

Sustainable Waste Recycling System for Temple Complex: A Design Proposal for Ambadevi Temple, Amravati

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Abstract - Religious institutions in India serve as major cultural and social centres, attracting thousands of visitors daily. Activities such as offering flowers, distributing prasad, and community cooking generate significant quantities of solid waste. A large portion of this waste is biodegradable, including flowers, coconuts, and food residues, while the remaining consists of plastic and paper waste. Improper disposal of such waste leads to environmental degradation and sanitation issues.

This study examines the potential for implementing a sustainable waste recycling system within the Ambadevi Temple complex in Amravati. Case studies of successful waste management practices in major pilgrimage centers are analysed to understand effective strategies and best practices. Based on estimated waste generation and existing site conditions, a conceptual model is proposed that integrates waste segregation, composting, biogas generation, and dry waste management.

The research highlights that the integration of decentralized waste management systems into temple infrastructure can significantly reduce landfill waste, improve sanitation, and encourage sustainable practices within religious environments.

Key Words: Temple waste management, Sustainable infrastructure, Composting, Biogas, Pilgrimage architecture, Recycling systems

1. INTRODUCTION

Temples in India are among the most active public spaces, accommodating large numbers of devotees daily. These activities generate substantial waste, primarily from ritual offerings and food distribution. Organic waste such as flowers, leaves, coconuts, and food residues forms a major component, while plastic packaging and paper waste contribute to non-biodegradable waste.

With increasing visitor footfall, traditional waste disposal methods are becoming inadequate. Accumulated waste leads to hygiene issues, unpleasant surroundings, and environmental damage. Therefore, integrating sustainable waste management systems into temple infrastructure has become essential.

This study focuses on the Ambadevi Temple in Amravati, aiming to develop a sustainable and site-responsive waste recycling system.

2. Literature Review

Previous studies indicate that temple waste is predominantly biodegradable and suitable for sustainable processing methods.

- **Composting** converts organic waste into nutrient-rich fertilizer used in landscaping.
- **Biogas generation** uses anaerobic digestion to produce methane from food waste, which can be used as energy.
- **Recycling systems** handle plastic and paper waste efficiently.

Case studies show successful implementation:

- Large temples have adopted **segregation + composting systems**
- Flower waste is converted into incense products
- Food waste is processed into biogas

These approaches highlight the feasibility of integrating waste recycling systems within temple environments without affecting religious activities.

3. Methodology

The study follows a combined qualitative and quantitative approach.

3.1 Site Study

The Ambadevi Temple experiences continuous footfall throughout the year, with peak numbers during festivals. Waste generation is directly linked to visitor volume and ritual activities.

3.2 Waste Generation Estimation

To estimate waste generation:

- Average daily visitors (normal days): 10,000–15,000

- Peak days: 20,000+

Assumption:

- Waste generated per person ≈ 0.25 kg

Estimated total waste:

- Normal
 $10,000 \times 0.25 = 2.5$ tons/day
- Peak
 $20,000 \times 0.25 = 5$ tons/day

3.3 Waste Composition Analysis

Waste Type	Percentage
Flower offerings	35%
Food waste	30%
Plastic waste	20%
Paper waste	10%
Miscellaneous	5%

Nearly 65% is biodegradable

3.4 Design Approach

A decentralized waste recycling system is proposed with the following components:

- Waste segregation zone
- Composting unit
- Biogas plant
- Dry waste storage
- Service access and maintenance area

The system is located in a **service zone**, ensuring separation from sacred areas.

4. Proposed System and Innovation

4.1 Integrated Waste Management Model

The proposed system follows a closed-loop approach:

1. Waste collection from temple areas
2. Segregation into wet and dry waste

3. Processing:

- Organic \rightarrow Composting + Biogas
- Dry waste \rightarrow Recycling storage

The proposed waste management process is illustrated in Fig. 1.

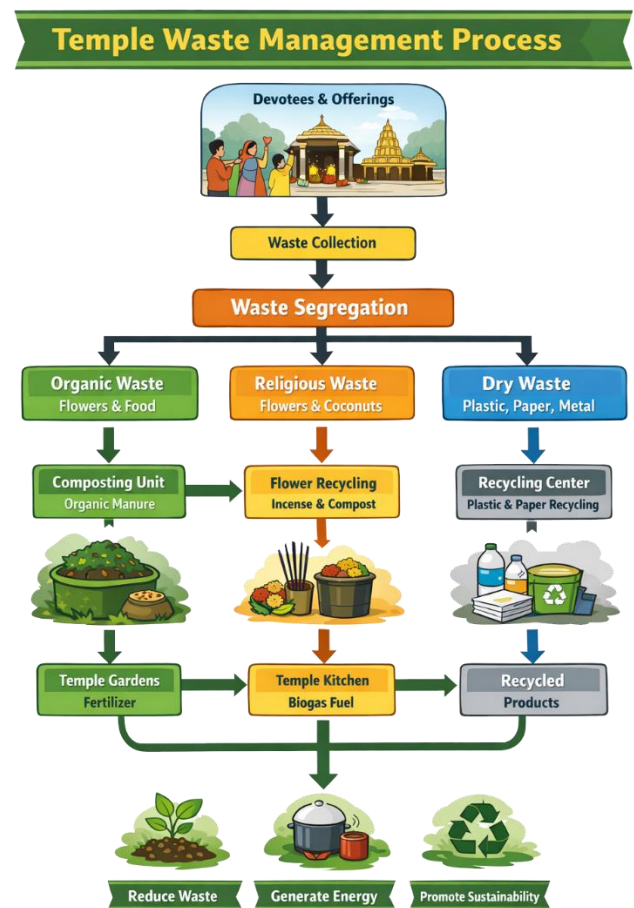


Fig -1: Integrated Temple Waste Management and Recycling Process

4.2 Key Innovations

- Temple-specific waste zoning integrated into architectural planning
- Decentralized recycling unit within campus
- Combination of composting + biogas system
- Use of compost in temple landscape areas
- Energy generation for kitchen use (biogas)

4.3 Area Requirement

- Total required area: 200–250 sq.m

Includes:

- Compost pits
- Biogas plant
- Sorting platform
- Storage space

5. Results and Analysis

The proposed system can:

- Reduce landfill waste by 60–70%
- Improve sanitation within temple premises
- Convert waste into useful resources:
 - Compost for landscaping
 - Biogas for cooking

It also ensures:

- Better waste handling during peak events
- Reduced environmental impact
- Improved visitor experience

6. Conclusion

Waste generation in temple complexes is unavoidable due to religious practices and high visitor numbers. However, improper management leads to environmental and hygiene issues.

This study demonstrates that sustainable waste recycling systems can be effectively integrated into temple infrastructure. By adopting segregation, composting, biogas generation, and recycling, temple complexes can become self-sustaining and environmentally responsible.

The proposed model for Ambadevi Temple serves as a replicable framework for other pilgrimage sites in India.

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