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Bridging Culture and Sustainability: Implementing *Tri Hita Karana* through Participatory Action Research in Community-Based Waste Management in Besakih Village, Bali

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Abstract: Besakih Village, home to Bali's most sacred temple complex, generates 7.23 tons of waste per day, of which only 6.78 percent is processed due to limited capacity, leaving the remainder unmanaged. This study develops a sustainable waste management model by integrating the Balinese philosophy of *Tri Hita Karana* (THK): spiritual balance (*parahyangan*), social (*pawongan*), and ecological (*palemahan*). Using Participatory Action Research, data were collected through focus group discussions, interviews, and stakeholder-led waste audits. The findings indicate that integrating THK enhances waste governance. The *parahyangan* dimension restructures ritual waste management, while *pawongan* strengthens community participation through banjar-level waste banks and the creation of 24 green jobs. The *palemahan* dimension promotes circular practices by converting organic waste into compost and Refuse Derived Fuel (RDF). Household participation reached 89 percent, diverting 125.57 tons of waste during the program period and increasing workers' monthly income by IDR 1.5 million. Overall, integrating cultural values with Circular Economy (CE). principles enhances resilience in community-based waste management systems

Keywords: *Tri Hita Karana*; circular economy; participatory action research; green product development; ritual waste management; SDGs

1. Introduction

Waste management is a global environmental issue of urgent concern. According to UNEP (2024), the tourism sector generated around 1.7 billion tons of waste in 2023, while marine plastic pollution from tourism

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activities has increased by 40 percent since 2018. Indonesia produces 72 million tons of waste per year, with Bali Province contributing around 4,200 tons per day, which increased by 10 percent following the recovery of tourism after the pandemic (Ministry of Environment and Forestry, 2025). Although the Bali Provincial Government has allocated IDR 76 billion in 2021 for the construction of Reduce–Reuse–Recycle Waste Management Facilities (TPS3R), the effectiveness of waste management remains low: only 35 percent of villages have optimally functioning TPS3R, and 45 percent of villages have active waste banks (Bali Provincial Environmental Agency, 2025). This indicates that waste management in Bali Province still faces structural and institutional challenges, especially in sacred areas and major tourist destinations, where the high intensity of cultural and tourism activities demands a more integrated, participatory, and adaptive system that responds to local dynamics and global pressures on environmental sustainability (Koski-Karell, 2019).

Besakih Temple, the spiritual center of Balinese Hindus and the largest religious tourist destination, faces serious waste management problems stemming from ritual activities and tourist visits. The Besakih Temple area produces an average of 7.23 tons of waste per day, of which 77.24 percent consists of organic materials such as flowers, coconut leaves, and ritual offerings, indicating that ritual activities are the primary source of waste, especially during major ceremonies when the volume of waste increases three to five times. On the other hand, 14.09 percent of the total waste is inorganic, dominated by plastic packaging and bottled drinks associated with tourism activities and food stalls. In comparison, only 6.78 percent (±490 kg) of the total waste is formally managed (Karangasem Regency Environmental Agency, 2023). Although waste management in Besakih has been regulated normatively through Bali Governor Regulation No. 97 of 2018, which limits the use of single-use plastics, Besakih Village Regulation No. 4 of 2023, which requires waste sorting and management based on source, and Besakih Village *Pararem* (customary regulation) No. 3 of 2021, which emphasizes the obligation of traditional villagers to maintain environmental cleanliness and sanctity through customary rules and sanctions. Implementation has not been optimal due to weak law enforcement, overlapping authorities, low community participation, social stigma against waste management work, minimal economic incentives, and weak political support (Suasih et al., 2024).

Balinese society possesses substantial cultural capital through the Tri Hita Karana (THK) philosophy, which emphasizes spiritual balance (*parahyangan*), social (*pawongan*), and ecological (*palemahan*) (Kristinayanti et al., 2020; Pitana, 2010). The integration of THK with formal regulations has even increased community participation, linking environmental cleanliness with religious

values, thereby increasing waste sorting rates by up to 40 percent (Suasih et al., 2024). On the other hand, the Circular Economy (CE) approach offers significant opportunities through the principles of reduce, reuse, recycle, redesign, and regenerate, which view waste as an economic resource (Carpenter et al., 2018; Gura et al., 2023). A study by Mazzoli et al. (2024) emphasizes that applying CE in the urban context in India provides a holistic solution by integrating technology-based circular management approaches, policies, and community participation. This approach reduces waste generation and creates economic and social added value through the transition from a linear to a circular system.

In Bali Province, there has been an initiative to utilize waste from ceremonies as Refuse Derived Fuel (RDF), as has been trialed by the Local Waste Processing Facility (TOSS) in Klungkung Regency since 2022 which processes organic and inorganic waste, including ceremonial waste and mixed waste, into fuel pellets or RDF as an alternative energy source to replace fossil fuels from waste, while reducing dependence on landfills (Suariyanti et al., 2025). A study by Law et al. (2016) demonstrates that ceremonial temple waste can be processed into RDF pellets as an alternative fuel, enabling previously discarded waste to provide energy benefits and economic value to the community.

To address the multi-actor complexity in Besakih, a collaborative approach such as Participatory Action Research (PAR) is needed, with a plan, act, observe, reflect cycle that places the community as active subjects in formulating joint solutions. The synergy between THK values and CE principles has the potential to create a waste management model that is ecologically sustainable, socially and culturally legitimate, and economically impactful.

Therefore, this study aims to develop a THK-based sustainable waste management model in Besakih Village through a PAR approach that integrates the principles of the CE. This model is expected to address institutional issues, increase community participation, and generate economic value from waste, while maintaining cultural and ecological balance in Bali's sacred area. Given this complexity, a theoretical framework is needed that prioritizes technical solutions and integrates cultural values, institutional governance, and participatory approaches.

2. Literature Review

Waste management is a multidimensional issue that requires an integrated approach to address the complexity of technical, institutional, economic, and socio-cultural issues (Pitakaso et al., 2024; Suryawan & Lee, 2023). Previous literature emphasizes that there is no single effective approach, but rather a combination of strategies tailored to a community's characteristics and local institutional capacity. One dominant framework is Integrated Sustainable Waste Management (ISWM), which emphasizes integrating technical aspects

(technology and logistics systems), institutional aspects (the roles of government, the private sector, and the community), and social aspects (community participation and behavior) (UNEP, 2024). The 3R approach (reduce, reuse, recycle) and zero-waste strategies are also widely adopted, though their effectiveness depends heavily on public compliance and the availability of infrastructure (Sutriyanti et al., 2025).

Over the past two decades, CE has developed as a new paradigm that views waste as a resource. Through the strategies of reduce, reuse, recycle, redesign, and regenerate, CE not only has technical value but also creates green economic opportunities (Murray et al., 2017). Globally, the European Commission (2015) is promoting the circular economy action plan as the primary strategy for achieving the green deal and the 2050 carbon neutrality target. However, studies in developing countries confirm that the obstacles to CE implementation are not only technical in nature, but also related to governance, coordination across stakeholders, and socio-cultural legitimacy (Fernando et al., 2023; Meyer, 2025; Murray et al., 2017; Waluyo & Kharisma, 2023). In other words, the success of CE largely depends on how its practices are rooted in the local context through regulations, market incentives, and the reinforcement of cultural norms.

The community-based waste management (CBWM) approach has been widely implemented in developing countries, such as Indonesia, involving cooperatives, community groups, and religious organizations. CBWM has been shown to improve management effectiveness by empowering communities. Studies in Indonesia, including in West Nusa Tenggara, show that this model can strengthen local capacity, while market-based approaches such as the polluter pays scheme or waste bank incentives encourage behavioral change, although they require strong regulations to ensure equitable access (Ramadhanti, 2022). Various studies in Indonesia emphasize the importance of a combination of approaches: national regulations such as restrictions on single-use plastics, technological innovations such as RDF, and the integration of socio-cultural values into governance (Suasih et al., 2024; Waluyo & Kharisma, 2023; Wiratama & Wijaya, 2024).

In the context of Bali, socio-cultural integration in waste management is relevant to the THK philosophy (Gusti et al., 2019; Pitana, 2010). As a cosmological foundation, THK has long supported the sustainability of Balinese society and has proven to be strategic in supporting sustainable tourism in various tourist villages (Rosalina et al., 2023; Sanjaya et al., 2023). However, research on the role of THK in waste management is still limited. A study by Mudana et al. (2023) shows that THK can strengthen social legitimacy in community-based conservation (Mayun, 2024). A study by Suryawan & Lee (2023) shows that a cultural-religious approach can strengthen social legitimacy when cleanliness is framed as part of religious practice, thereby increasing community participation in waste sorting.

Overall, the literature confirms that successful waste management stems from integrating multiple approaches: technical, institutional, economic, and socio-cultural. Thus, research has a significant scope in developing a waste management model that integrates CE with the local THK philosophy. These approaches can improve technical effectiveness and strengthen social legitimacy and ecological sustainability. Therefore, this study aims to address this gap by offering a THK-based waste management model that synergizes technical, institutional, economic, and cultural aspects within a single operational framework at the community level.

3. Method and Theory

3.1 Method

3.1.1 Study Location and Subject

This study was conducted in Besakih Village, Rendang District, Karangasem Regency, Bali (Figure 1), which is the location of Pura Agung Besakih, the largest Hindu ritual center and international tourist destination, with one main temple, Pura Penataran Agung Besakih, and 45 Pura Pakideh (supporting temples).

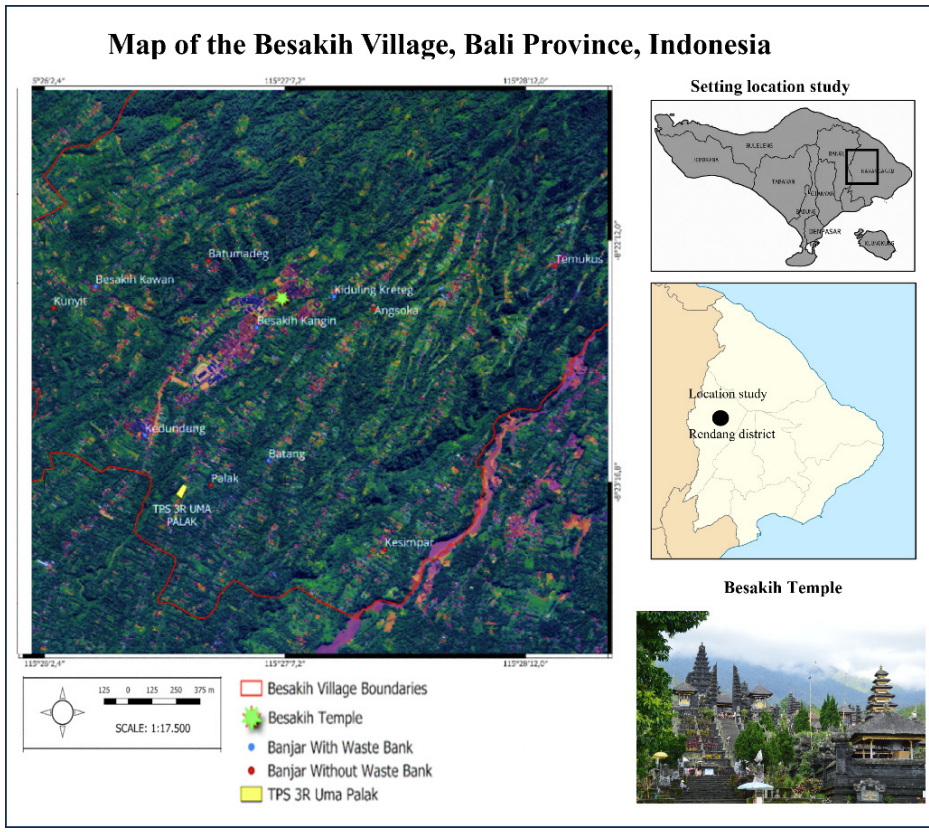

Figure 1. Study location: Besakih Village (Source: Author, 2025)

This area, covering approximately 15.36 km², is inhabited by around 2,264 households (approximately 7,816 people) whose main livelihoods are agriculture, trade, and ritual and tourism services (Besakih Village Profile, 2024). The intensity of religious ceremonies and tourist visits generates substantial waste volumes, while institutional management continues to face significant constraints. This study focuses on the Palak TPS3R facility, located approximately 1 km from the temple complex and formally designated as a 3R Waste Management Site owned by the Karangasem Regency Government. Operational responsibility has been delegated to the Traditional Village through the Village-Owned Enterprise (BUMDes). However, limitations in human resources, collection fleets, and an effective waste-sorting system have hindered optimal operations, resulting in the facility functioning primarily as an open waste accumulation site rather than an integrated processing center.

The study subjects included customary institutions (customary villages, temple administrators and customary law enforcers/*pecalang*), formal institutions (village offices, village-owned enterprises, waste management units (UPS)/TPS3R, Karangasem Regency Environmental Agency), Temple Area Management Agency, local communities (*banjar*, waste bank cadres, women's groups, traders, and volunteers), as well as the private sector and social organizations (recycling craftsmen, RDF offtaker partners, Wastehub® (Wastehub Alam Lestari)", Bali Waste Cycle, Rebricks, and GoTo Impact Foundation). This configuration indicates that waste management in Besakih is not solely a technical issue but also closely linked to socio-cultural dimensions, spirituality, and the image of Bali tourism.

3.1.2 Study Design

This study uses a Participatory Action Research (PAR) approach and a mixed-methods triangulation, in which quantitative and qualitative data complement each other (Creswell, 2018). This approach was chosen because the waste problem in Besakih Village is not only technical, but also has social, cultural, spiritual, and institutional dimensions. PAR provides a platform for indigenous communities, temple priests, and formal institutions to become active subjects in formulating, implementing, and evaluating solutions (Kemmis et al., 2014). Unlike conventional technical studies, this research emphasizes integrating local values, such as THK, *ngayah* (volunteer work), and *pararem* (customary rules), into the study process. This approach produces both academic knowledge and practical outcomes.

3.1.3 Stages of Participatory Action Research

This study uses a PAR with the plan–act–observe–reflect cycle, chosen because it can produce data while encouraging community involvement in social change (Goodman et al., 2020; Kemmis et al., 2014). This approach is highly relevant to Balinese traditions of participation through *sangkep* (deliberation) and *ngayah*, which enable the internalization of THK values in waste management practices. The PAR matrix is shown in Table 1.

Data was collected quantitatively through a survey of 1,717 respondents from eleven *banjars*, as well as qualitatively through focus group discussions (FGD) with 59 participants, in-depth interviews with village, customary, and government institutions, participatory observation at the Palak TPS3R and waste bank, and a review of Law No. 18/2008, Bali Provincial Governor Regulation No. 97/2018, Village Regulation 4/2023, and Customary law (*Pararem)* No. 3/2021.

The next stage is formulating solutions and intervention actions. This process involves 10 UPS/TPS3R administrators as the lead actors, trained to manage waste at the TPS3R facility, and 70 residents who receive training in making environmentally friendly products (green products). Furthermore, ongoing education is provided to all 2,281 households in Besakih Village, focusing on source sorting of waste, the use of inorganic waste, and the TPS3R transportation system. At this stage, local values such as THK, *ngayah*, and *pararem* were also integrated as a foundation to strengthen legitimacy and social involvement.

After implementation, an observation phase is conducted to monitor the results through quantitative data (volume of waste managed, level of community participation, amount of fees collected, creation of green jobs) and qualitative data (narratives of experiences, community perceptions, and records of behavioral changes). This observation was also used to assess the effectiveness of applicable regulations, including *pararem*, village regulations, and provincial government regulations.

Table 1. Participatory Action Research Matrix

Stages	Group Target	Method	Action Date
Problem Identification	a. Besakih Village Community b. Village and Temple Stakeholder c. TPS3R	a. Identify key waste management issues through initial focus group discussions, stakeholder mapping, and waste sampling. b. Explore local values (THK, *ngayah*, *pararem*) as a basis for strategy development.	Week of 1 June 2023 - Week of 4 January 2024
Action Study (Problem Solving)	a. Waste Management Unit b. Besakih Village Community	a. Implementation of pilot programs: Training in waste management at TPS3R, household education, establishment of waste banks, RDF, and roster production. b. Involvement of traditional institutions (Traditional Villages, Besakih Temple Managers) in supporting collective action.	Week of 1 February 2024 - Week of 4 October 2024 (with periodic evaluations every 3 months)
Observation	a. Waste Management Unit b. Besakih Village Community	a. Monitoring of implementation results through quantitative data (volume of waste, participation rate, amount of levies, green jobs) and qualitative data (citizen narratives, perceptions, participant experiences). b. Analysis of the effectiveness of regulations (*pararem*, village, district, and provincial).	Week of 1 November 2024 - Week of 3 December 2024
Reflection (Green Economy Development Planning)	a. Waste Management Unit Group b. Village and Temple Stakeholders c. Karangasem Regency Environmental Agency TPS3R and Waste Bank Management.	a. Focus Group Discussion on Evaluation b. Discussion with participants on successes, obstacles, and potential for sustainability. c. Identification of adaptation strategies for the next cycle.	Week of 4 December 2024 - Week of 2 January 2025

Source: Author (2025)

The final stage is reflection, which is carried out through panel discussions with community leaders, traditional institutions, village governments, and supporting organizations. The reflection forum evaluates achievements, identifies obstacles, and develops adaptation strategies for the next cycle. At this stage, the potential for green economic development through waste management is also mapped, including business opportunities from recycled products and the use of residues for RDF production. All stages of the research are carried out in a repeating plan–act–observe–reflect cycle. This cycle produces empirical data and strengthens institutional synergy, deepens community participation, and ensures that the solutions formulated are truly contextual to the socio-cultural dynamics of the Besakih community.

3.1.4 Data Analysis Techniques

This study used a mixed-methods triangulation, combining quantitative and qualitative data to obtain comprehensive results (Creswell, 2018). Quantitative data were collected through questionnaires and analyzed using descriptive statistics in Microsoft Excel, covering public perceptions of waste, indicators of managed waste volume, the number of households paying levies, the creation of green jobs, and the use of recycled products. Meanwhile, qualitative data were obtained through interviews and focus group discussions (FGDs), transcribed into Microsoft Word files within one to three days. The transcription process produced textual data and generated initial ideas for follow-up interviews, participant observation, and additional literature searches (Taylor et al., 2016; Yin, 2016).

Qualitative analysis was conducted using a thematic analysis approach in accordance with the guidelines provided by Braun & Clarke (2006), which allows researchers to explore transcripts in depth, develop codes, and group them into themes and sub-themes that focus on THK values, institutional governance, community participation levels, and circular economic opportunities. These themes form the basis for interpreting the research results. This analysis process is integrated with the PAR (plan–act–observe–reflect) cycle to assess change dynamics at each stage of program implementation. This study also utilizes secondary data from relevant formal and customary regulations.

3.2 Theory

This study is based on an integrative theoretical framework that links cultural, economic, participatory, and governance dimensions (see Figure 2). First, THK serves as a socio-cultural theory that emphasizes harmony in human relations with God (*parahyangan*), social relations (*pawongan*), and the environment (*palemahan*) (Gusti et al., 2019; Tripayana et al., 2024). In the context

of waste management, THK provides spiritual and social legitimacy, so that sustainable practices are not only viewed as an administrative obligation, but also as a manifestation of Balinese society's religious and moral values.

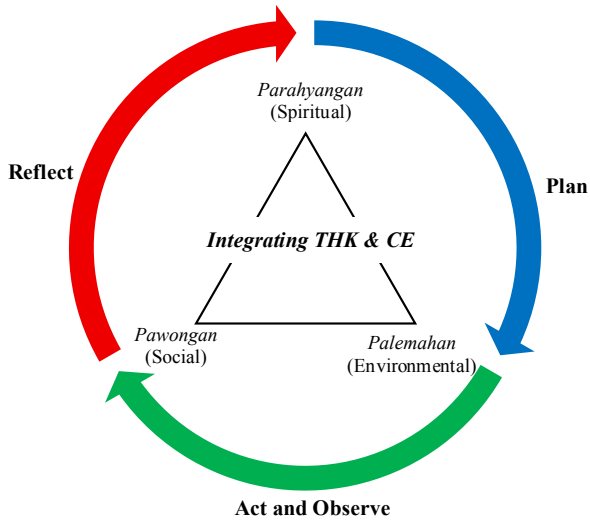

Figure 2. Conceptual Framework (Source: Author, 2025)

Second, the CE is a theory of sustainable development that rejects the linear "take-make-dispose" paradigm. CE views waste as a valuable resource that can be reprocessed into compost, RDF, or green products, while also opening opportunities for a circular economy and the creation of green jobs (European Commission, 2015; Gura et al., 2023; Meyer, 2025).

Third, the theoretical framework of this study is based on the theory of participation and empowerment through the Participatory Action Research (PAR) approach. Research participants' participation is evident in the community's active involvement at each stage of the plan–do–observe–reflect cycle. Empowerment is apparent in the process and in transformational outcomes, including increased critical awareness, capacity, and a sense of community ownership of resource management and decision-making (Kemmis et al., 2014; Reason & Bradbury, 2008).

In the context of Besakih, PAR not only produces measurable technical data such as the volume and composition of waste produced and managed, but also serves as a mechanism for empowerment through improved participation, collective awareness, and social control of indigenous peoples (Baum et al., 2006). Therefore, this study uses an integrative theoretical framework, with THK as the basis for cultural values, circular economy as the basis for economics and ecology, and PAR as a participatory methodology that bridges participation towards empowerment, to formulate a sustainable waste management model in Besakih Village.

4. Results and Discussion

4.1 Results

4.1.1 Plan Phase: Identification of Waste Management Issues in Besakih Village

The planning phase, which involves identifying problems at an early stage, is carried out in a participatory manner by involving the community, village officials, the Besakih Temple Management Agency, and the Waste Management Unit under BUMDes Besakih. This approach aligns with the Participatory Rural Appraisal (PRA) principle, which emphasizes the active involvement of the community in identifying problems and formulating priorities (Brown, 2006; Chambers, 1994; Thampi et al., 2024). Problem identification in the early stages was carried out participatively by involving the community, village officials, the Besakih Temple Management Agency, and the Waste Management Unit (UPS) under BUMDes Besakih. The THK approach serves as the basis for the analysis, in which the *parahyangan* aspect is realized through the field team's participation in religious activities and through formal legitimacy through a memorandum of understanding (BAK) between the Dharma Artha Basuki Village-Owned Enterprise and the Sukla Project consortium, the program implementation team. The *pawongan* aspect is reflected in the team's involvement in village meetings (*sangkep*), social activities such as mutual assistance, and informal communication that builds community trust in the program. Meanwhile, the *palemahan* aspect is evident from a comparative study of the TPS3R Tanjung Benoa, which indicates a capacity gap, because even though the TPS3R Palak has an experienced team, its operations are still constrained by limitations in human resources, fleet, and suboptimal governance.

Based on the characteristics of municipal solid waste (MSW) in Indonesia, the average calorific value of mixed waste is reported to be around 9.5 MJ/kg due to the dominance of organic fractions and high moisture content (Qonitan et al., 2021). According to data from the Karangasem Regency Environmental Agency (2023), Besakih Village generates an average of 7.23 tons of waste per day from approximately 2,281 households and 600 daily pilgrims, indicating a theoretical energy potential of roughly 68.7 GJ per day (±19 MWh). Of this amount, only 6.78 percent (approximately 490.2 kg) is managed. At the same time, most of the remains are still dumped directly into open land near the Palak TPS3R, burned in garden areas (*teba*), or carried away by river currents. Community participation in waste management services remains relatively low, as only 215 households are registered as users of waste transportation services, despite the much larger number of households. UPS has only eight employees and limited facilities, such as one operational vehicle and a damaged processing machine. At the same time, the unclear legal status of the Palak TPS3R land and buildings further hinders operational optimization. The implementation

of Village Regulation No. 4 of 2023 on waste management has also been inconsistent, as community understanding remains weak and enforcement of the regulations has not been effective.

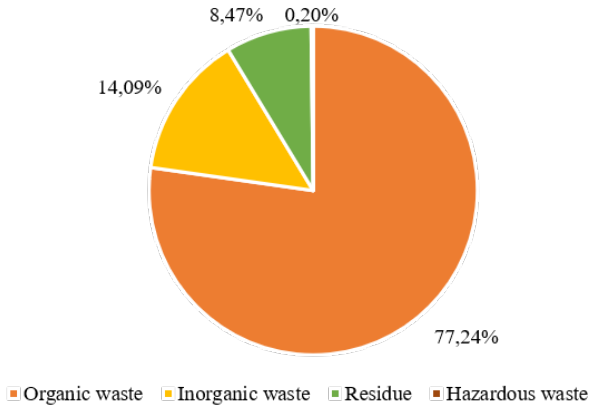

Figure 3. Composition of waste samples in Besakih Village (Source: Waste composition sampling, 2024).

The results of waste composition sampling in Besakih Village, shown in Figure 3, indicate that organic waste accounted for 77.24 percent, inorganic waste 14.09 percent, residue 8.47 percent, and hazardous waste 0.20 percent. This category of hazardous waste mainly consists of household hazardous waste, such as used batteries, lamps, aerosols, and expired medicines, that require special handling because they have the potential to pollute the environment if mixed with general waste (Letcher & Slack, 2019). This composition indicates that management of organic waste through composting or similar technologies is highly relevant, while also opening up opportunities for the circular economy in agriculture and renewable energy. Quantitatively, the average per capita waste generation is 0.14 kilograms per day, or about 0.65 liters per day, which is relatively low compared to the national average. However, the volume of waste still piles up significantly, especially during major traditional ceremonies at Pura Agung Besakih, resulting in a three- to five-fold increase in waste generation. The waste problem in Besakih Village is shown in Figure 4.

Based on the FGD results, waste management in Besakih Village still relies on the Palak TPS3R. Still, its capacity is limited by a lack of equipment, including RDF machines and organic shredders. Initiatives to provide new equipment can be an essential entry point for strengthening local capacity, both in the production of building materials (roster) and in the use of residues as alternative energy sources. The waste generation profile also demonstrates striking differences: in the temple area, 65–75 percent consists of low-density organic material from flowers and offerings, with a spike of up to one ton per

day during major ceremonies; while in residential areas, waste generation is more stable (500–600 kg/day) with plastic dominating 25–35 percent of total household waste.

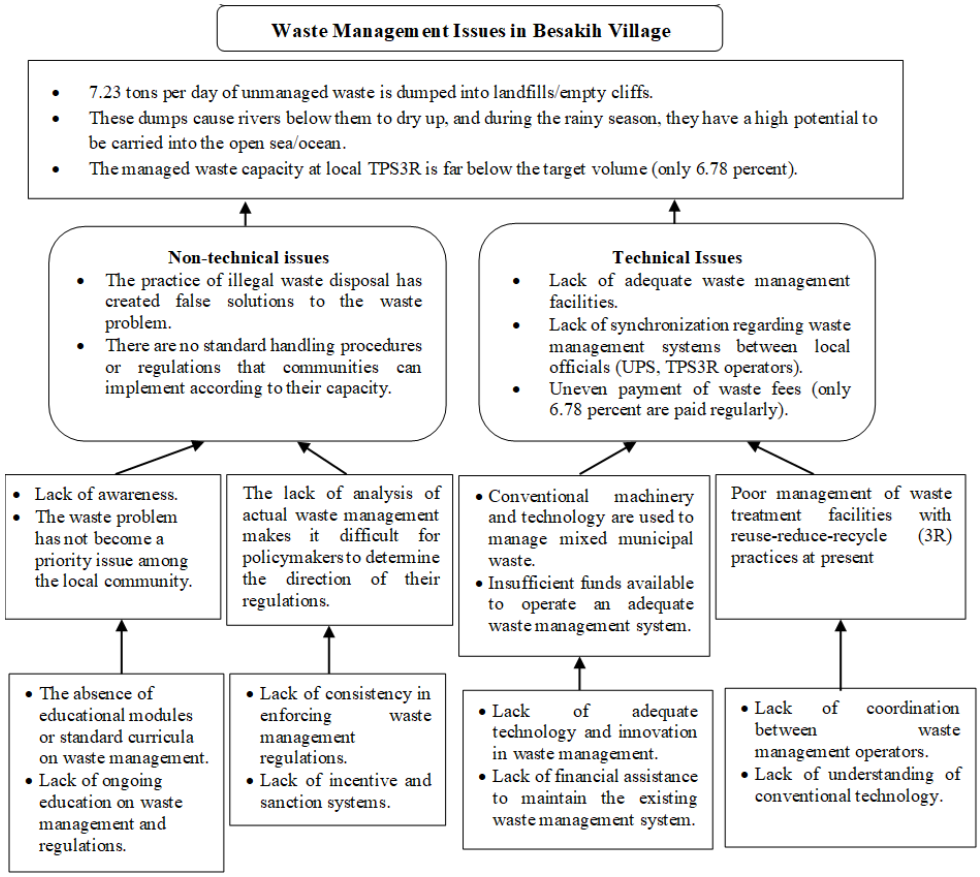

Figure 4. Problem tree in waste management in Besakih Village (Source: Focus group discussion results, 2024).

The main management challenges are multidimensional. Structurally, institutional fragmentation across traditional villages, administrative villages, village-owned enterprises, UPS, local governments, and temple management agencies results in overlapping roles. Operational constraints include limited human resources, fleets, and equipment. At the same time, socio-cultural aspects are reflected in low community participation, gender bias in public forums, and stigma attached to waste management work. Limited village budgets and weak enforcement of regulations further exacerbate the situation.

These findings are consistent with previous studies in Bali that highlight the dominance of organic waste from ritual activities and the limited capacity of TPS3R (Suasih et al., 2024; Wiratama & Wijaya, 2024). In terms of governance, institutional fragmentation has long been identified as an obstacle to waste

management systems in Indonesia. Thus, waste management in religious areas such as Besakih cannot be viewed solely as a technical issue but requires a multidimensional approach that simultaneously integrates structural, operational, social, and cultural aspects.

Table 2 demonstrates that the Besakih Village community perceives various waste management solutions positively. The majority of respondents emphasized the importance of establishing a cleanliness community (93.19 percent), training and education (≥96 percent), and seeing economic opportunities from waste management, both as a source of family income (95.69 percent) and as a commodity that can be sold (81.83 percent). However, participation is still lower at the practical level, such as in waste separation (63.48 percent) and collective cleanliness activities (57.95 percent).

Table 2. Community perceptions regarding solutions to waste problems in Besakih Village

Solution formulation	Agree (%)	Disagree (%)
1. A clean community is needed in my neighborhood.	93.19	6.81
2. I will participate if there is an educational program/training on turning waste into compost or other things.	96.16	3.84
3. Education on how to process waste is needed.	96.39	3.61
4. Waste can cause harm to the community.	98.30	1.70
5. If managed properly, waste can bring benefits.	97.90	2.10
6. Waste can be sold to stalls, collectors, scavengers, recycling units, and 3R disposal sites.	81.83	18.17
7. Waste can be a source of income for families because it has monetary value.	95.69	4.31
8. Waste bins should be separated into organic, inorganic, and residual waste.	95.81	4.19
9. Collected waste can be burned without disturbing cleanliness.	85.85	14.15
10. I separate organic and inorganic waste before sanitation workers transport it.	63.48	36.52
11. I always dispose of waste in trash bins.	73.97	26.03
12. I am involved in environmental cleanliness activities with the surrounding community.	57.95	42.05

Source: Survey result (2024)

This complexity indicates that waste management solutions in Besakih cannot rely solely on technical aspects; they must also integrate regulations, funding, and local value transformation through the THK framework, as shown in Table 3. The formulation of solutions in Besakih is rooted in integrating

THK, which bridges the spiritual, social, and ecological dimensions. From the *parahyangan* perspective, participation in religious ceremonies confirms that ritual waste requires specialized management.

Table 3. Formulation of solutions

Dimensions of THK	Field Activities	Findings Implications
Parahyangan (Spiritual)	Participation in religious ceremonies and waste sampling during rituals.	Waste from religious activities requires exceptional management.
Pawongan (Social Relationships)	Attending village meetings (*sangkep*) (4 times), participating in community discussions, and door-to-door socialization,	Community support is increasing, but a change in mindset is still needed.
Palemahan (Environment)	Cleaning the village and temple, sampling at the Palak TPS3R, visiting the Tanjung Benoa TPS3R, and Klungkung TOSS as best practices. In addition, providing RDF processing machines and crushers for roster production.	Highlighting the need for stronger technology, funding, and regulation. Additional equipment shows the potential for waste innovation to become a resource.

Source: Author (2025)

The *pawongan* dimension is reflected in community cooperation and socialization, which increases social support but still faces resistance due to the mindset. A similar phenomenon is shown in a study by Sembiring & Nitivattananon (2010) on the importance of socio-cultural legitimacy in waste management. Meanwhile, the environmental dimension (*palemahan*) highlights village cleaning practices, comparative studies of TPS3R, and RDF innovations that demonstrate the need for infrastructure, regulations, and financing to realize the potential of CE. Thus, the complexity of waste management in Besakih cannot be reduced to a purely technical issue; instead, it requires a multidimensional approach that integrates spirituality, social solidarity, and ecological innovation within the THK framework.

4.1.2 Act and Observe Phases: Community-Based Waste Management Transformation in Besakih Village

The THK is a philosophy of life that integrates spiritual, social, and ecological dimensions in a balanced way, providing a moral basis for environmental sustainability and demonstrating that internalizing THK values strengthens social legitimacy in community-based ecological programs. The act

and observe phases focus on collective actions that emphasize integrating THK values, particularly the dimensions of *parahyangan*, *pawongan*, and *palemahan*, into participation and innovation in waste management, as shown in Figures 5 and 6.

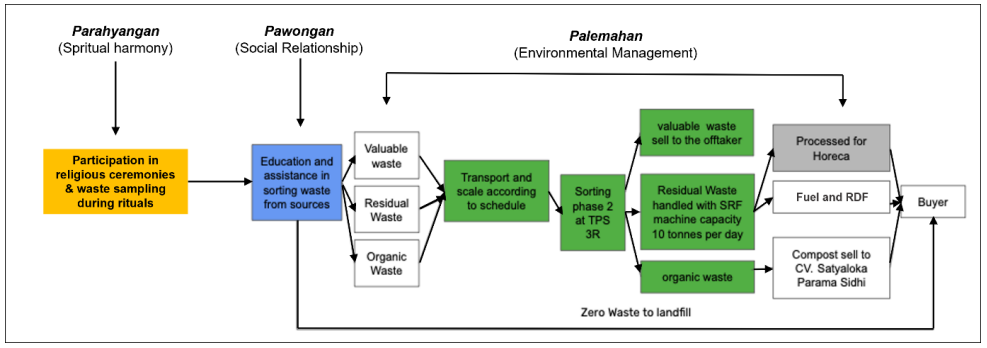

Figure 5. Waste Management with Tri Hita Karana Model in Besakih Village (Source: Author, 2025)

The initial stage involved direct participation in religious ceremonies and waste sampling during rituals at Besakih Temple and residents' homes. This activity was intended to obtain quantitative data on the composition and volume of ceremonial waste and served as a cultural strategy to build social and spiritual closeness with the indigenous community and temple authorities. The researchers' involvement in religious activities reflected the application of the parahyangan dimension, namely, the harmonious relationship between humans and God (Kristinayanti et al., 2020). Furthermore, this participation opens up a space for dialogue with cultural stakeholders, such as temple officials, *pecalang*, and village *krama*, who have moral authority over environmental management in sacred areas. These results reinforce the argument that waste management in sacred areas cannot be separated from *Parahyangan* values, because every activity related to ceremonies must be in harmony with religious norms and respect for the sanctity of temples.

From the *pawongan* perspective, the primary strategy focuses on strengthening community participation through education and community empowerment (Sutriyanti et al., 2025). Education was conducted door-to-door, reaching nearly 90 percent of households, or around 2,000 families. In addition, monthly community consultation forums (*sangkep* banjar) were held. However, only two of the seven *banjars* were active, and only men fulfilled their tax payment responsibilities.

(a) (b)

(c)

Figure 6. Collective waste management actions in Besakih Village: (a) cleaning up waste from religious ceremonies at Besakih Temple; (b) door-to-door socialization on the importance of waste management; (c) sorting waste to be used as green organic fertilizer (Source: Photo by Nadia Atika Amrin, 2024).

This indicates a gender bias in public forums that weakens the effectiveness of education. Capacity-building efforts through the establishment of five waste banks, of which only one worked consistently, align with the findings of Sembiring and Nitivattananon (2010), which emphasize weak institutions as a barrier to sustainability. Another initiative, namely socialization in schools, successfully involved more than 500 students. However, behavioral change at the household level has not been entirely significant, as the community still faces resistance from some residents to the obligation to pay monthly fees. Even households that pay fees decreased from 185 to 179 (-3.24 percent) during the one-year program. Field findings indicate that this resistance is related to willingness-to-pay (WTP). Some residents consider the IDR 30,000 fee disproportionate to the volume of waste they generate, especially households that produce mostly organic waste and choose to burn their plastic waste. However, it was still a challenge to change the long-standing habit/culture of throwing waste into the garden/yard (*teba* or *tegalan*) or into the nearby river.

There is also the practice of placing waste in Environmental Agency waste collection vehicles (which are supposed to be used only for waste from public areas such as temples and parks) without paying, creating a free-rider effect. This obstacle is also influenced by the limited geographic access to four of the eleven banjars, which are located quite far away and require passing through valleys, so the limited TPS3R operational vehicles cannot optimally reach the entire area. WTP studies show that payment compliance is more influenced by perceptions of service benefits, governance consistency, and accessibility than by income factors alone (Afroz et al., 2009; Wang et al., 2011). In this context, strengthening the Hindu-Balinese value of *menyama braya,* which emphasizes brotherhood and collective responsibility, is essential for fostering social solidarity in support of a sustainable waste management system (Suryawan & Lee, 2023).

Resistance from residents to monthly fees also highlights the lack of implementation of *pawongan* values, consistent with policy literature showing that low financial support weakens the effectiveness of waste management (Sembiring & Nitivattananon, 2010). Regarding waste reduction *(palemahan),* processing 42.5 tons of waste at the Palak TPS3R, with compost, RDF, and recycling achievements, remains limited due to technical and human resource constraints. Meyer (2025) emphasizes increasing RDF technology capacity to optimize the potential of the circular economy.

Regarding waste management *(palemahan),* technical innovation is the primary focus in Besakih. The Palak TPS3R processed 42.5 tons of waste during the trial period. Of this amount, approximately 16 percent was processed into compost, 14 percent into RDF, 3 percent entered the recycling stream, and 21 percent remained as unmanaged residue. The average processing capacity at TPS3R reached 443 kilograms per hour, but limitations in human and machine resources meant that its utilization was not yet optimal. This can be seen in the RDF production, which reached only 1.5 tons in eight months because the machines operated on a limited basis, averaging only 1-2 hours per day, far below the ideal requirement. These findings are in line with previous studies that emphasize the limited capacity of TPS3R as a constraint to sustainability, as well as research showing low RDF production due to limited machine operating hours (Suryawan & Lee, 2023; Wiratama & Wijaya, 2024). Other literature confirms that without community participation and increased technical capacity, TPS3R infrastructure will struggle to achieve ideal performance (Sembiring & Nitivattananon, 2010). In CE, technical innovations at the Palak TPS3R can potentially strengthen the transition to a circular economy. Still, their effectiveness remains highly dependent on resource availability and institutional governance.

The processing begins with collection and sorting at the TPS3R facility. Waste is separated into two main categories: clean waste and mixed waste. Clean waste refers to relatively uncontaminated materials, such as plastic bottles, paper, cardboard, and metal, which can be sold directly as raw materials for recycling or reused. Meanwhile, mixed waste consists of a mixture of organic waste, including food scraps and garden waste, and contaminated inorganic residues. The organic fraction is composted to produce fertilizer, while inorganic residues that cannot be recycled are processed into Refuse-Derived Fuel (RDF). Technically, these residues are filtered based on size using a trommel screen, then shredded to produce homogeneous material that is formed into Solid Recovered Fuel (SRF) as an alternative fuel to replace fossil fuels (Qonitan et al., 2021; Suryawan & Lee, 2023). In Besakih, the RDF produced is still in SRF form and is marketed to industries that need energy substitution (Figure 7).

(a) (b)

Figure 7. (a) management of alternative fuels (RDF) and (b) green product compost fertilizers (Source: Bali Waste Cycle document, 2024)

More prominent innovations emerged from green workshops, creative units that process plastic waste into roster products (Figure 8). During one production period, 3,357 small rosters and 45 large rosters were produced, with at least 1,000 rosters absorbed by the market through local sales and Corporate Social Responsibility (CSR) schemes. These products are not only a symbol of local circular-economy innovation but also provide real economic value to the surrounding community.

Figure 8. Green product (interior) (Source: Rebrick document, 2024)

This effort created 24 green jobs, though still below the target of 38, with an average increase in worker income of around IDR 1.5 million per month. Testimonials from green product workers confirm the socio-economic changes they have experienced. As expressed by a production roster staff member:

> *"It was difficult at first, but now I am used to it. I did not realize I had produced thousands of rosters, and from this I learned the importance of managing waste while also gaining economic benefits."*

This perspective demonstrates that innovations in waste management produce products and raise community awareness of its importance as a resource. Meanwhile, resistance to waste management jobs is still evident from a socio-economic perspective. As stated by one of the traders around Besakih:

> *"I do not mind paying the fee as long as the trash is collected on time. If trash piles up, it not only pollutes the environment, but also disrupts my business."*

This excerpt emphasizes that public trust in the waste management system depends heavily on service consistency and inter-agency coordination. Thus, this implementation phase has achieved significant outcomes in educational outreach, innovation in processing, and the creation of green jobs. However, these results are still limited by low compliance levels and operational capacity constraints. These findings align with a study by Sembiring & Nitivattananon (2010), which confirms that weak community financial commitment and limited technical capacity are the main factors behind the failure of community-based waste management programs in Indonesia. Meyer (2025) shows that the

operational limitations of the RDF machine at the temple reduce the potential for optimal waste processing.

The international perspective also confirms this, where technical innovation in the CE framework faces obstacles when not supported by adequate technological capacity. The transformation of community-based waste management in Besakih is shaped by the interaction of technical, socio-cultural, and institutional factors, which must be integrated within the THK framework to ensure sustainability, while religious and local cultural values strengthen its social legitimacy. Tripayana et al. (2024) found that the THK principle in the *awig-awig* of Balinese society is an essential instrument in building ecological citizenship and the sustainability of environmental programs.

4.1.3 Reflect Phase: Evaluation to Diagnose Structural Barriers and Design a Green Economy Roadmap in Besakih Village

The reflection stage emphasizes cross-actor institutional alignment and verification of field achievements as the basis for developing a THK-based green economy roadmap. The evaluation indicates fragmentation, such as the role of UPS under BUMDes in managing household waste, Traditional Village handling temple areas, and the Temple Management Agency being responsible for internal facilities. In contrast, the Karangasem Regency Environmental Agency manages public infrastructure. As a result, there are overlapping management processes. For example, traders have paid levies to UPS, but waste collection is only carried out twice a week, so the Temple Management Agency must collect waste daily. This situation has led to misunderstandings between institutions. This reflection reinforces the importance of a joint agreement to clarify the workflow, roles, and service standards. The evaluation of participatory actions in waste management in Besakih Village is presented in Table 4.

Regarding institutional aspects, obstacles arise due to UPS's status as a profit-oriented BUMDes unit. There is also a lack of guidance on business strategies in waste management. The Karangasem Regency Environmental Agency has proposed designating UPS as a Regional Technical Implementation Unit (UPTD) to expand its coverage to surrounding villages. Still, regulations only allow full support for non-profit entities such as KSM (*Kelompok Swadaya Masyarakat*/ Community Self-Help Group) and KPP (*Kelompok Pemelihara dan Pemanfaat*/ Maintenance and Utilization Group). Therefore, institutional transition to KSM/ KPP is a prerequisite for UPS to access public support in human resources, fleet, operational costs, technical training, and advocacy to the central government. Previous studies have shown that non-profit institutional forms are better able to ensure the sustainability of environmental services because of their broader access to government resources (Purnamawati et al., 2023).

Table 4. Evaluation of participatory actions in waste management in Besakih Village

Aspects	Key Findings (Problems)	Implications	Opportunities / Solution Directions
Institutional	Fragmentation of roles between BUMDes (UPS), traditional villages, temple management bodies, and the Environmental Agency; minimal coordination.	Overlapping responsibilities, suboptimal services, and incomplete public education.	Institutional synergy through multi-stakeholder forums; integration of roles into a single roadmap.
Regulatory	Formal regulations (village & customary) exist, but enforcement is weak.	Old community behaviors remain dominant (littering, burning plastic, etc.).	Revitalization of village regulations and rules with progressive sanctions + traditional-based campaigns.
Operational	Limited human resources, low interest in work because it lacks prestige, low salaries, a limited fleet, and 30 percent of the area is not served by transportation services.	Suboptimal RDF & roster production, high worker turnover, and limited transportation services.	Increased worker incentives, occupational safety and health training, machine optimization, and CSR/grant schemes.
Participation	Socialization is dominated by men, with low involvement of women in public forums, and old customs are still strong.	Waste banks are not functioning consistently, and door-to-door education has not led to behavioral change.	Family-based education, women's empowerment, and collective participation incentives.
Funding	The village budget is minimal (IDR 10-50 million per year), RDF income is low, and levies are challenging to collect.	UPS operations are in deficit, worker salaries are unstable, and the sustainability of TPS3R is threatened.	Diversification of funding sources (CSR, spiritual tourism, green products), adaptive retribution models.

Source: Author (2025)

From a regulatory perspective, village regulations and customary laws are already in place. Still, weak enforcement means old practices like burning plastic or dumping waste in fields continue. Therefore, the reflection recommends enforcement based on customary law with a clear mandate for *pecalang* and a system of incentives and disincentives: rewards for innovation and compliance, progressive sanctions for violations. This study suggests that a culture-based, social-incentive approach is more effective at changing behavior than a regulatory approach alone.

Technically, management capacity is still limited. Of the projected waste, only 18.43 percent (125.57 tons) was collected, and only 13.2 percent (16.63 tons) was managed. RDF production totaled only 1.5 tons over eight months due to limitations in machinery and human resources. These obstacles are consistent with the findings of Mazzoli et al. (2024), who found that weak infrastructure and operator skills are significant barriers to TPS3R in tourist areas. Regarding labor, the daily wage system (IDR 65,000–75,000) has increased the number of temporary workers, but the stigma of "working in the waste sector" has kept interest low. The income structure is hierarchical: core administrators such as the UPS Chairperson, division heads, and administrative staff receive approximately IDR 2.5 million per month, while the operational team (sorting, driver) receives variable income based on sorting results, averaging approximately IDR 1.5 million per month. Although this figure is still below the Karangasem Regency Minimum Wage (approximately IDR 3 million), the program has created 24 green jobs and increased workers' incomes compared to previous levels. Consistent with Tripayana et al. (2024), the stability of this sector still requires a guarantee of a living wage and social protection to strengthen workforce sustainability.

Community participation also faces challenges. Education reaches approximately 89 percent of households and schools, but the number of fee-paying households has decreased from 185 to 179 (-3.24 percent). Resistance is triggered by the IDR 30,000 fee, which is considered expensive, the dominance of men in *banjar* meetings (*sangkep*), and the lack of channels for women to discuss waste issues, where, in fact, more intensive household waste management is still minimally accommodated, given that women play a central role in household waste management. Reflections suggest adaptive fees based on a survey of payment capacity, strengthening the role of local educators, and adopting alternative forums, such as *sangkep merajèn*, that are more gender-inclusive. Research by Pakasi et al., (2024) emphasizes the importance of women-friendly participation spaces to encourage sustainable behavioral change.

In terms of funding, village allocations remain minimal: IDR 10 million per year, rising to IDR 50 million in 2025. Significant funds from the Temple

Management Agency have not been earmarked for waste management. Research by Mazzoli et al. (2024) shows that weaknesses in financial management are often more related to budget distribution and priorities than the nominal amount. Therefore, the reflection recommends diversifying funding through CSR, spiritual tourism, and circular economy products (compost, roster, RDF). In the future, multi-stakeholder synergies that open the door to investor/grantor support must secure joint contribution commitments and diversify income from the circular economy (compost, roster, RDF) and spiritual tourism, so that basic services and labor wages have certainty.

All the above findings confirm that the reflection phase is not just about compiling a list of problems but about formulating a measurable, contextually relevant architecture for change. In essence, the roadmap includes the drafting of a joint agreement that defines roles, procedures, and standards; the transition of entities to a community-based organization (KSM) so that the Environmental Agency can provide full support; enforcement of regulations with customary mandates (including *pecalang*) and incentive-disincentive schemes; strengthening of operational capacity (fleet, equipment maintenance, operator training); service accessibility to remote areas; and a gender-sensitive participatory approach through family and *sangkep merajèn* channels (Pakasi et al., 2024). With the THK framework as the basis for legitimacy, the circular economy principle as the engine for added value, and the PAR method as the mechanism for collective learning, this reflection phase lays the institutional and social foundations for the transition to sustainable waste management in Besakih.

The results of the PAR implementation in Besakih Village reveal a significant gap between the program targets and on-the-ground achievements. This finding is consistent with the literature, which emphasizes that the sustainability of community-based management depends on integrating technical, institutional, and socio-cultural factors (Purnamawati et al., 2023; Meyer, 2025; Suryawan & Lee, 2023). Education has successfully reached almost all households, but operational sustainability, retribution participation, and the creation of green jobs are still far from the set targets. A summary of the comparison between targets and achievements is shown in Table 5.

Table 5. Comparison of Targets and Achievements in Waste Management in Besakih Village

Steps	Target	Actual Achievements	Implications
Plan	7 tons/day of managed waste	Only 6.78 percent (490 kg/day) of waste is managed.	The majority of waste still ends up in landfills/ private land.
Implement	90 percent of households are educated, five active waste banks, 38 green jobs	Approximately 89 percent of households are educated, five waste banks (1 active), and 24 green jobs are established.	Education has been successful, but the achievements of waste banks and green jobs are not yet optimal.
Observe	70 percent of waste managed, 300 percent increase in revenue	Only 13.24 percent of waste is managed, while revenue has decreased by 3.24 percent.	Far below the target, resistance to high levels.
Reflect	Development of a green economy roadmap	Identification of institutional fragmentation, weak regulations, and minimal funding.	A roadmap is needed: joint agreement, entity transition, customary incentives, and diversification funding.

Source: Author (2025)

Table 5 confirms the fundamental gap between the plan and the realization of the waste management program in Besakih Village. Although education has reached almost all households and green product innovations have begun to take off, technical achievements, such as the volume of waste managed, the level of compliance with levies, and the number of green jobs, remain far below target. This indicates that the success of waste management cannot be supported solely by technical interventions but requires stronger institutional support, regulatory frameworks, and social participation. These findings reveal a significant gap between targets and achievements, underscoring the need for a more comprehensive transformation strategy. Previous literature confirms that the sustainability of community-based management can only be achieved through the integration of technical, institutional, and socio-cultural factors (Kristinayanti et al., 2020; Law et al., 2016; Wiratama & Wijaya, 2024). Based on collective reflection, this study formulates a green economy roadmap integrated with a circular flow framework based on THK.

4.2 Discussion: Green Economy Roadmap and Tri Hita Karana – Based Circular Flow Waste Management Model in Besakih Village

Field reflections confirm that waste management transformation in Besakih cannot stop at problem analysis; it must be followed by an integrated strategy that combines technical, social, institutional, and philosophical aspects (Sembiring & Nitivattananon, 2010; Wilson et al., 2009). A key finding of this study is the need for a joint agreement involving all stakeholders, including the Traditional Village, the Administrative Village, the Village-Owned Enterprise (BUMDes) or Waste Management Unit (UPS), the Environmental Agency, and the Temple Management Agency, as a formal instrument that defines service flows, role sharing, operational standards, and coordination and evaluation mechanisms. The integrated sustainable waste management study also confirmed that fragmentation of authority and unclear responsibilities between institutions were the main factors in implementation failure (Wilson et al., 2009). In this context, transforming the Waste Management Unit from a semi-commercial entity under the BUMDes into a Community Self-Help Group (KSM) or Management and Utilization Group (KPP) can strengthen social legitimacy while enabling full structural support from the Environmental Agency in the form of technical personnel, fleet, operational funding, and training. Community-based institutional models supported by the government have been shown to improve system sustainability and operational stability in local waste management.

The effectiveness of waste management also depends heavily on strengthening customary and village regulations, which can be achieved through the role of *pecalang* and the implementation of incentive-disincentive schemes (Jenkins et al., 2003; Kinnaman, 2006). Innovation and compliance should be rewarded, while violations such as illegal dumping or burning waste should be subject to progressive sanctions. Furthermore, the technical capacity of the Palak TPS3R must be improved through maintenance and modernization of machinery, addition of vehicles, implementation of occupational safety and health standards, and operator training, while expanding services to remote areas that are not yet covered (Wilson et al., 2009). The financial dimension also requires attention through adaptive financing mechanisms based on willingness to pay, so that retribution rates are more proportional, with additional support from diversified funding sources such as green products (compost, roster, RDF), CSR programs, and spiritual tourism (Massarutto, 2007; Shah et al., 2025).

In addition, the results of this study show the importance of expanding community participation through family and school-based education and more

inclusive sangkep merajèn forums. This overall strategy finds its philosophical basis in THK. In the *parahyangan* aspect, waste management is understood as *yadnya*, a form of spiritual devotion to God that maintains the sanctity of temples and the environment (Sembiring & Nitivattananon, 2010). From a *pawongan* perspective, the value of menyama braya embodies cooperation, togetherness, and inclusiveness in social participation. Meanwhile, in the *palemahan* aspect, CE innovations such as compost, RDF, and roster represent a harmonious relationship between humans and nature.

The findings of this study indicate that the THK circular flow model, when integrated with a green economy roadmap, can serve as an innovative alternative for community-based waste management. These results enrich the literature synthesized by Al Giffari et al. (2025a), which identified a gap: the need for a balance among economic growth, environmental conservation, and community involvement in creative economic development. By positioning THK as a source of social and spiritual legitimacy, this study offers a model that balances these three dimensions in sustainability practices in Bali.

Pitana (2010) asserts that THK is the foundation of socio-ecological sustainability. Meanwhile, Rosalina et al. (2023) and Al Giffari et al. (2025b) highlight the role of culture in strengthening collective behavior in the sustainable tourism sector. Given the dominance of ceremonial waste, the study emphasizes the urgency of a *parahyangan*-based approach. Thus, the results of this study not only present practical strategies to address structural, social, and technical issues but also make a theoretical contribution by showing that THK can be operationalized as an epistemic framework that unifies the spiritual, social, and ecological dimensions. The circular flow model of waste management in Besakih Village was initially formulated in three dimensions of THK, which became a follow-up to this program, as shown in Figure 9.

In the *parahyangan* dimension, cleanliness is understood as *yadnya* or sacred offering, so waste management is interpreted as part of the spiritual responsibility to maintain the sanctity of Pura Agung Besakih. This practice encourages collective awareness of not littering, making it part of daily religious practice.

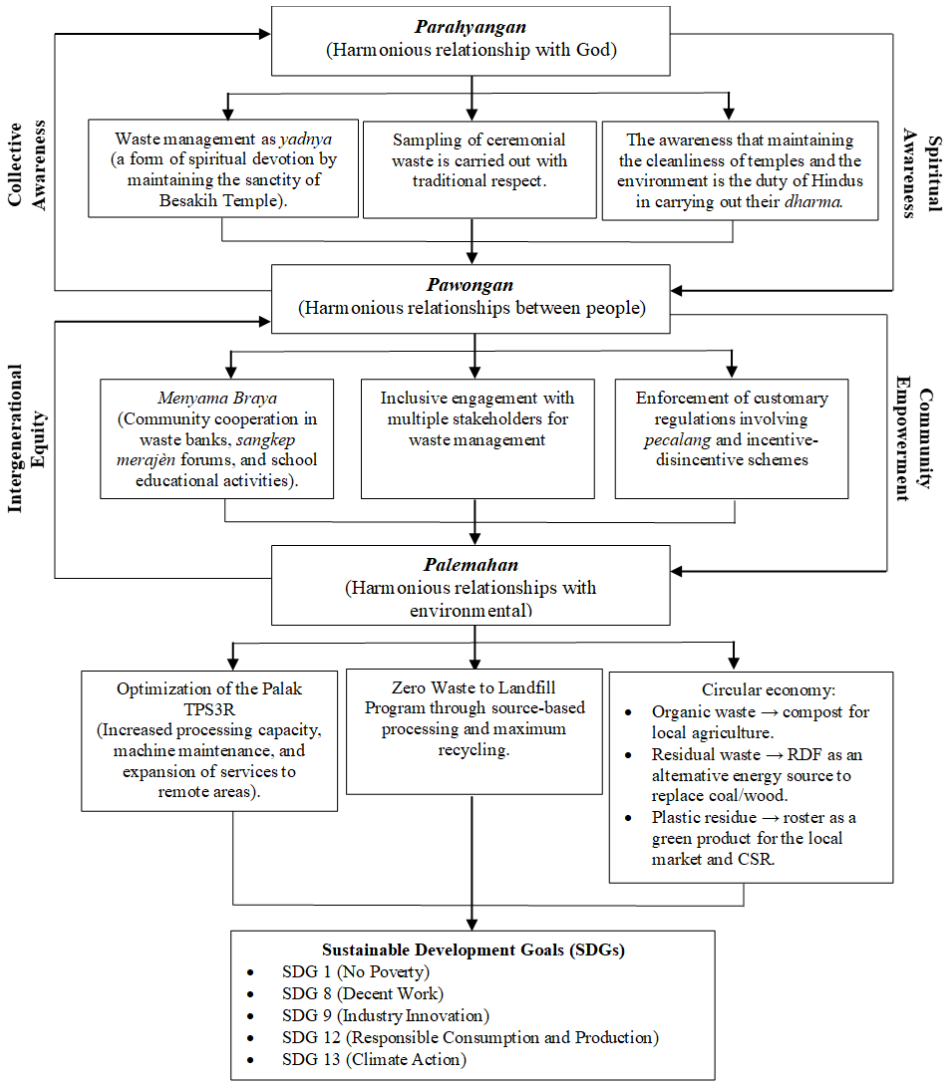

Figure 9. Sustainable Waste Management Model Integrating THK Values (Source: Author, 2025).

In the *pawongan* dimension, waste management is a social responsibility that binds all levels of society. Collaboration is evident in the participation of residents, *sangkep banjar*, traditional villages, administrative villages, and UPS. This participatory mechanism means that the community is not merely a recipient of services, but also an actor in management and supervision. A study by Waluyo & Kharisma (2023) demonstrates that community-based management systems in Indonesia are often built on collective work and social solidarity. However, they are prone to gender bias and unequal participation. This is consistent with findings from Besakih, where male dominance in public

forums and resistance to retribution remain obstacles, while women's role in household waste management is central.

In terms of waste management/*palemahan* dimension, the ecological aspect is realized through waste processing based on the principles of reduce, reuse, recycle, and further utilization, such as RDF and compost. The Palak TPS3R system, for example, has processed some of the waste into compost, RDF, and roster products. Although this achievement is still limited to 13.24 percent of total waste managed, this innovative effort demonstrates that waste can be considered a resource that supports green economic development at the village level. Wiratama & Wijaya (2024) emphasize that technical innovations in community-level waste management can create opportunities for alternative energy, though limitations in machine capacity and human resources remain significant challenges.

Integrating these three dimensions into the circular flow makes waste management in Besakih holistic, uniting spirituality, social aspects, and ecology. However, the research reflection confirms that, for this model to function effectively, it must be supported by a Green Economy Roadmap. The Roadmap outlines six key strategies: (a) a multi-stakeholder agreement to clarify institutional roles; (b) transitioning UPS entities to KSM/KPP so that the Environmental Agency can provide optimal support; (c) enforcing customary regulations by involving *pecalang* and incentive-disincentive schemes; (d) increasing the operational capacity of TPS3R Palak through the modernization of machinery, fleets, and technical training; (e) adaptive financing based on residents' ability to pay and diversification through green products, CSR, and spiritual tourism; and (f) expanding more inclusive community participation for women and the younger generation.

By integrating the roadmap into the circular flow, this model becomes a philosophical concept and a practical framework that can be implemented. The *Tri Hita Karana* circular flow provides value legitimacy, while the green economy roadmap provides operational direction. Together, they form a waste management system that solves technical problems and strengthens social participation, enforces customary regulations, ensures financial sustainability, and revives Balinese cultural values. With this format, the waste management model in Besakih can be seen as an innovative and contextually relevant alternative with the potential to be replicated in other areas by adapting to local wisdom. This finding is supported by a study by Mazzoli et al. (2024) that the effectiveness of CE requires social legitimacy and local governance. The internality of THK values also strengthens ecological and social legitimacy, as shown by Tripayana et al. (2024). Furthermore, the findings on gender inclusivity are in line with Pakasi et al. (2024) who emphasize the importance of

equitable community participation. Thus, this model can be seen as a contextual strategy that integrates spirituality, social solidarity, and technical innovation towards sustainability.

Furthermore, the achievements and challenges of waste management in Besakih can be linked to the Sustainable Development Goals (SDGs), particularly SDG 1 (No Poverty), SDG 8 (Decent Work), SDG 9 (Industry Innovation), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). Table 6 presents the relationship between key research indicators and relevant SDGs.

The relevance of the research results to the SDGs indicates that waste management efforts in Besakih Village contribute to global goals, although achievements remain limited. The low percentage of managed waste and declining participation in retribution confirm the challenges in achieving SDGs 11 and 12. At the same time, the creation of green jobs and green product innovation has had a positive impact on SDG 8. Thus, this study highlights the importance of integrating local cultural values such as THK into the sustainable development framework, so that Besakih can serve as an example of how local wisdom supports achieving the global agenda.

Table 6. Linkage of Besakih Waste Management Achievements to SDGs

Indicators	Achievement	Relevant SDGs
Managed waste: 13.24 percent.	Still far from the target	SDG 12 (Responsible Consumption & Production) (Implementing 12.1, 12.5, 12.7)
Household fee payments decreased by 3.24 percent.	Still facing financial challenges.	SDG 1 (No Poverty)
Creation of 24 green jobs	+IDR 1.5 million income/month	SDG 8 (Decent Work) (Implementing 8.4)
Green products (Roster, RDF, Compost)	Still in the early stage, with limited capacity	SDG 9 (Industry Innovation) and SDG 13 (Climate Action, Implementing 13.3)

Source: Author (2025)

This study makes an original academic contribution by integrating the cultural values of THK, the PAR approach, and circular-economy practices into a single community-based waste-management model. While previous studies in Bali have primarily focused on tourism or technical aspects of waste management, limited attention has been given to integrating cultural, institutional, and economic dimensions within a green economy framework, particularly in sacred areas such as Besakih. Thus, this study contributes to the

literature on waste governance by demonstrating how local wisdom can be operationalized as a strategic instrument for sustainable development.

5. Conclusion

Throughout the PAR cycle, this study identified multidimensional problems, including fragmented institutions, limited technical capacity, and low community participation. It implemented collective actions, including household education, waste banks, Palak TPS3R innovations, and green product workshops. The results show partial success: approximately 90 percent of households received education, 24 green jobs were created, and incomes increased, and waste management innovations such as composting, RDF, and roster production were introduced. However, structural barriers such as weak compliance with incentives, gender bias, and operational constraints limited the achievement of initial targets. Integrating CE with local governance is key to sustainable transition. THK can serve as both an ecological and social instrument in Balinese communities. The success of community-based systems requires gender-inclusive participation, indicating that internalizing THK can strengthen cultural legitimacy in sustainable development practices.

These findings show that cultural legitimacy through THK can bridge social trust and environmental responsibility, but institutional reform and adaptive financing must be effective. The discussion highlights the need for multi-stakeholder agreements, the transformation of UPS into a non-profit entity (KSM/KPP), the enforcement of customary regulations with incentive-disincentive mechanisms, technical improvements to the Palak TPS3R, and gender-inclusive participation channels. These recommendations, outlined in the Green Economy Roadmap, indicate that waste management in Besakih can evolve from a symbolic philosophy into a practical governance model contributing to community development and global sustainability targets.

6. Limitations and Future Research

This study has several limitations that should be noted. First, the field intervention lasted only a relatively short period, so changes in community behavior could not be continuously observed. Second, although the Participatory Action Research (PAR) approach involved various stakeholders, participation remained gender-biased, with male dominance in public forums resulting in the underrepresentation of women's voices. Third, financial data on operational costs and the market potential of green products (compost, RDF, roster) remain limited, so the economic sustainability analysis cannot yet be projected in greater detail.

For further research, several vital agendas can be developed. First, longitudinal studies are needed to assess the long-term effectiveness of integrating THK values, the circular economy, and PAR on changes in community behavior. Second, comparative research between traditional villages or other spiritual tourism areas in Bali and Indonesia will provide insights into the potential to replicate the THK-based circular flow model. Third, a more in-depth political-economic study of village budget allocation and alternative funding mechanisms will strengthen the financial sustainability dimension. Thus, further research can enrich conceptual and practical contributions to the design of a fair, sustainable, and contextually appropriate waste management system grounded in local wisdom.

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