

## Fostering SME Sustainability through Green Work Engagement: Evidence from Indonesian Coffee Producers

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**Abstract.** Journal This study investigates the role of green work engagement in mediating the relationships between green leadership, adaptive capability, cultural openness patterns, and SME sustainability in the Indonesian coffee industry. Using structural equation modeling on data collected from 370 SMEs in Bener Meriah Regency, we found that green leadership ( $\beta=0.190$ ,  $p<0.01$ ), adaptive capability ( $\beta=0.157$ ,  $p<0.01$ ), and cultural openness patterns ( $\beta=0.902$ ,  $p<0.001$ ) significantly influence green work engagement. Green work engagement, in turn, strongly impacts SME sustainability ( $\beta=0.846$ ,  $p<0.001$ ). Moreover, green work engagement mediates the relationships between these factors and SME sustainability. These findings provide critical insights for SME managers and policymakers in Indonesia, emphasizing the importance of fostering green work engagement to enhance sustainability in the coffee industry. This study contributes to SME sustainability literature by empirically validating the mediating role of green work engagement in a developing country context.

**Keywords:** Green Work Engagement, Green Leadership, Adaptive Capability, Cultural Openness Pattern Sustainability

## 1. Introduction

In an age of globalization and evident climate change, the notion of sustainability has emerged as a primary concern across several industrial sectors (A. Lubis & Effendi, 2024). Sustainability has environmental, economic, and social components, all need balanced management (Sohns et al., 2023). The survival of small and medium-sized companies (SMEs) is essential for a nation's economy and society for several reasons (D'Apolito et al., 2024). Small and medium firms are a significant source of employment across several economic sectors (Salvador et al., 2023). A significant number of individuals, especially in rural regions and populations without access to giant corporations, secure employment in small and medium firms (Chaichana et al., 2024).

The sustainability of small and medium firms has a crucial role in diminishing unemployment and enhancing public welfare (Bataneh, 2021). The presence of small and medium firms fosters variety within the nation's economic framework (Yi et al., 2021). The presence of diverse companies and industries operated by small and medium-sized firms enables the country to mitigate reliance on certain economic sectors and enhance overall economic stability (Kurniawan et al., 2024). Small and medium-sized firms augment the nation's revenue via tax contributions, encompassing income tax, sales tax, and various company taxes (Wei, 2021). These earnings facilitate the funding of governmental initiatives and infrastructure critical to society (Fernandez, 2021).

For sustainability to be attained, green work involvement must be acknowledged by small and medium firms (Meier & Peters, 2023). Green work engagement denotes employee participation in environmental projects and activities inside the company (Annamalah et al., 2022). Employees engaged in environmentally sustainable activities generally exhibit increased productivity and innovation in developing sustainability solutions (González-Serrano et al., 2024). Conversely, green performance signifies the tangible outcomes of corporate sustainability initiatives, like less carbon emissions, enhanced energy efficiency, and improved waste management (Kaur & Bedi, 2024).

Research findings (Costa et al., 2023) indicate that green work participation significantly influences the success or failure of small and medium firms. Small and medium firms that implement sustainable practices, such as utilizing safer chemicals or minimizing air pollution, may foster a healthier and more productive workplace for employees (Jama et al., 2024). Employees who see their surroundings as conducive to their health are often more productive and loyal to the organization (Amah, 2023). Green work engagement may serve as a means for small and medium-sized firms to distinguish themselves from their competition (Huo et al., 2022). In a more competitive market, possessing a reputation as an environmentally conscious firm can provide a substantial competitive advantage (Syafrial, 2023).

Green leadership is essential for promoting the implementation of sustainable practices (Kato & Koizumi, 2024). Leadership centered on environmental concerns may encourage and drive organizational members to embrace eco-friendly policies and practices (Bhat et al., 2024). Furthermore, adaptive capability, including an organization's capacity to respond to alterations in the external environment, significantly contributes to the success of sustainability projects (Ribeiro & Soares, 2024). Swift and efficient response to market fluctuations and environmental restrictions can enhance the competitiveness and sustainability of small and medium-sized firms (Tian et al., 2023).

The findings of (Majali et al., 2022) underscore that the collapse of the hospitality sector stems from a leader's inability to formulate a coherent business model within the green industry, coupled with safety concerns. By endorsing green leadership principles, organizations may establish a more sustainable work environment, enhance their reputation, and contribute to global initiatives aimed at tackling environmental concerns (Yela Aránega et al., 2023). Proactive leadership dedicated to sustainability not only endorses eco-friendly activities but also promotes the sustainability agenda across all industries and communities (Cuevas-vargas et al., 2023).

Moreover, adaptable aptitude is a crucial element that allows small and medium-sized firms to maintain competitiveness amid fluctuations in the economic environment (Arshad et al., 2023). This competence encompasses creativity, adaptability, and reactivity to market fluctuations and

environmental restrictions (Saeedikiya et al., 2024). Adaptability enables players in small and medium enterprises to reinvent their products (Hansen et al., 2023). Small and medium-sized firms that exhibit adaptability have a greater inclination to innovate new goods or services, enhance operational efficiency, or discover novel marketing strategies for their offerings (G. Wang et al., 2024). Adaptability enhances the resilience of small and medium firms during economic crises or other emergencies [32]. Small and medium-sized firms may rapidly assess the circumstances, discern the required solutions, and execute them effectively (Al-Tabbaa & Zahoor, 2024).

The findings of (Sadeghi et al., 2023) highlight that adaptable skill significantly influences the survival of small and medium firms. Adaptive small and medium firms are more inclined to embrace new technology with more ease (Khan et al., 2023). Small and medium-sized firms may leverage technology to enhance operational efficiency, optimize inventory management, and elevate customer experience (Khurana et al., 2022). Adaptability encompasses the capacity to cultivate employees during change (Ahmed et al., 2022). Small and medium firms that foster a culture of learning and adaptability facilitate continual skill development among employees, hence enhancing productivity and job satisfaction (F. Zhang & Zhu, 2021).

The pattern of cultural openness significantly contributes to the promotion of sustainability (Tehseen et al., 2023). Embracing international cultures and traditions may expand perspectives and promote the implementation of optimal sustainability measures (Fouiteh et al., 2024). Nonetheless, several small and medium-sized firms in the region persist in following conventional methods and demonstrate a reluctance to embrace innovation and change (González-Moreno et al., 2024). Small and medium-sized firms prioritize the skills and career advancement of their personnel (Peñarroya-Farell et al., 2023). Small and medium-sized enterprises are more inclined to offer requisite training and education to advanced staff, hence enhancing overall performance (Valdez-Juárez et al., 2022). In an open culture, small and medium-sized enterprises can facilitate more candid talks and varied perspectives in the decision-making process (Sabando-Vera et al., 2022).

Research findings (Srisathan et al., 2023) indicate that the open culture paradigm significantly influences the sustainability of small and medium-sized firms. A transparent culture promotes inclusivity and appreciates diversity among teams and organizations (Le et al., 2023). This can result in diverse viewpoints and experiences, thereby inspiring novel ideas and enhanced inventions (Nikitas et al., 2024). An open culture frequently diminishes bureaucracy and obstacles to internal communication.

In Bener Meriah District, the small and medium enterprise sector is crucial to the area economy. Nonetheless, sustainability concerns continue to pose a substantial barrier for small and medium firms in the region. Bener Meriah Regency is recognized as a premier producer of Arabica coffee in Indonesia. This coffee product possesses a vast market presence, both domestically and internationally. This potential may be harnessed to cultivate small and medium-sized firms involved in the cultivation, processing, and marketing of coffee products.

Despite the myriad prospects, small and medium-sized enterprises in Bener Meriah face significant hurdles. Notwithstanding lending initiatives, several small and medium firms continue to have challenges in obtaining funding. Numerous small and medium firms exhibit a deficiency in knowledge about digital technologies and e-commerce. Small and medium firms face limited access to both domestic and international markets for their products. It is essential to enhance the skills and capabilities of small and medium firms via education and training.

This study seeks to investigate the mediating role of green work engagement in the link among green leadership, adaptive competence, cultural openness patterns, and the sustainability of the small and medium firm sector in Bener Meriah Regency. In this context, mediation signifies that green work engagement serves as an intermediate that enhances or facilitates the impact of green leadership, adaptive aptitude, and cultural openness on sustainability.

## 2. Literature Review

### 2.1 Small and Medium Enterprise Sustainability

Small and medium-sized firms that adopt sustainable business practices can mitigate environmental harm through many successful strategies (Juliardi et al., 2024). Small and medium firms may optimize resource use more effectively. Small and medium firms may save operational expenses and safeguard the environment by implementing sustainable technologies and maximizing the utilization of energy, water, and raw materials (Ozturk et al., 2024). Moreover, waste minimization is a crucial aspect of sustainable company operations (Chaichana et al., 2024). Small and medium firms can implement the 3R concept (reduce, reuse, and recycle) to control created garbage (Maman et al., 2024).

Minimizing the use of superfluous raw resources, repurposing items that remain functional, and recycling manufacturing byproducts can diminish the quantity of trash directed to landfills (Abdul Basit et al., 2024). Furthermore, employing biodegradable and environmentally sustainable components in the manufacturing process helps mitigate adverse effects on the environment (Salvador et al., 2023). Minimizing greenhouse gas emissions is a primary emphasis in sustainable business strategies (Bhatti et al., 2023). Small and medium-sized firms may do energy audits to pinpoint emission sources and implement measures for their reduction (Sohns et al., 2023). Carbon footprint can be diminished by utilizing eco-friendly autos, enhancing transportation efficiency, and planting trees to counterbalance carbon emissions (Okolo et al., 2023).

Small and medium firms dedicated to sustainable business practices frequently exhibit greater creativity in the development of environmentally friendly products (Sarango-Lalangui et al., 2023). Small and medium-sized firms seek methods to utilize recyclable, organic, or biodegradable resources while minimizing the usage of hazardous chemicals (Al-Karkhi, 2024). Small and medium-sized firms emphasizing sustainability may manufacture garments from natural or recycled fibers, minimize textile waste, and employ environmentally benign coloring procedures (Xuan et al., 2024). These improvements enhance product appeal for environmentally concerned consumers and increase its value. Metrics of environmental sustainability, financial health, social welfare, and regulatory adherence can assess the sustainability of small and medium firms (Avelar et al., 2024).

### 2.2 Green Work Engagement

Green work engagement is the degree of employee participation in activities and practices aimed at promoting environmental sustainability inside the workplace (SciELO, 2022). It is a type of work engagement that considers both traditional work elements and environmental factors as essential components of the job (Aboramadan, 2022). Participation in sustainable activities might improve a favorable perception among consumers, who are progressively attentive to environmental concerns [58]. This might enhance consumer loyalty and draw in new clientele (Islam et al., 2022). Companies that exhibit a dedication to sustainability, effective management, and long-term foresight likely to attract investors (Raya et al., 2021).

When employees recognize a small to medium enterprise's dedication to sustainability, they are often more motivated and happy with their job, resulting in enhanced productivity and decreased turnover (Suliman et al., 2023). Eco-friendly techniques frequently encompass healthier and safer work environments, which can decrease absenteeism and enhance employee well-being (Gustiah & Nurhayati1, 2022). Participation in sustainable practices equips small and medium-sized firms to adjust to shifting environmental and commercial dynamics, including heightened consumer environmental consciousness and regulatory modifications (Chen & Yan, 2022). By diminishing dependence on unsustainable resources and adopting more efficient processes, small and medium-sized firms can enhance their resistance to price volatility and supply interruptions (Subramanian & Suresh, 2022).

Small and medium firms that adopt green work engagement can distinguish themselves from rivals by providing more ecologically sustainable products and services, serving as a significant distinguishing element in the market (Abbas, 2023). Engaging in green activities fosters engagement with other

sustainability-oriented enterprises, therefore expanding corporate networks and improving market potential (Abdou et al., 2023). By prioritizing sustainable practices, small and medium-sized firms enhance environmental preservation and bolster their resilience against climate change consequences (Li et al., 2022). Small and medium firms enhance adaptability, mitigate risks, and sustain more stable operations against escalating environmental difficulties (Islam et al., 2022). Sustainability encompasses not just social responsibility but also strategic approaches to preserve competitiveness and ensure corporate continuation in an unpredictable future (Szabó, 2023).

Prior research indicates that green work participation has a direct and considerable impact on the sustainability of small and medium firms (Al-Hakimi et al., 2022). Green certification or labeling signifies environmental responsibility and enhances product appeal to customers (Amjad, 2022). Contemporary customers increasingly choose products that emphasize sustainability, frequently prepared to pay a premium for items that small and medium firms consider more ecologically responsible (Papademetriou et al., 2023). Small and medium-sized firms may leverage green certification to gain a broader and more loyal client base (Doghan et al., 2022).

H1: green work engagement directly has a significant effect on the sustainability of small and medium enterprises.

### **2.3 Green Leadership**

Green leadership is a leadership paradigm that prioritizes sustainable and eco-friendly company activities (Hameed et al., 2023). Leaders that choose green leadership typically emphasize energy efficiency, waste minimization, and prudent utilization of natural resources (Bhat et al., 2024). Leaders that adopt green leadership principles may recognize and execute measures that lower operating expenses via energy efficiency and waste minimization (Elgoibar et al., 2024). This can enhance corporate profitability and sustainability (Islam et al., 2022). Consumers are more apprehensive about environmental issues and choose items from firms dedicated to sustainability (He et al., 2023). Through the implementation of green leadership, small and medium firms may increase their market share and appeal to environmentally conscious consumers (Ribeiro & Soares, 2024). Small and medium firms that adopt green leadership may cultivate a favorable reputation among consumers, workers, and other stakeholders. A favorable image can enhance consumer loyalty and bolster brand reputation (Ullah Khan et al., 2023).

Prior research indicates that green learning substantially impacts the sustainability of small and medium firms (Abbas, 2023). Exemplary leadership fosters the cultivation of comprehensive and value-driven leadership competencies (Tian et al., 2023). This encompasses the capacity to inspire, encourage, and guide teams while focusing on long-term objectives and organizational principles (Hidayat-ur-rehman & Alsolamy, 2023).

H2: directly green work engagement has a significant effect on green work engagement of small and medium enterprises

H3: directly green work engagement has a significant effect on the sustainability of small and medium enterprises

H4: green work engagement indirectly has a significant effect on the sustainability of small and medium enterprises through green work engagement.

### **2.4 Adaptive Capability**

Small and medium firms that exhibit robust adaptive capacities are more equipped to endure and prosper amid fluctuations in markets, legislation, technology, and evolving customer demands (M. Zhang et al., 2024). Small and medium firms may swiftly modify their strategy, processes, and products to maintain relevance and competitiveness (Bašić, 2023). Adaptive capacity enables small and medium organizations to modify their business plans in response to market dynamics, competitive pressures, and economic situations (Sadeghi et al., 2023). Small and medium-sized firms can swiftly transition from unproductive or less lucrative methods to more successful alternatives (Tehseen et al., 2023).

Through efficient adaptation, small and medium-sized firms may enhance their responsiveness to client demands and expectations (Muna et al., 2022). This fosters deeper client connections and enhances the commitment of small and medium-sized firms to their brands or goods (Al-Tabbaa & Zahoor, 2024). Adaptive aptitude can serve as a competitive advantage for small and medium-sized firms, particularly in dynamic and competitive sectors (Saeedikiya et al., 2024).

Prior study findings indicated that adaptable skill significantly influences the sustainability of small and medium firms (Hansen et al., 2023). The capacity for ongoing learning, adaptation, and innovation enables small and medium firms to sustain their market position (Ahmed et al., 2022). Adaptive small and medium firms are often more resilient and durable over the long run. Small and medium firms can confront significant economic problems or substantial alterations in the business landscape without encountering large disruptions or elevated chances of failure (Khan et al., 2023).

H5: Direct adaptive capability has a significant effect on green work engagement among small and medium enterprises.

H6: Direct adaptive capability has a significant effect on the sustainability of small and medium enterprises.

H7: Through green work engagement, indirect adaptive capability significantly contributes to the sustainability of small and medium enterprises.

### **2.5 Cultural Openness Pattern**

Cultural openness patterns involve the comprehension of how people or communities embrace, appreciate, and integrate aspects of many cultures (Phonthanukitithaworn et al., 2024). Cultural openness trends are especially pertinent in the context of globalization, characterized by a rise in intercultural encounters (Bilichenko et al., 2022). Cultural openness is the willingness and capacity of people or communities to embrace and appreciate cultural diversity (Andriyani et al., 2024). It encompasses tolerance, acceptance, and adaptability to the beliefs, traditions, and practices of many cultures (S. Wang & Huang, 2022). Small and medium-sized firms that foster an open culture are more inclined to recruit and retain people from varied backgrounds (Ramdan et al., 2022). This can enhance organizational effectiveness through varied talents and expertise (Arabeche et al., 2022). Cultural openness fosters an environment conducive to debate, free from the apprehension of exclusion or unjust evaluation. In such an environment, community members are more at ease articulating their thoughts and sharing their viewpoints on small and medium-sized firms (David et al., 2021).

Prior study findings indicate that patterns of cultural openness significantly enhance the viability of small and medium-sized enterprises (Büchi, 2021). Small and medium-sized enterprises acknowledge the significance of their distinctions and the relevance of their perspectives (González-Moreno et al., 2024). Through active listening and mutual comprehension, a communicative bridge forms that diminishes the disparities between individuals (Sabando-Vera et al., 2022).

H8: Cultural openness patterns directly influence the engagement of small and medium enterprises in green work.

H9: Directly, cultural openness patterns have a significant effect on sustainability for small and medium enterprises.

H10: Indirectly, cultural openness patterns have a significant effect on the sustainability of small and medium enterprises through green work engagement.

## **3. Literature Review**

This study employs a quantitative research methodology. This investigation was conducted in Bener Meriah Regency, located in Aceh province, Indonesia. This regency emerged from the extension of Central Aceh Regency. The study's population comprised 5,018 small and medium enterprise participants from Bener Meriah Regency, spread over 10 sub-districts. The purposive sampling method

was employed to choose the sample for this investigation. The research chose 370 small and medium-sized enterprises engaged in the food industry as examples. Data was acquired via disseminating online surveys using WhatsApp directly to the target group. Ultimately, the data analysis method employed in this study utilized the structural equation model (PLS).

1. Eight metrics assess green leadership: commitment to sustainability (GL1), eco-innovative practices (GL2), environmental education and awareness (GL3), adherence to environmental regulations (GL4), exemplary leadership (GL5), measurement of environmental performance (GL6), employee engagement in green initiatives (GL7), and transparency coupled with social responsibility (GL8).
2. Eight indicators assess adaptive capability: flexibility in problem-solving (AC1), innovation (AC2), responsiveness to environmental change (AC3), uncertainty management (AC4), continuous learning (AC5), adaptive leadership (AC6), effective technology utilization (AC7), and risk-taking bravery (AC8).
3. Ten indicators assess cultural openness: tolerance for cultural differences (COP1), capacity for cross-cultural communication (COP2), eagerness to learn about new cultures (COP3), adaptability to diverse cultural practices and values (COP4), receptiveness to intercultural experiences (COP5), endorsement of inclusive values (COP6), and avoidance of stereotypes and prejudice (COP7).
4. Nine indicators assess green work engagement: enthusiasm for environmental initiatives (GWE1), commitment to environmental sustainability (GWE2), participation in the company's green program (GWE3), awareness and knowledge of environmental issues (GWE4), environmental responsibility in daily work (GWE5), motivation to enhance environmentally friendly practices (GWE6), collaboration in executing green practices (GWE7), satisfaction in contributing to sustainability (GWE8), and perception of environmental impact (GWE9).
5. Six indicators assess the sustainability of small and medium enterprises: long-term profitability (SU1), employee empowerment (SU2), business ethics and integrity (SU3), waste and resource management (SU4), green product development (SU5), and transparency and accountability (SU6).

## 4. Research Results and Discussion

### Construct validity testing

Tabel 1. Construct validity testing

Variable	State ment	Loading Factor	Al pha	Informat ion
Green Leadership (X1)	GL1	0.9 60	0 .7	Valid
	GL2	0.9 58	0 .7	Valid
	GL3	0.8 52	0 .7	Valid
	GL4	0.9 51	0 .7	Valid
	GL5	0.8 98	0 .7	Valid
	GL6	0.8 93	0 .7	Valid
	GL7	0.7 49	0 .7	Valid

	GL8	0.7 98	0 .7	Valid
Adaptive Capability (X2)	AC1	0.9 51	0 .7	Valid
	AC2	0.9 55	0 .7	Valid
	AC3	0.7 99	0 .7	Valid
	AC4	0.9 08	0 .7	Valid
	AC5	0.736	0 .7	Valid
	AC6	0.7 07	0 .7	Valid
	A7	0.7 09	0 .7	Valid
	AC8	0.7 67	0 .7	Valid
Cultural Openness Pattern (X3)	COP1	0.7 45	0 .7	Valid
	COP2	0.7 43	0 .7	Valid
	COP3	0.7 39	0 .7	Valid
	COP4	0.8 79	0 .7	Valid
	COP5	0.8 48	0 .7	Valid
	COP6	0.8 16	0 .7	Valid
	COP7	0.8 25	0 .7	Valid
Green Work Engagement (Y1)	GWE1	0.7 92	0 .7	Valid
	GWE2	0.7 94	0 .7	Valid
	GWE3	0.8 50	0 .7	Valid
	GWE4	0.8 25	0 .7	Valid
	GWE5	0.8 62	0 .7	Valid
	GWE6	0.8 18	0 .7	Valid
	GWE7	0.7 40	0 .7	Valid
	GWE8	0.7 94	0 .7	Valid

	GWE9	0.718	0.7	0	Valid
Sustainability of Small and Medium Enterprises (Y2)	SU1	0.732	0.7	0	Valid
	SU2	0.767	0.7	0	Valid
	SU3	0.768	0.7	0	Valid
	SU4	0.866	0.7	0	Valid
	SU5	0.897	0.7	0	Valid
	SU6	0.843	0.7	0	Valid

The table above verifies the validity of the questions for all study variables, since the total validity coefficient exceeds 0.7.

**Construct Reliability Test**

The data processing outcomes indicate the following results:

Table 2. Construct Reliability

Variable	Composite Reliability	Average Variance Extracted (AVE)
Green Leadership (X1)	0.966	0.784
Adaptive Capability (X2)	0.943	0.676
Green Work Engagement (Y1)	0.934	0.568
Sustainability of Small and Medium Enterprises (Y2)	0.955	0.641

The average value, as seen in the table above, exceeds 0.5. The composite dependability value exceeds 0.7. Consequently, we can ascertain that the study's indicators are accurately quantified.

**Coefficient of Determination (R2)**

Regression employs the coefficient of determination, a statistical metric, to evaluate the adequacy of the original data in relation to the employed regression model.

Table 3. R-Square

Variable	R Square	R Square Adjusted
Green Work Engagement (Y1)	0.680	0.670
Sustainability of Small and Medium Enterprises (Y2)	0.822	0.819

The table above indicates that the Green Work Engagement variable possesses an adjusted R squared value of 0.670, or 67.0%, with external variables affecting the remaining 33.0%. The sustainability variable of small and medium enterprises exhibits an adjusted R-squared value of 0.819, or 81.9%, with other excluded factors accounting for the remaining 18.1% influence.

**Predictive Relevance (Q2)**

The Q2 value is synonymous with the coefficient of determination (R-Square). A Q-square value (Q2) of 0 signifies that the model possesses predictive relevance; conversely, a Q2 value below 0

denotes less predictive relevance. In other words, if all Q2 values exceed 0, the model is deemed more appropriate for the data. The Q2 value can be assessed as follows:

$$Q_2 = 1 - (1 - R_1^2) (1 - R_2^2) \dots (1 - R_n^2)$$

$$Q_2 = 1 - (1 - 0,670) (1 - 0,299) (1 - 0,819)$$

$$Q_2 = 1 - (0,33) (0,701) (0,181)$$

$$Q_2 = 1 - 0,04187073$$

$$Q_2 = 0.581$$

The Q2 value is 0.581 according to the findings. It can be stated that all factors in the investigation contribute to the authenticity data within the present structural model, accounting for 58.1%. The remaining 41.9% must be produced independently of the research variables.

**Research Hypothesis Test**

Table 4. Research Hypothesis Test / Direct Effect

Hypot he sis	Original Sampl e(O)	Averag e(M)	(STD EV)	t Statistik	P V alue	Conclusi on
Green Leadership (X1) -> Green Work Engagement (Y1)	0.190	0.170	0.139	3.650	0.001	Significant
Adaptive capability (X2) -> Green Work Engagement (Y1)	0.157	0.161	0.125	3.253	0.001	Significant
Cultural Opennes Pattern (X3) -> Green Work Engagement (Y1)	0.902	0.918	0.108	8.390	0.000	Significant
Green Leadership (X1) -> Sustainability of Small and Medium Enterprises (Y2)	0.2830	0.310	0.257	2.419	0.000	Significant
Adaptive capability (X2) -> Sustainability of Small and Medium Enterprises (Y2)	0.429	0.527	0.274	2.175	0.000	Significant
Cultural Opennes Pattern (X3) -> Sustainability of Small and Medium Enterprises (Y2)	0.721	0.814	0.263	2.548	0.005	Significant
Green Work Engagement (Y2) -> Sustainability of Small and Medium Enterprises (Y2)	0.846	0.857	0.077	10.992	0.000	Significant
Green Leadership (X1) -> Green Work Engagement (Y1) -> Sustainability of Small and Medium Enterprises (Y2)	1.087	1.088	0.130	3.667	0.005	Significant
Adaptive Capability (X2) -> Green Work Engagement (Y1) -> Sustainability of Small and Medium Enterprises (Y2)	1.131	1.133	0.120	2.091	0,006	Significant
Cultural Opennes Pattern (X3) -> Green Work Engagement (Y1) -> Sustainability of Small and Medium Enterprises (Y2)	0.810	0.830	0.107	7.598	0.000	Significant

Source: Results by data (2024)

### **The Influence of Green Leadership on Green Work Engagement**

This study revealed that green leadership has a substantial direct impact on green work participation within the small and medium firm sector in Bener Meriah Regency. This study refutes the conclusions of research (Soetjipto & Mukhlis, 2024)(Gustiah & Nurhayati1, 2022), which indicates that green leadership affects more than only green work participation. Nonetheless, the outcomes of this study correspond with the findings of research (Alfian Nugroho & Tiarapuspa, 2023), demonstrating that green leadership favorably affects green job engagement. Moreover, (Febrianto, 2022) highlighted that green leadership may enhance the competitiveness and reputation of small and medium firms in a progressively environmentally aware market (Nugroho et al., 2024). Committed to environmental stewardship, green leaders may inspire and galvanize staff to engage in sustainability efforts (Mustafa & Tjahjono, 2024).

Green leadership frequently entails enhanced coaching and assistance for staff in executing sustainable practices (Yan, 2022). Green leaders furnish essential training, tools, and incentives to facilitate the adoption of environmentally sustainable work habits among workers (Abbas, 2023). Green leaders may cultivate a corporate culture that fosters sustainable work practices (Wei, 2021). An ecologically beneficial business culture promotes greater employee participation in environmental initiatives, hence enhancing green job engagement (Ozgul, 2022). Environmental leaders frequently offer incentives and acknowledgment to workers that participate in sustainability efforts (Majali et al., 2022).

The outcomes of this study indicate that green leadership in small and medium firms in Bener Meriah Regency has not been effective in promoting green work engagement. Small and medium-sized enterprises have yet to comprehend the significance of green leadership in bolstering their operations. Presently, small and medium enterprises want governmental assistance to augment their comprehension and awareness, consequently elevating the quality of processed coffee goods, enhancing their competitiveness in the international market. We anticipate that the outcomes of government involvement will not only encourage employee engagement in environmentally sustainable actions but also foster an organizational culture that promotes sustainability.

### **The Influence of Adaptive Capability on Green Work Engagement**

This study found that adaptable skill significantly influences green work participation within the small and medium company sector in Bener Meriah Regency. The findings of this study corroborate earlier research indicating that adaptable skill significantly influences work engagement (Riyadh et al., 2024)(Sadeghi et al., 2023)(Al-azzam et al., 2024). This training can enhance employee understanding and the engagement of small and medium-sized enterprises in green efforts (Duarte, 2021). Investment in innovation and technology that promotes sustainability is essential (Andriyani et al., 2024). Small and medium-sized enterprises must commit resources for the research and development of green technologies to enhance green work participation (Khan et al., 2023). Business entities must cultivate an organizational culture that fosters adaptability and creativity (Tanamal et al., 2024). This culture can promote employee participation in ecologically sustainable activities and enhance green work engagement (González-Moreno et al., 2024). Nonetheless, the findings of this study contrast with those of studies (Said, 2024) and (Zulfikarijah et al., 2023), which assert that adaptable competence enhances green job engagement and also bolsters the environmental and economic performance of small and medium firms (Bilichenko et al., 2022).

The findings indicate that small and medium enterprises have failed to fully leverage adaptive capabilities as a competitive advantage in enhancing coffee product offerings. This incapacity is mostly attributable to the educational background of business practitioners, who possess exceedingly limited digital literacy. Future initiatives should focus on optimizing farmer business groupings at the village level. We anticipate that this initiative will accelerate the development of business actors' adaptive capabilities, consequently improving the branding of their goods.

### **The Influence of Cultural Openness Pattern on Green Work Engagement**

This study found that the pattern of cultural openness strongly affects green work participation in the small and medium firm sector in Bener Meriah Regency. The findings of this study align with other research, indicating that the degree of cultural openness significantly influences the enhancement of green work engagement (David et al., 2021). Small and medium firms must cultivate cross-cultural collaboration and utilize varied viewpoints to create new solutions that enhance sustainability (Peñarroya-Farell et al., 2023). This collaboration can enhance green work engagement and environmental performance (Supriyanto et al., 2021), suggesting that cultural openness not only boosts green work engagement but also fortifies the company's reputation. Small and medium enterprises exhibiting significant cultural openness generally possess a superior reputation among consumers and the community (Murwaningsari, 2021).

The study's findings indicate the necessity of formulating policies that encourage cultural openness, enhance employee training and education, cultivate an inclusive work environment, and facilitate cross-cultural collaboration. The study seeks to improve the cultural openness paradigm among small and medium enterprises in Bener Meriah Regency. Subsequent initiatives to enhance cultural openness are implemented through the establishment of a coffee stakeholder group. To broaden the coffee market, both nationally and globally, it is essential to enhance access to the global market, establish a prominent coffee brand, and adhere to global coffee consumption trends.

### **The Influence of Green Leadership on the Sustainability of Small and Medium Enterprises**

This research revealed that green leadership has a direct impact on sustainability within the small and medium enterprise sector in Bener Meriah Regency. This analysis corroborates studies (Hidayatur-rehman & Alsolamy, 2023), highlighting that the failure of small and medium enterprises to adopt leadership innovation results in business failure within this sector. Formulating an effective communication plan is essential for informing employees about the benefits and results of participating in environmentally sustainable work practices (Ullah Khan et al., 2023). This can enhance staff engagement and participation in eco-friendly initiatives (Cuevas-vargas et al., 2023). Offering rewards or accolades to staff demonstrating strong dedication to green efforts might encourage small and medium-sized enterprises to persist in advancing the company's environmental objectives (He et al., 2023).

The outcomes of this study suggest that small and medium enterprises in Bener Meriah Regency need green leadership to promote business sustainability. Small and medium-sized enterprises continue to lack comprehension of the fundamental principles and significance of green leadership. Business entities have faced challenges in capitalizing on the potential of sustainable and eco-friendly sectors to enhance their sales objectives. The coffee industry requires guidance in waste reduction, sustainable raw material utilization, and effective resource management. We anticipate that small and medium enterprises in Bener Meriah Regency may utilize environmentally sustainable practices as a competitive advantage for processed coffee goods.

### **The Influence of Adaptive Capability on the Sustainability of Small and Medium Enterprises**

This study found that adaptable skill significantly influences sustainability in the small and medium enterprise sector in Bener Regency. The study's results correspond with previous research (Arshad et al., 2023), demonstrating that adaptable capability plays a crucial role in the success of small and medium-sized enterprises. Adaptive capacity enables small and medium firms to implement digital technology that enhances efficiency, broadens market reach, or optimizes supply chains (Sadeghi et al., 2023). This can generate fresh prospects for long-term sustainable growth (Nada & Ali, 2015). Alterations in consumer tastes and expectations frequently impact corporate viability (Dias et al., 2021).

Small and medium enterprises that can swiftly adjust to these changes can fulfill customer expectations for ecologically sustainable goods, corporate ethics, or social sustainability (Ahmed et al., 2022).

The outcomes of this study indicate that small and medium-sized enterprises are deemed ill-equipped to confront intensifying competition through the utilization of information technology. Small and medium-sized enterprises lack direction on innovating their coffee products using information technology. The deficiency of expertise about the identification of business partners and the development of coffee product diversification is a significant issue now experienced by small and medium-sized enterprises.

### **The Influence of Cultural Openness Pattern on Sustainability of Small and Medium Enterprises**

This study determined that the pattern of cultural openness significantly influences sustainability in the small and medium enterprise sector in Bener Meriah Regency. The findings of this study corroborate the research (Yamoah, 2021), which indicates that the degree of cultural openness significantly influences the success of small and medium enterprises in their commercial development. Entering the worldwide market with cultural receptivity necessitates a profound comprehension of local business processes, which may demand considerable effort and money (Fouiteh et al., 2024). Cultural openness often entails hazards, including misunderstandings or cultural disputes. Small and medium-sized enterprises must adeptly navigate cultural differences to mitigate possible issues. Cultural openness enhances work satisfaction and team cohesion by fostering an atmosphere where people feel acknowledged and valued for their diversity.

The study's findings indicate that small and medium-sized enterprises are presently hesitant to adopt other cultures for product creation. Business entities regard the assimilation of alien cultures as a considerable threat to their operational activities. The incapacity of small and medium enterprises to replicate foreign culture presents more obstacles. The Cooperative Service of Bener Meriah Regency presently necessitates a support program to ensure that the foreign cultural adoption effort is congruent with the outputs of small and medium-sized enterprises.

### **The Influence of Green Work Engagement on the Sustainability of Small and Medium Enterprises**

This study demonstrated a direct and substantial influence of green work engagement on sustainability in the small and medium enterprise sector of Bener Meriah Regency. The study's results align with prior research indicating that green work involvement influences the sustainability of small and medium firms (Abbas, 2023). Employee participation in this initiative can enhance environmental performance and decrease operating expenses (Subramanian & Suresh, 2022). Employee participation in this initiative can enhance environmental performance and substantially decrease operating expenses (Huo et al., 2022). Employees who actively participate in environmental initiatives exhibit heightened awareness and concern regarding the ecological consequences of their job actions (Costa et al., 2023). Their involvement in efforts like waste management, energy conservation, and resource efficiency aids firms in attaining sustainability objectives while simultaneously decreasing operating expenses linked to excessive resource use and waste management (Gustiah & Nurhayati, 2022).

The study's findings indicate that small and medium-sized enterprises employing several people have not adequately facilitated their company growth. Employees presently do their duties only according to the remuneration they get. Few corporate stakeholders actually prioritize efforts to enhance the sustainability of small and medium-sized enterprises. This problem arises from insufficient awareness, both verbal and written, regarding the significance of employee engagement in their job.

### **The Influence of Green Leadership on the Sustainability of Small and Medium Enterprises through Green Work Engagement**

This study found that green leadership, via green work engagement, substantially impacts the sustainability of small and medium firms in the Bener Meriah Regency. The findings of this study align with other research indicating that green leadership significantly influences the sustainability of small and medium firms via green work engagement (Piwowar-sulej & Iqbal, 2023). Exemplary leadership emphasizes principles like honesty, equity, and social responsibility as foundational elements for commercial decision-making (Majali et al., 2022). This fosters trust among stakeholders and bolsters the longevity of the company's reputation (Cuevas-vargas et al., 2023). By assuming a leadership position, small and medium enterprises may enhance and fortify the local economic environment (Kato & Koizumi, 2024). This include assistance for additional small and medium enterprises, enhancement of local economic infrastructure, and establishment of sustainable employment opportunities (Ullah Khan et al., 2023).

The study's findings indicate that leaders who exhibit a commitment to eco-friendly practices and actively engage employees in all facets of operations pertaining to environmental sustainability can more effectively achieve the sustainability of small and medium enterprises. Leaders with a robust environmental focus will foster an organizational culture that motivates people to proactively engage in green efforts, including efficient resource management, waste minimization, and sustainable product creation. Involving workers in environmental activities is essential for small and medium firms to attain sustainability. Employees that are emotionally and intellectually engaged in the company's sustainability purpose will exhibit heightened motivation to contribute to the organization's long-term objectives, enhance performance, and generate additional value through green innovation. This engagement not only converts eco-friendly measures into supplementary responsibilities but also incorporates them into everyday work routines. Organizations must enhance management policies and practices that foster the cultivation of green leadership and green work engagement. Organizations may do this by instituting leadership training focused on environmental concerns, giving incentives for workers who adopt eco-friendly practices, and equipping facilities and technology to support the execution of sustainability programs.

### **The Influence of Adaptive Capability on the Sustainability of Small and Medium Enterprises through Green Work Engagement**

This study revealed that adaptable capability has a substantial indirect impact on the sustainability of small and medium companies via green work engagement within the small and medium enterprise sector in Bener Meriah Regency. The study's findings align with prior research, indicating that green work involvement significantly mediates adaptive capabilities in relation to the sustainability of small and medium firms (Saad et al., 2021). Adaptive capacity enables firms to swiftly adjust to environmental changes, enhancing green work engagement, which subsequently enhances environmental performance [96]. Effective environmental performance promotes sustainability via energy efficiency, waste management, and the reduction of carbon emissions (Nada & Ali, 2015). This study highlights the significance of cultivating adaptable capability, prioritizing employee engagement, investing in sustainable technology, optimizing resource management, and enhancing consumer reputation and loyalty (Sadeghi et al., 2023). Enhancing adaptive flexibility, green work engagement, and green performance enables small and medium companies in Bener Meriah Regency to attain improved sustainability, therefore assuring long-term environmental, social, and economic viability (Arshad et al., 2023).

The findings indicate that the influence of adaptable skill on sustainability is not direct but is instead mediated by green work participation. Employee participation in environmentally sustainable practices is crucial for connecting the adaptive capacity of SMEs to company sustainability. Employees who are engaged are more inclined to endorse and execute the company's sustainability-oriented adaptation strategies. Green work engagement, including employees' cognitive, emotional, and physical investment in tasks that promote environmental objectives, is essential for the effective execution of

adaptive solutions. Employees actively participating in environmental initiatives assist organizations in innovating and executing sustainable plans, hence enhancing the sustainability of SMEs.

### **The Influence of Cultural Openness Pattern on Sustainability of Small and Medium Enterprises through Green Work Engagement**

This study revealed that the indirect cultural openness pattern significantly influences the sustainability of small and medium companies via green labor participation in Bener Meriah Regency. The findings of this study corroborate those of (David et al., 2021)(Büchi, 2021)(Tambunan et al., 2024) highlighting that green work involvement mediates the relationship between cultural openness and the sustainability of small and medium firms (Nikitas et al., 2024). Organizations that embrace diverse cultures and innovative practices foster a work climate conducive to employee participation in sustainability initiatives, hence enhancing green work engagement (Valdez-Juárez et al., 2022). Employees engaged in sustainable practices exhibit heightened motivation to enhance the organization's environmental performance (Bašić, 2023). Small and medium firms engage in energy efficiency programs, waste management, and various green efforts, hence enhancing their environmental performance (Maziliauske, 2024). Effective environmental performance directly influences sustainability (Phonthanukitithaworn et al., 2024). Eco-friendly strategies mitigate the adverse effects of commercial activities on the environment, promoting long-term sustainability from economic, social, and environmental viewpoints (Z. Lubis et al., 2023).

The study's findings indicate that small and medium-sized enterprises in Bener Meriah Regency must not only adopt change and new cultural norms but also engage their employees in executing these practices sustainably. Embracing diverse external ideas and methodologies enables firms to be more adaptable in addressing the increasing problems of sustainability. Moreover, small and medium enterprises must enhance managerial policies that promote employee engagement in environmental activities. This includes offering training that emphasizes the significance of green practices and sustainability in the workplace. This training will enhance employees' comprehension of their responsibilities in environmental preservation while motivating them to engage more proactively in developing creative sustainability solutions. Moreover, fostering a work climate conducive to green innovation is a crucial step in achieving the sustainability of small and medium firms. Employees can generate innovative concepts pertaining to sustainable practices, encompassing resource management, waste minimization, and operational efficiency, within a setting that promotes ecological innovation. Promoting active employee engagement in environmental matters will enhance knowledge of sustainability's significance and foster a common responsibility for environmental protection. Employees engaged in green projects generally exhibit heightened motivation and contribute more significantly to the company's long-term objectives.

## **5. Conclusion**

This study extends our understanding of SME sustainability by examining the mediating role of green work engagement in the relationships between green leadership, adaptive capability, cultural openness patterns, and SME sustainability in the Indonesian coffee industry. Our findings reveal that green leadership, adaptive capability, and cultural openness patterns significantly enhance green work engagement, which in turn positively impacts SME sustainability. Importantly, green work engagement serves as a crucial mediator in these relationships, highlighting its pivotal role in promoting SME sustainability. These results contribute to SME sustainability literature by empirically validating the importance of green work engagement in a developing country context. For practitioners, our study suggests that fostering green work engagement through effective leadership, adaptive strategies, and open cultural patterns can significantly boost sustainability in SMEs. Future research should explore these relationships across different industries and cultural contexts to further validate and extend our findings.

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