

Halalan thayyiban and circular economy: A halal centric paradigm for sustainable resource management in Brunei

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Abstract

The halal industry is increasingly expected to ensure not only halal-certified products and services but also sustainable, ethical, and environmentally responsible operations. Although the circular economy (CE) promotes resource efficiency through reuse, recycling, and waste reduction, existing CE models largely emphasize technical and economic dimensions while overlooking religious and ethical values relevant to the halal sector. In Brunei Darussalam, food waste accounts for approximately 32% of total landfill waste, while only 11.3% is recycled, raising concerns about the Sungai Paku Engineered Landfill's projected capacity by 2030. This study addresses the absence of a halal-oriented food waste management model by examining the synergies between the principles of *Halalan Thayyiban* and the circular economy. Using a qualitative approach, thematic analysis was conducted on relevant literature and Islamic sources. The findings demonstrate that Islamic ethical principles, particularly safety, cleanliness, responsibility, and waste prevention, grounded in the objectives of *Maqasid al-Shari'ah*, reinforce circular economy practices and provide a stronger ethical foundation for sustainable food waste management. This study contributes by proposing a halal-centric conceptual perspective that integrates Islamic ethical values with circular economy strategies within Brunei's halal industry. The proposed framework offers practical guidance for policy development and implementation while supporting sustainable development, particularly responsible consumption and production (SDG 12) and climate action (SDG 13).

Keywords: Circular Economy, Food Waste Management, Halalan Thayyiban, Maqasid al-Shari'ah, Sustainability.

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1. Introduction

Food waste is a pressing global challenge with significant environmental, economic, and ethical implications. An estimated 2.5 billion tonnes of food are lost or wasted annually across the supply chain, from production and post-harvest handling to processing, distribution, retail, and consumption (FAO, 2024). In Southeast Asia, including Brunei Darussalam, food waste contributes to landfill pressures, methane emissions, resource inefficiency, and missed opportunities to enhance food security (Kusuma, 2023). Brunei's per capita solid waste generation of 1.4 kg per day is currently among the highest in ASEAN, with food waste accounting for a substantial proportion. Most is disposed of at the Sungai Paku Engineered Landfill, which is projected to reach capacity by 2030 (Shams et al., 2024; (Department of Environment, 2026), highlighting the urgency for sustainable waste management solutions.

Globally, the Circular Economy (CE) model, also known as the closed-loop system, has emerged as a strategic approach to addressing sustainability challenges by promoting resource efficiency through waste minimization, reuse, recycling, and



regeneration (KPMG Economics, 2020; Perdana et al., 2023). The model extends the lifespan of resources, optimizes their value throughout use, and focuses on resource recovery at the end of their life cycle.

This approach is increasingly recognized for its positive economic and environmental impacts, with estimates suggesting it could save \$624 billion by 2050 across industries such as food and agriculture, construction, and transportation (KPMG Economics, 2020). Countries such as Japan, South Korea, and the Netherlands have demonstrated successful CE-based food system interventions, from Japan's Food Recycling Law (Takata et al., 2012) and South Korea's conversion of food processing waste into animal feed and biogas (Envac Group, 2024), to the Netherlands' circular agriculture model that redistributes and valorizes surplus production (Hoogstra et al., 2024).

However, these models emerge from non-Muslim contexts and may not address the religious requirements of the halal industry. In the case of halal food waste, improper handling can lead to contamination with haram substances or najjis. If such waste is repurposed, recycled, or redistributed, returning it to the market without Halalan Thayyiban compliance could break the halal sustainability loop, rendering previously halal waste no longer guaranteed to be clean, safe, or ethically managed. In Islam, environmental sustainability is embedded in the concept of Halalan Thayyiban, which requires food to be not only permissible (halal) but also wholesome (thayyib), clean, safe, nutritious, ethically produced, and environmentally responsible (Talib & Zulfakar, 2023).

These values discourage wastefulness (israf), promote moderation (wasatiyyah), gratitude (shukr), responsibility (mas'uliyah), and stewardship (khilafah). The Qur'an urges mindful consumption (Al-A'raf 7:31; Al-Israa' 17:27), and several Hadiths emphasize safeguarding the environment (Majeed, 2020). Food waste, therefore, is both an environmental and a religious concern. Scholars also highlight Islam's emphasis on ethical, moderate, and responsible resource use, such as Abu Bakr al-Siddiq's instruction to avoid harming natural resources even in wartime and Sayyid Qutb's interpretation of wastefulness as following the devil's path (Majeed, 2020).

Given this, a clear gap exists in applying circular economy (CE) practices that fully respect halalan thayyiban (HT) requirements. This study addresses this gap by examining the thematic synergies between HT principles and CE practices to develop a halal-centric, sustainable resource management model for halal food waste within Brunei's halal industry

2. Research Method

A qualitative, secondary data approach was employed, involving a review of relevant literature, academic articles, and reports to identify the ethical, environmental, social, and economic intersections between Halalan Thayyiban (HT) principles and Circular Economy (CE) approaches. Drawing on approximately 20 purposively selected sources that link HT and CE concepts, thematic analysis was applied to extract recurring patterns and highlight key alignments, including resource efficiency, waste reduction, and ecosystem protection. The findings contribute to the development of a

halal-centric circular economy paradigm for Brunei, supporting several Sustainable Development Goals (SDGs) and Brunei Vision 2035.

3. Results and Discussion

3.1. Results

Table 1 summarises the key themes connecting Halalan Thayyiban (HT) principles and Circular Economy (CE) practices in relation to sustainable resource management. The table highlights how Islamic values, such as moderation, stewardship, and concern for safety and cleanliness, align with circular economy practices, including resource efficiency, waste reduction, and ecosystem protection (Javaid, 2022). These findings, drawn from the existing literature, provide an evidence-based foundation for exploring the implementation of halal-centric circular economy strategies and demonstrate how these principles can be applied to enhance halal industry food waste management practices in Brunei.

Table 1. Synergies Between Halalan Thayyiban Principles and Circular Economy Practices in Sustainable Food Waste Management

Theme	Halalan Thayyiban Perspective	Circular Economy Practices	Synthesized Implications & Outcomes
Environmental Protection & Avoiding Corruption (Fasad)	Prohibits <i>fasad</i> (ecological harm): Mandatory preservation of Earth from degradation. (Al-A'raf 7:56; Al-Baqarah 2:205; Majeed et al., 2020)	Systemic elimination: Designing out pollution, regenerating natural ecosystems, and extending product lifecycles. (Ellen McArthur Foundation, 2019; Khan et al., 2022)	<ul style="list-style-type: none"> Establishes an ethical-religious imperative to prevent ecological harm. Transforms passive waste management into restorative systems. Promotes long-lasting, durable product design
Environmental Stewardship (Khilafah)	Human Vicegerency: Humans are designated as <i>khalifah</i> on Earth, carrying a moral and spiritual responsibility for its care. (Al-Baqarah 2:30; (Faisal, 2024)	Systems Thinking: Long-term resource planning, holistic systems management, and biological/technical resource regeneration. (Ellen McArthur Foundation, 2019; (KPMG Economics, 2020); Javaid, 2022)	<ul style="list-style-type: none"> Elevates human stewardship from a secular task to a moral obligation. Encourages intergenerational, long-term planning for sustainable resource use. Aligns CE frameworks with spiritual accountability.
Mindful Consumption & Waste Reduction	Prohibition of Wastefulness: Explicitly forbids <i>israf</i> (extravagance) and <i>tabdhir</i> (squandering); mandates moderate,	The "R" Framework: Prioritizing recycling, reusing, and sustainable consumer choices to prevent waste generation.	<ul style="list-style-type: none"> Fosters consumer behavior centered on intentional consumption. Drastically reduces material loss at the source.

	intentional consumption. (Al-A'raf 7:31; Majeed et al., 2020)	(Perdana et al., 2023; Sulaiman & Talib, 2024)	<ul style="list-style-type: none"> • Optimizes circular efficiency by normalizing a zero-waste mindset.
Quality, Safety & Wholesomeness	Beyond Legality: Thayyiban demands absolute cleanliness, safety, nutritional wholesomeness, and ethical integrity. (Al-Baqarah 2:172; ; Ab Talib & Zulfakar, 2024)	Value Retention: Circulating materials and products at their highest utility and value; strict quality recovery at all lifecycle stages. (Ellen MacArthur Foundation, 2019; Do et al., 2021)	<ul style="list-style-type: none"> • Guarantees the wholesomeness and safety of secondary food products (e.g., upcycled food/feed). • Ensures safer, toxin-free circular reuse loops. • Builds consumer trust and resilient supply chains
Resource Conservation & Efficiency	Ethical Resource Moderation: Condemns resource extravagance; mandates preservation even in times of abundance. Al-Isra' 17:27; Hadith Ibn Majah 245 (Water conservation); Majeed et al. (2020)	Input Minimization: Maximizing resource efficiency, eliminating systematic waste, and using the Multi-R framework. (Ellen MacArthur Foundation, 2019; Zorpas, 2024)	<ul style="list-style-type: none"> • Embeds moderation as a core operational value. • Significantly lowers raw material inputs and dependency. • Drives continuous waste minimization across the food supply chain

The thematic synthesis emphasized that Halalan Thayyiban and Circular Economy principles are highly complementary. Across the five identified themes, both approaches share a core focus on ethical responsibility, sustainability, and long-term impact. While Halalan Thayyiban provides normative and ethical guidance grounded in Islamic teachings, Circular Economy offers operational and technical strategies for sustainable resource use. These alignments provide the conceptual foundation for a halal-centric CE model in Brunei, where HT principles guide sustainable resource management, waste valorization, and product lifecycle decisions, ensuring ethical, environmental, social, and economic considerations are fully integrated.

Recent studies further highlight the compatibility between HT principles and CE in food waste management. Surplus food can be valorized while maintaining standards of cleanliness, ethical use, and safety (Sulaiman & Talib, 2024). Research assessing waste management through Halalan Thayyiban criteria also demonstrates strong alignment with Circular Economy approaches, showing that ethical, environmental, and resource-efficient strategies are consistent with Islamic teachings on responsible stewardship and sustainability (Javaid, 2022). For Brunei, CE practices, if carefully adapted to local HT standards, can simultaneously support sustainable resource management and Islamic compliance.

Through the integration of these perspectives, a halal-centric paradigm for sustainable resource management emerges, one that: (1) Aligns ethical consumption with operational efficiency; (2) Ensures product safety, quality, and environmental protection throughout the lifecycle; (3) Encourages waste reduction via circular practices through religious and moral imperatives; and (4) Supports systemic stewardship by managing current operations responsibly while protecting the environment for the long term.

This synergy indicates that Halalan Thayyiban principles can guide and strengthen Circular Economy practices more ethically and holistically, particularly within Brunei's halal industry. As noted by the Minister of Primary Resources and Tourism DSS Dr. Abdul Manaf Metussin, Brunei has been actively promoting Circular Economy principles through policies, public awareness, and partnerships at both the local and international levels. Initiatives such as regenerative farming, aquaponics, sustainable forestry, and marine conservation show how these ideas are being put into practice (The Star, 2024).. When viewed through HT principles, these efforts not only address environmental and economic goals but also align with Maqasid al-Shari'ah and lead towards a halal-centric model of sustainability.

3.2. Discussion

Halal-Centric Paradigm for Sustainable Resource Management: The 4 Ps of Sustainability

Based on previous findings and viewed through the 3Ps of sustainability, adapted from Elkington (1977), namely, (1) People, (2) Planet, and (3) Profit, the intersection of Halalan Thayyiban and Circular Economy introduces an additional goal: (4) Purpose. This effectively creates a fourth 'P' that aligns sustainability with religious, ethical, and spiritual objectives, as illustrated in Figure 1.

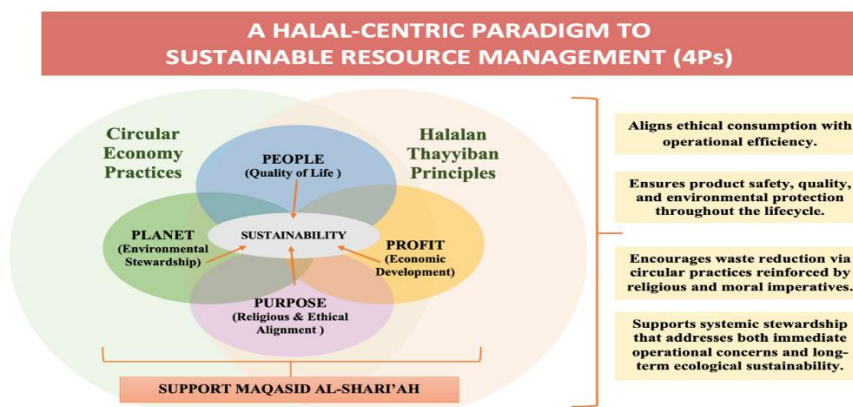


Figure 1. A Halal-Centric Sustainable Resource Management for Achieving Maqasid al-Shari'ah

This paradigm emphasises responsible operations that aim to maintain food safety and product quality while minimising harm to the environment. Rather than focusing solely on efficiency or compliance, it encourages businesses to consider how their everyday practices affect environmental sustainability in the long term (Nikhil Swaraj et al., 2025). Through the principles of reducing, reusing, and recycling, the paradigm

aligns operational decision-making with moral and religious values. It also allows organisations to balance commercial needs with environmental responsibility.

The paradigm is commonly explained through the 4Ps framework: People, Planet, Profit, and Purpose. Within the halal food aspects, the first P, People, relates to ethical responsibilities such as fair food redistribution, improved food security, and consumer protection. The second P, Planet, addresses environmental concerns, particularly food waste reduction, composting, and broader efforts to reduce ecological impacts. From the third P, Profit perspective, the paradigm highlights the importance of resource efficiency, supply chain resilience, and the potential economic value that can be generated through food waste valorization rather than disposal.

This study extends the framework by emphasising the fourth P; *Purpose*, as a guiding principle that connects the other three elements. Purpose reflects the need for actions and decisions to be grounded in religious, moral, and ethical principles, particularly those associated with Halalan Thayyiban values. This metaphysical orientation aligns precisely with the core tenets of *Maqasid al-Shari'ah* specifically the preservation of life (*Hifz al-Nafs*), the protection of intellect (*Hifz al-Aql*), and the preservation of wealth and resources (*Hifz al-Mal*). Although not always stated explicitly, this orientation aligns closely with the objectives of *Maqasid al-Shariah*, especially the protection of life, the promotion of societal welfare, and the responsible use of resources (Nurholis, 2025). In practice, this supports halal-compliant approaches to food waste management that prioritise ethical redistribution and meaningful valorisation, rather than treating waste solely as an operational problem.

As such, integrating halalan thayyiban principles into circular economy strategies allows food waste management practices to be environmentally responsible, socially considerate, and economically practical, while remaining consistent with Brunei Darussalam's identity as a Zikir Nation. This is particularly important in strengthening the legitimacy and acceptability of circular economy initiatives within the local halal ecosystem.

The Halalan Thayyiban Circular Flow: Mitigating Najis Risks

While a conventional secular circular economy values organic waste purely for its thermodynamic or nitrogenous value, a Halalan Thayyiban-centric paradigm imposes an uncompromising bio-security threshold. The fundamental operational vulnerability in closed-loop organic recovery is the high risk of cross-contamination by *Najis* (ritual impurities). Within a mixed-waste environment such as Brunei's municipal solid waste streams, halal food residues are consistently co-mingled with non-halal inputs, including swine byproducts, alcohol packaging, or carrion residues (Sulaiman & Talib, 2024). Returning organic materials recovered from these contaminated matrices back into the agricultural or commercial supply chain as bio-fertilisers or animal feed would compromise the integrity of the *Thayyiban* loop, violating the preservation of life (*Hifz al-Nafs*).

To operationalize this paradigm within Brunei's food sector, this study proposes a strict, dual-stream segregation and validation architecture. As conceptualized in Figure 2, the recovery process must feature completely isolated infrastructural collection

tracks. Commercial and residential food wastes must be strictly segregated at the source using a dedicated "Halal-Only" organic capture mechanism. This stream is then continuously monitored using real-time rapid DNA testing or ambient biosensors at processing depots to ensure zero cross-contamination.

Any batch showing non-halal traces is immediately systematically ejected from the circular economy loop and rerouted to deep-earth landfills or non-food industrial recovery. Only validated *Thayyiban* biomass is authorized for thermophilic composting or anaerobic digestion, ensuring that the resulting bio-fertilizers or energy outputs are wholly clean, biosecure, and permissible for nourishing future Bruneian agrifood production.

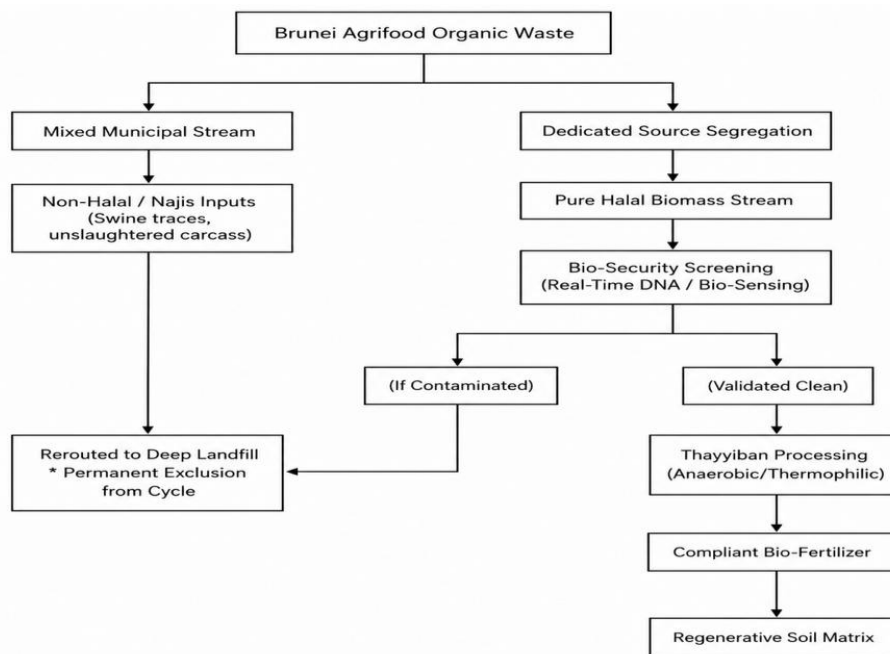


Figure 2. Operational Control for Bio-Secure Halalan Thayyiban Circular Resource Recovery

As illustrated in the control flow system above, the integration of real-time bio-security screening creates a structural firewall that resolves the inherent tension between circular material maximisation and strict ritual purity (Erhan Ada et al., 2023); Cahyadi, 2024). Moreover, the model provides an uncompromised assurance that resources recirculated into the economy retain their *Thayyiban* integrity by embedding these validation checkpoints directly into the municipal collection nodes. This systemic purification ensures that the circular model does not merely function as an eco-efficiency tool, but as an institutional mechanism protecting the collective welfare (*Maslahah Mursalah*) of the domestic consumer base (Nurholis, 2025). Consequently, waste valorisation ceases to be a marginal downstream activity and instead becomes a fully institutionalised pillar of Brunei's national infrastructure.

Implications for SDG 12 and Wawasan Brunei 2035

The proposed paradigm offers Brunei a way to strengthen sustainable resource management by going beyond mere permissibility and emphasizing wholesomeness, safety, and responsibility in production and consumption. When this ethic is connected to circular economy thinking, it becomes a practical framework for reducing waste,

extending product life, recovering materials, and designing production systems that use fewer resources while creating less pollution. This is highly relevant to SDG 12, which focuses on responsible consumption and production, and it also aligns well with Brunei Vision 2035's goals of a dynamic, sustainable economy and a high quality of life.

In the context of SDG 12, the Halalan Thayyiban approach can support more responsible consumption by encouraging individuals, businesses, and public institutions to avoid excess, minimise food loss, and choose products and processes that are clean, safe, and ethically managed (Aloysius & Ananda, 2023); Cahyadi, 2024). Circular economy principles make this ethic operational by translating values into concrete practices such as eco-design, reusable packaging, recycling, composting, and resource recovery (Perdana et al., 2023; Erhan Ada et al., 2023). In this way, the halal paradigm is not only a religious or moral standard but also a sustainability driver that helps reduce material throughput and waste generation, which is directly consistent with SDG 12 targets on waste reduction and sustainable production systems (Ab Talib & Zulfakar, 2024).

For Brunei Vision 2035, this framework is especially useful because it supports economic diversification without departing from national values. A halal-circular model can strengthen food systems, hospitality, logistics, and manufacturing by adding sustainability and traceability to halal value chains. This creates opportunities for innovation, green jobs, and value-added industries such as sustainable packaging, bio-waste conversion, compost production, and energy recovery from organic waste (Brunei Vision's Office, 2022). At the same time, it helps Brunei build a reputation for high-quality, ethically produced goods and services, which is consistent with the Vision's emphasis on a resilient and competitive economy.

4. Conclusion

In conclusion, integrating Halalan Thayyiban and the Circular Economy demonstrates how these approaches can complement and strengthen one another to promote sustainable halal food waste management. When halal food waste is repurposed or recycled, its original halal status is not automatically guaranteed, as there is no assurance that the recovery processes are free from contamination or unclean practices. The integration of Halalan Thayyiban principles ensures that circular resource recovery remains clean, safe, ethical, and responsibly managed, thereby preventing the loss of halal assurance throughout the sustainability cycle. This combination offers a halal-centric paradigm that is responsive to both religious values and environmental needs. It also strengthens the halal industry by not only emphasizing the provision of halal products and services but also ensuring that its entire operational system is sustainable, ethical, and environmentally friendly.

Importantly, the application of this approach in Brunei Darussalam supports global sustainability efforts and contributes to several Sustainable Development Goals (SDGs), including affordable and clean energy (SDG 7), decent work and economic growth (SDG 8), industry, innovation and infrastructure (SDG 9), sustainable cities and communities (SDG 11), responsible consumption and production (SDG 12), and

climate action (SDG 13). Simultaneously, it supports the objectives of Brunei Vision 2035, particularly in advancing a sustainable and green economy, improving quality of life, and strengthening food security resilience, while enhancing the country's reputation as a trusted halal hub not only in food production, but also in the responsible management and valorization of food waste.

Greater collaboration among government agencies, industry players, and waste management stakeholders is essential to support the practical implementation of this approach. Furthermore, future research should focus on developing a comprehensive halal-centric circular economy framework and on examining its feasibility, implementation challenges, and socio-economic impacts within the halal industry and the waste management sector.

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