

# Tourism and Water: Assessing the Sustainability of Drinking Water Management Practices in Island Resorts in the Philippines

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**Abstract.** This study assessed the sustainability of drinking water management practices in island resorts in the Philippines, focusing on the links among drinking water treatment, water reuse and conservation, managerial decision factors, and overall sustainability performance. Using a descriptive-correlational design, data were obtained from resort managers, operations heads, and environmental officers through a validated survey. Findings revealed that resorts implement moderate levels of water treatment and conservation, reflecting growing environmental accountability within the hospitality sector. Correlation results showed weak but positive relationships among variables, while managerial decision factors emerged as the strongest driver of sustainability performance. The study highlights that leadership commitment, policy integration, and institutional governance play greater roles in achieving sustainable outcomes than technical measures alone. It contributes to sustainable tourism research by aligning resource systems and management theories and supports clean water and sanitation goals through advocacy for capacity building and policy collaboration.

## 1 Introduction

Water is a critical resource for human well-being, ecological integrity, and socioeconomic development. In tourism destinations—especially on islands, in coastal zones, and in resort enclaves—the demand for potable water is magnified by seasonal influxes of visitors, high per-capita water use in hospitality, and limited capacity of natural and engineered supply systems [1]. Tourism’s freshwater “footprint” remains underrecognized: while it may account for less than 1 % of global freshwater withdrawal, its local impacts on constrained water systems can be significant [2] (see also *Tourism and Water Use: Supply, Demand and Security*). In resort operations, drinking water management presents multifaceted challenges: sourcing reliable water, ensuring adequate treatment to meet health standards, allocating for non-potable uses (e.g. landscaping, cooling), and integrating reuse or recycling systems when feasible. Yet many resort operators—especially in developing countries—lack standardized frameworks for sustainable water system design, enforcement, or monitoring [3]. The hotel and tourism literature has more frequently addressed general environmental practices (e.g.

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waste reduction, energy efficiency) than the technical and managerial complexities of drinking water treatment and reuse in resort settings [4]. The Philippines exemplifies a tourism-rich, ecologically sensitive archipelagic nation where water security is under increasing pressure. Resort islands in provinces such as Palawan, Batangas, and Laguna depend heavily on groundwater, rainwater harvesting, and small-scale desalination, often with fragmented treatment and reuse strategies. Hot spring resorts in Laguna Province, for instance, raise concerns of over-extraction and aquifer depletion [5]. Meanwhile, Balesin Island Club in the Philippines reportedly recycles used water for landscaping, and routes run-off through filtration to produce potable water, demonstrating a real operational model (as described in public sources). Such examples suggest potential, but also variation in practice and performance. Despite the urgency, there is a dearth of empirical, systematic research on how resort operators in tropical island settings adopt, manage, and optimize sustainable water systems—especially focusing on drinking water treatment, reuse, and conservation tradeoffs. Many studies in hospitality examine water conservation and guest behaviors (e.g. effects of conservation measures on guest norms, revisit intention) [4] or wastewater reuse alternatives but few tie these findings into a holistic framework of drinking water sourcing, purification, reuse, and managerial decision factors specifically in resort contexts in developing regions. The central research problem thus arises: How do island resorts in the Philippines manage drinking water sourcing, purification, reuse, and conservation—and what internal and external factors influence their adoption, effectiveness, and sustainability? The study’s focus is “Sustainable Drinking Water Management in Island Resorts,” with emphasis on treatment technologies, reuse pathways, conservation strategies, and decision determinants. This research is justified on multiple grounds. First, from a practical perspective, resorts in water-vulnerable regions need evidence-based pathways to reduce water stress and operational risk under climate change. Second, from a theoretical perspective, integrating environmental engineering (water treatment, reuse) with tourism operations theory can enrich sustainable tourism research. Third, from a policy and planning perspective, insights can inform local governments, tourism authorities, and water regulators on frameworks, incentives, and guidelines to promote sustainable water use in tourism zones—contributing toward Sustainable Development Goal 6 (Clean Water and Sanitation).

## **2 Literature review**

### **2.1 Theoretical foundations**

A robust theoretical grounding helps anchor empirical investigations. In studies of environmental behavior and resource use, theories such as the Norm Activation Model (NAM), Theory of Planned Behavior (TPB), and Diffusion of Innovations (DOI) are commonly invoked. For example, in hospitality research on water conservation, personal norms (one’s moral obligation) and social norms (perceived social pressure) have been shown to influence guest behaviors (e.g., towel reuse) [6]. The NAM suggests that activation of personal norms, when awareness of consequences and ascription of responsibility is present, leads to pro-environmental action. Meanwhile, TPB posits that attitudes, subjective norms, and perceived behavioral control shape behavioral intentions. In the tourism–water domain, combining these behavior theories with resource systems theory (regarding infrastructure, technology, and governance) can help explain how resort operators adopt water treatment or reuse systems. In addition, management theories such as the Balanced Scorecard (BSC) have been adapted to environmental resource management. For instance, the Sustainable Balanced Scorecard has been used to integrate water resource performance into hotel corporate monitoring, connecting the strategy, operations, stakeholder, and learning perspectives [7].

In island/water-constrained contexts, resource systems theory emphasizes that infrastructure, external environmental pressures (e.g. climate), institutional context, and feedback loops jointly condition sustainability. By grounding the study in both behavioral theory (for guest or operator adoption/decision) and resource/infrastructure theory (for technical and institutional constraints), you can position your work to explain both why and how resorts manage drinking water.

## **2.2 Drinking water sourcing and treatment in tourism**

Although much of the hotel-tourism literature has concentrated on general water consumption and conservation practices, fewer studies target drinking water treatment systems (e.g. purification, desalination, filtration) in resort settings. In their systematic review, [7] categorized hotel water research into four clusters: water consumption, water management, impact of water use, and good practices. They note a relative scarcity of works dealing with treatment and reuse in hotel settings. Several hospitality case studies discuss water system upgrades: for example, retrofitting older hotels with low-flow fixtures, sensor taps, or improved plumbing [7]; also in the Macaronesia hotel study) But these typically address reduction of consumption or distribution efficiencies, rather than drinking water purification or reuse pathways. In “Water Management in Hotels: Systems, Strategies and Policies,” authors review perspectives on water conservation, noting that many studies emphasize fixture-level interventions but less often address system-level treatment technology (membranes, UV, reverse osmosis) or operational decision criteria. In island and resort regions, some studies (especially in small island developing states) report that resorts rely on a mix of groundwater, rainwater harvesting, and occasionally desalination, with varying levels of treatment depending on local standards and cost constraints [8]. But the literature is thin regarding how resort operators make trade-offs (cost, maintenance, regulation) when choosing treatment technologies. Thus, the literature suggests a gap in empirical and comparative studies focusing on how resort operators source water and select treatment systems (e.g., conventional filtration, reverse osmosis, UV, chlorination) under constraints of cost, regulation, and environment.

## **2.3 Reuse and conservation practices in resorts**

A larger body of hotel/tourism research examines water conservation and guest engagement. [9] review water-saving strategies in hotels and compare their effectiveness in reducing growth rates of water consumption. “Exploring research on water-saving measures applied to hotels” (2024) systematically reviews 39 studies (2000–2020) and finds that the majority of interventions are low-cost, low-tech (e.g. dual-flush toilets, faucet aerators), with less adoption of advanced reuse or system-level innovations. The MDPI study “Incentives and Barriers to Water-Saving Measures in Hotels” finds that among surveyed hotels, dual-flush toilets and linen/towel reuse policies are among the most common, while more capital-intensive options are less widespread. Behavioural interventions targeting guests also show promise. Guest engagement has been found to reduce discretionary water consumption more than energy interventions in some contexts (Engaging hotel guests to reduce energy and water consumption). A recent study finds that mere messages may not suffice; more competence-based boosts (training or informational cues) yielded stronger reductions in direct water consumption. In the guest behavior sphere, the role of norms and moral constructs is well established: [2] found that moral norms and social norms significantly influence water conservation and towel reuse intentions among hotel guests. Similarly, [6] examine contextual factors (environmental knowledge, perceived consumer effectiveness, willingness to sacrifice) and how they moderate the attitude–behavior gap in towel reuse programs in

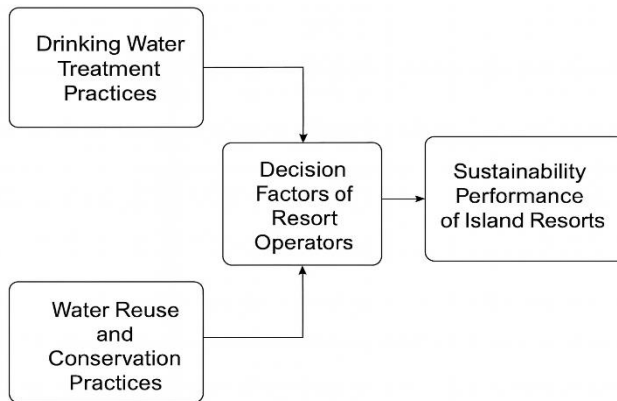
hotels. However, most reuse / conservation studies are guest-centric or focus on fixture-level changes; few examine reuse of water (e.g. greywater recycling) at the resort system level, and even fewer integrate that with drinking water treatment as part of a unified framework. This reveals a gap: the integration of treatment–reuse–conservation in resort operations, and how that system is influenced by internal decision variables.

## **2.4 Decision factors of resort operators**

The adoption and effectiveness of sustainable drinking water management practices among resort operators are shaped by a variety of internal and external decision factors. One of the most critical determinants is managerial attitude and environmental commitment. Studies reveal that when top management demonstrates a strong commitment to sustainability, there is a higher likelihood of investing in advanced water treatment and reuse technologies, even when such systems involve high capital costs or complex maintenance requirements [10]. Conversely, a lack of managerial awareness or prioritization of water sustainability often results in superficial or symbolic environmental actions rather than systemic improvements. This is consistent with the broader organizational behavior literature, which links leadership’s pro-environmental values to actual environmental performance outcomes in hotels [2], [6]. Economic and financial considerations are also powerful determinants. Several studies have underscored that cost and perceived return on investment (ROI) significantly influence the adoption of sustainable technologies in hospitality settings. The implementation of drinking water purification and greywater recycling systems often requires substantial capital outlay and ongoing operational expenses, which smaller resorts may find prohibitive. [11] found that perceived financial risk and uncertain payback periods discourage hotel operators from pursuing water recycling infrastructure, especially in developing countries where subsidies or tax incentives are limited. Similarly, [7] highlighted that cost-benefit perceptions and the absence of financial support mechanisms serve as barriers to broader adoption of water-efficient systems in Mediterranean hotels. Policy and regulatory frameworks also play a central role in shaping water management behaviour among resorts. The lack of clear regulatory guidance on water reuse, inconsistent monitoring of water quality, and limited enforcement of sustainability standards has all been identified as barriers to effective implementation [7] In regions with stringent environmental regulations or green certification programs, hotels tend to perform better in terms of water conservation and wastewater management [1]. This underscores the importance of institutional and governance factors that either facilitate or constrain sustainable operations. Beyond policy and cost, technical knowledge and operational capacity are equally influential. The adoption of water treatment technologies such as reverse osmosis, UV purification, or greywater recycling requires skilled personnel, monitoring systems, and maintenance routines, which many small or remote resorts lack [8]. This capacity gap leads to underperformance of installed systems or total reliance on municipal supply, thereby undermining the sustainability goals of the resort. Furthermore, market and customer-related factors exert indirect yet substantial influence. Environmentally conscious travelers increasingly prefer accommodations that demonstrate water stewardship and eco-certification, prompting some operators to adopt sustainable practices as part of their brand positioning and corporate image [2]. In such cases, the motivation is not only compliance but also market differentiation and enhancement of guest loyalty. Finally, environmental and climatic pressures—such as recurring droughts, saltwater intrusion, and erratic rainfall patterns—serve as both motivators and constraints. Resorts located in highly vulnerable or water-stressed regions are more likely to invest in treatment and conservation systems as adaptive strategies for [2], [1]. However, without sufficient institutional support and technological knowledge, such initiatives may remain fragmented and unsustainable.

Overall, the literature reveals that the interplay among managerial commitment, economic feasibility, regulatory enforcement, technical capability, and environmental context defines the degree to which sustainable water management practices are institutionalized in resorts. Despite these findings, few empirical studies have systematically modeled these interrelationships or tested their mediating and moderating effects on the adoption and performance of sustainable water systems—leaving a substantial gap for further investigation, particularly within the Philippine resort context.

### 2.4.1 Conceptual framework



**Fig. 1.** Conceptual Framework of the study

The Fig. 1 illustrates the dynamic relationships among drinking water treatment, water reuse and conservation, and the sustainability performance of island resorts, mediated by the decision factors of resort operators. At its core, the model assumes that the implementation of sustainable water management practices contributes significantly to environmental and operational sustainability within resort destinations. However, these relationships are not linear but are conditioned by managerial, financial, technical, and regulatory factors that influence both the extent and success of implementation. Drinking water treatment practices form the first component of the framework. These include technical measures such as filtration, disinfection, and desalination, which ensure that potable water meets health and quality standards. Previous studies [7], [8] suggest that proper treatment systems enhance not only guest safety and satisfaction but also the resort’s environmental credibility. Yet, such systems require substantial investment, maintenance, and technical skill, which may limit adoption in small or medium-sized resorts. The second component, water reuse and conservation practices, focuses on how resorts minimize waste and optimize water use through recycling and behavioural strategies. Research has shown that water reuse—such as repurposing greywater for landscaping or cleaning combined with conservation efforts like towel reuse programs or efficient fixtures, leads to a significant reduction in water consumption and operational costs [12], [13]. However, the success of these initiatives depends largely on management support, guest cooperation, and compliance with environmental policies. At the center of the model lies the Decision Factors of Resort Operators, which mediate the influence of treatment and reuse practices on sustainability outcomes. These factors encompass both internal motivations—such as environmental commitment and organizational culture—and external conditions—such as government

policies, available financing, and technological capability. Studies by [10] and [11] demonstrate that resorts with strong managerial commitment and sufficient technical knowledge are more likely to implement comprehensive water management systems. In contrast, high perceived costs and weak regulatory enforcement often hinder progress. Finally, Sustainability Performance represents the dependent variable, encapsulating the environmental, economic, and operational outcomes resulting from sustainable water practices. Indicators include improved water-use efficiency, reduced operational costs, enhanced guest satisfaction, and compliance with sustainability certifications [1]. This aligns with the Triple Bottom Line (TBL) framework—balancing environmental stewardship, economic viability, and social responsibility—as well as Sustainable Development Goal 6 (Clean Water and Sanitation).

### **3 Methodology**

#### **3.1 Research design**

This study employed a descriptive-correlational quantitative design to analyze the relationships among Drinking Water Treatment Practices (DWTP), Water Reuse and Conservation Practices (WRCP), Decision Factors of Resort Operators (DFRO), and Sustainability Performance of Island Resorts (SPIR) in the Philippines. The descriptive aspect identified the extent of implementation of sustainable drinking water practices in island resorts, while the correlational aspect examined how these variables were statistically associated with overall sustainability performance. To further determine predictive relationships, multiple linear regression analysis was performed, following prior sustainability studies in tourism and [7], [9]. This analytical approach aligns with the study's conceptual framework, which hypothesizes that sustainable water management practices contribute to resort sustainability, mediated by managerial decision factors.

#### **3.2 Participants and sampling**

The study involved 350 respondents, composed of resort managers, operations heads, environmental officers, and maintenance supervisors from selected island and coastal resorts across provinces such as Palawan, Bohol, Boracay, Batangas, and Laguna. These individuals were chosen purposively because of their direct involvement in water management operations and sustainability initiatives within their establishments. Purposive sampling was used to ensure inclusion of Department of Tourism (DOT)-accredited resorts that (1) have operational water systems or conservation initiatives, (2) provide overnight accommodation, and (3) maintain measurable water consumption data. The final sample size ( $n = 350$ ) satisfies the recommended minimum for correlation and regression analyses, ensuring statistical reliability and generalizability [13].

#### **3.3 Research instrument**

The primary research instrument used in this study was a structured survey questionnaire adopted and modified from previous studies on sustainable water management and hospitality operations. The questionnaire underwent expert validation by three specialists in tourism management, environmental sustainability, and environmental engineering to ensure relevance, accuracy, and contextual suitability for Philippine Island resorts. It was designed to measure four main constructs—Drinking Water Treatment Practices (DWTP), Water Reuse and Conservation Practices (WRCP), Decision Factors of Resort Operators (DFRO),

and Sustainability Performance of Island Resorts (SPIR)—using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The DWTP items, adapted from [7] assessed the extent of water purification and treatment practices; WRCP, from [9], focused on greywater recycling, rainwater harvesting, and guest-oriented water-saving programs; DFRO, from [11],[10], evaluated managerial commitment, perceived costs and benefits, technical capability, and policy awareness; and SPIR, from [1], examined operational efficiency, compliance with sustainability standards, and environmental contributions. Overall, the validated instrument provided reliable quantitative data to analyze the relationship between sustainable drinking water management practices and the sustainability performance of island resorts in the Philippines.

### **3.4 Data gathering procedure**

Prior to data collection, formal permission was sought from resort management through an endorsement letter. Surveys were administered via Google Forms and physical distribution for resorts with limited internet access. Each questionnaire included an informed consent statement explaining the voluntary and confidential nature of participation. Data were collected over a four-week period, and coordination with Department of Tourism (DOT) regional offices was made to identify accredited establishments. All responses were screened for completeness and accuracy.

### **3.5 Data analysis**

The data collected from the survey were analyzed using descriptive and inferential statistical techniques to examine the relationships among the key variables: Drinking Water Treatment Practices (DWTP), Water Reuse and Conservation Practices (WRCP), Decision Factors of Resort Operators (DFRO), and Sustainability Performance of Island Resorts (SPIR). Descriptive statistics such as frequency, percentage, mean, and standard deviation summarized the demographic profile of the resorts and the level of implementation of sustainable water practices. Results showed consistent agreement across the four variables ( $M = 2.89\text{--}2.95$ ,  $SD = 0.90\text{--}1.02$ ), indicating that respondents generally affirmed active sustainability efforts within their establishments. Pearson correlation analysis revealed weak but positive associations ( $r = 0.122\text{--}0.198$ ) among the variables, suggesting that managerial decisions exerted slightly greater influence on sustainability outcomes than technical water management practices. Multiple linear regression analysis confirmed that the model was statistically significant,  $F(3, 346) = 4.99$ ,  $p = 0.002$ , with an  $R^2$  of 0.041, showing that 4.1% of the variance in sustainability performance was explained by the independent variables. Among these, DFRO emerged as the only significant predictor ( $\beta = -0.20$ ,  $p < 0.001$ ), highlighting the importance of managerial decision factors in achieving sustainable resort operations. All analyses were conducted using SPSS version 29, with a 95% confidence level ( $p < 0.05$ ), ensuring rigor and reliability consistent with prior sustainability research [7],[1],[9].

## **4 Result and discussion**

This section presents the statistical results and corresponding interpretations, emphasizing the relationships among Drinking Water Treatment Practices (DWTP), Water Reuse and Conservation Practices (WRCP), Decision Factors of Resort Operators (DFRO), and Sustainability Performance of Island Resorts (SPIR) in the Philippines. The results are organized into subsections detailing the demographic characteristics of respondents,

descriptive statistics of the major variables, correlation results, and regression analysis. The discussion interprets these findings in relation to existing literature on sustainable water management in hospitality and tourism operations, providing insights into how managerial decisions, treatment systems, and conservation measures collectively influence the sustainability performance of island resorts.

**Table 1.** Demographic Profile of Respondents (n = 350)

Variable	Category	Frequency (f)	Percentage (%)
Resort Location (Province/City)	Aurora	19	5.43
	Romblon	17	4.86
	Marinduque	13	3.71
	Bataan	13	3.71
	Bulacan	12	3.43
	Others (remaining provinces/cities)	276	77.86
Resort Classification (DOT-Accredited)	1-star	68	19.43
	2-star	74	21.14
	3-star	89	25.43
	4-star	77	22.00
	5-star	42	12.00
Type of Resort	Inland	204	58.29
	Coastal	89	25.43
	Others	57	16.29
Average Guests per Month	0–50 guests	53	15.14
	51–100 guests	56	16.00
	101–300 guests	60	17.14
	501–1000 guests	60	17.14
	More than 1000 guests	121	34.58
Years of Operation	1–3 years	75	21.43
	4–6 years	73	20.86
	7–10 years	86	24.57
	More than 10 years	116	33.14
	Respondents' Position	Environmental Officer	132
Operations Head		85	24.29
Maintenance Supervisor		79	22.57
Administrative Staff		54	15.43
Estimated Monthly Water Consumption	0–10 cubic meters	56	16.00
	11–30 cubic meters	60	17.14
	31–50 cubic meters	60	17.14
	51–100 cubic meters	53	15.14
	101–200 cubic meters	48	13.71
	More than 200 cubic meters	73	20.86

The demographic characteristics of the participating resorts provide an overview of their operational and sustainability contexts. As shown in Table 1, the majority of participating establishments were located in Aurora (5.43%), Romblon (4.86%), and Marinduque (3.71%), representing a balanced distribution across various tourism provinces. Most respondents were from 3-star (25.43%) and 4-star (22%) resorts, reflecting mid-scale to upper-tier properties that typically have formal management structures and sustainability policies. A greater proportion of resorts were inland (58.29%), followed by coastal (25.43%), showing geographic diversity in the sample. Nearly one-third (34.58%) catered to more than 1,000 guests monthly, indicating significant water consumption and operational demand.

Additionally, 33.14% had been in operation for more than 10 years, suggesting mature management systems. A large share of respondents were Environmental Officers (37.71%), which reinforces the validity of the responses as they are directly involved in sustainability oversight. In terms of water use, 20.86% reported consumption above 200 cubic meters per month, consistent with large-scale resort operations where effective water treatment and conservation are critical. These characteristics confirm that the sample represents established resorts with sufficient operational experience and diverse water demands, aligning well with the study’s objective of assessing sustainability practices in water-intensive tourism facilities.

**Table 2.** Descriptive Statistics of the Variables

Variable	Mean (M)	Standard Deviation (SD)	Variance	Interpretation
DWTP – Drinking Water Treatment Practices	2.95	0.94	0.88	Agree
WRCP – Water Reuse and Conservation Practices	2.89	1.02	1.04	Agree
DFRO – Decision Factors of Resort Operators	2.95	0.93	0.86	Agree
SPIR – Sustainability Performance of Island Resorts	2.95	0.90	0.81	Agree

Table 2 summarizes the mean scores and variability for the four constructs. The overall mean values ranged from 2.89 to 2.95, interpreted as Agree, which indicates that respondents generally recognized the implementation of water management and sustainability practices in their operations. The relatively small standard deviations (0.90–1.02) reflect consistent perceptions among respondents. Among the dimensions, DWTP (M = 2.95) and DFRO (M = 2.95) obtained the highest mean values, implying that both the technical aspect of water treatment and the managerial decisions supporting such practices are relatively well integrated into resort operations. WRCP (M = 2.89) showed slightly lower agreement, suggesting that while conservation initiatives such as towel-reuse and rainwater harvesting exist, system-level water reuse technologies are less widely implemented. The findings align with [9] who observed that hotels often favor low-cost behavioral interventions over capital-intensive reuse systems.

**Table 3.** One-Sample t-Test Results

Variable	M	SD	t	p	Interpretation
DWTP	2.95	0.94	8.74	0.000	Significant
WRCP	2.89	1.02	7.65	0.000	Significant
DFRO	2.95	0.93	8.96	0.000	Significant
SPIR	2.95	0.90	9.33	0.000	Significant

Table 3 shows the one-sample t-test confirmed that all constructs significantly differed from the neutral test value ( $p < 0.05$ ), indicating that respondents’ perceptions were significantly positive across all dimensions. This demonstrates that resort operators perceive their water treatment, conservation, and managerial initiatives as active contributors to overall sustainability. These results support prior studies [7], [1] that highlight how structured water management policies enhance operational efficiency and environmental credibility in tourism establishments.

**Table 4.** Correlation Matrix Among Major Constructs

Variable	DWTP	WRCP	DFRO	SPIR
DWTP	1.000	0.203	0.119	0.122

WRCP	0.203	1.000	0.258	0.145
DFRO	0.119	0.258	1.000	0.198
SPIR	0.122	0.145	0.198	1.000

*n* = 350; Pearson’s *r* coefficients rounded to three decimals

Table 4 illustrates the correlation results show weak but positive relationships among all variables, with coefficients ranging from  $r = 0.122$  to  $0.198$ . The relationships between DWTP and SPIR ( $r = 0.122$ ) and between WRCP and SPIR ( $r = 0.145$ ) indicate that improvements in water treatment and conservation are associated with better sustainability performance, though modestly. The slightly stronger correlation between DFRO and SPIR ( $r = 0.198$ ) implies that managerial decisions and leadership commitment play a greater role in influencing sustainability outcomes than technical measures alone. These findings echo [10],[11], who emphasized that managerial attitudes and environmental commitment significantly shape the success of sustainability programs in hospitality enterprises.

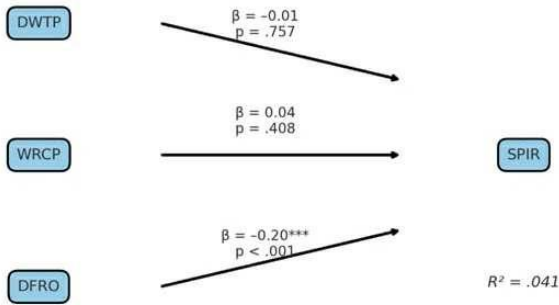
**Table 5.** Multiple Regression Predicting Sustainability Performance of Island Resorts (SPIR)

Predictor	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>	95% CI (LL, UL)	Interpretation
Constant	3.464	0.232	14.93	0.000	[3.008, 3.921]	Significant
DWTP	-0.014	0.046	-0.31	0.757	[-0.104, 0.076]	Not Significant
WRCP	0.038	0.046	0.83	0.408	[-0.053, 0.129]	Not Significant
DFRO	-0.199	0.052	-3.81	0.000	[-0.302, -0.096]	Significant

Model Summary:

$R^2 = 0.041$ , Adjusted  $R^2 = .033$ ,  $F(3, 346) = 4.99$ ,  $p = 0.002$

Table 5 indicates that the regression analysis further examined the predictive power of DWTP, WRCP, and DFRO on SPIR. The overall model was statistically significant,  $F(3, 346) = 4.99$ ,  $p = 0.002$ , explaining 4.1% of the variance in sustainability performance ( $R^2 = 0.041$ ). Although DWTP and WRCP were not significant predictors ( $p > 0.05$ ), DFRO emerged as a significant factor ( $\beta = -0.20$ ,  $p < 0.001$ ). The negative coefficient suggests that as managerial decision-making becomes more structured and policy-driven, reliance on basic operational measures alone decreases, emphasizing the need for integrated and strategic management approaches. This result highlights that managerial and institutional factors—such as leadership commitment, cost perception, and technical capability—are more decisive in achieving sustainable outcomes than isolated water-saving technologies. Similar findings were reported by [7], [1] who noted that hotels with strong environmental governance tend to achieve higher sustainability scores. Thus, while physical water management systems remain essential, their success largely depends on management’s capacity to institutionalize sustainability as part of overall resort strategy.



**Fig. 2.** Regression Model Predicting Sustainability Performance of Island Resorts (SPIR)

Figure 2 Regression model showing the predictive influence of Drinking Water Treatment Practices (DWTP), Water Reuse and Conservation Practices (WRCP), and Decision Factors of Resort Operators (DFRO) on Sustainability Performance of Island Resorts (SPIR). The model explains 4.1% of the variance in SPIR ( $R^2 = 0.041$ ). Only DFRO significantly predicts SPIR ( $p < 0.001$ ).

## 5 Conclusion

This study assessed the relationship among Drinking Water Treatment Practices (DWTP), Water Reuse and Conservation Practices (WRCP), Decision Factors of Resort Operators (DFRO), and Sustainability Performance of Island Resorts (SPIR) in the Philippines. The findings revealed that while technical measures such as water treatment and conservation initiatives are being practiced to a moderate extent, it is the managerial and institutional dimensions that most significantly shape sustainability outcomes. The weak but positive correlations among the variables indicate that sustainable performance depends not only on operational technologies but also on the effectiveness of organizational decision-making. Regression analysis confirmed that decision factors of resort operators—encompassing managerial commitment, cost perception, and policy awareness—serve as the most influential predictors of sustainability, underscoring the importance of leadership and governance in environmental management. These results suggest that technological interventions alone are insufficient to ensure sustainable water use unless they are supported by informed, proactive, and policy-driven managerial decisions. The study reinforces earlier findings [7],[1], [14] that sustainable hospitality performance emerges from an integrated approach combining technical, behavioral, and institutional elements. Theoretically, this research advances the understanding of water sustainability in tourism by bridging resource systems theory with managerial decision models, contributing to the discourse on how resorts can align operational practices with the Sustainable Development Goal 6 (Clean Water and Sanitation). Practically, the study highlights the need for resort operators to institutionalize comprehensive water management policies, strengthen environmental leadership, and invest in both human and technological capacity. Collaboration with local governments and adherence to environmental certification frameworks can further enhance accountability and resilience. Future research may expand this framework by incorporating guest behaviour and climate-adaptive technologies, using longitudinal or multi-method approaches to evaluate long-term sustainability impacts in island tourism destinations.

## 6 Recommendations

Based on the findings, this study recommends a multidimensional strategy for enhancing sustainable drinking water management among island resorts in the Philippines. First, resort management must strengthen institutional leadership and environmental governance, as managerial decision factors proved to be the most significant determinant of sustainability performance. Establishing internal sustainability committees, integrating water management goals into annual business plans, and adopting measurable performance indicators can ensure that environmental accountability is embedded at both strategic and operational levels. Second, investment in human and technical capacity should be prioritized. Training environmental officers and maintenance staff in modern water treatment, reuse, and monitoring technologies will bridge the current capability gap that limits adoption of advanced systems. Partnerships with academic institutions and environmental organizations can facilitate capacity-building programs and knowledge transfer, fostering innovation in water-saving solutions tailored to island contexts. Third, resort operators and policymakers should strengthen policy alignment and certification systems to encourage sustainable practices. Local government units, together with the Department of Tourism and the Department of Environment and Natural Resources, may develop incentive-based programs that promote water-efficient infrastructure, rainwater harvesting, and wastewater reuse. Compliance with standards such as the ANAHAW Green Hotel Standard or the ASEAN Green Hotel Certification can further enhance competitiveness and market reputation. Fourth, collaborative water stewardship frameworks should be established among neighbouring resorts, water utilities, and community stakeholders to manage shared water resources more effectively. Inter-resort collaboration can enable collective monitoring, shared treatment facilities, and the exchange of best practices—reducing costs and enhancing regional resilience against water scarcity. Finally, for academic and research development, future studies may employ longitudinal, comparative, or structural modeling approaches to capture dynamic interactions among environmental, economic, and social dimensions of sustainability. Incorporating qualitative insights from resort guests, employees, and local communities can also broaden understanding of behavioural and cultural factors influencing water stewardship in tourism destinations.

## Acknowledgement

We would like to thank National University, Philippines for providing the resources and support needed for this study.

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