OPEN ACCESS
Journal Islamic Economic Minangkabau
Vol. 4 No. 4. August 2026, pp. 326-345
DOI. 10.70177/jiem.v4i4.4329
Research Article

# AN ETHICAL EVALUATION OF CIRCULAR ECONOMY PRACTICES WITHIN GLOBAL HALAL INDUSTRY NETWORKS

Abdul Chalim[1], Hassan Al Mutawa[2], and Rasha Al Ansari[3]
[1] Politeknik Negeri Malang, Indonesia
[2] Higher Colleges of Technology, United Arab Emirates
[3] American University in Dubai, United Arab Emirates

**Corresponding Author:**

Abdul Chalim,
Department of Electrical Engineering, Politeknik Negeri Malang.
Jl. Soekarno Hatta No.9, Jatimulyo, Kec. Lowokwaru, Kota Malang, Jawa Timur 65141, Indonesia
Email: abdulchalim@polinema.ac.id

## Article Info

Received: February 9, 2026
Revised: May 12, 2026
Accepted: July 14, 2026
Online Version: August 25, 202

## Abstract

Global halal industry networks increasingly adopt circular economy practices to reduce waste, recover materials, and improve resource efficiency, yet their broader ethical adequacy remains insufficiently examined. This study aimed to evaluate whether circular practices within halal supply chains align with Sharīʿah integrity, environmental responsibility, social justice, governance transparency, and long-term value preservation. A qualitative comparative multiple-case design was employed across twelve organizations in six countries, involving forty-eight informants, document analysis, non-participant observation, and a structured Islamic ethical evaluation rubric. The findings showed that waste segregation, by-product valorization, sustainable packaging, and water recovery were the most common practices. Sharīʿah integrity achieved the strongest performance, while social justice received the lowest score. Digital chain-of-custody systems and independent auditing were associated with stronger transparency and overall ethical performance, although technology could not compensate for weak standards, inaccurate supplier data, or limited verification. The study concludes that circularity becomes ethically substantive only when material recovery is integrated with lawful sourcing, contamination control, worker protection, measurable environmental benefit, and accountable governance. Halal certification alone cannot demonstrate comprehensive ethical sustainability; broader evaluative frameworks are required to connect circular production with maqāṣid al-sharīʿah and responsible global value-chain management across diverse sectors, jurisdictions, communities, and future generations worldwide.

**Keywords**: Circular Economy, Ethical Governance, Global Halal Industry



Journal Homepage https://research.adra.ac.id/index.php/jiem
How to cite: Chalim, C., Mutawa, H. A., & Ansari, R. A. (2026). An Ethical Evaluation of Circular Economy Practices Within Global Halal Industry Networks. *Journal Islamic Economic Minangkabau*, *4*(4), 326–345. https://doi.org/10.70177/jiem.v4i4.4329
Published by: Yayasan Adra Karima Hubbi

## INTRODUCTION

Global production and consumption systems continue to depend heavily on the extraction of virgin materials, short product life cycles, and the disposal of resources after limited use. This linear economic model has intensified waste generation, pollution, biodiversity loss, greenhouse gas emissions, and unequal access to natural resources (Kusumawardhany et al., 2025; Moatari-Kazerouni et al., 2025). Circular economy practices offer an alternative by maintaining the value of products and materials through waste prevention, reduction, reuse, repair, remanufacturing, recycling, and biological regeneration. International environmental assessments nevertheless emphasize that circularity must address the distributional effects of resource use rather than focusing solely on material efficiency or economic value recovery (Cruz, 2026; Rashid et al., 2024).

Global halal industry networks operate across increasingly complex systems of production, processing, certification, transportation, storage, retail, and consumption. Halal integrity must be maintained as raw materials, ingredients, packaging, information, and finished products move among suppliers and markets with different regulatory systems (Halder et al., 2025; Xiao et al., 2025). Circular practices have become relevant to these networks because halal businesses face pressure to minimize food loss, reduce packaging waste, recover production residues, use renewable resources, improve logistics, and establish more sustainable supply chains. Halal compliance cannot be separated from traceability because the identity, condition, handling, and transformation of materials must remain verifiable throughout the product life cycle (Chan & Zailani, 2024; Leal Filho et al., 2025).

Islamic ethical thought provides a broader foundation for evaluating circular economy practices than a narrow distinction between technically permissible and prohibited materials. The principles of tawḥīd, amānah, khilāfah, ʿadl, maṣlaḥah, moderation, and the prohibition of waste establish moral responsibilities toward human beings, animals, natural resources, and future generations (Adhiwibowo et al., 2025; Hosseini et al., 2025). The concept of ṭayyib also requires halal products to embody wholesomeness, safety, cleanliness, and ethical quality. These principles indicate that a product should not be considered ethically adequate merely because its ingredients and processing methods satisfy minimum legal requirements. Islamic sustainability scholarship similarly connects maqāṣid al-sharīʿah with ecological balance, justice, and responsible development (Karmaker et al., 2023; Sharma & Gupta, 2024).

The central research problem concerns whether circular economy practices within halal industry networks genuinely advance Islamic ethical objectives or merely improve operational efficiency and corporate reputation. Recycling, industrial symbiosis, reverse logistics, reusable packaging, by-product valorization, and resource recovery can reduce waste and production costs (Chen et al., 2026; Sivaji et al., 2025). These practices may still reproduce unequal labour conditions, irresponsible sourcing, excessive consumption, environmental burdens, or misleading sustainability claims. An ethical evaluation must therefore move beyond measuring the quantity of materials recirculated and examine whether circular initiatives protect human dignity, prevent harm, distribute benefits fairly, and preserve ecological systems (Amoozad Mahdiraji et al., 2026; Xie et al., 2026).

Material recirculation creates specific challenges for halal integrity because recovered inputs may pass through uncertain, mixed, or contaminated material streams. Recycled packaging, reclaimed water, processed animal by-products, food-production residues, cosmetics ingredients, pharmaceutical materials, and organic fertilizers may raise questions about origin, transformation, purity, safety, and contact with prohibited substances (Esfahbodi & Sunmola, 2026; Keramati et al., 2025). A technically successful recycling process cannot automatically be regarded as halal, ṭayyib, or ethically responsible. Verification requires transparent chain-of-custody systems, reliable product identification, segregation procedures, laboratory testing, and clear rules concerning material transformation. International standards on traceability and trustworthy value chains illustrate the institutional importance of

maintaining verifiable information across complex production networks (Delle Foglie & Keshminder, 2022; Diraz et al., 2026).

Governance fragmentation creates another problem because halal certification and circular economy assessment are often administered through separate institutional systems. Halal authorities may concentrate on ingredients, slaughter, processing, storage, and contamination, while sustainability schemes evaluate emissions, waste, resource efficiency, or recycled content (Bobylev et al., 2022; Petrescu-Mag et al., 2025). Such separation can allow a product to receive halal certification without meaningful environmental responsibility or receive a circularity label without adequate verification of halal integrity. Cross-border differences in standards, certification procedures, data systems, and regulatory recognition further complicate ethical accountability. Digital traceability can improve transparency, but technology cannot resolve unclear standards, inaccurate data, weak auditing, or unequal power among supply-chain actors (Petrolo et al., 2022; Son et al., 2026).

The primary objective of this study is to evaluate the ethical adequacy of circular economy practices implemented across global halal industry networks. The analysis will examine practices associated with waste prevention, reuse, recycling, remanufacturing, renewable inputs, resource recovery, industrial symbiosis, reverse logistics, sustainable packaging, and by-product valorization (Bai et al., 2026; Thongsri, 2026). Ethical adequacy will be assessed through Islamic principles concerning permissibility, wholesomeness, justice, trusteeship, prevention of harm, moderation, and public benefit. This objective will clarify whether circular practices contribute to substantive ethical transformation or remain limited to material efficiency, regulatory compliance, and commercial advantage (Mubarak et al., 2024; Yazdani et al., 2022).

The second objective is to investigate how circularity affects halal integrity throughout interconnected supply and value chains. The research will examine the origin and movement of recovered materials, risks of cross-contamination, transformation of previously prohibited substances, traceability of recycled content, product safety, and the reliability of sustainability claims. Particular attention will be directed toward the responsibilities of producers, suppliers, certification bodies, logistics providers, retailers, technology companies, consumers, and regulators. The analysis will determine how digital traceability, chain-of-custody models, audits, and data verification can support ethical accountability without assuming that technological visibility is equivalent to trustworthy governance (Bhamra et al., 2022; Rubiconto et al., 2026).

The third objective is to develop an integrated framework for assessing environmental, social, religious, and governance dimensions of circular halal practices. The framework will connect material-flow indicators with halal compliance, maqāṣid al-sharīʿah, labour justice, animal welfare, consumer protection, ecological impact, and institutional transparency (Kantamaturapoj et al., 2022; Secinaro et al., 2022). Such integration is expected to identify practices that create multiple forms of value while also revealing trade-offs between economic efficiency and ethical responsibility. The intended outcome is an evaluative model that can assist researchers, businesses, certification agencies, and policymakers in distinguishing authentic circular transformation from superficial compliance or green marketing (Gadekar et al., 2022; Islam & Hasan, 2026).

Existing circular economy scholarship has generated extensive models for resource efficiency, closed-loop supply chains, industrial symbiosis, waste valorization, product-life extension, and regenerative production (Van Opstal et al., 2025). Environmental and economic performance remain the dominant dimensions in many studies, while moral responsibility, religious legitimacy, labour justice, and unequal exposure to environmental harm receive less consistent attention (Schlüter et al., 2022). Circular practices can retain material value without changing patterns of overproduction, exploitative employment, or excessive consumption. An evaluation based exclusively on recycling rates, cost reduction, or organizational performance

is therefore insufficient for determining whether circularity produces an ethically defensible economy (Yousefi & Tosarkani, 2025).

Halal supply-chain research has concentrated strongly on certification, food safety, consumer trust, traceability, logistics, technological integration, and protection against contamination. Blockchain, the Internet of Things, artificial intelligence, and other Industry 4.0 technologies have been proposed to strengthen transparency and product authentication (Allison et al., 2026; Piñeiro-Chousa et al., 2022). These studies offer important operational solutions, yet circular material flows and their ethical implications are rarely placed at the centre of halal governance. Recycled inputs, reverse supply chains, waste-derived products, reuse systems, and industrial by-products introduce questions that conventional linear halal assurance frameworks were not necessarily designed to evaluate (Anastasiadis et al., 2022; Schiaroli et al., 2025).

Islamic business ethics and sustainable-development scholarship provide normative discussions of maqāṣid al-sharīʿah, maṣlaḥah, social responsibility, environmental stewardship, and moral economy. Halal industry studies nevertheless frequently remain product-centred by treating certification as the principal indicator of Islamic legitimacy (Bruhn & Darendeli, 2026; Hwang et al., 2026). Critical scholarship has warned that legal responsibility may be emphasized while moral and spiritual responsibilities receive limited institutional attention. A comprehensive framework connecting Islamic ethics, circular material flows, supply-chain practices, and measurable social and environmental consequences remains underdeveloped. Empirical comparison across halal sectors and national regulatory environments is also limited.

The principal novelty of this study lies in conceptualizing halal circularity as an ethical governance system rather than a combination of halal certification and waste-management practices. The proposed perspective evaluates the complete life cycle of products and materials, including sourcing, design, production, circulation, consumption, recovery, reprocessing, and final disposal. Halal integrity will be assessed together with environmental regeneration, social justice, and institutional accountability. This approach challenges the assumption that circularity is ethically sufficient whenever materials remain in economic use or that halal legitimacy is secured once minimum procedural certification requirements have been satisfied.

The second contribution involves the development of a Halal Circularity Ethics Framework that integrates five analytical dimensions: Sharīʿah integrity, environmental circularity, social justice, governance transparency, and long-term value preservation. Sharīʿah integrity examines lawful origin, transformation, purity, safety, and ṭayyib quality. Environmental circularity evaluates waste prevention, resource retention, ecological restoration, and life-cycle impacts. Social justice assesses labour conditions, animal welfare, community effects, and distribution of benefits. Governance transparency examines traceability, auditing, certification, data reliability, and stakeholder accountability. Long-term value preservation considers whether practices protect wealth, life, health, ecosystems, and future generations.

The justification for this research rests on the expanding interaction between halal markets, global sustainability commitments, and circular production strategies. Businesses require guidance for managing recovered materials without compromising halal integrity, while certification agencies need criteria capable of addressing reverse logistics and circular supply chains. Policymakers require coherent standards that prevent contradictory environmental and religious claims. Consumers also need credible information to distinguish substantive ethical performance from labels that communicate halalness or sustainability without demonstrating their broader consequences. An integrated ethical evaluation can contribute to Islamic business ethics, circular economy studies, halal supply-chain management, sustainability governance, and the development of more responsible global production networks.

## RESEARCH METHOD

### *Research Design*

This study employed a qualitative comparative multiple-case study design supported by normative Islamic ethical analysis. The design was selected because circular economy practices within halal industry networks involve interconnected environmental, commercial, religious, technological, and social considerations that cannot be adequately examined through a single performance indicator. Each participating organization was treated as an individual case, while cross-case analysis was used to identify recurring practices, institutional differences, ethical tensions, and contextual variations across sectors and national regulatory environments (Cruz, 2026; Kusumawardhany et al., 2025).

The analytical framework combined circular economy principles with Islamic business ethics and maqāṣid al-sharīʿah. Circular practices were evaluated through five interrelated dimensions: Sharīʿah integrity, environmental circularity, social justice, governance transparency, and long-term value preservation. Sharīʿah integrity covered material origin, lawful transformation, purity, safety, contamination control, and ṭayyib quality. Environmental circularity addressed waste prevention, reuse, recycling, resource recovery, renewable inputs, and life-cycle impacts. Social justice included labour conditions, animal welfare, community protection, and the equitable distribution of costs and benefits.

The study examined organizational practices rather than assuming that halal certification or material recycling automatically demonstrated ethical adequacy. Particular attention was directed toward possible tensions between economic efficiency and moral responsibility, including the reuse of uncertain materials, misleading sustainability claims, unequal labour arrangements, weak traceability, excessive resource consumption, and the transfer of environmental burdens to vulnerable communities. This design allowed circularity to be evaluated as an ethical governance process extending across the entire product life cycle.

### *Research Target/Subject*

The research population comprised organizations participating in global halal industry networks, including raw-material suppliers, halal food manufacturers, cosmetics and pharmaceutical companies, packaging producers, logistics providers, certification bodies, retailers, waste-management companies, and technology firms supporting traceability. Relevant stakeholders included managers, halal-assurance officers, sustainability specialists, supply-chain personnel, auditors, Sharīʿah advisers, employees, regulators, and representatives of affected communities (Rashid et al., 2024; Xiao et al., 2025).

The organizational sample consisted of 12 case organizations operating across Malaysia, Indonesia, the United Arab Emirates, Saudi Arabia, the United Kingdom, and the Netherlands. These national contexts were selected to represent Southeast Asian, Gulf, and European halal markets with different regulatory, commercial, and sustainability environments. The cases included four food-processing companies, two cosmetics or pharmaceutical manufacturers, two logistics and warehousing providers, two packaging or material-recovery businesses, one halal certification body, and one digital traceability provider.

The participant sample comprised 48 informants selected through purposive and maximum-variation sampling. Participants included 12 senior or operational managers, eight halal-assurance officers, eight sustainability or circular-economy specialists, six Sharīʿah advisers or halal auditors, six supply-chain and logistics personnel, four regulators or certification representatives, and four employee or community representatives. Selection criteria required participants to possess direct knowledge of halal assurance, circular material flows, sustainability policy, product traceability, waste management, certification, or stakeholder impacts. Recruitment continued until thematic saturation was reached and additional interviews no longer generated substantively new ethical or institutional themes.

### *Research Procedure*

The research procedure began with the identification of organizations that had implemented at least one circular economy practice within a halal-certified or halal-oriented supply chain. Eligible practices included waste prevention, material reuse, recycling, remanufacturing, renewable-resource use, by-product recovery, industrial symbiosis, sustainable packaging, reverse logistics, or digital tracking of recovered materials. Institutional permission was obtained before data collection, and participants received written information concerning the study's purpose, confidentiality procedures, voluntary participation, and right to withdraw.

Semi-structured interviews were conducted face-to-face or through secure video-conferencing platforms. Each interview lasted approximately 50 to 90 minutes and was audio-recorded with the participant's consent. Recordings were transcribed verbatim and checked for accuracy. Non-participant observations were conducted where access was permitted, focusing on material segregation, waste handling, storage, production flows, traceability procedures, packaging recovery, worker practices, and contamination controls. Field notes documented operational conditions, institutional routines, ethical concerns, and possible differences between formal policies and observed practices.

Documentary evidence was collected from participating organizations and relevant public sources. Materials included halal certificates, sustainability disclosures, supplier agreements, environmental targets, audit documents, waste records, traceability reports, and circularity policies (Halder et al., 2025). Each document was assessed for relevance, consistency, completeness, and evidentiary strength. Organizational claims that could not be supported through interviews, observations, or documentary records were treated cautiously and were not accepted as verified ethical performance.

Data analysis was conducted through reflexive thematic analysis, normative ethical assessment, and cross-case comparison. Initial coding identified themes related to material origin, halal integrity, waste reduction, resource recovery, contamination risk, labour justice, animal welfare, environmental impact, digital traceability, certification, and institutional accountability. Focused coding organized these themes within the five dimensions of the ethical evaluation framework. Cross-case analysis compared practices across sectors, countries, organizational sizes, and positions within the halal value chain.

Ethical judgments were developed through a structured process rather than personal moral intuition. Each circular practice was examined according to its intended benefit, actual consequences, affected stakeholders, distribution of risks, compliance with Islamic principles, and consistency with long-term public welfare. Practices were classified as ethically substantive, conditionally acceptable, procedurally compliant but ethically limited, or ethically problematic. Classification decisions were supported by interview evidence, documentary verification, observations, and the ethical evaluation rubric.

Research trustworthiness was strengthened through source triangulation, method triangulation, member reflection, peer debriefing, and an audit trail. Evidence from managers was compared with information obtained from auditors, employees, sustainability specialists, and organizational documents. Selected participants reviewed preliminary case summaries to identify factual inaccuracies or missing contextual information. Two researchers independently assessed a portion of the cases using the ethical rubric before discussing differences and refining the assessment criteria. Organizational identities and commercially sensitive information were anonymized to protect confidentiality and reduce potential professional harm.

### *Instruments, and Data Collection Techniques*

The researcher served as the primary instrument responsible for collecting, interpreting, comparing, and ethically evaluating the evidence. A semi-structured interview guide was developed to examine organizational motivations, circular practices, halal-assurance procedures, traceability systems, environmental objectives, stakeholder responsibilities, and

ethical challenges. Interview questions addressed waste prevention, recycled inputs, reusable packaging, by-product valorization, reverse logistics, cross-contamination risks, material transformation, labour conditions, animal welfare, auditing, sustainability claims, and the distribution of environmental benefits and burdens (Adhiwibowo et al., 2025; Leal Filho et al., 2025).

A document-analysis matrix was used to review halal policies, sustainability reports, certification records, supplier requirements, waste-management procedures, audit reports, product specifications, material-flow records, traceability documents, life-cycle assessments, and corporate social-responsibility statements. The matrix recorded whether organizational claims were supported by measurable indicators, independent verification, documented chain-of-custody procedures, or publicly available evidence. Particular attention was given to inconsistencies between halal commitments, circular-economy claims, and actual operational practices.

An ethical evaluation rubric was developed from Islamic ethical principles, circular economy literature, and sustainability-governance criteria. Each case was assessed across Sharīʿah integrity, environmental circularity, social justice, governance transparency, and long-term value preservation. The rubric included indicators such as lawful material origin, contamination prevention, waste avoidance, resource efficiency, worker protection, animal welfare, disclosure quality, stakeholder participation, audit independence, and intergenerational benefit. Scores were used to support systematic comparison, while qualitative evidence remained central to the interpretation of ethical adequacy.

Instrument validity was strengthened through expert review involving scholars in Islamic business ethics, halal supply-chain management, circular economy, and qualitative research methodology. A pilot test was conducted with two halal-industry practitioners who were not included in the main sample. Their feedback was used to clarify technical terminology, remove overlapping questions, improve contextual sensitivity, and ensure that the instruments distinguished legal halal compliance from broader ethical responsibility.

## RESULTS AND DISCUSSION

The final dataset comprised evidence from 12 organizations operating within halal industry networks in Malaysia, Indonesia, the United Arab Emirates, Saudi Arabia, the United Kingdom, and the Netherlands. The organizational cases included four food-processing companies, two cosmetics or pharmaceutical manufacturers, two logistics providers, two packaging or material-recovery companies, one halal certification body, and one digital traceability provider. Primary data were obtained from 48 semi-structured interviews, 21 non-participant observation sessions, and 146 institutional documents. The documentary corpus included halal certificates, sustainability reports, waste-management records, supplier agreements, audit reports, traceability files, product specifications, and internal circular-economy policies.

Organizational records showed that waste segregation was the most widely adopted circular practice, appearing in 11 of the 12 cases. By-product valorization was implemented by nine organizations, while eight organizations had introduced recyclable, reduced-material, or partially recycled packaging. Water recovery or reuse was documented in six cases, while renewable-energy adoption and reverse logistics appeared in five cases each. More advanced practices, including industrial symbiosis, verified recycled inputs, reusable packaging systems, and circular product redesign, remained limited. The distribution suggests that organizations generally began with practices requiring modest operational change before adopting circular systems that demanded supply-chain coordination, product redesign, or new halal-assurance procedures.

**Table 1.** Distribution of Organizational Cases and Research Evidence

| Category | Classification | Frequency |
|---|---|---|
| Country | Malaysia | 3 |
| | Indonesia | 3 |
| | United Arab Emirates | 2 |
| | Saudi Arabia | 1 |
| | United Kingdom | 2 |
| | Netherlands | 1 |
| Sector | Food processing | 4 |
| | Cosmetics or pharmaceuticals | 2 |
| | Logistics and warehousing | 2 |
| | Packaging or material recovery | 2 |
| | Halal certification | 1 |
| | Digital traceability | 1 |
| Data source | Semi-structured interviews | 48 |
| | Observation sessions | 21 |
| | Institutional documents | 146 |

Table 1 presents the distribution of organizational cases and research evidence across countries, sectors, and data sources. The findings indicate that the reviewed cases were geographically distributed across several countries, with Malaysia and Indonesia representing the largest contributions (each with 3 cases), followed by the United Arab Emirates and the United Kingdom (each with 2 cases), while Saudi Arabia and the Netherlands contributed fewer cases. In terms of sectoral distribution, food processing emerged as the most frequently examined sector with 4 cases, followed by cosmetics or pharmaceuticals, logistics and warehousing, and packaging or material recovery, each represented by 2 cases, while halal certification and digital traceability appeared as emerging areas with limited representation.

Regarding data sources, institutional documents constituted the dominant source of research evidence with 146 records, followed by semi-structured interviews (48 records) and observation sessions (21 records). This distribution suggests that existing studies on organizational practices rely heavily on documentary evidence, while qualitative approaches such as interviews and observations provide complementary insights into organizational processes, implementation experiences, and operational realities across different halal-related industries.

**Table 2.** Frequency of Circular Economy Practices Across the Cases

| Circular Economy Practice | Frequency (n = 12) | Percentage |
|---|---|---|
| Waste segregation | 11 | 91.7% |
| By-product valorization | 9 | 75.0% |
| Sustainable or reduced-material packaging | 8 | 66.7% |
| Water recovery or reuse | 6 | 50.0% |
| Renewable-energy utilization | 5 | 41.7% |
| Reverse logistics | 5 | 41.7% |
| Verified recycled production inputs | 4 | 33.3% |
| Industrial symbiosis | 4 | 33.3% |
| Reusable packaging systems | 3 | 25.0% |
| Circular product redesign | 3 | 25.0% |

The high prevalence of waste segregation and by-product valorization indicates that circularity was most developed where organizations could recover value without fundamentally changing their products or supplier relationships. Food companies converted organic residues into animal feed, compost, biogas substrates, or secondary ingredients, while packaging

organizations recovered paper, plastic, and metal fractions. These practices produced visible reductions in disposal volume and operating costs. Their ethical adequacy varied because some organizations documented material safety, lawful end use, and beneficiary protection, while others reported only the quantity of waste diverted from landfills.

Document comparison revealed a recurring difference between declared circular commitments and independently verifiable practices. Ten organizations referred to sustainability or waste reduction in corporate documents, but only seven provided measurable circularity targets and six reported progress against a defined baseline. Eight organizations maintained documented halal traceability for conventional raw materials, while only five extended comparable verification to recovered, recycled, or reprocessed materials. Circularity claims were therefore more common than complete evidence concerning material origin, contamination control, environmental impact, and the distribution of social benefits.

Ethical evaluation produced a mean composite score of 73.10 on a scale of 0 to 100. Sharīʿah integrity received the highest mean score at 83.00, reflecting generally strong procedures for ingredient verification, contamination prevention, halal certification, and product safety. Governance transparency achieved a mean score of 75.08, followed by environmental circularity and long-term value preservation, which both obtained mean scores of 71.33. Social justice received the lowest mean score at 64.75 because worker welfare, informal waste-sector conditions, community consultation, animal welfare, and equitable benefit distribution were addressed less consistently than product compliance or resource efficiency.

Ethical classification identified four organizations as ethically substantive, five as conditionally acceptable, two as procedurally compliant but ethically limited, and one as ethically problematic. Substantive cases integrated halal assurance with measurable environmental targets, worker protection, supplier accountability, and independently verified reporting. Conditionally acceptable practices generated environmental benefits but contained unresolved concerns involving traceability, material safety, labour conditions, or carbon-intensive processing. Procedurally compliant organizations met formal halal requirements while providing limited evidence that their circular initiatives advanced broader Islamic objectives related to justice, harm prevention, and long-term public welfare.

**Table 3.** Ethical Performance Across the Five Evaluation Dimensions

| Ethical Dimension | Mean Score | Standard Deviation | Principal Strength | Main Weakness |
|---|---|---|---|---|
| Sharīʿah integrity | 83.00 | 4.51 | Ingredient verification and contamination control | Limited guidance for complex recovered materials |
| Environmental circularity | 71.33 | 4.70 | Waste diversion and resource recovery | Weak life-cycle and rebound-effect assessment |
| Social justice | 64.75 | 4.29 | Basic employee-safety policies | Limited attention to informal workers and benefit distribution |
| Governance transparency | 75.08 | 6.60 | Certification and internal documentation | Uneven public disclosure and audit independence |
| Long-term value preservation | 71.33 | 4.33 | Reduction of material loss | Limited evidence of regenerative or intergenerational outcomes |
| Composite ethical performance | 73.10 | 4.00 | Integration of halal assurance and circular practices | Uneven social and environmental verification |

Exploratory inferential analysis compared organizations using integrated digital chain-of-custody systems with organizations relying primarily on fragmented or manual records. Digitally integrated organizations achieved a mean governance-transparency score of 78.50, compared with 68.25 among organizations without integrated systems. A Mann–Whitney U test indicated a statistically significant difference, (U=32.00), (p=.004). Digitally integrated organizations also achieved a higher mean composite ethical score of 75.03, compared with 69.25 among the remaining cases, (U=32.00), (p=.008). These findings identify an association between information integration and ethical performance but do not demonstrate that technology independently caused stronger governance.

Independent auditing was also associated with higher composite ethical performance. The seven organizations subjected to external environmental, social, or traceability audits achieved a mean composite score of 75.46, while the five organizations without comparable independent assurance obtained a mean of 69.80. The difference was statistically significant, (U=33.00), (p=.015). Formal halal certification alone did not produce a comparable difference in environmental-circularity scores because every case maintained some form of halal-oriented control, while the scope and quality of sustainability assurance varied considerably.

**Table 4.** Exploratory Inferential Analysis of Ethical Performance

| Comparison | Group means | Statistical result | Significance | Interpretation |
|---|---|---|---|---|
| Digital chain of custody and governance transparency | 78.50 vs. 68.25 | (U=32.00) | (p=.004) | Significant difference |
| Digital chain of custody and composite ethical performance | 75.03 vs. 69.25 | (U=32.00) | (p=.008) | Significant difference |
| Independent auditing and composite ethical performance | 75.46 vs. 69.80 | (U=33.00) | (p=.015) | Significant difference |
| Digital chain of custody and environmental circularity | 72.63 vs. 68.75 | (U=26.00) | (p=.106) | Nonsignificant difference |

Correlation analysis showed that governance transparency was strongly and positively associated with composite ethical performance, ($r_s$=.841), (p<.001). Environmental circularity was strongly related to long-term value preservation, ($r_s$=.926), (p<.001), indicating that organizations reducing material loss and environmental burdens were also more likely to protect resources over extended periods. Social-justice performance was strongly associated with overall ethical performance, ($r_s$=.879), (p<.001). This relationship demonstrates that worker protection and benefit distribution were not peripheral concerns but important differentiators between basic circular compliance and ethically substantive practice.

The relationship between Sharīʿah-integrity scores and environmental-circularity scores was positive but statistically nonsignificant, ($r_s$=.298), (p=.347). Strong halal-assurance procedures did not automatically correspond with advanced circular or environmental performance. Several organizations maintained rigorous ingredient and contamination controls while continuing to depend on single-use packaging, resource-intensive processing, or weak waste recovery. The result confirms that halal compliance and circular sustainability are related ethical domains but require distinct institutional competencies, indicators, and assurance mechanisms.

Case A involved a Malaysian halal food processor that converted organic residues into animal-feed ingredients and anaerobic-digestion inputs. The company reused treated water for non-product-contact cleaning, reduced packaging weight, and maintained digital batch-level traceability from suppliers to recovered by-products. Halal officers, environmental personnel, and production managers jointly reviewed material transformations and potential contamination risks. The case achieved a composite ethical score of 78.80 and was classified as ethically substantive. Independent laboratory testing and external auditing supported most of its

environmental and halal-integrity claims, although the organization had not completed a comprehensive life-cycle assessment.

Case B involved a British packaging company using recycled polymers for secondary halal-food packaging, while Case C examined a traceability provider based in the United Arab Emirates. Case B reduced virgin-material use but relied on supplier declarations that provided incomplete information about previous material contact and informal-sector labour conditions. The practice received a composite score of 70.40 and was classified as conditionally acceptable. Case C developed a digital system linking halal certificates, supplier records, recycled-material batches, logistics events, and audit results. Its composite score reached 80.40, although the platform could not verify inaccurate information entered by suppliers or resolve ethical questions absent from certification standards.

**Table 5.** Comparative Results of Selected Organizational Cases

| Case | Principal circular practice | Ethical classification | Composite score | Main strength | Main limitation |
|---|---|---|---|---|---|
| Case A: Malaysian food processor | By-product valorization, water reuse, and packaging reduction | Ethically substantive | 78.80 | Integrated halal, environmental, and digital controls | Incomplete life-cycle assessment |
| Case B: British packaging company | Recycled polymer packaging | Conditionally acceptable | 70.40 | Reduced virgin-material consumption | Uncertain material history and labour traceability |
| Case C: UAE traceability provider | Digital chain-of-custody platform | Ethically substantive with qualifications | 80.40 | Strong visibility and document integration | Dependence on supplier data accuracy |

The strength of Case A resulted from institutional integration rather than from waste recovery alone. Organic residues were evaluated for lawful origin, safety, transformation, environmental benefit, and final use before entering a secondary value chain. Joint oversight reduced the separation between halal assurance and environmental management. Economic benefits supported the continuity of the program, while external verification reduced the risk that cost savings were presented as sufficient evidence of ethical performance. The remaining absence of full life-cycle analysis prevented the case from demonstrating whether all processing, transport, and substitution effects generated a net environmental benefit.

Case comparison shows that digital visibility and recycled content were enabling conditions rather than final indicators of ethical adequacy. Case B achieved material savings but could not fully demonstrate the purity, previous use, or social conditions associated with recycled polymers. Case C improved traceability by connecting fragmented records, yet its effectiveness depended on accurate data, agreed definitions, and credible audits. Technology made information easier to retrieve but could not determine whether a practice satisfied *ṭayyib* requirements, distributed benefits fairly, or prevented environmental harm.

The combined findings indicate that circular economy practices within halal industry networks become ethically substantive when material efficiency is integrated with Sharīʿah integrity, social justice, transparent governance, and long-term environmental responsibility. Waste diversion or recycled content alone did not provide sufficient evidence of ethical performance. Stronger cases verified the origin and transformation of materials, prevented

contamination, measured environmental results, protected affected stakeholders, and subjected organizational claims to independent scrutiny. Ethical circularity therefore depended on the quality of governance surrounding material circulation rather than on circulation itself.

The results should not be interpreted as evidence that existing halal certification systems are environmentally inadequate in every context. Halal certification and circular-economy assessment address partially different questions and possess different institutional histories. The evidence instead shows that procedural halal compliance cannot substitute for environmental and social evaluation when organizations make broader ethical claims (Karmaker et al., 2023; Sharma & Gupta, 2024). A credible halal circularity framework must preserve legal compliance while expanding accountability toward wholesomeness, harm prevention, justice, ecological stewardship, and intergenerational welfare.

The findings demonstrate that circular economy practices have begun to enter global halal industry networks, but their ethical depth remains uneven. Waste segregation, by-product valorization, packaging reduction, and water recovery were more widely adopted than industrial symbiosis, reusable packaging, reverse logistics, or circular product redesign. This pattern indicates that most organizations initially implemented circular practices that could reduce disposal costs or recover economic value without requiring fundamental changes to product design and supplier relationships. Circularity was consequently more visible at the operational level than at the level of business-model transformation.

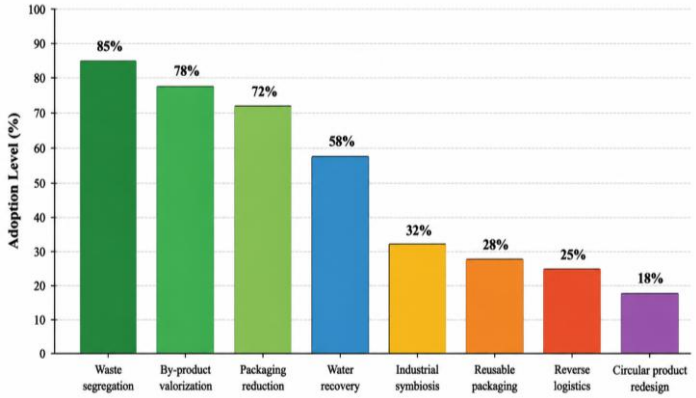


**Figure 1.** Adoption Circular Economy Practies in Global Halal Industry Networks

Sharīʿah integrity achieved the strongest average performance among the five ethical dimensions. Most organizations maintained established procedures for verifying ingredients, preventing contamination, protecting product safety, and documenting halal compliance. Environmental circularity and long-term value preservation produced moderate results, while social justice received the lowest average score. The imbalance reveals that organizations were generally more capable of demonstrating the lawful status of products than explaining how their circular practices affected workers, informal waste collectors, local communities, animals, ecosystems, and future generations.

Governance transparency emerged as a central differentiator of ethical performance. Organizations using integrated digital chain-of-custody systems achieved higher transparency and composite ethical scores than organizations relying on fragmented or manual records. Independent auditing was also associated with stronger overall performance (Chen et al., 2026; Sivaji et al., 2025). These relationships suggest that ethical circularity depends partly on whether organizations can trace recovered materials, document their transformations, verify supplier claims, and submit sustainability information to external examination. Technology and auditing did not independently guarantee ethical outcomes, but they strengthened the informational conditions required for accountability.

The comparative cases clarified the difference between circular activity and ethically substantive circularity. The Malaysian food processor combined by-product recovery, water

reuse, contamination control, digital traceability, and external verification, producing a more integrated ethical outcome. The British packaging company reduced its consumption of virgin polymers but could not fully verify previous material contact or labour conditions within the recycling chain. The Emirati traceability provider improved visibility across organizational boundaries, yet its system remained dependent on the quality of data entered by suppliers. Ethical performance consequently arose from the governance of material circulation rather than from material recirculation alone.

The strong performance of Sharīʿah integrity is consistent with research emphasizing that halal supply chains possess relatively developed procedures for ingredient verification, cleanliness, contamination prevention, certification, and traceability. Research on halal meat sustainability similarly identifies halal integrity, food safety, animal welfare, transparency, and *halalan ṭayyiban* as interrelated ethical requirements extending beyond the permissibility of ingredients. The present findings support this broader interpretation but show that such principles were not consistently extended to recycled inputs, waste-derived materials, labour arrangements, and environmental consequences.

The positive relationship between traceability and ethical performance corresponds with recent consumer-centred research showing that effective traceability systems can strengthen halal supply-chain compliance, sustainability practices, transparency, and consumer trust. The present study expands that relationship from consumer acceptance to organizational ethics by demonstrating how traceability can support the verification of recovered materials and circular claims. Its findings also impose an important limitation: traceability records the information supplied to a system but does not automatically establish that the information is complete, accurate, ethically relevant, or independently verified.

The weak social-justice performance resembles wider criticism of circular economy initiatives that prioritize resource efficiency while neglecting labour, participation, inequality, and environmental justice. Recent global analysis distinguishes weak circularity, which improves material productivity without transforming social relations, from stronger sustainability approaches that integrate ecological and distributive concerns. The present findings place this distinction within halal industry networks. Several organizations diverted waste or increased recycled content while providing little evidence concerning informal workers, community burdens, or the distribution of recovered economic value.

The association between digital traceability and governance transparency is also compatible with circular supply-chain research that presents blockchain as an enabling infrastructure for secure transactions, shared records, coordination, and stakeholder trust. The current study differs from technologically optimistic accounts by showing that digital systems had no statistically significant relationship with environmental-circularity performance. Digital records can reveal material movements and certification status, but they cannot independently reduce waste, redesign products, improve working conditions, or verify life-cycle benefits. Technological adoption must therefore be distinguished from substantive circular transformation (Amoozad Mahdiraji et al., 2026; Xie et al., 2026).

The gap between Sharīʿah integrity and environmental circularity signals institutional compartmentalization within the global halal economy. Halal-assurance departments, sustainability teams, procurement units, and waste managers often operate through different standards and reporting systems. Such separation enables an organization to maintain rigorous control over conventional ingredients while applying weaker procedures to recovered materials or environmental claims. Ethical integration requires these functions to evaluate the same material flow from lawful origin and product safety to ecological consequences and final disposition.

The low social-justice score signals that circular economy adoption can reproduce the limitations of conventional sustainability management. Material recovery may appear environmentally beneficial while depending on insecure employment, dangerous sorting

activities, low-paid subcontractors, or the transfer of waste-processing burdens to less powerful communities. Islamic ethical evaluation exposes this limitation because *ʿadl*, *amānah*, prevention of harm, and public welfare cannot be satisfied through resource efficiency alone. A circular system that preserves material value while externalizing human costs remains ethically incomplete.

The higher scores achieved by externally audited organizations signal a shift from declared responsibility toward verifiable responsibility. Corporate sustainability statements and halal commitments are relatively easy to communicate, while independent assurance requires organizations to disclose evidence, explain methodologies, and address inconsistencies. External audits can create stronger reporting discipline and reduce opportunities for selective disclosure. Audit presence should not be equated automatically with audit quality, since auditor independence, scope, competence, and access to supply-chain information determine whether assurance is credible.

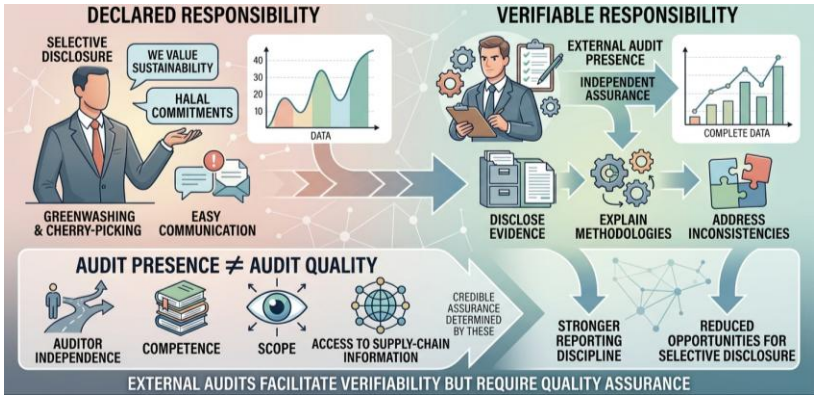


**Figure 2.** The Shift: From Declared to Verifiable Responsibility

The mixed results of digital traceability signal that information technology is becoming an important infrastructure of ethical governance without becoming a substitute for moral judgment. Digital systems can connect certificates, batch records, supplier identities, logistics events, recycled-material histories, and audit findings (Esfahbodi & Sunmola, 2026; Keramati et al., 2025). Ethical questions concerning exploitation, animal welfare, environmental harm, wholesomeness, and intergenerational justice still require substantive standards and accountable human interpretation. Immutable data remain ethically weak when the categories recorded by the system are narrow or when inaccurate inputs become permanently preserved.

The principal theoretical implication is that halal circularity should be conceptualized as an integrated ethical-governance system. Conventional circular economy indicators measure waste diversion, recycled content, resource productivity, or product-life extension, while halal assurance focuses on lawful origin, purity, processing, and contamination. The findings show that neither framework is sufficient in isolation. Ethical evaluation must connect Sharīʿah integrity, environmental performance, social justice, transparent governance, and long-term preservation of value across the complete material life cycle.

The managerial implication requires organizations to replace departmental separation with cross-functional oversight. Halal officers should participate in decisions concerning recycled materials, waste-derived ingredients, reusable packaging, and reverse logistics. Sustainability personnel should understand the implications of purity, transformation, contamination, and *ṭayyib* quality. Procurement, production, human-resource, and community-relations units should jointly evaluate suppliers because the ethical adequacy of circular practices depends on material origin, worker protection, environmental effects, and final use.

The certification implication concerns the need to broaden assurance beyond product permissibility without weakening the precision of halal law. Certification bodies could introduce complementary modules addressing recovered materials, circular packaging, waste

valorization, animal welfare, environmental claims, and responsible labour practices. Such development should distinguish mandatory halal requirements from broader ethical-performance categories so that legal status is not confused with voluntary sustainability excellence. Integrated standards could nevertheless reduce the institutional gap between a product being halal and a production network being socially and ecologically responsible.

The policy implication involves harmonizing circular-economy regulation, halal certification, consumer protection, waste law, and cross-border traceability. Differences in recycled-material standards, certification recognition, terminology, and data requirements can create uncertainty for global halal businesses. Regulators need shared rules concerning chain of custody, acceptable evidence, contamination risks, transformation processes, recycled content, and sustainability disclosure. Consumer-facing labels should also avoid implying comprehensive ethical superiority when only one dimension, such as halal certification or recyclability, has been independently verified.

The dominance of waste segregation and by-product recovery can be explained by organizational path dependence and economic accessibility. These practices can often be added to existing production systems without redesigning products, renegotiating extensive supplier networks, or changing consumer behaviour. Disposal savings and revenue from secondary materials also create immediate financial incentives. Reusable packaging, industrial symbiosis, and circular product redesign demand broader coordination, infrastructure, market acceptance, and long-term investment, making their adoption institutionally more difficult.

The strong Sharīʿah-integrity scores can be explained by the maturity and commercial importance of halal-assurance systems. Certification requirements, consumer expectations, reputational risks, and market-access conditions encourage organizations to document ingredients, segregate production, and prevent contamination (Bobylev et al., 2022; Delle Foglie & Keshminder, 2022). Comparable requirements for social justice, life-cycle impact, and intergenerational value are less standardized. Organizations consequently perform more strongly in areas supported by established rules, professional expertise, audit routines, and direct commercial consequences.

The limited relationship between digital traceability and environmental circularity can be explained by the difference between informational capability and operational capability. A traceability system can document where a material originated and how it moved through the supply chain. Environmental improvement requires changes in product design, production technology, energy sources, material selection, collection infrastructure, and end-market development. Organizations may possess excellent information about an environmentally weak process unless the information is used to support redesign and corrective action.

The association between independent audits and ethical performance may result from several mutually reinforcing mechanisms. Organizations willing to undergo external review may already possess stronger governance, greater resources, and more mature sustainability systems. Audit preparation can also improve data quality, clarify responsibilities, and expose weaknesses requiring correction. The cross-sectional design cannot establish whether auditing produced stronger ethics or whether ethically stronger organizations were more likely to commission audits. Causal claims would therefore exceed the available evidence.

The next institutional step should involve operationalizing the Halal Circularity Ethics Framework through sector-specific indicators. Food, pharmaceuticals, cosmetics, logistics, and packaging industries face different material risks and circular opportunities. Each sector requires measurable criteria for lawful origin, contamination control, waste prevention, resource recovery, worker welfare, environmental impact, stakeholder participation, and carbon or water performance. Score thresholds and weighting procedures should be developed transparently with participation from Sharīʿah scholars, scientists, industry representatives, workers, regulators, and affected communities.

The next technological step should focus on verified digital product passports and interoperable chain-of-custody systems. Traceability platforms should connect halal status with material composition, recycled content, transformation history, environmental data, labour assurance, audit findings, and end-of-life instructions. Independent sampling and physical testing remain necessary because digital records cannot verify every material claim by themselves. Small enterprises also require affordable participation models to prevent digital traceability from becoming a barrier that concentrates market access among larger corporations.

The next organizational step should prioritize social inclusion within circular supply chains. Companies need to map the workers and communities involved in collection, sorting, processing, logistics, and disposal rather than limiting analysis to direct employees. Supplier contracts should include occupational safety, fair remuneration, freedom from coercion, grievance mechanisms, and responsible treatment of informal workers. Community consultation should be conducted when waste-recovery facilities, animal-processing operations, or reverse-logistics centres create local environmental and social burdens.

The next research step should use longitudinal, cross-sectoral, and cross-national designs to test whether circular practices produce sustained ethical improvements. Larger samples could examine regulatory differences and allow multivariate analysis of the relationships among certification, traceability, auditing, organizational size, and ethical performance. Life-cycle assessment should be combined with Islamic ethical analysis to quantify environmental benefits without reducing moral evaluation to carbon or waste indicators. Future studies should also investigate rebound effects, greenwashing, recycled-material contamination, audit quality, labour conditions, consumer willingness to support ethical circularity, and conflicts between cost efficiency and *maqāṣid al-sharīʿah*.

## CONCLUSION

The most important finding of this study is that circular economy practices within global halal industry networks cannot be considered ethically adequate solely because they reduce waste, recover materials, or improve operational efficiency. Ethically substantive practices emerged only when environmental circularity was integrated with Sharīʿah integrity, social justice, transparent governance, and long-term value preservation. The findings also revealed that halal-assurance systems were generally more developed than mechanisms for evaluating labour conditions, community impacts, environmental burdens, and intergenerational welfare. Digital traceability and independent auditing strengthened accountability, yet neither mechanism could guarantee ethical performance when organizational standards, supplier data, or verification procedures remained incomplete.

The principal contribution of this research lies in the development of an integrated ethical perspective that conceptualizes halal circularity as a governance system rather than a combination of halal certification and waste-management practices. The proposed framework connects lawful material origin, purity, safety, resource efficiency, worker protection, environmental responsibility, auditability, and public welfare across the complete product life cycle. Its methodological contribution derives from the combination of comparative case studies, stakeholder interviews, organizational observations, document analysis, normative Islamic ethical assessment, and exploratory quantitative comparison. This integrated approach enables researchers to distinguish materially circular practices from practices that are also religiously legitimate, socially equitable, environmentally verifiable, and institutionally accountable.

The limitations of this study include its small purposively selected sample, restricted sectoral and geographical coverage, cross-sectional design, and partial dependence on organizational documents and self-reported information. The exploratory statistical relationships cannot establish causal effects, while differences in national regulations and

certification systems limit broad generalization. Several cases also lacked comprehensive life-cycle assessments, independent labour audits, and complete records concerning recovered-material origins. Future research should involve larger cross-national samples, longitudinal observation, sector-specific ethical indicators, and mixed-method analysis combining life-cycle assessment with Islamic ethical evaluation. Further investigation should examine recycled-material contamination, informal-sector labour, audit independence, digital data reliability, greenwashing, rebound effects, consumer trust, and tensions between commercial efficiency and the objectives of maqāṣid al-sharīʿah.

## DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this manuscript, the author(s) utilized Google Gemini solely for language translation and linguistic refinement purposes. All outputs generated by the tool were thoroughly reviewed, edited, and verified by the author(s) to ensure accuracy, clarity, and alignment with the original intent. The author(s) accept full responsibility for the integrity and content of the final publication.

## AUTHOR CONTRIBUTIONS

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

Author 2: Conceptualization; Data curation; In-vestigation.

Author 3: Data curation; Investigation.

## DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## REFERENCES

Adhiwibowo, W., Widayat, W., & Syafei, W. A. (2025). Design of dual blockchain-based with Point of Authority for halal traceability system application on fresh meat-based supply chain. Results in Engineering, 26, 105133. https://doi.org/https://doi.org/10.1016/j.rineng.2025.105133

Allison, A. L., Curtis O'Reilly, A., Abicht, A., Purkiss, D., Michie, S., Miodownik, M., & Lorencatto, F. (2026). Applying behavioural science to reduce plastic waste from diapers: a mixed-methods study. Cleaner and Responsible Consumption, 21, 100400. https://doi.org/https://doi.org/10.1016/j.clrc.2026.100400

Amoozad Mahdiraji, H., Arabi, H. S., Vrontis, D., & Pang, G. (2026). Exploring the Nexus of industry 4.0 on structural power and B2B marketing: A comprehensive approach to sustainability and competitive advantage. Industrial Marketing Management, 134, 220–245. https://doi.org/https://doi.org/10.1016/j.indmarman.2026.02.009

Anastasiadis, F., Manikas, I., Apostolidou, I., & Wahbeh, S. (2022). The role of traceability in end-to-end circular agri-food supply chains. Industrial Marketing Management, 104, 196–211. https://doi.org/https://doi.org/10.1016/j.indmarman.2022.04.021

Bai, Z., Su, R., Liang, Q., Yang, J., Sun, X., He, Q. S., Rashid, A., Liu, P., Zhang, A., & Ren, X. (2026). A systematic review of anti-skin-aging collagen peptides: from source preparation and activity evaluation to multi-target mechanisms. Food Bioscience, 79, 108743. https://doi.org/https://doi.org/10.1016/j.fbio.2026.108743

Bhamra, R., Hicks, C., Small, A., & García-Villarreal, E. (2022). Value, product delivery strategies and operational performance in the medical technology industry. International Journal of Production Economics, 245, 108399. https://doi.org/https://doi.org/10.1016/j.ijpe.2021.108399

Bobylev, N., Syrbe, R.-U., & Wende, W. (2022). Geosystem services in urban planning. Sustainable Cities and Society, 85, 104041. https://doi.org/https://doi.org/10.1016/j.scs.2022.104041

Bruhn, G. Ö., & Darendeli, T. (2026). The transforming spatial structure of İstanbul's historic shipyards: An investigation in terms of conservation, use, and sustainability. Frontiers of Architectural Research. https://doi.org/https://doi.org/10.1016/j.foar.2026.06.016

Chan, C. Y. R., & Zailani, S. (2024). Capabilities to create new value for business sustainability: a retailer case study from Malaysia. Benchmarking: An International Journal, 32(8), 3256–3307. https://doi.org/https://doi.org/10.1108/BIJ-07-2023-0499

Chen, Y., Wang, W., Zhou, G., Deveci, M., Kadry, S., & Coffman, D. (2026). Promoting circular supply chain in food sector: A decision framework for analysing the role of artificial intelligence-driven open innovation. Engineering Applications of Artificial Intelligence, 165, 113387. https://doi.org/https://doi.org/10.1016/j.engappai.2025.113387

Cruz, J. M. (2026). Multi-period, multi-blockchain optimization for risk-aware and sustainable supply chain networks. European Journal of Operational Research. https://doi.org/https://doi.org/10.1016/j.ejor.2026.02.032

Delle Foglie, A., & Keshminder, J. S. (2022). Challenges and opportunities of SRI sukuk toward financial system sustainability: a bibliometric and systematic literature review. International Journal of Emerging Markets, 19(10), 3202–3225. https://doi.org/https://doi.org/10.1108/IJOEM-04-2022-0601

Diraz, T. A., Mollah, M. M., & Tanvir Anzum, K. M. (2026). Decision support framework for assessing smart supply chain barriers in the context of I4.0: Implications for sustainability. Journal of Open Innovation: Technology, Market, and Complexity, 12(1), 100728. https://doi.org/https://doi.org/10.1016/j.joitmc.2026.100728

Esfahbodi, A., & Sunmola, H. O. (2026). Mediation effects in blockchain technology adoption for social sustainability: Pre- and post-adoption analysis of existing and future socially sustainable supply chains. International Journal of Production Economics, 292, 109868. https://doi.org/https://doi.org/10.1016/j.ijpe.2025.109868

Gadekar, R., Sarkar, B., & Gadekar, A. (2022). Investigating the relationship among Industry 4.0 drivers, adoption, risks reduction, and sustainable organizational performance in manufacturing industries: An empirical study. Sustainable Production and Consumption, 31, 670–692. https://doi.org/https://doi.org/10.1016/j.spc.2022.03.010

Halder, S., Rafiqul Islam, M., Mamun, Q., Mahboubi, A., Walsh, P., & Zahidul Islam, M. (2025). A comprehensive survey on AI-enabled secure social industrial Internet of Things in the agri-food supply chain. Smart Agricultural Technology, 11, 100902. https://doi.org/https://doi.org/10.1016/j.atech.2025.100902

Hosseini, S. E., Barati, A. A., Asadi, A., Bozorgi-Amiri, A., & Azadi, H. (2025). Smart agri-food supply chains during the 2020s: Mapping emerging trends, prevailing themes, and future directions. Sustainable Futures, 10, 101553. https://doi.org/https://doi.org/10.1016/j.sftr.2025.101553

Hwang, Y., Luo, A. (Angie), Li, W. (Wela), & Mattila, A. S. (2026). What matters most in upcycled foods? A conjoint analysis of consumer preferences across indulgent and healthy foods. Future Foods, 14, 101107. https://doi.org/https://doi.org/10.1016/j.fufo.2026.101107

Islam, M. M., & Hasan, M. M. (2026). Islamic marketing of conventional banks: bridging managers' and clients' perceived gaps. Journal of Islamic Accounting and Business Research, 17(4), 694–733. https://doi.org/https://doi.org/10.1108/JIABR-11-2023-0379

Kantamaturapoj, K., McGreevy, S. R., Thongplew, N., Akitsu, M., Vervoort, J., Mangnus, A., Ota, K., Rupprecht, C. D. D., Tamura, N., Spiegelberg, M., Kobayashi, M., Pongkijvorasin, S., & Wibulpolprasert, S. (2022). Constructing practice-oriented futures

for sustainable urban food policy in Bangkok. Futures, 139, 102949. https://doi.org/https://doi.org/10.1016/j.futures.2022.102949

Karmaker, C. L., Aziz, R. Al, Ahmed, T., Misbauddin, S. M., & Moktadir, M. A. (2023). Impact of industry 4.0 technologies on sustainable supply chain performance: The mediating role of green supply chain management practices and circular economy. Journal of Cleaner Production, 419, 138249. https://doi.org/https://doi.org/10.1016/j.jclepro.2023.138249

Keramati, A., Siau, B., Bellitto, T., Heydari, J., & Panchal, T. (2025). Blockchains effects on responsiveness to recalls in the food and beverage industry. Journal of Economy and Technology, 3, 283–298. https://doi.org/https://doi.org/10.1016/j.ject.2025.05.001

Kusumawardhany, P. A., Baihaqi, I., & Karningsih, P. D. (2025). Frugal innovation framework for micro-entrepreneurs' sustainable performance: From design thinking approach. Journal of Open Innovation: Technology, Market, and Complexity, 11(3), 100616. https://doi.org/https://doi.org/10.1016/j.joitmc.2025.100616

Leal Filho, W., Wall, T., Williams, K., Dinis, M. A. P., Fernandez Martin, R. M., Mazhar, M., & Gatto, A. (2025). European sustainability reporting standards: An assessment of requirements and preparedness of EU companies. Journal of Environmental Management, 380, 125008. https://doi.org/https://doi.org/10.1016/j.jenvman.2025.125008

Moatari-Kazerouni, A., Antonucci, Y. L., & Kirchmer, M. (2025). Unraveling the resilience strategies for supply chain network designs. Supply Chain Management: An International Journal, 30(2), 263–282. https://doi.org/https://doi.org/10.1108/SCM-10-2024-0676

Mubarak, M. F., Ghobakhloo, M., Evans, R., Jucevicius, G., Prestianawati, S. A., & Mubarik, M. (2024). Metaverse adoption in the manufacturing industry: impact on social and environmental sustainability performance. Asia-Pacific Journal of Business Administration, 17(4), 915–934. https://doi.org/https://doi.org/10.1108/APJBA-02-2024-0043

Petrescu-Mag, R. M., Petrescu-Mag, I. V., Petrescu, D. C., Ginsca, C., & Pistea, I. (2025). Mapping the research landscape of meat replacers in Romania: A bibliometric analysis and a cross-cluster synergy model of emerging trends. Future Foods, 11, 100619. https://doi.org/https://doi.org/10.1016/j.fufo.2025.100619

Petrolo, D., Fakhar Manesh, M., Pellegrini, M. M., & Flamini, G. (2022). Agri-food entrepreneurship. Harvesting, growing and reseeding the orchard through a bibliometric study. British Food Journal, 124(7), 2396–2426. https://doi.org/https://doi.org/10.1108/BFJ-08-2021-0954

Piñeiro-Chousa, J., López-Cabarcos, M. Á., Quiñoá-Piñeiro, L., & Pérez-Pico, A. M. (2022). US biopharmaceutical companies' stock market reaction to the COVID-19 pandemic. Understanding the concept of the 'paradoxical spiral' from a sustainability perspective. Technological Forecasting and Social Change, 175, 121365. https://doi.org/https://doi.org/10.1016/j.techfore.2021.121365

Rashid, A., Rasheed, R., Ngah, A. H., & Amirah, N. A. (2024). Unleashing the power of cloud adoption and artificial intelligence in optimizing resilience and sustainable manufacturing supply chain in the USA. Journal of Manufacturing Technology Management, 35(7), 1329–1353. https://doi.org/https://doi.org/10.1108/JMTM-02-2024-0080

Rubiconto, F., Vink, M., van der Vlist, M. D., Lens, L. A., & Wensing, J. (2026). Circular cities: Exploring motives and barriers to citizen engagement in circular food behaviors. Regional Science Policy & Practice, 18(6), 100312. https://doi.org/https://doi.org/10.1016/j.rspp.2026.100312

Schiaroli, V., Alvino, L., Verdonk, E., Dangelico, R. M., & Fraccascia, L. (2025). Sustainability across Borders: which factors influence sustainable footwear Choices? An

empirical study on Italian and Dutch consumers. Journal of Cleaner Production, 521, 146133. https://doi.org/https://doi.org/10.1016/j.jclepro.2025.146133

Schlüter, L., Mortensen, L., Drustrup, R., Gjerding, A. N., Kørnøv, L., & Lyhne, I. (2022). Uncovering the role of the industrial symbiosis facilitator in literature and practice in Nordic countries: An action-skill framework. Journal of Cleaner Production, 379, 134652. https://doi.org/https://doi.org/10.1016/j.jclepro.2022.134652

Secinaro, S., Calandra, D., Lanzalonga, F., & Ferraris, A. (2022). Electric vehicles' consumer behaviours: Mapping the field and providing a research agenda. Journal of Business Research, 150, 399–416. https://doi.org/https://doi.org/10.1016/j.jbusres.2022.06.011

Sharma, R., & Gupta, H. (2024). Leveraging cognitive digital twins in industry 5.0 for achieving sustainable development goal 9: An exploration of inclusive and sustainable industrialization strategies. Journal of Cleaner Production, 448, 141364. https://doi.org/https://doi.org/10.1016/j.jclepro.2024.141364

Sivaji, S., Gunasekaran, S., Saengrayap, R., Mahajan, P., Trongsatitkul, T., Wu, D., Vadakkan, K., Sukrong, S., & Chaiwong, S. (2025). Response surface methodology in postharvest and food technology research: A bibliometric assessment. Applied Food Research, 5(2), 101461. https://doi.org/https://doi.org/10.1016/j.afres.2025.101461

Son, B.-G., M. De Menezes, L., Kim, S., Leiras, A., & Ruel, S. (2026). On sustainable operations and supply chain management: has the debate on diversity, equity and inclusion been settled. International Journal of Operations & Production Management, 46(3), 341–366. https://doi.org/https://doi.org/10.1108/IJOPM-09-2025-0883

Thongsri, N. (2026). From waste to data: a strategic foresight study using an integrated UTAUT–TTF model. Foresight, 28(1), 81–98. https://doi.org/https://doi.org/10.1108/FS-09-2025-0215

Van Opstal, W., Bocken, N., & Brusselaers, J. (2025). Cooperating for circularity? Perspectives of citizen energy cooperative members on circular solar business models. Journal of Cleaner Production, 487, 144653. https://doi.org/https://doi.org/10.1016/j.jclepro.2025.144653

Xiao, Y., Xiang, R., Sun, Y., Chen, J., & Hao, Y. (2025). Digital disruption, knowledge and collaborative networks and green innovation in China manufacturing transformation. Technological Forecasting and Social Change, 216, 124120. https://doi.org/https://doi.org/10.1016/j.techfore.2025.124120

Xie, K., Machado, M. R., Spierdijk, L., & Yazan, D. M. (2026). Financing circularity strategies in critical raw materials supply chains: Toward a novel blended framework. Resources Policy, 112, 105811. https://doi.org/https://doi.org/10.1016/j.resourpol.2025.105811

Yazdani, M., Torkayesh, A. E., Chatterjee, P., Fallahpour, A., Montero-Simo, M. J., Araque-Padilla, R. A., & Wong, K. Y. (2022). A fuzzy group decision-making model to measure resiliency in a food supply chain: A case study in Spain. Socio-Economic Planning Sciences, 82, 101257. https://doi.org/https://doi.org/10.1016/j.seps.2022.101257

Yousefi, S., & Tosarkani, B. M. (2025). Unlocking blockchain's potential for supply chain transformation: A robust system analysis for enhanced strategic performance. Technological Forecasting and Social Change, 218, 124216. https://doi.org/https://doi.org/10.1016/j.techfore.2025.124216