

Green Work Motivation as A Predictor of Strategic Employee Green Behaviour in Manufacturing Firms

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ABSTRACT

Manufacturing firms are increasingly expected to translate environmental management commitments into daily workplace practices. However, formal environmental procedures may remain symbolic when employees are not personally and organisationally motivated to enact them. This study examines green work motivation as a predictor of strategic employee green behaviour in manufacturing firms. Strategic employee green behaviour refers to employee actions that support environmental sustainability through task-related green behaviour, proactive green behaviour and standard-oriented green behaviour aligned with organisational environmental objectives. The study used a quantitative cross-sectional survey design involving 304 technicians from manufacturing firms in Malaysia recognised under ISO 14001 and registered with the Federation of Malaysian Manufacturers. Technicians were selected because their operational responsibilities are closely connected with pollution control, resource use, waste management and environmental procedure implementation. The research instrument was adapted from established measures and validated through exploratory factor analysis, confirmatory factor analysis and structural equation modelling using SPSS 23 and AMOS 23. The measurement results supported the adequacy of the constructs. Green work motivation showed strong item loadings, while strategic employee green behaviour demonstrated high composite reliability and convergent validity. The structural result discovered a strong and significant positive effect of green work motivation on strategic employee green behaviour ($\beta = 0.750$, C.R. = 8.244, $p < 0.001$). The correlation between the two constructs was also substantial ($r = 0.755$, $p < 0.001$), indicating that motivated employees were more likely to demonstrate green behaviour that was not only routine but also proactive and aligned with organisational standards. The findings suggest that environmental management in manufacturing firms should not depend solely on audits or certification. Instead, firms need to develop motivational conditions that encourage employees to internalise environmental responsibility and consistently perform strategic green actions at work.

Keywords: Green work motivation, manufacturing firms, strategic employee green behaviour, employee green behaviour, ISO 14001

INTRODUCTION

Environmental sustainability is no longer a peripheral concern for manufacturing firms. It has become a practical, regulatory and strategic issue that affects how firms design their processes, manage resources and demonstrate accountability to stakeholders. Manufacturing operations are closely associated with energy consumption, raw material use, emissions, waste generation and environmental risk. For this reason, many firms adopt environmental management systems such as ISO 14001 to guide environmental policy, planning, monitoring and continual improvement [11]. Yet, a certified system does not by itself guarantee meaningful behavioural change among employees. Standards need to be translated into work routines, operational decisions and daily environmental actions.

This behavioural issue is especially important in manufacturing firms because environmental performance is not produced only by managers, documents or technologies. It is also influenced by employees who operate machines, handle materials, respond to production problems, report non-compliance, segregate waste and follow procedures designed to reduce environmental harm. Technicians are particularly relevant because their tasks are situated close to operational sources of environmental impact. When these employees understand and support environmental goals, environmental management systems become more than formal compliance. When they are not motivated, green procedures may be followed only superficially or during audit periods.

Employee green behaviour has therefore received increasing attention in organisational and sustainability research. It is commonly understood as employee behaviour that contributes to or detracts from environmental sustainability at work [15]. Studies have distinguished between required green behaviour, which is related to formal job tasks, and voluntary or proactive green behaviour, which goes beyond minimum role expectations [2,14]. Recent reviews and meta-analyses show that employee green behaviour is influenced by individual, motivational, social and organisational factors [12,21,23]. These developments indicate that environmental sustainability requires a clearer understanding of why employees choose to act in environmentally responsible ways.

This article focuses on strategic employee green behaviour (SEGB), a construct that extends conventional employee green behaviour by linking employee actions to the strategic and standard-oriented needs of manufacturing firms. SEGB is viewed as a broad workplace behaviour that includes three forms of action. The first is task-related green behaviour, where employees perform their assigned work in ways that reduce environmental harm. The second is proactive green behaviour, where employees voluntarily initiate or support environmental improvement. The third is standard-oriented green behaviour, where employees align their actions with formal environmental standards, organisational policies and objectives such as those embedded in ISO 14001. This third dimension is important because green behaviour in certified firms should not only be personally desirable but also strategically consistent with the firm's environmental management system.

The central predictor examined in this study is green work motivation. In general, work motivation refers to the internal and external forces that initiate, direct and sustain work-related behaviour. In the environmental context, green work motivation can be understood as the psychological drive that encourages employees to perform work in a way that supports environmental sustainability. The construct draws from self-determination theory, which explains how people act because of internalised values, interest, meaning, external recognition or contextual expectations [5,8]. It also relates to the theory of planned behaviour, which emphasises intention and motivational readiness as immediate antecedents of behaviour [1].

Although previous studies have examined leadership, green human resource management, green climate and environmental values as determinants of employee green behaviour [6,7,18], the direct role of green work motivation remains worthy of focused examination. This is because motivation is the point at which environmental values, organisational expectations and work realities are converted into action. A manufacturing employee may be aware of environmental procedures, but without motivation the behaviour may remain minimal. Conversely, a highly motivated employee is more likely to perform environmental actions consistently, encourage others and comply with standards even when such actions require effort, time or attentiveness.

The present study therefore aims to examine the influence of green work motivation on strategic employee green behaviour in manufacturing firms. Using data from 304 technicians in ISO 14001-recognised manufacturing firms in Malaysia, the article reports a focused direct-effect model. The contribution is threefold. First, it provides empirical evidence on the motivational basis of strategic employee green behaviour in manufacturing firms. Second, it positions SEGB as a useful behavioural outcome for settings where environmental management is tied to formal standards and operational risk. Third, it offers practical implications for managers who seek to strengthen environmental performance through employee motivation rather than relying solely on compliance systems.

LITERATURE REVIEW

Strategic employee green behaviour

Employee green behaviour is generally defined as individual behaviour at work that supports or undermines environmental sustainability [15]. Within organisational research, this behaviour has been discussed as part of environmental performance, organisational citizenship behaviour for the environment, task performance and extra-role behaviour. Ones and Dilchert [15] argued that environmental sustainability at work should be treated as a meaningful work performance domain because employees can either protect or damage environmental quality through their actions. This view opened a wider conversation on how green behaviour can be measured as a workplace phenomenon rather than as a general lifestyle practice.

A major distinction in the literature is between required and voluntary green behaviour. Required green behaviour refers to environmental actions that are embedded in formal job responsibilities, such as following waste disposal procedures, reducing unnecessary resource use or complying with operational instructions. Voluntary green behaviour refers to discretionary actions that go beyond formal job descriptions, such as proposing environmental improvements, encouraging co-workers or participating in environmental initiatives [2,14]. Both forms are important, but manufacturing firms with environmental management systems require an additional focus on behaviour that is consistent with organisational standards and long-term environmental objectives.

Strategic employee green behaviour responds to this need. It does not treat green behaviour as scattered individual acts, but as employee behaviour that is connected to the firm's environmental strategy. In this article, SEGB combines task-related behaviour, proactive behaviour and standard-oriented behaviour. The standard-oriented element is especially relevant for manufacturing firms because environmental management systems rely on procedures, monitoring, corrective action and continuous improvement. For a certified firm, the question is not only whether employees act green occasionally, but whether their behaviour supports the organisation's environmental policy and operational control systems.

The concept is also important because ISO 14001 has sometimes been criticised for becoming symbolic when it is implemented mainly for legitimacy, audit compliance or market signalling [3,4]. Such criticism does not mean that environmental standards are ineffective. Rather, it suggests that standards require behavioural support. Employees need to understand the meaning of environmental procedures and feel responsible for putting them into practice. SEGB therefore provides a useful outcome variable for examining how employees contribute to environmental sustainability in manufacturing firms.

Green work motivation

Green work motivation refers to the motivational force that encourages employees to perform their work in environmentally responsible ways. It includes the desire, willingness and perceived importance of engaging in workplace behaviours that support environmental sustainability. In the context of this study, green work motivation is treated as one overall construct rather than as separate intrinsic and extrinsic components. This treatment is appropriate because the article aims to test the overall motivational strength behind strategic green behaviour, not to compare different forms of motivation.

Self-determination theory offers a useful foundation for understanding this construct. Deci and Ryan [5] explain that human behaviour may be driven by different degrees of self-determination, ranging from controlled external reasons to internalised and autonomous reasons. Gagne and Deci [8] extended this logic to the workplace by showing that motivation is central to explaining sustained work behaviour. In environmental settings, motivation may emerge because employees personally value environmental protection, because they identify with the organisation's environmental goals, or because the work context makes green action visible, expected and meaningful.

Green work motivation also has a clear behavioural logic in the theory of planned behaviour. Ajzen [1] explains that behaviour is strongly influenced by intention, and intention reflects a person's readiness to perform a

particular action. When employees are motivated to protect the environment at work, they are more likely to develop the intention and persistence needed to perform green behaviour. This is particularly relevant in manufacturing firms, where green actions may require attentiveness, procedural discipline and willingness to go beyond production-focused routines.

Empirical studies have increasingly supported the role of motivation in employee green behaviour. Graves et al. [9] found that employee motivation helped explain pro-environmental behaviour in an organisational context. Sharpe et al. [20] showed that corporate environmental responsibility can strengthen intrinsic pro-environmental motivation, which in turn supports pro-environmental behaviour at work. Yafi et al. [22] demonstrated that green training affects environmental performance through competencies and motivation. These findings indicate that motivation is not merely an attitudinal state; it is a pathway through which organisational and individual conditions become observable environmental actions.

Green work motivation and strategic employee green behaviour

The relationship between green work motivation and SEGB can be explained through the conversion of motivational energy into behaviour. A motivated employee is more likely to take environmental requirements seriously, act consistently when following procedures and remain alert to opportunities for improvement. In manufacturing firms, this may include reducing unnecessary material use, preventing waste, reporting environmental risks, supporting recycling procedures, using resources efficiently and encouraging colleagues to observe environmental standards.

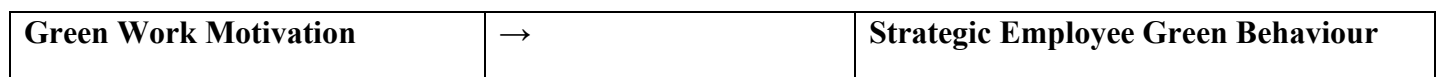
The link between motivation and SEGB is also theoretically meaningful because SEGB involves more than a single form of action. Task-related green behaviour requires employees to perform assigned work in an environmentally responsible way. Proactive green behaviour requires initiative and personal effort. Standard-oriented behaviour requires awareness of organisational expectations and willingness to align with them. Green work motivation is able to support all three because it provides the psychological reason for acting, whether the action is required, voluntary or linked to standards.

In a manufacturing setting, motivation may be particularly influential because employees often face practical tensions between speed, productivity, cost and environmental responsibility. Environmental actions can be seen as additional work if employees do not value them or if they perceive them as distant from production goals. Green work motivation reduces this gap by making environmental behaviour personally and organisationally meaningful. Employees who are motivated to protect the environment are more likely to integrate green considerations into their routine work rather than treat them as separate administrative requirements.

Based on this reasoning, the study proposes the following hypothesis:

H1: Green work motivation has a significant positive influence on strategic employee green behaviour in manufacturing firms.

Figure 1. Focused conceptual model



The model tests a direct motivational pathway. Other individual factors measured in the wider doctoral project are not interpreted in this article because the present manuscript is deliberately restricted to the predictive role of green work motivation.

METHODOLOGY

Research design and context

This study employed a quantitative cross-sectional survey design to examine the predictive relationship between green work motivation and strategic employee green behaviour in manufacturing firms. A survey design was

considered appropriate because the study aimed to measure employees' perceptions, motivational orientation and self-reported green behaviour at a single point in time. The cross-sectional design enabled the collection of data from a relatively large group of operational employees who were directly involved in manufacturing-related work processes. However, the design was not intended to establish definitive causal relationships. Therefore, the term "predictor" in this study refers to statistical prediction within the estimated structural equation model rather than causal inference.

Population, sampling and respondents

The population of this study comprised technicians working in manufacturing firms in Malaysia that were recognised under ISO 14001 and registered with the Federation of Malaysian Manufacturers. Manufacturing firms were selected because their operational activities are closely associated with resource consumption, waste generation, pollution control and environmental compliance. Technicians were selected as the respondents because they are directly involved in production, maintenance, technical operations and environmental control practices at the workplace. Their work roles make them suitable respondents for examining the relationship between green work motivation and strategic employee green behaviour.

The study involved 45 ISO 14001-recognised manufacturing firms. The firms were located in key manufacturing areas in Malaysia, including Selangor, Johor and Penang. These locations were selected because they represent major industrial zones with active manufacturing operations. The inclusion criteria for firms were: first, the firm must be involved in manufacturing activities; second, the firm must have ISO 14001 recognition; third, the firm must be registered with the Federation of Malaysian Manufacturers; and fourth, the firm must permit data collection among its technical employees.

At the individual level, the respondents were selected based on their technical job roles and involvement in operational tasks related to manufacturing processes. Only technicians who were involved in work activities with potential implications for environmental performance, such as production processes, material handling, waste management, machine operation, maintenance or environmental control, were included. This criterion was used to ensure that the respondents had sufficient exposure to workplace situations where green behaviour could be meaningfully practised.

A total of 500 questionnaires were distributed to eligible technicians across the participating firms. Of these, 345 questionnaires were returned, and 304 questionnaires were retained for final analysis after screening for completeness and usability. The final usable response rate was 69%. The sample size of 304 was considered adequate for structural equation modelling because it exceeded the minimum sample requirement for the proposed model and provided sufficient statistical power for testing the structural relationship between green work motivation and strategic employee green behaviour.

Table 1. Research design summary

Element	Description
Research design	Quantitative cross-sectional survey
Research context	45 Manufacturing firms in Malaysia recognised under ISO 14001
Respondents	304 technicians
Organisations	Manufacturing firms registered with the Federation of Malaysian Manufacturers
Main predictor	Green work motivation
Outcome variable	Strategic employee green behaviour
Analytical approach	Exploratory factor analysis, confirmatory factor analysis and structural equation modelling using SPSS 23 and AMOS 23

Measures

Green work motivation was measured using items adapted from established motivation measures grounded in self-determination theory and goal-related motivation research [5,8]. In the original instrument, the items represented internal and external motivational content. For the present focused article, green work motivation was analysed as one overall motivational construct because the purpose was to assess its total predictive effect on SEGB rather than compare motivational subtypes.

Strategic employee green behaviour was measured as a broad workplace green behaviour construct. The original item pool was developed by adapting employee green behaviour measures and aligning them with the strategic and standard-oriented context of ISO 14001 manufacturing firms. The final construct reflected employee actions related to green work behaviour, proactive green behaviour and standard-oriented green behaviour. This approach is consistent with the argument that workplace green behaviour can include both required and voluntary actions [2,14,15].

Table 2. Measurement information for the focused constructs

Construct	Measurement treatment in this article	Evidence from validation process
Green work motivation	Treated as one overall predictor representing employees' motivation to perform environmentally responsible work behaviour.	Standalone CFA retained 8 items with standardised loadings ranging from 0.64 to 0.96. Model fit: CMIN/DF = 2.632, GFI = 0.967, TLI = 0.977, CFI = 0.987, NFI = 0.979, RMSEA = 0.073.
Strategic employee green behaviour	Treated as one outcome construct representing task-related, proactive and standard-oriented green behaviour.	Final CFA retained 7 items with standardised loadings ranging from 0.74 to 0.98. Composite reliability = 0.962 and AVE = 0.783. Model fit: CMIN/DF = 2.020, GFI = 0.975, TLI = 0.992, CFI = 0.995, NFI = 0.990, RMSEA = 0.058.

Data analysis

The data were analysed using SPSS 23 and AMOS 23. Data screening was conducted before hypothesis testing. Exploratory factor analysis was used during instrument refinement, while confirmatory factor analysis was used to assess the validity and reliability of the measurement structure. The structural relationship between green work motivation and SEGB was then tested using structural equation modelling.

Model adequacy was evaluated using standard fit indices, including CMIN/DF, GFI, TLI, CFI, NFI and RMSEA. Following common SEM guidelines, CMIN/DF values below 5.00, GFI, TLI, CFI and NFI values at or above 0.90, and RMSEA values below 0.08 were interpreted as indicating acceptable model fit [10,13]. The hypothesised path was assessed through the standardised path coefficient, critical ratio and significance value.

RESULTS

Measurement model assessment

The measurement assessment indicated that the constructs used in the focused model were adequate for structural analysis. The green work motivation CFA showed acceptable fit across major indices. The retained indicators loaded strongly on their intended construct, indicating that the items captured a coherent motivational orientation toward environmental work behaviour. Although the original scale contained internal and external motivational content, this article treated the construct holistically in line with its focused objective.

Strategic employee green behaviour also demonstrated strong measurement quality. Seven items were retained in the final model, with standardised loadings above the commonly accepted threshold. The construct achieved composite reliability of 0.962 and AVE of 0.783, indicating high internal consistency and strong convergent

validity. The CFA fit indices for SEGB were also satisfactory. These results support the suitability of SEGB as a behavioural outcome in the manufacturing-firm context.

Correlation between green work motivation and strategic employee green behaviour

The correlation analysis showed a strong positive association between green work motivation and strategic employee green behaviour. The correlation coefficient was 0.755, with C.R. = 8.768 and $p < 0.001$. This result indicates that technicians who reported higher green work motivation were also more likely to report higher levels of strategic green behaviour at work. The squared correlation suggests that the association between the two constructs was substantial, providing preliminary support for the hypothesised motivational pathway.

Direct effect of green work motivation on strategic employee green behaviour

The structural analysis provided support for the hypothesis. Green work motivation had a positive and significant direct effect on strategic employee green behaviour. The standardised path coefficient was strong ($\beta = 0.750$), with C.R. = 8.244 and $p < 0.001$. This means that higher motivation to act in environmentally responsible ways was associated with higher levels of SEGB among technicians in manufacturing firms. Therefore, H1 was supported.

The size of the standardised coefficient is noteworthy. It indicates that green work motivation is not only statistically significant but also practically meaningful. In a manufacturing context, where environmental action can be constrained by production pressure, workload and procedural complexity, motivation appears to be a major psychological condition that helps employees translate environmental requirements into routine, proactive and standard-aligned behaviour.

Table 3. Correlation and direct effect results

Analysis	Relationship	Coefficient	C.R.	p-value	Decision
Correlation	Green work motivation <-> SEGB	$r = 0.755$	8.768	< 0.001	Significant
Direct effect	SEGB <- Green work motivation	$\beta = 0.750$	8.244	< 0.001	H1 supported

DISCUSSION

The findings show that green work motivation is a strong predictor of strategic employee green behaviour in manufacturing firms. This result supports the central argument that environmental management systems require motivational commitment from employees, not only formal procedures. When technicians are motivated to perform green work, they are more likely to behave in ways that support environmental sustainability through their assigned tasks, voluntary initiatives and adherence to standards.

The result is consistent with motivational theories. From the perspective of self-determination theory, employees are more likely to sustain behaviour when they see meaning, value or purpose in that behaviour [5,8]. In environmental work, this means that employees must perceive green actions as meaningful rather than as additional administrative obligations. A technician who is motivated by environmental responsibility is more likely to pay attention to resource use, pollution prevention and procedural compliance even when these actions require extra care. The theory of planned behaviour also supports this interpretation because motivation and intention are closely connected to behavioural enactment [1].

The finding also aligns with empirical studies showing that employee green behaviour is shaped by motivational and psychological mechanisms. Graves et al. [9] demonstrated that employee motivation helps predict pro-environmental behaviour. Sharpe et al. [20] showed that intrinsic pro-environmental motivation connects organisational environmental responsibility with employee behaviour. Similarly, Yafi et al. [22] found that motivation plays an important role in linking green training to environmental performance. The present study

extends this line of evidence by showing that green work motivation is particularly relevant to strategic employee green behaviour in manufacturing firms.

The strength of the relationship suggests that motivation may help address the gap between environmental certification and actual environmental practice. ISO 14001 provides a management structure, but employees decide how carefully procedures are followed in real work situations. If employees are weakly motivated, environmental procedures may be performed only when required, monitored or audited. If employees are strongly motivated, environmental behaviour becomes more embedded in routine work and is more likely to extend into proactive improvement and standard-oriented conduct.

This study is also important because it focuses on technicians. Much environmental management research gives attention to organisational systems, managerial commitment or policy implementation. These elements matter, but technicians are central to operational implementation. They often observe waste, process inefficiency and environmental risk more directly than higher-level managers. Their motivation therefore carries practical importance. Motivated technicians may not only comply with procedures but may also identify problems, report potential risks and encourage better environmental practice within work teams.

The findings should not be interpreted to mean that motivation alone is sufficient. Motivation develops within a context. Manufacturing firms need training, leadership support, clear procedures, fair recognition and a climate that makes environmental action legitimate. However, the results indicate that without green work motivation, other environmental investments may not fully translate into employee behaviour. Motivation is the internal bridge between environmental management systems and workplace action.

Theoretical Implications

This study offers several theoretical implications. First, it strengthens the motivational explanation of employee green behaviour. While earlier research has identified various antecedents such as leadership, green HRM practices, environmental climate and personal values [6,7,18], the present study shows that green work motivation itself is a strong predictor of SEGB. This supports the view that motivation is a central psychological mechanism in explaining environmentally sustainable organisations [23].

Second, the study contributes to the conceptual development of strategic employee green behaviour. SEGB provides a broader behavioural outcome that is suitable for manufacturing firms because it integrates task-related, proactive and standard-oriented actions. This is useful for organisations with environmental management systems, where employee behaviour needs to be connected to formal standards and long-term environmental objectives. The construct therefore responds to calls for more contextualised and theoretically refined employee green behaviour research [21].

Third, the study connects self-determination theory with strategic environmental behaviour at work. The findings suggest that motivation can support both voluntary and standard-aligned behaviour. This is important because environmental action in manufacturing firms is often neither purely voluntary nor purely required. It involves a mixture of compliance, initiative and internalised responsibility.

Practical Implications

The practical implication is clear to manufacturing firms should treat green work motivation as a managerial priority. Environmental systems, audits and policies are necessary, but they need to be supported by employee motivation. Managers should explain the environmental purpose behind procedures rather than communicate them only as compliance requirements. When employees understand why a procedure matters, they are more likely to follow it with care and consistency.

Firms can strengthen green work motivation through several practices. First, environmental training should be designed to build both knowledge and meaning. Training should connect daily technical tasks with environmental consequences, not merely describe rules. Second, supervisors should recognise employees who demonstrate green initiative, including those who report problems, reduce waste or suggest improvements.

Recognition does not always need to be financial; feedback, visibility and involvement in environmental decision-making can also strengthen motivation.

Third, firms should integrate green behaviour into performance conversations and operational routines. When environmental behaviour is discussed only during audits, employees may treat it as temporary compliance. When it is discussed regularly in team meetings, toolbox talks and improvement programmes, it becomes part of work identity. Fourth, management should create channels for technicians to share environmental observations because these employees often have practical knowledge of process-level risks and improvements.

Finally, ISO 14001 implementation should be understood as a behavioural system as well as a documentation system. A firm may have strong environmental procedures but weak employee motivation. In such cases, certification may not produce its full intended benefit. Strengthening motivation can help firms move from formal compliance toward strategic environmental behaviour.

Limitations And Future Research

This study has several limitations. First, it used a cross-sectional survey design. Although the SEM results indicate a significant predictive relationship, causal interpretation should be made cautiously. Future studies could use longitudinal designs to examine whether green work motivation predicts changes in SEGB over time. Second, the study relied on self-reported questionnaire data. Although self-report is common in employee behaviour research, future studies could include supervisor ratings, peer assessments, audit records or behavioural observations.

Third, the study focused on technicians in manufacturing firms with ISO 14001 recognition in Malaysia. The findings are relevant to this context, but future research should test the model in other sectors, countries and organisational settings. Fourth, this article deliberately examined green work motivation as one overall construct. Future studies may compare intrinsic and extrinsic green motivation if sufficient analytical justification and data are available. Such comparison could show whether internalised environmental values or external organisational signals are more influential in different manufacturing environments.

Future research may also examine moderating factors. For example, green leadership, psychological safety, environmental climate and perceived organisational support may strengthen or weaken the effect of green work motivation on SEGB. Researchers could also investigate whether SEGB predicts objective environmental outcomes, such as waste reduction, energy efficiency, fewer non-compliance incidents or improved environmental audit performance.

CONCLUSION

This article examined green work motivation as a predictor of strategic employee green behaviour in manufacturing firms. Based on survey data from 304 technicians in ISO 14001-recognised manufacturing firms in Malaysia, the findings show that green work motivation has a strong and significant positive influence on SEGB. Employees who are motivated to act in environmentally responsible ways are more likely to demonstrate green behaviour that is task-related, proactive and aligned with organisational standards.

The study reinforces the argument that environmental sustainability in manufacturing firms cannot rely solely on formal systems, procedures or certification. These structures are important, but they become effective only when employees are motivated to enact them. Green work motivation therefore represents a critical behavioural foundation for environmental management. For manufacturing firms seeking to move beyond symbolic compliance, strengthening employee motivation may be one of the most practical ways to build a more consistent and strategic green work culture.

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