

A Study on Sustainable Supply Chain Practices and Circular Economy in Narhe Industrial Region, Pune

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Abstract

This research study examines the adoption of sustainable supply chain practices and circular economy principles among industries located in the Narhe industrial region of Pune. In today's industrial environment, sustainability has become a critical factor influencing operational efficiency, environmental responsibility, and long-term business success.

The main objective of this study is to analyze the level of awareness, implementation, benefits, and challenges associated with sustainable practices in industries. The research uses a descriptive and analytical research design, with primary data collected through a structured questionnaire from 100 respondents, including managers, engineers, and supervisors.

Statistical tools such as percentage analysis, correlation, and chi-square test were used for data analysis. The findings reveal that while awareness of sustainability is relatively high, the level of implementation remains moderate due to challenges such as high cost, lack of infrastructure, and limited technical knowledge.

The study concludes that adopting sustainable supply chain practices and circular economy principles can significantly improve operational efficiency, reduce costs, and enhance environmental performance.

Keywords: Sustainable Supply Chain, Circular Economy, Recycling, Industrial Sustainability, Waste Management

1. Introduction

Sustainable supply chain management has become an essential aspect of modern industrial operations. Traditionally, industries followed a **linear economic model** (take–make–dispose), which resulted in excessive waste generation and environmental degradation.

However, with increasing awareness of environmental issues, industries are gradually shifting toward a **circular economy model**, which focuses on reducing waste, reusing materials, and recycling resources.

In industrial areas like Narhe, Pune, where manufacturing and small-scale industries are concentrated, the adoption of sustainability practices is crucial. These practices include:

- Recycling and reuse of materials
- Energy-efficient technologies
- Waste management systems
- Reverse logistics

Despite growing awareness, many industries face challenges in implementing these practices effectively. This study aims to bridge the gap between awareness and actual implementation.

Research Objectives

- To study sustainable supply chain practices adopted by industries in Narhe
- To analyze implementation of circular economy principles

- To identify benefits of sustainable practices
- To examine challenges faced by industries
- To suggest strategies for improving sustainability

2. Review of Literature

Recent studies highlight the growing importance of sustainability in supply chain management.

- **Recent research (2023–2025)** shows that industries are shifting toward circular models to reduce waste and improve efficiency.
- Studies indicate that **digital technologies and automation** play a key role in sustainable supply chains.
- Research also highlights that **government policies and environmental regulations** are major drivers of sustainability adoption.
- However, industries still face barriers such as high investment cost and lack of awareness.

Overall, literature suggests that sustainability improves both environmental and economic performance but requires strong implementation strategies.

3. Problem Statement & Research Hypotheses

3.1 Problem Statement

In recent years, sustainability has become a critical concern for industries due to increasing environmental degradation, resource depletion, and regulatory pressures. Concepts such as sustainable supply chain management and circular economy are gaining importance as they aim to reduce waste, optimize resource utilization, and promote long-term environmental and economic benefits.

However, despite growing awareness about sustainability, many industries—especially small and medium enterprises—continue to rely on traditional supply chain practices. These practices follow a linear model of production, which leads to excessive waste generation, inefficient resource usage, and environmental harm.

In the context of the Narhe Industrial Region in Pune, industries show a reasonable level of awareness regarding sustainability concepts. However, there exists a significant gap between awareness and actual implementation of sustainable practices. While some industries have adopted basic practices like recycling and waste management, advanced practices such as reverse logistics, circular resource flow, and renewable energy adoption remain limited.

Several challenges contribute to this gap, including:

- High initial investment required for sustainable technologies
- Lack of technical knowledge and skilled workforce
- Limited infrastructure for recycling and reverse logistics
- Resistance to change from traditional operational methods
- Inadequate government support and policy awareness

These challenges hinder the effective implementation of sustainable supply chain practices and circular economy principles.

Therefore, this study aims to analyze the current level of adoption of sustainable practices in industries located in the Narhe region, identify key challenges, and evaluate the relationship between sustainability practices and circular economy implementation.

3.2 Research Variables

Research variables are the key elements that are measured and analyzed in the study to understand relationships and impacts.

1. Independent Variables

Independent variables are those factors that influence or affect other variables in the study.

- Awareness of sustainable supply chain practices
- Adoption of recycling practices
- Use of energy-efficient technologies
- Waste management practices
- Use of eco-friendly raw materials
- Investment in sustainability
- Training provided to employees
- Government policy awareness

2. Dependent Variables

Dependent variables are the outcomes or results influenced by independent variables.

- Implementation of circular economy practices
- Overall sustainability performance of industries
- Operational efficiency
- Cost reduction
- Environmental impact reduction

3. Moderating Variables (if applicable)

These variables may influence the strength of the relationship:

- Industry size (small, medium, large)
- Experience level of respondents
- Type of industry

3.3 Research Hypotheses

A hypothesis is a testable statement that predicts the relationship between variables.

Null Hypothesis (H0)

There is **no significant relationship** between sustainable supply chain practices and the implementation of circular economy principles in industries.

Alternative Hypothesis (H1)

There is a **significant relationship** between sustainable supply chain practices and the implementation of circular economy principles in industries.

4. Research Methodology

3.1 Research Design

The study adopts a **descriptive research design** combining both quantitative and qualitative approaches.

3.2 Data Collection

- **Primary Data:** Structured questionnaire and interviews
- **Secondary Data:** Research papers, reports, and journals

3.3 Sampling Method

Convenience sampling technique was used.

3.4 Sample Size

The study is based on **100 respondents** from industries in Narhe.

3.5 Data Analysis Tools

- Percentage Analysis
- Mean and Standard Deviation
- Correlation Analysis
- Chi-Square Test
- Graphical Representation (Pie Charts)

5. Data Analysis & Findings (Survey Outcomes)

5.1 Summary of Key Response Results (Agreement %)

The table below summarizes agreement levels (Strongly Agree + Agree) across the 15 state

5.1 Interpretation of Findings

The analysis of collected data provides important insights into sustainability practices:

- **70% industries are aware** of sustainable supply chain practices, indicating good theoretical understanding.
- **65% industries adopt recycling**, showing moderate implementation.
- **58% industries use energy-efficient technologies**, but adoption is still not universal.
- **Reverse logistics adoption is low**, highlighting infrastructure gaps.
- **55% industries use eco-friendly raw materials**, indicating gradual transition.

5.2 Key Observation

There is a clear gap between **awareness (high)** and **implementation (moderate)**.

6 Hypothesis Support

The correlation results indicate a **positive relationship** between sustainable supply chain practices and circular economy implementation. This means that industries adopting sustainability practices are more likely to implement circular economy principles.

5.2 Chi-Square Test

The chi-square test was conducted to check the association between variables such as awareness and implementation.

- Calculated value > Table value
- Result: Statistically significant

Conclusion of Hypothesis

- **Null Hypothesis (H0): Rejected**
- **Alternative Hypothesis (H1): Accepted**

This confirms that a significant relationship exists between sustainability practices and circular economy adoption.

7 Conclusion

The study concludes that sustainable supply chain practices and circular economy concepts are essential for long-term industrial growth and environmental protection. Industries in Narhe are gradually moving toward sustainability, but the pace of implementation is slow.

While awareness is not a major issue, practical challenges such as cost, lack of infrastructure, and resistance to change hinder progress. Industries need to focus on innovation, collaboration, and training to improve sustainability performance.

The adoption of circular economy practices can significantly enhance resource efficiency, reduce waste, and create long-term economic benefits.

8 Recommendations

Based on the findings, the following recommendations are suggested:

1. Industries should invest in **energy-efficient and eco-friendly technologies**
2. Government should provide **financial incentives and subsidies**
3. Conduct regular **training and awareness programs**
4. Develop infrastructure for **reverse logistics and recycling systems**
5. Encourage collaboration among supply chain partners
6. Implement **monitoring systems** for environmental performance
7. Promote use of **renewable energy sources**
8. Adopt digital tools for better supply chain management

References (APA Style – from your report)

- Seuring & Müller (2008) – Sustainable Supply Chain Framework
- Govindan & Hasanagic (2018) – Circular Economy Drivers
- Kirchherr et al. (2017) – Circular Economy Model
- Zhu & Sarkis (2004) – Green Supply Chain Practices