

## Integrating the Values of Tri Hita Karana and the Triple Bottom Line in the Acceptance of Solar Energy Technology in Religious Environments

I Gede Suputra Widharma<sup>1\*</sup>, I Ketut Sumadi<sup>2</sup>, I Nengah Sunaya<sup>3</sup>, I Nyoman Kiriana<sup>4</sup>, I Ketut Darminta<sup>5</sup>

<sup>1,3,5</sup>Politeknik Negeri Bali

<sup>2,4</sup>UHN IGB Sugriwa Denpasar

**Corresponding Author:** I Gede Suputra Widharma [suputra@pnb.ac.id](mailto:suputra@pnb.ac.id)

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### ABSTRACT

This study examines the acceptance of solar energy technology in a religious environment by integrating the values of Tri Hita Karana (THK) and the Triple Bottom Line (TBL) sustainability framework. The study was conducted at Dadia Temple, a Hindu sacred site in Karangasem, Bali, where solar-powered lighting systems were installed to support ritual and environmental needs. A qualitative descriptive approach was used, with data collected through participatory observation, semi-structured interviews, and field documentation involving temple caretakers, community members, and university students. Thematic analysis was applied based on the conceptual alignment between THK (Parhyangan, Pawongan, Palemahan) and TBL (People, Planet, Profit). The results show that acceptance of solar technology is influenced not only by technical benefits but also by cultural-spiritual meanings, social collaboration, and perceived ecological harmony.

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## **INTRODUCTION**

The global transition toward clean and renewable energy is increasingly recognized as a critical response to climate change, environmental degradation, and the rising demand for sustainable development. However, the adoption of renewable energy technologies is rarely determined by technical or economic factors alone. Cultural, social, and symbolic dimensions also shape how communities perceive and accept new technologies, particularly in regions with deeply rooted spiritual traditions. In Bali, energy-related innovations must align with cultural identity and religious practices, as the island's worldview is strongly informed by philosophies that emphasize harmony and balance.

Hindu temples (*pura*) play a central role in Balinese social and spiritual life. These sacred spaces are not only sites of worship but also hubs of community gathering, cultural transmission, and preservation of collective memory. Any technological intervention within these areas must therefore maintain spiritual sanctity and cultural resonance. Introducing modern energy technologies, such as solar-powered lighting systems, requires sensitivity to these contextual values to ensure that the technology is perceived not as an intrusion but as a harmonious extension of the environment and belief system.

The cultural framework of *Tri Hita Karana* (THK) provides an essential lens for understanding the relationship between humans and their spiritual, social, and ecological surroundings. THK emphasizes the balance between humans and God (*Parhyangan*), among humans (*Pawongan*), and between humans and nature (*Palemahan*). In parallel, the Triple Bottom Line (TBL) framework offers a contemporary model for evaluating sustainability outcomes based on social equity (People), environmental integrity (Planet), and economic feasibility (Profit). While TBL is widely applied in global sustainability discourse, its integration with THK introduces a culturally grounded dimension of spiritual harmony that is often absent in Western sustainability models.

Despite the conceptual complementarity of THK and TBL, empirical studies examining their integration in the context of renewable energy implementation in sacred environments remain limited. There is a need to analyze how local cultural values interact with sustainability frameworks to influence community acceptance of green technologies. Therefore, this study aims to investigate the integration of THK and TBL in shaping the acceptance of solar energy technology at Dadia Temple. The findings are expected to contribute to the development of culturally responsive sustainability models applicable to other traditional and religious settings.

## LITERATURE REVIEW

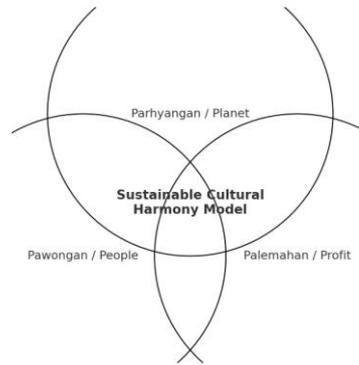
### *Integrated of THK and TBL*

The concept of Tri Hita Karana (THK) has long been recognized as a foundational philosophical framework that guides social and cultural life in Bali. THK emphasizes the importance of maintaining harmony among three interconnected relationships: the relationship between humans and the divine (Parhyangan), among human beings (Pawongan), and between humans and the natural world (Palemahan). This principle not only shapes religious and ceremonial practices but also influences decision-making in community development, land management, and the adoption of new technologies. As noted by Pitana (2018), THK represents a holistic worldview in which spiritual, social, and ecological well-being are interdependent and must be balanced to sustain communal harmony.

Parallel to THK, the Triple Bottom Line (TBL) framework introduced by Elkington (1997) has become a cornerstone in sustainability studies, particularly in evaluating the performance of development initiatives and business practices. TBL assesses sustainability based on three core dimensions: People, referring to social welfare and equity; Planet, referring to environmental protection and ecological stewardship; and Profit, referring to economic viability and resource efficiency. While widely applied in global sustainability efforts, TBL has been critiqued for its limited engagement with cultural and spiritual dimensions, which are crucial in many non-Western contexts where identity and tradition strongly influence community responses to innovation.

Several scholars have suggested that bridging local values with global sustainability frameworks can improve the acceptance and long-term success of renewable energy projects. In culturally embedded communities, technology adoption is not merely a matter of functional efficiency but also of cultural compatibility and spiritual resonance. Research on renewable energy in indigenous and traditional societies has shown that community acceptance increases when technological implementation is framed as aligning with local values and cosmological beliefs (Gössling, Hall, & Scott, 2021).

This conceptual alignment between THK and TBL allows for the development of an integrative sustainability model. Parhyangan aligns with the Planet dimension by emphasizing sacred ecological respect; Pawongan aligns with People through the promotion of social cooperation; and Palemahan aligns with Profit through responsible stewardship of natural resources that ensures long-term economic benefit. Integrating these conceptual pillars results in a culturally grounded sustainability approach that both respects traditional wisdom and fulfills contemporary renewable energy objectives.



**Figure 1. Conceptual Integration of Tri Hita Karana and the Triple Bottom Line**

As illustrated in Figure 1, the conceptual integration aligns the three relational domains of Tri Hita Karana with the sustainability dimensions of the Triple Bottom Line. Parhyangan corresponds with the Planet dimension, emphasizing a sacred ecological responsibility in which environmental preservation is regarded not only as a physical necessity but as a spiritual obligation. Pawongan aligns with People, highlighting community cooperation, shared responsibility, and participatory engagement in technology adoption. Meanwhile, Palemahan aligns with Profit, which in this context refers to sustainable resource management that ensures long-term economic benefit without compromising cultural or ecological harmony. The overlapping core of the model represents a culturally grounded sustainability paradigm in which spiritual, social, and ecological values work together to guide the acceptance and use of renewable energy technologies in sacred environments.

**Table 1. Alignment of THK and TBL Dimensions**

Tri Hita Karana	Triple Bottom Line	Core Meaning
Parhyangan	Planet	Sacred ecological responsibility
Pawongan	People	Social cohesion & cooperative participation
Palemahan	Profit	Resource preservation & long-term economic benefit

Despite its theoretical potential, empirical applications of this integrated model in religious or heritage contexts remain limited. Therefore, further investigation is necessary to understand how THK enhances the cultural legitimacy of sustainability frameworks such as TBL, particularly in the adoption of renewable energy technologies in sacred spaces. The integration of THK and TBL therefore offers a holistic sustainability framework that incorporates spiritual, social, environmental, and economic considerations. While TBL provides a widely recognized global model, its application in culturally embedded contexts requires the inclusion of local philosophical foundations such as THK to ensure cultural legitimacy and community acceptance. However, existing studies rarely examine how the alignment

between cultural values and sustainability frameworks influences the adoption of renewable energy technologies in religious spaces. This research seeks to address that gap by analyzing the acceptance of solar energy technology at Dadia Temple through the integrated THK-TBL lens. The literature suggests that culturally aligned sustainability models can significantly improve the successful implementation and long-term maintenance of green technologies in traditional communities.

## **METHODOLOGY**

This research employed a qualitative descriptive approach to examine how cultural values influence the acceptance of solar energy technology in a religious environment. The qualitative approach was chosen because it enables the exploration of meaning, interpretation, and shared community perspectives that cannot be captured solely through quantitative measurements. The study was conducted at Dadia Temple in Karangasem, Bali, a temple characterized by active ritual activities and strong community involvement in temple management. The site was selected purposively based on its recent implementation of solar-powered lighting technology through collaborative installation activities involving lecturers, students, and local temple caretakers.

### ***Participants and Sampling***

Participants included three temple caretakers (pengempon pura), two community leaders, and five students from the Electrical Engineering Department of Politeknik Negeri Bali who assisted in the installation process. The sampling technique used was purposive sampling, in which participants were selected based on their direct involvement and understanding of both the temple's cultural practices and the technology implementation process. This ensured that the data collected reflected authentic perceptions and experiences related to spiritual, social, and environmental considerations.

### ***Data Collection***

Data were collected through participatory observation, semi-structured interviews, and documentation. Participatory Observation was conducted during the installation of the solar lighting system, allowing the researchers to observe interactions, decision-making, and symbolic interpretations of technology within the sacred space. Semi-structured Interviews were used to gather in-depth perspectives on the meaning of technology adoption, the perceived benefits, and its alignment with cultural values. Interview duration ranged from 15 to 35 minutes per participant. Documentation included photographs, field notes, temple layout sketches, and records of ceremonial activities before and after the installation.

### ***Data Analysis***

Data analysis followed the thematic analysis technique as outlined by Miles and Huberman (2014), consisting of:

- a. Data Reduction: coding statements according to the conceptual alignment of Tri Hita Karana (Parhyangan, Pawongan, Palemahan) and the Triple Bottom Line (People, Planet, Profit).
- b. Data Display: organizing coded data into narrative matrices and thematic clusters.
- c. Conclusion Drawing: identifying patterns of meaning that explain community acceptance of solar technology in the temple context.

### ***Research Validity***

Validity was ensured through triangulation of data sources (caretakers, community members, and students), triangulation of methods (observation, interview, documentation), and member-checking to confirm interpretive accuracy with participants.

## **RESEARCH RESULT**

### ***Implementation of Solar Energy Technology***

The installation of the solar-powered lighting system was conducted through a collaborative process involving students of the Electrical Engineering Department and the temple caretakers. The initial stage involved preparing the lighting components, transporting mounting poles, and coordinating layout plans for the temple area. This preparatory phase provided the opportunity for knowledge transfer and hands-on learning, reinforcing community-based technological empowerment.



**Figure 2. Preparation of Solar Lighting Components by Students and Temple Caretakers.**

This Reflects the Pawongan Dimension, Emphasizing Cooperation and Shared Responsibilities in the Adoption of Technology.

The process continued with determining the appropriate location for the placement of the lighting poles. Spatial alignment within temple grounds must respect sacred zoning principles known as hulu-teben (sacred-profane spatial orientation). Therefore, decisions regarding pole placement were made collectively to ensure that the technology did not disrupt symbolic order or ritual pathways.



**Figure 3. Placement and Installation of the Solar-Powered Illumination Pole**

The collaborative installation process highlights environmental awareness and sensitivity to sacred space orientation.

This installation stage demonstrates that technical acceptance is inseparable from cultural reasoning. The community did not evaluate the technology solely for functional efficiency, but also based on whether it aligned with spiritual meaning and ritual aesthetics.

#### ***Cultural and Social Engagement in the Technology Adoption Process***

Community engagement continued beyond the installation phase. Temple caretakers and community members participated in discussions and ceremonies associated with the introduction of the new lighting system. This involvement reinforces a sense of ownership and legitimacy in the adoption of renewable technology in a sacred context.



**Figure 4. Community Participation in Temple Activities Demonstrating Cultural Continuity and Social Cohesion in the Context of Renewable Energy Implementation**

This finding aligns with the Pawongan dimension of Tri Hita Karana, where harmonious relationships among community members are central to sustaining collective well-being. Social acceptance of technology was strengthened by cultural participation, indicating that renewable energy adoption in sacred spaces is fundamentally a social process rather than merely a technical intervention.

***Integration of THK and TBL in Interpreting Community Acceptance***

The results indicate that the acceptance of solar energy technology in Dadia Temple reflects a convergence between Tri Hita Karana values and the Triple Bottom Line sustainability framework. The table demonstrates that THK enriches TBL by adding spiritual significance to sustainability processes. While TBL addresses social, environmental, and economic outcomes, THK frames sustainability through harmonization with the divine, producing a sustainability model that is not only rationally beneficial but culturally meaningful.

**Table 2. Alignment of Observed Practices with THK and TBL Dimensions**

Observed Practice	THK Dimension	TBL Dimension	Interpretation
Collaborative installation work	Pawongan	People	Strengthens social cohesion and knowledge sharing
Placement of solar-powered illumination	Palemahan	Planet	Reduces environmental impact and supports ecological sustainability
Reduced electricity cost for temple lighting	Palemahan	Profit	Ensures long-term economic efficiency for temple operations
Ritual involvement and cultural endorsement	Parhyangan	Spiritual value	Adds sacred legitimacy to the technology

The findings suggest that renewable energy implementation in religious environments succeeds when it aligns with cultural ideology, spiritual symbolism, and collective involvement. The integration of THK and TBL provides a stronger sustainability model than either framework alone, because it acknowledges that community acceptance is emotional, cultural, and spiritual, not merely functional. This research contributes to sustainability theory by demonstrating that “cultural sustainability” is a necessary dimension in renewable energy adoption in traditional societies.

## DISCUSSION

The findings of this study demonstrate that the adoption of solar energy technology in religious environments is influenced by factors that extend beyond technical performance or economic benefit. In the context of Pura Dalem Tarukan, acceptance of the solar-powered lighting system emerged through a negotiation of meaning embedded in cultural identity, spiritual symbolism, and collective community engagement. This suggests that the success of renewable energy initiatives in culturally rooted societies is contingent upon the degree to which technological implementation resonates with local cosmology and social norms.

The cultural framework of Tri Hita Karana (THK) provides the interpretive lens through which the community evaluates new technologies. The alignment of the solar lighting system with Parhyangan reflects the perception that renewable energy supports sacred environmental stewardship, where nature is regarded not merely as a resource but as an extension of divine creation. This spiritual dimension is absent in the original structure of the Triple Bottom Line (TBL), which primarily conceptualizes sustainability from material and social standpoints. The integration of THK therefore enriches TBL by adding spiritual legitimacy as a fourth dimension of sustainability that guides ethical decision-making.

Meanwhile, the community involvement observed during the installation represents the Pawongan dimension. Participation in collaborative tasks fosters trust, shared responsibility, and collective learning, thereby strengthening social cohesion. This aligns with the People dimension of TBL, which emphasizes inclusion, empowerment, and social well-being. The process of collaborative installation, rather than being incidental, becomes a structural component of technology acceptance because it creates emotional investment and reinforces social ownership of the system.

Furthermore, the ecological and economic outcomes observed correspond with the Palemahan dimension and the Planet-Profit components of TBL. The use of solar power reduces electricity dependence, operational costs, and carbon footprint, thereby providing long-term environmental and economic benefits. However, what differentiates this case from typical sustainability evaluations is that the community interprets environmental benefits not only as efficiency gains, but also as acts of honoring nature as a sacred partner in spiritual life.

Thus, THK expands the scope of TBL by situating sustainability in a worldview where spiritual ethics are foundational to environmental and social decision-making. This integrated THK-TBL model demonstrates that technology adoption in traditional communities is a cultural process, not merely a technical transition. Sustainability is achieved when technologies support cultural identity rather than disrupt it.

Accordingly, this research contributes to sustainability studies by proposing the concept of Cultural Sustainability Integration, which emphasizes that renewable energy innovations must be adapted to cultural-spiritual contexts to be legitimate, accepted, and maintained over time. This implies that policy-makers, engineers, and development practitioners working in culturally embedded environments must prioritize cultural resonance and participatory engagement alongside technical design.

## **CONCLUSION**

This study concludes that the acceptance of solar energy technology in Dadia Temple is shaped not only by functional and technical considerations, but also by cultural, social, and spiritual values embedded in the community. The implementation process demonstrated that technology adoption within a sacred environment requires sensitivity to local cosmology, social relationships, and ecological ethics. By integrating the Tri Hita Karana (THK) philosophy with the Triple Bottom Line (TBL) framework, a more holistic sustainability perspective emerges one that aligns Parhyangan (spiritual harmony), Pawongan (social harmony), and Palemahan (environmental harmony) with the dimensions of People, Planet, and Profit. The findings show that community participation and cultural coherence played a pivotal role in legitimizing the presence of solar-powered lighting in the temple space. Spiritual alignment ensured that the system was viewed not merely as a technological tool, but as an extension of sacred environmental stewardship. Social collaboration promoted shared ownership and knowledge transfer, while ecological benefits and reduced operational costs provided tangible long-term advantages. The integrated THK-TBL model therefore moves beyond conventional sustainability metrics by incorporating cultural-spiritual values as an essential dimension of renewable energy adoption.

## **ADVANCED RESEARCH**

This research contributes theoretically by proposing Cultural Sustainability Integration as a conceptual approach for implementing green technologies in culturally rooted communities. Practically, the study emphasizes the need for participatory, culturally respectful installation processes when introducing renewable technologies in religious or heritage contexts. Future research may expand this model to other temples or traditional villages to further validate its applicability across diverse cultural settings.

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