

The Management of Natural Resources in Tourist Destinations: Challenges and Their Future Potential in Bali

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Abstract

Bali offers a compelling case study for understanding the complex challenges of managing natural resources in a tourism-intensive setting. The island's natural beauty, cultural richness, and biodiversity have made it a global tourism hotspot, yet these assets are increasingly threatened by over-tourism, water scarcity, unmanaged waste, and land-use conversion. This study adopts a qualitative approach using a library-based case study method, drawing on academic literature, government reports, legal frameworks, environmental data, and policy documents to analyze the ecological, socio-cultural, and governance dynamics of resource management in Bali. The findings highlight critical issues such as excessive groundwater extraction by the hospitality sector, inadequate waste management systems leading to marine and land pollution, and deforestation driven by tourism infrastructure development. Despite these challenges, Bali demonstrates significant potential through its cultural philosophy of Tri Hita Karana, policy instruments like Law No. 15 of 2023 and RTRW 2020, and growing innovations in community-based tourism, renewable energy, and participatory governance. The study concludes that Bali's future sustainability depends on the integration of traditional values with regulatory enforcement, inclusive stakeholder collaboration, and adaptive environmental management. If implemented holistically, these strategies can position Bali as a global model for sustainable tourism rooted in cultural integrity and ecological resilience.

Keywords: Sustainable Tourism, Natural Resource Management, Environmental Governance, Bali, Case Study



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INTRODUCTION

Bali, referred to as the Island of the Gods, serves as a textbook case for a tourism destination where the careful management of natural resources is vital for sustainable development. Bali is famous the world over as a tourism hotspot primarily for its natural, cultural, and biological resources. At the same time, these resources are deeply threatened by the ever-growing influx of tourists (Januar, 2024; Mananda & Sudiarta, 2024; Pickel-Chevalier & Ketut, 2016). Recovering and balancing economic growth and the sustainable preservation of the environment is the number one concern for Bali (Bagus et al., 2025a; Muhamad et al., 2025; Wulandari, 2024a). The tourists already come with their own set of issues including, but not limited to, excess waste, water, and land consumption. The described scenario is bound to bring pollutants, ravage Bali's natural ecosystems, and bring the tourism industry to its knees. Bali, like most of the rest of the world, is already facing the challenges of climate change (Bagus et al., 2025a; Muhamad et al., 2025; Wulandari, 2024a). This includes but is not limited to rising sea levels, extreme climates, and volatile changes in temperature. This leads to the breakdown of infrastructure, a certain devastation to tourism that's bound to bring along economic loss. The focus of Bali may still pioneer by adopting policies in the tourism management field and enforcing sustainability that expect tourists to enjoy natural resources for controlled and limited periods (Bagus et al., 2025b). Utilising renewable energy sources can mitigate the carbon footprint associated with tourism activities (Januar, 2024; Mananda &

Sudiarta, 2024). Also, community-based resource management can enable local communities to both conserve their environment and enjoy the economic benefits tourism can bring. The future potential on the management of natural resources in Bali can be achieved by adopting a comprehensive approach which combines economic, environmental, and social factors. This would allow Bali to preserve its natural resources as a marvel for future generations while maintaining a vigorous tourism industry.

METHOD

This research employs a qualitative method and employs a library research-based case study (Lim, 2025). This specific case study focuses on the management of natural resources in Bali as a representative case of a tourism-dominated region that suffers socio-cultural and environmental issues. This research does not collect primary data; rather, it relies entirely on secondary data through systematic literature review and document review. These include scholarly articles, government publication submissions, policy documents and briefs, publication of statistics (e.g., BPS reports), international studies on the environment, and relevant theories on sustainable tourism and resource management. The materials collected were subjected to thematic content analysis to determine the key patterns, challenges, and strategies regarding the issue of tourism and the environment in Bali. The selection of Bali is due to its status as a tourist destination of international renown that is increasingly facing the challenge of sustainably managing economic growth, ecological preservation, and the protection of culture and heritage. The study in this context is conducted by synthesising the available literature and policy proposals to construct a sound understanding of the issues involved and provide concrete recommendations on sustainably managing natural resources in those regions.

DISCUSSION

Expanding on the Management of Natural Resources in Bali

The rapid expansion of tourism in Bali exacerbates an already troubling set of problems concerning the management of the island's natural resources. Perhaps the most urgent of these problems is the increasing scarcity of clean water. The number of international tourists in Bali reached 6.2 million in 2019 while domestic tourism surpassed 10.5 million. This naturally drove up the demand for water, especially in the tourism sector. Research indicates that Bali's luxury hotels can use up to 4,000 litres of water for every guest each day, which is well over 20 times the average consumption of local residents, 183 litres. Even budget hotels use water much more liberally, around 1,000 litres per guest per day. Since there are over 77,000 hotel rooms in Bali, with an average occupancy rate of 50%, the tourism sector's water demand is 160 million litres per day. This is nearly one-fifth of Bali's total daily water consumption. This demand is often met through the pumping of deep bore wells over 60 metres deep which has led to the water tables dropping, the shallow community wells drying up, and seawater intrusion as far as 330 metres inland into the tourist zones Kuta and Sanur. This results in water equity that benefits large well drilling investors while local residents suffer water scarcity (Antara News, 2023; Phys.org, 2022). Bali's waste management is a very pressing issue. It produces about 4,281 metric tonnes of waste daily. Indiscriminate disposal contributes to about 944 metric tonnes of waste, while open burning contributes 824 metric tonnes, and transporting waste into water bodies contributes 452 metric tonnes. This amounts to over 52% of global waste management. 829 metric tonnes of plastic waste is produced daily and only 7% is recycled, with the rest ending up in landfills. Bali faces a problem referred to as "garbage emergency" where plastic waste washes ashore onto beaches

which harms marine environments and the island's reputation as a clean place (Denpost., 2020; Phys.org., 2022).

The development of tourism facilities is also triggering localized deforestation as well as the reduction of green spaces. Today, Bali's forest cover is only 23.27% of its area and significantly below the ecological threshold of 30%. Agricultural lands, particularly in tourism hotspots like Gianyar and Badung, are increasingly being converted into hotels and villas, with an annual loss of 600 to 1,000 hectares of farmland. This type of development is also most detrimental to Bali's iconic landscapes, including the rice terraces, as they now face severe ecological disruption alongside loss of biodiversity. Sensitive habitat fragmentation threatens Bali's endemics, such as the Bali Starling and other forest-dependent fauna. At the same time, traditional cultural performances are being dished out as mere spectacles to meet the needs of tourists which endangers Bali's cultural identity (Phys.org., 2022). Bali has enormous opportunities for advancement despite many obstacles in the way. Responsible tourism focused on the island's environmental sanitation, such as sorting waste at the source, recycling, and community-based composting, has proven to ameliorate the impact of tourism. Eco-friendly hotels paired with low emission transportation make strides towards green infrastructure. Furthermore, Bali's embracing of smart technology aids in environmental monitoring, conservancy, and education about sustainable living (Antara News, 2023). Bali's sustainable tourism innovations can capitalise on local culture and traditions as groundwork which can further the island's tourism. Desa adat, local customary villages, already has in place measures such as pollution restrictions, reforestation mandates, and the protection of sacred forests. An example of sociocultural environmental harmony is the subak irrigation system, a UNESCO recognised cultural heritage site. Ethically rooted Bali is guided by sustainable resource management based on locally derived principles such as the Tri Hita Karana philosophy which espouses harmony between humans, nature, and the divine (Hidayah & Farhan, 2023). Integrated and innovative approaches are essential for resolving environmental issues if Bali seeks to uphold its reputation as one of the leading global tourist destinations. A comprehensive strategy that encompasses the government, the tourism sector, the local community, and customary bodies is indispensable. Effective management of Bali's natural resources is critical, not just for the viability of its tourism sector, but also for safeguarding the island's cultural identity and ecological resilience. By melding cultural intelligence with contemporary innovation and robust policy frameworks, Bali can become an exemplar for the world on the management of tourism-related natural resources.

Actionable Strategies for Sustainable Management in Bali

Bali's tourism industries must implement a multi-sectoral approach to achieve sustainable natural resource management, which includes tourism, waste, water, and agriculture and tourism facilities management. Enhancing waste management is a critical concern. Out of approximately 4,281 tons of waste produced daily, Bali mismanages more than 50% (52%) by indiscriminate disposal, open burning, and waterway discharge. This problem prompted the provincial government to introduce Governor Regulation No. 97/2018, restricting the use of single-use plastics, bags, straws, and styrofoam. The regulation has yielded measurable results: plastic bag use in modern retail dropped by 90% in two years, and by 2020, coastal plastic waste had reduced by about 50%. To improve waste management, the government also issued Decree No. 381/2021 to formalise the community-based waste management systems bank sampah, composting, and TPS3R at the village level. Such local initiatives are vital to curb landfill-related pollution and slow down environmental degradation.

Water Conservation is also an extremely important strategy. Bali is at risk of a water crisis considering hotel consumption is peaking at 160 million litres per day, with signs of sea water intrusion and ground water over-extraction in certain tourist regions. To aid in combating this, there have been infrastructure investments aimed at moving surface water from rivers outside tourist areas like Tukad Petanu and Tukad Unda to southern Bali through the Sarbagita Pipeline. Some resorts are looking into desalination technologies. Meanwhile, the government is in favour of rain water harvesting, waste water recycling, and requires the installation of recharge wells (sumur resapan) in new tourism constructions. There have also been stricter regulations on licensing and taxation for ground water extraction, but enforcement is inconsistently reliable. Farmers are being encouraged to adopt Sustainable Agriculture to bolster the local food system and mitigate the importation of food and the associated carbon footprint. Economically productive, yet resort-less, land is being encouraged to adopt agrotourism, such as fruit-picking tourism in Karangasem, enabling them to gain economically without losing land to resort developers. In an attempt to stem farmland conversion, which is surpassing 600 to 1,000 hectares per year, the government has started to protect subak irrigated fields with LP2B certification (Sustainable Agricultural Land Protection) in southern Bali.

Integrating Tradition with Modernity for Long-Term Sustainability Balinese Philosophical Approach

At the heart of Bali's approach to sustainable development is the traditional Hindu philosophy of Tri Hita Karana (THK), which promotes harmony among humans (pawongan), nature (palemahan), and the divine (parahyangan). This worldview has long guided Balinese communities in managing natural resources in a spiritually, socially, and ecologically responsible manner. A prime example is the subak irrigation system, recognized by UNESCO in 2012, which integrates ecological water distribution, social cooperation among farmers, and spiritual devotion through temples dedicated to Dewi Danu, the goddess of water. In modern times, this philosophy has been revitalized and formalized into development planning. The Provincial Regulation No. 5 of 2020 mandates that all tourism activities in Bali uphold the values of Sad Kerthi and Tri Hita Karana as the basis of sustainable cultural tourism. Gubernatorial initiatives such as "Nangun Sat Kerthi Loka Bali" further embed this approach by encouraging protection of six sacred sources (atma, jana, jagat, wana, danu, segara), encompassing life, humanity, the universe, forests, water, and seas.

Spiritual Conservation

THK emphasizes that nature is not merely a resource, but a sacred entity. In many parts of Bali, forests, springs, and mountains are considered sacred and are protected through religious customs and rituals. Ceremonies such as Tumpek Uduh (for plants) and Tumpek Kadang (for animals) are periodically celebrated to foster environmental awareness rooted in spiritual values. In practice, sacred forests and springs (beji) are guarded by customary communities. As part of the TAMASYA program (Tabungan Air di Masa Yadnya), these sacred springs are now being integrated into provincial conservation efforts to stabilize water flows in tourism regions. In the Nusa Dua tourism zone, the state-owned operator ITDC has incorporated THK into its masterplan by zoning areas into parahyangan (sacred temples), pawongan (guest accommodations), and palemahan (green open space). Nine temples exist within the hotel complex and are preserved under the obligation that hotels must not obstruct ritual access or modify temple function. For example, the Grand Hyatt hotel in Nusa Dua is designed around a temple that remains under the management of the local desa adat and remains open for Melasti rituals before Nyepi (the Balinese Day of Silence).

Cultural Landscapes

Bali's iconic rice terraces and agrarian systems are more than scenic beauty, they are part of an intact cultural landscape that supports biodiversity and watershed health. However, rapid tourism development has endangered these landscapes through massive land conversion. Between 600–1,000 hectares of rice fields have been lost annually, particularly in the southern regions. To counteract this trend, the Provincial Spatial Plan (RTRW) of 2020 prohibits the conversion of subak-irrigated rice fields into non-agricultural use and introduces LP2B certification (Sustainable Food Agricultural Land) to legally protect productive farmland. At the same time, the government encourages agrotourism in areas where traditional agriculture is still practiced. In Karangasem, for instance, fruit orchards have been transformed into community-run ecotourism destinations, allowing farmers to benefit economically while preserving Bali's rural identity and ecological integrity.

Innovative Technologies

While rooted in traditional wisdom, Bali is also embracing modern technologies to advance sustainable resource management. In energy, there is growing adoption of renewable sources such as solar panels and biogas units, particularly in eco-resorts and community-based accommodations. Following the G20 Summit in 2022, Bali was declared a pilot province for Net Zero Emissions by 2045, initiating investments in electric vehicles and solar infrastructure to reduce reliance on fossil fuels in the tourism sector. Smart technologies are also being deployed for environmental monitoring and education. Programs such as Bali Water Protection have installed groundwater sensors across the island to track aquifer levels. Tourism villages and nature-based attractions increasingly use digital applications and QR codes to provide sustainability-related information, manage visitor flows, and raise environmental awareness. These tools enable data-driven policy and visitor education without compromising the cultural authenticity of the experience.

Policy and Governance for Long-Term Sustainability

Effective governance is critical in balancing the needs of tourism, development, and the sustainable management of Bali's natural resources. Environmental protection requires a clear institutional framework, eliciting community involvement, and enforcement of cross-sector participation and sustainability. On the national level, sustainable tourism governance is legally supported through Indonesia's Law No. 15 of 2023. The law requires the natural, cultural, and social resources to be managed in an integrated and equitable manner with a focus on conservation and community empowerment (Putra et al., 2025). While the law strengthens Bali's legal basis for environmental protection, gaps in inter-agency coordination and enforcement, particularly with tourism, village governance, and environmental bodies, pose critical challenges. The revision of Province Bali Spatial Plan (RTRW) Bali 2020, under the vision of "Nangun Sat Kerthi Loka Bali" supports its implementation. The revision translates to "to uphold and protect the Bali within," signifying an eco-cultural balancing framework for land and sea utilization. It adopts "one island, one governance and one pattern," guiding the island's zoning system and land/sea utilization in alignment with the ecological and cultural equilibrium envisioned by Tri Hita Karana (THK). Within tourism, the revised RTRW prohibits construction of tourism facilities that block public beach access, and/or sacred sites, thus ensuring sustained cultural and environmental integrity.

Consistent collaborative work with stakeholders is useful in ensuring the success of the collaborative work being done. The Penta-Helix governance model, which is the combination of government, academia, business, civil society, and the media, is known to be a significant

concern of Bali's sustainable development work (Wulandari, 2024b). This model has propelled the development of cross-sectoral projects, which include Sarbagita water and community-based waste management systems, as well as the decentralized developments of tourism villages which drive the need for shared responsibility and ongoing dialogue. The hotel industry governance which integrates THK provides an ethnocultural perspective of sustainability. The tourism developments like the Nusa Dua complex now include zoning schemes that consist of *parahyangan* (sacred spaces), *pawongan* (human activity zones), and *palemahan* (natural or green spaces), which institutionalizes the cultural balance to be achieved in land use planning (Astuti et al., 2023). Besides zoning, there is also a recognition of customary governance (*desa adat*) which allows these governance systems to be recognized as co-governors of environmental governance, for instance, the management of plastic bans and the management of the sacred forests and springs. Despite the research conducted, there is no denying the fact that more inclusive and cross-sectoral policy frameworks are required. Some studies conducted on the Soka Tourism Area indicate that without defining stakeholder responsibilities and having mechanisms for long-term planning, achieving sustainability becomes challenging (Rustini et al., 2023). Also, Salam et al. (2024) emphasize the necessity to rethink the tourism policies for Bali to mitigate the environmental and social impacts of mass tourism. They argue policies should pivot to focused education, enforcement, and governance that incorporate community-based sustainable policy embedding. Operationally, enforcement is still inconsistent. Small hotels and villas disregard the laws regarding groundwater extraction, waste management, and land-use change, construction with no consequences. There is a need to improve institutional capacity, enforcement of accountability, and enhance the local watch, especially village and civil society-based organizations (Hidayah & Farhan, 2023).

Envisioning a Sustainable Future for Tourism in Bali

Bali tempts the world as a travel destination, but economic opportunities and cultural conservation are at dichotomy Bali faces. The unique crossroads of the island, juxtaposing its economics and nature, its modern technology and traditional wisdom, poses opportunities as well. Current policies balancing the two halves of the dichotomy are deeply rooted in economics, but the economic focus should shift to environmental conservation. Bali's world standing as the epitome of tourism accolades is accompanied by its interests as a cultural ecosystem. The factors to achieve this are obtaining sustained cooperation from the government, private sectors, civil society, the media and academia. The island's interests can be fulfilled through well-structured governing principles based on *Tri Hita Karana* policies with socially inclusive, economically viable, and environmentally regenerative tourism. Bali faces the world with its pristine nature, vivid culture, and peaceful ecological balance - the very things the world envies and adores - through this urgent active approach.

Summary of Key Points

Managing natural resources in Bali faces increasing difficulty from a combination of overtourism, environmental decline, and cultural erosion. The infrastructure and services needed to support and accommodate the tourism industry's growth has begun to strain water resources, result in large amounts of waste, alter land-use patterns, and burden customary practices. If these developments are permitted to continue, the ecological balance of Bali, in addition to the cultural values and natural vistas that render it distinctive and appealing, will be fundamentally undermined. To address these issues, there is a need to focus Bali's natural ecological systems on active ecological conservation and to apply some combination of

unforged technologies and community participation. Nonetheless, the outcome of such strategies is Bali's cultural and religious identity. This is best addressed through the philosophy of Tri Hita Karana, which looks at the balance of humans and other living creatures and the environment and God. This indigenous wisdom complemented with the contemporary sustainability approach provide the ethical basis and guidelines to craft a tourism system that is ecologically enduring, respectful to Balinese cultures.

Bali's focus and innovations towards becoming a sustainable tourism destination could potentially position the island as a global leader in sustainable tourism. The island's vision entails the restoration and protection of natural resources, forests, water systems, coastlines, and biodiversity, for the living beings and ecosystems to thrive. The island's ecosystems are inherently resilient. The island's communities are given the substantive opportunity to participate in tourism decisions, allowing them to benefit from tourism activities. Mindful of their socioeconomic and environmental impact, tourists are drawn to the island, recognizing Bali for its commitments, thus cementing the island's sustainability tourism identity. Realizing such a vision requires collaboration towards a shared goal from all actors in the tourism system. Researchers, policymakers, community members, and tourists must work towards a sustainable tourism framework, honoring the environment and culture of Bali. Bali's context must be uniquely sustained and refined by rigorous ongoing research and policy frameworks to enable Bali's sustainability. Integrated policy frameworks must ensure cross-sectoral and multi-scalar consistency in the application of sustainability principles and their enforcement, while in-situ tourism policy must define tourists as education partners to promote viable travel choices. While convoluted, the path toward an ideal future for Bali offers major opportunities. With the preservation of Bali's ecosystem, coordinated efforts, strategic alteration of laws, advancement of technology, and the revival of traditional values, Bali has the potential to become an example of the preservation of traditions while adapting new technologies for socio-ecological equilibrium and wellness. Bali's preservation is not only a local concern, but an obligation for the entire world. Bali is one of the few existing phenomena while civilization and nature can thrive together. Bali can also become the model for the global sustainable development approaches.

CONCLUSION

Bali's resource management is critically positioned within a region suffering the consequences of over-tourism, which includes but is not limited to, the diminishment of water resources, waste pollution, and the conversion of land-use, all while endangering the island's ecology and cultural heritage. Even so, Bali is poised to become a global frontrunner for sustainable tourism with the adoption of its indigenous philosophy of Tri Hita Karana, strong community engagement, and advancing laws like RTRW 2020 and Law No. 15 of 2023. Sustainable community tourism, along with community and environmentally driven renewable energy initiatives to waste management, prove the island's cultural creativity coupled with contemporary advances can construct resilient frameworks of governance. Ultimately, the future tourism and the environment of Bali rests upon a comprehensive, enforceable framework that blends economic growth with ecological preservation and cultural heritage.

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