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Green Innovation: Driving Sustainable Performance in Yogyakarta's Hospitality Industry

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Abstract

This research employs a quantitative approach with a descriptive design to analyze relationships among variables in the hospitality industry of Yogyakarta. The study investigates three independent variables—Environmental Regulations, Management Commitment, and Resource Capabilities—alongside one dependent variable, Sustainable Performance, and one mediating variable, Green Innovation. Utilizing non-probability and purposive sampling methods, data were gathered from hospitality businesses in Yogyakarta. Analysis techniques included descriptive statistics, outer model evaluation for validity and reliability, and inner model assessment through Structural Equation Modelling (SEM) based on Partial Least Squares (PLS). Findings reveal significant positive impacts of environmental regulations, management commitment, and resource capabilities on green innovation, which subsequently enhances sustainable performance. The results suggest that stringent regulations and strong management support effectively drive green innovation, leading to improved sustainability outcomes. The study recommends that local governments strengthen environmental regulations and that hospitality firms implement training programs to foster further green initiatives.

Keywords: green innovation, environmental regulations, management commitment, resource capabilities, sustainable performance

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INTRODUCTION

The hospitality industry is a service sector company that has a close relationship with resource use. The growth of the hospitality industry increases resource consumption, which has a direct impact on the environment. Therefore, strategies are needed to maintain environmental balance. One such strategy is green innovation, which enables businesses to operate while keeping the environment in mind. This green innovation will ultimately contribute to sustainable performance.

Sustainable Performance in the hospitality industry means integrating eco-friendly practices into hotel operations to reduce negative environmental and social impacts and provide benefits to local communities. In Yogyakarta, many large hotels have implemented policies such as renewable energy, waste management, and plastic reduction. However, small and medium-sized hotels often lag behind due to limited resources, suggesting a disparity in the implementation of sustainability practices in this sector that needs to be further explored.

Green Innovation has been recognized as a new business model that meets the growing demand for quality and sustainable products, which are notoriously justified to protect the environment. The hotel industry carries out its activities in a global market, which is characterized by high dynamics and uncertainty (Pereira-Moliner et al., 2021). Therefore, green hotel practices are indispensable to assist hotel managers in developing and implementing green practices and strategies (Dang-Van et al., 2023).

Green innovation focuses on minimizing environmental damage, including saving energy, recycling waste, eliminating carbon emissions, utilizing sustainable resources, and preventing pollution (Lestari & Sunyoto, 2023). Many hotels have considered incorporating green practices, including strategic actions and activities that reduce or eliminate the negative environmental impact of their business (Dang-Van et al., 2023).

Green hotel practices not only represent various green initiatives and activities but also indicate the level of green innovation in green hotel products and services (Suki et al., 2023). Green practices also bring several benefits and values to consumers (Assaker et al., 2020; Moise et al., 2021). Implementing green innovations is the right strategy because environmental regulations are getting stricter. This strategy is supported by public awareness of environmental sustainability, so that consumers switch to safe products and cause higher demand for environmentally friendly products (Lestari & Sunyoto, 2023). That way this strategy is not only profitable for the company but can also help in terms of protecting the environment and increasing value for consumers.

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Green innovation includes hardware or software innovations that support energy saving, pollution prevention, waste recycling, eco-friendly product design, and corporate environmental management. This approach aims to reduce negative impacts on nature. Companies pioneering green innovation can improve production efficiency, product value, and corporate reputation, ultimately offsetting the cost of investing in sustainability and resulting in better performance and profitability. More and more companies are realizing the importance of green innovation to deal with external environmental pressures to support sustainable development (Zhang & Zhu, 2019).

Sustainable performance is seen as closely related to corporate social responsibility where organizations integrate social and environmental concerns of stakeholders into their activities. The three indicators of sustainable performance, namely economic, social, and environmental, produce a chain effect leading to win-win solutions to sustainability challenges. Researchers have considered effective integration of the three indicators as a competitive advantage (Iqbal et al., 2021).

With increasing environmental concerns and resource constraints, scholars have focused heavily on green innovation in the last decade. Green capabilities and green supply practices strongly influence green innovation. In addition to the findings mentioned above, which help business excellence, several other potential factors can complement business sustainability more significantly (Suki et al., 2023).

Research conducted by (Lestari & Sunyoto, 2023) examined the small and medium industrial sector in Malang, East Java. In this study, the results show that environmental regulations have no significant impact on green innovation, while research conducted by Kesidou & Wu (2020) states that strict environmental regulations will be more significant to green innovation.

THEORETICAL

Resource-Based Theory (RBV)

The resource-based view (RBV) emphasizes that a firm's unique assets become a source of sustainable competitive advantage, especially through superior activities related to transaction-cost theory and property rights (Giustiziero et al., 2023). RBV also suggests that value theory helps economic actors recognize unique opportunities in competitive markets (Wuebker et al., 2023). RBV emphasizes the importance of financial resources as central to a firm's competitive advantage.

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Green Innovation

Green innovation encourages companies to adjust operations and build new systems, utilizing and developing new capabilities (Zhang & Zhu, 2019). The goal is to reduce pollution through new products, services and processes that reduce environmental impact, while becoming a major driver of long-term socio-economic growth (Suki et al., 2023). Indicators of green innovation include improving service quality, using environmentally friendly tools and recycling waste.

Environmental Regulation

Regulations in the public and private sectors encourage organizations to align economic performance with social and environmental aspects to meet sustainability challenges, so compliance with these regulations is important for sustainable development goals (Iqbal et al., 2021). These requirements influence environmental management, where responsive companies commit to good management practices (Bhatia & Jakhar, 2021). Based on institutional theory, green innovation requires compliance with environmental regulations for legitimacy and access to green resources (Wang & Juo, 2021). Indicators of environmental regulation are strict government regulations, resource-saving regulations and regulations that limit the consumption of hazardous materials.

Management Commitment

Top management commitment is a crucial factor in implementing sustainability practices, as without such support, efforts can be ineffective (Wijethilake & Lama, 2019). This level of commitment influences sustainability risk management, including strategy setting, resource allocation and implementation of risk management practices. While there has been research on sustainability risk implementation, there has been limited attention to the impact of sustainability core values and the influence of top management commitment and stakeholder pressure (Wijethilake & Lama, 2019). Indicators on management commitment are management has a clear environmental policy, management invests in sustainable practices and management realizes the importance of sustainable practices.

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Resources and Capabilities

Resources and capabilities are important for improving competitiveness and business performance. Competitive advantage comes from utilizing resources, both tangible (machinery, financial reserves) and intangible (knowledge, skills), that support green innovation practices (Lestari & Sunyoto, 2023).

Organizations need to develop human resources through training to build capabilities according to sustainability principles and achieve competitive advantage. In addition, it is important to create a collaborative culture between top management and employees in supporting product and process innovation (Suki et al., 2023). Indicators in resources and capabilities are financial resources, human resource competencies and technological capabilities.

Sustainable Performance

Sustainable performance is related to corporate social responsibility, where organizations integrate social and environmental concerns. The three main indicators-economic, social, and environmental-create win-win solutions and are considered a competitive advantage (Iqbal et al., 2021). Sustainable development theory encourages the application of environmental concepts in production to protect the welfare of future generations and improve resource efficiency. Sustainable performance consists of two aspects: environmental performance that focuses on preservation and economic performance that reflects changes in the company's annual return (Budi & Sundiman, 2021; Saudi et al., 2019). Indicators of sustainable performance are economic performance, social performance, and environmental performance.

Conceptual Framework

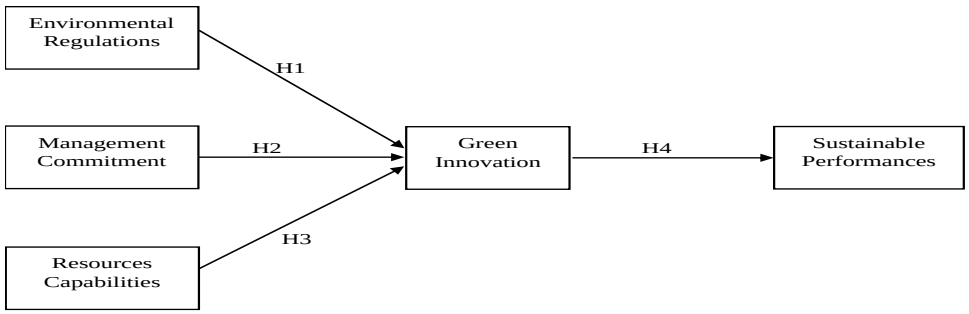


Figure 1. Conceptual Framework

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Hypothesis development

Effect of Environmental Regulations on Green Innovation

Environmental regulations support the development of green products through the regulation of materials, management of hazardous substances, and recycling. This encourages raw material efficiency and green innovation (Yu et al., 2022). Companies that do not comply risk legal sanctions and loss of operating licenses (Qiu et al., 2020). Thus, environmental regulations are important for driving innovation and improving environmental performance (Graafland & Bovenberg, 2020; Xin et al., 2020).

Effect of Management Commitment on Green Innovation

Organizational support is critical to the success of green innovation, especially through management involvement. Companies that care about the environment tend to implement green practices. Management needs to change organizational values and culture, and commit to hazardous waste reduction. Cooperation, effective communication, and creativity from top management are also important to motivate employees and increase innovation (Ojo & Fauzi, 2020).

The Effect of Resources and Capability on Green Innovation

Resources and capabilities are essential for green innovation. Companies need to strengthen intangible (knowledge, skills, technology) and tangible (finance, machinery, buildings) resources for green practices (Lestari & Sunyoto, 2023). Strong resources support the implementation of these practices, whereas financial constraints and unforeseen demand can hinder green innovation (Zhang & Zhu, 2019).

The Effect of Green Innovation on Sustainable Performance

Large companies are now shifting from a focus on financial performance to sustainable performance goals, which include economic, environmental, and social dimensions. The practice of green innovation is triggered by economic and social pressures, which support business sustainability and people's welfare (Fernando et al., 2019). Strategies to improve sustainability performance include green innovation, quality improvement, cost reduction, and brand image enhancement (Giustiziero et al., 2023). Green innovation includes product and process innovations that reduce energy use, pollution, and waste, and utilize sustainable resources (Budi & Sundiman, 2021).

THEORETICAL

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This research uses a quantitative approach with a descriptive design to analyze the relationship between variables. The focus of the research is to test hypotheses related to three independent variables: Environmental Regulations, Management Commitment, and Resources Capabilities, as well as one dependent variable, Sustainable Performance, and one mediating variable, Green Innovation. The research population is the entire hotel industry in the Special Region of Yogyakarta, with a non-probability sampling method and purposive sampling to select elements that meet certain criteria.

Data analysis techniques in this study include descriptive analysis, outer model test, and inner model test. Descriptive analysis is used to describe and summarize data without making further conclusions, including respondent and variable characteristics (Hair et al., 2022).

The outer model test aims to evaluate the validity and reliability of the constructs in the path analysis model. The validity test ensures that the measuring instrument reflects the intended construct, using convergent validity and average variance extracted. The reliability test measures the consistency and stability of the measuring instrument, with good reliability showing consistent results. The reliability test in this study uses composite reliability and Cronbach's alpha (Hair et al., 2022). The inner model test aims to evaluate the relationship between constructs in the Partial Least Square (PLS) based Structural Equation Model (SEM). This test includes R-square, Q-square, SRMR, and PLS predict to assess the fit and predictive power of the model, and test hypotheses with a significance level of 5% (Hair et al., 2022).

RESULT

Data Description

The respondents consisted of 67 men (54.5%) and 56 women (45.5%). Based on position, respondents were divided into three groups: front office (80 people), managers (18 people), and supervisors (25 people).

This study divides the variables into dependent and independent. The dependent variables include green innovation (Y1) and sustainable performance (Y2), while the independent variables consist of environmental regulation (X1), management commitment (X2), and resource capabilities (X3). A total of 101 respondents (82.11%) rated the company's green innovation highly, indicating a strong commitment to sustainability. For sustainable performance (Y2), 109 respondents (88.62%) rated the

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company's sustainable performance as also very high, reflecting the alignment between business growth and social responsibility.

For environmental regulation (X1), 83 respondents (67.48%) rated the company's environmental regulation very high, reflecting good compliance. In terms of management commitment (X2), 101 respondents (82.11%) rated management commitment as very high, showing dedication to sustainable practices. As for resource capabilities (X3), 100 respondents (81.30%) rated the company's resource capabilities as very high, indicating optimal resource management. Overall, respondents' assessments reflect a strong commitment to sustainability and the ability to face challenges in the hospitality sector.

Outer model - Validity test

The validity test in this study uses convergent validity and average variance extracted. Convergent validity is measured through factor loading on latent variables and their indicators, with an expected value of > 0.7 (Hair et al., 2022). The results of the convergent validity analysis can be seen in the table and graph as follows:

Table 1 Results of Factor Loading Analysis

Value	ER	GI	MC	RC	SP	Description
ER1	0.834					Valid
ER2	0.844					Valid
ER3	0.939					Valid
ER4	0.832					Valid
GI1		0.894				Valid
GI2		0.866				Valid
GI3		0.852				Valid
GI4		0.735				Valid
MC1			0.926			Valid
MC2			0.908			Valid
MC3			0.855			Valid
MC4			0.863			Valid
RC1				0.864		Valid
RC2				0.852		Valid
RC3				0.788		Valid

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RC4				0.897		Valid
SP1					0.952	Valid
SP2					0.882	Valid
SP3					0.900	Valid

In addition to convergent validity, this study also uses average variance extracted (AVE) to measure validity. AVE is a measure that evaluates the convergent validity of constructs in the measurement model, with an expected value above 0.5 (Hair et al., 2022). The results of the AVE analysis can be seen in the following table:

Table 2 Average variance extracted (AVE) value

Variable	AVE
ER (X1)	0.746
GI (Y1)	0.704
MC (X2)	0.789
RC (X3)	0.725
SP (Y2)	0.831

Based on the table above, it can be seen that all research variables have values above 0.500. This value indicates that this research is valid.

Outer model - Reliability test

Reliability measurement is carried out using Cronbach's alpha (α) and composite reliability. A construct is considered reliable if the α value is more than 0.7 (Hair et al., 2022). Composite reliability assesses the internal consistency of constructs measured by several indicators, provided that the composite reliability value is more than 0.6 (Hair et al., 2022). The measurement results can be seen as follows:

Table 3 Reliability test

Variable	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)
ER (X1)	0.885	0.893	0.921
GI (Y1)	0.858	0.860	0.904

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MC (X2)	0.911	0.912	0.937
RC (X3)	0.873	0.880	0.913
SP (Y2)	0.898	0.905	0.937

Based on the table, the Cronbach's alpha (α) value for variable X1 is 0.885, X2 0.911, X3 0.873, Y1 0.858, and Y2 0.898, indicating excellent reliability. A composite reliability value above 0.80 indicates high reliability, and the items in the variable show good internal consistency, meaning that the indicators measure the same construct consistently.

Inner model – R Square

The R square value shows the variation in endogenous variables that can be explained by the independent variables in the model. According to R square, it is categorized as large if> 0.75, medium if> 0.50, and low if> 0.25. The R square value obtained is as follows:

Table 4 R-Square

Variable	R-square	R-square adjusted
GI (Y1)	0.872	0.868
SP (Y2)	0.613	0.609

Based on the table, the R square value for variable Y1 is 0.872, indicating a large influence. This means that 87.2% of the variation in Y1 can be explained by the relevant independent variables, indicating that the model has a very strong predictive ability, with only 12.8% of the variation unexplained. The R square value for variable Y2 is 0.613, indicating a medium influence. This means that 61.3% of the variation in Y2 can be explained by the independent variables, with a fairly good predictive power of the model, although 38.7% of the variation remains unexplained. Overall, the model for Y1 is more effective than Y2 in explaining the variability of the data. This result suggests that the independent variables are better able to predict Y1 than Y2.

Inner model – SRMR

According to (Yamin, 2021), SRMR reflects the difference between the correlation matrix of the measured data and the estimated model. Hair et al. (2022) state that SRMR

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below 0.08 indicates a good model fit. However, according to Schermelleh et al. (2003), the SRMR value between 0.08 to 0.10 is still considered acceptable. The SRMR results in this study are as follows:

Table 5 SRMR Results

	Saturated model	*Estimated model*
SRMR	0.094	0.099
d_ULS	1.693	1.872
d_G	1.462	1.504
Chi-square	880.290	904.542
NFI	0.687	0.678

Based on the table, the saturated model value was recorded at 0.094 and the estimated model at 0.099. These values indicate that the model fits, as it is within the range of 0.08 to 0.10. This result indicates that the structure and relationship between variables in the model can represent the observed data well.

Inner model – Q Square

Q-square is used as a validity indicator in PLS to assess the predictive accuracy of the model. A Q-square value equal to 0 indicates low influence, 0.25 indicates moderate influence, and 0.50 indicates high influence (Hair Jr. et al., 2021). The following are the Q-square results:

Table 6 Q-Square Results

Variable	Q^2predict	RMSE	MAE
GI (Y1)	0.863	0.391	0.300
SP (Y2)	0.598	0.674	0.395

Based on the table, the Q^2 predict value for variable Y1 is 0.863, indicating excellent predictive ability, with approximately 86.3% of Y1 variation explained by the independent variables. Meanwhile, the Q^2 predict for Y2 is 0.598, indicating a fairly good predictive ability, where approximately 59.8% of Y2 variation can be predicted. Overall,

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these results indicate that the model is able to explain variations in both variables with different levels of accuracy.

Inner model – PLS Predict

PLS predict is used as a form of validation to measure the predictive power of PLS. The results of PLS predict are as follows:

Table 7 PLS Predict Results

	Q^2prediction	PLS-SEM_RMSE	PLS-SEM_MAE	LM_RMSE	LM_MAE
GI1	0.669	0.507	0.484	0.505	0.447
GI2	0.526	0.554	0.516	0.568	0.527
GI3	0.610	0.532	0.492	0.563	0.512
GI4	0.559	0.487	0.403	0.505	0.408
SP1	0.514	0.404	0.325	0.426	0.324
SP2	0.496	0.394	0.306	0.422	0.320
SP3	0.407	0.398	0.315	0.424	0.322

Based on the table, most measurement items have lower RMSE and MAE values, so the PLS model is considered to have moderate predictive power. This indicates that the model is quite reliable in estimating the relationship between variables.

Inner model - Bootstrapping and partial test

The bootstrapping results are as follows:

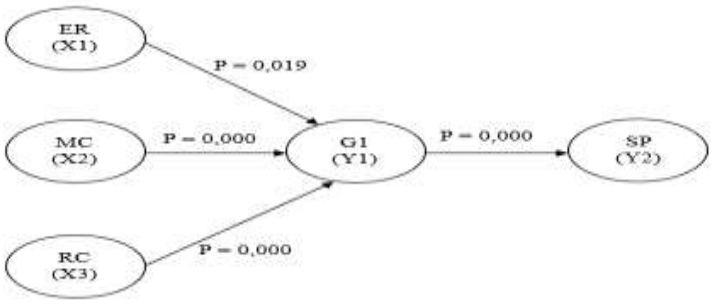


Figure 2 Estimate model

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Based on boostrapping, the researcher concludes in tabular form with the following results:

Table 8 PLS Predict Results

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
ER -> GI	-0.125	-0.113	0.060	2.099	0.019
MC -> GI	0.539	0.546	0.079	6.851	0.000
RC -> GI	0.520	0.503	0.094	5.518	0.000
GI -> SP	0.744	0.742	0.085	8.727	0.000

The results of testing the first hypothesis show a positive and significant effect of environmental regulations on green innovation, with a p-value of 0.019, which is smaller than 0.05. This means that strict environmental regulations encourage hotel companies in the Special Region of Yogyakarta to adopt environmentally friendly innovations.

The results of testing the second hypothesis show a positive and significant effect of management commitment on green innovation, with a p-value of 0.000, which is far below 0.05. This confirms that management commitment contributes significantly to the increase in green innovation, encouraging hospitality companies to implement more environmentally friendly policies and practices.

The results of testing the third hypothesis show that resources and capability have a positive and significant influence on green innovation, with a p-value of 0.000, which is below 0.05. This indicates that the stronger the resources and capabilities of hospitality companies, the greater their ability to develop innovations that support environmental sustainability.

Testing the fourth hypothesis shows a positive and significant effect of green innovation on sustainable performance, with a p-value of 0.000, which means this hypothesis is accepted. These results indicate that the application of green innovation contributes significantly to the sustainable performance of hospitality companies in the Special Region of Yogyakarta.

DISCUSSION

Environmental regulations are government rules that protect the environment and public health, encouraging organizations to align economic performance with

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environmental and social aspects. Compliance with regulations is important for sustainable development. The results of the analysis show that these regulations have a significant effect on green innovation, encouraging hospitality companies in the Special Region of Yogyakarta to develop environmentally friendly solutions.

Management commitment is essential to drive green innovation. The analysis shows a positive and significant effect of management commitment in hospitality companies. Top management support in green practices provides strategic signals, so companies are more likely to allocate resources for sustainability and empower employees in green innovation programs.

Resources and capabilities are important factors in managing corporate resources to achieve superior performance. The analysis shows their significant influence on green innovation. Financial resources enable investment in green technologies, while employee competencies and technological capabilities support sustainable innovation. This is in line with the Resource-Based View (RBV) theory that emphasizes the importance of internal resources and capabilities in enhancing the competitiveness of the firm.

Green innovation has a positive and significant effect on sustainable performance, improving product quality with local and environmentally friendly raw materials, and encouraging efficient recycling. It helps companies reduce operating costs, enhance reputation, and strengthen social responsibility, supporting long-term growth and increasing public trust.

CONCLUSION

Based on the analysis, it can be concluded that environmental regulation, management commitment, and resources and capabilities have a positive and significant effect on green innovation in hospitality companies in the Special Region of Yogyakarta. In addition, green innovation is also important in improving sustainable performance. The findings suggest that these aspects are interrelated in encouraging firms to adopt environmentally friendly practices.

It is recommended that local governments strengthen and expand environmental regulations and provide incentives for firms that implement green innovation practices. This will create an environment conducive to innovation and meeting sustainability standards. Stricter regulations are expected to encourage companies to adapt and develop green solutions, benefiting both companies and society.

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Hospitality companies are advised to conduct training programs on green innovation for management and employees, to strengthen commitment and increase participation in sustainability initiatives. In addition, investment in resources that support green innovation needs to be increased to be ready for the challenges of sustainable practices. Future research is expected to explore other variables that influence green innovation and sustainable performance, such as consumer perceptions.

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