

THE GREEN VILLA MANAGEMENT MODEL FOR EFFICIENCY IN BALI LUXURY ACCOMMODATION

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Abstract

Sustainable tourism has become a central paradigm in the global tourism industry, driven by increasing environmental pressures caused by accommodation activities. In Bali, particularly within the rapidly growing villa sector, challenges arise from high resource consumption and the lack of integration of environmentally friendly practices into operational management. This study aims to analyze the complexity and challenges of Green Villa implementation, evaluate its impact on operational efficiency, and develop an applicable management model at Javana Royal Villa. This research employs a qualitative approach using the Research and Development (R&D) method. Data were collected through in-depth interviews, participatory observation, and document analysis, and analyzed descriptively through data reduction, display, and conclusion drawing. The findings indicate that Green Villa implementation involves moderate to high complexity with multidimensional challenges, including limited investment, absence of a dedicated person in charge, and varying staff understanding of sustainability practices. Despite these challenges, the implementation improves operational efficiency through better control of water and energy usage and a shift toward systematic monitoring. This study proposes a Managerial–Behavioral Based Green Villa Management Model integrating technical, managerial, and stakeholder aspects through the establishment of a Green Committee, integration of Green KPIs into SOPs, and strengthening of green organizational culture. Successful implementation depends on strong managerial commitment and the internalization of sustainable behavior.

Keywords: *Green Villa, Operational Efficiency, Sustainable Tourism, Operational Management, Green KPI.*

Abstrak

Pariwisata berkelanjutan menjadi paradigma utama dalam pengembangan industri pariwisata global, seiring meningkatnya tekanan terhadap lingkungan akibat aktivitas akomodasi wisata. Di Bali, khususnya pada sektor villa yang berkembang pesat, tantangan muncul dalam bentuk tingginya konsumsi sumber daya dan belum terintegrasinya praktik ramah lingkungan dalam manajemen operasional. Penelitian ini bertujuan menganalisis kompleksitas dan tantangan implementasi *Green Villa*, mengevaluasi dampaknya terhadap efisiensi operasional, serta merancang model pengelolaan yang aplikatif di Javana Royal Villa. Penelitian menggunakan pendekatan kualitatif dengan metode *Research and Development (R&D)*. Data dikumpulkan melalui wawancara mendalam, observasi partisipatif dan studi dokumentasi, kemudian dianalisis secara deskriptif melalui reduksi, penyajian dan penarikan kesimpulan. Hasil penelitian menunjukkan bahwa implementasi *Green Villa* memiliki kompleksitas moderat hingga tinggi dengan kendala multidimensional, meliputi keterbatasan investasi, belum adanya penanggung jawab khusus, serta variasi pemahaman staf terhadap praktik keberlanjutan. Meskipun demikian, implementasi memberikan dampak positif berupa peningkatan efisiensi operasional melalui pengendalian penggunaan air dan energi serta pergeseran menuju sistem monitoring yang lebih terstruktur. Penelitian ini menghasilkan Model Pengelolaan *Green Villa* Berbasis Manajerial–Perilaku yang mengintegrasikan aspek teknis, manajerial dan partisipasi *stakeholder* melalui pembentukan *Green Committee*, integrasi *Green KPI* dalam SOP, serta penguatan budaya organisasi hijau. Keberhasilan implementasi ditentukan oleh komitmen manajerial dan internalisasi perilaku berkelanjutan.

Kata Kunci: *Green Villa, Efisiensi Operasional, Pariwisata Berkelanjutan, Manajemen Operasional, Green KPI.*

INTRODUCTION

Sustainable tourism has become a primary paradigm in global tourism development, driven by the increasing awareness of environmental impacts caused by tourism activities. As a major contributor to resource consumption and waste production, the accommodation sector faces growing pressure to adopt eco-friendly practices. However, implementing "green hospitality" is not merely about technology; it requires structured and integrated management within operational systems to ensure long-term sustainability.

In line with these developments, the concept of green hospitality has evolved into the "Green Villa" approach, which adapts sustainability principles to the flexible and private operational characteristics of villas. Unlike hotels with standardized management systems, independent villas often struggle to integrate green practices into daily routines. Therefore, the implementation of a Green Villa must emphasize not only technical aspects like energy efficiency but also managerial and behavioral approaches.

This need is particularly relevant in Bali, where the rapid growth of the villa sector, especially in the Badung Regency, has led to significant environmental challenges. Data shows that while there are 413 registered hotels in Badung, the number of villas is estimated to be much higher, intensifying competition for resources like fresh water. Research indicates that groundwater levels in South Bali have dropped by more than 50 meters in less than a decade due to exploitation exceeding natural capacity. Furthermore, land conversion for villas has raised concerns regarding ecological balance and local social structures.

Javana Royal Villa, a private villa in Seminyak, faces these operational challenges, including inefficient groundwater use and suboptimal waste management. Although its design incorporates tropical architecture to optimize natural light and ventilation, its green practices remain partial and are not yet integrated into a structured operational management system. Transformation towards sustainability at this property is hindered by the need for initial investment, management mindset shifts, and the requirement for active stakeholder involvement.

Academic literature reveals a research gap, as most previous studies focus on environmental impacts in general or sustainability practices within large-scale star hotels. Research specifically designing a Green Villa management model based on operational practices for independent villas remains limited.

Based on these issues, this study is designed to analyze the complexity of implementing the Green Villa concept at Javana Royal Villa, evaluate its impact on operational efficiency, and formulate a Managerial-Behavioral Based Green Villa Management Model. This model is expected to provide a practical reference for villa managers to develop adaptive and sustainable operational systems in Bali.

This study contributes to the existing literature in several important ways. First, it shifts the focus of sustainable hospitality research from large-scale hotels to independent villa accommodations, a segment that remains underexplored despite its rapid growth in Bali. Second, it develops a Managerial–Behavioral Based Green Villa Management Model that integrates technical, managerial, and behavioral dimensions into a unified operational framework, addressing the common fragmentation found in previous studies. Third, this research introduces the practical integration of Green Key Performance Indicators (Green KPIs) into Standard Operating Procedures (SOPs), enabling measurable and systematic sustainability implementation at the operational level. By combining empirical evidence with a context-specific model, this study provides both theoretical advancement and practical guidance for sustainable villa management.

METHOD

This study employs a qualitative approach integrated with the Research and Development (R&D) method. The R&D framework is utilized to develop a conceptual management model that is not only descriptive but also applicable to the specific operational characteristics of villas in Bali. The research is rooted in a positivistic paradigm, emphasizing objective observation and verifiable analysis. Furthermore, a synchronic approach is adopted, focusing on the contemporary implementation of Green Villa practices at a specific point in time rather than historical developments.

Research Location and Sampling The research was conducted at Javana Royal Villa, located in Seminyak, Badung Regency, Bali. The site was selected through purposive sampling, as the property demonstrates a commitment to sustainability while simultaneously facing significant operational challenges in groundwater and waste management. This sampling strategy ensures that the data collected is rich and highly relevant to the research objectives.

Data Sources and Instruments The study utilizes both primary and secondary data. Primary data were obtained directly from field activities, while secondary data were gathered from internal villa documents, such as Standard Operating Procedures (SOPs) and utility reports, as well as external statistics from the Central Bureau of Statistics (BPS) and academic literature. The researcher acts as the key instrument, supported by interview guides, observation sheets, and technological tools such as Microsoft Excel and Visio for data quantification and visualization.

Data Collection Techniques To ensure validity, the study applies triangulation by combining three data collection techniques:

1. **In-Depth Interviews:** Semi-structured interviews were conducted with management (General Manager, HR Manager, Chief Engineering) and operational staff to explore experiences and perceptions regarding green practices.
2. **Participatory Observation:** Direct observation was performed to record daily operational activities related to energy efficiency, water conservation, and waste sorting.
3. **Document Study:** Analysis of formal documents and visual archives was conducted to verify operational consistency and financial utility trends.

Data Analysis Method Data analysis follows the qualitative descriptive model proposed by Miles, Huberman, and Saldaña. This process involves three simultaneous stages: data reduction (simplifying and organizing raw data), data display (presenting findings through narratives, tables, and diagrams), and conclusion drawing and verification. The R&D process in this study follows a simplified model consisting of three main stages: (1) needs analysis based on field findings, (2) model design integrating managerial, technical, and behavioral dimensions, and (3) model validation through iterative comparison with empirical data and existing theoretical frameworks. This approach ensures that the proposed model is both contextually relevant and conceptually grounded.

RESULTS AND DISCUSSION

Implementation Complexities and Multi-dimensional Challenges

The transition toward a Green Villa at Javana Royal Villa reveals a moderate to high level of complexity due to several interconnected challenges across technical, financial, managerial, behavioral, and institutional dimensions. These findings indicate that sustainability implementation in independent villa settings is not merely a technical adjustment but a systemic organizational transformation.

Table 1. Summary of Implementation Challenges in Green Villa Management

Dimension	Key Findings	Evidence from Case Study	Implication
Technical	Lack of advanced green technology (e.g., greywater recycling, solar panels)	Utility monitoring still manual; no digital system implemented	Limits real-time efficiency tracking and data-driven decision-making
Financial	High initial investment (Capex) constraints	Management prioritizes expansion over sustainability investment	Delays adoption of green infrastructure
Managerial	Absence of dedicated Green PIC or unit	Responsibilities scattered across departments	Weak coordination and lack of accountability
Behavioral	Low staff awareness and inconsistent practices	AC left running in empty villas; waste sorting often neglected	Reduces effectiveness of sustainability initiatives
Social & Institutional	Limited external collaboration	No structured partnership with green suppliers or certification bodies	Slows down institutional sustainability development

- **Technical and Financial Barriers:** Current infrastructure relies heavily on manual systems. There is a notable absence of advanced technologies such as greywater recycling, rainwater harvesting, or solar panels. Utility monitoring is still conducted manually, which hinders data-driven decision-making. From a financial perspective, the high initial capital expenditure (Capex) for green technology is a primary deterrent, as the management currently prioritizes villa expansion and service maintenance over long-term sustainability investments.
- **Managerial and Behavioral Hurdles:** Management practices regarding sustainability are largely informal. There is no dedicated unit or "Person in Charge" (PIC) specifically assigned to oversee green initiatives, causing responsibilities to be scattered across departments. Furthermore, staff behavior remains inconsistent; for instance, air conditioners are frequently left running in unoccupied spaces, and waste sorting is often neglected during busy periods. Many employees still perceive sustainability as a sectoral duty of the Engineering or Housekeeping departments rather than a collective organizational culture.
- **Social and Institutional Constraints:** There is a lack of formal collaboration with external stakeholders, such as "green" certified suppliers or government bodies for environmental certification. Interactions with the local community regarding waste management or environmental education also remain limited and unstructured.

These findings are consistent with previous studies that highlight the multidimensional nature of sustainability implementation in hospitality, such as Abdou et al. (2020) and Kim et al. (2022). However, this study extends the existing literature by demonstrating that in the context of independent villa accommodations, managerial coordination and behavioral consistency play a more critical role than technological sophistication alone. Unlike large-scale hotels that operate under standardized systems, villas tend to rely more heavily on informal structures, making internal alignment a key determinant of success.

Impact on Operational Efficiency and Effectiveness

Despite the aforementioned challenges, the preliminary adoption of green villa has demonstrated significant improvements in resource management.

- **Energy Consumption Control:** Data from November 2025 to January 2026 shows that while energy costs spiked by 11.8% in December due to seasonal holiday occupancy, they decreased by 4.8% in January 2026. This reduction followed the implementation of standardized AC temperatures and stricter monitoring of vacant villas.
- **Significant Water Conservation:** The most notable impact was observed in water usage, where costs dropped by over 62% over a three-month period (from Rp1,515,020 in November 2025 to Rp568,085 in January 2026). This efficiency was achieved through systematic leak detection in the piping network and the optimization of garden irrigation schedules.
- **Waste and Operational Governance:** The villa has successfully transitioned from reactive waste management to proactive segregation of organic and inorganic waste. Management has also shifted its utility monitoring from an *ad-hoc* basis (only when problems arise) to a systematic routine, allowing for earlier identification of resource waste.

Table 2. Operational Efficiency Performance (Water and Energy)

Indicator	November 2025	December 2025	January 2026	Change (%)	Key Driver
Water Cost (IDR)	1,515,020	—	568,085	↓ 62.5%	Leak detection & optimized irrigation
Energy Cost Trend	Baseline	↑ 11.8%	↓ 4.8%	Fluctuating	AC standardization & monitoring
Monitoring System	Manual	Manual	Improved routine monitoring	—	Increased operational control

These findings suggest that sustainability improvements do not necessarily require high-cost technological investments. Instead, simple yet consistent managerial controls and behavioral adjustments can generate substantial efficiency gains when implemented systematically. This challenges the prevailing assumption in sustainability literature that technological innovation is the primary driver of environmental performance.

Furthermore, the shift from reactive to proactive operational governance—particularly in utility monitoring and waste management—indicates an important transformation toward a more structured and data-driven management approach. This transition enhances not only cost efficiency but also operational effectiveness and long-term organizational resilience.

Proposed Managerial–Behavioral Based Green Villa Management Model

To address existing gaps, this study proposes a comprehensive management model that integrates three core components:

1. **Managerial Component:** This involves establishing a Green Committee led by the General Manager to provide strategic direction. This committee ensures that sustainability is institutionalized through formal policies and cross-departmental coordination.
2. **Technical Component:** This focuses on integrating Green KPIs—such as electricity-to-occupancy ratios and waste segregation percentages—into the Standard Operating Procedures (SOP) of every department. It also plans for future technical upgrades like digital monitoring and renewable energy sources.

3. Behavioral Component: This prioritizes "Internal Branding" and training to foster a Green Culture. It aims to shift the mindset of both staff and guests through visual reminders (*signage*), incentives for eco-friendly behavior, and educational programs.

Table 3. Proposed Managerial–Behavioral Green Villa Management Model

Component	Description	Key Elements	Expected Outcome
Managerial	Institutional strengthening through formal structure	Green Committee led by General Manager	Strong leadership & cross-department coordination
Technical	Integration of sustainability into operations	Green KPIs, SOP integration, future digital monitoring	Measurable and consistent performance
Behavioral	Development of sustainability culture	Staff training, internal branding, eco-incentives	Increased awareness & behavioral change
System Approach	Continuous improvement cycle	Plan–Do–Check–Act (PDCA)	Sustainable and adaptive management system

The integration of these dimensions into a "Plan-Do-Check-Act" (PDCA) cycle ensures that the *Green Villa* concept moves beyond a temporary initiative and becomes a sustainable, data-driven management system. These findings are consistent with previous studies by Abdou et al. (2020) and Kim et al. (2022), which emphasize the importance of structured management systems in enhancing sustainability performance. This highlights the importance of internal organizational transformation in achieving sustainable operational efficiency.

Contextual Implications in the Bali Villa Sector

The findings of this study are particularly relevant in the context of Bali, where rapid villa development has intensified pressure on natural resources, especially groundwater availability. In such a setting, sustainability is not only a strategic positioning tool but also an operational necessity.

The significant reduction in water usage observed in this study demonstrates that even basic managerial interventions can yield substantial environmental and economic benefits. This indicates that small- and medium-scale accommodation providers can initiate sustainability transformation without waiting for large-scale technological investments.

Limitations and Future Research

Despite its contributions, this study is limited by its single-case study design, which may restrict the generalizability of the findings. The proposed model is context-specific and reflects the operational characteristics of one villa property in Bali. Future research is therefore recommended to test and refine the model across different types of villa accommodations and geographical contexts. Additionally, further studies incorporating quantitative approaches are needed to validate the effectiveness of Green KPIs in improving sustainability performance.

CONCLUSION

The implementation of the Green Villa concept at Javana Royal Villa leads to several critical conclusions that address the complexity, impact, and strategic framework of sustainable management in the villa sector:

First, the complexity and challenges of implementing the Green Villa concept are classified as moderate to high. This complexity arises from multidimensional factors, including technical limitations such

as manual utility tracking, the need for significant initial capital expenditure for green technology, and the absence of integrated formal policies and SOPs. Furthermore, behavioral resistance among staff and limited external stakeholder support remain primary hurdles that necessitate a comprehensive and structured management approach.

Second, the adoption of green villa has a proven positive impact on operational effectiveness and efficiency. Empirical data demonstrates a significant 62.5% reduction in water costs over a three-month period and a stabilization of energy consumption through systematic monitoring and staff awareness. These practices not only control operational costs but also shift the management paradigm from a reactive to a proactive, data-driven approach, thereby enhancing the villa's competitive advantage and brand image.

Third, this research successfully formulated the "Managerial–Behavioral Based Green Villa Management Model" as a strategic instrument for sustainable operations. This model integrates four key dimensions—managerial, technical, behavioral, and impact—through a structured implementation mechanism. The framework emphasizes the establishment of a Green Committee, the integration of green clauses into standard SOPs, the utilization of Green Key Performance Indicators (KPIs) for objective measurement, and the cultivation of a green organizational culture.

In conclusion, the successful transformation toward a Green Villa is not solely dependent on technical or technological adoption but is fundamentally driven by managerial commitment and the internalization of sustainable behaviors across all levels of the organization. This model provides a replicable framework for independent villas in Bali to achieve long-term environmental and operational sustainability

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