

Growth And Development of Green Management Practices in Small Scale Industries in Madurai District

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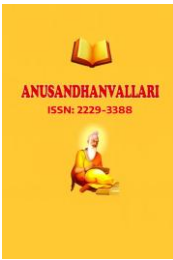
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Abstract: The imperative for environmental sustainability has permeated every sector of the global economy, and the small-scale industrial sector often regarded as the backbone of developing economies is no exception. This article examines the growth and development of green management practices among small-scale industries in Madurai District, Tamil Nadu, one of India's significant industrial hubs. Through a comprehensive review of existing literature, government policy frameworks, and empirical studies conducted in the region, this article explores the current state of green management adoption, the drivers facilitating this transition, and the formidable barriers that impede progress. Madurai District hosts over 214,000 registered MSMEs, predominantly micro and small enterprises, engaged in diverse activities ranging from food processing and textiles to metal-based industries and paper printing. The findings reveal that while awareness of environmental issues and government support mechanisms have emerged as significant motivating factors for adopting green practices, high implementation costs, lack of technical knowledge, inadequate infrastructure, and limited access to green financing continue to constrain widespread adoption. The article further highlights that green management practices in Madurai's small-scale industries encompass energy efficiency measures, waste management, water conservation, and the adoption of eco-friendly production processes. The study underscores the critical role of government initiatives such as the MSE-GIFT Scheme, MSE-SPICE Scheme, and the ZED Certification Programme in accelerating the green transition. However, a significant implementation gap persists between awareness and action. The article concludes with strategic recommendations for policymakers, industry associations, and entrepreneurs to foster a robust ecosystem for green management practices in Madurai's small-scale industrial sector, thereby contributing to both environmental sustainability and long-term industrial competitiveness.

Keywords: Green Management, Small Scale Industries, Madurai District, Sustainable Development, MSMEs, Environmental Sustainability, Green Practices, Barriers to Green Adoption, Government Initiatives, Tamil Nadu

Introduction

The twenty-first century has witnessed an unprecedented global reckoning with the environmental consequences of industrial development. Climate change, resource depletion, pollution, and biodiversity loss have emerged as existential challenges that demand urgent and concerted action across all sectors of the economy. The industrial sector, historically a significant contributor to environmental degradation, finds itself at the epicentre of this sustainability transition. Within this broader context, small and medium enterprises (SMEs) which constitute the vast majority of industrial establishments in developing countries occupy a uniquely challenging position. They are simultaneously vital to economic growth and employment generation, yet often lack the resources and technical capabilities to adopt environmentally sustainable practices.



India, as one of the world's fastest-growing economies, exemplifies this tension. The country's Micro, Small and Medium Enterprises (MSMEs) sector is the backbone of the Indian economy, contributing approximately 30% to the national GDP and employing over 110 million people. These enterprises are crucial for boosting industrial output, exports, and job creation, particularly in rural and semi-urban areas. However, Indian manufacturing SMEs face considerable challenges that hinder their growth, competitiveness, and capacity to implement sustainable practices, including limited access to financing, reliance on outdated technology, and a shortage of skilled labour. Moreover, as global markets shift towards eco-friendly and sustainable practices, Indian SMEs face growing pressure to align with these standards to remain competitive.

Tamil Nadu, one of India's most industrialised states, is home to more than 3.5 million registered MSMEs, with a total contribution of about 8% to the Gross State Domestic Product and providing employment to more than 25 million people. The state has demonstrated a strong commitment to promoting sustainable industrial development through initiatives such as the Climate Governing Council, Green Energy Mission, and Wetland Conservation, alongside supporting MSMEs in adopting green practices. The Tamil Nadu government has also established the TANSEED fund to support green startups, fostering innovation in sustainable practices with a focus on waste management and sustainable agriculture.

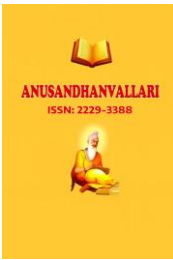
Madurai District, often referred to as the "Athens of the East" for its rich cultural heritage, has gradually emerged as a significant hub for small businesses and start-ups. The district offers ample scope for diverse industrial activities, including textiles, readymade garments, food processing, agro-based industries, rubber and plastic-based industries, and metal-based industries. As of December 2024, Madurai had a total of 214,109 registered MSMEs, comprising 211,676 micro enterprises, 2,273 small enterprises, and 160 medium enterprises. The activity-wise distribution reveals that food and food-based industries (5,229 units), paper-based and printing industries (4,372 units), metal-based industries (4,810 units), and hosiery and readymade garments (3,827 units) are among the predominant sectors.

The industrial landscape of Madurai, however, is not without its challenges. Small-scale industries in the district face a number of problems relating to finance, production, marketing, and labour. The industrial estates in the district do not adequately meet the growing demands of industrial expansion, and there are concerns about insufficient land allocation for industrial purposes. Additionally, MSMEs in Madurai struggle with weak market linkages, a growing skills mismatch, particularly in technology-driven sectors and advanced manufacturing, and limited access to formal credit. These challenges are compounded by the environmental pressures that accompany industrial activity, including pollution, effluent control, and waste management issues.

The Concept of Green Management

Green management, in its essence, refers to the production of goods or the generation of services through strategies, technologies, and workplace practices aimed at reducing industrial waste, minimising pollution, and optimising resource utilisation. It is the continuous application of an integrated preventative environmental strategy in production and marketing processes to reduce risks to human health and the environment. Green management encompasses a wide range of practices, including environmental management, energy management, waste reduction, water conservation, green supply chain management, and the adoption of cleaner production technologies.

For small-scale industries, green management represents both a challenge and an opportunity. While large corporations have long been the primary adopters of green management practices, SMEs are increasingly under pressure to initiate moves towards becoming green companies to ensure their survival in the evolving green



economy. Green manufacturing, in particular, has emerged as the most promising sustainable manufacturing practice with the capability to address many of the issues that Indian industries currently face. It covers all aspects of reducing environmental impact through the optimum use of available resources and the reduction of waste.

Significance of the Study

The study of green management practices in Madurai's small-scale industries holds considerable significance for several reasons. First, Madurai's industrial sector is at a critical juncture where traditional manufacturing practices are increasingly coming into conflict with environmental regulations and market expectations. Understanding the current state of green management adoption can help identify gaps and opportunities for intervention.

Second, the small-scale industrial sector in Madurai is a major source of employment and livelihood for a significant portion of the district's population. The transition to green practices has implications not only for environmental sustainability but also for the economic well-being of thousands of workers and entrepreneurs.

Third, Madurai's experience with green management adoption can offer valuable lessons for other industrial clusters in Tamil Nadu and across India that face similar challenges. As the state and national governments intensify their efforts to promote sustainable industrial development, understanding the ground-level realities of green practice adoption becomes essential for effective policy design and implementation.

Fourth, the growing international focus on sustainable supply chains and the emergence of climate-related trade barriers, such as the European Union's Carbon Border Adjustment Mechanism (CBAM), make the greening of small-scale industries not just an environmental imperative but also a competitive necessity.

Finally, the study contributes to the broader academic discourse on sustainability transitions in developing country contexts, particularly in the SME sector, which has often been overlooked in favour of larger corporations in environmental management research.

Objectives of the Article

This article aims to:

1. Examine the current state of green management practices in small-scale industries in Madurai District.
2. Identify the key drivers facilitating the adoption of green practices among these enterprises.
3. Analyse the major barriers and challenges that impede the implementation of green management.
4. Evaluate the role of government policies and programmes in promoting green practices.
5. Provide strategic recommendations for accelerating the green transition in Madurai's small-scale industrial sector.

Research Problem

The small-scale industrial sector in Madurai District faces a critical challenge: how to balance the imperatives of economic growth and industrial development with the growing demands for environmental sustainability. While there is increasing awareness of the need for green practices, the actual adoption of such practices remains limited, and the factors that facilitate or impede this transition are not well understood.

The research problem can be articulated through the following questions:

- What is the current state of green management practices in small-scale industries in Madurai District?
- What are the key drivers that motivate small-scale industries in Madurai to adopt green practices?
- What are the major barriers and challenges that hinder the adoption of green management practices?
- How effective are government policies and programmes in promoting green practices in the district?
- What strategies can be recommended to accelerate the adoption of green management practices?

Limitations of the Study

This study has certain limitations. First, being based on secondary sources, it does not include primary data collection through surveys or interviews with entrepreneurs. Second, the study focuses on the small-scale industrial sector broadly and does not delve into sector-specific variations in green practice adoption. Third, the rapidly evolving policy landscape means that some information may become outdated. Despite these limitations, the study provides a comprehensive overview of the subject and offers valuable insights for policymakers, industry associations, and entrepreneurs.

Industrial Landscape of Madurai District

Overview

Madurai District, one of the 38 districts of Tamil Nadu, is located on the banks of the Vaigai River and is the third-largest city in the state. Known for its rich cultural heritage, ancient temples, and vibrant traditions, Madurai has also emerged as a significant industrial centre in southern Tamil Nadu. The district's strategic location, well-developed infrastructure, and availability of skilled labour have contributed to its growth as an industrial hub.

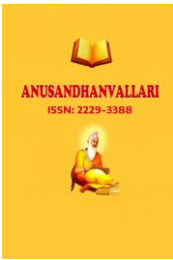
The district offers ample scope for diverse industrial activities, including textiles, readymade garments, bakery units, floriculture, dairy and cold storage units, agro and herbal products, blue metal jelly, chamber bricks, rubber and plastic-based industries, and food processing. The city's cultural heritage has given rise to renowned products, including Sungudi sarees, handicrafts, and traditional jewellery.

MSME Profile

As of December 2024, Madurai has a total of 214,109 registered MSMEs, according to data from the Udyam portal. Out of these, 211,676 are micro enterprises, 2,273 are small enterprises, and 160 are medium enterprises. The activity-wise distribution of existing MSME units is as follows:

Grouped by Category (for better perspective)

Category	Included Activities	Total Units	% of Total
Manufacturing (S.No. 1–15)	Food, textiles, wood, paper, leather, rubber, chemicals, minerals, metals, machinery, electrical, transport, misc.	31,467	96.7%
Services (S.No. 16–17)	Individual service-based & business-based units	279	0.9%
Repairing (S.No. 18)	Repairing and servicing units	800	2.4%



These figures represent the number of MSMEs registered through the online portal, and the actual number of operational units may vary. The data reveals that food and food-based industries, paper-based and printing industries, metal-based industries, and miscellaneous industries constitute the largest segments of Madurai's industrial landscape.

Growth and Development of Green Management Practices

The adoption of green management practices in Madurai's small-scale industries has evolved from a reactive measure of regulatory compliance into a strategic business imperative, driven by a confluence of market forces, economic incentives, and growing environmental consciousness. This transformation is evident in the phased progression from minimal compliance with Tamil Nadu Pollution Control Board standards before 2010, to a period of growing awareness and early adoption of energy efficiency and waste reduction between 2010 and 2018—exemplified by the revival of eco-friendly products like the Manjapai. The current phase, from 2018 to the present, marks an accelerated transition fueled by government schemes, technological advancements, and the emergence of dedicated green entrepreneurs. This has resulted in widespread adoption of practices such as energy-efficient technologies (LED lighting, solar power), robust waste management and recycling, and water conservation measures in water-intensive sectors. Furthermore, the rise of green entrepreneurship and the integration of green supply chain management, driven by pressures from large corporations and international buyers, underscore a fundamental shift where sustainability is increasingly viewed not just as a cost of doing business, but as a driver of innovation, cost savings, and competitive advantage in the region.

Government Initiatives and Policy Support

The promotion of green practices in Madurai's small-scale industries is underpinned by a multi-layered framework of central, state, and local initiatives that collectively provide financial incentives, technical support, and capacity-building opportunities. At the national level, flagship schemes such as the MSE-GIFT Scheme offer a 2% interest subvention to facilitate the adoption of energy-efficient technologies, while the MSE-SPICE Scheme provides a 25% capital subsidy to encourage circular economy practices, both implemented under the broader RAMP Programme. Complementing these are the ZED Certification Scheme, which has already certified over 6.7 lakh MSMEs nationwide and offers substantial subsidies for quality and sustainable manufacturing, and the RAMP Programme, which strengthens the overall MSME ecosystem. The Tamil Nadu state government reinforces these efforts through its own 25% capital subsidy for green technologies, the TANSEED fund to nurture green startups, and a comprehensive Green Energy Mission aimed at reducing emissions and promoting renewable energy adoption. At the local level, Madurai has witnessed targeted interventions, including workshops and training programmes organized by associations like MADITSSIA and Auroville Consulting to disseminate knowledge on schemes and energy audits, alongside dedicated support for green entrepreneurship through initiatives like the Greenpreneurs Initiative and VAPS-led skill development programmes. Notably, women-led local enterprises such as GreenKraft, Green Fem, and Sakthi Magalir Kulu have emerged as powerful examples of how these initiatives translate into tangible on-ground impact, transforming agricultural waste into marketable products, promoting wellness, and creating sustainable livelihoods while advancing the green agenda in the region.

Conclusion

The growth and development of green management practices in small-scale industries in Madurai District represent a critical dimension of the broader sustainability transition in India's industrial sector. This article has examined the

current state of green practice adoption, the drivers and barriers to adoption, and the role of government policies in facilitating the transition.

The findings reveal that while there is growing awareness of environmental issues and increasing adoption of green practices, the transition remains incomplete. Green practices are most commonly adopted in areas such as energy efficiency and waste management, where there are clear cost-saving benefits and regulatory requirements. However, adoption of more comprehensive green management practices remains limited, constrained by financial barriers, technical barriers, organizational barriers, and policy-related challenges.

The emergence of green entrepreneurship and women-led initiatives in Madurai demonstrates the potential for integrating environmental sustainability with business success. These examples provide valuable lessons for promoting green practices in the broader small-scale industrial sector.

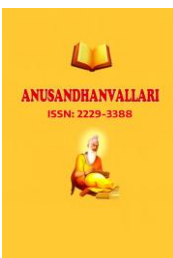
Government policies, including the MSE-GIFT Scheme, MSE-SPICE Scheme, and ZED Certification Programme, provide important support for green practice adoption. However, the effectiveness of these policies is constrained by limited awareness among enterprises, complex procedures, and implementation challenges.

The transition to green management practices in Madurai's small-scale industries is not merely an environmental imperative but also an economic opportunity. Green practices can lead to cost savings through resource efficiency, enhance market access, improve brand reputation, and contribute to long-term competitiveness. However, realizing these benefits requires concerted action by policymakers, industry associations, entrepreneurs, and other stakeholders.

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