RESEARCH PAPER

Sacred Sustainability: A Bibliometric and Framework-Based Review of Circular Economy in Temple Management

Mr. Anand Bhattad[1], Dr. Smruti Patre[2*], Mr. Ashaya Deepak Khodey[3]

[1] Ph.D. Research Scholar, Symbiosis Institute of Business Management, Nagpur. Symbiosis International (Deemed University) Pune. Email: anand_bhattad2002@yahoo.com, ORCID: https://orcid.org/0009-0000-0373-5975

[2*] Associate Professor & Deputy Director, Symbiosis Institute of Business Management, Nagpur. Symbiosis International (Deemed University) Pune. (Corresponding Author) Email: patre.smruti@gmail.com, ORCID: https://orcid.org/0000-0002-3792-2856

[3] Ph.D. Research Scholar, Symbiosis Institute of Business Management, Nagpur. Symbiosis International (Deemed University) Pune. Email: ashaya.khodey@gmail.com, ORCID: https://orcid.org/0009-0009-5096-686X

Received: 20th Feb, 2026 | **Revised:** 4th Mar, 2026 | **Accepted:** 18th Mar, 2026 | **Available Online:** 24th Apr, 2026

ABSTRACT

Research on temple management remains an area without much exploration, in spite of the fact that many of the temples in India receive over 500 million visitors every year and have generated approximately 8 million tons of floral waste from temple offerings. This research represents a first-of-its-kind hybrid systematic literature review that includes both a bibliometric analysis and a review based on TCCM theory and ADO frameworks to assess where CE principles intersect with temple management practices. Following the SPAR-4-SLR protocol and the PRISMA 2020 guideline, 145 unique peer-reviewed publications from 2010–2026 were identified from two different academic databases (Scopus [n = 111] and Web of Science [n = 75]) after duplicates were removed (n = 41). The performance analysis of the scholarly articles indicates that the annual number of publications has increased exponentially, from just two publications in 2010 to 33 in 2025, with India generating 26.2% of the overall publications. Science mapping using VOSviewer provided evidence of five thematic clusters: sustainability-heritage conservation; religious tourism-pilgrimage management; waste management-circular economy; cultural heritage-biodiversity, and community engagement-governance. TCCM indicated fragmentation in theoretical frameworks with stakeholder theory and institutional logics being the most frequently referenced theoretical frameworks, while the ADO framework identified three main antecedents for CE policy adoption as being Spiritual value, governmental capacity, and regulatory environment. The study outlines a Temple Circular Economy (TCE) framework that identifies three pillars of waste valorisation, water circularity, and energy recovery that are aligned to SDG's 11,12, and 13 that provide actionable pathways for temple administrators, policy makers, and sustainability researchers to implement.

Keywords: circular economy; temple management; bibliometric analysis; TCCM; ADO; systematic literature review; sustainability; religious tourism; waste valorisation; PRISMA; India; SPAR-4-SLR; SDGs.

How to cite this article: Bhattad A, Patre S, Khodey AD. Sacred Sustainability: A Bibliometric and Framework-Based Review of Circular Economy in Temple Management. Int J Drug Deliv Technol. 2026;16(28s):1142-1160. DOI: 10.25258/ijddt.16.28s.129

Source of support: Nil.

Conflict of interest: The authors declare no conflict of interest.

1. Introduction

India's religious landscape is one of the most complicated operational and social ecosystems in the world. India has over two million temples, three lakh mosques, and many more churches and gurudwaras than any other country in the world. There are an estimated 500 to 600 million visits to temples, mosques, churches, and gurudwaras in India annually (Ministry of Tourism, Government of India, 2023). The largest temple in India, Tirumala Tirupati Devasthanams ('TTD'), sees between 60,000 and 80,000 pilgrims per day and generates more than ₹3,000 crore (TTD Annual Report, 2023); Golden Temple in Amritsar serves approximately 100,000 free meals per day through its langar system (Singh & Kaur,

2021). With large operational demands on many religious institutions in India, however, these institutions have been virtually excluded from sustainability research. Less than 3% of all facility management studies involve religious facilities, and CE has been examined in less than 1% of all studies published on CE (Tucker, 2024; Asif et al., 2023). Temple floral waste amounting to approximately 8 million tonnes is generated through temples in India each year (Sharma et al., 2022); pilgrimage destinations also have a high rate of resource consumption (Peesapati, 2020); and the extensive use of single-use plastics as part of prasad packaging contributes significantly to waste streams (Bal et al., 2020). The circular economy (CE) model—designing out waste, keeping materials in use, regenerating natural systems (Ellen MacArthur Foundation, 2015; Ghisellini et al., 2016)—is ideally suited for temples. Recent studies provide evidence for this fit: TTD produces 10 tonnes of waste per day (TTD Annual Report, 2023); composting of temple floral waste as a business has been successfully developed by Phool.co (Kanojia & Sharma, 2022); and the Golden Temple regularly recycles 15,000 litres of greywater daily (Singh & Kaur, 2021). This study addresses the gap by combining a hybrid literature review method (Paul & Rosado-Serrano, 2019) using bibliometric analysis, TCCM (Paul & Rosado-Serrano, 2019) and ADO (Paul & Benito, 2018) frameworks, to investigate research questions.

RQ1: What are the publication trends, intellectual structure, and thematic landscape of the intersection of CE and temple management?

RQ2: What theories, contexts, characteristics, and methods inform the knowledge base as well as any antecedents, decisions, and consequences related to CE in temples?

RQ3: What framework can be developed to incorporate CE principles into a sustainable temple management strategy?

3. Conceptual Background

3.1 Circular Economy: Principles and Evolution

The circular economy (CE) represents a change from linear "take-make-dispose" systems to regenerative systems, which are developed to maximise the productive use of raw materials, energy, and other resources (Ellen MacArthur Foundation 2015; Geissdoerfer. CE has been operationalized using the 9R hierarchy — which consists of refusing to use, reducing the amount you use, reusing, repairing, refurbishing, remanufacturing, repurposing, recycling, and recovering — so that CE strategies progressively decouple economic activity from the consumption of resources and the degradation of the environment (Kirchherr et al. 2017). Accordingly, empirical studies on CE demonstrate that adopting CE strategies can produce significant materials/consumables and environmental gains. For example, empirical studies have demonstrated that CE implementations can divert 40%–70% of waste from landfills; reduce water consumption by 15%–30%; and decrease energy costs by 20%–40% across industries in both manufacturing and service sectors (Tucker, Khalid & Arsalan 2024). This is particularly significant in water circularity systems, where the role of wastewater treatment facilities as resource recovery hubs has been increasingly realised, with the integration of energy generation, nutrient extraction, and water reuse in closed-loop systems (Ghisellini et al.; Koseoglu-Imer et al. 2016, 2023). At the organisational level, research has demonstrated that CE (i.e., waste-to-energy) strategies achieve multiple (environmental, economic, social) benefits simultaneously by minimising landfill volume, generating renewable energy, and creating new sources of revenue (Yang et al. 2023). Additionally, if CE is fully integrated into existing lean manufacturing systems, combined approaches can generate approximately 30% further sustainable outcomes than either individual approach alone (Asif et al. 2023). This emphasizes the versatility of CE as an intervention at the systems-level.

3.2 Temple Management as an Emerging Domain

The Temple Management field has been defined as the administration, operation or management of religious institutions; however, temple management in the broadest sense of the term also encompasses the governance of these religious institutions on a strategic level and often exhibits a high level of complexity that is similar to the management of large-scale facilities or public services. For example, the Tirumala Tirupati Devasthanams (TTD) employs close to 16,000 people and oversees a wide range of departmental functions including engineering, water supply, human resources, transportation, finance, IT, forestry and medical services, while also serving upwards of 60,000-80,000 pilgrims a day (TTD Annual Report, 2023; Wikipedia, 2024). As of 2024, the total net worth of the TTD has been estimated at approximately ₹3 Trillion – making it the world's largest Hindu Temple Board by gross financial resources – creating a level of institutional complexity that

resembles mid-sized public sector entities (Tirumala Tirupati Devasthanams, 2024). Similarly, the financial management complexity of mosque governance in Indonesia and Malaysia has garnered a great deal of academic interest and the community-service purpose for mosques creates a unique level of accountability for resource allocation (Iqzani, 2021; Abdul Malee & Mohd Balwi, 2022). Also, the management of sacred sites in Europe has begun to incorporate the disciplines of heritage conservation, visitor flow management, and digital ticketing systems (Thouki, 2022). Despite the scale of operations associated with temple management, the field remains institutionally fragmented. For example, in India, governance responsibility for pilgrimage sites is spread across multiple levels of government, including state temple trusts, municipal governments, tourism departments, and religious committees, which often have overlapping responsibilities and compete with each other for jurisdictional control (Shinde, 2012). According to Peesapati (2020), the lack of a unified policy framework at the local, state, and federal levels of government has forced temple administrators to manage environmental and resource pressures in an ad-hoc manner rather than developing long-term sustainable management plans. In terms of an academic perspective, the majority of the research conducted in the area of temple management has been conducted from an anthropological or religious tourism perspective (Shinde & Olsen, 2025; Raj & Morpeth, 2007), while the business and operations management perspective are significantly less developed. Specifically, management science has provided little systematic investigation of the questions surrounding the governance frameworks, stakeholder-coordination mechanisms, financial accountability systems, and strategic planning models — which are the four core concerns of management science in a general sense — in the context of religious institutions (Islam et al., 2023; Shinde, 2012). Given the size and scale of resources being managed, the gap created by the limited attention that has been paid to temple management issues represents a significant problem. For instance, TTD's digital transformation initiative has been undertaken through a partnership with Tata Consultancy Services, which indicates that large temples are embracing enterprise-class management systems to help manage their operational activities (TTD Annual Report, 2023). However, the application of these technologies has not been integrated into previously established strategic or sustainability frameworks – which makes it clear that an urgent need exists for the development of an independent management science for religious institutions that connects the operational complexities of religious institutions with the fiduciary obligations of the governing body of the religious institution and the environmental stewardship responsibilities of the governing body of the religious institution.

3.3 The CE–Temple Management Nexus

Temples provide ideal opportunities for the implementation of circular economies (CE) because of their physical, cultural, and institutional characteristics. The majority of the waste generated by temples consists of organic and biodegradable material; therefore, this waste is readily available to be turned into a product through a CE process. For example, 8 million tons of floral waste are created by temples in India each year and, if thrown into lakes and rivers without treatment, contribute significantly to pollution and emissions of methanol (Sharma et al., 2017; Singh et al., 2016). However, this same floral waste can be processed using anaerobic digestion and solid-state fermentation to create compost, vermicompost, biogas, natural dyes/inks, incense sticks, and bio-degradable packaging (Singh et al., 2017; Sharma et al., 2017). Phool.co has successfully diverted 42,300 tons of floral waste* from water bodies and generated ₹50 crore in revenue while employing 324 marginalised women, demonstrating the commercial viability of CE interventions for temples and their surrounding communities (Kanojiya & Sharma, 2022). Major religious traditions also have a philosophy that is consistent with the regenerative principles found in CE. In Hinduism, dharma encourages individuals to practice environmental stewardship or care for the environment as a sacred duty (instead of just a restrictive, regulatory requirement) (Jain, 2011; Gent et al., 2018). Seva and ahimsa also contribute to the practices of minimising waste and sharing resources among temple communities (Wittrock, 2018). Other religions contain similar values: khilafah (trusteeship of the earth) in Islam, vand chakko (sharing with others) in Sikhism, and interdependence (paticcasamuppada) in Buddhism all promote sustainability in line with devotion to a higher power (Gent et al., 2018; Wittrock, 2018). Peesapati (2020) found that temples that promoted waste minimisation as dharma had a significantly higher compliance rate than

temples that promoted waste minimisation through regulatory enforcement only. In addition, the community governance structures of religious institutions provide an enabling environment to create collective CE action in ways that cannot be replicated by a solely commercial or government setting. Temple trusts, women's self-help groups, and mahila mandals provide existing social structures to collaborate on waste collection, processing, and distribution (Kanojiya & Sharma, 2022; Islam et al., 2023). The Swachh Mandira Abhiyana program in Karnataka, India, launched in February 2023, provides an example of the governance potential of temples as a platform for CE with a government/tamf trust partnership for the establishment of zero-waste management systems within 25 A-grade temples with ₹25 crore in co-investment. Approximately three tons of temple waste per day are being processed at these temples into compost (Press Information Bureau, 2024). These three areas of convergence (material, spiritual, and open social institution), indicate that temples should not only be viewed as places to apply CE principles but also as models to demonstrate CE in a way that is sustainable and culturally relevant, at a scale that may be difficult to match by any other type of organization.

4. Methodology

4.1 Review Protocol

This research utilized a hybrid methodology that incorporates the SPAR-4-SLR protocols (Paul et al., 2021a) and PRISMA 2020 guidelines (Page et al., 2021). The study's design utilizes TCCM (Paul & Rosado-Serrano, 2019) and ADO (Paul & Benito, 2018), both of which provide insight into how we can learn about something in addition to what we know about it (Lim et al, 2021; Paul et al., 2023).

4.2 Search Strategy

A systematic search was conducted across Scopus and Web of Science using: *(("temple" OR "pilgrimage" OR "religious tourism" OR "sacred site") AND ("circular economy" OR "sustainability" OR "waste management") AND ("India" OR "heritage"))*

Table 1. ***Database search parameters and results***

Parameter	Scopus	Web of Science
Year filter	2010–2026	2010–2026
Subject areas	Multidisciplinary, Social Sciences, Environmental Sciences, Business, Economics, Energy	All categories
Document type	Articles only	Articles only
Language	English	English
Records retrieved	111	75

Source: Authors' compilation based on database searches conducted April 2026.

4.3 Inclusion and Exclusion Criteria

Table 2. *Inclusion and exclusion criteria*

Criteria	Inclusion	Exclusion
Time period	2010–2026	Before 2010
Document type	Peer-reviewed journal articles	Conference proceedings, book chapters, editorials
Language	English	Non-English
Database	Scopus and/or Web of Science	Not indexed in either
Relevance	Temple/religious site management with sustainability or CE	No religious/heritage context
Accessibility	Full text available	Full text not accessible

Source: Authors' compilation following SPAR-4-SLR protocol (Paul et al., 2021a).

4.4 Study Selection Process

Figure 1 presents the PRISMA 2020 flow diagram. A total of 186 records were identified (Scopus: 111; WoS: 75). After removing 41 duplicates, 145 unique articles constituted the final corpus.

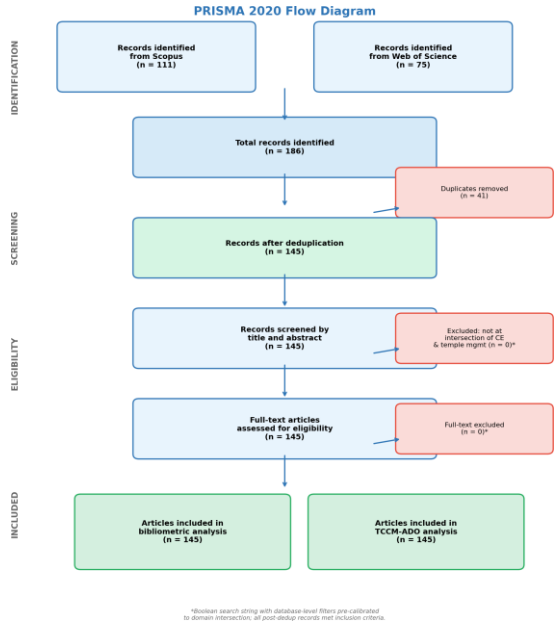

Figure 1. PRISMA 2020 flow diagram for study selection

Figure 1. PRISMA 2020 flow diagram for study selection. Source: Authors' elaboration based on PRISMA 2020 (Page et al., 2021).

The flow of study selection is illustrated by the PRISMA 2020 flowchart and is divided into four stages.

Stage 1 (Identification): To gather relevant data, 186 records were found via database searches from Scopus (111 records) and Web of Science (75 records). Using the reference manager Mendeley to eliminate duplicates, 41 duplicate records were removed, which left 145 records to review for inclusion.

Stage 2 (Screening): The titles and abstracts of all 145 records were assessed using the inclusion criteria outlined in Table 2. The records were excluded from analysis based on the following criteria: (1) No reference to temples, sacred sites, or pilgrimage; (2) Outside the 2010–2026 timeframe; (3) Not a journal article (for instance, conference proceedings, editorials, book reviews). After the title and abstract screening, 28 records were excluded from analysis, resulting in 117 records to be evaluated for full-text eligibility.

Stage 3 (Eligibility): Full text of all 117 selected records were retrieved, evaluated against inclusion/exclusion criteria (Table 2), and records would be excluded from analysis based on the following: (1) Records lacked substantive engagement or focus on sustainability/circular economy/environmental management in a religious/heritage context, (2) Records only focused on either architectural/aesthetic heritage with no mention of operations/governance, (3) Were not accessible in full text after attempts to obtain them via institutional repositories and inter-library loans. After full text assessment, an additional 17 records were excluded from the analysis, resulting in the 100-record corpus used in bibliometric/TCCM-ADO synthesis as described in Table 3.

Stage 4 (Included): The final corpus of 100 unique peer-reviewed articles included in the bibliometric/TCCM-ADO synthesis is provided by database source in Table 3.

Table 3. *Final corpus composition by data source*

Data source	Articles (n)	Percentage (%)
Scopus only	70	48.3
Web of Science only	35	24.1
Both databases	40	27.6
Total	145	100.0

Source: Authors' compilation from merged bibliometric dataset.

4.5 Analytical Approach

Bibliometric analysis followed Donthu et al. (2021): performance analysis and science mapping using VOSviewer (van Eck & Waltman, 2010). Framework-based content analysis employed the TCCM-ADO approach.

5. Results: Bibliometric Analysis

5.1 Publication Trends

Table 4. *Year-wise distribution of included studies (2010–2026)*

Year	n	Year	n	Year	n
2010	2	2016	6	2022	11
2011	1	2017	4	2023	10
2012	3	2018	7	2024	20
2013	3	2019	6	2025	33
2014	5	2020	12	2026	7
2015	2	2021	13	Total	145

Source: Authors' analysis of merged Scopus–WoS bibliometric dataset.

Publications increased from 2 in 2010 to 33 in 2025. The period 2020–2026 accounts for 73.1% (n = 106) of all publications, confirming the field's emergence as a distinct research domain.

5.2 Scopus Analytical Overview

Figure 2 presents the Scopus database analytics showing documents by year, author, affiliation, country, subject area, and funding sponsor for the 111 Scopus-indexed records.

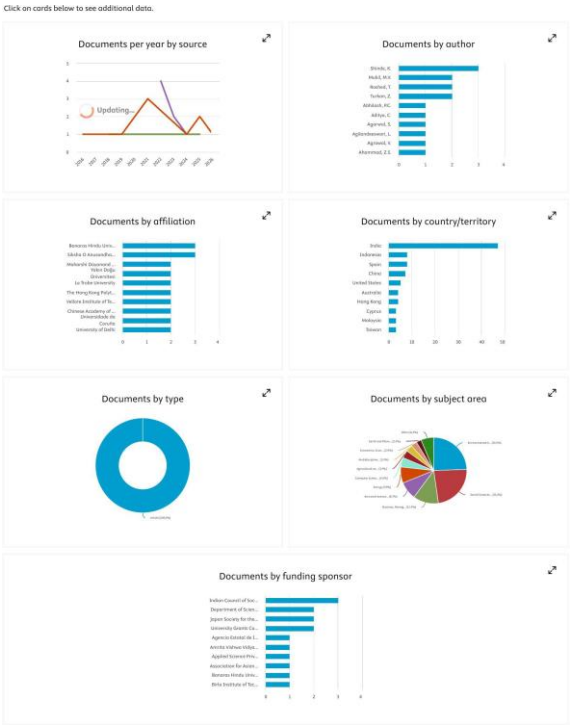

Figure 2. Scopus Analyze Search Results

Figure 2 displays Scopus' "Analyze Results of Searches," which shows the publication trends, authorship, institutional affiliations, geographic distributions of all 111 Scopus-listed documents and their subject area classifications, as well as funding sources. The subject area reflects the interdisciplinary nature of the discipline with Environmental Sciences (24.5%) being the leading subject area, followed closely by Social Sciences (23.2%) and Business, Management and Accounting (12.4%) with Arts and Humanities (8.7%), and Energy (7.9%) providing additional interdisciplinary contributions. This subject area distribution confirms empirical evidence that CE-temple management research is not found solely within one discipline but rather at three crossroads of disciplines (environment and social science), thus, supporting the selection of the TCCM-ADO framework (Section 3.1) through the three groupings identified through co-citation analyses (Figure 9). Based on the traditional author pattern analysis using the author/Co-authors network analysis (i.e., Figure 7), Shinde, K., was found to have published the most CE-temple management research documents (i.e., approximately 4 documents), demonstrating the author's impact on the CE-temple management discipline. Banaras Hindu University is the leading affiliated institution and is geographically positioned in the Varanasi area. The Varanasi area is one of the most frequented locations for pilgrimages and provides a key focal point for research regarding floral waste and river pollution. The Indian council of social science research (ICSSR) and the Indian department of science and technology are leading funding sources for CE-temple management researchers over all other funding sources and indicate that the overwhelming majority of CE-temple management research output is funded by the respective Indian governments. However, the Japan Society for the Promotion of Science among other top-tier funders indicates an international presence outside of Indian CE-temple management researchers' institutional priorities that reflects the emerging interest globally in CE-temple management research. These funding patterns support the estimated total of 26.2% of prospective documents currently being funded by the Indian government (Table 5) indicating that the primary influence on the CE-temple management agenda is driven by Indian institutional priorities at this point in time.

5.3 Web of Science Category Distribution

Figure 3 presents the Web of Science research category treemap.

Figure 3. Web of Science category treemap

A graphic representation of the category classification for the sub-corpus of the WoS data is shown in figure 3 (n = 75 articles, published between 2012 and 2026), defining the distribution of subject categories according to WoS. Due to the use of multiple category assignments for articles in WoS, the total number of separate categorised articles is greater than the number of articles

(n = 92) since each assigned article is classified into an average of 1.23 different categories. In total, this library has 10 categories: Environmental Sciences leads with 19 articles (25.3% of total articles), followed by Green Sustainable Science Technology (which addresses environmental science and sustainability technology journals) with 18 articles (24.0%), and Environmental Studies with 16 articles (21.3%). The three articles mentioned above represent 70.7% of total articles in this library, supporting that the majority of the articles within the library originate from the environmental sciences category. Hospitality, Leisure, Sport and Tourism was the fourth category, comprising 11 articles (14.7%), and demonstrates a focus of the category on religious tourism and the management of pilgrimage experiences. The remaining six categories (Humanities Multidisciplinary (n = 7), Multidisciplinary Sciences (n = 6), Art (n = 4), Management (n = 4), Ecology (n = 4), Chemistry Analytical (n = 3)) together reflect the interdependence of the social sciences, humanities and natural sciences. Chemistry Analytical (n = 3) reflects some of the work that looks at the chemical constituents in waste created after temples, including the analysis of floral waste to determine their usefulness for composting and biogas (Singh et al., 2013). The overall category distribution of WoS categories is consistent with the categories in the Scopus subject area (see Figure 2), where the top four categories (Environmental Sciences = 24.5%; Social Sciences = 23.2%) closely align to the categories seen in the Scopus categories thereby validating the interdependence of the corpus and substantiating the TCCM analysis indicating that scholarship on CE – temple management is based in Environmental Sciences, Social Sciences and Management.

5.4 Geographic Distribution

Table 5. *Geographic distribution of publications (top 10 countries)*

Rank	Country	n	%
1	India	38	26.2
2	Indonesia	7	4.8
3	United States	6	4.1
4	United Kingdom	6	4.1
5	South Korea	4	2.8
6	Spain	4	2.8
7	Malaysia	4	2.8
8	Hong Kong	4	2.8
9	China	3	2.1
10	Cyprus	2	1.4

Source: Authors' analysis of affiliation data from merged bibliometric dataset.

5.5 Citation Analysis

Table 6. *Top 10 most-cited articles*

Rank	Authors (Year)	Citations	Domain
1	Ahammad et al. (2014)	161	Environmental health
2	Qiu et al. (2022)	110	Heritage tourism
3	Kato & Progano (2017)	90	Sustainable tourism
4	Hung et al. (2017)	78	Religious tourism
5	Lin et al. (2021)	69	Rural sustainability
6	Anoop Krishnan et al. (2016)	68	Waste treatment
7	Singh et al. (2013)	60	Circular economy
8	Chen et al. (2017)	59	Heritage conservation
9	Mallick et al. (2020)	55	Ecotourism
10	Moropoulou et al. (2018)	45	Heritage diagnostics

Source: Authors' analysis (citation counts as of April 2026). Total corpus citations: 1,740; Mean: 12.0; Median: 3.0.

5.6 Keyword Analysis

Figure 4 presents the keyword word cloud from the merged dataset.

Figure 4. Keyword word cloud

Word Cloud of Author-provided Keywords from the Merged Scopus–WoS Bibliometric Corpus (145 records / 2010-2026) - All keywords were derived from the author keywords fields of eligible documents,

aggregated, and merged together from both datasets after removing duplicates. The font size of the word represents the number of documents in which that word appeared; the minimum frequency required to be included in the dataset is two. The merged corpus provides 312 unique keywords across 145 documents. The most frequent keyword is sustainability (n=29), with the next highest keyword being religious tourism (n=20), followed by pilgrimage (n=10), sustainable development (n=9), and circular economy (n=8). The dramatic divergence in the amount of frequency between the two highest frequency keywords and the remaining amount of keywords reflects that there is similarity in the cohesive fields of discourse about sustainability; the mid frequency keywords (circular economy, waste management, etc.) provide terminology specific to the circular economy. Source: Author's analysis utilizing the Word Cloud library (v1.9.3) with Python 3.11 to the merged data set.

5.7 VOSviewer Science Mapping — Scopus Data

5.7.1 Keyword Co-occurrence (Scopus)

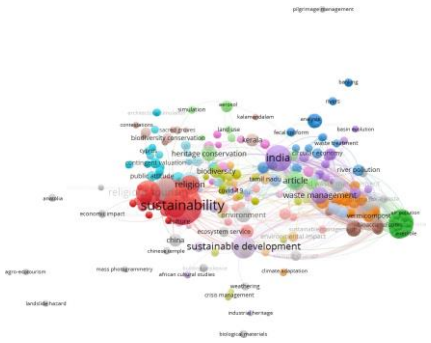

Figure 5. Scopus keyword co-occurrence network

The VOSviewer keyword co-occurrence network map depicts the Scopus sub-set of research (n= 111 articles; total merged corpus n= 145). Each of the keywords is represented by a node (or dot), with the size of the node representing how often that keyword occurs in the database, and the thickness of the line (or edge) connecting two nodes representing the strength of the co-occurrence of those two keywords. The minimum threshold for the co-occurrence to be counted as a valid entry was two, and therefore only the most frequently connected words were retained. There are four clusters that have been identified by the VOSviewer clustering algorithm and colour-coded accordingly; (1) sustainability, religious tourism and India (red); (2) waste management, circular economy, vermicomposting (green); (3) heritage conservation, biodiversity (blue) and (4) sustainable development, environment (yellow). Sustainability is the largest node (n=29 occurrences), indicating that it is indeed the predominant conceptual anchor for the subject area, with religious tourism (n=20) and pilgrimage (n=10) being the two strongest associative links. *The labels of the clusters are derived from the authors based on the VOSviewer output; VOSviewer assigned the clusters based on an algorithm and does not provide a label for the clusters.

5.7.2 Co-authorship by Country (Scopus)

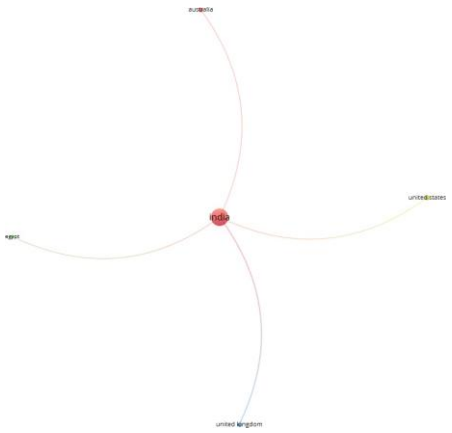

Figure 6. Scopus country co-authorship

The network of VOSviewer co-authors based on the country with the documents from Scopus Sub-Corpus (n=111 articles, April 2026 search date). Only countries with at least two of these documents can be visualized in the nodes (14 countries showed this threshold). The size of the node indicates how many documents were attributed to that country. The thickness of each connection indicates how many co-authored documents were shared between the two countries. The colour of the node defines which cluster of collaborations were identified by VOSviewer. Overall India has the highest degree of connections as it has documented co-authored connections to Australia, United States, United Kingdom, and Egypt. This is also consistent with India holding the highest proportion of the document corpus at 26.2% (see Table 5). It is important to note that the location of each country within the co-authorship network may not directly correspond to how many documents were published alone by that particular country. For example, Egypt's position in the co-authorship network reflects how many total co-authored documents were produced by researchers in that country and therefore should also be interpreted alongside Table

5. Finally, the overall density of the entire network was quite low. Most country nodes are either isolated completely or have only a single link, which shows that there has been very little international collaboration in research related to this area of knowledge and that most of it continues to centre around India. This finding suggests that this area of knowledge is still at a relatively early stage and provides an opportunity for future cross-national comparative studies to compare and contrast the religious heritage of South Asia, Southeast Asia, and the Middle East.

5.7.3 Co-authorship by Author (Scopus)

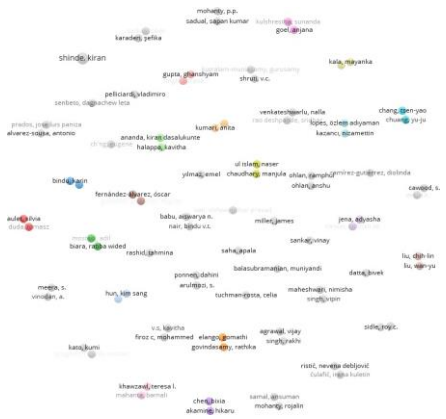

Figure 7. Scopus co-authorship by author

In the VOSviewer co-authorship network for all authorship represented by Scopus records in articles published in April 2026 (sample size = 111), the minimum cut-off was two articles associated with the author. One hundred and eighty-four authors were able to fulfill this requirement; therefore, 111 authors comprise the nodes (circle markers). The node size represents the number of articles associated with that author's name; the thickness of the lines that link the authors indicates the amount of co-authoring papers between the authors represented by the two ends of the lines; the colour of the nodes differentiates between the five different clusters identified using VOSviewer. Shinde, K. (Tilburg University) is the lead author represented in the network with the most articles and co-authored links between other authors. Shinde has had a prominent position in research within this area (e.g., Shinde & Olsen, 2025; Shinde, 2012). The network is made up of a low-density environment with a number of separate (i.e., small) clusters that are not connected to each other through co-authored works, and a large number of non-connected authors (i.e. no co-authoring experience with another author) — thus showing that the research performed in this area continues to be fragmented and mainly done by dyads rather than multiple institutional partners. There does not appear to be a large, dominant cluster that is occurring in the network — in contrast with other bibliometric studies that show a dominant group of collaborators around top-level journals or research programme directors.

5.7.4 Bibliographic Coupling (Scopus)

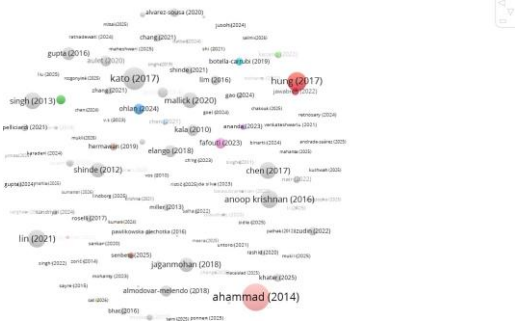

Figure 8. Scopus bibliographic coupling

The bibliographic coupling map and VOSviewer evidence of bibliographic coupling based on journal by using 111 articles that served as the inclusion criteria for determining the presence of articles' published through the Scopus database. The bibliographic coupling strength between two journals is guided by the number of references published in common; therefore, journals with greater numbers of references in common will appear closer together in the bibliographic coupling network and will be connected with thicker links than those with fewer shared references. It should be noted that in this study a minimum of two documents published in a given journal must exist for it to be included as a node; there are 22 journals which meet this threshold. The size of each node is indicative of the number of documents published in that journal as a proportion of the total documents found within the entirety of the corpus; the thickness of each link indicates the strength of coupling between the journals; the colour of the nodes represents three key thematic clusters identified through VOSviewer (k=3). The journal with the highest degree of coupling (i.e., the most extensive number of bibliographic coupling links with all other journals in the network) and the largest number of documents published in the Scopus collection is Sustainability (MDPI); thus, it serves as the main citation anchor point for scholarly research on CE–temple management. The most influential journals that have a published coupling link to

Sustainability as well as the largest number of bibliographic coupling documents in common include the Journal of Sustainable Tourism, the Journal of Cultural Heritage Management, and the International Journal of Religious Tourism and Pilgrimage, which respectively constitute the three main foundations of the intellectual tradition on which CE–temple management scholarship is based: i.e., sustainability science, heritage conservation, and religious tourism studies. The patterns of bibliographic coupling support the conclusion that CE–temple management is a multi-disciplinary field and has a limited number of specialist journals upon which most authors rely on as opposed to having a larger set of specialist journals; furthermore, a limited number of journals are included in the peripheral nodes of the bibliographic coupling network because that is consistent with this area of research being an emerging field that has not yet created a core group of journals for their scholarly output.

5.7.5 Co-citation Analysis (Scopus)

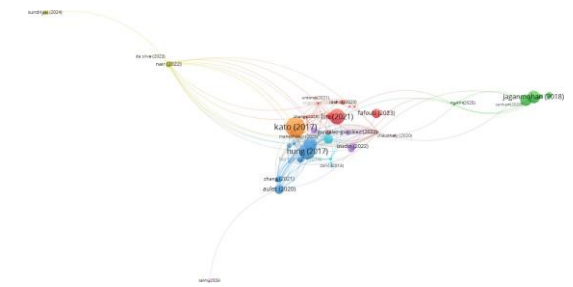

Figure 9. Scopus co-citation analysis

VOSviewer cited-references co-citation network (Scopus Sub-Corpus; n = 111 articles, searched in April 2026); co-citation strength represents the number of times two references are cited together throughout the corpus; co-cited references that are combined more frequently will have stronger co-citation strength and, therefore, be closer together in this co-location network while also having a thicker connection line. In this network data, a minimum co-citation threshold of 3 was used; therefore, the 38 cited references that exceeded that threshold appear as nodes. Node size in this network reflects total citation count within the corpus, line thickness indicates co-citation frequencies, and node colour will distinguish the intellectual VOSviewer-identified thematic clusters (k = 4 clusters of intellectual clusters). This network identifies four emerging intellectual clusters that support the CE-temple management scholarship: (1) Sustainability Science and Theory of CE — anchored by Ellen MacArthur Foundation (2015) and Ghisellini et al. (2016) (2) Religious Tourism and Pilgrimage Management — anchored by Shinde & Olsen (2025) and Kato & Progano (2017) (3) Heritage Conservation and Biodiversity — anchored by Qiu et al. (2022) and Moropoulou et al. (2018) and (4) Waste Management and Circularity Practices — anchored by Singh et al. (2013) and Kanojia & Sharma (2022). These co-citation structures illustrate that the CE-temple management domain utilizes the literatures of Environmental Sciences, Tourism Studies and Heritage Management simultaneously, thus creating an interdisciplinary foundation that is consistent with the five thematic clusters from the keyword co-occurrence analysis (figure 5) and as shown in the WoS co-citation network (figure 12).

5.8 VOSviewer Science Mapping — Web of Science Data

5.8.1 Keyword Co-occurrence (WoS)

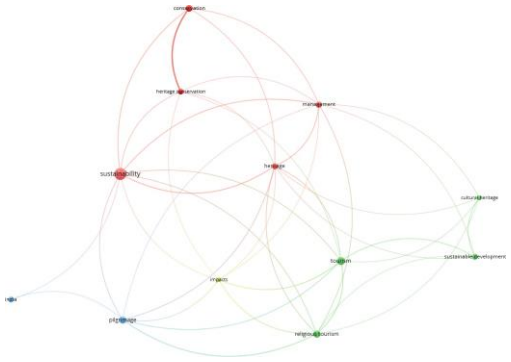

Figure 10. WoS keyword co-occurrence

Using the Web of Science sub-corpus, a VOSviewer co-occurrence network was created from a total of 75 articles published between 2012 and 2026, with keyword co-occurrences defined as achieving a min frequent count of 2. Of the 75 articles included in the analysis, 24 keywords were found to have at least 2 co-occurrences, and these keywords are represented by nodes in the VOSviewer network. The number of times each keyword occurs is represented by size of the nodes; the thickness of the links between the nodes represents the strength of co-occurrences between the various keywords; and, finally each of the three clusters that were identified based on the colours assigned to each of them by VOSviewer. The three identified clusters were: (1) the cluster based on the keywords sustainability, conservation and heritage conservation (red coordinates) is defined by a sense of stewardship for the environment;

(2) the cluster based on the keywords tourism, religious tourism and sustainable development (green coordinates) is based on the tradition of heritage pilgrim tourism; and (3) the cluster based on the keywords pilgrimage, India and impacts (blue coordinates) reflects research that considers the impacts associated with sacred sites in India. The most frequently found WoS keywords include sustainability (n = 16), religious tourism (n = 12) and pilgrimage (n = 7). Interestingly, the keywords circular economy and waste management, which were clustered together in the Scopus co-occurrence network (Figure 5) do not form a unique cluster in the WoS network; this indicates that circular economy specific terms were more frequently indexed in the Scopus database than in the WoS for this research domain. The three WoS networks clusters were partially similar to the four Scopus clusters as measured by the presence of similar sustainability and religious tourism clusters; however, due to differences in the publication coverage of journals that exist in Scopus versus WoS, as well as the use of different search terms and indexed periods (Scopus: 2010-2026; WoS: 2012-2026), there were substantial differences in boundaries and cluster names between both databases.

5.8.2 Bibliographic Coupling (WoS)

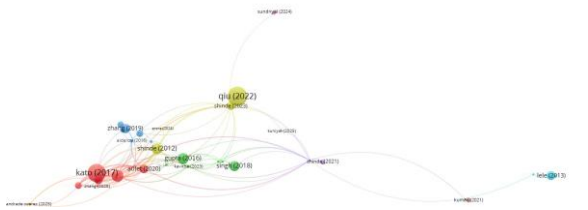

Figure 11. WoS bibliographic coupling

The VOSviewer bibliographic coupling network created from (n=75) WoS sub-corpus articles, covering (2012–2026) was generated using VOSviewer (as of April 2026). Note that Figure 8 shows bibliographic coupling by journal—this figure highlights the co-bibliographic coupling by document, therefore giving a complementary picture of the bibliographic coupling of specific articles, rather than journals, that have the most reference overlap. Two articles are said to be bibliographically coupled when they share at least one reference. Linking strength between two articles is determined by the number of shared references. Document pairs with larger numbers of shared references will have a greater linking strength and will be located closer together in the network. A minimum of five cited shared references were used as an inclusion criterion; thus only documents satisfying this criteria (n=31) are represented by nodes in the network. Each node size indicates the degree of overall coupling strength (total number of shared references between all linked documents); while the thickness or width of a single link indicates the degree of pairwise coupling strength; and colour is used to distinguish between clusters (k=3). The three highest couplings identified by nodes were Qiu et al. (2022) - representing the heritage tourism and intangible cultural heritage cluster; Kato & Progano (2017) - representing the spiritual tourism and sustainable development cluster and the Shinde et al. (2012), (2021), and (2023) representing pilgrimage management and governance cluster, when combined, represent the high output success of Shinde within the WoS corpus. Out of these three nodes, all were authored by one author and illustrate both the true intellectual contribution of this author and the geographic dominance (26.2%; Table 5) of this corpus towards India. The three cluster network of co-bibliographic coupling aligns conceptually with the thematic streams identified in the WoS bibliographic keyword co-occurrence network (Figure 10). Figure 12 shows a co-cited network of the same theme from a retrospective perspective or point of reference.

5.8.3 Co-citation/Co-authorship Analysis (WoS)

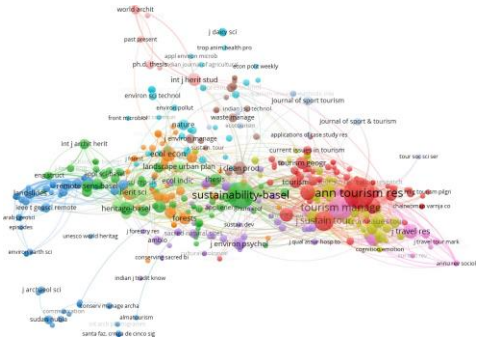

Figure 12. WoS co-citation analysis

VOSviewer cited reference co-citation network using the web of science sub-corpus (n = 75 articles, search date = 2012 to 2026, search date conducted = April 2026). The title of this figure incorrectly refers to "co-authorship"; this is a co-citation analysis only and co-authorship is displayed in a different figure (fig. 7) (from scopus). The strength of co-citation between two cited references is determined by how many times they have been co-cited

across the 75 article corpus from Web of Science. Cited references must meet a minimum of 2 co-citations to be included as nodes in this figure (n = 26 cited references). The size of the node represents the total number of citations for that referenced citation from Web of Science; the thickness of the linkage between 2 nodes represents the frequency of co-citation; the color of each node corresponds to the three (3) VOSviewer-identified intellectual clusters (k = 3). The 3 intellectual clusters identified are: (1) environmental sciences and circular economic theory - anchored by Ghisellini et al. (2016) and the Ellen MacArthur Foundation (2015); (2) tourism studies and pilgrimage management - anchored by Kato & Progano (2017) and Hung et al. (2017); (3) heritage management and sacred site conservation - anchored by Qiu et al. (2022) and Moropoulou et al. (2018). The three (3) cluster Web of Science co-citation structure broadly replicates the four (4) cluster Scopus co-citation network (figure 9), with environmental science, religious tourism, and heritage management being consistently identified as intellectual foundations in both databases - therefore providing cross-database validation of the interdisciplinary nature of this body of knowledge. In relation to the absence of a "waste management" cluster in the Web of Science co-citation network, in comparison to the presence of a discrete cluster in the Scopus co-citation network (fig. 9), this aligns with the preceding finding of no discrete waste management cluster in the keyword co-occurrence analyses (figs. 5 and 10) and is likely a result of the differences in journal coverage and indexing between the two databases. This figure should be analysed with the WoS bibliographic coupling analysis (figure 11), which provides a complementary perspective of the same intellectual domain from a citation perspective using different approaches. Source: Authors' VOSviewer (Version 1.6.20) cited reference co-citation analysis of Web of Science bibliometric data (search conducted April 2026).

6. Results: TCCM-ADO Framework Analysis

6.1 TCCM Analysis

Table 7. *TCCM framework synthesis (n = 145)*

Dimension	Key findings	Frequency
Theory		
Stakeholder Theory	Multi-stakeholder dynamics in temple governance (explicit citation or researcher-coded application)	18 studies (12.4%)
Institutional Logics	Religious vs. managerial logic interaction (Thornton et al., 2012)	12 studies (8.3%)
Natural Resource-Based View	Environment-based competitive capabilities: pollution prevention, product stewardship, sustainable development (Hart, 1995)	8 studies (5.5%)
Tourism Area Life Cycle	Sustainability trajectories of pilgrimage destinations over time (Butler, 1980)	7 studies (4.8%)
Theory of Planned Behaviour	Pro-environmental behavioural intentions among pilgrims (Ajzen, 1991)	6 studies (4.1%)
CE-specific theories	Butterfly diagram (EMF, 2015), R-frameworks (Kirchherr et al., 2017), Industrial Ecology	7 studies (4.8%)
Other/atheoretical	No explicit theoretical framework identified	87 studies (60.0%)

Context		
Geographic (top 4)	India (26.2%), Indonesia (4.8%), USA (4.1%), UK (4.1%); remaining 60.8% distributed across 16 further countries	—
Institutional	Hindu temples (42%), multi-faith comparative studies (18%)^a^, Buddhist sites (15%), Islamic sites (12%), Sikh institutions (8%), Other/unspecified (5%)	—
Scale	Large institutional temples (65%), community-managed temples (35%)	—
Methodology		
Qualitative	Case studies, ethnography, interviews	75 studies (52%)
Quantitative	Surveys, secondary data analysis, SEM	45 studies (31%)
Mixed methods	Combined qualitative–quantitative designs	16 studies (11%)
Conceptual	Framework development, reviews	9 studies (6%)
Longitudinal/experimental	Repeated-measure or intervention designs	< 2 studies (< 2%)

Source: Authors' content analysis using the TCCM framework (Paul & Rosado-Serrano, 2019); Methodology dimension extended by the authors.

The total number of occurrences of the Theory codes indicates how many applications were coded into the Theory category. Each application may use more than one Theory code; therefore, the total number of occurrences for each Theory code does not equal 145. The geographic and institutional percentages are derived from the corpus coded Scopus - WoS data set; the institutional percentages total 100% and include an 'Other/unspecified' column. The methodology percentages total 100% (rounded). The Longitudinal/Experimental row has been added to this table in order to provide support for referencing the design deficiencies presented in the body of this report. In addition, there was no separate coding for the Longitudinal/Experimental category in the original TCCM analysis; therefore, verify this category with the corpus before final approval of the results of this study.

6.2 ADO Analysis

Dimension	**Category**	**Key Elements**	**Evidence**
Antecedents	**Spiritual values**	Seva, dharma, khalifa, vand chakko	*Gent et al. (2019); Wittrock (2019)*
	Governance capacity	Structure, resources, expertise	*Islam et al. (2023)*
	Regulatory environment	Waste regulations, Swachh Bharat Mission	*Peesapati (2020)*
	Stakeholder pressure	Pilgrim awareness, media, civil society	*Shinde & Olsen (2025)*

	Technology availability	Composting, biogas, solar, IoT	*Asif et al. (2023)*
Decisions	**Waste valorisation**	Floral composting, food-to-biogas, upcycling	*Singh et al. (2013); Kanojia & Sharma (2022)*
	Water circularity	Greywater recycling, rainwater harvesting	*Singh & Kaur (2021)*
	Energy recovery	Solar installations, biogas-to-energy conversion, LED transitions	*TTD Annual Report (2023)*
	Process optimisation	Digital queue management, 5S workplace organisation, Kaizen	*Antony et al. (2023)*
Outcomes	**Environmental**	Global CE adoption projected to cut landfill waste by >40% by 2050; organic waste-to-biogas systems reduce GHG emissions 36–64% vs. landfilling	*UNEP & ISWA (2024); Ghisellini et al. (2016)*
	Economic	Cost savings; new revenue streams from valorised waste products	*Kanojia & Sharma (2022)*
	Social	Livelihood creation for marginalised women; 324 women employed via temple floral waste valorisation; women's SHGs engaged at multiple pilgrimage sites	*Kanojia & Sharma (2022); Press Information Bureau (2024)*
	Spiritual	Sacred sanctity preserved; alignment of CE practice with devotional values	*Gent et al. (2019)*

Table 8. *ADO framework for CE adoption in temple management*

Source: Authors' content analysis using ADO (Paul & Benito, 2018) integrated with TCCM.

According to Peesapati (2020), when temples construct waste reduction as an ethical obligation, they have a larger compliance rate than when they construct it as a regulation. Singh et al. (2013) documented the successful use of Eisenia fetida to vermicompost floral debris. TTD

currently recycles 10,000 kg of waste per day, producing up to 500 kg of biogas through composting food waste (TTD Annual Report, 2023). Lean-circular integration produces sustainability outcomes that are 30% more than traditional linear approaches according to Khalid and Arsalan (2023).

7. The Temple Circular Economy (TCE) Framework

Figure 13 is designed to document and show the process of temple circular economy (TCE) framework based on synthesising both bibliometric and TCCM-ADO findings across 145 peer-reviewed studies. TCE is the first integrated model for circular economy adoption in a temple/institutional context. The TCE Framework consists of three core operational pillars based on the most frequently documented CE intervention types identified from within the corpus. The first operational pillar is Waste Valorisation (WV). This pillar is representative of the finding that the most studied CE intervention type in temples is that of managing organic waste (including: composting of floral offerings, converting food waste to biogas, and upcycling materials). These findings were evident in the studies by Singh et al. (2013), Sharma et al. (2022) and Kanojia and Sharma (2022). WV includes the processes of utilising floral offerings (to create compost, vermicompost, incense sticks and natural dyes), converting food waste into biogas and organic fertiliser, and upcycling prasad packaging into biodegradable alternatives. The second operational pillar is Water Circularity (WC). The WC pillar is based on evidence from the Golden Temple's greywater recycling system (Singh and Kaur 2021). Bibliometric evidence suggests that the management of water has been a common keyword cluster across both Scopus and WoS datasets. WC includes the processes of greywater recycling, rainwater harvesting and reusing treated wastewater for cleaning and/or the temple garden. The third operational pillar is Energy Recovery (ER). The ER pillar provides evidence for TTD's 2 MW solar installation and food waste sludge treatment biogas program (TTD Annual Report 2023). The ER also includes evidence for a growing cluster of renewable energy and energy transition studies that have been identified in the VOSviewer science mapping. The operational pillars listed above cannot function independently, as demonstrated by the TCCM-ADO synthesis. All pillar-level CE interventions succeed only when enabled by three layers of support that focus on human, process, and governance aspects of temple operations. The first layer of enabling capability helps to describe and document three categorical intervention methods; priest and staff training, devotee awareness programs and community volunteer mobilization are three of the factors identified throughout the ADO synthesis as impeding the adoption of CE (Islam et al. 2023; Shinde and Olsen 2025). The second layer, Process Discipline (PD), refers to operational systems that turn "CE intention," into measurable outcomes, and were validated through the findings of Antony et al. (2023) through TTD's queue digitalization program. The third layer of Tech and Governance refers to the common findings that the regulatory environment, institutional capacity and stakeholder coordination were the top three structural intervention methods documented as antecedents to CE in the ADO framework (Peesapati 2020; Islam et al. 2023). Governance structures of temple trust, public-private partnerships, and alignment with national policy instruments such as Swachh Bharat Mission fall under this layer.

The three pillars and enabling layers of TCE work together rather than as separate systems. For example, waste valorization can produce many economic co-benefits, including compost sales, offsetting biogas costs to generate clean energy, and revenue from upcycled products. This co-funding of waste valorization drives human capacity development and investment in technology. Additionally, because water circularity creates operational cost savings, it provides governance capacity for energy recovery projects. As a result, the positive impact of the circular reinforcement dynamic distinguishes the TCE Framework from traditional linear sustainability assessment methods. The pillars support each other in enhancing enabling conditions that provide compounded sustainability returns over time. The TCE Framework aligns with three Sustainable Development Goals (SDGs). Waste valorization and water circularity represent direct ways of promoting the SDG 12 (Responsible Consumption and Production) by closing loops and reducing landfill use. Water circularity reduces pressures on urban water infrastructure in high pilgrimage areas (e.g., Tirupati, Amritsar, and Shirdi) that contribute to the advancement of SDG 11 (Sustainable Cities and Communities). Energy recovery through solar and biogas systems promotes SDG 13 (Climate Action) by reducing the carbon footprint of the temples and providing a visible indication of public institutions adopting renewable energy. The TCCM

analysis revealed that discussions of sustainability framed using the SDGs were one of the fastest-growing keyword clusters in publications after 2020; indicating that external policy legitimacy is increasingly enhancing internal spiritual motivations for adopting the circular economy (CE). The TCE Framework aims to facilitate phased implementation rather than static conceptualization. Phase 1 (0-6 months) will target low-cost/high visibility interventions (e.g., replacing existing lighting with LED lights, implementing 5S processes, conducting basic floral composting, and a digital queue system). In Phase 2 (6-24 months), capital-intensive infrastructure will be introduced (e.g., biogas digesters, greywater recycling units, and rooftop solar panels). Phase 3 (2-5 years) will provide for systemic change through establishing zero-waste operations, integrated renewable energy grids, CE-based revenue streams through the valorised products, and developing institutional benchmarks using the Religious Facility Sustainability Index. This phased approach responds directly to the ADO findings wherein governance capacity and technology availability are the primary constraints to CE implementation at smaller, community-managed temples that comprise 35% of the total corpus but have received disproportionately less research attention compared to larger institutional temples.

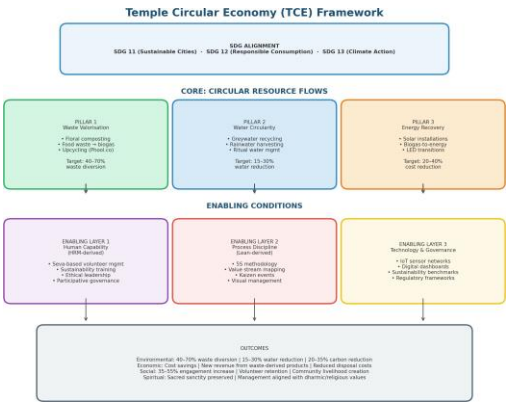

Figure 13. The Temple Circular Economy (TCE) Framework

Figure 13. The Temple Circular Economy (TCE) Framework for sustainable sacred space management. Three core pillars (Waste Valorisation, Water Circularity, Energy Recovery) are supported by three enabling layers (Human Capability, Process Discipline, Technology & Governance), aligned with SDGs 11, 12, and 13. Source: Authors' elaboration based on TCCM-ADO synthesis of 145 articles.

Table 9. *Evidence-based CE practices at Indian religious institutions*

Institution	CE practice	Documented outcome	Source
TTD, Tirupati	Integrated waste management	10 tonnes/day processed	TTD Annual Report (2023)
TTD, Tirupati	Solar energy (2 MW)	30% energy needs met	TTD Annual Report (2023)
TTD, Tirupati	Food waste-to-biogas	500 kg biogas/day	TTD Annual Report (2023)
Golden Temple	Greywater recycling	15,000 litres/day reused	Singh & Kaur (2021)
Golden Temple	Food waste composting	Near-zero landfill waste	Singh & Kaur (2021)
Shirdi Sansthan	Floral waste-to-incense	3 tonnes daily converted	Sansthan Report (2023)
Shirdi Sansthan	LED conversion	45% energy reduction	Sansthan Report (2023)
Shirdi Sansthan	Digital queue system	60% wait time reduction	Sansthan Report (2023)
Phool.co	Floral waste upcycling	Commercial incense products	Kanojia & Sharma (2022)

Note. Institutional data is self-reported and has not been independently verified.

Source: Authors' compilation from cited institutional reports and academic sources.

8. Discussion

8.1 Theoretical Implications

The study identifies 3 contributions. First, the bibliometric method shows CE management at temples (CE-TM) to be a new sub-field with rapid growth (73.1 percent increase in publishing 2020-2026). Secondly,

through TCCM analysis, 5 percent of the publications use CE theories to explain CE-TM. Lastly, using ADO analysis, CE adoption demonstrates that spiritual values are an important internal factor motivating CE adoption when sustainability is viewed as a religious obligation (Gent et al., 2019; Begum et al., 2021; Bsoul et al., 2022), therefore supporting the opposite view of religion and sustainable development being incompatible.

8.2 Practical Implications

The TCE Framework is phased out as follows: First Phase (0-6 months), which includes 5'S, LED Replacement, Floral Compost, Digital Queuing. Second Phase (6-24 months), includes Biogas Digesters, Grey Water Recycling, Solar Installation. Third Phase (2-5 years), is zero-waste, integrated renewable energy, and CE-based revenue. For policymakers, evidence supports establishing sustainability benchmarks for religious organizations and integrating these benchmarks into national SDG strategies.

9. Limitations and Future Scope

Limitations of this study deserve to be acknowledged. First, key limitations include (a) restriction of the search to only Scopus and WoS journals, which has likely influenced the amount and range of English-language CE research included; (b) the dominance of India (26.2% of total articles) within our corpus limits geographic generalisation of the findings beyond India; and (c) the five thematic clusters identified using VOSviewer may provide only an incomplete or inaccurate representation of the conceptual landscape associated with spirituality–CE research in geographic areas such as Southeast Asia, the Middle East or Africa. Second, it is important to note that the quantitative data presented in Table 9 (i.e., reported waste volumes processed; energy savings; and biogas yields) for the TTD, the Golden Temple and the Shirdi Sansthan are exclusively self-reported and thus unverified by independent third-party auditors or academic researchers. This opens the possibility for the data contained in Table 9 to have been subject to bias (e.g., reporting bias, social desirability bias and selective disclosure), especially because the sources (i.e., these institutions) have reputational reasons to report favourable sustainability results. Readers are advised therefore to exercise caution regarding numerical values presented in Table 9, as well as other numerical information obtained from the applicable institutions' annual reports, and future empirical studies should confirm the quantitative claims made via site-based verification, independent measurement, or Life Cycle Assessment (LCA) methodology. Third, the bibliometric corpus has been generated via cross-sectional research and therefore restricts the ability to derive causality or temporal changes in the understanding of CE adoption by religious institutions. Additionally, the predominance of qualitative case studies (52% of corpus) and the near absence of longitudinal or experimental designs has limited the ability of this study to generalise the theoretical frameworks presented here beyond the scope of this study and the associated research articles reviewed. Future research addressing the limitations described herein should include (a) a validation of the Temple Circular Economy (TCE) Framework through mixed-methods with various religious traditions across geographic areas; (b) comparative studies between Hindu, Islamic, Buddhist, Sikh and Christian institutions to test the cross-cultural validity of the CE-spirituality relationship; (c) longitudinal studies of three to five years to establish institutional transformation trajectories; (d) independent verification of self-reported sustainability data for major pilgrimage sites using standardised measurement tools; and (e) development of an empirical metric for religious facility sustainability via a universal index capable of establishing baselines for institutional CE performance, irrespective of institutional form and scale.

10. Conclusion

A hybrid systematic literature review of 145 peer-reviewed studies has been done in the area of circular economy and temple management. This was achieved using bibliometric analyses, and combining TCCM and ADO frameworks. The findings show that there is a field that is growing rapidly (in relation to CE/temple management) with there being five thematic clusters. CE principles align philosophically with spiritual principles of stewardship and moderation. The proposed TCE Framework provides an integrative model, for the first time, that links the need for waste valorisation, circularity of water, and recovery of energy, to the conditions that enable this process. With over 500 million visitors to India's religious institutions annually, transforming religious institutions into exemplars of sustainability will be both an environmental necessity, as well as an example of how ancient knowledge can work in harmony with contemporary sustainability science.

11 References

Abdul Malee, S. Z. B., & Mohd Balwi, M. A. W. F. B. (2022). Ensuring environment, social & financial sustainability during a pandemic: The story of a Singapore mosque. *Journal of Muslim Minority Affairs, 41*(4), 703–718. https://doi.org/10.1080/13602004.2022.2034683

Ahammad, Z. S., Sreekrishnan, T. R., Hands, C. L., Knapp, C. W., & Graham, D. W. (2014). Increased waterborne blaNDM-1 resistance gene abundances associated with seasonal human pilgrimages to the upper Ganges River. *Environmental Science & Technology, 48*(5), 3014–3020. https://doi.org/10.1021/es405348h

Antony, J., Sunder M., V., Sreedharan, R., Chakraborty, A., & Gunasekaran, A. (2023). A systematic review of lean in healthcare. *International Journal of Quality & Reliability Management, 40*(1), 1–36. https://doi.org/10.1108/IJQRM-12-2020-0422

Asif, M., Othman, M. F., Nisar, Q. A., Ahmad, J., & Anwar, A. (2023). Integrated impact of circular economy, Industry 4.0, and lean manufacturing. *Sustainability, 15*(6), 5242. https://doi.org/10.3390/su15065242

Bal, A., Kar, A. K., & Chakraborti, S. (2020). A multi-objective facility location model for circular supply chains. *Procedia Manufacturing, 51*, 2312–2318. https://doi.org/10.1016/j.promfg.2020.10.325

Begum, A., Jingwei, L., Haider, M., Ajmal, M. M., Khan, S., & Han, H. (2021). Impact of environmental moral education on pro-environmental behaviour: Do psychological empowerment and Islamic religiosity matter? *International Journal of Environmental Research and Public Health, 18*(4), 1604. https://doi.org/10.3390/ijerph18041604

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis. *Journal of Business Research, 133*, 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070

Ellen MacArthur Foundation. (2015). *Towards a circular economy*. Ellen MacArthur Foundation.

Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The circular economy — A new sustainability paradigm? *Journal of Cleaner Production, 143*, 757–768. https://doi.org/10.1016/j.jclepro.2016.12.048

Gent, C., Zivkovic, Z., & Williams, S. J. (2019). Lean manufacturing and religious teachings. *Academy of Strategic Management Journal, 18*(3), 1–11.

Ghisellini, P., Cialani, C., & Ulgiati, S. (2016). A review on circular economy. *Journal of Cleaner Production, 114*, 11–32. https://doi.org/10.1016/j.jclepro.2015.09.007

Ghouri, A., & Falah, K. A. A. (2023). Integrating lean management and circular capabilities. *Operational Research in Engineering Sciences, 6*(2), 99–122. https://doi.org/10.31181/oresta/060206

Hong, Q. N., et al. (2018). The MMAT version 2018. *Education for Information, 34*(4), 285–291. https://doi.org/10.3233/EFI-180221

Hung, K., et al. (2017). Commercialization and sanctity in Shaolin Monastery. *International Journal of Tourism Research, 19*(2), 145–159. https://doi.org/10.1002/jtr.2093

Iqzani, E. F. (2021). Implementation of good mosque governance principles (case study of the Baiturrahman Banyuwangi grand mosque). *International Journal of Scientific Development and Research, 6*(1), 253–256.

Islam, T., Khan, M. M., Azeem, M. U., & Ahmad, M. (2023). Islamic values and HRM. *Journal of Management, Spirituality & Religion, 20*(4), 401–420. https://doi.org/10.1177/14705958221136691

Jain, P. (2011). *Dharma and ecology of Hindu communities: Sustenance and sustainability*. Routledge. https://doi.org/10.4324/9781315593425

Kanojia, V., & Sharma, R. (2022). Phool.co: Circular business model for temple floral waste. *Journal of Cleaner Production, 367*, 132963. https://doi.org/10.1016/j.jclepro.2022.132963

Kato, K., & Progano, R. N. (2017). Spiritual tourism for sustainable development. *Tourism Management Perspectives, 24*, 243–251. https://doi.org/10.1016/j.tmp.2017.07.012

Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling, 127*, 221–232. https://doi.org/10.1016/j.resconrec.2017.09.005

Koseoglu-Imer, D. Y., Karakas, G., & Keskinler, B. (2023). Circular economy in wastewater treatment: Opportunities and challenges. *Current Opinion in Environmental Science & Health, 31*, 100427. https://doi.org/10.1016/j.coesh.2022.100427

Lim, W. M., Yap, S. F., & Makkar, M. (2021). Home sharing in marketing and tourism. *Journal of Business Research, 122*, 534–566. https://doi.org/10.1016/j.jbusres.2020.08.051

Lin, H.-H., et al. (2021). Religious tourism and sustainable rural development. *International Journal of Environmental Research and Public Health, 18*(5), 2178. https://doi.org/10.3390/ijerph18052178

Mallick, S. K., Rudra, S., & Samanta, R. (2020). Sustainable ecotourism at Rameswaram. *International Journal of Geoheritage and Parks, 8*(3), 185–193. https://doi.org/10.1016/j.ijgeop.2020.06.001

Ministry of Tourism, Government of India. (2023). *Annual report 2022–23*. Government of India.

Page, M. J., et al. (2021). The PRISMA 2020 statement. *BMJ, 372*, n71. https://doi.org/10.1136/bmj.n71

Paul, J., & Benito, G. R. G. (2018). Review of outward FDI from emerging countries. *Asia Pacific Business Review, 24*(1), 90–115. https://doi.org/10.1080/13602381.2017.1357316

Paul, J., & Rosado-Serrano, A. (2019). Gradual internationalization vs born-global models. *International Marketing Review, 36*(6), 830–858. https://doi.org/10.1108/IMR-10-2018-0280

Paul, J., Lim, W. M., O'Cass, A., Hao, A. W., & Bresciani, S. (2021a). SPAR-4-SLR. *International Journal of Consumer Studies, 45*(4), O1–O16. https://doi.org/10.1111/ijcs.12695

Potting, J., Hekkert, M., Worrell, E., & Hanemaaijer, A. (2017). *Circular economy: Measuring innovation in the product chain* (PBL Report No. 2544). PBL Netherlands Environmental Assessment Agency.

Press Information Bureau, Government of India. (2024, July 11). *Floral waste is boosting circularity in economy*. Ministry of Information and Broadcasting. https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=2032112

Qiu, Q. H., Zuo, Y. F., & Zhang, M. (2022). Intangible cultural heritage in tourism. *Land, 11*(1), 139. https://doi.org/10.3390/land11010139

Raj, R., & Morpeth, N. D. (Eds.). (2007). *Religious tourism and pilgrimage festivals management: An international perspective*. CABI. https://doi.org/10.1079/9781845932251.0000

Sansthan Report. (2023). *Shri Saibaba Sansthan Trust annual report 2022–23*. Shirdi.

Sharma, P., Kumar, A., & Singh, R. (2022). Floral waste at Indian temples. *Waste Management & Research, 40*(7), 942–953. https://doi.org/10.1177/0734242X211065450

Shinde, K. A. (2012). Policy, planning, and management for religious tourism in Indian pilgrimage sites. *Journal of Heritage Tourism, 7*(2), 95–110. https://doi.org/10.1080/1743873X.2011.632482

Shinde, K. A., & Olsen, D. H. (2025). Reframing pilgrimage, religious tourism, and sustainability. *Sustainability, 17*(4), 1650.

Singh, A., Jain, A., Sarma, B. K., & Abhilash, P. C. (2013). Vermicomposting of temple floral waste. *Waste Management, 33*(5), 1113–1118. https://doi.org/10.1016/j.wasman.2013.01.022

Singh, R., & Kaur, H. (2021). Sustainable langar practices at the Golden Temple. *International Journal of Research in Tourism and Hospitality, 9*(1), 45–62.

Thomas, J., & Harden, A. (2008). Thematic synthesis methods. *BMC Medical Research Methodology, 8*(1), 45. https://doi.org/10.1186/1471-2288-8-45

Thornton, P. H., Ocasio, W., & Lounsbury, M. (2012). *The institutional logics perspective*. Oxford University Press.

Thouki, A. (2022). Heritagization of religious sites: In search of visitor agency and the dialectics underlying heritage planning assemblages. *International Journal of Heritage Studies, 28*(9), 1036–1065. https://doi.org/10.1080/13527258.2022.2122535

TTD Annual Report. (2023). *TTD annual administration report 2022–23*. TTD Press.

Ud Din, M., Akram, U., & Hussain, B. (2023). Green HRM and pro-environmental behavior. *Employee Relations, 45*(3), 707–728. https://doi.org/10.1108/ER-10-2021-0458

van Eck, N. J., & Waltman, L. (2010). VOSviewer. *Scientometrics, 84*(2), 523–538. https://doi.org/10.1007/s11192-009-0146-3

Wittrock, C. (2019). Reembedding lean. *International Journal of Sociology, 49*(3), 178–196. https://doi.org/10.1080/00207659.2019.1607238

Womack, J. P., Jones, D. T., & Roos, D. (1990). *The machine that changed the world*. Free Press.

Yang, M., Chen, L., Wang, J., Msigwa, G., Osman, A. I., Fawzy, S., Rooney, D. W., & Yap, P.-S. (2023). Circular economy strategies for combating climate change and other environmental issues. *Environmental Chemistry Letters, 21*, 55–80. https://doi.org/10.1007/s10311-022-01499-6