisational processes through which community-based relationships are interpreted and operationalised. As discussed earlier, community development activities allow firms to build relational capital with local communities, fostering trust, reciprocity and cooperative exchanges that support sustainability goals (Bosse et al. 2009). However, in the absence of formal organisational mechanisms, the environmental value embedded in these relationships may remain informal, fragmented or unevenly leveraged, potentially limiting their impact on emissions performance (Jabbour et al. 2019).

EMTs address this challenge by functioning as organisational interfaces that interpret, translate and prioritise community-derived inputs, embedding stakeholder relationships into formal organisational routines. Through this role, EMTs influence whether and how community partnerships are converted into organisational knowledge and actions relevant to emissions outcomes (Ahmad et al. 2023; Guenther et al. 2016). This function is particularly important because community development activities often emerge as locally driven or ad hoc practices that require organisational support to evolve into more systematic capabilities (Yuan et al. 2011). EMTs serve as such supporting structures by providing dedicated human capital resources and governance mechanisms that link relational engagement with environmental management processes.

From a dynamic capabilities perspective, EMTs contribute critical micro-foundations—including monitoring, evaluation, learning and implementation—that underpin firms' ability to orchestrate community development activities in relation to emissions performance (Guenther et al. 2016; Jabbour et al. 2019). These micro-foundations shape firms' capacity to sense community-level environmental concerns, seize relevant opportunities and reconfigure internal processes accordingly (Teece 2007). Depending on how these processes are enacted, EMTs may either facilitate or constrain the effective integration of community-derived insights into emissions-reduction efforts.

Moreover, EMTs facilitate the formalisation of interactions with communities by establishing objectives, performance indicators and accountability mechanisms that link community initiatives to corporate sustainability strategies (Balzarova and Castka 2008; Vigneau 2020). They may also play an internal advocacy role by mobilising resources and legitimising community-related programmes within the organisation, thereby influencing how community development is prioritised amid competing demands (Ahmad et al. 2023; Guenther et al. 2016). Through these actions, EMTs affect whether community development is treated as a peripheral CSR activity or integrated into broader environmental management systems (Yuan et al. 2011).

This formalisation further shapes knowledge sharing between firms and communities, enabling two-way flows of information related to environmental challenges, recycling practices and emissions-reduction opportunities (Camacho-Otero et al. 2018; Inigo and Blok 2019). By overseeing the monitoring of community-based programmes and tracking environmental outcomes, EMTs influence the feedback mechanisms through which firms identify effective practices and adjust engagement strategies (Guenther et al. 2016; Jabbour et al. 2019; Klubeck 2012). In this way, EMTs shape the extent to which community engagement evolves from informal relational exchanges into more structured processes aligned with emissions objectives (Balzarova and Castka 2008).

EMTs influence how community-derived insights are captured, interpreted and integrated into organisational decision-making, thereby shaping the relationship between community development and emissions performance (Inigo and Blok 2019; Teece 2007). Rather than uniformly enhancing environmental outcomes, EMTs condition the effectiveness of community development by structuring the organisational pathways through which relational capital is translated into emissions-related action. Therefore, we propose:

**Hypothesis 2.** *The presence of EMTs positively moderates the relationship between community development and emissions performance, such that when EMTs are present, the positive effect of community development on emissions performance is strengthened.*

### 3.3 | Impact of Community Development on Product Responsibility

In this hypothesis, drawing on the dynamic capabilities perspective (Teece 2007) and instrumental stakeholder theory (Jones 1995), we argue that community development enhances a firm's ability to develop its product responsibility. From the instrumental stakeholder theory perspective, community development builds trust and legitimacy with external stakeholders, motivating communities to share knowledge (Jones et al. 2018) and collaborate in responsible product innovation and improvement (Dangelico 2016). The relational capital generated through continuous, transparent community engagement reduces transactional distance between firms and local communities, enhancing the credibility of firms' environmental initiatives and fostering constructive feedback loops (Bosse et al. 2009).

Complementary to these engagement activities, policies supporting ethical governance—such as anti-corruption measures and fair competition rules (Sheehy 2019)—serve as enabling micro-foundations that foster trust with community stakeholders (Luthin et al. 2023; Mies and Gold 2021). By adhering to such policies, firms avoid opportunistic behaviours (e.g., bribery, unfair market advantages) that could undermine community relationships and stakeholder perceptions (Krishnamurti et al. 2018; Preuss 2010). Ethical governance signals organisational integrity (Joseph et al. 2016) and enhances transparency, particularly regarding sensitive aspects such as data privacy (Kang and Hustvedt 2014; Martin and Murphy 2017), further encouraging communities to engage openly with firms about product-related concerns.

From the dynamic capabilities perspective, community feedback informs firms about expectations regarding product safety, environmental impact and quality standards (Papagiannakis et al. 2019), allowing firms to sense opportunities. They can then seize these opportunities by integrating the feedback into product design and QMS (Wastling et al. 2018). These insights enable firms to reassess material choices, redesign manufacturing processes and implement more sustainable energy strategies (Helander et al. 2019). Therefore, we argue that community development enables firms to integrate community insights into responsible product design, development and lifecycle management practices (Inigo and Blok 2019). This results in products that better align with community values and environmental expectations, ultimately strengthening firms' product responsibility. Thus, we hypothesise:

**Hypothesis 3.** *Community development positively influences firms' product responsibility.*

### 3.4 | Impact of Product Responsibility on Emissions Performance

From the dynamic capability perspective, we conceptualise product responsibility as a strategic capability that enhances emissions performance through its integrated sensing and seizing functions. First, product responsibility monitoring, as a sensing micro-foundation, allows firms to gather real-time insights into the environmental and social impacts of their products on customers and broader society (Camacho-Otero et al. 2018; Islam et al. 2021). Through lifecycle assessments, firms can identify resource inefficiencies, emissions hotspots and end-of-life challenges (Helander et al. 2019). This proactive sensing enables firms to redesign products for greater eco-friendliness, emphasising recyclability, reusability and safe disposal (Braungart et al. 2007). It also informs policies to enhance resource efficiency—optimising water and energy use—and guides firms toward responsible material choices (Helander et al. 2019). These monitoring-driven insights allow firms to continuously adapt their production and product strategies to improve emissions performance (Liu et al. 2021).

Building on this sensing capability, firms seize opportunities for emissions reduction through the implementation of QMS (Siva et al. 2016) and lean manufacturing processes (Dey et al. 2020), which serve as key seizing micro-foundations (Mies and Gold 2021). QMS frameworks (e.g., ISO 9000), Lean, and Six Sigma enable firms to standardise processes, improve traceability and minimise waste throughout the value chain (Dey et al. 2020; Hernandez-Vivanco and Bernardo 2022; Prajogo et al. 2012; Sroufe and Curkovic 2008). However, rather than treating QMS merely as operational tools, we view them as dynamic mechanisms that help firms act upon sensed opportunities, such as adopting circular product designs, reducing packaging waste and implementing take-back schemes (De los Rios and Charnley 2017; Ellen MacArthur Foundation 2021). These initiatives directly contribute to emissions performance by reducing material usage, energy consumption and waste generation across the product lifecycle (da Costa et al. 2022; Siva et al. 2016).

Additionally, policies on customer health, safety and privacy form an essential part of this dynamic capability (Mies and Gold 2021). These policies drive firms to eliminate hazardous materials, prioritise safe and sustainable production processes and ensure responsible end-of-life product management (Lieder and Rashid 2016). Designing products to be safe for customers and ecosystems supports circularity and minimises emissions across the entire lifecycle (De los Rios and Charnley 2017). Based on these arguments, we propose:

**Hypothesis 4.** *Stronger product responsibility enhances emissions performance.*

### 3.5 | Mediating Role of Product Responsibility in the Relationship Between Community Development and Emissions Performance

In this hypothesis, drawing upon the dynamic capabilities perspective (Teece et al. 1997) and instrumental stakeholder theory (Jones 1995), we argue that product responsibility mediates the relationship between community development and emissions performance. As proposed in Hypothesis 4, product responsibility functions as a sensing and seizing capability (Fainshmidt et al. 2019; Teece 2014), transforming community-derived insights into actionable practices. Specifically, firms integrate community input into responsible product design (Dangelico 2016), enhanced QMS, and customer health, safety and privacy policies (Dey et al. 2020). These operational mechanisms support the implementation of circular design principles, reduce resource use (Liu et al. 2021) and ultimately lower emissions (Hailemariam and Erdiaw-Kwasie 2023). Thus, we propose:

**Hypothesis 5.** *Product responsibility mediates the relationship between community development and emissions performance.*

A summary of the hypotheses is presented in Figure 1.

## 4 | Methodology

### 4.1 | Data and Sample

The firm-level data for this research were collected from the Refinitiv database and subsequently combined with country-level data from the International Monetary Fund, World Bank, and OECD. Firm-level data were collected from manufacturing firms due to their significant environmental impact (Bjørnbet et al. 2021). These firms face increasing pressure from stakeholders to adopt strategies that reduce material and energy consumption, minimise waste and lower greenhouse gas (GHG) emissions (Adomako et al. 2023).

Data were collected from countries worldwide for the period 2016 to 2024. This timeframe was selected because the Paris Agreement, adopted in 2015, legally committed countries to take action on climate change, with firm-level implementation beginning in 2016 (United Nations 2025). Only firms with available emissions performance data were included, resulting in an initial sample of 5101 firms and 30,871 firm-year observations. Following previous studies (Haque and Ntim 2020), we excluded firm-year observations with missing values for main variables and country-level variables, yielding a final sample of 4414 firms

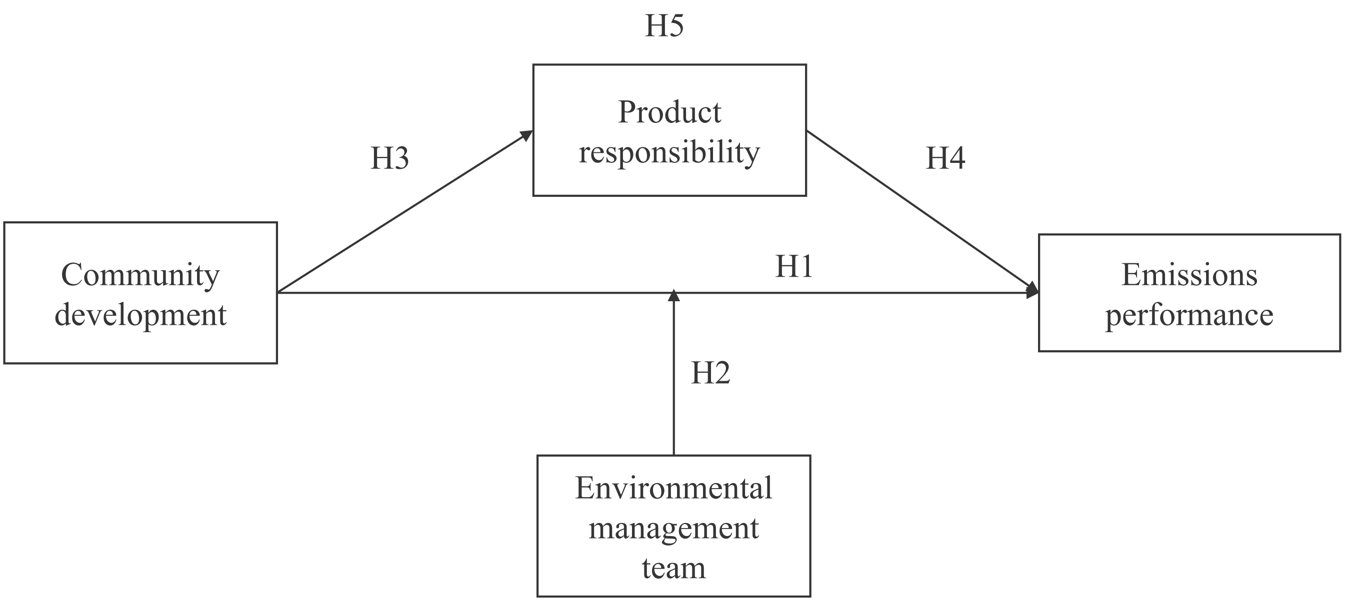


**FIGURE 1** | Summary of hypotheses.

and 26,089 firm-year observations. To mitigate the influence of extreme values, all continuous variables were winsorised at the top and bottom 1% (Lewandowski 2017). This approach enhanced the robustness of the sample distribution across countries, years and NAICS industry classifications (see Appendix B for sample distribution).

## 4.2 | Variables and Measures

### 4.2.1 | Dependent Variable

Emissions performance was measured using the calculated emissions score from Refinitiv (Kyaw et al. 2022; Tanthanongsakkun et al. 2023). This score is derived from emissions-related metrics (see Appendix A) that reflect a firm's commitment to reducing GHG emissions in its operations (Haque and Ntim 2022). Each metric is evaluated using a percentile-based scoring system, calculated as follows (Refinitiv 2022, 9):

$$score = \frac{no.\ of\ companies\ with\ a\ worse\ value + \frac{no.of\ companies\ with\ the\ same\ value\ included\ in\ the\ current\ one}{2}}{no.\ of\ companies\ with\ a\ value}$$

After calculating the percentile score for each metric, the scores are aggregated at the firm level to produce a company's overall emissions score. Emissions scores range from 0 to 100, with higher scores indicating superior emissions performance relative to industry peers (see Refinitiv 2022 for a detailed explanation of the scoring methodology).

### 4.2.2 | Independent Variable

Community development was measured using the community score provided by Refinitiv, which reflects a firm's percentile ranking relative to competitors within its industry group (Refinitiv 2022). Similar to the emissions score, this measure is calculated based on several metrics (see Appendix A), including policies on community involvement, total donations relative to revenues, community lending and investments, availability of communication tools to enhance business ethics, and the presence of policies on fair competition, bribery and corruption (Refinitiv 2022).

### 4.2.3 | Mediator

Product responsibility was measured using the score provided by Refinitiv, which is based on percentile rankings relative to industry competitors. This score incorporates several metrics, including product responsibility monitoring, QMS, policies on customer health and safety and policies on data privacy (Thomson Reuters 2017).

### 4.2.4 | Moderator

EMT was a categorical variable indicating whether a firm had a dedicated team responsible for addressing environmental concerns and performing related functions.

### 4.2.5 | Control Variables

In this research, several control variables were included. Consistent with prior studies, these comprised firm profitability, measured as the ratio of net income to total assets; firm age, measured as the logarithm of firm age; firm size, measured as the logarithm of total assets; and leverage, measured as the ratio of total debt to total assets (Kyaw et al. 2022; Wagner and Fischer-Kreer 2023). Additionally, investment intensity, measured as capital expenditures divided by total assets, and R&D intensity, measured as research and development expenditures divided by total assets, were included (Tanthanongsakkun et al. 2023).

Given prior evidence that top management support significantly influences firms' environmental performance, several board-level control variables were also included. These comprised board size, measured as the natural logarithm of the number of directors; board independence, measured as the percentage of independent directors; and role duality, captured by whether the CEO also serves as the chairperson of the board (Kyaw et al. 2022). Gender diversity was measured as the percentage of female directors on the board (Kyaw et al. 2022). Additionally, the presence of a sustainability committee was controlled for, as it may affect firms' efforts to improve emissions performance (Agnese et al. 2023).

As the data were collected globally, institutional and macroeconomic conditions may also influence firms' environmental performance (Botta and Koźluk 2014). Accordingly, several country-level variables were controlled for. Specifically, rule of law was included, as stronger legal institutions are better able to enforce environmental commitments (Muhammad and Long 2021). Political stability was also controlled for, as stable governments are more capable of implementing environmental programmes and infrastructure that support improvements in firms' emissions performance (Muhammad and Long 2021). Finally, to capture broader economic conditions, GDP per capita (in logarithmic form) and GDP growth were included as controls (Hailemariam and Erdiaw-Kwasie 2023; Hussain and Kumar 2025).

## 4.3 | Model Design and Descriptive Statistics

The data for this research were analysed using STATA 18. To determine the appropriate panel data specification, both fixed-effects and random-effects models were estimated. A Hausman test was conducted to assess whether the fixed- or random-effects model provides consistent estimates. The results ($\chi^2(24) = 1396.39$, $p < 0.001$) indicate significant differences in the coefficient estimates between the two models, suggesting that the fixed-effects model is preferable.

Table 1 presents the summary statistics of the variables used in this research. Emissions performance ranges from a minimum of 0 to a maximum of 98.72. Community development and

TABLE 1 | Descriptive statistics.

| Variables | Obs | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|
| Emissions performance | 26,089 | 42.502 | 32.212 | 0 | 98.718 |
| Community development | 26,089 | 50.723 | 28.545 | 1.449 | 98.98 |
| Product responsibility | 26,089 | 48.68 | 30.238 | 0 | 98.716 |
| Environmental management team (EMT) | 26,089 | 0.499 | 0.5 | 0 | 1 |
| Profitability | 26,089 | 0.051 | 0.122 | −0.595 | 0.488 |
| Age (Log age) | 26,089 | 3.33 | 0.887 | 0.693 | 4.86 |
| Size | 26,089 | 21.811 | 1.69 | 17.404 | 25.682 |
| Leverage | 26,089 | 2.499 | 9.042 | 0 | 69.547 |
| Investment | 26,089 | 0.049 | 0.077 | 0 | 0.672 |
| R&D Investment | 26,089 | 0.195 | 0.596 | 0 | 4.582 |
| Board size (log) | 26,089 | 2.172 | 0.314 | 0 | 4.927 |
| Independent board member (%) | 26,089 | 50.974 | 28.128 | 1.508 | 98.575 |
| Gender diversity (%) | 26,089 | 20.613 | 13.874 | 0 | 55.556 |
| Current CEO duality | 26,089 | 0.243 | 0.429 | 0 | 1 |
| CSR committee | 26,089 | 0.601 | 0.49 | 0 | 1 |
| Rule of law | 26,089 | 0.678 | 0.131 | 0.374 | 0.902 |
| Political stability | 26,089 | 0.172 | 0.566 | −2.397 | 1.599 |
| GDP growth | 26,089 | 2.797 | 3.26 | −18.869 | 16.258 |
| GDP per capita | 26,089 | 10.351 | 1.025 | 6.693 | 11.832 |

product responsibility range from 1.45 and 0 to 98.98 and 98.72, respectively. Additionally, 49.9% of the observations have dedicated EMTs in place. Table 2 presents the correlation matrix for the variables.

## 5 | Results

### 5.1 | Main Effects and Moderation

Table 3 presents the fixed-effects panel regression results. Model 1 includes only the control variables. Age, firm size, leverage, board size, presence of a CSR committee and GDP per capita are significantly and positively associated with emissions performance. In contrast, profitability, investment intensity, R&D intensity, gender diversity, CEO duality, rule of law, political stability and GDP growth do not have a significant effect. Model 2 tests Hypothesis 1 and shows that community development has a positive and significant effect on emissions performance ($\beta = 0.21$, $p < 0.01$). Model 3 incorporates the interaction term between community development and EMTs to test Hypothesis 2. The interaction term is negative and significant ($\beta = -0.06$, $p < 0.01$), indicating that the presence of EMTs weakens the positive relationship between community development and emissions performance. This finding does not support Hypothesis 2. Model 4 examines the effect of community development on product responsibility, supporting Hypothesis 3 ($\beta = 0.29$, $p < 0.01$). Model 5 evaluates the effect of product responsibility on emissions performance, confirming Hypothesis 4 ($\beta = 0.20$, $p < 0.01$).

### 5.2 | Mediation Analysis

Model 6 investigates the mediating role of product responsibility in the relationship between community development and emissions performance. Two methods were used to test for mediation. First, following Baron and Kenny (1986), partial mediation is supported because three conditions are met: (1) the total effect of community development on emissions performance is positive and significant (Model 2: $\beta = 0.21$, $p < 0.01$); (2) community development significantly predicts product responsibility (Model 4: $\beta = 0.29$, $p < 0.01$); and (3) product responsibility significantly predicts emissions performance while controlling for community development (Model 5: $\beta = 0.20$, $p < 0.01$). Second, the Sobel test was employed. As shown in Table 4, product responsibility partially mediates the relationship between community development and emissions performance, accounting for approximately 24% of the total effect.

Finally, Model 7 presents the full model, simultaneously incorporating the moderating effect of EMTs and the mediating role of product responsibility (see Table 3).

### 5.3 | Endogeneity Test

To address potential endogeneity concerns related to community development, we employed a two-stage residual inclusion (2SRI) approach. Compared with conventional two-stage least squares (2SLS), the 2SRI method is particularly well suited

**TABLE 2** | Correlation.

| Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Emissions performance | 1.00 | | | | | | | | | | | | | | | | | | | |
| (2) Community development | 0.46* | 1.00 | | | | | | | | | | | | | | | | | | |
| (3) Product responsibility | 0.54* | 0.42* | 1.00 | | | | | | | | | | | | | | | | | |
| (4) Environmental management team (EMT) | 0.56* | 0.31* | 0.39* | 1.00 | | | | | | | | | | | | | | | | |
| (5) Community development * EMT | 0.59* | 0.65* | 0.45* | 0.83* | 1.00 | | | | | | | | | | | | | | | |
| (6) Profitability | 0.14* | 0.09* | 0.06* | 0.09* | 0.10* | 1.00 | | | | | | | | | | | | | | |
| (7) Age (log age) | 0.28* | 0.13* | 0.19* | 0.20* | 0.19* | 0.16* | 1.00 | | | | | | | | | | | | | |
| (8) Size | 0.40* | 0.29* | 0.26* | 0.31* | 0.35* | 0.16* | 0.17* | 1.00 | | | | | | | | | | | | |
| (9) Leverage | −0.20* | −0.13* | −0.11* | −0.16* | −0.14* | −0.29* | −0.13* | −0.43* | 1.00 | | | | | | | | | | | |
| (10) Investment | −0.04* | −0.08* | −0.04* | −0.03* | −0.05* | 0.02* | −0.02* | −0.22* | 0.23* | 1.00 | | | | | | | | | | |
| (11) R&D investment | −0.15* | −0.12* | −0.09* | −0.13* | −0.13* | 0.00 | −0.07* | −0.44* | 0.34* | 0.16* | 1.00 | | | | | | | | | |
| (12) Board size (log) | 0.38* | 0.28* | 0.26* | 0.27* | 0.30* | 0.06* | 0.19* | 0.40* | −0.20* | −0.07* | −0.20* | 1.00 | | | | | | | | |
| (13) Independent board member | 0.14* | 0.19* | 0.12* | 0.12* | 0.17* | 0.04* | 0.04* | 0.09* | −0.04* | −0.02* | −0.04* | 0.03* | 1.00 | | | | | | | |
| (14) Gender diversity (%) | 0.15* | 0.22* | 0.14* | 0.09* | 0.17* | 0.00 | −0.05* | −0.02* | 0.02* | −0.03* | 0.01 | 0.06* | 0.13* | 1.00 | | | | | | |
| (15) Current CEO duality | −0.05* | 0.04* | −0.04* | −0.02* | 0.01 | 0.01 | 0.00 | 0.08* | −0.03* | −0.02* | −0.06* | 0.03* | 0.04* | −0.01 | 1.00 | | | | | |
| (16) CSR committee | 0.58* | 0.39* | 0.39* | 0.47* | 0.48* | 0.12* | 0.21* | 0.20* | −0.16* | −0.01 | −0.04* | 0.28* | 0.11* | 0.18* | −0.05* | 1.00 | | | | |
| (17) Rule of law | 0.00 | 0.14* | 0.11* | −0.02* | 0.06* | −0.10* | 0.03* | 0.05* | 0.07* | −0.11* | 0.02 | −0.06* | 0.01 | 0.18* | −0.06* | −0.04* | 1.00 | | | |
| (18) Political stability | 0.09* | 0.03* | 0.13* | 0.04* | 0.05* | −0.08* | 0.10* | 0.06* | 0.04* | −0.08* | 0.03* | −0.04* | −0.01 | 0.08* | −0.12* | 0.01 | 0.88* | 1.00 | | |
| (19) GDP growth | −0.05* | −0.07* | −0.09* | −0.05* | −0.07* | 0.09* | −0.07* | −0.11* | −0.04* | 0.08* | 0.04* | −0.04* | 0.00 | −0.03* | 0.05* | 0.03* | −0.45* | −0.40* | 1.00 | |
| (20) GDP per capita | −0.14* | 0.09* | 0.02 | −0.05* | 0.01 | −0.15* | −0.12* | 0.12* | 0.09* | −0.12* | −0.07* | −0.08* | 0.03* | 0.17* | 0.08* | −0.20* | 0.78* | 0.62* | −0.36* | 1.00 |

*Shows significance at $p < 0.01$.

**TABLE 3** | Model results.

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|---|---|---|---|---|---|---|---|
| **Variables** | Emissions performance | | | Product responsibility | Emissions performance | | |
| Community development | — | 0.205*** (0.011) | 0.221*** (0.013) | 0.287*** | — | 0.169*** (0.011) | 0.185*** (0.013) |
| Product responsibility | — | — | — | — | 0.198*** (0.010) | 0.169*** (0.010) | 0.151*** (0.010) |
| Environmental management team (EMT) | — | — | 11.852*** (0.890) | — | — | — | 10.359*** (0.859) |
| Community development * EMT | — | — | −0.062*** (0.014) | — | — | — | −0.051*** (0.014) |
| Profitability | −0.349 (1.131) | 0.029 (1.111) | −0.107 (1.079) | — | −0.055 (1.095) | 0.213 (1.082) | 0.070 (1.055) |
| Age (log age) | 1.117*** (0.412) | 1.016** (0.403) | 0.937** (0.389) | — | 0.968** (0.398) | 0.906** (0.391) | 0.847** (0.379) |
| Firm size | 1.086*** (0.199) | 0.984*** (0.196) | 0.901*** (0.188) | — | 1.003*** (0.194) | 0.932*** (0.192) | 0.862*** (0.185) |
| Leverage | 0.051*** (0.014) | 0.048*** (0.014) | 0.040*** (0.013) | — | 0.050*** (0.014) | 0.048*** (0.013) | 0.041*** (0.013) |
| Investment | 0.038 (1.287) | 0.201 (1.284) | 0.010 (1.263) | — | 0.058 (1.227) | 0.190 (1.234) | 0.009 (1.222) |
| R&D investment | 0.194 (0.252) | 0.141 (0.248) | 0.157 (0.247) | — | 0.103 (0.241) | 0.073 (0.240) | 0.094 (0.239) |
| Board size (log) | 1.746** (0.778) | 1.729** (0.766) | 1.726** (0.751) | — | 1.809** (0.751) | 1.786** (0.745) | 1.777** (0.735) |
| Gender diversity (%) | 0.026 (0.018) | 0.023 (0.018) | 0.032* (0.018) | — | 0.035* (0.018) | 0.031* (0.018) | 0.038** (0.018) |
| CEO duality | 0.141 (0.499) | 0.036 (0.483) | 0.024 (0.468) | — | 0.139 (0.482) | 0.053 (0.472) | 0.041 (0.460) |
| CSR committee | 14.413*** (0.546) | 12.483*** (0.535) | 10.241*** (0.523) | — | 12.524*** (0.533) | 11.209*** (0.528) | 9.353*** (0.519) |
| Rule of law | 17.187 (21.268) | −6.070 (20.876) | 3.747 (20.762) | — | 9.653 (20.225) | −8.425 (20.029) | 0.559 (20.007) |
| Political stability | 0.576 (1.412) | 1.616 (1.386) | 2.099 (1.362) | — | 0.093 (1.350) | 1.022 (1.335) | 1.509 (1.318) |
| GDP growth | −0.070 (0.052) | −0.049 (0.050) | −0.009 (0.049) | — | −0.049 (0.050) | −0.035 (0.049) | −0.001 (0.048) |
| GDP per capita | 14.346*** (1.847) | 14.328*** (1.834) | 12.701*** (1.794) | — | 12.468*** (1.770) | 12.730*** (1.771) | 11.461*** (1.742) |
| **Within $r^2$** | 0.326 | 0.358 | 0.382 | 0.162 | 0.363 | 0.383 | 0.402 |
| **Observations** | 26,089 | 26,089 | 26,089 | 26,089 | 26,089 | 26,089 | 26,089 |
| **Number of firms** | 4414 | 4414 | 4414 | 4414 | 4414 | 4414 | 4414 |

*Note:* Coefficients presented are unstandardised. Standard errors are in parentheses.
*$p < 0.10$.
**$p < 0.05$.
***$p < 0.01$.

**TABLE 4** | Sobel test of mediation effect.

| Mediator | c | a | σa | b | σb | Z (Sobel) | Effect ratio |
|---|---|---|---|---|---|---|---|
| Product responsibility | 0.20 | 0.29 | 0.025 | 0.169 | 0.0097 | 13.9*** | 0.24 |

*Note:* Sobel Z = (a × b)/sqrt ($b^2 \cdot \sigma a^2 + a^2 \cdot \sigma b^2$). Effect ratio = $a \times b/c$; c = effect of community development on emissions performance (Model 2). a = effect of community development on product responsibility (Model 4). b = effect of product responsibility on emissions performance (Model 5).
***$p < 0.01$ (two-tailed).

for panel data models with fixed effects and interaction terms (Terza et al. 2008). Endogeneity may arise from omitted variables, reverse causality or measurement error in community development, potentially biasing standard fixed-effects estimates (Hamilton and Nickerson 2003).

Following prior studies (Hamilton and Nickerson 2003; Mavroudi et al. 2023), we used the industry–year–country average level of community development (excluding the focal firm) as an instrument for firm-level community development. This instrument satisfies two key requirements (Ullah et al. 2018). First, exogeneity: industry-level community development reflects broader institutional pressures, norms and collective initiatives within an industry that influence individual firms' engagement in community development but are unlikely to be directly driven by firm-specific emissions or product responsibility outcomes (Mavroudi et al. 2023). Accordingly, the industry average affects firm-level product responsibility and emissions performance only indirectly through its influence on the firm's own community development, satisfying the exclusion restriction. Second, relevance and variation: the instrument varies across industries, countries and years (2016–2024), capturing temporal and contextual shifts in community development practices and expectations. The first-stage regression confirms the relevance of the instrument, as the industry–year–country average of community development strongly predicts firm-level community development (β = 0.810, SE = 0.009, t = 88.15, $p < 0.001$).

In the first stage, firm-level community development was regressed on the instrument and year fixed effects within a fixed-effects panel model, and the resulting residuals were retained. In the second stage, to examine the impact of community development on product responsibility, both community development and the first-stage residual were included in a fixed-effects model predicting product responsibility. The coefficient for community development remained positive and significant (β = 0.288, SE = 0.025, t = 11.54, $p < 0.001$), while the residual term was negative and significant (β = −0.062, SE = 0.028, t = −2.21, $p = 0.027$), indicating that endogeneity was present and successfully corrected.

To assess the impact of community development on emissions performance, community development was instrumented in the same manner, and the first-stage residuals were included in a fixed-effects model predicting emissions performance, incorporating EMT moderation and additional control variables. The coefficient for community development remained positive and significant (β = 0.227, SE = 0.022, t = 10.48, $p < 0.001$), while the residual term was not statistically significant (β = −0.008, SE = 0.022, $p = 0.722$), indicating that endogeneity concerns were effectively addressed in this specification. These results support the validity of the industry–year–country average of community development as a robust instrument.

### 5.4 | Robustness Test

To verify the robustness of our findings, we conducted several additional tests. First, following prior research (Hussain and Kumar 2025), we excluded observations from dominant countries (the US and China), G7 countries, dominant sectors, and the exogenous shock year (COVID-19 in 2020) to ensure that these factors did not unduly influence the results. We further divided the sample into two periods, 2016–2020 and 2021–2024, to assess whether the findings hold across different timeframes. Across all robustness checks, the results remained consistent with our main conclusions (see Appendix C). We also conducted additional analyses to examine the impact of selected country-level and industry-level factors. The details of these analyses are reported in Appendix D.

## 6 | Discussion

This study investigates whether community development improves firms' emissions performance, and whether EMTs moderate and product responsibility mediates this relationship. The findings indicate that community development enhances emissions performance both directly and indirectly through product responsibility. However, contrary to expectations, EMTs negatively moderate this relationship.

First, contrary to views that frame community development as reactive or symbolic (Aguinis and Glavas 2013; Gardner et al. 2012), our findings support a strategic interpretation consistent with instrumental stakeholder theory (Jones 1995; Jones et al. 2018) and recent CSR literature (Fan et al. 2025; Valentinov, de Oliveira Santos Jhunior, & de Araujo Góes 2025). This perspective suggests that ethical, proactive engagement with community stakeholders can generate reciprocal value and enhance firm performance (Jones et al. 2018). We extend this view by demonstrating that strategically implemented community development (Yuan et al. 2011) contributes to improved emissions outcomes—likely driven by stronger stakeholder alignment, support for circular economy initiatives, and local sustainability collaborations (Tapaninaho and Heikkinen 2022).

While our hypothesis proposed that EMTs would strengthen the relationship between community development and emissions performance, our findings reveal a more complex and context-dependent pattern. Across the full sample, EMTs negatively moderate this relationship. EMTs were initially expected to serve as complementary resources that embed stakeholder relationships into formal routines, enabling firms to systematically leverage community engagement (Guenther et al. 2016). However, our results suggest that EMTs may sometimes lack a nuanced understanding of evolving local dynamics, leading to initiatives that are misaligned with community needs or perceived as inauthentic (Frynas 2005; Gardner et al. 2012). Prior studies have long highlighted the challenges firms face in building trust and influencing community behaviour, particularly when efforts are not genuinely collaborative or responsive to local contexts (McLennan and Banks 2019).

Instrumental stakeholder theory suggests that community development enables firms to build relational capital and acquire tacit, context-specific knowledge through sustained engagement with local communities (Fan et al. 2025; Mies and Gold 2021; Teece 2007). This knowledge supports firms' ability to co-develop solutions to local environmental challenges, thereby improving emissions performance. EMTs, in contrast, often operate through formalised routines, monitoring systems and standardised performance metrics (Guenther et al. 2016; Jabbour et al. 2019; Klubeck 2012). While these mechanisms are effective for control and reporting, they may crowd out relational learning by prioritising compliance-driven approaches over community-derived insights. Consequently, the contribution of community development to emissions performance can be attenuated in the presence of EMTs.

The negative moderation effect is further explained by the social and moral dimensions of stakeholder engagement. Instrumental stakeholder theory emphasises that the performance benefits of community engagement arise from trust, reciprocity and moral motivation (Bosse et al. 2009; Jones 1995; Jones et al. 2018). Community development relies on relational governance and voluntary cooperation, whereas EMT-led initiatives may frame engagement primarily as a tool for risk management or legitimacy (Frynas 2005; Gardner et al. 2012). When engagement becomes overly formalised, communities may perceive firm actions as symbolic or inauthentic, weakening trust and reducing their willingness to actively support environmental initiatives (Donia et al. 2017; Valentinov et al. 2025). This erosion of moral motivation diminishes the relational mechanisms through which community development enhances emissions performance.

Moreover, EMTs may inadvertently foster symbolic or decoupled implementation of community initiatives. CSR research indicates that specialised environmental units often prioritise visibility, reporting and compliance over substantive outcomes, particularly under institutional and performance pressures (Calvano 2008; Munshi and Kurian 2005). In such cases, community development initiatives risk being perceived as greenwashing rather than meaningful partnerships, reducing community ownership and participation (Frynas 2005; Gardner et al. 2012). This is particularly critical for emissions reduction efforts that rely on behavioural change, such as recycling, reuse and waste management practices (Tapaninaho and Heikkinen 2022).

Importantly, consistent with prior studies (DasGupta and Roy 2023; Muttakin et al. 2022), our extended analyses (see Appendix D) confirm the context-dependent nature of EMTs' moderating role. The negative moderating effect of EMTs is evident in both low- and high-collectivism cultures but is stronger in high-collectivism countries—characterised by shared responsibility, social cohesion and group-oriented norms (Cherry 2017). This pattern suggests that formal EMT structures more strongly attenuate the marginal impact of community development in highly collectivist environments.

In addition, the GDP per capita split reveals an asymmetric pattern, consistent with prior evidence that national development conditions shape environmental performance (Fatima et al. 2022). In high–GDP-per-capita countries, the interaction between community development and EMTs is positive but insignificant, suggesting no meaningful moderating effect. In contrast, in low–GDP-per-capita countries, the interaction is negative and significant, indicating that EMTs more strongly attenuate the marginal impact of community development.

Sectoral comparisons across technological intensity also show a consistent but uneven pattern. Although EMTs dampen the marginal contribution of community development in both low-tech and high-tech industries, the negative moderating effect is stronger in low/medium-low-tech sectors. This suggests that in industries where technological sophistication is limited, relational and stakeholder-driven mechanisms are particularly important, and thus more susceptible to being crowded out by formal environmental structures.

Our findings also confirm a positive link between community development and product responsibility. Prior studies demonstrate that sustained engagement with local stakeholders helps firms adapt to evolving social and environmental expectations (Dangelico 2016; Papagiannakis et al. 2019). Building on this, we show that community development functions as a critical resource, enabling the systematic integration of environmental and social criteria into product design (Yuan et al. 2011). Community insights inform key decisions regarding materials, manufacturing processes and energy use—core aspects of product responsibility (Luthin et al. 2023; Mies and Gold 2021). Our results also align with research emphasising the role of stakeholder expectations in shaping responsible product practices (Tatoglu et al. 2020; Wastling et al. 2018). Moreover, in line with Tapaninaho and Heikkinen (2022), we show that communities are not merely beneficiaries but co-creators of sustainability-oriented innovation, contributing to enhanced product safety, circularity and environmental standards.

Building on prior studies in responsible production and green manufacturing (Liu et al. 2021), as well as research on green products (Dangelico 2016), our results underscore the importance of product responsibility in enhancing emissions performance. We find that strong product responsibility contributes positively to emissions outcomes. This finding reinforces arguments grounded in the dynamic capabilities framework (Teece 2007), conceptualising product responsibility as a strategic capability that enables firms to sense environmental risks, seize opportunities for product and process improvements, and transform operations in ways that reduce emissions across the value chain.

Consistent with prior literature, our study shows that product responsibility functions as a sensing micro-foundation, enabling firms to monitor and evaluate the environmental and social impacts of their products throughout their lifecycle (Camacho-Otero et al. 2018). This finding aligns with research highlighting the role of life cycle assessments and material footprint analyses in identifying emissions hotspots and inefficiencies in product design and manufacturing processes (Helander et al. 2019).

Moreover, we extend this line of work by emphasising the seizing dimension of product responsibility. Firms with strong product responsibility capabilities not only identify sustainability challenges but also address them by deploying QMS frameworks, eco-product design, lean manufacturing and Six Sigma methodologies to reduce waste and enhance process efficiency (Dey et al. 2020; Hernandez-Vivanco and Bernardo 2022; Siva et al. 2016; Sroufe and Curkovic 2008). While previous studies often regard QMS and lean systems as operational tools, our findings support the emerging perspective that these systems function as dynamic mechanisms, enabling firms to implement circular product designs, take-back programmes and low-emission packaging strategies (De los Rios and Charnley 2017; Prajogo et al. 2012).

## 7 | Conclusion

### 7.1 | Theoretical Contribution

This study makes several important contributions. First, our research advances the CSR literature by highlighting the instrumental role of communities. While prior studies primarily focused on primary stakeholders (Butt et al. 2025; Mostaghel and Chirumalla 2021), we show that communities can act as key enablers of emissions performance when firms actively invest in their development and well-being. Additionally, we respond to ongoing calls to integrate stakeholders (Goes et al. 2023; Valentinov et al. 2025)—particularly the social dimensions of CSR (Luthin et al. 2023; Mies and Gold 2021)—into mainstream sustainability and management research. By focusing on community development and product responsibility, this study addresses an important gap in the literature.

Second, our research contributes to instrumental stakeholder theory (Jones 1995) by corroborating the positive role of community development in enhancing firm performance, particularly emissions performance. In addition, we address calls to clarify how and under what conditions secondary stakeholders contribute to improved outcomes (Fan et al. 2025; Jones et al. 2018). Building on prior work (Freeman et al. 2021; Jones et al. 2018; Singh et al. 2022; Sodhi 2015), we integrate instrumental stakeholder theory with the dynamic capabilities perspective, offering novel insights into the mechanisms through which community engagement can translate into sustainable performance gains.

Third, our findings also contribute to the previous literature (Cheffi et al. 2023; Marrucci et al. 2021) by highlighting the role of human capital in influencing emissions performance. Specifically, we show that EMTs negatively moderate the relationship between community development and emissions performance, revealing a substitution effect rather than a complementary one. This result suggests that organisational structures such as EMTs do not automatically enhance the benefits of external stakeholder relationships (Jabbour et al. 2019) and may, in some cases, 'crowd out' the relational mechanisms through which community development drives emissions reductions. Moreover, we extend prior research (DasGupta and Roy 2023; Fatima et al. 2022; Muttakin et al. 2022) by demonstrating that this substitution effect is context-contingent—stronger in highly collectivist cultures, in lower–GDP-per-capita countries, and in low-technology industries—thereby underscoring the importance of cultural, economic and technological conditions in shaping the effectiveness of environmental governance mechanisms.

In addition, we advance the literature on green production and product responsibility (Dangelico 2016; Liu et al. 2021) by adopting a novel, holistic perspective on product responsibility. Whereas prior studies have typically examined elements such as product design (Braungart et al. 2007; da Costa et al. 2022), production planning (Liu et al. 2021; Suzanne et al. 2020), QMS, lean manufacturing (Dey et al. 2020) and customer health and safety (Straková et al. 2018) in isolation, our research integrates these micro-foundations into a unified conceptualisation of product responsibility as a dynamic capability.

Our study further contributes to the dynamic capability perspective in the context of CSR and sustainability. Building on prior research highlighting the role of dynamic capabilities in improving sustainability outcomes (Khan et al. 2020, 2021), we emphasise the development of product responsibility as a strategic capability. This extends the theoretical premise that resources and dynamic capabilities can be complementary and mutually reinforcing (Fainshmidt et al. 2019; Teece 2014). In addition, we contribute to the net-zero literature by identifying an actionable capability that supports emissions reductions, addressing recent calls to clarify which dynamic capabilities are most critical for achieving climate goals (Arranz et al. 2023).

Finally, this study contributes to the literature on emissions performance in the manufacturing sector, which has traditionally focused on the environmental risks associated with industrial expansion (Govindan and Hasanagic 2018; Moktadir et al. 2020). As global demand for manufactured goods continues to rise, our findings underscore the importance of developing targeted capabilities that allow firms to decouple growth from environmental harm. By identifying the dynamic capabilities and resource interactions that most strongly influence emissions outcomes, this study provides a clearer theoretical foundation for advancing sustainable manufacturing in the circular economy era.

### 7.2 | Managerial Implications

This study offers several practical implications for managers aiming to enhance emissions performance through community development and product responsibility. First, our findings highlight that community development is more than a CSR add-on—it is a strategic resource. Managers should integrate community engagement into core operations by investing in policies, local initiatives, ethical practices and anti-corruption measures. Such sustained engagement builds trust, strengthens legitimacy and generates tacit, context-specific knowledge that can guide environmental decision-making.

Second, while EMTs provide formal structures and technical expertise, they can sometimes crowd out the relational and trust-based mechanisms that make community development effective. Managers should ensure that EMTs complement, rather than substitute for, community-led initiatives by coordinating technical governance with flexible, locally attuned stakeholder engagement. Overly formalised EMTs may inadvertently reduce community ownership, moral motivation and the effectiveness of grassroots environmental practices.

In addition, managers should recognise that the effectiveness of EMTs depends heavily on cultural, economic and industry contexts. In highly collectivist and lower–GDP-per-capita countries, as well as in low-technology sectors, formal EMT structures may unintentionally crowd out the relational and community-based mechanisms that drive emissions performance. In such settings, managers should carefully balance formal environmental governance with stakeholder-oriented initiatives to avoid diminishing the marginal benefits of community development. Conversely, in high-income or high-technology environments, where the substitution effect is weaker or insignificant, EMTs can be implemented with less risk of undermining community engagement.

Finally, community development complements product responsibility. Managers should incorporate insights from local stakeholders into product design, materials sourcing, energy use and manufacturing processes. This approach enables firms to anticipate social and environmental expectations, enhance product quality and safety and implement sustainable innovations—such as circular product designs and low-emission packaging. By doing so, product responsibility becomes a strategic capability that actively supports emissions reduction across the value chain.

### 7.3 | Limitations and Future Research Direction

Despite its contributions to theory and practice, this study acknowledges several limitations. First, the analysis is limited to the period 2016–2024, which may constrain the generalisability of the findings to other timeframes. Second, the focus on manufacturing firms restricts the applicability of the results to other industries. Future research could extend this work by examining a broader range of sectors. Finally, given that our findings reveal a partial mediation in the relationship between community development and emissions performance, future research could empirically investigate the specific mechanisms identified in this study—such as reciprocal cooperation, knowledge sharing, stakeholder attraction, transaction cost reduction and moral motivation. Further work could also examine the boundary conditions under which these mechanisms operate, extending beyond product responsibility to other dimensions of sustainability and organisational performance.

**Acknowledgments**

The authors acknowledge the use of AI-assisted tools for proofreading and improving the clarity and quality of the writing.

**Funding**

The authors have nothing to report.

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### Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Data S1:** Supporting Information.