Journal of Social Sciences Review (JSSR) DOI: https://doi.org/10.54183/jssr.v3i2.221

**How to Cite This Article:** Malokani, D. K. A. K., Qureshi, A. A., Inayat, A., & Mahar, Q. (2023). Impact of Reduction of Waste and Waste, Green Employee Behavior and Reduction of Resource Use on Environmental Strategy: Manufacturing Companies top management's Perception. *Journal of Social Sciences Review*, 3(2), 27-39. https://doi.org/10.54183/jssr.v3i2.221

# Impact of Reduction of Waste and Waste, Green Employee Behavior and Reduction of Resource Use on Environmental Strategy: Manufacturing Companies top management's Perception

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**Vol.** 3, **No.** 2 (Spring 2023)

**Pages:** 27 – 39

**ISSN (Print):** 2789-441X

**ISSN (Online):** 2789-4428

**Key Words**

Environmental Strategy, Green Employee Behavior, Reduction of Waste and Emissions, Reduction of Resource Use

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**Abstract:** *This study explores the impact of reduction of waste and waste, green employee Behavior and reduction of resource use on environmental strategy in manufacturing companies of Sindh, Pakistan. Using a cross-sectional design and a sample of 220 firms, data was collected through face-to-face surveys conducted from August 1 to October 31, 2022. The questionnaire adopted in this study focused on including the reduction of waste and waste, green employee behavior and reduction of resource use. The collected data were analyzed using structural equation modelling (SEM) to test the proposed hypotheses. The findings suggest that these variables have a positive and significant impact on environmental strategy, indicating that these variables can be valuable tools for promoting environmental strategy in the manufacturing sector of Sindh, Pakistan. These results have practical implications for manufacturing companies in Sindh, Pakistan, as it suggests that top management should prioritize the development of effective strategies to promote the reduction of waste and waste, green employee behavior and reduction of resource use in the future strategies.*

## Introduction

Businesses should not be expected to solve social problems or engage in charitable activities, as such actions would be a misuse of shareholder's resources (Saiia & Schwartz, 2022). Instead, they believed that the market itself would address social problems through the creation of economic incentives for businesses to address them in a profitable way. Many companies now recognize that the long-term success remained closely linked to the ability to manage environmental risks and opportunities. As a result, they are incorporating environmental considerations into their strategic planning and decision-making processes. This included adopting sustainable business practices, investing in renewable energy and other clean technologies, and working with suppliers and partners to reduce environmental impact across the value chain (Werdhiastutie et al., 2020). Overall, a continuous debate over the role of businesses in society and the extent to which they should prioritize environmental considerations, many companies are taking steps to integrate sustainability into the shape of strategy implementation, and this current trend

is likely to continue in the years ahead (Dmytriyev et al., 2021). While some critics may argue that this approach can be costly and may reduce short-term profits, many companies have found that it can lead to increased efficiency, reduced risk, and enhanced reputation and brand value. In addition, many consumers and investors are increasingly seeking out companies that demonstrate a commitment to sustainability, which can provide a competitive advantage in the marketplace (Sciarelli et al., 2021).

Researchers and managers have recognized that a range of factors can influence the extent to which businesses are able to adopt sustainable practices (Jeronimo et al., 2020). These factors can include internal factors such as organizational culture, leadership, and employee attitudes, as well as external factors such as regulatory requirements, market pressures, and stakeholder expectations. To effectively incorporate environmental considerations into strategy implementation, researchers and managers must consider how these different factors interact and how such factors can be leveraged to promote sustainable practices (Yu et al., 2021). This all required a multidisciplinary approach that draws on insights from fields such as economics, management, environmental science, and social psychology. This can help businesses to reduce the environmental impact, improve their reputation, and enhance their long-term success (Li et al., 2020).

The waste and emissions and reduction of resource use are central components of many environmental strategies adopted by businesses (Haldorai et al., 2022; Khan et al., 2021). The rationale for this approach is that through reducing the number of resources consumed and waste generated, businesses can reduce their environmental impact and enhance their long-term sustainability. Reducing resource use can take many forms, such as improving energy efficiency, reducing water consumption, and minimizing the use of raw materials (Yang et al., 2023). The adoption of such practices, businesses and economic activities can reduce the environmental footprint, cut costs, and increase the competitiveness. Similarly, reducing waste and emissions can help businesses to reduce the environmental impact and comply with regulatory requirements (Kazancoglu et al., 2021). This can involve implementing recycling programs, adopting cleaner production processes, and investing in renewable energy and other clean technologies. The waste and emissions and the reduction of resource use is an important part of many environmental strategies adopted by businesses. By adopting such practices, businesses can reduce their environmental impact, enhance their long-term sustainability, and generate social and economic benefits (Yong, 2020).

Many earlier research studies have studied only the motives of an employee of either with respect to social practices or environmental one's, rather than considering the intersection between the two (Alam et al., 2023; Chatzopoulou et al., 2022; Gurmani, et al., 2021). However, businesses that adopt sustainable practices may seek to minimize their environmental impacts by reducing resource use and emissions, but may also consider the social implications of such activities. Therefore, in this study economic factors including reducing resource use and emissions are taken for measuring their impact on environmental strategy. Political and economic instability can present significant challenges for businesses in emerging economies that are seeking to adopt proactive sustainability strategies (Onyiriuba et al., 2020). In past previous studies have been conducted in developed countries only (Balsalobre-Lorente et al., 202; Lin & Zhu, 2019; Mongo et al., 2021). Therefore, the present study is being conducted in developing country, like Pakistan and manufacturing companies of Sindh, the province of Pakistan is targeted due to time and resource constraints.

Rest of paper follows as, section 2, theoretical framework and hypothesis development, section

3 methodology, section 4 results and discussion and section 5 conclusion and practical implications.

## Theoretical framework and Hypothesis development

### Theoretical framework

The natural-resource-based view (NRBV) emphasizing the importance of natural resources in determining a firm's sustainable competitive advantage (Battisti et al., 2022). The RBV suggests that a firm's resources and capabilities are the primary drivers of its competitive advantage. The NRBV, on the other hand, emphasizes the importance of natural resources as a critical input to a firm's production processes (Ertuna et al., 2022). According to the NRBV, firms that have access to high-quality natural resources, or that can develop sustainable practices that minimize the negative impacts on natural resources, are more likely to achieve sustainable competitive advantage (Sahoo t al., 2023). This is because natural resources can be a source of both cost advantage and differentiation. A firm that can source sustainable, high-quality raw materials may be able to produce higher-quality products than its competitors. This could give the firm a competitive advantage in terms of product differentiation. Similarly, a firm that can reduce its environmental impact through sustainable practices may be able to reduce its costs and improve its efficiency, giving it a cost advantage over its competitors. A firm that can source sustainable, high-quality raw materials may be able to produce higher-quality products than its competitors (Islam et al., 2021). This could give the firm a competitive advantage in terms of product differentiation.

## Hypothesis Development Arguments

### Reduction of Resource Use

Nikolaou et al., (2019) conducted a study on the implementation of environmental sustainability practices in Greek SMEs. The study aimed to identify the barriers and enablers of environmental sustainability practices adoption and implementation in Greek SMEs, as well as the relationship between the implementation of such practices and the firms' financial performance. The study found that the main barriers to the adoption and implementation of environmental sustainability practices in Greek SMEs were the lack of financial resources, the lack of knowledge and skills, and the lack of regulatory support. On the other hand, the main enablers were the perceived benefits of such practices, the firms' environmental consciousness, and the pressure from stakeholders. A study by Gualandris and Kalchschmidt (2014) found that firms that adopt sustainable production practices, such as lean manufacturing and closed-loop systems, are more likely to achieve both environmental and economic benefits. Similarly, a study by Ramanathan et al., (2019) found that firms that implement sustainable supply chain practices, such as eco-design and green procurement, are more likely to achieve environmental and economic performance improvements. Another area of research has focused on the role of technological innovation in reducing resource use and supporting environmental sustainability strategies. For example, a study by Stengel et al., (2019) found that the firms adopted green technologies, such as renewable energy and energy-efficient processes, are more likely to achieve both environmental and economic benefits. However, implementing sustainable practices that reduce resource use can also present challenges for firms, such as the need for significant upfront investment and changes into the existing processes and practices. Therefore, it is important for firms to carefully evaluate the costs and benefits of sustainable practices and develop a strategic approach that aligns with their overall business goals (Kiron et al., 2012). Therefore, below alternative hypothesis H1 is recommended on the basis of above-given literature review:

*H1: Reduction of resource use is positively related to environmental performance.*

## Green Employee Behavior

Green employee behavior is an increasingly important aspect of environmental sustainability strategies for firms, as employees are often the driving force behind organizational change and can significantly impact a company's environmental performance (Sinha & Jain, 2021). Several recent studies have explored the relationship between green employee behavior and environmental strategy, highlighting the importance of fostering a culture of sustainability within organizations. A study by Azizi et al., (2021) found that firms that prioritize sustainability in their organizational culture and provide employees with training and education on environmental issues are more likely to see positive outcomes in terms of green employee behavior and overall environmental performance. Similarly, a study by Tlili et al., (2021) found that employee participation in green initiatives, such as recycling programs and energy conservation efforts, can lead to significant reductions in carbon emissions and other environmental impacts. Another area of research has focused on the role of leadership in promoting green employee behavior and driving environmental sustainability strategies. For example, a study by Wang et al., (2021) found that transformational leadership, which emphasizes empowering employees and promoting a shared vision of sustainability, is positively associated with green employee behavior and overall environmental performance. However, implementing sustainable practices and fostering green employee behavior can also present challenges for firms, such as resistance to change and difficulty in measuring the impact of sustainability initiatives. Therefore, it is important for firms to develop a comprehensive approach to environmental sustainability that included both top-down leadership and bottom-up employee engagement (Sinha & Jain, 2021). Overall, the literature suggests that green employee behavior is a critical element of effective environmental sustainability strategies, and that firms can benefit from prioritizing sustainability in their organizational culture, providing employees with training and education on environmental issues, and promoting transformational leadership that empowers employees to drive change. Therefore, below alternative hypothesis H2 is recommended based as per above given literature review:

*H2: Green employee behavior is positively related to environmental performance.*

## Reducing Waste and Emissions

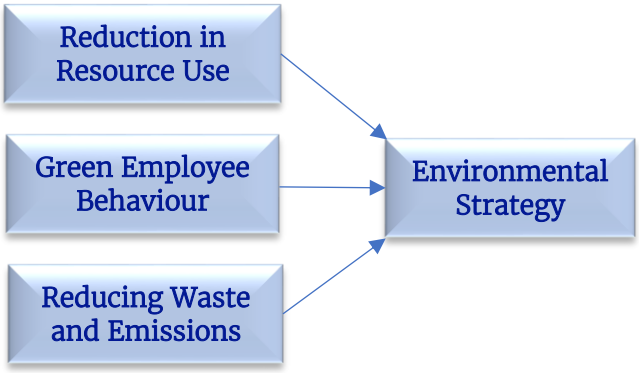
A study by Zou et al., (2018) found that firms that implement circular economy practices, such as product reuse and recycling, are more likely to achieve both environmental and economic benefits. Similarly, a study by Goyal and Rahman (2020) found that firms that adopt sustainable production practices, such as eco-design and green manufacturing, are more likely to achieve waste and emissions reduction and environmental performance improvements. Another area of research has focused on the role of regulatory frameworks in driving the waste and emissions reduction and supporting environmental sustainability strategies. For example, a study by Han et al., (2018) found that firms that are subject to stricter environmental regulations are more likely to implement sustainable practices and achieve waste and emissions reduction. However, implementing sustainable practices that reduce waste and emissions can also present challenges for firms, such as the need for significant upfront investment and changes to existing processes and practices. Therefore, it is important for firms to carefully evaluate the costs and benefits of sustainable practices and develop a strategic approach that aligns with their overall business goals (Chen et al., 2018). Reducing waste and emissions is an increasingly important aspect of environmental sustainability strategies for firms, as stakeholders increasingly demand that companies must take practical actions to reduce and address the impact on the environment

(Sarkis et al., 2021). Another study by Khan et al., (2021) found that firms that implement sustainable supply chain practices, such as waste reduction and green procurement, are more likely to achieve both environmental and financial benefits. Similarly, a study by Vimal et al., (2021) found that firms that adopt sustainable manufacturing practices, such as energy-efficient technologies and waste management systems, are more likely to achieve waste and emissions reduction and improve their overall environmental performance. Therefore, below alternative hypothesis H2 is recommended and is based on above given literature review:

*H3: Reducing waste and emissions is positively related to environmental performance.*

**Figure 1**

*Conceptual Framework*




## Methodology

### Population, Sample Size and Procedure

This study utilized a cross-sectional research design to investigate the impact reduction of waste and waste, green employee behavior and reduction of resource use on environmental strategy. In primary data collection, the researcher is responsible for designing the data collection methods, such as questionnaires or interview protocols, and selecting the appropriate sample size and sampling method (Arndt et al., 2022). The researcher then directly collected the data from the participants or sources. In the present study primary data is gathered from top management employees of manufacturing companies of Sindh, Pakistan. A sample size of 220 participants was selected using a non-probability sampling method including convenience sampling and snowball sampling strategies. The data collection period extended from August 1 to October 31, 2022 during which respondents were contacted and asked to participate in a face-to-face survey. Participants were contacted in advance to set up an appointment for the interview. The study was conducted in accordance with ethical principles and guidelines. Informed consent was obtained from all participants, and their confidentiality and anonymity were ensured. The results of the study were reported in aggregate, without any identifying information on individual participant. A structured questionnaire was developed and adopted to collect data from the participants. The questionnaire included items designed to measure reducing waste and emissions, green employee behavior, reduction in resources and environmental strategy.

### Measurements

The independent variable reducing waste and emissions is adopted from the research of Cantele & Zardini (2018). Research items are "Optimization of processes is used to reduce solid wastes, we consider and manage the environmental impacts from transport of our people, goods and services, Waste sorting is managed and planned and, We adopt processes in order to recycle waste".

The independent variable green employee behavior is taken from the study of Mi et al., (2020). Items are "I can accomplish the environmental protection tasks within my duties competently, I can fulfil the environmental protection responsibilities clearly specified in the job description, I can meet the environmental standards of formal work performance requirements and I voluntarily carry out environmental actions and initiatives in my daily work".

The independent variable reduction in resources is taken from the study of Tomaz et al., (2023). Items are "We minimize resource consumption in our business processes, we consider the use of sustainable materials in our business processes, Optimization of processes is used to reduce energy consumption and we consider water efficiency in our projects".

The dependent variable environmental strategy is adopted from the research of Tomaz et al. (2023). Research items are "We have integrated environmental issues of sustainability into our strategic planning process, we make every effort to link environmental objectives with other strategic goals, we define precisely how we plan to achieve our strategic objectives related to environmental protection, and We make every effort to link social objectives with other strategic goals".

### Statistical Tools

The data obtained from the survey were analyzed using structural equation modeling (SEM) to test the hypotheses. Version 3 of SEM was utilized for the data analysis. Structural equation modeling (SEM) is a statistical method used to analyze complex relationships between multiple variables. SEM involves both confirmatory and exploratory factor analysis, and uses path analysis to test hypotheses about relationships between variables. In SEM, researchers specify a model of hypothesized relationships between latent and observed variables, and the model is then tested against the data.

## Results and Discussion

### Reliability and Validity (Questionnaire)

**Table 1**

*Reliability and Validity (Questionnaire)*

| Factors | Item SPSS coding | Items loading | Cronbach alpha value | Composite Reliability | Average Variance Extraction (AVE) |
|---|---|---|---|---|---|
| Reduction in resource use | RSU1 | 0.952 | 0.934 | 0.954 | 0.837 |
| | RSU2 | 0.955 | | | |
| | RSU3 | 0.909 | | | |
| | RSU4 | 0.840 | | | |
| Green employee behavior | GEB1 | 0.924 | 0.940 | 0.957 | 0.848 |
| | GEB2 | 0.943 | | | |
| | GEB3 | 0.922 | | | |
| | GEB4 | 0.895 | | | |
| Reducing waste and emissions | RWE1 | 0.956 | 0.959 | 0.970 | 0.890 |
| | RWE2 | 0.950 | | | |
| | RWE3 | 0.937 | | | |
| | RWE4 | 0.931 | | | |
| Environmental strategy | ES1 | 0.954 | 0.960 | 0.971 | 0.892 |
| | ES2 | 0.945 | | | |
| | ES3 | 0.938 | | | |
| | ES4 | 0.941 | | | |

Establishing reliability and validity is essential to ensure that the data collected is accurate and can be used to test hypotheses (Sürücü et al., 2020). Without reliable and valid data, the results of the hypothesis testing may not be accurate and may lead to incorrect conclusions. Therefore, researchers should prioritize establishing reliability and validity in their research

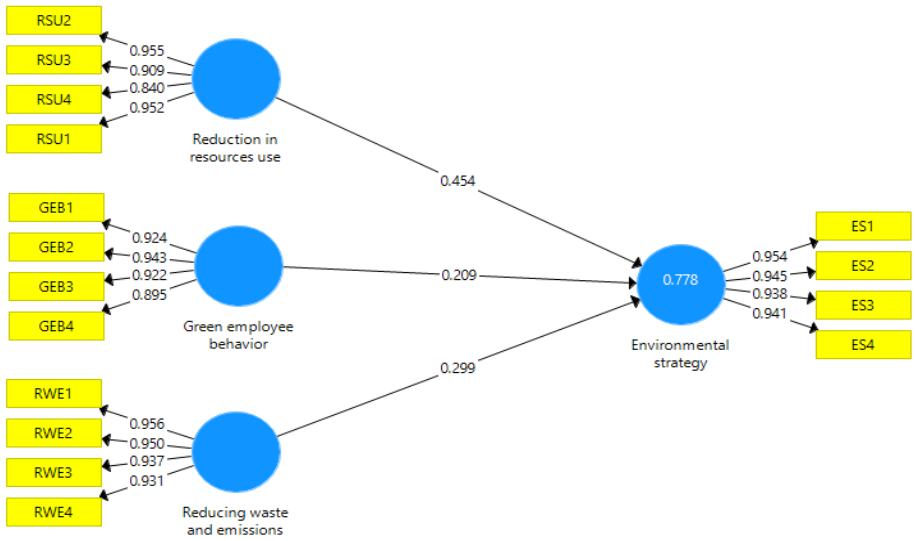
methodology before conducting hypothesis testing. Reliability and validity are critical components of any research study and should be established before conducting the required hypothesis testing. Reliability refers to the consistency and stability of the measurement instrument or method used in data collection. Validity referred to the accuracy and truthfulness of the measurement instrument or method used in data collection (Clark & Watson, 2019).

Both Cronbach's alpha and Composite Reliability can be used to assess the reliability of a research study, and researchers may choose to report both measures in their analysis. However, it is important to note that reliability is just one aspect of data quality, and researchers should also establish the validity and accuracy of the said measurement instrument or method before conducting hypothesis testing. A Cronbach's alpha and Composite Reliability of 0.70 or higher are generally considered acceptable for most research studies, although higher values are preferable (Hair et al., 2021). For present research study all the values are greater than 0.70. Cronbach's alpha and Composite Reliability values are given in Table 1 and Figure 2:

Average Variance Extracted (AVE) is a commonly used measure of construct validity in structural equation modelling (SEM). An AVE value of 0.50 or higher is often considered acceptable for construct validity, although this can vary depending on the research context and the number of items in the scale (Hanafiah, 2020). At the present, all the values are greater than 0.50. Average Variance Extracted values are given inn Table 1 and Figure 2:

**Figure 2**

*Fitness of Model*




## Hypotheses Testing

### Reduction in Resources

This study aimed to explore the relationship between the reduction in the usage of resources and the environmental performance of manufacturing companies in Sindh, Pakistan. To do so, the researchers examined how reduction in resources the independent variable impacted the environmental performance the dependent variable. After conducting the analysis, the results showed that there was a statistically significant and positive relationship between reduction in resources and the environmental performance. This was demonstrated by a beta value of 0.455 and a T-value of 4.911 which exceeded the recommended threshold of 1.96.

Based on these findings, the alternative hypothesis (H1) was supported, while the null hypothesis was rejected.

## Green Employee Behavior

This study aimed to explore the relationship between green employee behavior and the environmental performance in manufacturing companies of Sindh, Pakistan. To do so, the researchers examined how green employee behavior the independent variable impacted the environmental performance the dependent variable. After conducting the analysis, the results showed that there was a statistically significant and positive relationship between green employee behavior and the environmental performance. This was demonstrated by a beta value of 0.209 and a T-value of 4.779 which exceeded the recommended threshold of 1.96. Based on these findings, the alternative hypothesis (H2) was supported, while the null hypothesis was rejected.

## Reducing Waste and Emissions

This study aimed to explore the relationship between reducing waste and emissions and the environmental performance in manufacturing companies of Sindh, Pakistan. To do so, the researchers examined how reducing waste and emissions the independent variable impacted the environmental performance the dependent variable. After conducting the analysis, the results showed that there was a statistically significant and positive relationship between reducing waste and emissions and environmental performance. This was demonstrated by a beta value of 0.298 and a T-value of 3.808 which exceeded the recommended threshold of 1.96. Based on these findings, the alternative hypothesis (H3) was supported, while the null hypothesis was rejected.

Table 2

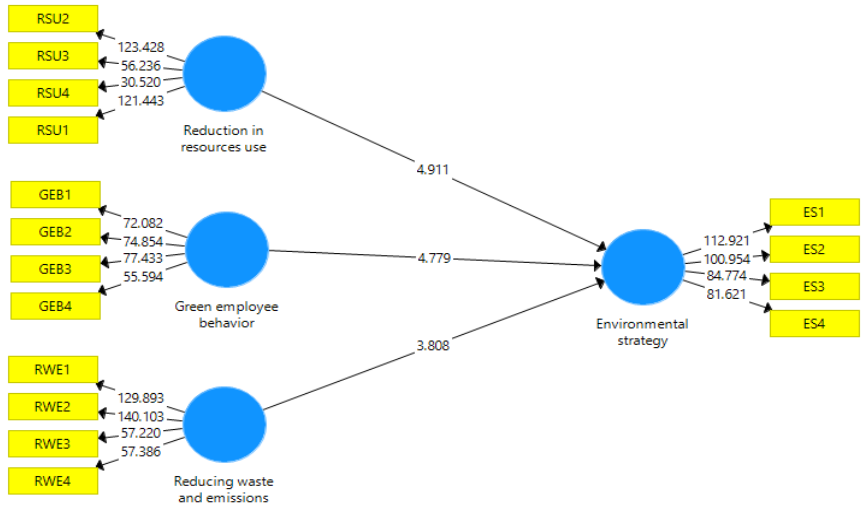
*Multiple Regression Analysis*

| Independent variables | Value of Beta | T-Value | Remarks |
|---|---|---|---|
| Reduction in resources | 0.455 | 4.911 | Supported |
| Green Employee Behavior | 0.209 | 4.779 | Supported |
| Reducing waste and emissions | 0.298 | 3.808 | Supported |

*Dependent variable: Environmental Strategy*

**Figure 3**

*Multiple Regression Analysis*



## Discussion on Results

This approach recognizes the importance of environmental sustainability in business strategy and performance. By adopting these practices, firms can reduce their impact on the environment even though correspondingly improving their financial outcomes. According to Hart (1995), stakeholder integration is a crucial resource in the (NRBV) model. This highlights the importance of stakeholder management in developing a firm's competitive advantage can be achieved with the help of effective use of its limited resources. However, stakeholder management can also be challenging, as firms may face conflicting stakeholder demands and limited resources to address them (Gupta et al., 2020). In addition, resource constraints can pose challenges for firms seeking to implement sustainability strategies, especially in emerging economies or industries with thin profit margins (Cezarino et al., 2021). Therefore, firms need to carefully balance their sustainability goals with their resource limitations to achieve sustainable competitive advantage. This required a strategic approach that prioritizes sustainability activities that are most aligned with the firm's core competencies and stakeholder's expectations while also leveraging available resources effectively (Asiaei et al., 2022; Stahl et al., 2020)

Firms facing low operating profits and debt repayment challenges may seek cost savings by waste and emission outputs and reducing their resource use (Jensen & Whitfield 2022). This approach aligns with the four-group conceptualization of environmental practices proposed by Hart (1995), which includes reducing resource use, waste, and emissions as one of the key environmental practices. By reducing their resource consumption and waste generation, firms can lower their operational costs and improve their environmental performance (Roscoe et al., 2019). However, this cost-saving approach may have limitations, as it could lead to reduced production efficiency and quality, which can negatively affect customer satisfaction and overall profitability (Aljohani, 2023). Additionally, firms may face challenges in implementing these practices due to a lack of technical expertise or the necessary investment in new technology and equipment (Akpan et al., 2022; Salmenperä et al., 2021). Therefore, firms need to carefully weighes the costs and benefits of reducing resource use and waste and emission outputs and consider other potential strategies, such as innovation and product differentiation, to improve their financial performance while also promoting environmental sustainability (Yang et al., 2020).

## Concluding Remarks and Practical implications

This study has highlighted the importance of reduction of waste and emissions, reduction of resource use and green employee behavior in promoting environmental strategy in manufacturing companies of Sindh, Pakistan. The findings suggest that these variables have a positive and significant impact on environmental strategy, indicating that they can be valuable tools for promoting sustainable practices in the manufacturing sector. These results have practical implications for manufacturing companies, as they suggest that top management should prioritize the development of effective strategies to promote reduction of waste and emissions, green employee behavior and reduction of resource use. This could involve investing in new technology, training and development programs, and initiatives to promote employee engagement and participation in environmental sustainability efforts. It is through the adoption of a strategic approach that prioritizes these variables, manufacturing companies can achieve a sustainable competitive advantage while also promoting environmental sustainability. Overall, this study provides valuable insights for manufacturing companies seeking to improve their environmental performance and contribute to a more sustainable future.

One potential limitation of this study is its focus on manufacturing companies, which may

limit the generalizability of its findings to other sectors or industries. Moreover, the study did not examine the potential trade-offs or synergies between different environmental practices, which could provide additional insights into the most effective strategies for promoting environmental sustainability in manufacturing companies. In future, the mediation effect can be checked, such as environmental education and environmental certification so on in developing countries such as Pakistan. Lastly, future research is needed to confirm and extend these findings and explore the broader contextual factors that influence environmental sustainability in different industries and sectors.

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