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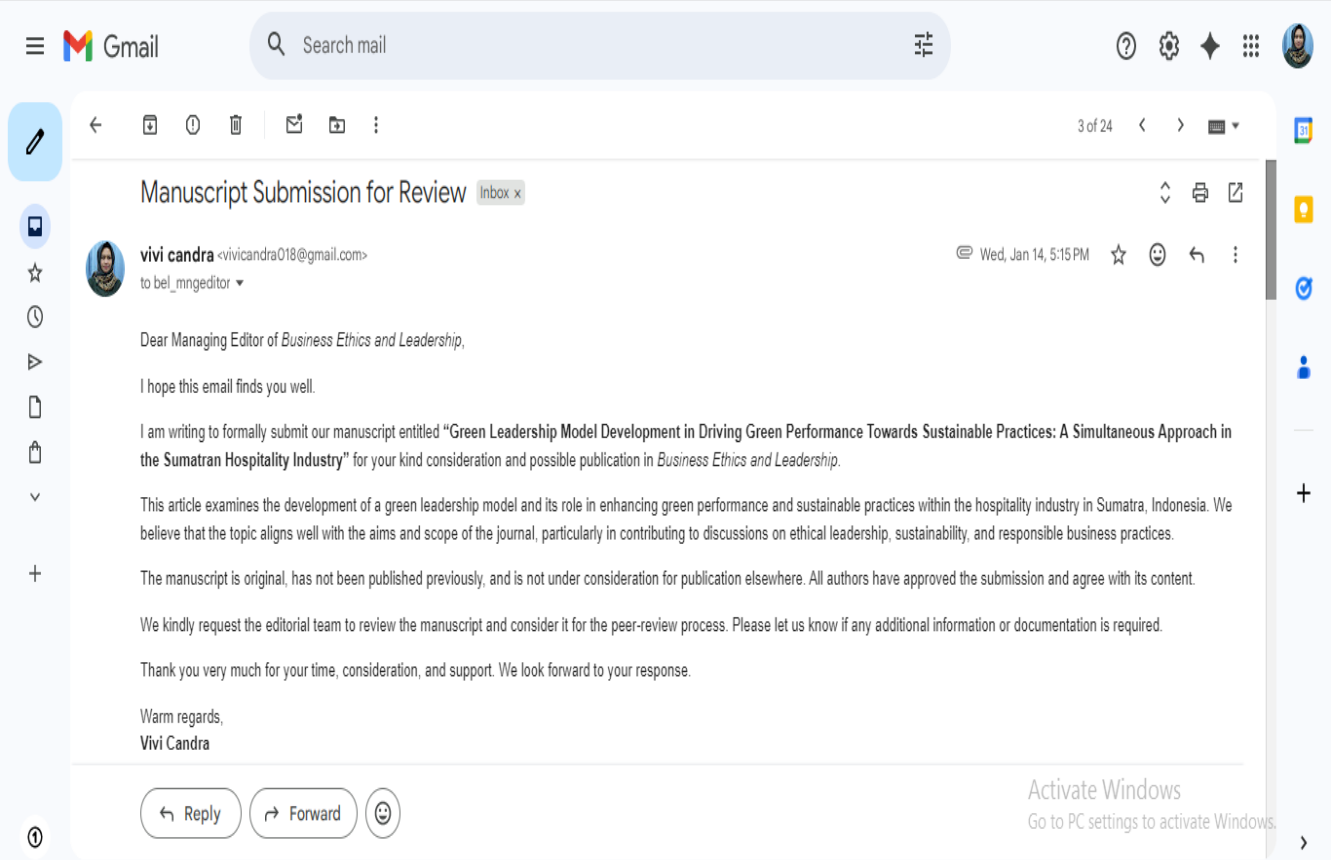


# Green Leadership Model Development in Driving Green Performance Towards Sustainable Practices: A Simultaneous Approach in the Sumatran Hospitality Industry

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**Abstract:** Global climate change and increasing pressure on sustainability have driven the hospitality industry to adopt environmentally friendly business practices. However, the implementation of green performance in this sector, particularly in developing regions, still faces structural, managerial, and human resource limitations. This study aims to develop and test a simultaneous model that explains the influence of green leadership, green intellectual capital, and green commitment on green performance within the hospitality industry in North Sumatra. This study uses a quantitative approach with data analysis using Structural Equation Modelling based on Partial Least Squares (PLS-SEM). Data were collected through a survey of 170 respondents from various hotels in the Lake Toba Samosir tourist area and Simalungun Regency. The analysis results indicate that green leadership, green intellectual capital, and green commitment have a positive and statistically significant impact on green performance. Among the three variables, green intellectual capital has the most dominant influence, followed by green leadership and green commitment. These findings confirm that improving environmental performance depends not only on technical policies but also on the synergy between sustainability-oriented leadership, green knowledge, innovation capacity, and consistent organizational commitment. The primary contribution of this research lies in the development of an integrative model that expands the sustainability literature in the service sector, particularly the hospitality industry. Practically, the research findings provide strategic implications for hotel management in designing more holistic sustainability policies and practices to enhance organizational competitiveness and environmental resilience.

**Keywords:** green leadership, green intellectual capital, green commitment, green performance
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## INTRODUCTION

Global climate change and environmental degradation have become strategic issues driving major transformations in business practices across sectors, including the hospitality industry (Akpa et al., 2022; Hashish et al., 2022). A United Nations World Tourism Organization (UNWTO) report indicates that the tourism sector accounts for approximately 8% of global carbon emissions, with the hospitality industry contributing significantly through energy and water consumption and waste production (UNWTO, 2016). In line with the 2030 Sustainable Development Goals (SDGs), particularly goals 12 and 13, the hospitality industry is required to adopt sustainable practices to minimize environmental impacts while maintaining long-term competitiveness (Zeng et al., 2023; Sobaih et al., 2022). Furthermore, at the national level, Indonesia faces serious challenges in environmental management in the tourism sector. The Ministry of tourism and creative economy reported that hotel energy consumption in major tourist destinations increased by an average of 6–8% per year following the pandemic, as the tourism sector recovered (Kemenparekraf RI, 2014). This situation reinforces the urgency of systematically implementing green practices, not only through environmentally friendly technologies but also through sustainability-oriented managerial and human resource approaches (Luu, 2020; Indajang et al., 2024).

In the context of North Sumatra, particularly in strategic tourism areas like Lake Toba, the growth of the hotel industry has been accompanied by increasing pressure on local ecosystems. The Indonesian Central Statistics Agency (2020) reports a considerable growth in hotels and room occupancy rates in this area, which affects water, electricity, and trash management. Green performance strategies have not been incorporated into many hotels' leadership systems or organizational cultures (Nisar et al., 2021; Alsetoohy, 2022; Riva, 2021). Leadership's limited role in implementing sustainability ideals is a major hotel business concern. Green leadership is a policy director and change agent that shapes pro-environmental visions, norms, and behaviors in a company (He et al., 2021; Kim, 2022). Research indicates that green-oriented executives significantly impact environmental innovation and corporate green performance (Özgül & Zehir, 2023). Many hotel executives still value short-term profits above long-term sustainability.

Besides leadership, another challenge lies in the limited availability of green intellectual capital, which encompasses employees' knowledge, skills, and environmental awareness. Empirical studies confirm that green intellectual capital is an intangible asset that determines the successful implementation of sustainability strategies (Shah et al., 2021; Chao & Juo, 2021). In the North Sumatran hotel industry, investment in developing employees' green competencies remains relatively low, hampering the optimization of green performance. Another issue relates to organizational green commitment. Environmental commitment reflects management's commitment to allocating resources, setting standards, and ensuring the consistency of green policies. Previous research has shown that green commitment has a significant impact on energy efficiency, waste reduction, and green innovation (Haldorai et al., 2022). However, many hotels still consider green practices as a response to external pressures, rather than as a core organizational value.

The transformation towards sustainable practices has become a strategic agenda in the global hospitality industry, given the sector's significant contribution to energy consumption, water use, and waste production. Numerous studies confirm that improving organizational green performance is strongly influenced by managerial factors and organizational behavior, not solely by the adoption of green technologies (Riva et al., 2021; Suliman et al., 2023). However, despite increasing attention to sustainability issues, the implementation of green practices in the hospitality industry, particularly in developing countries, still faces various structural and resource constraints. Previous literature has extensively examined the role of green leadership in driving organizational environmental performance. Leaders with a green orientation have been shown to influence employees' pro-environmental attitudes, motivations, and behaviors (Özgül & Zehir, 2023). However, most studies consider green leadership as a single predictor or examine it separately from other internal organizational factors. This partial approach limits our understanding of how green leadership interacts with organizational resources and commitment to generate sustainable green performance.

In addition to leadership, green intellectual capital is also recognized as a crucial determinant in improving environmental performance. Green intellectual capital, encompassing knowledge, skills, and environmentally friendly innovation, has been shown to contribute to resource efficiency and green innovation (Shah et al., 2021; Wang & Juo, 2021). However, most studies still position green intellectual capital as a mediating variable or are tested in the context of the manufacturing sector and SMEs. Therefore, empirical evidence in the hospitality industry, particularly in developing tourism regions, remains limited. On the other hand, organizational green commitment has been studied as a factor that strengthens the consistency of environmental policy implementation. Research indicates that management's commitment to sustainability has a positive influence on environmental performance and employee green behaviour (Haldorai et al., 2022; Khan et al., 2022). However, empirical findings regarding the strength of green commitment's influence still show varying results and are rarely analyzed simultaneously alongside green leadership and green intellectual capital within an integrated model framework.

There is a lack of research on the topic, thus it is crucial to create a model that can explain how these three strategic factors interact to drive green performance towards sustainable practices all at once. Since the success of sustainable practices is not determined by a single element but rather by the synergy of leadership, intellectual capital, and organizational commitment, it is considered that a simultaneous approach would give a more thorough understanding than a fragmented approach. This description will be used to design and evaluate a model of green leadership, green intellectual capital, and green commitment in the North Sumatran hotel business, with the goal of pushing green performance towards sustainable practices. Improving green performance in the North Sumatran hotel business may be achieved by enhancing our knowledge of all three aspects at once. This research aims to do just that. This study is critical because it will provide the groundwork for the hotel sector to create a comprehensive sustainability plan. This may boost the company's reputation and help it compete in a market where consumers are placing a higher value on eco-friendly products and services.

## LITERATURE REVIEW

### Theoretical Framework

In recent years, research on green performance has experienced a paradigm shift toward a perspective that emphasizes behavior, leadership, and intangible resources. Within the framework of the resource-based view (RBV) and dynamic capabilities theory, sustainability within an organization is crucial, built on hard-to-imitate internal assets, environmentally oriented leadership, green intellectual capital, and organizational commitment to sustainability (Sobaih et al., 2020; Asadi et al., 2020; Saleem et al., 2025). Within the organizational structural hierarchy, sustainability issues are crucial to understand and implement in every policy as a form of organizational commitment to supporting sustainability issues (Pham et al., 2023; Han et al., 2019). Green leadership is an extension of transformational leadership theory in the context of sustainability, where leaders play a role in shaping environmentally friendly visions, values, and strategic orientations (Kim, 2022; Suliman et al., 2023). From the RBV perspective, green intellectual capital is positioned as a strategic asset encompassing

employee knowledge, competence, innovation, and environmental awareness. This capital functions as a cognitive infrastructure that enables organizations to translate sustainability visions into operational practices (Martínez-Falcó et al., 2023; Chao & Juo, 2021). However, its direct contribution to green performance in the service sector, particularly in the hospitality industry of developing regions, remains underdeveloped. Meanwhile, green commitment represents the internalization of sustainability values into organizational policies and practices. Although proven to strengthen the consistency of environmental strategies, previous research remains fragmented (Elzek et al., 2021; Sabellah et al., 2025). Therefore, the main theoretical gap lies in the lack of integrative models that simultaneously examine green leadership, green intellectual capital, and green commitment. This study proposes a conceptual framework that positions these three constructs as direct, mutually reinforcing determinants of green performance, particularly in the context of the North Sumatran hotel industry.

**Green Leadership and Green Performance**

Green leadership is characterised by leaders who prioritise environmental concerns, integrate sustainability into decision-making processes, and inspire employees to adopt environmentally friendly behaviours (Shah et al., 2023; Luu, 2020; Liu et al., 2023). Several studies have shown that green leadership positively influences green performance, which encompasses aspects such as energy efficiency, waste reduction, and the adoption of environmentally friendly technologies (Perez et al., 2023; Özgül & Zehir, 2023; Riva et al., 2021). Studies Suliman et al. (2023), Ullah et al. (2023), Hidayati et al. (2024), and Saleem et al. (2025), emphasize the importance of a green leadership style that empowers employees to innovate and initiate environmentally sustainable initiatives. In addition, organizational support and commitment to sustainability goals significantly influence green performance outcomes (Úbeda-García et al., 2021; Sobaih et al., 2022). Researchers have highlighted the need for leaders to demonstrate proactivity, vision, and commitment to environmental responsibility to drive green performance within their organizations effectively (Kim, 2022; Perez et al., 2023; Asadi et al., 2020).

Furthermore, several recent studies have demonstrated that green transformational leadership enhances environmental performance at both the individual and organizational levels by promoting green innovation, resource efficiency, and pro-environmental employee behaviour (Riva et al., 2021; Özgül & Zehir, 2023). However, findings across studies are not entirely consistent in explaining the magnitude and stability of these effects. In some contexts, the effects of green leadership appear relatively direct when green leadership is institutionalized within organizational strategy and supported by incentive systems and environmental performance controls; while in other contexts, the effects are predominantly indirect through psychological and social mechanisms such as green work engagement, green creativity, and an organizational climate supportive of environmental practices (Sobaih et al., 2022; Suliman et al., 2023; Balwant et al., 2020). A significant research gap exists in the service sector, particularly in the hospitality industry of developing regions, where green performance is strongly influenced by the intensity of energy and water use, service characteristics, and pressure from destination stakeholders. Therefore, based on the results of several previous studies, we develop the following hypothesis:

**H1:** Green leadership management influences green performance

**Green Intellectual Capital and Green Performance**

Green intellectual capital (GIC) is a concept that refers to the knowledge, skills, and capabilities of individuals or organizations in the context of environmental sustainability (Yadiati et al., 2019; Sohu et al., 2024; Khan et al., 2021). Research Chawewong & Naipinit (2024), Renaldo & Augustine (2022), Haldorai et al. (2022), shows that the adoption of green intellectual capital positively influences green performance in various ways, such as increasing the efficiency of natural resource use, reducing negative environmental impacts, and creating environmentally friendly product and process innovations. Factors such as environmental awareness, knowledge of sustainable practices, and the ability to implement environmentally friendly solutions are key in linking green intellectual capital with green performance (Nisar et al., 2021; Shah et al., 2021; Tjahjadi et al., 2023). Furthermore, some literature emphasizes the need for investment in the development of sustainable intellectual capital, both through training and education, and through an organizational culture that supports sustainability initiatives (Marco-Lajara et al., 2022; Chao & Juo, 2021).

Several cross-sector studies have found that organizations with high levels of GIC tend to demonstrate better energy efficiency, consistent waste reduction, and superior green innovation capabilities (Anik & Sulistyo, 2021; Shah et al., 2021; Augustinah et al., 2022). However, a synthesis of these findings reveals significant variation in the effects. Some studies report a direct effect of GIC on green performance, particularly when environmental knowledge is internalized in operational routines and management systems (Sohu et al., 2024; Yadiati et al., 2019). Conversely, other studies confirm that the effect of GIC is predominantly indirect through mechanisms such as green innovation, green human resource management, or pro-environmental employee

behavior, indicating that green intellectual capital requires institutional channels to generate measurable environmental performance (Rustiarini et al., 2022; Anik & Sulistyo, 2021; Chao & Juo, 2021). A significant research gap exists in the lack of contextual studies in developing regions that examine the direct contribution of GIC to green performance, considering the operational complexity of the service sector. Therefore, based on several previous studies, the following hypotheses are developed:

**H2:** Green intellectual capital influences green performance

**Green Commitment and Green Performance**

Green commitment encompasses an organization's commitment to adopt and practice environmentally friendly behaviours and to achieve sustainability goals (Zhang & Walton, 2017; Basana et al., 2022; Khan et al., 2022). Studies Sharma et al. (2021), Iftikhar et al. (2021), and Mushtaq et al. (2019), demonstrate that the level of green commitment has a positive influence on green performance in various ways, including reducing waste and emissions, increasing resource efficiency, and developing more environmentally friendly innovations. Factors influencing green commitment include sustainability-oriented leadership, a supportive organizational culture, and pressure from external stakeholders (Somjai et al., 2020; Elshaer et al., 2022; Ahmad et al., 2023). Studies Riva et al. (2021) and Sabellah et al. (2025), also highlight the importance of transparently measuring and reporting environmental performance as a means to strengthen green commitment and motivate behavioral change.

However, cross-study synthesis reveals differing findings regarding its impact mechanisms. Some studies find a direct effect of GIC on green performance, particularly when green knowledge and competencies are institutionalized in organizational systems, procedures, and work routines (Shah et al., 2021; Migdadi, 2023). Conversely, other studies confirm that the influence of GIC is predominantly indirect through green innovation, green human resource management, or employee pro-environmental behavior, suggesting that green intellectual capital requires institutional mechanisms to generate measurable environmental performance (Nisar et al., 2021; Haldorai et al., 2022; Úbeda-García et al., 2021). These differences in results are also influenced by the industry context and the level of organizational maturity; empirical evidence is relatively strong in the manufacturing and SME sectors, while in the service sector, particularly the hospitality industry, results are still limited and inconsistent (Renaldo & Augustine, 2022; Sohu et al., 2024). A prominent research gap lies in the lack of contextual studies in developing regions that examine the direct contribution of GIC to green performance, as well as the limited separate analysis of GIC dimensions to identify the most important components. Therefore, based on several previous studies, the following hypotheses are developed:

**H3:** Green commitment influences green performance

## METHODOLOGY

### Research Design

This study uses a library and field research design with a quantitative approach. The approach used is a simultaneous approach that considers the interaction between these three factors within a single analytical framework. The research location is the hotel industry in the tourist attraction of Lake Toba, located in Samosir and Simalungun Regency, North Sumatra. This tourist attraction was selected because it has significant potential in the hotel industry and is a key destination in the context of North Sumatra tourism. The presence of hotels around Lake Toba, Samosir, and Simalungun Regency offers variations in size, class, and business model, allowing for a more comprehensive analysis of the influence of green leadership models, green intellectual capital, and green commitment on green performance.

### Sample and Data Collection

The population of this study comprises entrepreneurs and employees from all hotels operating in the Lake Toba Samosir tourist attraction, North Sumatra. This tourist attraction was chosen because it serves as a major hub of tourism activity in the region. The research sample will be selected purposively from this population, taking into account variations in hotel size, class, and business model. Inclusion criteria for sample selection include the existence of policies or practices related to environmental sustainability, as well as the availability of relevant data for analysis. According to Hair et al. (2019), if the population size is unknown, the sample size can be determined from 5-10 times the number of indicators used in a single construct. This study utilizes 17 indicators from four existing variable dimensions, resulting in a total of $17 \times 10 = 170$ research samples. The explanation of the characteristics of the respondents in this study is explained in the following table:

**Table 1:** Descriptions of Research Respondents

| Category | Detail | Amount | Percentage (%) |
|---|---|---|---|
| Gender | Men | 106 | 62.35 |
| | Woman | 64 | 37.65 |
| Age (years) | < 25 | 22 | 12.94 |
| | 26 - 35 | 48 | 28.23 |
| | 36 - 45 | 70 | 41.18 |
| | 46 - 55 | 20 | 11.75 |
| | > 55 | 10 | 5.88 |
| Level of education | SENIOR HIGH SCHOOL | 85 | 50 |
| | Diploma | 35 | 20.59 |
| | Bachelor | 45 | 26.47 |
| | Masters | 5 | 2.94 |
| Length of Service (years) | < 1 | 22 | 12.94 |
| | 1 - 5 | 58 | 34.12 |
| | 6 - 10 | 60 | 35.29 |
| | > 10 | 30 | 17.65 |
| Title/Position | Operations Manager | 19 | 11.18 |
| | General Manager | 10 | 5.88 |
| | Supervivi | 31 | 18.24 |
| | Front Office | 40 | 23.54 |
| | Executive Staff | 20 | 11.76 |
| | Employee | 50 | 29.4 |

Source: data processing results (2025)

According to the data in Table 1, the demographic characteristics of the respondents in this study are categorized into several primary categories, including gender, age, education level, length of service, and job title or position. Based on gender, the majority of respondents were male, comprising 106 people (62.35%), while female respondents numbered 64 (37.65%), indicating a predominance of male participation in the study. In terms of age, the largest group of respondents was in the 36–45 years age range, with a total of 70 people (41.18%), followed by the 26–35 years age group, with 48 people (28.23%). Respondents aged under 25 years numbered 22 people (12.94%), while the 46–55 years and above 55 years age groups each comprised 20 people (11.75%) and 10 people (5.88%), indicating that most respondents fell within the productive age range with relatively mature work experience.

In terms of educational level, the majority of respondents had a high school education background, with 85 people (50%), followed by Bachelor's graduates (45 people, 26.47%) and Diploma graduates (35 people, 20.59%). Meanwhile, respondents with a Master's degree were relatively few, namely 5 people (2.94%). Based on the length of service, respondents with 6–10 years of service were the largest group, comprising a total of 60 people (35.29%), followed by respondents with 1–5 years of service, who totaled 58 people (34.12%). Respondents with more than 10 years of work experience numbered 30 people (17.65%), while respondents with less than one year of work experience numbered 22 people (12.94%). In terms of position, the majority of respondents were in the employee category, comprising 50 people (29.4%), followed by front office positions, which included 40 people (23.54%), and supervisors, who numbered 31 people (18.24%). Meanwhile, respondents serving as operational managers and general managers numbered 19 (11.18%) and 10 (5.88%) respectively, while executive staff numbered 20 (11.76%). Overall, this composition indicates that the study respondents came from diverse demographic backgrounds and job positions, thus comprehensively representing the research population.

**Measurement Instruments**

Operational definitions of research variables are developed to provide conceptual clarity and empirical guidance in the measurement process for each variable studied. These definitions aim to translate abstract theoretical concepts into indicators that can be systematically observed and measured. With operational definitions, each research variable has clear boundaries regarding its meaning, dimensions, and measurement methods, thereby reducing the potential for differences in interpretation during both the data collection and analysis stages. Furthermore, operational definitions play a crucial role in ensuring the consistency, validity, and

reliability of research instruments, as well as ensuring that the measurements taken truly represent the intended constructs in accordance with the research's conceptual framework.

**Table 2:** Operational Definition of Research Variables

| Variables | Code | Item | Source |
|---|---|---|---|
| ***Green Leadership*** | GL1 | *Sustainable Vision and Mission* | (Perez et al., 2023; Suliman et al., 2023) |
| | GL2 | *Ability to Inspire and Motivate* | |
| | GL3 | *Skills and Knowledge Development* | |
| | GL4 | *Involvement in Sustainable Initiatives* | |
| ***Green Intellectual Capital*** | GIC1 | *Knowledge of Sustainable Practices* | (Sohu et al., 2024; Chawewong & Naipinit, 2024) |
| | GIC2 | *Implementation of Sustainable Practices* | |
| | GIC3 | *Innovation and Creativity* | |
| | GIC4 | *Personal Awareness and Commitment* | |
| ***Green Commitment*** | GC1 | *Leadership and Management Commitment* | (Basana et al., 2022; Iftikhar et al., 2021) |
| | GC2 | *Investments and Resources* | |
| | GC3 | *Sustainability Policies and Standards* | |
| | GC4 | *Participation in External Initiatives* | |
| ***Green Performance*** | GP1 | *Energy Efficiency* | (Pham et al., 2023; Han et al., 2019) |
| | GP2 | *Waste Management* | |
| | GP3 | *Water Conservation* | |
| | GP4 | *Use of Environmentally Friendly Materials* | |
| | GP5 | *Green Education and Awareness* | |

Source: constructed by the authors using prior research (2025)

Operational definitions of the research variables were developed to provide conceptual clarity and empirical guidance in measuring each construct. Green leadership is defined as a leader's ability to direct, influence, and inspire organizational members to integrate sustainability principles into their vision and work practices. This variable is measured through indicators of sustainable vision and mission (GL1), ability to inspire and motivate (GL2), skills and knowledge development (GL3), and involvement in sustainable initiatives (GL4). Green intellectual capital is defined as the accumulation of knowledge, skills, creativity, and environmental awareness of individuals and organizations as strategic assets in supporting green performance. Measurements include knowledge of sustainable practices (GIC1), implementation of sustainable practices (GIC2), innovation and creativity (GIC3), and personal awareness and commitment (GIC4). Green commitment is defined as the level of seriousness and consistency with which an organization internalizes sustainability values into its policies, resource allocation, and managerial practices. This variable is measured through leadership and management commitment (GC1), investments and resources (GC2), sustainability policies and standards (GC3), and participation in external initiatives (GC4). Meanwhile, green performance refers to the level of achievement of an organization in managing environmental impacts effectively and sustainably, which is measured through energy efficiency (GP1), waste management (GP2), water conservation (GP3), use of environmentally friendly materials (GP4), and green education and awareness (GP5).

**Conceptual Framework**

Green leadership, green intellectual capital, and green commitment are the primary factors that determine green performance in the hospitality business. This study conceptual framework aims to explain the causal link between these three variables. An organization's environmental performance is seen in this research as the outcome of exploiting internal assets that are intangible and difficult to mimic. This perspective is based on the resource-based view and dynamic capacities theory. By setting an example of environmentally conscious conduct and providing opportunities for staff to take initiative, "green leadership" may influence an organization's long-term goals and objectives in a positive way. The capacity to effectively implement the organization's sustainability goal is made possible by green intellectual capital, which serves as a cognitive and inventive facilitator by offering green knowledge, skills, and creativity. Green commitment, on the other hand, is an institutional system that makes sure that green practices are consistently and sustainably implemented by integrating sustainability ideals into policies, resource allocation, and operational standards. Green performance is defined here as an improvement in areas such as energy efficiency, water conservation, waste management, and environmental education and awareness. This improvement is believed to be the result of a direct and complementary influence from these three constructs. By examining all three factors at once, we may learn more about the interplay between leadership, intellectual capital, and organizational commitment as they pertain to the

hotel industry's pursuit of sustainability. Therefore, Figure 1 below shows the conceptual framework model that was applied in this study:

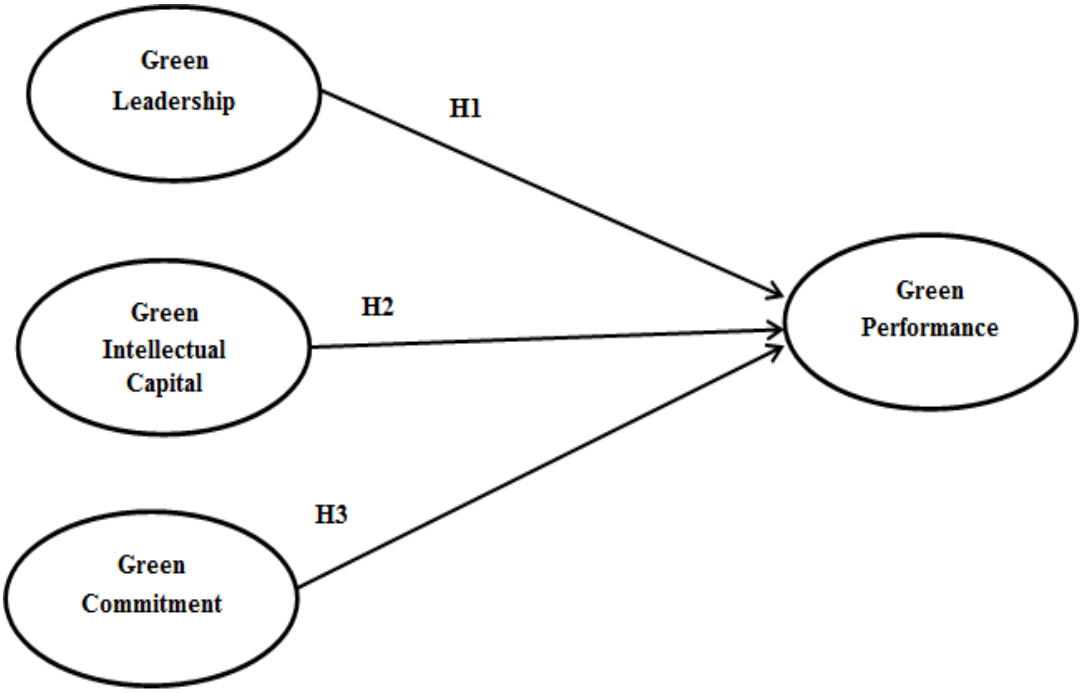


**Figure 1** Research Framework Model
Source: constructed by the authors using prior research (2025)

Figure 1: Research Framework Model illustrates the conceptual relationship between the main variables tested in this study, namely green leadership, green intellectual capital, and green commitment, as independent variables that influence green performance, the dependent variable. The model shows that improving an organization's environmental performance is not influenced by a single factor, but rather is the result of a synergy between sustainability-oriented leadership, green knowledge and innovation capacity, and the organization's institutional commitment to environmentally friendly practices. The direction of the arrows in the model represents the hypothesized direct causal relationship, where green leadership acts as a strategic driver in shaping pro-environmental vision and behavior, green intellectual capital functions as a cognitive and innovative enabler that allows the translation of the sustainability vision into operational practices, and green commitment acts as a normative and structural mechanism that ensures consistent implementation of green practices. Thus, Figure 1 confirms the simultaneous approach used in this study, namely that green performance is achieved through the complementary interaction between leadership, intellectual capital, and organizational commitment, particularly in the context of the hospitality industry that faces high sustainability demands and ecological pressures.

**Data Analysis**

The primary analytical approach used in this work was Partial Least Squares-Structural Equation Modelling (PLS-SEM) using SmartPLS software. For models with reflecting measurement indicators in particular, PLS-SEM's strong predictive orientation and capacity to concurrently investigate complicated causal interactions among latent variables made it an ideal choice. There were two primary steps to the analytical procedure. Following the procedures outlined by Hair et al. (2019), the validity and reliability of the research equipment were first checked by evaluating the measurement model, also known as the outer model. Tests for construct reliability included Cronbach's alpha and composite reliability indicators, while tests for convergent validity included analyzing outer loading values and Average Variance Extracted (AVE). To further ensure that each concept was empirically different from others, the Fornell-Larcker criteria was used to test discriminant validity. We moved on to the structural model (the inner model) after making sure the measurement model was up to scratch. At this point, we looked at the coefficient of determination ($R^2$) to see how well the predicted correlations between latent variables explained the data, and we measured the effect size ($f^2$) to see how much of an impact each predictor had. A thorough and reliable assessment of the suggested research model was achieved by conducting hypothesis testing using a bootstrapping approach to provide path coefficients, t-values, and p-values.

## RESULTS

### Measurement Model Assessment

Following standard analytical methods, the results from the questionnaire were evaluated using SmartPLS version 3.2.9. Validity and reliability tests were administered to the measurement model, which is also known as the outer model. By looking at factor loadings and the Average Variance Extracted (AVE), we were able to determine that the construct validity was sufficient; all indicator loadings were higher than the suggested threshold of 0.7, and the AVE values were higher than 0.5. There was also an evaluation of construct reliability via the use of composite reliability (CR) and Cronbach's alpha. Both indicators provide satisfactory internal consistency with values over 0.7, as stated by Hair et al. (2019). The reliability and validity of the measuring equipment for further structural model analysis may be shown by their fulfillment of these requirements. Referring to Table 3 and Figure 2, the findings of the validity and reliability evaluations are shown in detail.

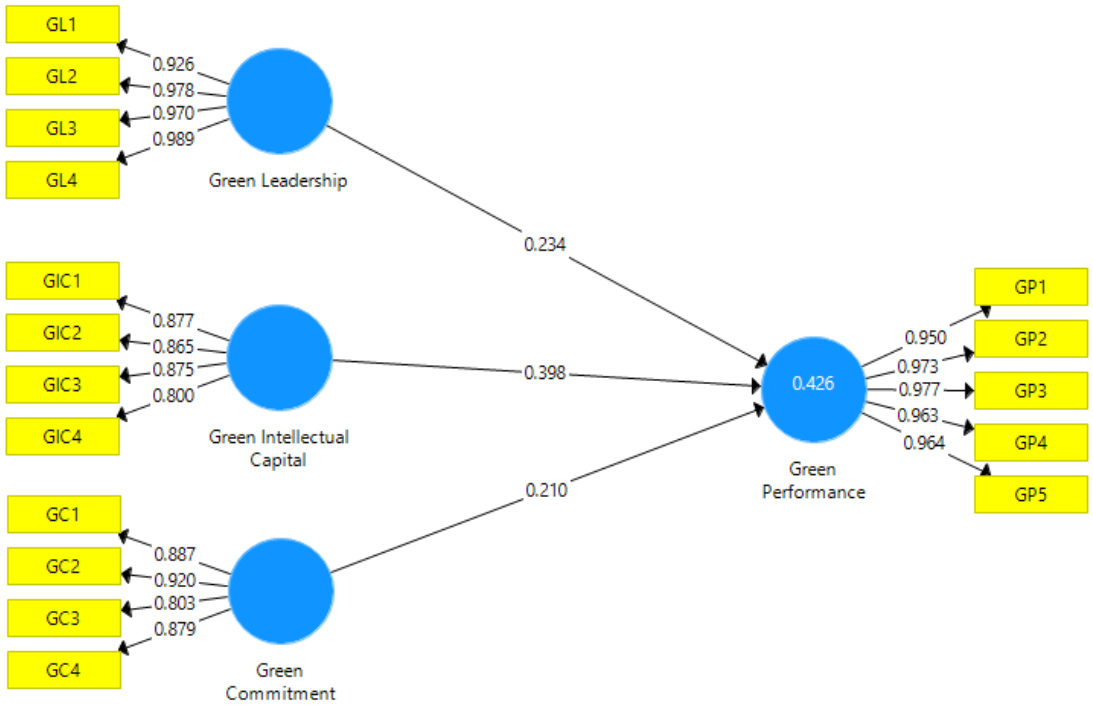


**Figure 2** Measurement model analysis

**Table 3:** Measurement Model Analysis

| Construct/item | Code | Outer Loadings | Cronbach's alpha | CR | AVE |
|---|---|---|---|---|---|
| **Green Leadership** | | | 0.976 | 0.982 | 0.933 |
| Sustainable Vision and Mission | GL1 | 0.926 | | | |
| Ability to Inspire and Motivate | GL2 | 0.978 | | | |
| Skills and Knowledge Development | GL3 | 0.970 | | | |
| Involvement in Sustainable Initiatives | GL4 | 0.989 | | | |
| **Green Intellectual Capital** | | | 0.877 | 0.916 | 0.731 |
| Knowledge of Sustainable Practices | GIC1 | 0.877 | | | |
| Implementation of Sustainable Practices | GIC2 | 0.865 | | | |
| Innovation and Creativity | GIC3 | 0.875 | | | |
| Personal Awareness and Commitment | GIC4 | 0.800 | | | |
| **Green Commitment** | | | 0.896 | 0.928 | 0.763 |
| Leadership and Management Commitment | GC1 | 0.887 | | | |
| Investments and Resources | GC2 | 0.920 | | | |
| Sustainability Policies and Standards | GC3 | 0.803 | | | |
| Participation in External Initiatives | GC4 | 0.879 | | | |
| **Green Performance** | | | 0.982 | 0.986 | 0.932 |
| Energy Efficiency | GP1 | 0.950 | | | |
| Waste Management | GP2 | 0.973 | | | |
| Water Conservation | GP3 | 0.977 | | | |

| | | | | | |
|---|---|---|---|---|---|
| Use of Environmentally Friendly Materials | GP4 | 0.963 | | | |
| Green Education and Awareness | GP5 | 0.964 | | | |

Source: Analysis results from SmartPLS software (2025)

The analysis results show that the four constructs have excellent reliability and validity. Green Leadership recorded a CR value of 0.982 and an AVE of 0.933, with all indicators having outer loadings above 0.92, indicating a strong contribution from each indicator. Green Intellectual Capital was also reliable (CR 0.916; AVE 0.731), supported by adequate indicators despite their greater variation. Furthermore, Green Commitment showed high consistency (CR 0.928; AVE 0.763), reflecting the organization's solid commitment to sustainable practices. Meanwhile, Green Performance obtained a CR value of 0.986 and an AVE of 0.932, which was reinforced by very high outer loadings on all indicators, confirming that the organization's environmental performance falls into the very strong category.

**Table 4:** Discriminant Validity: Fornell-larcker Criterion

| | Green Commitment | Green Intellectual Capital | Green Leadership | Green Performance |
|---|---|---|---|---|
| Green Commitment | 0.873 | | | |
| Green Intellectual Capital | 0.277 | 0.855 | | |
| Green Leadership | 0.176 | 0.563 | 0.966 | |
| Green Performance | 0.361 | 0.588 | 0.495 | 0.965 |

Source: Analysis results from SmartPLS software (2025)

All of the model's constructs show sufficient uniqueness, according to the discriminant validity evaluation using the Fornell-Larcker criteria. To be more precise, the square root of each construct's Average Variance Extracted (AVE) is higher than its correlations with other constructs, indicating that each variable represents a distinct idea. With a score of 0.873, green commitment outperforms its relationships with other factors. Also, the related inter-construct correlations are lower than the values shown by green intellectual capital (0.855), green leadership (0.966), and green performance (0.965). Based on these findings, it is clear that the measurement model meets the criteria for discriminant validity. The validity of the ensuing hypothesis testing is supported by the structural model analysis, which is resilient and credible since each construct may be evaluated individually without major overlap with other constructs.

**Inner Model Measurement**

Examining the proposed research model's structural links among latent variables is done via the inner model assessment in the SEM-PLS framework. The coefficient of determination ($R^2$), which shows how much variation in endogenous variables is explained by exogenous variables, is one of the main indicators that are examined in this evaluation. Also, the relative amount of impact exerted by each predictor construct is determined by analyzing the effect size ($f^2$). Additionally, the assessment includes calculating path coefficients and determining if they are statistically significant using a bootstrapping technique. This procedure gives us t-values and p-values, which we can use to see how strong the links are between the various constructs. Taken as a whole, these metrics reveal how well the model predicts outcomes and how sturdy its structure is. According to Sarstedt et al. (2020), values of 0.19 for $R^2$ imply poor explanatory power, 0.33 for moderate explanatory power, and 0.67 for good explanatory power. Ghozali (2014) provided evidence in support of this claim by stressing that a $R^2$ value more than 0.67 indicates a robust association between exogenous and endogenous variables, suggesting a structural model that is well-suited for testing hypotheses.

**Table 5:** Coefficient of Determination Result R2

| Notes | R-Square | R-Square Adjusted |
|---|---|---|
| Green Performance | 0.426 | 0.416 |

Source: Analysis results from SmartPLS software (2025)

According to Table 5, the Green Performance variable has a $R^2$ value of 0.426 and an adjusted $R^2$ of 0.416, as shown in the coefficient of determination analysis. Based on the results, it seems that the structural

model accounts for about 42.6% of the variation in green performance with the predictor constructs that were considered. The rest of the variation is likely caused by additional characteristics that were not taken into account by the model. The independent factors contribute significantly and moderately strongly to explaining differences in Green Performance, as shown by the moderate explanatory category $R^2$ value. However, this does suggest that other organizational, environmental, or contextual factors may be present; future research might benefit from include them to fully understand the effects of environmental performance.

Also, in the structural model, the impact size of each exogenous construct on the endogenous variable is evaluated using the F-square ($f^2$) analysis in the PLS-SEM framework. Beyond simple statistical significance, this test provides insight into the practical importance of each causal link by measuring the amount each predictor contributes to changes in the $R^2$ value when it is included or deleted from the model. According to Cohen's criteria, an $f^2$ value of 0.02 indicates a small effect, 0.15 indicates a medium effect, and 0.35 indicates a substantial effect (Sarstedt et al., 2020). Therefore, the F-Square test is a crucial instrument for evaluating the relevance and relative contribution of each independent variable in explaining the variability of the dependent construct more comprehensively.

**Table 6:** F-Square Value

| | Green Performance |
|---|---|
| Green Commitment | 0.071 |
| Green Intellectual Capital | 0.180 |
| Green Leadership | 0.065 |

Source: Analysis results from SmartPLS software (2025)

Furthermore, the results of the F-Square analysis show that each predictor variable has a varying effect on Green Performance. Green intellectual capital has the most significant influence, with a value of 0.180, which falls within the small to moderate effect category. Therefore, its contribution to improving green performance is quite substantial. Green commitment has an F-Square value of 0.071, while green leadership shows a value of 0.065, both of which fall within the small effect category, yet still play a role in influencing green performance. This finding confirms that although all variables contribute, green intellectual capital is the most dominant factor in strengthening organizational environmental performance.

**Hypothesis Testing**

In this study, the researchers tested their hypotheses by looking for correlations between the latent constructs that were part of the research framework using the PLS-SEM method (Sarstedt et al., 2020). An evaluation of the statistical significance, direction, and size of the impacts of exogenous factors on endogenous variables concurrently is the goal of this approach. In order to evaluate hypotheses, the testing approach utilized a bootstrapping method to obtain estimates of path coefficients and the accompanying t-values and p-values. When the t-statistic is more than the crucial value and the p-value is less than the preset significance threshold, the hypothesis is said to be supported. By taking sample variability into consideration, this method makes the analysis more robust and gives proof of the validity of the hypothesized associations, which strengthens the credibility of the study's findings and its theoretical implications.

**Table 7:** Hypothesis Test

| Hypothesis | Coefficient | Standard Deviation | t-count | P-Value | Conclusion |
|---|---|---|---|---|---|
| Green Leadership>>Green Performance (H1) | 0.234 | 0.082 | 2,872 | **0.004** | **Accepted** |
| Green Intellectual Capital>>Green Performance (H2) | 0.398 | 0.076 | 5,245 | **0.000** | **Accepted** |
| Green Commitment>>Green Performance (H3) | 0.210 | 0.044 | 4,764 | **0.000** | **Accepted** |

Note: t-count = T-Statistics; p-value = probability value.
Source: Analysis results from SmartPLS software (2025)

According to the findings, all of the study's assumptions are correct and significantly impact green performance in a good way. Leading with a focus on sustainability practices is known as "green leadership," and research shows that it helps organizations do better for the environment. Furthermore, green intellectual capital greatly improves green performance by bolstering an organization's skills in environmentally friendly

knowledge, innovation, and intellectual resource management. In addition, green commitment is essential for making sure that the company's sustainability goals, culture, and values are well-integrated into daily operations. In sum, our results show that eco-friendly practices, environmentally conscious leadership, and long-term planning all contribute to an organization's environmental performance.

## DISCUSSION

The research findings suggest that green leadership plays a crucial role in enhancing the environmental performance of hotels in North Sumatra. This confirms that leadership that instills a vision of sustainability, provides ecological role models, and encourages employee participation can create a work environment conducive to green practices. The mechanism of this influence can be understood through transformational leadership theory, where leaders become the primary drivers of organizational behavioral change through idealized influence and inspirational motivation. When leaders demonstrate a genuine concern for the environment, employees are encouraged to adjust their behaviour and performance in line with sustainability values. These results are consistent with the literature, which indicates that green transformational leadership fosters green creativity, eco-friendly innovation, and pro-environmental behaviour, ultimately leading to enhanced environmental performance (Özgül & Zehir, 2023; Riva et al., 2021). In the context of the North Sumatran hotel industry, green leadership becomes increasingly relevant due to the resource-intensive nature of the industry and the need for cross-functional coordination to implement sustainable practices. Leaders who can integrate environmental policies into the organizational vision not only strengthen employee commitment but also improve operational efficiency through more responsible energy, water, and waste management. Furthermore, green leadership creates a green climate that reinforces internal norms related to environmental awareness. Thus, the mechanism of green leadership's influence on green performance operates through the formation of a pro-environmental organizational culture, increased employee engagement, and the reinforcement of sustainability values as part of the hotel's business strategy. These findings reinforce the argument that shifting toward sustainable practices must begin at the leadership level as the primary driver of organizational transformation.

The research findings confirm that green intellectual capital is a crucial determinant of green performance. Environmentally oriented intellectual capital, encompassing employees' knowledge, skills, creativity, and ecological awareness, serves as the foundation for organizations to generate green innovations and implement sustainable operational practices. Based on the resource-based view, green intellectual capital is a rare and difficult-to-imitate intangible asset, enabling it to provide a competitive advantage in improving environmental performance. This finding aligns with previous research, which confirms that environmental knowledge and innovative capabilities facilitate the implementation of green strategies, such as energy efficiency, water conservation, and waste reduction (Shah et al., 2021; Nisar et al., 2021; Chao & Juo, 2021). At the mechanistic level, green intellectual capital acts as a cognitive enabler, enabling organizations to identify ecological opportunities and develop solutions that align with the environmental dynamics of the hospitality industry. Employees with a deep understanding of sustainable practices tend to be more proactive in finding new ways to minimize environmental impacts. In the context of North Sumatra, a hotel's success in improving green performance is strongly influenced by its internal ability to translate green knowledge into operational actions. The hospitality industry, located in the Lake Toba tourist area, faces special demands for maintaining environmental quality, making green intellectual capital a strategic necessity. Green intellectual capital also enhances the effectiveness of sustainability policies through internal collaboration mechanisms, knowledge transfer, and environmentally oriented innovation. Thus, green intellectual capital not only supports the achievement of environmental performance standards but also builds organizational resilience to the demands of sustainable business.

The finding that green commitment significantly influences green performance underscores the importance of organizational commitment as a foundation for sustainability. Green commitment reflects the willingness of management and employees to prioritize environmental goals, allocate resources, and maintain consistent implementation of green policies. From a social exchange theory perspective, when an organization demonstrates a strong commitment to sustainability, employees respond by increasing their participation in green programs and exhibiting pro-environmental behaviour, which ultimately enhances the company's environmental performance. Previous literature supports this finding, where green commitment has been shown to strengthen green innovation, environmental policy implementation, and resource utilization efficiency (Sharma et al., 2021; Somjai et al., 2020; Zhang & Walton, 2017). This influence mechanism works through strengthening an organizational culture that places sustainability as a core value, as well as the creation of formal structures such as green operational standards, environmental performance evaluation, and transparent reporting. Organizational commitment also reduces resistance to change because employees view sustainability not merely as an external demand but as an integral part of the organization's identity. In the context of the North Sumatran hospitality

industry, green commitment is crucial because this industry operates in areas with high ecological sensitivity such as Lake Toba. Hotels that demonstrate a strong commitment to green practices are better able to maintain environmental quality, reduce their carbon footprint, and meet the expectations of increasingly eco-conscious travelers. A green commitment also ensures the sustainability of green practices through a long-term orientation, rather than just a short-term initiative. Therefore, this variable serves as a driver of consistency and stability in the implementation of sustainability strategies, leading to sustained improvements in green performance.

## CONCLUSIONS

The findings of this study suggest that green leadership, green intellectual capital, and green commitment collectively form a strategic foundation for enhancing the environmental performance of the hospitality industry. The synthesis of the analysis results shows that sustainability-oriented leadership can establish a visionary direction that encourages changes in ecological behaviour at the organizational level, while green intellectual capital provides employees with the cognitive and innovative capacity to translate sustainability values into operational practices. Organizational commitment confirms the consistency of these values in work systems and cultures, thus ensuring that sustainability is not only implemented in policy, but also internalized in action. The main contribution of this study lies in the simultaneous integration of these three variables within a single empirical framework, thereby enriching the literature on green performance in the service sector and providing evidence that structural, psychological, and normative approaches must be considered simultaneously to understand the dynamics of green performance more comprehensively. Thus, the obtained model confirms that building organizational sustainability requires a combination of leadership vision, intellectual capacity, and mutually reinforcing institutional commitment.

Theoretically, this study broadens our understanding of the mechanisms linking green leaders, sustainability-based knowledge, and organizational commitment as determinants of environmental behavior and performance. The integration of variables within a simultaneous framework demonstrates that green intellectual capital not only acts as a knowledge asset but also as a catalyst for the effectiveness of green leadership and commitment in producing organizational change. These findings support the literature emphasizing the importance of intangible assets in improving environmental performance, while also demonstrating that the resource-intensive context of the hospitality industry, heavily influenced by tourists' ecological demands, requires a more adaptive managerial approach. Practically, the results offer relevant implications for hotel management, including the need to strengthen sustainability training, restructure green achievement-based incentive systems, and create an organizational climate that consistently supports green innovation. This approach not only improves operational efficiency but also strengthens hotels' competitive position in the face of regulatory pressures and increasingly green-oriented tourist preferences.

Based on these findings, several recommendations can be put forward to advance sustainability practices in the North Sumatran hospitality industry. First, organizations need to develop more systematic green leadership programs, including competency-based sustainability training and the establishment of internal forums to communicate a green vision continuously. Second, investments in developing green intellectual capital should be directed not only at increasing technical knowledge but also at creating innovation spaces that enable employees to test and implement green solutions in daily operations. Third, organizational commitment should be reinforced through formal policies, transparent green performance reporting mechanisms, and incentives that recognize employees' ecological contributions. For future research, exploring mediation or moderation models, such as the influence of green culture, green technology, or external pressures, could enrich our understanding of the dynamics of environmental performance in the tourism industry context. Furthermore, longitudinal studies have the potential to reveal how changes in sustainability policies and investments affect green performance over the long term, thereby providing a more comprehensive picture of environmental transformation in the hospitality sector.

### Author Contributions

Conceptualization: VC, G. M .PD, MS, WL, HPS; data curation: VC, GMPD, MS, WL, HPS; formal analysis: VC, MS, WL, HPS; investigation: VC, GMPD, MS, WL, HPS; methodology: ED, GMPD, MB, WL, HPS; project administration: ED, MB, WL; supervision: VC, MS, WL: validation: VC, GMPD, MS, WL, HPS; visualization: VC, G. M .PD, MS, WL.; writing – original draft: VC, MS, WL; writing – review & editing: VC, GMPD, MS, WL, HPS

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**Conflicts of Interest**

The authors declare that they have no conflict of interest.

**Data Availability Statement**

The data is available and can be provided on request.

**Informed Consent Statement**

This research received official approval from the Sekolah Tinggi Ilmu Ekonomi Sultan Agung prior to data collection. All respondents participated voluntarily after being explained the research objectives and procedures. The confidentiality of the information collected, including data and interviews with respondents, is guaranteed and will be used solely for academic purposes without disclosing the respondents' personal identities.

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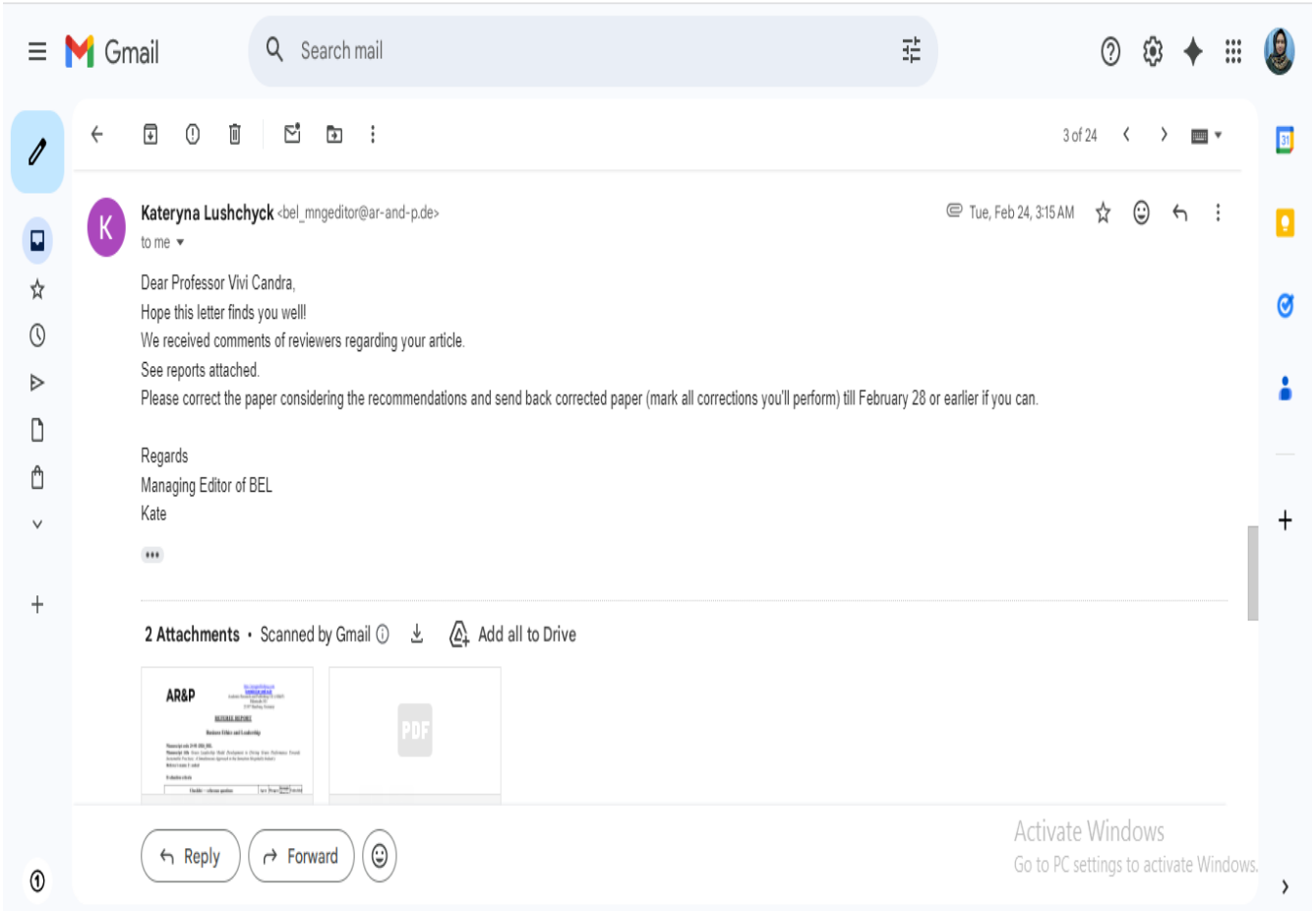
# Bukti konfirmasi review round 1 dan hasil review round 1 (24 Febuari 2026)

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**REFEREE REPORT**

Business Ethics and Leadership

Manuscript code 24-01-2026_BEL

Manuscript title Green Leadership Model Development in Driving Green Performance Towards Sustainable Practices: A Simultaneous Approach in the Sumatran Hospitality Industry

**Referee's name 1: coded**

**Evaluation criteria**

| Checklist — reference questions | Agree | Disagree | Strongly disagree | Undecided |
|---|---|---|---|---|
| Does the manuscript correspond the Journal's scope and key topics? | + | | | |
| Does the title correspond to the content? | + | | | |
| Are the Article's aims (propositions, hypotheses) clearly stated? | + | | | |
| Is the abstract written logically and does it represent the main ideas of the manuscript? | | | | + |
| Does the Author use clear keywords, which do not replicate the title of the manuscript? | + | | | |
| Does the Introduction clearly reflect the relevance of the research? | + | | | |
| Does the Literature review cover relevant academic literature? | + | | | |
| Has the Author adopted adequate research methodology? | + | | | |
| Are the outcomes (conclusions) correct (or do they offer new insights)? | + | | | |
| Are the findings (conclusions) applicable or possible to implement? | | | | + |
| Are the graphical components relevant and laid out properly? | | | | + |
| Are the results properly presented? | + | | | |
| Is the reference list prepared properly? | + | | | |
| Is the research topic valid and up-to-date? | + | | | |
| Does the Manuscript meet all submission guidelines and requirements? | + | | | |
| Does the Article meet established scientific standards? | + | | | |
| Is the Manuscript written in good academic English? | | | | + |
| Is the Manuscript original? | + | | | |
| Does the research have prospects for further study? | + | | | |
| Does the results of the research have practical application? | | | | + |

**Strengths of Article** (add lines if necessary)*:*

The article corresponds to the aims and scope of the journal.

**REQUIRED IMPROVEMENTS (ADD LINES IF NECESSARY):**

In order to attract a wider readership, I'd advise authors to remove references to specific countries from the title of the article. In other words, the title remains the same, but without the word Sumatran.

I'd recommend revising the abstract. The recommended length is 250-300 characters with spaces. The first sentence should be about the relevance of the specific, narrow research topic in relation to the journal's subject matter (i.e., this first sentence should literally use words such as "business leadership" or others that clearly appear in the description of the journal's subject categories). The second sentence should describe the specific gap in the previous literature that this research fills (this second sentence should literally use words such as "business leadership" or others that clearly appear in the description of the journal's thematic sections). The third sentence should describe the purpose of the research. The fourth sentence should describe the data on which the calculations were based. If this article is based on a survey, then in this sentence it is necessary to describe the sample: in what year, in what country, what is the sample size, who specifically are the respondents, and a couple of other parameters that characterize the sample. The fifth sentence is the research methods. If this article is based on a survey, then in this sentence it is necessary to describe the method used to conduct the survey, the statistical methods used to process the survey results, and the software used for this purpose. The sixth, seventh,

and eighth sentences describe the main results and new patterns identified in the research process. Each of these sentences should be very specific, containing a specific result or a new pattern that has been identified. Each sentence should contain a figure (statistical indicator, percentage of respondents who think so, or calculated statistical parameter) that confirms this conclusion. The ninth sentence is the concluding one. It should indicate the prospects for future research and practice that this article opens up for the specific field of knowledge that corresponds to the theme of the journal (this sentence should literally use words such as “business leadership” or others that clearly appear in the description of the journal's thematic sections).

Several more words that clearly correspond to the journal's thematic sections should be added to the keywords. These words should also be used in the abstract, introduction, and conclusions.

I’d recommend rephrasing the sentence “Referring to Table 3 and Figure 2, the findings of the validity and reliability evaluations are shown in detail”.

It is necessary to upload all intermediate calculations and input data from the questionnaire (anonymized) to Zenodo or another repository. And put a link in the Data Availability Statement block

**Recommendations for Publisher:**

a) accept
***b) accept on minor revisions indicated above***
c) accept on major revisions indicated above
d) reject entirely

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Academic Research and Publishing UG (AR&P)

**REFEREE REPORT**

Business Ethics and Leadership

Manuscript code 24-01-2026_BEL

Manuscript title Green Leadership Model Development in Driving Green Performance Towards Sustainable Practices: A Simultaneous Approach in the Sumatran Hospitality Industry

**Referee’s name 2: coded**

**Evaluation criteria**

| Checklist — reference questions | Agree | Disagree | Strongly disagree | Undecided |
|---|---|---|---|---|
| Does the manuscript correspond the Journal's scope and key topics? | + | | | |
| Does the title correspond to the content? | + | | | |
| Are the Article's aims (propositions, hypotheses) clearly stated? | + | | | |
| Is the abstract written logically and does it represent the main ideas of the manuscript? | + | | | |
| Does the Author use clear keywords, which do not replicate the title of the manuscript? | + | | | |
| Does the Introduction clearly reflect the relevance of the research? | | | | + |
| Does the Literature review cover relevant academic literature? | + | | | |
| Has the Author adopted adequate research methodology? | + | | | |
| Are the outcomes (conclusions) correct (or do they offer new insights)? | + | | | |
| Are the findings (conclusions) applicable or possible to implement? | + | | | |
| Are the graphical components relevant and laid out properly? | + | | | |
| Are the results properly presented? | + | | | |
| Is the reference list prepared properly? | + | | | |
| Is the research topic valid and up-to-date? | + | | | |
| Does the Manuscript meet all submission guidelines and requirements? | + | | | |
| Does the Article meet established scientific standards? | + | | | |
| Is the Manuscript written in good academic English? | | | | + |
| Is the Manuscript original? | + | | | |
| Does the research have prospects for further study? | + | | | |
| Does the results of the research have practical application? | | | | + |

***Required improvements (add lines if necessary):***

1. In the Introduction, there is the phrase "This description will be used to design and evaluate a model...." The word 'description' is inappropriate here. It is better to replace it with the word "research."
2. After hypothesis 3 and before the beginning of the Methodology section, at least a couple of sentences should be inserted, because the review looks incomplete.
3. The explanation of the characteristics of the respondents in this study is explained in the following table: Table 1: Descriptions of Research Respondents. This cannot be. A colon is always followed by a numbered or marked list. The last sentence should not have a colon but should contain a reference to the table with its number.
4. Each table and figure in the text should be preceded by a line with a number.
5. The conclusions should contain three main ideas: 1) they should once again dryly describe the most significant new patterns revealed by the study, then necessarily - 2) the limitations of the study and necessarily - 3) what prospects this study opens up for the future. The recommended length of the conclusions is one full page in the journal template.
6. The section on AI should be added

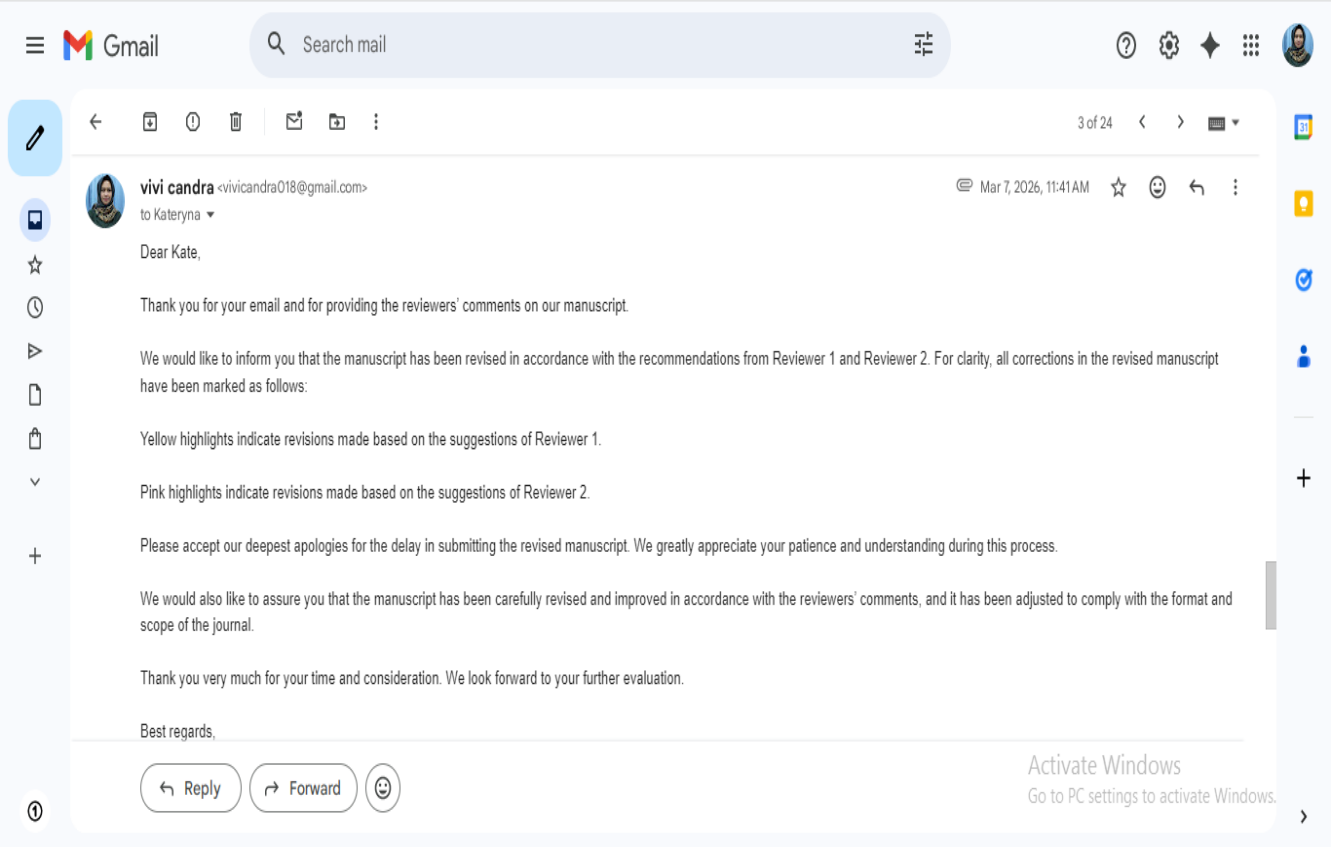
***Statement on the Use of AI Tools***

At AR&P, we believe that full and accurate disclosure of AI usage is essential for the advancement of science and promoting academic integrity. That is why we encourage authors to openly and fully declare how and what generative AI was used. To achieve this, when preparing a manuscript, we ask authors to fill out this section, using the ready-made taxonomies (e.g., https://panbibliotekar.github.io/gaidet-declaration/ or https://stm-assoc.org/new-stm-draft-report-classifying-ai-use-in-manuscript-preparation/) or writing a corresponding statement themselves. If authors adopt the ready-made taxonomy, they should provide in References an appropriate scholarly citation to the source describing it.

***Recommendations for Publisher:***

a) accept
b) ***accept on minor revisions indicated above***
c) accept on major revisions indicated above
d) reject entirely

# Bukti konfirmasi submit revisi pertama, respon kepada reviewer, dan artikel yang diresubmit (07 Maret 2026)




1) **<u>Comments Reviewer 1 to the Author</u>**

| |
|---|
| I'd recommend revising the abstract. The recommended length is 250-300 characters with spaces. The first sentence should be about the relevance of the specific, narrow research topic in relation to the journal's subject matter (i.e., this first sentence should literally use words such as "business leadership" or others that clearly appear in the description of the journal's subject categories). The second sentence should describe the specific gap in the previous literature that this research fills (this second sentence should literally use words such as "business leadership" or others that clearly appear in the description of the journal's thematic sections). The third sentence should describe the purpose of the research. The fourth sentence should describe the data on which the calculations were based. If this article is based on a survey, then in this sentence it is necessary to describe the sample: in what year, in what country, what is the sample size, who specifically are the respondents, and a couple of other parameters that characterize the sample. The fifth sentence is the research methods. If this article is based on a survey, then in this sentence it is necessary to describe the method used to conduct the survey, the statistical methods used to process the survey results, and the software used for this purpose. The sixth, seventh, and eighth sentences describe the main results and new patterns identified in the research process. Each of these sentences should be very specific, containing a specific result or a new pattern that has been identified. Each sentence should contain a figure (statistical indicator, percentage of respondents who think so, or calculated statistical parameter) that confirms this conclusion. The ninth sentence is the concluding one. It should indicate the prospects for future research and practice that this article opens up for the specific field of knowledge that corresponds to the theme of the journal (this sentence should literally use words such as "business leadership" or others that clearly appear in the description of the journal's thematic sections). |

**Response:**

Thank you for the detailed and highly constructive recommendations regarding the abstract structure and content. In response, the abstract has been comprehensively revised to align with the journal's thematic focus and formatting expectations. The revised version now consists of nine logically connected sentences emphasizing business leadership, identifying the research gap, clarifying the research purpose, and presenting detailed information on the sample, methodology, statistical techniques, and software used. Furthermore, the main findings are presented through specific quantitative indicators and newly identified patterns, while the concluding sentence highlights future research and practical implications within the field of business leadership and related journal themes..

With the rising need for sustainability, good business leadership is now more important than ever for developing trust in the workplace and getting the hospitality sector to do better for the environment. However, previous research in the field of business leadership has primarily analyzed environmental performance through discrete variables, neglecting the interplay between green leadership, green intellectual capital, and green commitment in enhancing sustainable outcomes, especially in developing regions. This study aims to develop and test a simultaneous model that explains the influence of green leadership, green intellectual capital, and green commitment on green performance within the hospitality industry in North Sumatra. Data were gathered in 2025 via a survey administered in Indonesia, including 170 workers from hotels situated in the Lake Toba Samosir tourism region and Simalungun Regency, comprising both operational and management personnel within the hospitality industry. The survey included structured questions, and the results were analyzed with Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS software. The findings demonstrate that green leadership has a positive and substantial influence on green performance ($\beta = 0.234$, $p < 0.004$), indicating that sustainability-focused leadership practices enhance environmental performance in hospitality firms. Green intellectual capital significantly impacts green performance ($\beta = 0.398$, $p < 0.000$), indicating that environmental knowledge, innovation aptitude, and green organizational learning are crucial in enhancing sustainability results. The commitment to environmental sustainability substantially influences green performance ($\beta = 0.210$, $p < 0.00$), validating that persistent organizational devotion enhances the efficacy of environmental activities. These results provide new avenues for future study and managerial practice in business leadership, specifically in the integration of leadership, knowledge resources, and organizational commitment to enhance sustainable performance in the hospitality industry.

2) **Comments Reviewer 1 to the Author**

| |
|---|
| Several more words that clearly correspond to the journal's thematic sections should be added to the keywords. These words should also be used in the abstract, introduction, and conclusions. |

**Response:**

Thank you for the valuable recommendation regarding thematic alignment with the journal's scope. In response, several additional keywords closely related to the journal's thematic sections have been incorporated into the manuscript. Furthermore, these terms have been consistently integrated into the abstract, Introduction, and Conclusions sections to strengthen the conceptual coherence and thematic relevance of the study. These revisions enhance the manuscript's visibility, alignment with the journal's subject focus, and overall academic positioning.

green business leadership, green intellectual capital, green commitment, green performance

Besides leadership, another challenge lies in the limited availability of green intellectual capital, which encompasses employees' knowledge, skills, and environmental awareness. Empirical studies confirm that green intellectual capital is an intangible asset that determines the successful implementation of sustainability strategies (Shah et al., 2021; Chao & Juo, 2021). In the North Sumatran hotel industry, investment in developing employees' green competencies remains relatively low, hampering the optimization of green performance. Another issue relates to organizational green commitment. Environmental commitment reflects management's commitment to allocating resources, setting standards, and ensuring the consistency of green policies. Previous

research has shown that green commitment has a significant impact on energy efficiency, waste reduction, and green innovation (Haldorai et al., 2022). However, many hotels still consider green practices as a response to external pressures, rather than as a core organizational value

3) **Comments Reviewer 1 to the Author**

| |
|---|
| I'd recommend rephrasing the sentence "Referring to Table 3 and Figure 2, the findings of the validity and reliability evaluations are shown in detail". |

**Response:**

Thank you for the constructive suggestion regarding sentence clarity and academic style. In response, the sentence "Referring to Table 3 and Figure 2, the findings of the validity and reliability evaluations are shown in detail" has been rephrased to improve readability, grammatical accuracy, and alignment with formal academic writing standards. The revised wording now provides a clearer and more concise introduction to the presentation of the validity and reliability analysis results.

Following standard analytical methods, the results from the questionnaire were evaluated using SmartPLS version 3.2.9. Validity and reliability tests were administered to the measurement model, which is also known as the outer model. By looking at factor loadings and the Average Variance Extracted (AVE), we were able to determine that the construct validity was sufficient; all indicator loadings were higher than the suggested threshold of 0.7, and the AVE values were higher than 0.5. There was also an evaluation of construct reliability via the use of composite reliability (CR) and Cronbach's alpha. Both indicators provide satisfactory internal consistency with values over 0.7, as stated by Hair et al. (2019). The reliability and validity of the measuring equipment for further structural model analysis may be shown by their fulfillment of these requirements. The findings of the validity and reliability evaluations are shown in detail:

As shown in Table 3, the analysis results show that the four constructs have excellent reliability and validity. Green Leadership recorded a CR value of 0.982 and an AVE of 0.933, with all indicators having outer loadings above 0.92, indicating a strong contribution from each indicator. Green Intellectual Capital was also reliable (CR 0.916; AVE 0.731), supported by adequate indicators despite their greater variation. Furthermore, Green Commitment showed high consistency (CR 0.928; AVE 0.763), reflecting the organization's solid commitment to sustainable practices. Meanwhile, Green Performance obtained a CR value of 0.986 and an AVE of 0.932, which was reinforced by very high outer loadings on all indicators, confirming that the organization's environmental performance falls into the very strong category.

4) **Comments Reviewer 1 to the Author**

| |
|---|
| It is necessary to upload all intermediate calculations and input data from the questionnaire (anonymized) to Zenodo or another repository. And put a link in the Data Availability Statement block |

**Response:**

Thank you for the important recommendation regarding research transparency and reproducibility. In response, all anonymized questionnaire input data, along with the intermediate calculation files and supporting analytical outputs, have been uploaded to the Zenodo repository. In addition, the corresponding access link has been included in the Data Availability Statement section of the manuscript. These revisions strengthen the transparency, reliability, and accessibility of the research in accordance with current international academic publishing and open science standards.

## Data Availability Statement

Not applicable.

## APPENDIX

**Questionnaire Form**

| ***GREEN LEADERSHIP*** | | | | | | |
|---|---|---|---|---|---|---|
| No | What is your opinion, attitude, knowledge regarding the statement below: | Strongly agree | Agree | Neutral | Disagree | Strongly Disagree |
| | ***Sustainable Vision and Mission*** | | | | | |
| 1 | Our hotel has a clear vision and mission to support environmentally friendly business practices. | | | | | |
| 2 | Company leadership consistently communicates the importance of sustainability in every operational activity. | | | | | |
| | ***Ability to Inspire and Motivate*** | | | | | |
| 3 | Leaders at my workplace are able to inspire employees to care about environmental issues. | | | | | |
| 4 | I feel motivated to contribute to sustainability programs because of the support from my superiors. | | | | | |
| | ***Skills and Knowledge Development*** | | | | | |
| 5 | We regularly receive training on sustainability practices in the hospitality industry. | | | | | |
| 6 | The company encourages employees to develop knowledge about green management and resource efficiency. | | | | | |
| | ***Involvement in Sustainable Initiatives*** | | | | | |
| 7 | I am actively involved in environmental activities or programs organized by the hotel. | | | | | |
| 8 | My company works with local communities to run eco-friendly initiatives. | | | | | |
| ***GREEN INTELLECTUAL CAPITAL*** | | | | | | |
| No | What is your opinion, attitude, knowledge regarding the statement below: | Strongly agree | Agree | Neutral | Disagree | Strongly Disagree |
| | ***Knowledge of Sustainable Practices*** | | | | | |
| 1 | I have a good understanding of sustainability principles in the hospitality industry. | | | | | |
| 2 | I know various methods to reduce environmental impact in hotel operations. | | | | | |
| | ***Implementation of Sustainable Practices*** | | | | | |
| 3 | Our hotel actively implements environmentally friendly policies in its daily operations. | | | | | |
| 4 | Sustainability practices such as reducing single-use plastics and energy efficiency have been implemented in my workplace. | | | | | |
| | ***Innovation and Creativity*** | | | | | |
| 5 | I am driven to create new solutions in implementing environmentally friendly practices. | | | | | |
| 6 | The place I work supports innovative ideas to improve sustainability. | | | | | |
| | ***Personal Awareness and Commitment*** | | | | | |
| 7 | I feel responsible for supporting sustainability practices in the workplace. | | | | | |
| 8 | I am personally committed to practicing environmentally friendly work behavior. | | | | | |
| ***GREEN COMMITMENT*** | | | | | | |
| No | What is your opinion, attitude, knowledge | Very | Good | Neutral | Not good | Very Bad |

| | | | | | | |
|---|---|---|---|---|---|---|
| | regarding the statement below: | good | | | | |
| ***Leadership and Management Commitment*** | | | | | | |
| 1 | The leadership where I work actively encourages the implementation of sustainability principles. | | | | | |
| 2 | Management consistently demonstrates commitment to environmentally friendly practices. | | | | | |
| 3 | Commitment to sustainability is an important part of the managerial strategy in our organization. | | | | | |
| ***Investments and Resources*** | | | | | | |
| 4 | Our organization allocates a dedicated budget to support sustainability initiatives. | | | | | |
| 5 | The company provides adequate resources for training and implementation of sustainable practices. | | | | | |
| 6 | Investment in environmentally friendly technologies is a priority in operational development. | | | | | |
| ***Sustainability Policies and Standards*** | | | | | | |
| 7 | The company has a written policy regarding sustainability practices. | | | | | |
| 8 | We follow nationally or internationally recognized sustainability standards. | | | | | |
| 9 | There are clear operational guidelines regarding environmental management and social responsibility. | | | | | |
| ***Participation in External Initiatives*** | | | | | | |
| 10 | Our company is involved in sustainability programs initiated by the government or NGOs. | | | | | |
| 11 | We actively collaborate with external parties to support environmental and social goals. | | | | | |
| 12 | Our organization participates in certifications or awards related to sustainability. | | | | | |
| ***GREEN PERFORMANCE*** | | | | | | |
| No | What is your opinion, attitude, knowledge regarding the statement below: | Strongly agree | Agree | Neutral | Disagree | Strongly Disagree |
| ***Energy Efficiency*** | | | | | | |
| 1 | Our company actively uses energy-saving technologies in its operations. | | | | | |
| 2 | Energy usage in the workplace is monitored and optimized regularly. | | | | | |
| ***Waste Management*** | | | | | | |
| 3 | Our company has an organized waste sorting and management system. | | | | | |
| 4 | We reduce the use of disposable materials in our operational processes. | | | | | |
| ***Water Conservation*** | | | | | | |
| 5 | Our organization implements technology to conserve water usage. | | | | | |
| 6 | Employees are educated about the importance of maintaining efficient water use. | | | | | |
| ***Use of Environmentally Friendly Materials*** | | | | | | |
| 7 | We choose raw materials that have minimal environmental impact in the production process. | | | | | |
| 8 | Our products are designed to reduce negative impact on the environment. | | | | | |
| ***Green Education and Awareness*** | | | | | | |
| 9 | The company regularly holds training or campaigns on sustainability. | | | | | |
| 10 | Employees have a high awareness of the importance of protecting the environment. | | | | | |

5) **Comments Reviewer 2 to the Author**

| |
|---|
| In the Introduction, there is the phrase "This description will be used to design and evaluate a model...." The word 'description' is inappropriate here. It is better to replace it with the word "research." |

**Response:**

Thank you for the careful observation regarding word choice and academic clarity. In response, the phrase "This description will be used to design and evaluate a model..." in the Introduction section has been revised by replacing the word "description" with "research," as recommended. This modification improves the precision, readability, and appropriateness of the academic language used in the manuscript while ensuring greater consistency with scholarly writing conventions.

In the context of North Sumatra, particularly in strategic tourism areas like Lake Toba, the growth of the hotel industry has been accompanied by increasing pressure on local ecosystems. The Indonesian Central Statistics Agency (2020) reports a considerable growth in hotels and room occupancy rates in this area, which affects water, electricity, and trash management. Green performance strategies have not been incorporated into many hotels' leadership systems or organizational cultures (Nisar et al., 2021; Alsetoohy, 2022; Riva, 2021). Limited leadership involvement in implementing sustainability initiatives remains a major concern in the hotel industry. Green leadership refers to a leadership approach that guides environmental policies and drives organizational change, shaping pro-environmental visions, norms, and employee behaviors within the company to support sustainability goals and long-term environmental performance (He et al., 2021; Kim, 2022). Research indicates that green-oriented executives significantly impact environmental innovation and corporate green performance (Özgül & Zehir, 2023). Many hotel executives still value short-term profits above long-term sustainability.

There is a lack of research on the topic, thus it is crucial to create a model that can explain how these three strategic factors interact to drive green performance towards sustainable practices all at once. Since the success of sustainable practices is not determined by a single element but rather by the synergy of leadership, intellectual capital, and organizational commitment, it is considered that a simultaneous approach would give a more thorough understanding than a fragmented approach. This research will be used to design and evaluate a model of green leadership, green intellectual capital, and green commitment in the North Sumatran hotel business, with the goal of pushing green performance towards sustainable practices. Improving green performance in the North Sumatran hotel business may be achieved by enhancing our knowledge of all three aspects at once. This research aims to do just that. This study is critical because it will provide the groundwork for the hotel sector to create a comprehensive sustainability plan. This may boost the company's reputation and help it compete in a market where consumers are placing a higher value on eco-friendly products and services.

6) **Comments Reviewer 2 to the Author**

| |
|---|
| After hypothesis 3 and before the beginning of the Methodology section, at least a couple of sentences should be inserted, because the review looks incomplete. |

**Response:**

Thank you for the valuable observation regarding the structural flow of the manuscript. In response, additional transitional sentences have been inserted after Hypothesis 3 and before the beginning of the Methodology section to improve coherence and continuity. These additions provide a clearer connection between the theoretical framework and the methodological approach, thereby enhancing the completeness, readability, and logical progression of the manuscript.

This research synthesizes the three aforementioned hypotheses by including green leadership, green intellectual capital, and green commitment into a cohesive conceptual framework to elucidate green performance within the hospitality industry. While prior research has analyzed these characteristics individually, there is a paucity of studies investigating their concurrent impact within a singular empirical framework, especially in

service-oriented sectors where environmental policies are intricately linked to operational procedures and staff conduct. In the hospitality sector, sustainability performance is influenced by management guidance, the organization's knowledge assets, and the collective dedication of workers to environmental objectives. So, looking at all three of these aspects together gives us a better idea of how policies that focus on sustainability lead to observable environmental results. Additionally, the hotel industry in developing areas has its own set of problems, such as a lack of access to technology, personnel who are not very environmentally conscious, and growing demand from tourist stakeholders to embrace sustainable practices. The following part delineates the study methods used to evaluate the offered hypotheses, grounded on this theoretical framework.

7) **Comments Reviewer 2 to the Author**

| |
|---|
| The explanation of the characteristics of the respondents in this study is explained in the following table: Table 1: Descriptions of Research Respondents. This cannot be. A colon is always followed by a numbered or marked list. The last sentence should not have a colon but should contain a reference to the table with its number. |

**Response:**

We appreciate the reviewer's valuable comment regarding the improper use of the colon in the sentence introducing Table 1. In response, the sentence has been revised to comply with academic writing conventions by removing the colon and integrating a direct reference to the table within the sentence. The revised sentence now appropriately introduces the descriptive information of the research respondents while maintaining grammatical and stylistic accuracy in accordance with formal scholarly standards.

The explanation of the characteristics of the respondents in this study is explained in the following table 1.

According to the data in Table 1, the demographic characteristics of the respondents in this study are categorized into several primary categories, including gender, age, education level, length of service, and job title or position. Based on gender, the majority of respondents were male, comprising 106 people (62.35%), while female respondents numbered 64 (37.65%), indicating a predominance of male participation in the study. In terms of age, the largest group of respondents was in the 36–45 years age range, with a total of 70 people (41.18%), followed by the 26–35 years age group, with 48 people (28.23%). Respondents aged under 25 years numbered 22 people (12.94%), while the 46–55 years and above 55 years age groups each comprised 20 people (11.75%) and 10 people (5.88%), indicating that most respondents fell within the productive age range with relatively mature work experience.

In terms of educational level, the majority of respondents had a high school education background, with 85 people (50%), followed by Bachelor's graduates (45 people, 26.47%) and Diploma graduates (35 people, 20.59%). Meanwhile, respondents with a Master's degree were relatively few, namely 5 people (2.94%). Based on the length of service, respondents with 6–10 years of service were the largest group, comprising a total of 60 people (35.29%), followed by respondents with 1–5 years of service, who totaled 58 people (34.12%). Respondents with more than 10 years of work experience numbered 30 people (17.65%), while respondents with less than one year of work experience numbered 22 people (12.94%). In terms of position, the majority of respondents were in the employee category, comprising 50 people (29.4%), followed by front office positions, which included 40 people (23.54%), and supervisors, who numbered 31 people (18.24%). Meanwhile, respondents serving as operational managers and general managers numbered 19 (11.18%) and 10 (5.88%) respectively, while executive staff numbered 20 (11.76%). Overall, this composition indicates that the study respondents came from diverse demographic backgrounds and job positions, thus comprehensively representing the research population.

8) **Comments Reviewer 2 to the Author**

| |
|---|
| Each table and figure in the text should be preceded by a line with a number. |

**Response:**

We thank the reviewer for this important observation regarding the formatting of tables and figures. In response, all tables and figures in the manuscript have been carefully revised to ensure that each is preceded by an appropriate numbered title or caption in accordance with the journal's formatting guidelines and academic writing standards. These revisions were made to improve the clarity, consistency, and overall presentation quality of the manuscript.

As shown in Table 2, operational definitions of the research variables were developed to provide conceptual clarity and empirical guidance in measuring each construct.

As shown in Figure 1, research framework model illustrates the conceptual relationship between the main variables tested in this study, namely green leadership, green intellectual capital, and green commitment, as independent variables that influence green performance, the dependent variable.

According to Table 4, all of the model's constructs show sufficient uniqueness, according to the discriminant validity evaluation using the Fornell-Larcker criteria.

As shown in Table 6, the results of the F-Square analysis show that each predictor variable has a varying effect on Green Performance.

According to the findings Table 7, all of the study's assumptions are correct and significantly impact green performance in a good way.

9) **Comments Reviewer 2 to the Author**

| |
|---|
| The conclusions should contain three main ideas: 1) they should once again dryly describe the most significant new patterns revealed by the study, then necessarily - 2) the limitations of the study and necessarily - 3) what prospects this study opens up for the future. The recommended length of the conclusions is one full page in the journal template. |

**Response:**

We sincerely appreciate the reviewer's constructive suggestion regarding the structure and comprehensiveness of the conclusion section. In response, the conclusion has been substantially revised and expanded to incorporate three essential aspects: the principal findings and significant patterns identified in the study, the limitations of the research, and the implications as well as future research opportunities arising from the study. Furthermore, the length and depth of the conclusion have been adjusted to align with the journal template and academic standards recommended by the reviewer.

This study's findings reveal significant trends about the factors influencing green performance in the hospitality sector. The study establishes that green intellectual capital is the preeminent element affecting green performance ($\beta = 0.398$, $p < 0.000$), signifying that workers' environmental knowledge, abilities, and innovative capacity are essential for enhancing sustainability results. Second, green leadership has a big positive impact ($\beta = 0.234$, $p < 0.004$), which means that leaders who make decisions based on environmental principles may motivate people to behave in ways that are good for the environment and improve the company's sustainability policies. Third, green commitment has a big effect on green performance ($\beta = 0.210$, $p < 0.00$), which shows that an organization's commitment to environmental objectives helps them carry out sustainability efforts on a regular basis. These results show a new trend in the hotel industry: sustainable success is not only reliant on leadership direction, but also on the combination of leadership orientation, knowledge-based resources, and organizational

commitment. The findings also suggest that intangible organizational resources, especially environmental knowledge and learning ability, have a more significant influence than previously highlighted in the literature concerning green performance in service sectors.

This work has several limitations that should be recognized, even if it made some important contributions. First, the study uses cross-sectional survey data from 170 hotel workers, which makes it hard to see how sustainable policies improve over time. As firms implement new sustainability initiatives, environmental performance and leadership practices may change. Longitudinal techniques might potentially provide more profound insights into causal links. Second, the research concentrates on hotels situated in North Sumatra, Indonesia, thereby limiting the applicability of the results to other areas or tourist destinations characterized by distinct institutional forces, regulatory frameworks, or degrees of environmental consciousness. Third, the study focuses exclusively on three primary predictors—green leadership, green intellectual capital, and green commitment—omitting other pertinent factors such as green organizational culture, environmental technology adoption, stakeholder pressure, and regulatory support from the model. Lastly, the information comes from workers' own perspectives, which might lead to response bias or a subjective judgment of how well the firm is doing in terms of sustainability.

This study presents several opportunities for further research and managerial practices, especially within the domains of corporate leadership and sustainability management. Subsequent research may enhance this model by integrating mediating or moderating variables, including green organizational culture, green innovation capability, digital environmental monitoring systems, or external stakeholder pressure, to elucidate the mechanisms connecting leadership and sustainability performance more effectively. Comparative research across various tourist locations or countries may provide comprehensive insights into the impact of contextual variables on the efficacy of sustainability-oriented leadership. Longitudinal study designs may also elucidate the evolution of leadership tactics, knowledge resources, and organizational commitment over time, therefore influencing long-term environmental performance. From a practical standpoint, the results underscore the necessity of fortifying sustainability-focused business leadership, creating environmental training initiatives that augment green intellectual capital, and instituting institutional policies that bolster organizational dedication to environmental objectives. These kinds of combined initiatives may help hospitality businesses do more for the environment while also making them more competitive in a tourist industry that is becoming more focused on sustainability.

**10) Comments Reviewer 2 to the Author**

| |
|---|
| The section on AI should be added |

**Response:**

We thank the reviewer for the valuable recommendation regarding the inclusion of an AI-related discussion in the manuscript. In response, a dedicated section addressing the role and relevance of Artificial Intelligence (AI) has been added to strengthen the theoretical and contextual foundation of the study. This addition aims to enhance the manuscript's alignment with current academic developments and to provide a more comprehensive understanding of the research topic within the context of contemporary technological advancements.

The authors recognize the utilization of artificial intelligence (AI) tools to enhance the clarity of the manuscript and facilitate language refinement during the writing process. Grammatical editing, wording suggestions, and overall language enhancement were the sole purposes of these instruments. The authors were responsible for the entire process of conceptual development, research design, collecting data, analysis, interpretation of results, and final conclusions. The authors assume full responsibility for the content of this article and verify that the originality, integrity, and scientific validity of the research were not impacted by the use of AI tools.

# Green Business Leadership Model Development in Driving Green Performance Towards Sustainable Practices: A Simultaneous Approach in the Hospitality Industry

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**Type of manuscript:** research paper

**Abstract:** With the rising need for sustainability, good business leadership is now more important than ever for developing trust in the workplace and getting the hospitality sector to do better for the environment. However, previous research in the field of business leadership has primarily analyzed environmental performance through discrete variables, neglecting the interplay between green leadership, green intellectual capital, and green commitment in enhancing sustainable outcomes, especially in developing regions. This study aims to develop and test a simultaneous model that explains the influence of green leadership, green intellectual capital, and green commitment on green performance within the hospitality industry in North Sumatra. Data were gathered in 2025 via a survey administered in Indonesia, including 170 workers from hotels situated in the Lake Toba Samosir tourism region and Simalungun Regency, comprising both operational and management personnel within the hospitality industry. The survey included structured questions, and the results were analyzed with Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS software. The findings demonstrate that green leadership has a positive and substantial influence on green performance ($\beta = 0.234$, $p < 0.004$), indicating that sustainability-focused leadership practices enhance environmental performance in hospitality firms. Green intellectual capital significantly impacts green performance ($\beta = 0.398$, $p < 0.000$), indicating that environmental knowledge, innovation aptitude, and green organizational learning are crucial in enhancing sustainability results. The commitment to environmental sustainability substantially influences green performance ($\beta = 0.210$, $p < 0.00$), validating that persistent organizational devotion enhances the efficacy of environmental activities. These results provide new avenues for future study and managerial practice in business leadership, specifically in the integration of leadership, knowledge resources, and organizational commitment to enhance sustainable performance in the hospitality industry.

**Keywords:** green business leadership, green intellectual capital, green commitment, green performance
**JEL Classification:** L83, M12, M14, Q56

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**Cite as:**

## INTRODUCTION

Global climate change and environmental degradation have become strategic issues driving major transformations in business practices across sectors, including the hospitality industry (Akpa et al., 2022; Hashish et al., 2022). A United Nations World Tourism Organization (UNWTO) report indicates that the tourism

sector accounts for approximately 8% of global carbon emissions, with the hospitality industry contributing significantly through energy and water consumption and waste production (UNWTO, 2016). In line with the 2030 Sustainable Development Goals (SDGs), particularly goals 12 and 13, the hospitality industry is required to adopt sustainable practices to minimize environmental impacts while maintaining long-term competitiveness (Zeng et al., 2023; Sobaih et al., 2022). Furthermore, at the national level, Indonesia faces serious challenges in environmental management in the tourism sector. The Ministry of tourism and creative economy reported that hotel energy consumption in major tourist destinations increased by an average of 6–8% per year following the pandemic, as the tourism sector recovered (Kemenparekraf RI, 2014). This situation reinforces the urgency of systematically implementing green practices, not only through environmentally friendly technologies but also through sustainability-oriented managerial and human resource approaches (Luu, 2020; Indajang et al., 2024).

In the context of North Sumatra, particularly in strategic tourism areas like Lake Toba, the growth of the hotel industry has been accompanied by increasing pressure on local ecosystems. The Indonesian Central Statistics Agency (2020) reports a considerable growth in hotels and room occupancy rates in this area, which affects water, electricity, and trash management. Green performance strategies have not been incorporated into many hotels' leadership systems or organizational cultures (Nisar et al., 2021; Alsetoohy, 2022; Riva, 2021). Limited leadership involvement in implementing sustainability initiatives remains a major concern in the hotel industry. Green leadership refers to a leadership approach that guides environmental policies and drives organizational change, shaping pro-environmental visions, norms, and employee behaviors within the company to support sustainability goals and long-term environmental performance (He et al., 2021; Kim, 2022). Research indicates that green-oriented executives significantly impact environmental innovation and corporate green performance (Özgül & Zehir, 2023). Many hotel executives still value short-term profits above long-term sustainability.

Besides leadership, another challenge lies in the limited availability of green intellectual capital, which encompasses employees' knowledge, skills, and environmental awareness. Empirical studies confirm that green intellectual capital is an intangible asset that determines the successful implementation of sustainability strategies (Shah et al., 2021; Chao & Juo, 2021). In the North Sumatran hotel industry, investment in developing employees' green competencies remains relatively low, hampering the optimization of green performance. Another issue relates to organizational green commitment. Environmental commitment reflects management's commitment to allocating resources, setting standards, and ensuring the consistency of green policies. Previous research has shown that green commitment has a significant impact on energy efficiency, waste reduction, and green innovation (Haldorai et al., 2022). However, many hotels still consider green practices as a response to external pressures, rather than as a core organizational value.

The transformation towards sustainable practices has become a strategic agenda in the global hospitality industry, given the sector's significant contribution to energy consumption, water use, and waste production. Numerous studies confirm that improving organizational green performance is strongly influenced by managerial factors and organizational behavior, not solely by the adoption of green technologies (Riva et al., 2021; Suliman et al., 2023). However, despite increasing attention to sustainability issues, the implementation of green practices in the hospitality industry, particularly in developing countries, still faces various structural and resource constraints. Previous literature has extensively examined the role of green leadership in driving organizational environmental performance. Leaders with a green orientation have been shown to influence employees' pro-environmental attitudes, motivations, and behaviors (Özgül & Zehir, 2023). However, most studies consider green leadership as a single predictor or examine it separately from other internal organizational factors. This partial approach limits our understanding of how green leadership interacts with organizational resources and commitment to generate sustainable green performance.

In addition to leadership, green intellectual capital is also recognized as a crucial determinant in improving environmental performance. Green intellectual capital, encompassing knowledge, skills, and environmentally friendly innovation, has been shown to contribute to resource efficiency and green innovation (Shah et al., 2021; Wang & Juo, 2021). However, most studies still position green intellectual capital as a mediating variable or are tested in the context of the manufacturing sector and SMEs. Therefore, empirical evidence in the hospitality industry, particularly in developing tourism regions, remains limited. On the other hand, organizational green commitment has been studied as a factor that strengthens the consistency of environmental policy implementation. Research indicates that management's commitment to sustainability has a positive influence on environmental performance and employee green behaviour (Haldorai et al., 2022; Khan et al., 2022). However, empirical findings regarding the strength of green commitment's influence still show varying results and are rarely analyzed simultaneously alongside green leadership and green intellectual capital within an integrated model framework.

There is a lack of research on the topic, thus it is crucial to create a model that can explain how these three strategic factors interact to drive green performance towards sustainable practices all at once. Since the success

of sustainable practices is not determined by a single element but rather by the synergy of leadership, intellectual capital, and organizational commitment, it is considered that a simultaneous approach would give a more thorough understanding than a fragmented approach. This research will be used to design and evaluate a model of green leadership, green intellectual capital, and green commitment in the North Sumatran hotel business, with the goal of pushing green performance towards sustainable practices. Improving green performance in the North Sumatran hotel business may be achieved by enhancing our knowledge of all three aspects at once. This research aims to do just that. This study is critical because it will provide the groundwork for the hotel sector to create a comprehensive sustainability plan. This may boost the company's reputation and help it compete in a market where consumers are placing a higher value on eco-friendly products and services.

## LITERATURE REVIEW

### Theoretical Framework

In recent years, research on green performance has experienced a paradigm shift toward a perspective that emphasizes behavior, leadership, and intangible resources. Within the framework of the resource-based view (RBV) and dynamic capabilities theory, sustainability within an organization is crucial, built on hard-to-imitate internal assets, environmentally oriented leadership, green intellectual capital, and organizational commitment to sustainability (Sobaih et al., 2020; Asadi et al., 2020; Saleem et al., 2025). Within the organizational structural hierarchy, sustainability issues are crucial to understand and implement in every policy as a form of organizational commitment to supporting sustainability issues (Pham et al., 2023; Han et al., 2019). Green leadership is an extension of transformational leadership theory in the context of sustainability, where leaders play a role in shaping environmentally friendly visions, values, and strategic orientations (Kim, 2022; Suliman et al., 2023). From the RBV perspective, green intellectual capital is positioned as a strategic asset encompassing employee knowledge, competence, innovation, and environmental awareness. This capital functions as a cognitive infrastructure that enables organizations to translate sustainability visions into operational practices (Martínez-Falcó et al., 2023; Chao & Juo, 2021). However, its direct contribution to green performance in the service sector, particularly in the hospitality industry of developing regions, remains underdeveloped. Meanwhile, green commitment represents the internalization of sustainability values into organizational policies and practices. Although proven to strengthen the consistency of environmental strategies, previous research remains fragmented (Elzek et al., 2021; Sabellah et al., 2025). Therefore, the main theoretical gap lies in the lack of integrative models that simultaneously examine green leadership, green intellectual capital, and green commitment. This study proposes a conceptual framework that positions these three constructs as direct, mutually reinforcing determinants of green performance, particularly in the context of the North Sumatran hotel industry.

### Green Leadership and Green Performance

Green leadership is characterised by leaders who prioritise environmental concerns, integrate sustainability into decision-making processes, and inspire employees to adopt environmentally friendly behaviours (Shah et al., 2023; Luu, 2020; Liu et al., 2023). Several studies have shown that green leadership positively influences green performance, which encompasses aspects such as energy efficiency, waste reduction, and the adoption of environmentally friendly technologies (Perez et al., 2023; Özgül & Zehir, 2023; Riva et al., 2021). Studies Suliman et al. (2023), Ullah et al. (2023), Hidayati et al. (2024), and Saleem et al. (2025), emphasize the importance of a green leadership style that empowers employees to innovate and initiate environmentally sustainable initiatives. In addition, organizational support and commitment to sustainability goals significantly influence green performance outcomes (Úbeda-García et al., 2021; Sobaih et al., 2022). Researchers have highlighted the need for leaders to demonstrate proactivity, vision, and commitment to environmental responsibility to drive green performance within their organizations effectively (Kim, 2022; Perez et al., 2023; Asadi et al., 2020).

Furthermore, several recent studies have demonstrated that green transformational leadership enhances environmental performance at both the individual and organizational levels by promoting green innovation, resource efficiency, and pro-environmental employee behaviour (Riva et al., 2021; Özgül & Zehir, 2023). However, findings across studies are not entirely consistent in explaining the magnitude and stability of these effects. In some contexts, the effects of green leadership appear relatively direct when green leadership is institutionalized within organizational strategy and supported by incentive systems and environmental performance controls; while in other contexts, the effects are predominantly indirect through psychological and social mechanisms such as green work engagement, green creativity, and an organizational climate supportive of environmental practices (Sobaih et al., 2022; Suliman et al., 2023; Balwant et al., 2020). A significant research gap exists in the service sector, particularly in the hospitality industry of developing regions, where green performance is strongly influenced by the intensity of energy and water use, service characteristics, and pressure

from destination stakeholders. Therefore, based on the results of several previous studies, we develop the following hypothesis:

**H1:** Green leadership management influences green performance

**Green Intellectual Capital and Green Performance**

Green intellectual capital (GIC) is a concept that refers to the knowledge, skills, and capabilities of individuals or organizations in the context of environmental sustainability (Yadiati et al., 2019; Sohu et al., 2024; Khan et al., 2021). Research Chawewong & Naipinit (2024), Renaldo & Augustine (2022), Haldorai et al. (2022), shows that the adoption of green intellectual capital positively influences green performance in various ways, such as increasing the efficiency of natural resource use, reducing negative environmental impacts, and creating environmentally friendly product and process innovations. Factors such as environmental awareness, knowledge of sustainable practices, and the ability to implement environmentally friendly solutions are key in linking green intellectual capital with green performance (Nisar et al., 2021; Shah et al., 2021; Tjahjadi et al., 2023). Furthermore, some literature emphasizes the need for investment in the development of sustainable intellectual capital, both through training and education, and through an organizational culture that supports sustainability initiatives (Marco-Lajara et al., 2022; Chao & Juo, 2021).

Several cross-sector studies have found that organizations with high levels of GIC tend to demonstrate better energy efficiency, consistent waste reduction, and superior green innovation capabilities (Anik & Sulistyo, 2021; Shah et al., 2021; Augustinah et al., 2022). However, a synthesis of these findings reveals significant variation in the effects. Some studies report a direct effect of GIC on green performance, particularly when environmental knowledge is internalized in operational routines and management systems (Sohu et al., 2024; Yadiati et al., 2019). Conversely, other studies confirm that the effect of GIC is predominantly indirect through mechanisms such as green innovation, green human resource management, or pro-environmental employee behavior, indicating that green intellectual capital requires institutional channels to generate measurable environmental performance (Rustiarini et al., 2022; Anik & Sulistyo, 2021; Chao & Juo, 2021). A significant research gap exists in the lack of contextual studies in developing regions that examine the direct contribution of GIC to green performance, considering the operational complexity of the service sector. Therefore, based on several previous studies, the following hypotheses are developed:

**H2:** Green intellectual capital influences green performance

**Green Commitment and Green Performance**

Green commitment encompasses an organization's commitment to adopt and practice environmentally friendly behaviours and to achieve sustainability goals (Zhang & Walton, 2017; Basana et al., 2022; Khan et al., 2022). Studies Sharma et al. (2021), Iftikhar et al. (2021), and Mushtaq et al. (2019), demonstrate that the level of green commitment has a positive influence on green performance in various ways, including reducing waste and emissions, increasing resource efficiency, and developing more environmentally friendly innovations. Factors influencing green commitment include sustainability-oriented leadership, a supportive organizational culture, and pressure from external stakeholders (Somjai et al., 2020; Elshaer et al., 2022; Ahmad et al., 2023). Studies Riva et al. (2021) and Sabellah et al. (2025), also highlight the importance of transparently measuring and reporting environmental performance as a means to strengthen green commitment and motivate behavioral change.

However, cross-study synthesis reveals differing findings regarding its impact mechanisms. Some studies find a direct effect of GIC on green performance, particularly when green knowledge and competencies are institutionalized in organizational systems, procedures, and work routines (Shah et al., 2021; Migdadi, 2023). Conversely, other studies confirm that the influence of GIC is predominantly indirect through green innovation, green human resource management, or employee pro-environmental behavior, suggesting that green intellectual capital requires institutional mechanisms to generate measurable environmental performance (Nisar et al., 2021; Haldorai et al., 2022; Úbeda-García et al., 2021). These differences in results are also influenced by the industry context and the level of organizational maturity; empirical evidence is relatively strong in the manufacturing and SME sectors, while in the service sector, particularly the hospitality industry, results are still limited and inconsistent (Renaldo & Augustine, 2022; Sohu et al., 2024). A prominent research gap lies in the lack of contextual studies in developing regions that examine the direct contribution of GIC to green performance, as well as the limited separate analysis of GIC dimensions to identify the most important components. Therefore, based on several previous studies, the following hypotheses are developed:

**H3:** Green commitment influences green performance

This research synthesizes the three aforementioned hypotheses by including green leadership, green intellectual capital, and green commitment into a cohesive conceptual framework to elucidate green performance within the hospitality industry. While prior research has analyzed these characteristics individually, there is a paucity of studies investigating their concurrent impact within a singular empirical framework, especially in

service-oriented sectors where environmental policies are intricately linked to operational procedures and staff conduct. In the hospitality sector, sustainability performance is influenced by management guidance, the organization's knowledge assets, and the collective dedication of workers to environmental objectives. So, looking at all three of these aspects together gives us a better idea of how policies that focus on sustainability lead to observable environmental results. Additionally, the hotel industry in developing areas has its own set of problems, such as a lack of access to technology, personnel who are not very environmentally conscious, and growing demand from tourist stakeholders to embrace sustainable practices. The following part delineates the study methods used to evaluate the offered hypotheses, grounded on this theoretical framework.

## METHODOLOGY

### Research Design

This study uses a library and field research design with a quantitative approach. The approach used is a simultaneous approach that considers the interaction between these three factors within a single analytical framework. The research location is the hotel industry in the tourist attraction of Lake Toba, located in Samosir and Simalungun Regency, North Sumatra. This tourist attraction was selected because it has significant potential in the hotel industry and is a key destination in the context of North Sumatra tourism. The presence of hotels around Lake Toba, Samosir, and Simalungun Regency offers variations in size, class, and business model, allowing for a more comprehensive analysis of the influence of green leadership models, green intellectual capital, and green commitment on green performance.

### Sample and Data Collection

The population of this study comprises entrepreneurs and employees from all hotels operating in the Lake Toba Samosir tourist attraction, North Sumatra. This tourist attraction was chosen because it serves as a major hub of tourism activity in the region. The research sample will be selected purposively from this population, taking into account variations in hotel size, class, and business model. Inclusion criteria for sample selection include the existence of policies or practices related to environmental sustainability, as well as the availability of relevant data for analysis. According to Hair et al. (2019), if the population size is unknown, the sample size can be determined from 5-10 times the number of indicators used in a single construct. This study utilizes 17 indicators from four existing variable dimensions, resulting in a total of 17 × 10 = 170 research samples. The explanation of the characteristics of the respondents in this study is explained in the following table 1.

**Table 1. Descriptions of Research Respondents**

| Category | Detail | Amount | Percentage (%) |
|---|---|---|---|
| Gender | Men | 106 | 62.35 |
| | Woman | 64 | 37.65 |
| Age (years) | < 25 | 22 | 12.94 |
| | 26 - 35 | 48 | 28.23 |
| | 36 - 45 | 70 | 41.18 |
| | 46 - 55 | 20 | 11.75 |
| | > 55 | 10 | 5.88 |
| Level of education | SENIOR HIGH SCHOOL | 85 | 50 |
| | Diploma | 35 | 20.59 |
| | Bachelor | 45 | 26.47 |
| | Masters | 5 | 2.94 |
| Length of Service (years) | < 1 | 22 | 12.94 |
| | 1 - 5 | 58 | 34.12 |
| | 6 - 10 | 60 | 35.29 |
| | > 10 | 30 | 17.65 |
| Title/Position | Operations Manager | 19 | 11.18 |
| | General Manager | 10 | 5.88 |
| | Supervivi | 31 | 18.24 |
| | Front Office | 40 | 23.54 |
| | Executive Staff | 20 | 11.76 |
| | Employee | 50 | 29.4 |

Source: data processing results (2025)

According to the data in Table 1, the demographic characteristics of the respondents in this study are categorized into several primary categories, including gender, age, education level, length of service, and job title or position. Based on gender, the majority of respondents were male, comprising 106 people (62.35%), while female respondents numbered 64 (37.65%), indicating a predominance of male participation in the study. In terms of age, the largest group of respondents was in the 36–45 years age range, with a total of 70 people (41.18%), followed by the 26–35 years age group, with 48 people (28.23%). Respondents aged under 25 years numbered 22 people (12.94%), while the 46–55 years and above 55 years age groups each comprised 20 people (11.75%) and 10 people (5.88%), indicating that most respondents fell within the productive age range with relatively mature work experience.

In terms of educational level, the majority of respondents had a high school education background, with 85 people (50%), followed by Bachelor's graduates (45 people, 26.47%) and Diploma graduates (35 people, 20.59%). Meanwhile, respondents with a Master's degree were relatively few, namely 5 people (2.94%). Based on the length of service, respondents with 6–10 years of service were the largest group, comprising a total of 60 people (35.29%), followed by respondents with 1–5 years of service, who totaled 58 people (34.12%). Respondents with more than 10 years of work experience numbered 30 people (17.65%), while respondents with less than one year of work experience numbered 22 people (12.94%). In terms of position, the majority of respondents were in the employee category, comprising 50 people (29.4%), followed by front office positions, which included 40 people (23.54%), and supervisors, who numbered 31 people (18.24%). Meanwhile, respondents serving as operational managers and general managers numbered 19 (11.18%) and 10 (5.88%) respectively, while executive staff numbered 20 (11.76%). Overall, this composition indicates that the study respondents came from diverse demographic backgrounds and job positions, thus comprehensively representing the research population.

**Measurement Instruments**

Operational definitions of research variables are developed to provide conceptual clarity and empirical guidance in the measurement process for each variable studied. These definitions aim to translate abstract theoretical concepts into indicators that can be systematically observed and measured. With operational definitions, each research variable has clear boundaries regarding its meaning, dimensions, and measurement methods, thereby reducing the potential for differences in interpretation during both the data collection and analysis stages. Furthermore, operational definitions play a crucial role in ensuring the consistency, validity, and reliability of research instruments, as well as ensuring that the measurements taken truly represent the intended constructs in accordance with the research's conceptual framework.

**Table 2. Operational Definition of Research Variables**

| Variables | Code | Item | Source |
|---|---|---|---|
| ***Green Leadership*** | GL1 | *Sustainable Vision and Mission* | (Perez et al., 2023; Suliman et al., 2023) |
| | GL2 | *Ability to Inspire and Motivate* | |
| | GL3 | *Skills and Knowledge Development* | |
| | GL4 | *Involvement in Sustainable Initiatives* | |
| ***Green Intellectual Capital*** | GIC1 | *Knowledge of Sustainable Practices* | (Sohu et al., 2024; Chawewong & Naipinit, 2024) |
| | GIC2 | *Implementation of Sustainable Practices* | |
| | GIC3 | *Innovation and Creativity* | |
| | GIC4 | *Personal Awareness and Commitment* | |
| ***Green Commitment*** | GC1 | *Leadership and Management Commitment* | (Basana et al., 2022; Iftikhar et al., 2021) |
| | GC2 | *Investments and Resources* | |
| | GC3 | *Sustainability Policies and Standards* | |
| | GC4 | *Participation in External Initiatives* | |
| ***Green Performance*** | GP1 | *Energy Efficiency* | (Pham et al., 2023; Han et al., 2019) |
| | GP2 | *Waste Management* | |
| | GP3 | *Water Conservation* | |
| | GP4 | *Use of Environmentally Friendly Materials* | |
| | GP5 | *Green Education and Awareness* | |

Source: constructed by the authors using prior research (2025)

As shown in Table 2, operational definitions of the research variables were developed to provide conceptual clarity and empirical guidance in measuring each construct. Green leadership is defined as a leader's ability to direct, influence, and inspire organizational members to integrate sustainability principles into their vision and work practices. This variable is measured through indicators of sustainable vision and mission (GL1), ability to inspire and motivate (GL2), skills and knowledge development (GL3), and involvement in sustainable

initiatives (GL4). Green intellectual capital is defined as the accumulation of knowledge, skills, creativity, and environmental awareness of individuals and organizations as strategic assets in supporting green performance. Measurements include knowledge of sustainable practices (GIC1), implementation of sustainable practices (GIC2), innovation and creativity (GIC3), and personal awareness and commitment (GIC4). Green commitment is defined as the level of seriousness and consistency with which an organization internalizes sustainability values into its policies, resource allocation, and managerial practices. This variable is measured through leadership and management commitment (GC1), investments and resources (GC2), sustainability policies and standards (GC3), and participation in external initiatives (GC4). Meanwhile, green performance refers to the level of achievement of an organization in managing environmental impacts effectively and sustainably, which is measured through energy efficiency (GP1), waste management (GP2), water conservation (GP3), use of environmentally friendly materials (GP4), and green education and awareness (GP5).

**Conceptual Framework**

Green leadership, green intellectual capital, and green commitment are the primary factors that determine green performance in the hospitality business. This study conceptual framework aims to explain the causal link between these three variables. An organization's environmental performance is seen in this research as the outcome of exploiting internal assets that are intangible and difficult to mimic. This perspective is based on the resource-based view and dynamic capacities theory. By setting an example of environmentally conscious conduct and providing opportunities for staff to take initiative, "green leadership" may influence an organization's long-term goals and objectives in a positive way. The capacity to effectively implement the organization's sustainability goal is made possible by green intellectual capital, which serves as a cognitive and inventive facilitator by offering green knowledge, skills, and creativity. Green commitment, on the other hand, is an institutional system that makes sure that green practices are consistently and sustainably implemented by integrating sustainability ideals into policies, resource allocation, and operational standards. Green performance is defined here as an improvement in areas such as energy efficiency, water conservation, waste management, and environmental education and awareness. This improvement is believed to be the result of a direct and complementary influence from these three constructs. By examining all three factors at once, it was investigated learn more about the interplay between leadership, intellectual capital, and organizational commitment as they pertain to the hotel industry's pursuit of sustainability. Therefore, Figure 1 below shows the conceptual framework model that was applied in this study:

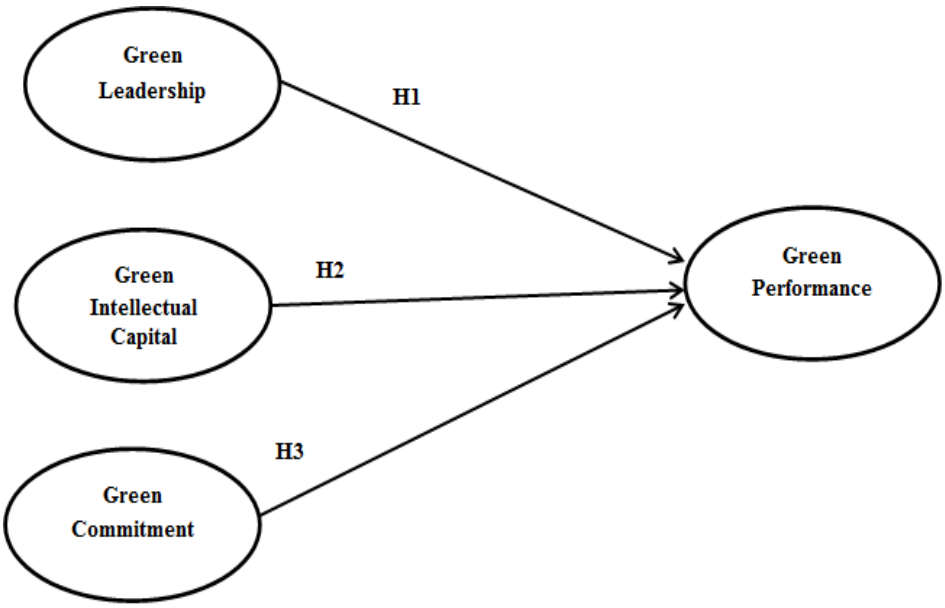


**Figure 1** Research Framework Model

Source: constructed by the authors using prior research (2025)

As shown in Figure 1, research framework model illustrates the conceptual relationship between the main variables tested in this study, namely green leadership, green intellectual capital, and green commitment, as independent variables that influence green performance, the dependent variable. The model shows that improving an organization's environmental performance is not influenced by a single factor, but rather is the result of a synergy between sustainability-oriented leadership, green knowledge and innovation capacity, and the organization's institutional commitment to environmentally friendly practices. The direction of the arrows in the model represents the hypothesized direct causal relationship, where green leadership acts as a strategic driver in

shaping pro-environmental vision and behavior, green intellectual capital functions as a cognitive and innovative enabler that allows the translation of the sustainability vision into operational practices, and green commitment acts as a normative and structural mechanism that ensures consistent implementation of green practices. Thus, Figure 1 confirms the simultaneous approach used in this study, namely that green performance is achieved through the complementary interaction between leadership, intellectual capital, and organizational commitment, particularly in the context of the hospitality industry that faces high sustainability demands and ecological pressures.

**Data Analysis**

The primary analytical approach used in this work was Partial Least Squares-Structural Equation Modelling (PLS-SEM) using SmartPLS software. For models with reflecting measurement indicators in particular, PLS-SEM's strong predictive orientation and capacity to concurrently investigate complicated causal interactions among latent variables made it an ideal choice. There were two primary steps to the analytical procedure. Following the procedures outlined by Hair et al. (2019), the validity and reliability of the research equipment were first checked by evaluating the measurement model, also known as the outer model. Tests for construct reliability included Cronbach's alpha and composite reliability indicators, while tests for convergent validity included analyzing outer loading values and Average Variance Extracted (AVE). To further ensure that each concept was empirically different from others, the Fornell-Larcker criteria was used to test discriminant validity. We moved on to the structural model (the inner model) after making sure the measurement model was up to scratch. At this point, we looked at the coefficient of determination ($R^2$) to see how well the predicted correlations between latent variables explained the data, and it was investigated measured the effect size ($f^2$) to see how much of an impact each predictor had. A thorough and reliable assessment of the suggested research model was achieved by conducting hypothesis testing using a bootstrapping approach to provide path coefficients, t-values, and p-values.

**RESULTS**

**Measurement Model Assessment**

Following standard analytical methods, the results from the questionnaire were evaluated using SmartPLS version 3.2.9. Validity and reliability tests were administered to the measurement model, which is also known as the outer model. By looking at factor loadings and the Average Variance Extracted (AVE), we were able to determine that the construct validity was sufficient; all indicator loadings were higher than the suggested threshold of 0.7, and the AVE values were higher than 0.5. There was also an evaluation of construct reliability via the use of composite reliability (CR) and Cronbach's alpha. Both indicators provide satisfactory internal consistency with values over 0.7, as stated by Hair et al. (2019). The reliability and validity of the measuring equipment for further structural model analysis may be shown by their fulfillment of these requirements. The findings of the validity and reliability evaluations are shown in detail:

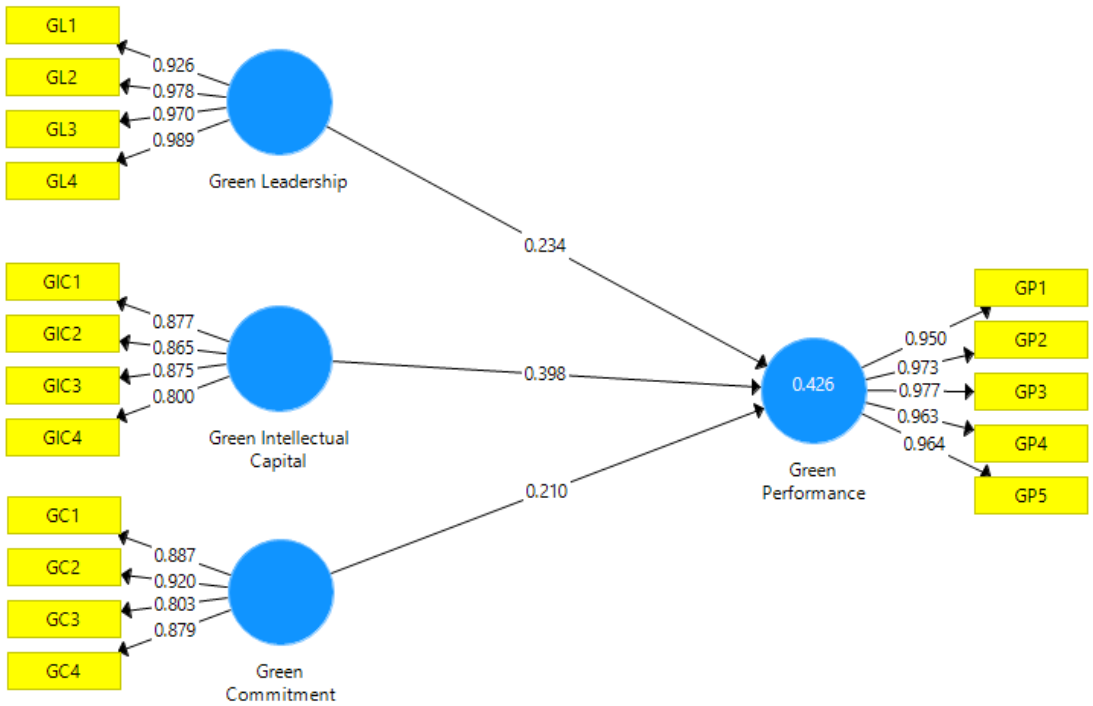


**Figure 2** Measurement model analysis

**Table 3. Measurement Model Analysis**

| Construct/item | Code | Outer Loadings | Cronbach's alpha | CR | AVE |
|---|---|---|---|---|---|
| **Green Leadership** | | | 0.976 | 0.982 | 0.933 |
| Sustainable Vision and Mission | GL1 | 0.926 | | | |
| Ability to Inspire and Motivate | GL2 | 0.978 | | | |
| Skills and Knowledge Development | GL3 | 0.970 | | | |
| Involvement in Sustainable Initiatives | GL4 | 0.989 | | | |
| **Green Intellectual Capital** | | | 0.877 | 0.916 | 0.731 |
| Knowledge of Sustainable Practices | GIC1 | 0.877 | | | |
| Implementation of Sustainable Practices | GIC2 | 0.865 | | | |
| Innovation and Creativity | GIC3 | 0.875 | | | |
| Personal Awareness and Commitment | GIC4 | 0.800 | | | |
| **Green Commitment** | | | 0.896 | 0.928 | 0.763 |
| Leadership and Management Commitment | GC1 | 0.887 | | | |
| Investments and Resources | GC2 | 0.920 | | | |
| Sustainability Policies and Standards | GC3 | 0.803 | | | |
| Participation in External Initiatives | GC4 | 0.879 | | | |
| **Green Performance** | | | 0.982 | 0.986 | 0.932 |
| Energy Efficiency | GP1 | 0.950 | | | |
| Waste Management | GP2 | 0.973 | | | |
| Water Conservation | GP3 | 0.977 | | | |
| Use of Environmentally Friendly Materials | GP4 | 0.963 | | | |
| Green Education and Awareness | GP5 | 0.964 | | | |

Source: Analysis results from SmartPLS software (2025)

As shown in Table 3, the analysis results show that the four constructs have excellent reliability and validity. Green Leadership recorded a CR value of 0.982 and an AVE of 0.933, with all indicators having outer loadings above 0.92, indicating a strong contribution from each indicator. Green Intellectual Capital was also reliable (CR 0.916; AVE 0.731), supported by adequate indicators despite their greater variation. Furthermore, Green Commitment showed high consistency (CR 0.928; AVE 0.763), reflecting the organization's solid commitment to sustainable practices. Meanwhile, Green Performance obtained a CR value of 0.986 and an AVE of 0.932, which was reinforced by very high outer loadings on all indicators, confirming that the organization's environmental performance falls into the very strong category.

**Table 4. Discriminant Validity: Fornell-larcker Criterion**

| | Green Commitment | Green Intellectual Capital | Green Leadership | Green Performance |
|---|---|---|---|---|
| Green Commitment | 0.873 | | | |
| Green Intellectual Capital | 0.277 | 0.855 | | |
| Green Leadership | 0.176 | 0.563 | 0.966 | |
| Green Performance | 0.361 | 0.588 | 0.495 | 0.965 |

Source: Analysis results from SmartPLS software (2025)

According to Table 4, all of the model's constructs show sufficient uniqueness, according to the discriminant validity evaluation using the Fornell-Larcker criteria. To be more precise, the square root of each construct's Average Variance Extracted (AVE) is higher than its correlations with other constructs, indicating that each variable represents a distinct idea. With a score of 0.873, green commitment outperforms its relationships with other factors. Also, the related inter-construct correlations are lower than the values shown by green intellectual capital (0.855), green leadership (0.966), and green performance (0.965). Based on these findings, it is clear that the measurement model meets the criteria for discriminant validity. The validity of the ensuing hypothesis testing is supported by the structural model analysis, which is resilient and credible since each construct may be evaluated individually without major overlap with other constructs.

**Inner Model Measurement**

Examining the proposed research model's structural links among latent variables is done via the inner model assessment in the SEM-PLS framework. The coefficient of determination ($R^2$), which shows how much

variation in endogenous variables is explained by exogenous variables, is one of the main indicators that are examined in this evaluation. Also, the relative amount of impact exerted by each predictor construct is determined by analyzing the effect size ($f^2$). Additionally, the assessment includes calculating path coefficients and determining if they are statistically significant using a bootstrapping technique. This procedure gives us t-values and p-values, which we can use to see how strong the links are between the various constructs. Taken as a whole, these metrics reveal how well the model predicts outcomes and how sturdy its structure is. According to Sarstedt et al. (2020), values of 0.19 for $R^2$ imply poor explanatory power, 0.33 for moderate explanatory power, and 0.67 for good explanatory power. Ghozali (2014) provided evidence in support of this claim by stressing that a $R^2$ value more than 0.67 indicates a robust association between exogenous and endogenous variables, suggesting a structural model that is well-suited for testing hypotheses.

**Table 5. Coefficient of Determination Result R2**

| Notes | R-Square | R-Square Adjusted |
|---|---|---|
| Green Performance | 0.426 | 0.416 |

Source: Analysis results from SmartPLS software (2025)

According to Table 5, the Green Performance variable has a $R^2$ value of 0.426 and an adjusted $R^2$ of 0.416, as shown in the coefficient of determination analysis. Based on the results, it seems that the structural model accounts for about 42.6% of the variation in green performance with the predictor constructs that were considered. The rest of the variation is likely caused by additional characteristics that were not taken into account by the model. The independent factors contribute significantly and moderately strongly to explaining differences in Green Performance, as shown by the moderate explanatory category $R^2$ value. However, this does suggest that other organizational, environmental, or contextual factors may be present; future research might benefit from include them to fully understand the effects of environmental performance.

Also, in the structural model, the impact size of each exogenous construct on the endogenous variable is evaluated using the F-square ($f^2$) analysis in the PLS-SEM framework. Beyond simple statistical significance, this test provides insight into the practical importance of each causal link by measuring the amount each predictor contributes to changes in the $R^2$ value when it is included or deleted from the model. According to Cohen's criteria, an $f^2$ value of 0.02 indicates a small effect, 0.15 indicates a medium effect, and 0.35 indicates a substantial effect (Sarstedt et al., 2020). Therefore, the F-Square test is a crucial instrument for evaluating the relevance and relative contribution of each independent variable in explaining the variability of the dependent construct more comprehensively.

**Table 6. F-Square Value**

| | Green Performance |
|---|---|
| Green Commitment | 0.071 |
| Green Intellectual Capital | 0.180 |
| Green Leadership | 0.065 |

Source: Analysis results from SmartPLS software (2025)

As shown in Table 6, the results of the F-Square analysis show that each predictor variable has a varying effect on Green Performance. Green intellectual capital has the most significant influence, with a value of 0.180, which falls within the small to moderate effect category. Therefore, its contribution to improving green performance is quite substantial. Green commitment has an F-Square value of 0.071, while green leadership shows a value of 0.065, both of which fall within the small effect category, yet still play a role in influencing green performance. This finding confirms that although all variables contribute, green intellectual capital is the most dominant factor in strengthening organizational environmental performance.

**Hypothesis Testing**

In this study, the researchers tested their hypotheses by looking for correlations between the latent constructs that were part of the research framework using the PLS-SEM method (Sarstedt et al., 2020). An evaluation of the statistical significance, direction, and size of the impacts of exogenous factors on endogenous variables concurrently is the goal of this approach. In order to evaluate hypotheses, the testing approach utilized a bootstrapping method to obtain estimates of path coefficients and the accompanying t-values and p-values. When the t-statistic is more than the crucial value and the p-value is less than the preset significance threshold, the hypothesis is said to be supported. By taking sample variability into consideration, this method makes the analysis more robust and gives proof of the validity of the hypothesized associations, which strengthens the credibility of the study's findings and its theoretical implications.

**Table 7. Hypothesis Test**

| Hypothesis | Coefficient | Standard Deviation | t-count | P-Value | Conclusion |
|---|---|---|---|---|---|
| Green Leadership>>Green Performance (H1) | 0.234 | 0.082 | 2,872 | **0.004** | **Accepted** |
| Green Intellectual Capital>>Green Performance (H2) | 0.398 | 0.076 | 5,245 | **0.000** | **Accepted** |
| Green Commitment>>Green Performance (H3) | 0.210 | 0.044 | 4,764 | **0.000** | **Accepted** |

Note: t-count = T-Statistics; p-value = probability value.
Source: Analysis results from SmartPLS software (2025)

According to the findings Table 7, all of the study's assumptions are correct and significantly impact green performance in a good way. Leading with a focus on sustainability practices is known as "green leadership," and research shows that it helps organizations do better for the environment. Furthermore, green intellectual capital greatly improves green performance by bolstering an organization's skills in environmentally friendly knowledge, innovation, and intellectual resource management. In addition, green commitment is essential for making sure that the company's sustainability goals, culture, and values are well-integrated into daily operations. In sum, our results show that eco-friendly practices, environmentally conscious leadership, and long-term planning all contribute to an organization's environmental performance.

## DISCUSSION

The research findings suggest that green leadership plays a crucial role in enhancing the environmental performance of hotels in North Sumatra. This confirms that leadership that instills a vision of sustainability, provides ecological role models, and encourages employee participation can create a work environment conducive to green practices. The mechanism of this influence can be understood through transformational leadership theory, where leaders become the primary drivers of organizational behavioral change through idealized influence and inspirational motivation. When leaders demonstrate a genuine concern for the environment, employees are encouraged to adjust their behaviour and performance in line with sustainability values. These results are consistent with the literature, which indicates that green transformational leadership fosters green creativity, eco-friendly innovation, and pro-environmental behaviour, ultimately leading to enhanced environmental performance (Özgül & Zehir, 2023; Riva et al., 2021). In the context of the North Sumatran hotel industry, green leadership becomes increasingly relevant due to the resource-intensive nature of the industry and the need for cross-functional coordination to implement sustainable practices. Leaders who can integrate environmental policies into the organizational vision not only strengthen employee commitment but also improve operational efficiency through more responsible energy, water, and waste management. Furthermore, green leadership creates a green climate that reinforces internal norms related to environmental awareness. Thus, the mechanism of green leadership's influence on green performance operates through the formation of a pro-environmental organizational culture, increased employee engagement, and the reinforcement of sustainability values as part of the hotel's business strategy. These findings reinforce the argument that shifting toward sustainable practices must begin at the leadership level as the primary driver of organizational transformation.

The research findings confirm that green intellectual capital is a crucial determinant of green performance. Environmentally oriented intellectual capital, encompassing employees' knowledge, skills, creativity, and ecological awareness, serves as the foundation for organizations to generate green innovations and implement sustainable operational practices. Based on the resource-based view, green intellectual capital is a rare and difficult-to-imitate intangible asset, enabling it to provide a competitive advantage in improving environmental performance. This finding aligns with previous research, which confirms that environmental knowledge and innovative capabilities facilitate the implementation of green strategies, such as energy efficiency, water conservation, and waste reduction (Shah et al., 2021; Nisar et al., 2021; Chao & Juo, 2021). At the mechanistic level, green intellectual capital acts as a cognitive enabler, enabling organizations to identify ecological opportunities and develop solutions that align with the environmental dynamics of the hospitality industry. Employees with a deep understanding of sustainable practices tend to be more proactive in finding new ways to minimize environmental impacts. In the context of North Sumatra, a hotel's success in improving green performance is strongly influenced by its internal ability to translate green knowledge into operational actions. The hospitality industry, located in the Lake Toba tourist area, faces special demands for maintaining environmental quality, making green intellectual capital a strategic necessity. Green intellectual capital also enhances the effectiveness of sustainability policies through internal collaboration mechanisms, knowledge transfer, and environmentally oriented innovation. Thus, green intellectual capital not only supports the

achievement of environmental performance standards but also builds organizational resilience to the demands of sustainable business.

The finding that green commitment significantly influences green performance underscores the importance of organizational commitment as a foundation for sustainability. Green commitment reflects the willingness of management and employees to prioritize environmental goals, allocate resources, and maintain consistent implementation of green policies. From a social exchange theory perspective, when an organization demonstrates a strong commitment to sustainability, employees respond by increasing their participation in green programs and exhibiting pro-environmental behaviour, which ultimately enhances the company's environmental performance. Previous literature supports this finding, where green commitment has been shown to strengthen green innovation, environmental policy implementation, and resource utilization efficiency (Sharma et al., 2021; Somjai et al., 2020; Zhang & Walton, 2017). This influence mechanism works through strengthening an organizational culture that places sustainability as a core value, as well as the creation of formal structures such as green operational standards, environmental performance evaluation, and transparent reporting. Organizational commitment also reduces resistance to change because employees view sustainability not merely as an external demand but as an integral part of the organization's identity. In the context of the North Sumatran hospitality industry, green commitment is crucial because this industry operates in areas with high ecological sensitivity such as Lake Toba. Hotels that demonstrate a strong commitment to green practices are better able to maintain environmental quality, reduce their carbon footprint, and meet the expectations of increasingly eco-conscious travelers. A green commitment also ensures the sustainability of green practices through a long-term orientation, rather than just a short-term initiative. Therefore, this variable serves as a driver of consistency and stability in the implementation of sustainability strategies, leading to sustained improvements in green performance.

## CONCLUSIONS

This study's findings reveal significant trends about the factors influencing green performance in the hospitality sector. The study establishes that green intellectual capital is the preeminent element affecting green performance ($\beta = 0.398$, $p < 0.000$), signifying that workers' environmental knowledge, abilities, and innovative capacity are essential for enhancing sustainability results. Second, green leadership has a big positive impact ($\beta = 0.234$, $p < 0.004$), which means that leaders who make decisions based on environmental principles may motivate people to behave in ways that are good for the environment and improve the company's sustainability policies. Third, green commitment has a big effect on green performance ($\beta = 0.210$, $p < 0.00$), which shows that an organization's commitment to environmental objectives helps them carry out sustainability efforts on a regular basis. These results show a new trend in the hotel industry: sustainable success is not only reliant on leadership direction, but also on the combination of leadership orientation, knowledge-based resources, and organizational commitment. The findings also suggest that intangible organizational resources, especially environmental knowledge and learning ability, have a more significant influence than previously highlighted in the literature concerning green performance in service sectors.

This work has several limitations that should be recognized, even if it made some important contributions. First, the study uses cross-sectional survey data from 170 hotel workers, which makes it hard to see how sustainable policies improve over time. As firms implement new sustainability initiatives, environmental performance and leadership practices may change. Longitudinal techniques might potentially provide more profound insights into causal links. Second, the research concentrates on hotels situated in North Sumatra, Indonesia, thereby limiting the applicability of the results to other areas or tourist destinations characterized by distinct institutional forces, regulatory frameworks, or degrees of environmental consciousness. Third, the study focuses exclusively on three primary predictors—green leadership, green intellectual capital, and green commitment—omitting other pertinent factors such as green organizational culture, environmental technology adoption, stakeholder pressure, and regulatory support from the model. Lastly, the information comes from workers' own perspectives, which might lead to response bias or a subjective judgment of how well the firm is doing in terms of sustainability.

This study presents several opportunities for further research and managerial practices, especially within the domains of corporate leadership and sustainability management. Subsequent research may enhance this model by integrating mediating or moderating variables, including green organizational culture, green innovation capability, digital environmental monitoring systems, or external stakeholder pressure, to elucidate the mechanisms connecting leadership and sustainability performance more effectively. Comparative research across various tourist locations or countries may provide comprehensive insights into the impact of contextual variables on the efficacy of sustainability-oriented leadership. Longitudinal study designs may also elucidate the evolution of leadership tactics, knowledge resources, and organizational commitment over time, therefore influencing long-term environmental performance. From a practical standpoint, the results underscore the necessity of fortifying sustainability-focused business leadership, creating environmental training initiatives that augment

green intellectual capital, and instituting institutional policies that bolster organizational dedication to environmental objectives. These kinds of combined initiatives may help hospitality businesses do more for the environment while also making them more competitive in a tourist industry that is becoming more focused on sustainability.

**Author Contributions**

Conceptualization: VC, G. M .PD, MS, WL, HPS; data curation: VC, GMPD, MS, WL, HPS; formal analysis: VC, MS, WL, HPS; investigation: VC, GMPD, MS, WL, HPS; methodology: ED, GMPD, MB, WL, HPS; project administration: ED, MB, WL; supervision: VC, MS, WL: validation: VC, GMPD, MS, WL, HPS; visualization: VC, G. M .PD, MS, WL.; writing – original draft: VC, MS, WL; writing – review & editing: VC, GMPD, MS, WL, HPS

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**Conflicts of Interest**

The authors declare that they have no conflict of interest.

**Data Availability Statement**

Not applicable.

**Statement on the Use of AI Tools**

The authors recognize the utilization of artificial intelligence (AI) tools to enhance the clarity of the manuscript and facilitate language refinement during the writing process. Grammatical editing, wording suggestions, and overall language enhancement were the sole purposes of these instruments. The authors were responsible for the entire process of conceptual development, research design, collecting data, analysis, interpretation of results, and final conclusions. The authors assume full responsibility for the content of this article and verify that the originality, integrity, and scientific validity of the research were not impacted by the use of AI tools.

**Informed Consent Statement**

This research received official approval from the Sekolah Tinggi Ilmu Ekonomi Sultan Agung prior to data collection. All respondents participated voluntarily after being explained the research objectives and procedures. The confidentiality of the information collected, including data and interviews with respondents, is guaranteed and will be used solely for academic purposes without disclosing the respondents' personal identities.

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**APPENDIX**

**Questionnaire Form**

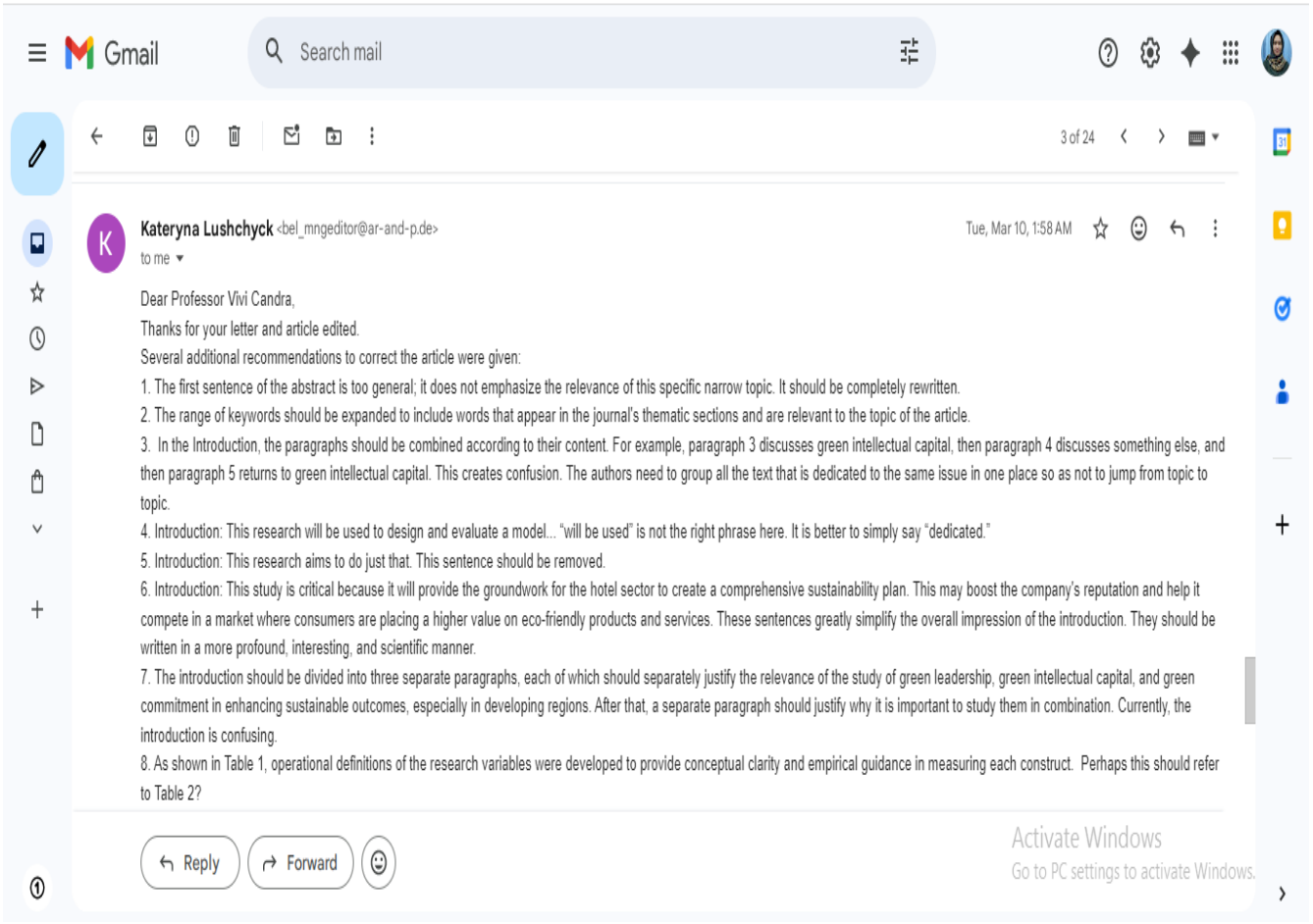
| ***GREEN LEADERSHIP*** | | | | | | |
|---|---|---|---|---|---|---|
| No | What is your opinion, attitude, knowledge regarding the statement below: | Strongly agree | Agree | Neutral | Disagree | Strongly Disagree |
| | ***Sustainable Vision and Mission*** | | | | | |
| 1 | Our hotel has a clear vision and mission to support environmentally friendly business practices. | | | | | |
| 2 | Company leadership consistently communicates the importance of sustainability in every operational activity. | | | | | |
| | ***Ability to Inspire and Motivate*** | | | | | |
| 3 | Leaders at my workplace are able to inspire employees to care about environmental issues. | | | | | |
| 4 | I feel motivated to contribute to sustainability programs because of the support from my superiors. | | | | | |
| | ***Skills and Knowledge Development*** | | | | | |
| 5 | We regularly receive training on sustainability practices in the hospitality industry. | | | | | |
| 6 | The company encourages employees to develop knowledge about green management and resource efficiency. | | | | | |
| | ***Involvement in Sustainable Initiatives*** | | | | | |
| 7 | I am actively involved in environmental activities or programs organized by the hotel. | | | | | |
| 8 | My company works with local communities to run eco-friendly initiatives. | | | | | |

| ***GREEN INTELLECTUAL CAPITAL*** | | | | | | |
|---|---|---|---|---|---|---|
| No | What is your opinion, attitude, knowledge regarding the statement below: | Strongly agree | Agree | Neutral | Disagree | Strongly Disagree |
| | ***Knowledge of Sustainable Practices*** | | | | | |
| 1 | I have a good understanding of sustainability principles in the hospitality industry. | | | | | |
| 2 | I know various methods to reduce environmental impact in hotel operations. | | | | | |
| | ***Implementation of Sustainable Practices*** | | | | | |
| 3 | Our hotel actively implements environmentally friendly policies in its daily operations. | | | | | |
| 4 | Sustainability practices such as reducing single-use plastics and energy efficiency have been implemented in my workplace. | | | | | |
| | ***Innovation and Creativity*** | | | | | |
| 5 | I am driven to create new solutions in implementing environmentally friendly practices. | | | | | |
| 6 | The place I work supports innovative ideas to improve sustainability. | | | | | |
| | ***Personal Awareness and Commitment*** | | | | | |
| 7 | I feel responsible for supporting sustainability practices in the workplace. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8 | I am personally committed to practicing environmentally friendly work behavior. | | | | | |
| ***GREEN COMMITMENT*** | | | | | | |
| No | What is your opinion, attitude, knowledge regarding the statement below: | Very good | Good | Neutral | Not good | Very Bad |
| ***Leadership and Management Commitment*** | | | | | | |
| 1 | The leadership where I work actively encourages the implementation of sustainability principles. | | | | | |
| 2 | Management consistently demonstrates commitment to environmentally friendly practices. | | | | | |
| 3 | Commitment to sustainability is an important part of the managerial strategy in our organization. | | | | | |
| ***Investments and Resources*** | | | | | | |
| 4 | Our organization allocates a dedicated budget to support sustainability initiatives. | | | | | |
| 5 | The company provides adequate resources for training and implementation of sustainable practices. | | | | | |
| 6 | Investment in environmentally friendly technologies is a priority in operational development. | | | | | |
| ***Sustainability Policies and Standards*** | | | | | | |
| 7 | The company has a written policy regarding sustainability practices. | | | | | |
| 8 | We follow nationally or internationally recognized sustainability standards. | | | | | |
| 9 | There are clear operational guidelines regarding environmental management and social responsibility. | | | | | |
| ***Participation in External Initiatives*** | | | | | | |
| 10 | Our company is involved in sustainability programs initiated by the government or NGOs. | | | | | |
| 11 | We actively collaborate with external parties to support environmental and social goals. | | | | | |
| 12 | Our organization participates in certifications or awards related to sustainability. | | | | | |
| ***GREEN PERFORMANCE*** | | | | | | |
| No | What is your opinion, attitude, knowledge regarding the statement below: | Strongly agree | Agree | Neutral | Disagree | Strongly Disagree |
| ***Energy Efficiency*** | | | | | | |
| 1 | Our company actively uses energy-saving technologies in its operations. | | | | | |
| 2 | Energy usage in the workplace is monitored and optimized regularly. | | | | | |
| ***Waste Management*** | | | | | | |
| 3 | Our company has an organized waste sorting and management system. | | | | | |
| 4 | We reduce the use of disposable materials in our operational processes. | | | | | |
| ***Water Conservation*** | | | | | | |
| 5 | Our organization implements technology to conserve water usage. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6 | Employees are educated about the importance of maintaining efficient water use. | | | | | |
| ***Use of Environmentally Friendly Materials*** | | | | | | |
| 7 | We choose raw materials that have minimal environmental impact in the production process. | | | | | |
| 8 | Our products are designed to reduce negative impact on the environment. | | | | | |
| ***Green Education and Awareness*** | | | | | | |
| 9 | The company regularly holds training or campaigns on sustainability. | | | | | |
| 10 | Employees have a high awareness of the importance of protecting the environment. | | | | | |

# Bukti konfirmasi review round 2 dan hasil review round 2 (10 Maret 2026)



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3 of 24

**Kateryna Lushchyck** <bel_mngeditor@ar-and-p.de> Tue, Mar 10, 1:58 AM

to me

Dear Professor Vivi Candra,

Thanks for your letter and article edited.

Several additional recommendations to correct the article were given:

1. The first sentence of the abstract is too general; it does not emphasize the relevance of this specific narrow topic. It should be completely rewritten.
2. The range of keywords should be expanded to include words that appear in the journal's thematic sections and are relevant to the topic of the article.
3. In the Introduction, the paragraphs should be combined according to their content. For example, paragraph 3 discusses green intellectual capital, then paragraph 4 discusses something else, and then paragraph 5 returns to green intellectual capital. This creates confusion. The authors need to group all the text that is dedicated to the same issue in one place so as not to jump from topic to topic.
4. Introduction: This research will be used to design and evaluate a model... "will be used" is not the right phrase here. It is better to simply say "dedicated."
5. Introduction: This research aims to do just that. This sentence should be removed.
6. Introduction: This study is critical because it will provide the groundwork for the hotel sector to create a comprehensive sustainability plan. This may boost the company's reputation and help it compete in a market where consumers are placing a higher value on eco-friendly products and services. These sentences greatly simplify the overall impression of the introduction. They should be written in a more profound, interesting, and scientific manner.
7. The introduction should be divided into three separate paragraphs, each of which should separately justify the relevance of the study of green leadership, green intellectual capital, and green commitment in enhancing sustainable outcomes, especially in developing regions. After that, a separate paragraph should justify why it is important to study them in combination. Currently, the introduction is confusing.
8. As shown in Table 1, operational definitions of the research variables were developed to provide conceptual clarity and empirical guidance in measuring each construct. Perhaps this should refer to Table 2?

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**REFEREE REPORT**

Business Ethics and Leadership

Manuscript code 24-01-2026_BEL

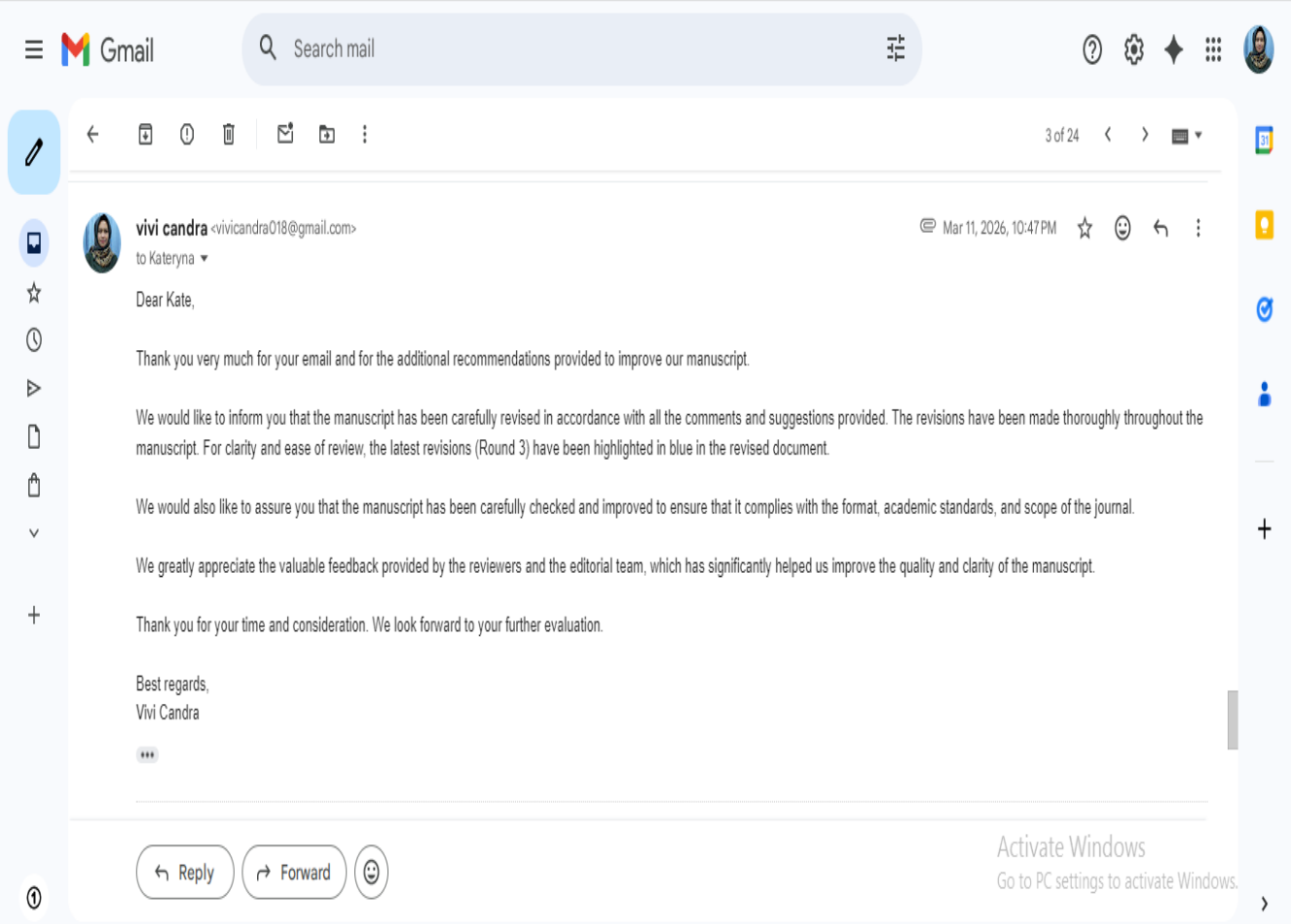
Manuscript title Green Leadership Model Development in Driving Green Performance Towards Sustainable Practices: A Simultaneous Approach in the Sumatran Hospitality Industry

**Referee's name 3: coded**

**Several additional recommendations to correct the article were given:**

1) The first sentence of the abstract is too general; it does not emphasize the relevance of this specific narrow topic. It should be completely rewritten.
2) The range of keywords should be expanded to include words that appear in the journal's thematic sections and are relevant to the topic of the article.
3) In the Introduction, the paragraphs should be combined according to their content. For example, paragraph 3 discusses green intellectual capital, then paragraph 4 discusses something else, and then paragraph 5 returns to green intellectual capital. This creates confusion. The authors need to group all the text that is dedicated to the same issue in one place so as not to jump from topic to topic.
4) As shown in Table 1, operational definitions of the research variables were developed to provide conceptual clarity and empirical guidance in measuring each construct. Perhaps this should refer to Table 2?
5) Before Table 3 and before Tables 4, 5, 6, and 7, text should be written that introduces these tables, indicating the table numbers.
6) The text in the Conclusions should not duplicate the text in the abstract verbatim.

# Bukti konfirmasi submit revisi kedua, respon kepada reviewer, dan artikel yang diresubmit (11 Maret 2026)




1) **Comments Reviewer 3 to the Author**

| |
|---|
| The first sentence of the abstract is too general; it does not emphasize the relevance of this specific narrow topic. It should be completely rewritten. |

**Response:**

We sincerely appreciate the reviewer's insightful comment regarding the opening sentence of the abstract. In response, the first sentence has been completely revised to provide a more specific and focused introduction that clearly emphasizes the relevance and significance of the particular research topic addressed in this study. The revised statement is intended to better reflect the study's scope, research context, and academic contribution, thereby improving the overall clarity and effectiveness of the abstract.

Green performance in the hospitality industry increasingly depends on how green business leadership mobilizes green intellectual capital and strengthens organizational green commitment. However, existing studies

typically examine these elements separately, offering limited understanding of their simultaneous interaction in driving sustainable practices. This study addresses this gap by developing an integrated model linking green business leadership, green intellectual capital, and green commitment to enhance green performance, particularly within hospitality contexts in developing regions.

2) **Comments Reviewer 3 to the Author**

| |
|---|
| The range of keywords should be expanded to include words that appear in the journal's thematic sections and are relevant to the topic of the article. |

**Response:**

We thank the reviewer for the constructive suggestion regarding the selection of keywords. In response, the keyword section has been revised and expanded to include additional terms that are closely aligned with the journal's thematic focus and the core subject matter of the article. The updated keywords were carefully selected to improve the manuscript's visibility, indexing relevance, and discoverability within the appropriate academic and research domains.

green business leadership, sustainable practices, green commitment, green performance, hospitality industry

3) **Comments Reviewer 3 to the Author**

| |
|---|
| In the Introduction, the paragraphs should be combined according to their content. For example, paragraph 3 discusses green intellectual capital, then paragraph 4 discusses something else, and then paragraph 5 returns to green intellectual capital. This creates confusion. The authors need to group all the text that is dedicated to the same issue in one place so as not to jump from topic to topic. |

**Response:**

We sincerely appreciate the reviewer's valuable comment regarding the organization and coherence of the Introduction section. In response, the Introduction has been carefully revised by reorganizing and combining related paragraphs based on thematic consistency. Discussions concerning the same concepts, including green intellectual capital, have been grouped into a unified and logically structured sequence to improve clarity, readability, and the overall flow of the argument. These revisions were made to ensure a more systematic and coherent presentation of the study background and theoretical discussion.

The shift towards sustainable practices has emerged as a strategic priority in the worldwide hospitality business, given its substantial impact on energy consumption, water use, and trash production (Natalie et al., 2024; Siaw et al., 2022). Multiple research demonstrate that enhancing organizational green performance is not only reliant on technology adoption but is significantly affected by managerial characteristics and organizational behavior (Riva et al., 2021; Suliman et al., 2023). In this setting, green corporate leadership has become a pivotal influence on employees' environmental views, incentives, and pro-environmental behaviors inside firms (Özgül & Zehir, 2023). Leaders with a robust environmental focus may incorporate sustainability principles into organizational strategy, operational practices, and decision-making processes. Nonetheless, despite the increasing focus on sustainability leadership, several research continue to analyze green leadership as a singular determinant of environmental performance (Ullah et al., 2023; Zhao & Huang, 2022). This approach constrains the comprehension of how leadership engages with other internal organizational resources to produce sustainable results, especially in the hospitality industry of developing nations where resource constraints and structural obstacles are common.

In addition to leadership, the presence of green intellectual capital is a vital element affecting the success of environmental efforts (Yadiati et al., 2019; Marco-Lajara et al., 2022). Green intellectual capital denotes the aggregate environmental knowledge, competences, innovative capacities, and eco-centric skills held by people and companies (Renaldo & Augustine, 2022). Previous research indicates that green intellectual capital serves as

a strategic intangible asset that aids in the execution of sustainability plans, improves resource efficiency, and fosters environmentally focused innovation (Shah et al., 2021; Chao & Juo, 2021). In the hotel sector, workers' comprehension of sustainable practices, waste management systems, and energy efficiency protocols is crucial for attaining optimal green performance. Nonetheless, in several growing tourist locations, including areas like North Sumatra, investment in cultivating workers' green competences remains somewhat constrained. Consequently, firms often have difficulties in converting sustainability principles into efficient operational practices. Current research mostly categorizes green intellectual capital as either a mediating variable or emphasizes manufacturing sectors and small- to medium-sized firms, resulting in a relative paucity of empirical data within the hospitality industry.

A crucial organizational characteristic that enhances environmental performance is green commitment (Chawewong & Naipinit, 2024; Khan et al., 2022). Organizational green commitment denotes the degree to which management emphasizes sustainability via resource allocation, environmental standards, and the constant enforcement of eco-friendly policies (Zhou et al., 2021; Iftikhar et al., 2021). Empirical research indicates that robust management dedication to environmental objectives may enhance energy efficiency, promote waste reduction, and foster green innovation inside firms (Haldorai et al., 2022; Khan et al., 2022). In fact, some hospitality firms continue to see environmental measures primarily as reactions to legal or commercial demands rather than as fundamental company principles. Moreover, empirical evidence about the impact of green commitment on environmental performance remains incongruous. Significantly, prior studies hardly analyze green commitment concurrently with green business leadership and green intellectual capital within a unified framework (Sabellah et al., 2025; Haldorai et al., 2022). This study addresses the existing gap by developing a simultaneous model that integrates green business leadership, green intellectual capital, and green commitment to elucidate how these organizational factors collectively enhance green performance and promote sustainable practices in the hospitality sector.

This research dedicated to design and evaluate a model of green leadership, green intellectual capital, and green commitment in the North Sumatran hotel business, with the goal of pushing green performance towards sustainable practices. Improving green performance in the North Sumatran hotel business may be achieved by enhancing our knowledge of all three aspects at once. This research adds to the conversation on sustainability by creating a framework that shows how green business leadership, green intellectual capital, and green commitment all work together to affect the green performance of organizations in the hospitality sector. The study advances a simultaneous model, yielding profound theoretical insights into the internal organizational mechanisms that promote sustainable practices, while also presenting strategic implications for hospitality firms aiming to integrate environmental sustainability into their long-term competitive and operational frameworks.

**4) Comments Reviewer 3 to the Author**

| |
|---|
| As shown in Table 1, operational definitions of the research variables were developed to provide conceptual clarity and empirical guidance in measuring each construct. Perhaps this should refer to Table 2? |

**Response:**

We thank the reviewer for the careful observation regarding the table reference in the manuscript. In response, the table numbering and corresponding in-text citation have been carefully rechecked and corrected. The sentence referring to the operational definitions of the research variables has been revised to accurately correspond with the appropriate table number, thereby improving consistency, clarity, and accuracy throughout the manuscript.

As shown in Table 2, operational definitions of the research variables were developed to provide conceptual clarity and empirical guidance in measuring each construct. Green leadership is defined as a leader's ability to direct, influence, and inspire organizational members to integrate sustainability principles into their vision and work practices. This variable is measured through indicators of sustainable vision and mission (GL1), ability to inspire and motivate (GL2), skills and knowledge development (GL3), and involvement in sustainable initiatives (GL4). Green intellectual capital is defined as the accumulation of knowledge, skills, creativity, and environmental awareness of individuals and organizations as strategic assets in supporting green performance. Measurements include knowledge of sustainable practices (GIC1), implementation of sustainable practices

(GIC2), innovation and creativity (GIC3), and personal awareness and commitment (GIC4). Green commitment is defined as the level of seriousness and consistency with which an organization internalizes sustainability values into its policies, resource allocation, and managerial practices. This variable is measured through leadership and management commitment (GC1), investments and resources (GC2), sustainability policies and standards (GC3), and participation in external initiatives (GC4). Meanwhile, green performance refers to the level of achievement of an organization in managing environmental impacts effectively and sustainably, which is measured through energy efficiency (GP1), waste management (GP2), water conservation (GP3), use of environmentally friendly materials (GP4), and green education and awareness (GP5).

**5) Comments Reviewer 3 to the Author**

| |
|---|
| Before Table 3 and before Tables 4, 5, 6, and 7, text should be written that introduces these tables, indicating the table numbers. |

**Response:**

We sincerely appreciate the reviewer's constructive suggestion regarding the presentation of tables in the manuscript. In response, introductory explanatory text has been added before Table 3 as well as before Tables 4, 5, 6, and 7 to appropriately introduce and contextualize each table within the discussion. The revised text explicitly refers to the corresponding table numbers to improve the logical flow, readability, and structural consistency of the manuscript in accordance with academic writing conventions.

The measurement model analysis was performed to assess the reliability and validity of the constructs used in this research. This test makes sure that the indicators accurately reflect their latent variables before moving on to the structural model evaluation. The study encompasses the evaluation of indicator loadings, internal consistency reliability, and convergent validity, often measured by composite reliability and the average variance extracted (AVE). These criteria verify that the assessment items consistently assess the specified constructs and adequately capture variation from their indicators. Table 3 shows the findings of the assessment of the measurement model. It shows the indicator loadings, reliability coefficients, and validity measures for the constructs of green business leadership, green intellectual capital, green commitment, and green performance.

We did a test of discriminant validity to make sure that each concept in the study model is different from the others in a real way. The Fornell–Larcker criteria was used in this work to check for discriminant validity. This criterion compares the square root of the Average Variance Extracted (AVE) for each construct to the correlations between constructs. This criteria states that the square root of the AVE for a construct must exceed its correlations with other constructs, indicating that the construct shares a higher amount of variation with its indicators than with other variables in the model. Table 4 shows the results of the discriminant validity test using the Fornell–Larcker criterion. It shows whether the constructs of green business leadership, green intellectual capital, green commitment, and green performance meet the required level of discriminant validity.

Examining the proposed research model's structural links among latent variables is done via the inner model assessment in the SEM-PLS framework. The coefficient of determination ($R^2$), which shows how much variation in endogenous variables is explained by exogenous variables, is one of the main indicators that are examined in this evaluation. Also, the relative amount of impact exerted by each predictor construct is determined by analyzing the effect size ($f^2$). Additionally, the assessment includes calculating path coefficients and determining if they are statistically significant using a bootstrapping technique. This procedure gives us t-values and p-values, which we can use to see how strong the links are between the various constructs. Taken as a whole, these metrics reveal how well the model predicts outcomes and how sturdy its structure is. According to Sarstedt et al. (2020), values of 0.19 for $R^2$ imply poor explanatory power, 0.33 for moderate explanatory power, and 0.67 for good explanatory power. Ghozali (2014) provided evidence in support of this claim by stressing that a $R^2$ value more than 0.67 indicates a robust association between exogenous and endogenous variables, suggesting a structural model that is well-suited for testing hypotheses.

The F-square ($f^2$) analysis inside the PLS-SEM framework was used to find the impact size of each exogenous construct on the endogenous variable in the structural model assessment. This test shows how useful each structural connection is in real life by assessing how much each predictor alters the $R^2$ value when it is added to or taken out of the model. Cohen's criteria say that a $f^2$ value of 0.02 means a minor impact, 0.15 means a medium effect, and 0.35 means a strong effect (Sarstedt et al., 2020). Table 6 shows the findings of the impact size study. It shows how much green business leadership, green intellectual capital, and green commitment each contributed to explaining differences in green performance within the suggested structural model.

In this study, the hypotheses were tested by examining the relationships among latent constructs within the research framework using the PLS-SEM method (Sarstedt et al., 2020). This approach allows the simultaneous evaluation of the significance, direction, and magnitude of the effects of exogenous variables on endogenous variables. To assess the proposed relationships, a bootstrapping procedure was employed to estimate path coefficients along with their corresponding t-values and p-values. A hypothesis is considered supported when the t-statistic exceeds the critical value and the p-value is below the predetermined significance level. The detailed results of the hypothesis testing are presented in Table 7, which summarizes the path coefficients, t-statistics, and p-values for each relationship in the structural model. This analysis provides empirical evidence regarding the strength and significance of the relationships proposed in the research framework.

**6) Comments Reviewer 3 to the Author**

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| The text in the Conclusions should not duplicate the text in the abstract verbatim. |

**Response:**

We thank the reviewer for the valuable comment regarding the overlap between the Abstract and Conclusions sections. In response, the Conclusions section has been carefully revised to avoid verbatim repetition of the abstract content. The revised conclusion now provides a more comprehensive interpretation of the findings, including their implications, limitations, and future research directions, thereby ensuring greater distinction, depth, and academic coherence between the two sections.

This research offers empirical data about the organizational determinants that foster green performance within the hotel sector by analyzing the concurrent effects of green business leadership, green intellectual capital, and green commitment. The results show that green intellectual capital has the biggest effect on green performance ($\beta = 0.398$, $p < 0.001$). This means that environmental knowledge, employee skills, and the ability to come up with new ideas are all important resources for hospitality organizations that want to use good sustainability practices. These findings underscore the strategic significance of knowledge-driven environmental competencies in enhancing operational sustainability. The analysis also shows that green business leadership has a positive effect on green performance ($\beta = 0.234$, $p < 0.004$). This means that leaders who make strategic decisions that take the environment into account can encourage pro-environmental behavior and the use of sustainable practices throughout the organization. Furthermore, organizational green commitment has a strong positive impact on green performance ($\beta = 0.210$, $p < 0.01$), underscoring the need of persistent management support, environmental policies, and resource allocation in maintaining environmental activities.

# Green Business Leadership Model Development in Driving Green Performance Towards Sustainable Practices: A Simultaneous Approach in the Hospitality Industry

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**Type of manuscript:** research paper

**Abstract:** Green performance in the hospitality industry increasingly depends on how green business leadership mobilizes green intellectual capital and strengthens organizational green commitment. However, existing studies typically examine these elements separately, offering limited understanding of their simultaneous interaction in driving sustainable practices. This study addresses this gap by developing an integrated model linking green business leadership, green intellectual capital, and green commitment to enhance green performance, particularly within hospitality contexts in developing regions. This study aims to develop and test a simultaneous model that explains the influence of green leadership, green intellectual capital, and green commitment on green performance within the hospitality industry in North Sumatra. Data were gathered in 2025 via a survey administered in Indonesia, including 170 workers from hotels situated in the Lake Toba Samosir tourism region and Simalungun Regency, comprising both operational and management personnel within the hospitality industry. The survey included structured questions, and the results were analyzed with Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS software. The findings demonstrate that green leadership has a positive and substantial influence on green performance ($\beta = 0.234$, $p < 0.004$), indicating that sustainability-focused leadership practices enhance environmental performance in hospitality firms. Green intellectual capital significantly impacts green performance ($\beta = 0.398$, $p < 0.000$), indicating that environmental knowledge, innovation aptitude, and green organizational learning are crucial in enhancing sustainability results. The commitment to environmental sustainability substantially influences green performance ($\beta = 0.210$, $p < 0.00$), validating that persistent organizational devotion enhances the efficacy of environmental activities. These results provide new avenues for future study and managerial practice in business leadership, specifically in the integration of leadership, knowledge resources, and organizational commitment to enhance sustainable performance in the hospitality industry.

**Keywords:** green business leadership, sustainable practices, green commitment, green performance, hospitality industry
**JEL Classification:** L83, M12, M14, Q56

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## INTRODUCTION

Global climate change and environmental degradation have become strategic issues driving major transformations in business practices across sectors, including the hospitality industry (Akpa et al., 2022; Hashish et al., 2022). A United Nations World Tourism Organization (UNWTO) report indicates that the tourism sector accounts for approximately 8% of global carbon emissions, with the hospitality industry contributing

significantly through energy and water consumption and waste production (UNWTO, 2016). In line with the 2030 Sustainable Development Goals (SDGs), particularly goals 12 and 13, the hospitality industry is required to adopt sustainable practices to minimize environmental impacts while maintaining long-term competitiveness (Zeng et al., 2023; Sobaih et al., 2022). Furthermore, at the national level, Indonesia faces serious challenges in environmental management in the tourism sector. The Ministry of tourism and creative economy reported that hotel energy consumption in major tourist destinations increased by an average of 6–8% per year following the pandemic, as the tourism sector recovered (Kemenparekraf RI, 2014). This situation reinforces the urgency of systematically implementing green practices, not only through environmentally friendly technologies but also through sustainability-oriented managerial and human resource approaches (Luu, 2020; Indajang et al., 2024).

In the context of North Sumatra, particularly in strategic tourism areas like Lake Toba, the growth of the hotel industry has been accompanied by increasing pressure on local ecosystems. The Indonesian Central Statistics Agency (2020) reports a considerable growth in hotels and room occupancy rates in this area, which affects water, electricity, and trash management. Green performance strategies have not been incorporated into many hotels' leadership systems or organizational cultures (Nisar et al., 2021; Alsetoohy, 2022; Riva, 2021). Limited leadership involvement in implementing sustainability initiatives remains a major concern in the hotel industry. Green leadership refers to a leadership approach that guides environmental policies and drives organizational change, shaping pro-environmental visions, norms, and employee behaviors within the company to support sustainability goals and long-term environmental performance (He et al., 2021; Kim, 2022). Research indicates that green-oriented executives significantly impact environmental innovation and corporate green performance (Özgül & Zehir, 2023).

The shift towards sustainable practices has emerged as a strategic priority in the worldwide hospitality business, given its substantial impact on energy consumption, water use, and trash production (Natalie et al., 2024; Siaw et al., 2022). Multiple research demonstrate that enhancing organizational green performance is not only reliant on technology adoption but is significantly affected by managerial characteristics and organizational behavior (Riva et al., 2021; Suliman et al., 2023). In this setting, green corporate leadership has become a pivotal influence on employees' environmental views, incentives, and pro-environmental behaviors inside firms (Özgül & Zehir, 2023). Leaders with a robust environmental focus may incorporate sustainability principles into organizational strategy, operational practices, and decision-making processes. Nonetheless, despite the increasing focus on sustainability leadership, several research continue to analyze green leadership as a singular determinant of environmental performance (Ullah et al., 2023; Zhao & Huang, 2022). This approach constrains the comprehension of how leadership engages with other internal organizational resources to produce sustainable results, especially in the hospitality industry of developing nations where resource constraints and structural obstacles are common.

In addition to leadership, the presence of green intellectual capital is a vital element affecting the success of environmental efforts (Yadiati et al., 2019; Marco-Lajara et al., 2022). Green intellectual capital denotes the aggregate environmental knowledge, competences, innovative capacities, and eco-centric skills held by people and companies (Renaldo & Augustine, 2022). Previous research indicates that green intellectual capital serves as a strategic intangible asset that aids in the execution of sustainability plans, improves resource efficiency, and fosters environmentally focused innovation (Shah et al., 2021; Chao & Juo, 2021). In the hotel sector, workers' comprehension of sustainable practices, waste management systems, and energy efficiency protocols is crucial for attaining optimal green performance. Nonetheless, in several growing tourist locations, including areas like North Sumatra, investment in cultivating workers' green competences remains somewhat constrained. Consequently, firms often have difficulties in converting sustainability principles into efficient operational practices. Current research mostly categorizes green intellectual capital as either a mediating variable or emphasizes manufacturing sectors and small- to medium-sized firms, resulting in a relative paucity of empirical data within the hospitality industry.

A crucial organizational characteristic that enhances environmental performance is green commitment (Chawewong & Naipinit, 2024; Khan et al., 2022). Organizational green commitment denotes the degree to which management emphasizes sustainability via resource allocation, environmental standards, and the constant enforcement of eco-friendly policies (Zhou et al., 2021; Iftikhar et al., 2021). Empirical research indicates that robust management dedication to environmental objectives may enhance energy efficiency, promote waste reduction, and foster green innovation inside firms (Haldorai et al., 2022; Khan et al., 2022). In fact, some hospitality firms continue to see environmental measures primarily as reactions to legal or commercial demands rather than as fundamental company principles. Moreover, empirical evidence about the impact of green commitment on environmental performance remains incongruous. Significantly, prior studies hardly analyze green commitment concurrently with green business leadership and green intellectual capital within a unified framework (Sabellah et al., 2025; Haldorai et al., 2022). This study addresses the existing gap by developing a simultaneous model that integrates green business leadership, green intellectual capital, and green commitment

to elucidate how these organizational factors collectively enhance green performance and promote sustainable practices in the hospitality sector.

There is a lack of research on the topic, thus it is crucial to create a model that can explain how these three strategic factors interact to drive green performance towards sustainable practices all at once. Since the success of sustainable practices is not determined by a single element but rather by the synergy of leadership, intellectual capital, and organizational commitment, it is considered that a simultaneous approach would give a more thorough understanding than a fragmented approach. This research dedicated to design and evaluate a model of green leadership, green intellectual capital, and green commitment in the North Sumatran hotel business, with the goal of pushing green performance towards sustainable practices. Improving green performance in the North Sumatran hotel business may be achieved by enhancing our knowledge of all three aspects at once. This research adds to the conversation on sustainability by creating a framework that shows how green business leadership, green intellectual capital, and green commitment all work together to affect the green performance of organizations in the hospitality sector. The study advances a simultaneous model, yielding profound theoretical insights into the internal organizational mechanisms that promote sustainable practices, while also presenting strategic implications for hospitality firms aiming to integrate environmental sustainability into their long-term competitive and operational frameworks.

## LITERATURE REVIEW

### Theoretical Framework

In recent years, research on green performance has experienced a paradigm shift toward a perspective that emphasizes behavior, leadership, and intangible resources. Within the framework of the resource-based view (RBV) and dynamic capabilities theory, sustainability within an organization is crucial, built on hard-to-imitate internal assets, environmentally oriented leadership, green intellectual capital, and organizational commitment to sustainability (Sobaih et al., 2020; Asadi et al., 2020; Saleem et al., 2025). Within the organizational structural hierarchy, sustainability issues are crucial to understand and implement in every policy as a form of organizational commitment to supporting sustainability issues (Pham et al., 2023; Han et al., 2019). Green leadership is an extension of transformational leadership theory in the context of sustainability, where leaders play a role in shaping environmentally friendly visions, values, and strategic orientations (Kim, 2022; Suliman et al., 2023). From the RBV perspective, green intellectual capital is positioned as a strategic asset encompassing employee knowledge, competence, innovation, and environmental awareness. This capital functions as a cognitive infrastructure that enables organizations to translate sustainability visions into operational practices (Martínez-Falcó et al., 2023; Chao & Juo, 2021). However, its direct contribution to green performance in the service sector, particularly in the hospitality industry of developing regions, remains underdeveloped. Meanwhile, green commitment represents the internalization of sustainability values into organizational policies and practices. Although proven to strengthen the consistency of environmental strategies, previous research remains fragmented (Elzek et al., 2021; Sabellah et al., 2025). Therefore, the main theoretical gap lies in the lack of integrative models that simultaneously examine green leadership, green intellectual capital, and green commitment. This study proposes a conceptual framework that positions these three constructs as direct, mutually reinforcing determinants of green performance, particularly in the context of the North Sumatran hotel industry.

### Green Leadership and Green Performance

Green leadership is characterised by leaders who prioritise environmental concerns, integrate sustainability into decision-making processes, and inspire employees to adopt environmentally friendly behaviours (Shah et al., 2023; Luu, 2020; Liu et al., 2023). Several studies have shown that green leadership positively influences green performance, which encompasses aspects such as energy efficiency, waste reduction, and the adoption of environmentally friendly technologies (Perez et al., 2023; Özgül & Zehir, 2023; Riva et al., 2021). Studies Suliman et al. (2023), Ullah et al. (2023), Hidayati et al. (2024), and Saleem et al. (2025), emphasize the importance of a green leadership style that empowers employees to innovate and initiate environmentally sustainable initiatives. In addition, organizational support and commitment to sustainability goals significantly influence green performance outcomes (Úbeda-García et al., 2021; Sobaih et al., 2022). Researchers have highlighted the need for leaders to demonstrate proactivity, vision, and commitment to

environmental responsibility to drive green performance within their organizations effectively (Kim, 2022; Perez et al., 2023; Asadi et al., 2020).

Furthermore, several recent studies have demonstrated that green transformational leadership enhances environmental performance at both the individual and organizational levels by promoting green innovation, resource efficiency, and pro-environmental employee behaviour (Riva et al., 2021; Özgül & Zehir, 2023). However, findings across studies are not entirely consistent in explaining the magnitude and stability of these effects. In some contexts, the effects of green leadership appear relatively direct when green leadership is institutionalized within organizational strategy and supported by incentive systems and environmental performance controls; while in other contexts, the effects are predominantly indirect through psychological and social mechanisms such as green work engagement, green creativity, and an organizational climate supportive of environmental practices (Sobaih et al., 2022; Suliman et al., 2023; Balwant et al., 2020). A significant research gap exists in the service sector, particularly in the hospitality industry of developing regions, where green performance is strongly influenced by the intensity of energy and water use, service characteristics, and pressure from destination stakeholders. Therefore, based on the results of several previous studies, we develop the following hypothesis:

**H1:** Green leadership management influences green performance

**Green Intellectual Capital and Green Performance**

Green intellectual capital (GIC) is a concept that refers to the knowledge, skills, and capabilities of individuals or organizations in the context of environmental sustainability (Yadiati et al., 2019; Sohu et al., 2024; Khan et al., 2021). Research Chawewong & Naipinit (2024), Renaldo & Augustine (2022), Haldorai et al. (2022), shows that the adoption of green intellectual capital positively influences green performance in various ways, such as increasing the efficiency of natural resource use, reducing negative environmental impacts, and creating environmentally friendly product and process innovations. Factors such as environmental awareness, knowledge of sustainable practices, and the ability to implement environmentally friendly solutions are key in linking green intellectual capital with green performance (Nisar et al., 2021; Shah et al., 2021; Tjahjadi et al., 2023). Furthermore, some literature emphasizes the need for investment in the development of sustainable intellectual capital, both through training and education, and through an organizational culture that supports sustainability initiatives (Marco-Lajara et al., 2022; Chao & Juo, 2021).

Several cross-sector studies have found that organizations with high levels of GIC tend to demonstrate better energy efficiency, consistent waste reduction, and superior green innovation capabilities (Anik & Sulistyo, 2021; Shah et al., 2021; Augustinah et al., 2022). However, a synthesis of these findings reveals significant variation in the effects. Some studies report a direct effect of GIC on green performance, particularly when environmental knowledge is internalized in operational routines and management systems (Sohu et al., 2024; Yadiati et al., 2019). Conversely, other studies confirm that the effect of GIC is predominantly indirect through mechanisms such as green innovation, green human resource management, or pro-environmental employee behavior, indicating that green intellectual capital requires institutional channels to generate measurable environmental performance (Rustiarini et al., 2022; Anik & Sulistyo, 2021; Chao & Juo, 2021). A significant research gap exists in the lack of contextual studies in developing regions that examine the direct contribution of GIC to green performance, considering the operational complexity of the service sector. Therefore, based on several previous studies, the following hypotheses are developed:

**H2:** Green intellectual capital influences green performance

**Green Commitment and Green Performance**

Green commitment encompasses an organization's commitment to adopt and practice environmentally friendly behaviours and to achieve sustainability goals (Zhang & Walton, 2017; Basana et al., 2022; Khan et al., 2022). Studies Sharma et al. (2021), Iftikhar et al. (2021), and Mushtaq et al. (2019), demonstrate that the level of green commitment has a positive influence on green performance in various ways, including reducing waste and emissions, increasing resource efficiency, and developing more environmentally friendly innovations. Factors influencing green commitment include sustainability-oriented leadership, a supportive organizational culture, and pressure from external stakeholders (Somjai et al., 2020; Elshaer et al., 2022; Ahmad et al., 2023). Studies Riva et al. (2021) and Sabellah et al. (2025), also highlight the importance of transparently measuring

and reporting environmental performance as a means to strengthen green commitment and motivate behavioral change.

However, cross-study synthesis reveals differing findings regarding its impact mechanisms. Some studies find a direct effect of GIC on green performance, particularly when green knowledge and competencies are institutionalized in organizational systems, procedures, and work routines (Shah et al., 2021; Migdadi, 2023). Conversely, other studies confirm that the influence of GIC is predominantly indirect through green innovation, green human resource management, or employee pro-environmental behavior, suggesting that green intellectual capital requires institutional mechanisms to generate measurable environmental performance (Nisar et al., 2021; Haldorai et al., 2022; Úbeda-García et al., 2021). These differences in results are also influenced by the industry context and the level of organizational maturity; empirical evidence is relatively strong in the manufacturing and SME sectors, while in the service sector, particularly the hospitality industry, results are still limited and inconsistent (Renaldo & Augustine, 2022; Sohu et al., 2024). A prominent research gap lies in the lack of contextual studies in developing regions that examine the direct contribution of GIC to green performance, as well as the limited separate analysis of GIC dimensions to identify the most important components. Therefore, based on several previous studies, the following hypotheses are developed:

**H3:** Green commitment influences green performance

This research synthesizes the three aforementioned hypotheses by including green leadership, green intellectual capital, and green commitment into a cohesive conceptual framework to elucidate green performance within the hospitality industry. While prior research has analyzed these characteristics individually, there is a paucity of studies investigating their concurrent impact within a singular empirical framework, especially in service-oriented sectors where environmental policies are intricately linked to operational procedures and staff conduct. In the hospitality sector, sustainability performance is influenced by management guidance, the organization's knowledge assets, and the collective dedication of workers to environmental objectives. So, looking at all three of these aspects together gives us a better idea of how policies that focus on sustainability lead to observable environmental results. Additionally, the hotel industry in developing areas has its own set of problems, such as a lack of access to technology, personnel who are not very environmentally conscious, and growing demand from tourist stakeholders to embrace sustainable practices. The following part delineates the study methods used to evaluate the offered hypotheses, grounded on this theoretical framework.

## METHODOLOGY

### Research Design

This study uses a library and field research design with a quantitative approach. The approach used is a simultaneous approach that considers the interaction between these three factors within a single analytical framework. The research location is the hotel industry in the tourist attraction of Lake Toba, located in Samosir and Simalungun Regency, North Sumatra. This tourist attraction was selected because it has significant potential in the hotel industry and is a key destination in the context of North Sumatra tourism. The presence of hotels around Lake Toba, Samosir, and Simalungun Regency offers variations in size, class, and business model, allowing for a more comprehensive analysis of the influence of green leadership models, green intellectual capital, and green commitment on green performance.

### Sample and Data Collection

The population of this study comprises entrepreneurs and employees from all hotels operating in the Lake Toba Samosir tourist attraction, North Sumatra. This tourist attraction was chosen because it serves as a major hub of tourism activity in the region. The research sample will be selected purposively from this population, taking into account variations in hotel size, class, and business model. Inclusion criteria for sample selection include the existence of policies or practices related to environmental sustainability, as well as the availability of relevant data for analysis. According to Hair et al. (2019), if the population size is unknown, the sample size can be determined from 5-10 times the number of indicators used in a single construct. This study utilizes 17 indicators from four existing variable dimensions, resulting in a total of 17 × 10 = 170 research samples. The explanation of the characteristics of the respondents in this study is explained in the following table:

**Table 1. Descriptions of Research Respondents**

| Category | Detail | Amount | Percentage (%) |
|---|---|---|---|
| Gender | Men | 106 | 62.35 |
| | Woman | 64 | 37.65 |
| Age (years) | < 25 | 22 | 12.94 |
| | 26 - 35 | 48 | 28.23 |
| | 36 - 45 | 70 | 41.18 |
| | 46 - 55 | 20 | 11.75 |
| | > 55 | 10 | 5.88 |
| Level of education | SENIOR HIGH SCHOOL | 85 | 50 |
| | Diploma | 35 | 20.59 |
| | Bachelor | 45 | 26.47 |
| | Masters | 5 | 2.94 |
| Length of Service (years) | < 1 | 22 | 12.94 |
| | 1 - 5 | 58 | 34.12 |
| | 6 - 10 | 60 | 35.29 |
| | > 10 | 30 | 17.65 |
| Title/Position | Operations Manager | 19 | 11.18 |
| | General Manager | 10 | 5.88 |
| | Supervivi | 31 | 18.24 |
| | Front Office | 40 | 23.54 |
| | Executive Staff | 20 | 11.76 |
| | Employee | 50 | 29.4 |

Source: data processing results (2025)

According to the data in Table 1, the demographic characteristics of the respondents in this study are categorized into several primary categories, including gender, age, education level, length of service, and job title or position. Based on gender, the majority of respondents were male, comprising 106 people (62.35%), while female respondents numbered 64 (37.65%), indicating a predominance of male participation in the study. In terms of age, the largest group of respondents was in the 36–45 years age range, with a total of 70 people (41.18%), followed by the 26–35 years age group, with 48 people (28.23%). Respondents aged under 25 years numbered 22 people (12.94%), while the 46–55 years and above 55 years age groups each comprised 20 people (11.75%) and 10 people (5.88%), indicating that most respondents fell within the productive age range with relatively mature work experience.

In terms of educational level, the majority of respondents had a high school education background, with 85 people (50%), followed by Bachelor's graduates (45 people, 26.47%) and Diploma graduates (35 people, 20.59%). Meanwhile, respondents with a Master's degree were relatively few, namely 5 people (2.94%). Based on the length of service, respondents with 6–10 years of service were the largest group, comprising a total of 60 people (35.29%), followed by respondents with 1–5 years of service, who totaled 58 people (34.12%). Respondents with more than 10 years of work experience numbered 30 people (17.65%), while respondents with less than one year of work experience numbered 22 people (12.94%). In terms of position, the majority of respondents were in the employee category, comprising 50 people (29.4%), followed by front office positions, which included 40 people (23.54%), and supervisors, who numbered 31 people (18.24%). Meanwhile, respondents serving as operational managers and general managers numbered 19 (11.18%) and 10 (5.88%) respectively, while executive staff numbered 20 (11.76%). Overall, this composition indicates that the study respondents came from diverse demographic backgrounds and job positions, thus comprehensively representing the research population.

**Measurement Instruments**

Operational definitions of research variables are developed to provide conceptual clarity and empirical guidance in the measurement process for each variable studied. These definitions aim to translate abstract

theoretical concepts into indicators that can be systematically observed and measured. With operational definitions, each research variable has clear boundaries regarding its meaning, dimensions, and measurement methods, thereby reducing the potential for differences in interpretation during both the data collection and analysis stages. Furthermore, operational definitions play a crucial role in ensuring the consistency, validity, and reliability of research instruments, as well as ensuring that the measurements taken truly represent the intended constructs in accordance with the research's conceptual framework.

**Table 2. Operational Definition of Research Variables**

| Variables | Code | Item | Source |
|---|---|---|---|
| ***Green Leadership*** | GL1 | *Sustainable Vision and Mission* | (Perez et al., 2023; Suliman et al., 2023) |
| | GL2 | *Ability to Inspire and Motivate* | |
| | GL3 | *Skills and Knowledge Development* | |
| | GL4 | *Involvement in Sustainable Initiatives* | |
| ***Green Intellectual Capital*** | GIC1 | *Knowledge of Sustainable Practices* | (Sohu et al., 2024; Chawewong & Naipinit, 2024) |
| | GIC2 | *Implementation of Sustainable Practices* | |
| | GIC3 | *Innovation and Creativity* | |
| | GIC4 | *Personal Awareness and Commitment* | |
| ***Green Commitment*** | GC1 | *Leadership and Management Commitment* | (Basana et al., 2022; Iftikhar et al., 2021) |
| | GC2 | *Investments and Resources* | |
| | GC3 | *Sustainability Policies and Standards* | |
| | GC4 | *Participation in External Initiatives* | |
| ***Green Performance*** | GP1 | *Energy Efficiency* | (Pham et al., 2023; Han et al., 2019) |
| | GP2 | *Waste Management* | |
| | GP3 | *Water Conservation* | |
| | GP4 | *Use of Environmentally Friendly Materials* | |
| | GP5 | *Green Education and Awareness* | |

Source: constructed by the authors using prior research (2025)

As shown in Table 2, operational definitions of the research variables were developed to provide conceptual clarity and empirical guidance in measuring each construct. Green leadership is defined as a leader's ability to direct, influence, and inspire organizational members to integrate sustainability principles into their vision and work practices. This variable is measured through indicators of sustainable vision and mission (GL1), ability to inspire and motivate (GL2), skills and knowledge development (GL3), and involvement in sustainable initiatives (GL4). Green intellectual capital is defined as the accumulation of knowledge, skills, creativity, and environmental awareness of individuals and organizations as strategic assets in supporting green performance. Measurements include knowledge of sustainable practices (GIC1), implementation of sustainable practices (GIC2), innovation and creativity (GIC3), and personal awareness and commitment (GIC4). Green commitment is defined as the level of seriousness and consistency with which an organization internalizes sustainability values into its policies, resource allocation, and managerial practices. This variable is measured through leadership and management commitment (GC1), investments and resources (GC2), sustainability policies and standards (GC3), and participation in external initiatives (GC4). Meanwhile, green performance refers to the level of achievement of an organization in managing environmental impacts effectively and sustainably, which is measured through energy efficiency (GP1), waste management (GP2), water conservation (GP3), use of environmentally friendly materials (GP4), and green education and awareness (GP5).

**Conceptual Framework**

Green leadership, green intellectual capital, and green commitment are the primary factors that determine green performance in the hospitality business. This study conceptual framework aims to explain the causal link between these three variables. An organization's environmental performance is seen in this research as the outcome of exploiting internal assets that are intangible and difficult to mimic. This perspective is based on the resource-based view and dynamic capacities theory. By setting an example of environmentally conscious conduct and providing opportunities for staff to take initiative, "green leadership" may influence an

organization's long-term goals and objectives in a positive way. The capacity to effectively implement the organization's sustainability goal is made possible by green intellectual capital, which serves as a cognitive and inventive facilitator by offering green knowledge, skills, and creativity. Green commitment, on the other hand, is an institutional system that makes sure that green practices are consistently and sustainably implemented by integrating sustainability ideals into policies, resource allocation, and operational standards. Green performance is defined here as an improvement in areas such as energy efficiency, water conservation, waste management, and environmental education and awareness. This improvement is believed to be the result of a direct and complementary influence from these three constructs. By examining all three factors at once, it was investigated learn more about the interplay between leadership, intellectual capital, and organizational commitment as they pertain to the hotel industry's pursuit of sustainability. Therefore, Figure 1 below shows the conceptual framework model that was applied in this study:

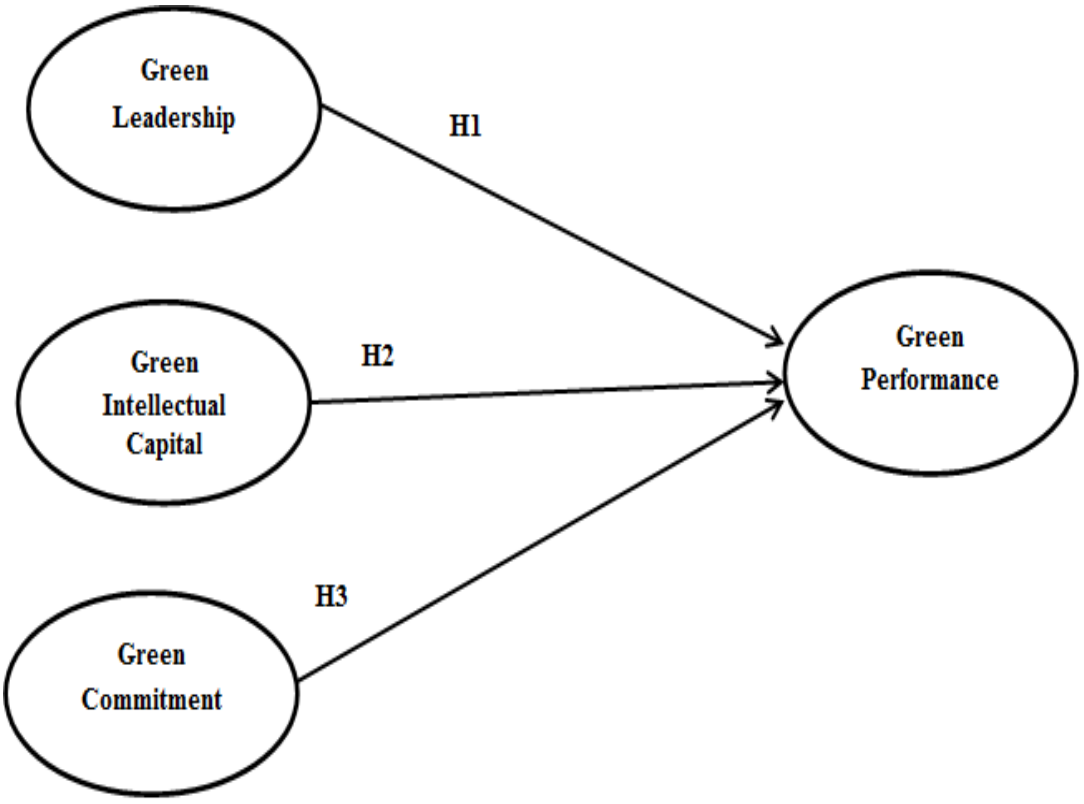


**Figure 1** Research Framework Model

Source: constructed by the authors using prior research (2025)

As shown in Figure 1, research framework model illustrates the conceptual relationship between the main variables tested in this study, namely green leadership, green intellectual capital, and green commitment, as independent variables that influence green performance, the dependent variable. The model shows that improving an organization's environmental performance is not influenced by a single factor, but rather is the result of a synergy between sustainability-oriented leadership, green knowledge and innovation capacity, and the organization's institutional commitment to environmentally friendly practices. The direction of the arrows in the model represents the hypothesized direct causal relationship, where green leadership acts as a strategic driver in shaping pro-environmental vision and behavior, green intellectual capital functions as a cognitive and innovative enabler that allows the translation of the sustainability vision into operational practices, and green commitment acts as a normative and structural mechanism that ensures consistent implementation of green practices. Thus, Figure 1 confirms the simultaneous approach used in this study, namely that green performance is achieved through the complementary interaction between leadership, intellectual capital, and organizational commitment, particularly in the context of the hospitality industry that faces high sustainability demands and ecological pressures.

**Data Analysis**

The primary analytical approach used in this work was Partial Least Squares-Structural Equation Modelling (PLS-SEM) using SmartPLS software. For models with reflecting measurement indicators in particular, PLS-SEM's strong predictive orientation and capacity to concurrently investigate complicated causal interactions among latent variables made it an ideal choice. There were two primary steps to the analytical procedure. Following the procedures outlined by Hair et al. (2019), the validity and reliability of the research equipment were first checked by evaluating the measurement model, also known as the outer model. Tests for construct reliability included Cronbach's alpha and composite reliability indicators, while tests for convergent validity included analyzing outer loading values and Average Variance Extracted (AVE). To further ensure that each concept was empirically different from others, the Fornell-Larcker criteria was used to test discriminant validity. We moved on to the structural model (the inner model) after making sure the measurement model was up to scratch. At this point, we looked at the coefficient of determination ($R^2$) to see how well the predicted correlations between latent variables explained the data, and it was investigated measured the effect size ($f^2$) to see how much of an impact each predictor had. A thorough and reliable assessment of the suggested research model was achieved by conducting hypothesis testing using a bootstrapping approach to provide path coefficients, t-values, and p-values.

## RESULTS

### Measurement Model Assessment

Following standard analytical methods, the results from the questionnaire were evaluated using SmartPLS version 3.2.9. Validity and reliability tests were administered to the measurement model, which is also known as the outer model. By looking at factor loadings and the Average Variance Extracted (AVE), we were able to determine that the construct validity was sufficient; all indicator loadings were higher than the suggested threshold of 0.7, and the AVE values were higher than 0.5. There was also an evaluation of construct reliability via the use of composite reliability (CR) and Cronbach's alpha. Both indicators provide satisfactory internal consistency with values over 0.7, as stated by Hair et al. (2019). The reliability and validity of the measuring equipment for further structural model analysis may be shown by their fulfillment of these requirements. The findings of the validity and reliability evaluations are shown in detail:

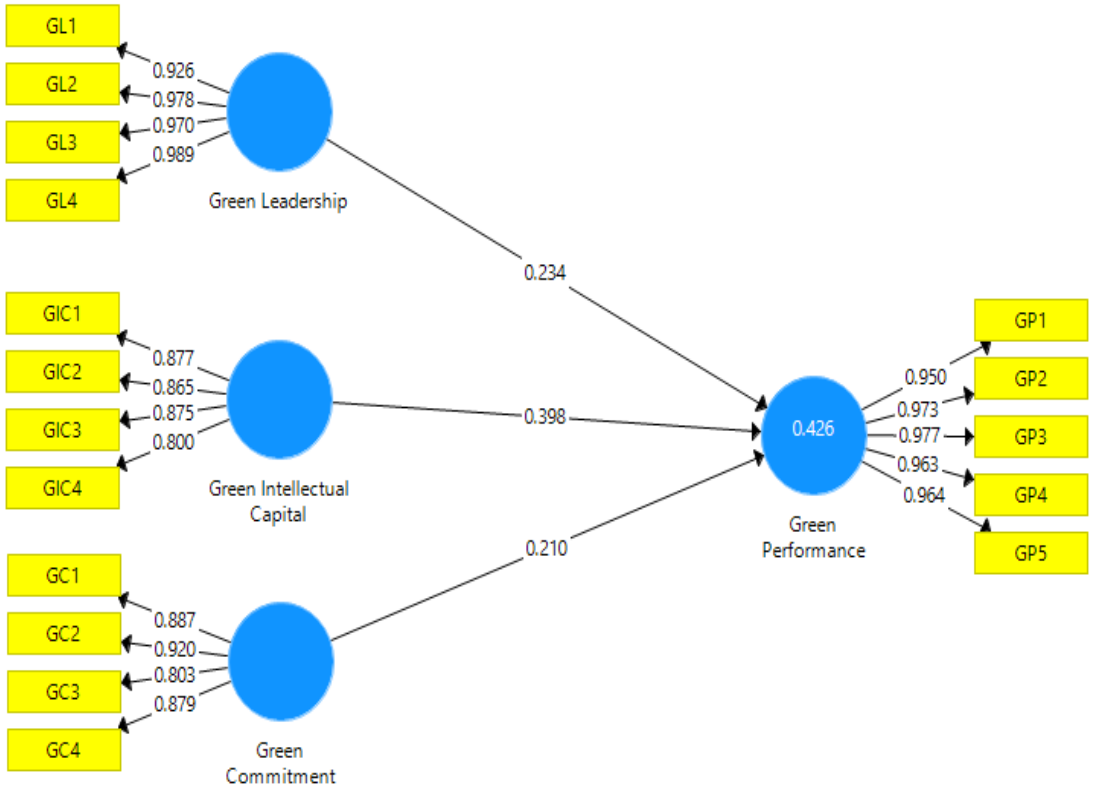


**Figure 2** Measurement model analysis

The measurement model analysis was performed to assess the reliability and validity of the constructs used in this research. This test makes sure that the indicators accurately reflect their latent variables before

moving on to the structural model evaluation. The study encompasses the evaluation of indicator loadings, internal consistency reliability, and convergent validity, often measured by composite reliability and the average variance extracted (AVE). These criteria verify that the assessment items consistently assess the specified constructs and adequately capture variation from their indicators. Table 3 shows the findings of the assessment of the measurement model. It shows the indicator loadings, reliability coefficients, and validity measures for the constructs of green business leadership, green intellectual capital, green commitment, and green performance.

**Table 3. Measurement Model Analysis**

| Construct/item | Code | Outer Loadings | Cronbach's alpha | CR | AVE |
|---|---|---|---|---|---|
| **Green Leadership** | | | 0.976 | 0.982 | 0.933 |
| Sustainable Vision and Mission | GL1 | 0.926 | | | |
| Ability to Inspire and Motivate | GL2 | 0.978 | | | |
| Skills and Knowledge Development | GL3 | 0.970 | | | |
| Involvement in Sustainable Initiatives | GL4 | 0.989 | | | |
| **Green Intellectual Capital** | | | 0.877 | 0.916 | 0.731 |
| Knowledge of Sustainable Practices | GIC1 | 0.877 | | | |
| Implementation of Sustainable Practices | GIC2 | 0.865 | | | |
| Innovation and Creativity | GIC3 | 0.875 | | | |
| Personal Awareness and Commitment | GIC4 | 0.800 | | | |
| **Green Commitment** | | | 0.896 | 0.928 | 0.763 |
| Leadership and Management Commitment | GC1 | 0.887 | | | |
| Investments and Resources | GC2 | 0.920 | | | |
| Sustainability Policies and Standards | GC3 | 0.803 | | | |
| Participation in External Initiatives | GC4 | 0.879 | | | |
| **Green Performance** | | | 0.982 | 0.986 | 0.932 |
| Energy Efficiency | GP1 | 0.950 | | | |
| Waste Management | GP2 | 0.973 | | | |
| Water Conservation | GP3 | 0.977 | | | |
| Use of Environmentally Friendly Materials | GP4 | 0.963 | | | |
| Green Education and Awareness | GP5 | 0.964 | | | |

Source: Analysis results from SmartPLS software (2025)

As shown in Table 3, the analysis results show that the four constructs have excellent reliability and validity. Green Leadership recorded a CR value of 0.982 and an AVE of 0.933, with all indicators having outer loadings above 0.92, indicating a strong contribution from each indicator. Green Intellectual Capital was also reliable (CR 0.916; AVE 0.731), supported by adequate indicators despite their greater variation. Furthermore, Green Commitment showed high consistency (CR 0.928; AVE 0.763), reflecting the organization's solid commitment to sustainable practices. Meanwhile, Green Performance obtained a CR value of 0.986 and an AVE of 0.932, which was reinforced by very high outer loadings on all indicators, confirming that the organization's environmental performance falls into the very strong category.

We did a test of discriminant validity to make sure that each concept in the study model is different from the others in a real way. The Fornell–Larcker criteria was used in this work to check for discriminant validity. This criterion compares the square root of the Average Variance Extracted (AVE) for each construct to the correlations between constructs. This criteria states that the square root of the AVE for a construct must exceed its correlations with other constructs, indicating that the construct shares a higher amount of variation with its indicators than with other variables in the model. Table 4 shows the results of the discriminant validity test using the Fornell–Larcker criterion. It shows whether the constructs of green business leadership, green intellectual capital, green commitment, and green performance meet the required level of discriminant validity.

**Table 4. Discriminant Validity: Fornell-larcker Criterion**

| | Green Commitment | Green Intellectual Capital | Green Leadership | Green Performance |
|---|---|---|---|---|
| Green Commitment | 0.873 | | | |
| Green Intellectual Capital | 0.277 | 0.855 | | |
| Green Leadership | 0.176 | 0.563 | 0.966 | |
| Green Performance | 0.361 | 0.588 | 0.495 | 0.965 |

Source: Analysis results from SmartPLS software (2025)

According to Table 4, all of the model's constructs show sufficient uniqueness, according to the discriminant validity evaluation using the Fornell-Larcker criteria. To be more precise, the square root of each construct's Average Variance Extracted (AVE) is higher than its correlations with other constructs, indicating that each variable represents a distinct idea. With a score of 0.873, green commitment outperforms its relationships with other factors. Also, the related inter-construct correlations are lower than the values shown by green intellectual capital (0.855), green leadership (0.966), and green performance (0.965). Based on these findings, it is clear that the measurement model meets the criteria for discriminant validity. The validity of the ensuing hypothesis testing is supported by the structural model analysis, which is resilient and credible since each construct may be evaluated individually without major overlap with other constructs.

**Inner Model Measurement**

Examining the proposed research model's structural links among latent variables is done via the inner model assessment in the SEM-PLS framework. The coefficient of determination ($R^2$), which shows how much variation in endogenous variables is explained by exogenous variables, is one of the main indicators that are examined in this evaluation. Also, the relative amount of impact exerted by each predictor construct is determined by analyzing the effect size ($f^2$). Additionally, the assessment includes calculating path coefficients and determining if they are statistically significant using a bootstrapping technique. This procedure gives us t-values and p-values, which we can use to see how strong the links are between the various constructs. Taken as a whole, these metrics reveal how well the model predicts outcomes and how sturdy its structure is. According to Sarstedt et al. (2020), values of 0.19 for $R^2$ imply poor explanatory power, 0.33 for moderate explanatory power, and 0.67 for good explanatory power. Ghozali (2014) provided evidence in support of this claim by stressing that a $R^2$ value more than 0.67 indicates a robust association between exogenous and endogenous variables, suggesting a structural model that is well-suited for testing hypotheses.

**Table 5. Coefficient of Determination Result R2**

| Notes | R-Square | R-Square Adjusted |
|---|---|---|
| Green Performance | 0.426 | 0.416 |

Source: Analysis results from SmartPLS software (2025)

According to Table 5, the Green Performance variable has a $R^2$ value of 0.426 and an adjusted $R^2$ of 0.416, as shown in the coefficient of determination analysis. Based on the results, it seems that the structural model accounts for about 42.6% of the variation in green performance with the predictor constructs that considered. The rest of the variation is likely caused by additional characteristics that were not taken into account by the model. The independent factors contribute significantly and moderately strongly to explaining differences in Green Performance, as shown by the moderate explanatory category $R^2$ value. However, this does suggest that other organizational, environmental, or contextual factors may be present; future research might benefit from include them to fully understand the effects of environmental performance.

The F-square ($f^2$) analysis inside the PLS-SEM framework was used to find the impact size of each exogenous construct on the endogenous variable in the structural model assessment. This test shows how useful each structural connection is in real life by assessing how much each predictor alters the $R^2$ value when it is added to or taken out of the model. Cohen's criteria say that a $f^2$ value of 0.02 means a minor impact, 0.15 means a medium effect, and 0.35 means a strong effect (Sarstedt et al., 2020). Table 6 shows the findings of the impact size study. It shows how much green business leadership, green intellectual capital, and green commitment each contributed to explaining differences in green performance within the suggested structural model.

**Table 6. F-Square Value**

| | Green Performance |
|---|---|
| Green Commitment | 0.071 |
| Green Intellectual Capital | 0.180 |
| Green Leadership | 0.065 |

Source: Analysis results from SmartPLS software (2025)

As shown in Table 6, the results of the F-Square analysis show that each predictor variable has a varying effect on Green Performance. Green intellectual capital has the most significant influence, with a value of 0.180, which falls within the small to moderate effect category. Therefore, its contribution to improving green performance is quite substantial. Green commitment has an F-Square value of 0.071, while green leadership shows a value of 0.065, both of which fall within the small effect category, yet still play a role in influencing green performance. This finding confirms that although all variables contribute, green intellectual capital is the most dominant factor in strengthening organizational environmental performance.

**Hypothesis Testing**

In this study, the hypotheses were tested by examining the relationships among latent constructs within the research framework using the PLS-SEM method (Sarstedt et al., 2020). This approach allows the simultaneous evaluation of the significance, direction, and magnitude of the effects of exogenous variables on endogenous variables. To assess the proposed relationships, a bootstrapping procedure was employed to estimate path coefficients along with their corresponding t-values and p-values. A hypothesis is considered supported when the t-statistic exceeds the critical value and the p-value is below the predetermined significance level. The detailed results of the hypothesis testing are presented in Table 7, which summarizes the path coefficients, t-statistics, and p-values for each relationship in the structural model. This analysis provides empirical evidence regarding the strength and significance of the relationships proposed in the research framework.

**Table 7. Hypothesis Test**

| Hypothesis | Coefficient | Standard Deviation | t-count | P-Value | Conclusion |
|---|---|---|---|---|---|
| Green Leadership>>Green Performance (H1) | 0.234 | 0.082 | 2,872 | **0.004** | **Accepted** |
| Green Intellectual Capital>>Green Performance (H2) | 0.398 | 0.076 | 5,245 | **0.000** | **Accepted** |
| Green Commitment>>Green Performance (H3) | 0.210 | 0.044 | 4,764 | **0.000** | **Accepted** |

Note: t-count = T-Statistics; p-value = probability value.

Source: Analysis results from SmartPLS software (2025)

According to the findings Table 7, all of the study's assumptions are correct and significantly impact green performance in a good way. Leading with a focus on sustainability practices is known as "green leadership," and research shows that it helps organizations do better for the environment. Furthermore, green intellectual capital greatly improves green performance by bolstering an organization's skills in environmentally friendly knowledge, innovation, and intellectual resource management. In addition, green commitment is essential for making sure that the company's sustainability goals, culture, and values are well-integrated into daily operations. In sum, our results show that eco-friendly practices, environmentally conscious leadership, and long-term planning all contribute to an organization's environmental performance.

## DISCUSSION

The research findings suggest that green leadership plays a crucial role in enhancing the environmental performance of hotels in North Sumatra. This confirms that leadership that instills a vision of sustainability, provides ecological role models, and encourages employee participation can create a work environment conducive to green practices. The mechanism of this influence can be understood through transformational leadership theory, where leaders become the primary drivers of organizational behavioral change through

idealized influence and inspirational motivation. When leaders demonstrate a genuine concern for the environment, employees are encouraged to adjust their behaviour and performance in line with sustainability values. These results are consistent with the literature, which indicates that green transformational leadership fosters green creativity, eco-friendly innovation, and pro-environmental behaviour, ultimately leading to enhanced environmental performance (Özgül & Zehir, 2023; Riva et al., 2021). In the context of the North Sumatran hotel industry, green leadership becomes increasingly relevant due to the resource-intensive nature of the industry and the need for cross-functional coordination to implement sustainable practices. Leaders who can integrate environmental policies into the organizational vision not only strengthen employee commitment but also improve operational efficiency through more responsible energy, water, and waste management. Furthermore, green leadership creates a green climate that reinforces internal norms related to environmental awareness. Thus, the mechanism of green leadership's influence on green performance operates through the formation of a pro-environmental organizational culture, increased employee engagement, and the reinforcement of sustainability values as part of the hotel's business strategy. These findings reinforce the argument that shifting toward sustainable practices must begin at the leadership level as the primary driver of organizational transformation.

The research findings confirm that green intellectual capital is a crucial determinant of green performance. Environmentally oriented intellectual capital, encompassing employees' knowledge, skills, creativity, and ecological awareness, serves as the foundation for organizations to generate green innovations and implement sustainable operational practices. Based on the resource-based view, green intellectual capital is a rare and difficult-to-imitate intangible asset, enabling it to provide a competitive advantage in improving environmental performance. This finding aligns with previous research, which confirms that environmental knowledge and innovative capabilities facilitate the implementation of green strategies, such as energy efficiency, water conservation, and waste reduction (Shah et al., 2021; Nisar et al., 2021; Chao & Juo, 2021). At the mechanistic level, green intellectual capital acts as a cognitive enabler, enabling organizations to identify ecological opportunities and develop solutions that align with the environmental dynamics of the hospitality industry. Employees with a deep understanding of sustainable practices tend to be more proactive in finding new ways to minimize environmental impacts. In the context of North Sumatra, a hotel's success in improving green performance is strongly influenced by its internal ability to translate green knowledge into operational actions. The hospitality industry, located in the Lake Toba tourist area, faces special demands for maintaining environmental quality, making green intellectual capital a strategic necessity. Green intellectual capital also enhances the effectiveness of sustainability policies through internal collaboration mechanisms, knowledge transfer, and environmentally oriented innovation. Thus, green intellectual capital not only supports the achievement of environmental performance standards but also builds organizational resilience to the demands of sustainable business.

The finding that green commitment significantly influences green performance underscores the importance of organizational commitment as a foundation for sustainability. Green commitment reflects the willingness of management and employees to prioritize environmental goals, allocate resources, and maintain consistent implementation of green policies. From a social exchange theory perspective, when an organization demonstrates a strong commitment to sustainability, employees respond by increasing their participation in green programs and exhibiting pro-environmental behaviour, which ultimately enhances the company's environmental performance. Previous literature supports this finding, where green commitment has been shown to strengthen green innovation, environmental policy implementation, and resource utilization efficiency (Sharma et al., 2021; Somjai et al., 2020; Zhang & Walton, 2017). This influence mechanism works through strengthening an organizational culture that places sustainability as a core value, as well as the creation of formal structures such as green operational standards, environmental performance evaluation, and transparent reporting. Organizational commitment also reduces resistance to change because employees view sustainability not merely as an external demand but as an integral part of the organization's identity. In the context of the North Sumatran hospitality industry, green commitment is crucial because this industry operates in areas with high ecological sensitivity such as Lake Toba. Hotels that demonstrate a strong commitment to green practices are better able to maintain environmental quality, reduce their carbon footprint, and meet the expectations of increasingly eco-conscious

travelers. A green commitment also ensures the sustainability of green practices through a long-term orientation, rather than just a short-term initiative. Therefore, this variable serves as a driver of consistency and stability in the implementation of sustainability strategies, leading to sustained improvements in green performance.

## CONCLUSIONS

This research offers empirical data about the organizational determinants that foster green performance within the hotel sector by analyzing the concurrent effects of green business leadership, green intellectual capital, and green commitment. The results show that green intellectual capital has the biggest effect on green performance ($\beta = 0.398$, $p < 0.001$). This means that environmental knowledge, employee skills, and the ability to come up with new ideas are all important resources for hospitality organizations that want to use good sustainability practices. These findings underscore the strategic significance of knowledge-driven environmental competencies in enhancing operational sustainability. The analysis also shows that green business leadership has a positive effect on green performance ($\beta = 0.234$, $p < 0.004$). This means that leaders who make strategic decisions that take the environment into account can encourage pro-environmental behavior and the use of sustainable practices throughout the organization. Furthermore, organizational green commitment has a strong positive impact on green performance ($\beta = 0.210$, $p < 0.01$), underscoring the need of persistent management support, environmental policies, and resource allocation in maintaining environmental activities.

This work has several limitations that should be recognized, even if it made some important contributions. First, the study uses cross-sectional survey data from 170 hotel workers, which makes it hard to see how sustainable policies improve over time. As firms implement new sustainability initiatives, environmental performance and leadership practices may change. Longitudinal techniques might potentially provide more profound insights into causal links. Second, the research concentrates on hotels situated in North Sumatra, Indonesia, thereby limiting the applicability of the results to other areas or tourist destinations characterized by distinct institutional forces, regulatory frameworks, or degrees of environmental consciousness. Third, the study focuses exclusively on three primary predictors green leadership, green intellectual capital, and green commitment omitting other pertinent factors such as green organizational culture, environmental technology adoption, stakeholder pressure, and regulatory support from the model. Lastly, the information comes from workers' own perspectives, which might lead to response bias or a subjective judgment of how well the firm is doing in terms of sustainability.

This study presents several opportunities for further research and managerial practices, especially within the domains of corporate leadership and sustainability management. Subsequent research may enhance this model by integrating mediating or moderating variables, including green organizational culture, green innovation capability, digital environmental monitoring systems, or external stakeholder pressure, to elucidate the mechanisms connecting leadership and sustainability performance more effectively. Comparative research across various tourist locations or countries may provide comprehensive insights into the impact of contextual variables on the efficacy of sustainability-oriented leadership. Longitudinal study designs may also elucidate the evolution of leadership tactics, knowledge resources, and organizational commitment over time, therefore influencing long-term environmental performance. From a practical standpoint, the results underscore the necessity of fortifying sustainability-focused business leadership, creating environmental training initiatives that augment green intellectual capital, and instituting institutional policies that bolster organizational dedication to environmental objectives. These kinds of combined initiatives may help hospitality businesses do more for the environment while also making them more competitive in a tourist industry that is becoming more focused on sustainability.

### Author Contributions

Conceptualization: VC, G. M .PD, MS, WL, HPS; data curation: VC, GMPD, MS, WL, HPS; formal analysis: VC, MS, WL, HPS; investigation: VC, GMPD, MS, WL, HPS; methodology: ED, GMPD, MB, WL, HPS; project administration: ED, MB, WL; supervision: VC, MS, WL: validation: VC, GMPD, MS, WL, HPS; visualization: VC, G. M .PD, MS, WL.; writing – original draft: VC, MS, WL; writing – review & editing: VC, GMPD, MS, WL, HPS

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**Conflicts of Interest**

The authors declare that they have no conflict of interest.

**Data Availability Statement**

Not applicable.

**Statement on the Use of AI Tools**

The authors recognize the utilization of artificial intelligence (AI) tools to enhance the clarity of the manuscript and facilitate language refinement during the writing process. Grammatical editing, wording suggestions, and overall language enhancement were the sole purposes of these instruments. The authors were responsible for the entire process of conceptual development, research design, collecting data, analysis, interpretation of results, and final conclusions. The authors assume full responsibility for the content of this article and verify that the originality, integrity, and scientific validity of the research were not impacted by the use of AI tools.

**Informed Consent Statement**

This research received official approval from the Sekolah Tinggi Ilmu Ekonomi Sultan Agung prior to data collection. All respondents participated voluntarily after being explained the research objectives and procedures. The confidentiality of the information collected, including data and interviews with respondents, is guaranteed and will be used solely for academic purposes without disclosing the respondents' personal identities.

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## APPENDIX

**Questionnaire Form**

| ***GREEN LEADERSHIP*** | | | | | | |
|---|---|---|---|---|---|---|
| No | What is your opinion, attitude, knowledge regarding the statement below: | Strongly agree | Agree | Neutral | Disagree | Strongly Disagree |
| ***Sustainable Vision and Mission*** | | | | | | |
| 1 | Our hotel has a clear vision and mission to support environmentally friendly business practices. | | | | | |
| 2 | Company leadership consistently communicates the importance of sustainability in every operational activity. | | | | | |
| ***Ability to Inspire and Motivate*** | | | | | | |
| 3 | Leaders at my workplace are able to inspire employees to care about environmental issues. | | | | | |
| 4 | I feel motivated to contribute to sustainability programs because of the support from my superiors. | | | | | |
| ***Skills and Knowledge Development*** | | | | | | |
| 5 | We regularly receive training on sustainability practices in the hospitality industry. | | | | | |
| 6 | The company encourages employees to develop knowledge about green management and resource efficiency. | | | | | |
| ***Involvement in Sustainable Initiatives*** | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7 | I am actively involved in environmental activities or programs organized by the hotel. | | | | | |
| 8 | My company works with local communities to run eco-friendly initiatives. | | | | | |
| ***GREEN INTELLECTUAL CAPITAL*** | | | | | | |
| No | What is your opinion, attitude, knowledge regarding the statement below: | Strongly agree | Agree | Neutral | Disagree | Strongly Disagree |
| ***Knowledge of Sustainable Practices*** | | | | | | |
| 1 | I have a good understanding of sustainability principles in the hospitality industry. | | | | | |
| 2 | I know various methods to reduce environmental impact in hotel operations. | | | | | |
| ***Implementation of Sustainable Practices*** | | | | | | |
| 3 | Our hotel actively implements environmentally friendly policies in its daily operations. | | | | | |
| 4 | Sustainability practices such as reducing single-use plastics and energy efficiency have been implemented in my workplace. | | | | | |
| ***Innovation and Creativity*** | | | | | | |
| 5 | I am driven to create new solutions in implementing environmentally friendly practices. | | | | | |
| 6 | The place I work supports innovative ideas to improve sustainability. | | | | | |
| ***Personal Awareness and Commitment*** | | | | | | |
| 7 | I feel responsible for supporting sustainability practices in the workplace. | | | | | |
| 8 | I am personally committed to practicing environmentally friendly work behavior. | | | | | |
| ***GREEN COMMITMENT*** | | | | | | |
| No | What is your opinion, attitude, knowledge regarding the statement below: | Very good | Good | Neutral | Not good | Very Bad |
| ***Leadership and Management Commitment*** | | | | | | |
| 1 | The leadership where I work actively encourages the implementation of sustainability principles. | | | | | |
| 2 | Management consistently demonstrates commitment to environmentally friendly practices. | | | | | |
| 3 | Commitment to sustainability is an important part of the managerial strategy in our organization. | | | | | |
| ***Investments and Resources*** | | | | | | |
| 4 | Our organization allocates a dedicated budget to support sustainability initiatives. | | | | | |
| 5 | The company provides adequate resources for training and implementation of sustainable practices. | | | | | |
| 6 | Investment in environmentally friendly technologies is a priority in operational development. | | | | | |
| ***Sustainability Policies and Standards*** | | | | | | |
| 7 | The company has a written policy regarding sustainability practices. | | | | | |
| 8 | We follow nationally or internationally recognized sustainability standards. | | | | | |
| 9 | There are clear operational guidelines regarding environmental management and social | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | responsibility. | | | | | |
| ***Participation in External Initiatives*** | | | | | | |
| 10 | Our company is involved in sustainability programs initiated by the government or NGOs. | | | | | |
| 11 | We actively collaborate with external parties to support environmental and social goals. | | | | | |
| 12 | Our organization participates in certifications or awards related to sustainability. | | | | | |
| ***GREEN PERFORMANCE*** | | | | | | |
| No | What is your opinion, attitude, knowledge regarding the statement below: | Strongly agree | Agree | Neutral | Disagree | Strongly Disagree |
| ***Energy Efficiency*** | | | | | | |
| 1 | Our company actively uses energy-saving technologies in its operations. | | | | | |
| 2 | Energy usage in the workplace is monitored and optimized regularly. | | | | | |
| ***Waste Management*** | | | | | | |
| 3 | Our company has an organized waste sorting and management system. | | | | | |
| 4 | We reduce the use of disposable materials in our operational processes. | | | | | |
| ***Water Conservation*** | | | | | | |
| 5 | Our organization implements technology to conserve water usage. | | | | | |
| 6 | Employees are educated about the importance of maintaining efficient water use. | | | | | |
| ***Use of Environmentally Friendly Materials*** | | | | | | |
| 7 | We choose raw materials that have minimal environmental impact in the production process. | | | | | |
| 8 | Our products are designed to reduce negative impact on the environment. | | | | | |
| ***Green Education and Awareness*** | | | | | | |
| 9 | The company regularly holds training or campaigns on sustainability. | | | | | |
| 10 | Employees have a high awareness of the importance of protecting the environment. | | | | | |

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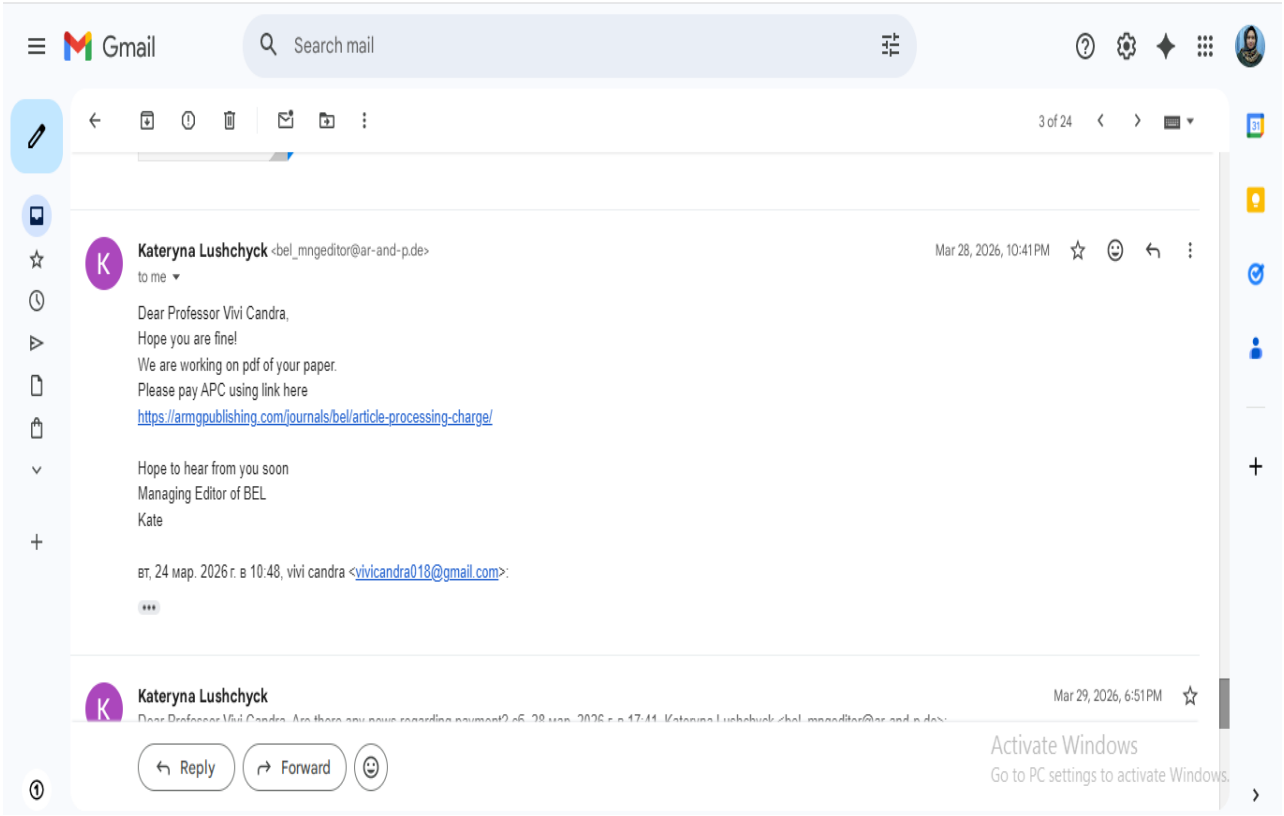

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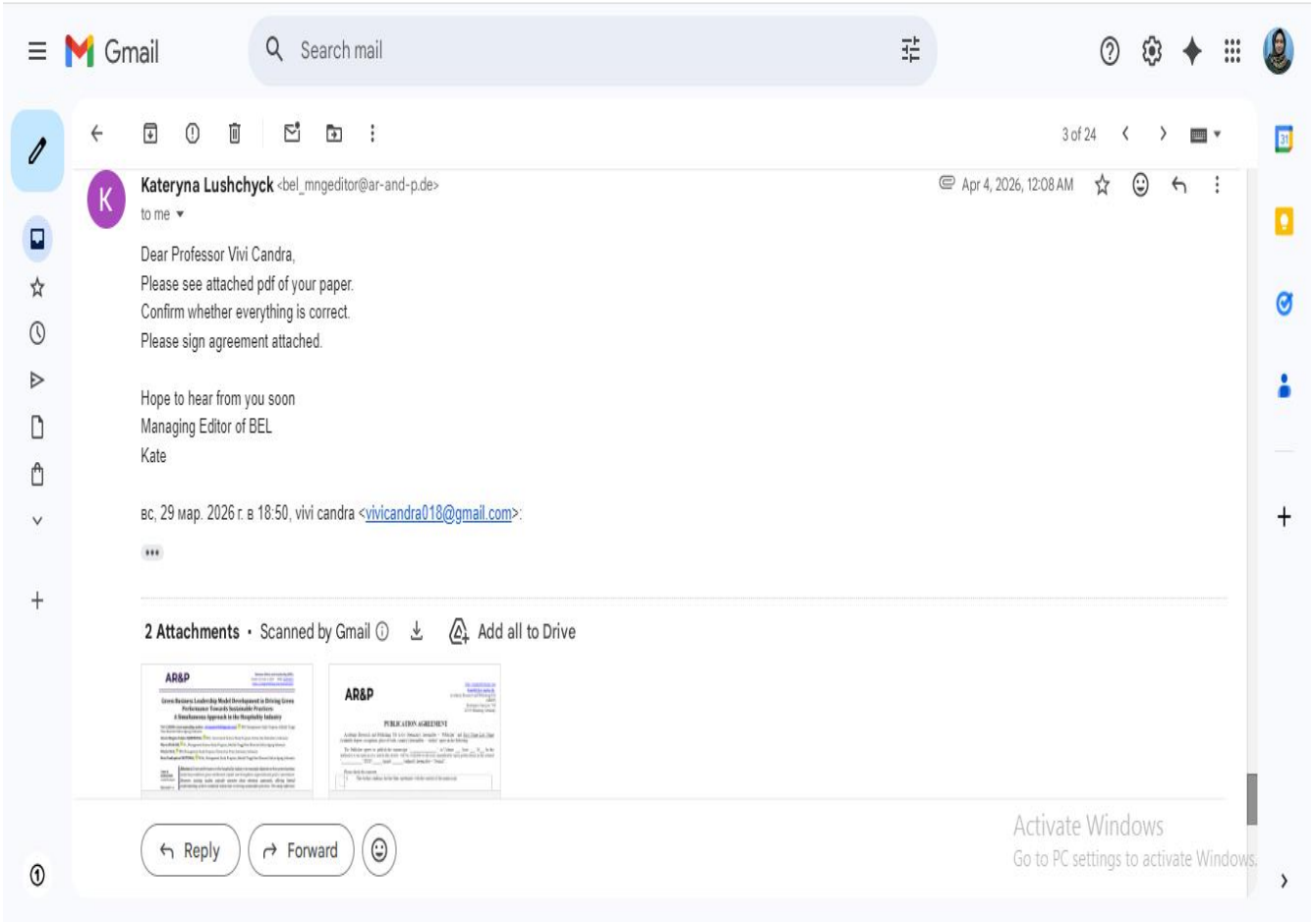

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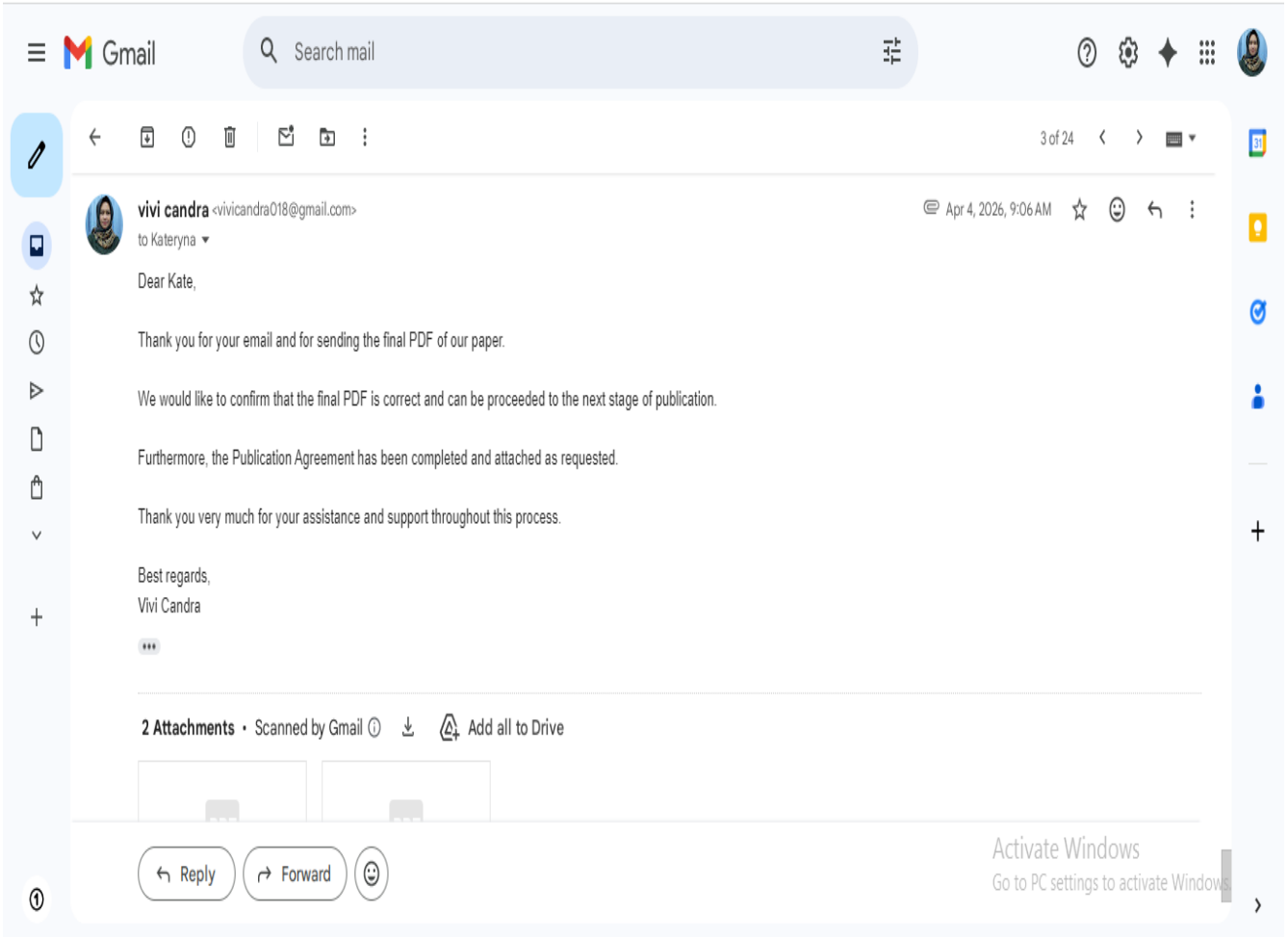

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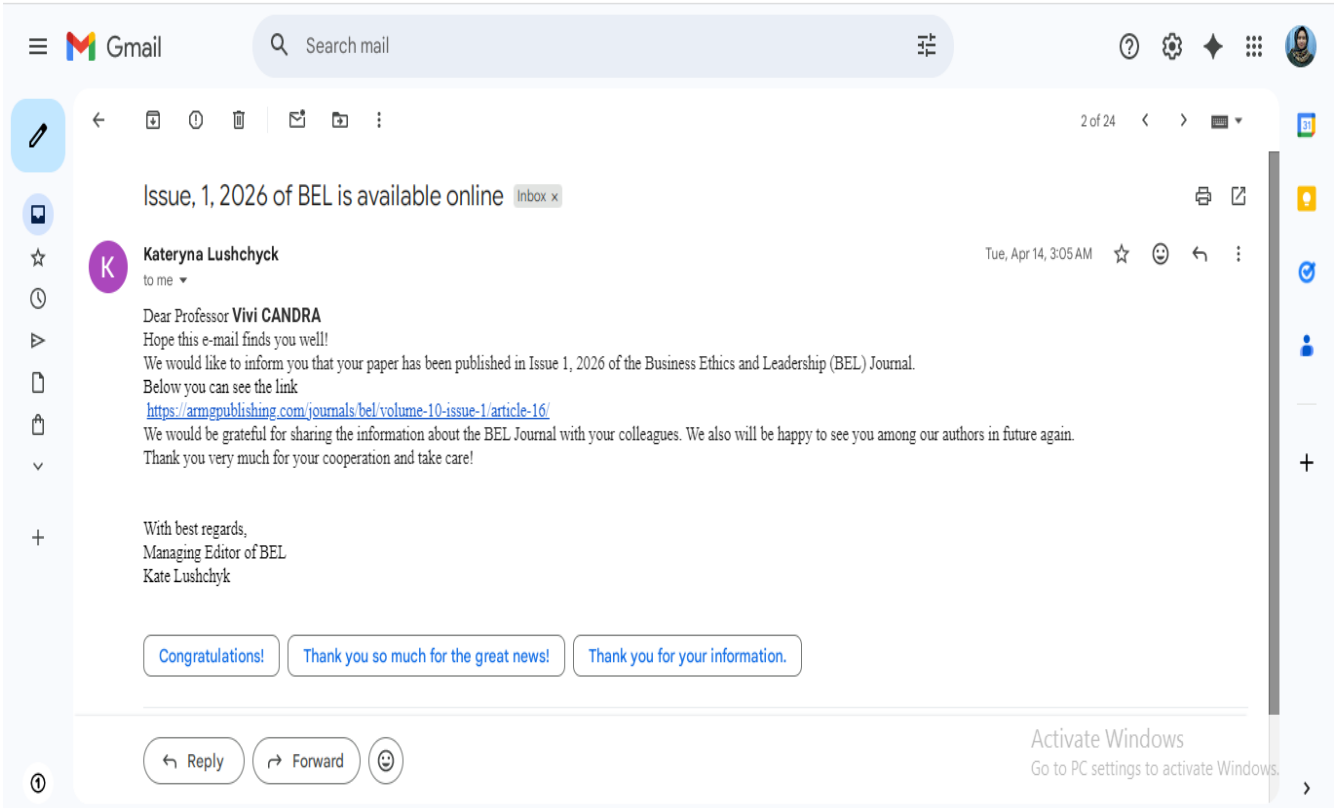

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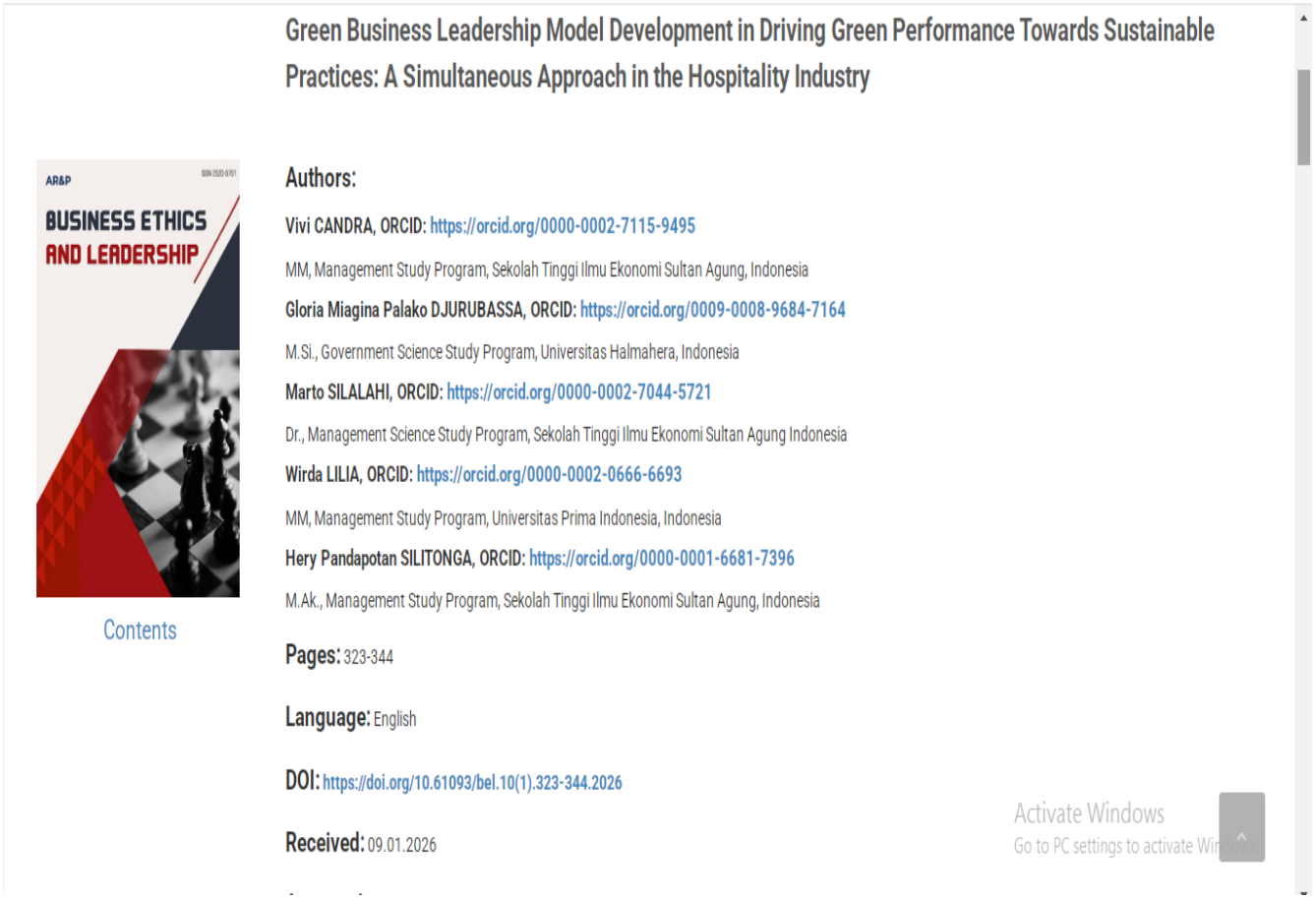

## Green Business Leadership Model Development in Driving Green Performance Towards Sustainable Practices: A Simultaneous Approach in the Hospitality Industry




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