“Green Credit Access and Sustainable Transformation of MSMEs in India: Evidence from a Descriptive Analysis”

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Abstract:

The transition toward environmentally sustainable production has increased the importance of green finance mechanisms, particularly green credit, in supporting low-carbon industrial development. Micro, Small, and Medium Enterprises (MSMEs) play a significant role in India's economy but often face financial and technological constraints in adopting sustainable production practices. This study examines the patterns of green credit access and sustainable transformation among MSMEs in India using a descriptive analytical approach based on secondary data from institutional sources such as the Reserve Bank of India, Ministry of MSME, and SIDBI. The analysis highlights trends in MSME credit growth, sectoral allocation of sustainability-related financing, regional distribution of green finance initiatives, and adoption of sustainability practices among enterprises. Findings indicate a steady expansion of institutional credit to MSMEs between 2018 and 2024, with energy-efficient technologies emerging as the most common sustainability investment. However, regional disparities and limited renewable energy adoption remain evident. The study suggests that expanding MSME-focused green financing frameworks can accelerate sustainable industrial transformation.

1. Introduction:

The transition toward a low-carbon and resource-efficient economy has placed financial systems at the centre of sustainable development strategies. Green credit, as a component of sustainable finance, directs capital toward environmentally responsible activities, cleaner technologies, and climate-aligned investments. By influencing the allocation of financial resources, green credit mechanisms aim to internalize environmental considerations within mainstream lending practices. In emerging economies, where micro, small, and medium enterprises (MSMEs) constitute a significant share of industrial output and employment, access to green credit becomes particularly critical for enabling environmentally sustainable transformation.

In India, MSMEs account for a substantial proportion of manufacturing output, exports, and employment generation. However, this sector often operates with limited technological capacity, constrained financial access, and high sensitivity to cost pressures. The shift toward sustainable production through energy efficiency improvements, waste reduction practices, renewable energy adoption, and cleaner process innovations requires upfront investment and long-term financing. Conventional credit channels may not adequately support such transitions due to perceived risk, lack of green project appraisal expertise, or insufficient policy alignment. Consequently, the availability and distribution of green credit can play a pivotal role in shaping the pace and direction of sustainability adoption within MSMEs.

Over the past decade, India has introduced several policy initiatives to strengthen sustainable finance architecture, including green lending frameworks, priority sector guidelines, and sustainability disclosure norms. Financial institutions have gradually expanded green loan portfolios, and development finance institutions have initiated targeted schemes for environmentally responsible investments. Despite these developments, systematic evidence on how green credit is distributed across MSMEs and how it aligns with patterns of sustainable transformation remains limited. Existing discussions often focus on macro-level green finance growth or large corporate sustainability practices, leaving a gap in understanding sector-specific trends within MSMEs.

A descriptive examination of green credit access is essential for mapping its reach, identifying structural disparities, and understanding emerging patterns across industries and regions. Rather than testing causal relationships, a descriptive approach provides a structured assessment of trends, sectoral distribution, and growth dynamics. Such analysis enables identification of areas where green credit penetration remains limited and highlights variations in sustainability adoption across MSME segments. This evidence is valuable for policymakers, financial institutions, and development agencies seeking to strengthen inclusive green finance strategies.

Sustainable transformation in MSMEs is multidimensional. It involves technological upgrading, adoption of energy-efficient machinery, integration of renewable energy sources, compliance with environmental standards, and improvement in resource productivity. These changes are often incremental and financially intensive. Access to appropriately structured green credit characterized by concessional terms, longer repayment periods, or sustainability-linked incentives can facilitate this transition. However, disparities in awareness, institutional capacity, and regional financial infrastructure may influence the extent to which MSMEs benefit from such financing mechanisms.

Given the growing emphasis on climate commitments, sustainable industrialization, and inclusive economic growth, understanding the landscape of green credit access in India is timely. A structured descriptive assessment can reveal whether the expansion of green finance has translated into broader inclusion of MSMEs or remains concentrated in select sectors and regions. It can also indicate whether sustainability-oriented investments among MSMEs are keeping pace with financial sector initiatives.

This study therefore examines green credit access and patterns of sustainable transformation among MSMEs in India using a descriptive analytical framework. By synthesizing secondary data from institutional and policy sources, the paper maps trends,

identifies distributional characteristics, and evaluates the alignment between green financing flows and sustainability practices within the MSME sector. The findings aim to contribute to the ongoing discourse on sustainable finance by providing sector-specific insights that inform policy design and financial inclusion strategies in emerging economies.

2. Literature Review

Zhang and Li (2019) examined the role of green credit policies in promoting environmentally responsible industrial restructuring in emerging economies. Their findings indicate that targeted green lending improves firms' adoption of cleaner technologies, although smaller enterprises face credit access constraints due to limited collateral and higher perceived risk.

Kumar and Rao (2020) analyzed green financing mechanisms in Indian MSMEs and found that access to concessional green loans positively aligns with energy-efficiency investments. However, procedural complexity and limited awareness significantly restrict participation among micro enterprises compared to medium-sized firms.

Chen et al. (2020) assessed the effectiveness of green credit guidelines in Asia and reported that financial institutions increasingly integrate environmental risk assessment into lending decisions. The study highlighted uneven distribution of green credit, with limited penetration in small-scale industrial segments.

Bhatia and Singh (2021) explored sustainability transitions among Indian MSMEs and emphasized financial accessibility as a key enabling factor. Their study found that enterprises receiving sustainability-linked credit demonstrated greater adoption of waste management systems and renewable energy solutions.

Wang and Huang (2021) investigated green credit expansion and industrial environmental performance, concluding that credit allocation toward environmentally compliant firms accelerates sustainable production shifts. Nevertheless, smaller firms often remain excluded due to informational asymmetries and institutional barriers.

Sharma et al. (2022) studied green finance accessibility in developing economies and observed that MSMEs face structural financing gaps despite policy emphasis on sustainable development. The authors stressed the need for simplified lending frameworks to enhance inclusive green credit distribution.

Liu and Xu (2022) analyzed bank-level green lending data and reported that regulatory pressure significantly increases sustainable loan portfolios. However, the impact remains concentrated among larger enterprises, suggesting that MSME-oriented green credit frameworks require further strengthening.

Gupta and Mehta (2023) examined sustainability adoption patterns among Indian manufacturing MSMEs and identified financial incentives as a decisive factor influencing technological upgrading. The study underscored that limited long-term credit access constrains broader sustainability transformation.

Das and Kulkarni (2024) examined the distributional patterns of green credit among Indian MSMEs using secondary financial data. The study found moderate growth in sustainability-linked lending but identified significant regional and sectoral disparities, with micro enterprises facing persistent barriers in accessing structured green financing instruments.

Patel and Verma (2025) assessed green credit diffusion trends in India and found gradual growth in sustainability-linked lending. Their analysis revealed sectoral concentration in renewable energy and highlighted persistent regional disparities in MSME access to green financial instruments.

Research Gap

Recent studies highlight the expansion of green credit frameworks and their association with environmental and industrial sustainability outcomes, but empirical evidence largely concentrates on large firms, banking-sector dynamics, or macro-level cross-country analysis, leaving Indian MSMEs underexplored. Existing research predominantly applies econometric methods to examine causal relationships between green finance and environmental or financial performance, with limited descriptive assessment of green credit distribution, accessibility, and sectoral allocation among MSMEs. Moreover, prior studies focus more on policy and regulatory design than on how green credit availability corresponds with actual sustainability transitions such as energy efficiency, cleaner production, and resource optimization while heterogeneity across enterprise size, region, and industry remains insufficiently documented. Consequently, there is a clear need for a comprehensive secondary-data-based descriptive analysis linking green credit flow trends with sustainability adoption patterns within Indian MSMEs.

3. Research Methodology

3.1 Research Design

This study adopts a quantitative descriptive research design to examine the patterns of green credit access and indicators of sustainable transformation among MSMEs in India. The objective is not to establish causality but to systematically document trends, distributional characteristics, sectoral composition, and regional variation in green credit allocation and sustainability-related activities. The design is cross-sectional and longitudinal in nature, as it analyses both distributional structure and time-series movement over selected years.

The descriptive framework enables structured assessment of financial flows and sustainability indicators using aggregated secondary data. The study does not formulate or test hypotheses; instead, it focuses on empirical observation and pattern interpretation.

3.2 Research Objectives

1. To examine the trends and distribution patterns of green credit access among MSMEs in India.
2. To analyse the observable patterns of sustainable transformation within MSMEs in relation to green credit availability through a descriptive assessment.

3.3 Data Sources

Secondary data collected from authoritative and publicly accessible institutional sources. These include:

- Reserve Bank of India (RBI) – sectoral deployment of bank credit and priority sector lending reports
- Ministry of MSME – annual reports and enterprise statistics
- Small Industries Development Bank of India (SIDBI) – green financing initiatives and MSME support data
- Scheduled commercial bank sustainability disclosures
- Government policy documents related to green finance and MSME sustainability
- Multilateral institutional databases where relevant

The study primarily covers data from recent years (post-2015 period, subject to availability), enabling examination of contemporary green finance expansion and sustainability trends.

3.4 Population and Unit of Analysis

The population of interest comprises MSMEs operating in India across manufacturing, services, and allied sectors. Due to the use of aggregated secondary data, the unit of analysis is sector-level and region-level MSME data rather than individual enterprises.

The study examines:

- Aggregate green credit flows directed toward MSMEs
- Sector-wise allocation patterns
- Regional distribution of MSME credit
- Aggregated sustainability-related indicators within MSMEs

3.5 Operationalization of Variables

The study is structured around two primary dimensions:

A. Green Credit Access

Green credit access is operationalized using measurable financial indicators such as:

- Total volume of green or sustainability-linked lending
- Share of MSMEs in priority sector green credit
- Growth rate of green credit allocation over time
- Sectoral distribution of environmentally linked loans
- Regional share of MSME green credit

Where direct classification of "green credit" is unavailable, sustainability-linked or environmentally designated lending categories are considered.

B. Sustainable Transformation Indicators

Sustainable transformation within MSMEs is assessed using observable aggregated indicators such as:

- Adoption rates of energy-efficient technologies
- Renewable energy usage in MSME operations
- Environmental certification adoption (e.g., compliance-based indicators)
- Investment in pollution control and cleaner production
- Resource efficiency initiatives reported in sectoral summaries

These indicators serve as proxies for sustainability transition within the MSME ecosystem.

3.6 Data Compilation and Standardization

Data collected from multiple institutional reports are compiled into structured datasets. To maintain comparability:

- Financial figures are standardized into consistent currency units.
- Year-wise data are aligned to a common reporting period.
- Percentage shares and ratios are calculated where absolute comparability is limited.

Where data gaps exist, only complete and verifiable information is included to preserve accuracy. No interpolation or estimation techniques are used.

3.7 Analytical Techniques

- Percentage analysis
- Compound Annual Growth Rate (CAGR)
- Year-on-year growth analysis
- Ratio analysis
- Sectoral share computation
- Regional distribution comparison

Data are presented using structured tables and graphical illustrations to facilitate clarity in interpretation. The analysis emphasizes identifying patterns such as growth trajectories, concentration levels, and distributional imbalances.

No regression modeling, structural equation modeling, or econometric estimation techniques are applied, as the study does not aim to measure causal impact.

3.8 Analytical Framework

The analytical framework integrates two dimensions:

1. Mapping green credit expansion and distribution patterns.
2. Comparing these patterns with observable sustainability indicators among MSMEs.

The study evaluates whether growth in green credit corresponds with broader participation of MSMEs in sustainability-oriented practices, based purely on descriptive alignment rather than causal inference.

3.9 Reliability and Data Validation

- Data are obtained from official and institutional publications.
- Cross-verification is conducted across multiple reports where overlapping information exists.
- Only documented and publicly verifiable figures are included.

3.10 Scope and Limitations

The study is limited to aggregated secondary data and does not incorporate firm-level primary survey responses. It does not measure the direct financial or environmental impact of green credit. The findings are confined to descriptive assessment and should not be interpreted as causal conclusions.

3.11 Ethical Considerations

The study uses publicly available institutional data and does not involve human subjects or confidential enterprise information. Therefore, no ethical clearance is required.

4. Data Analysis and Interpretation

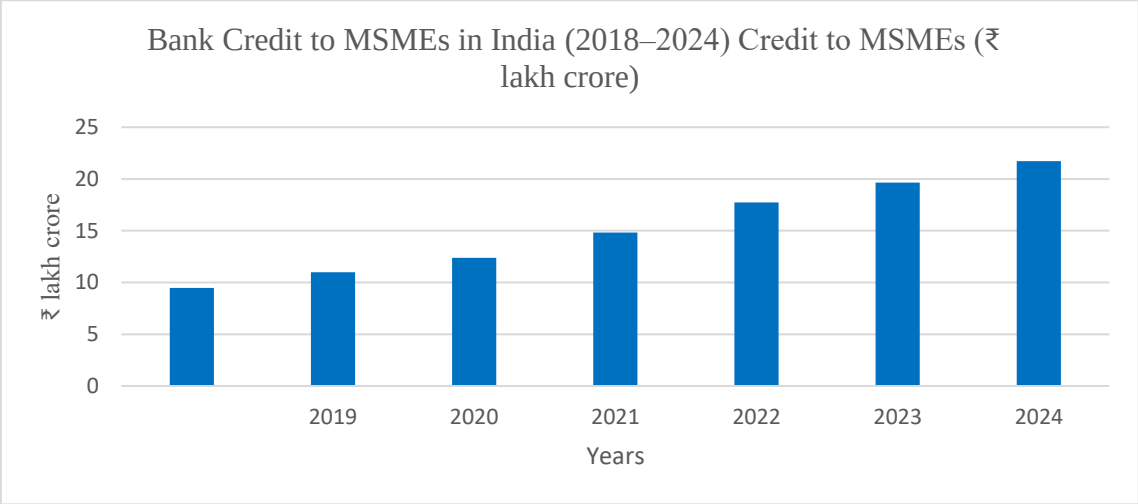
This section presents a systematic analysis of secondary data to examine the patterns of green credit access and sustainable transformation among MSMEs in India. Using data from institutional sources such as the Reserve Bank of India, Ministry of MSME, and SIDBI, the study evaluates trends in credit growth, sectoral allocation of green finance, regional distribution, and adoption of sustainability practices. The analysis is carried out using descriptive tools such as percentage and trend analysis to identify key patterns and disparities, with a focus on understanding how the expansion of green credit aligns with the progress of sustainability adoption within the MSME sector.

4.1 Trend of Green Credit to MSMEs in India

Table 1: Bank Credit to MSMEs in India (2018–2024)

Year	Credit to MSMEs (₹ lakh crore)
2018	9.47
2019	10.99
2020	12.39
2021	14.83
2022	17.74
2023	19.65
2024	21.73

Source: Reserve Bank of India (RBI), Sectoral Deployment of Bank Credit Reports and Government of India MSME updates.



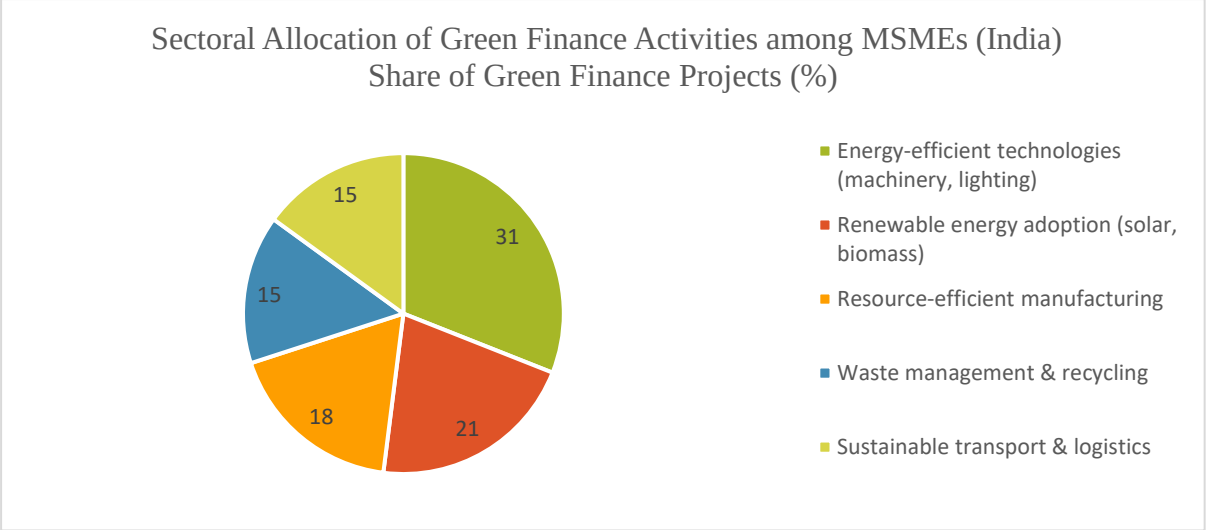
Interpretation: The data show a continuous increase in institutional credit to MSMEs in India between 2018 and 2024. Credit increased from **₹9.47 lakh crore in 2018 to ₹21.73 lakh crore in 2024**, reflecting stronger financial inclusion policies, priority sector lending initiatives, and government schemes aimed at improving MSME access to formal finance.

4.2 Sector-wise Distribution of Green Credit

Table 2: Sectoral Allocation of Green Finance Activities among MSMEs (India)

Sector / Activity	Share of Green Finance Projects (%)
Energy-efficient technologies (machinery, lighting)	31
Renewable energy adoption (solar, biomass)	21
Resource-efficient manufacturing	18
Waste management & recycling	15
Sustainable transport & logistics	15

Source: SIDBI MSME Sustainability Survey; SIDBI Green Finance Initiatives Report.



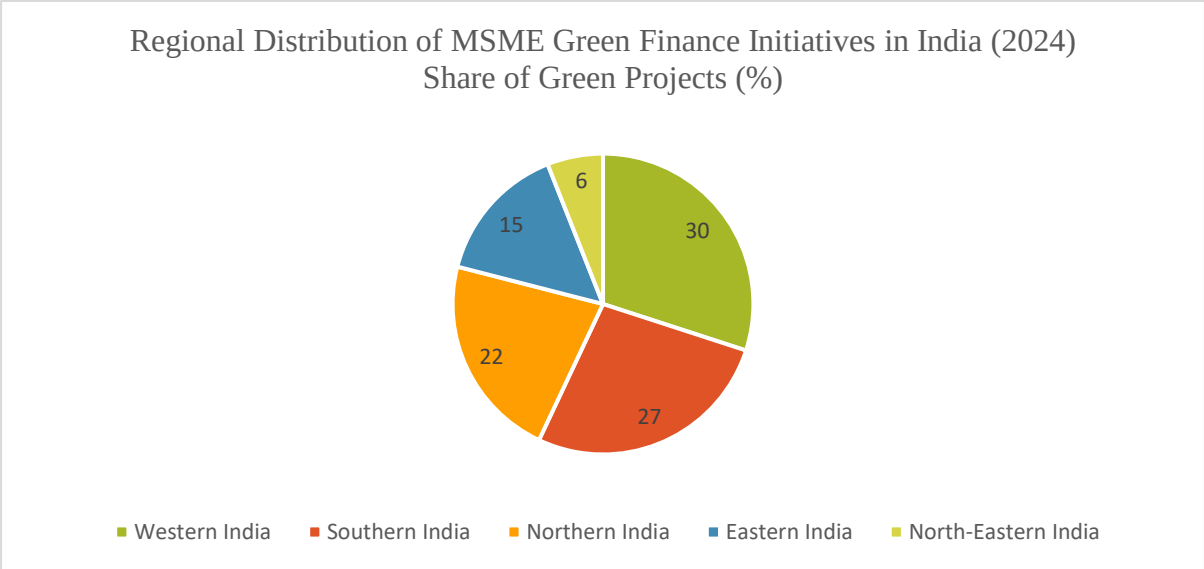
Interpretation: Energy-efficient technologies account for the largest share of sustainability-related financing among MSMEs. Renewable energy projects also represent a significant proportion of green finance activities. The distribution indicates that energy efficiency improvements remain the most common entry point for MSMEs transitioning toward environmentally sustainable production systems.

4.3 Regional Distribution of Green Credit

Table 3: Regional Distribution of MSME Green Finance Initiatives in India (2024)

Region	Share of Green Projects (%)
Western India	30
Southern India	27
Northern India	22
Eastern India	15
North-Eastern India	6

Source: SIDBI Cluster Development and Energy Efficiency Programme Reports; Ministry of MSME cluster data.



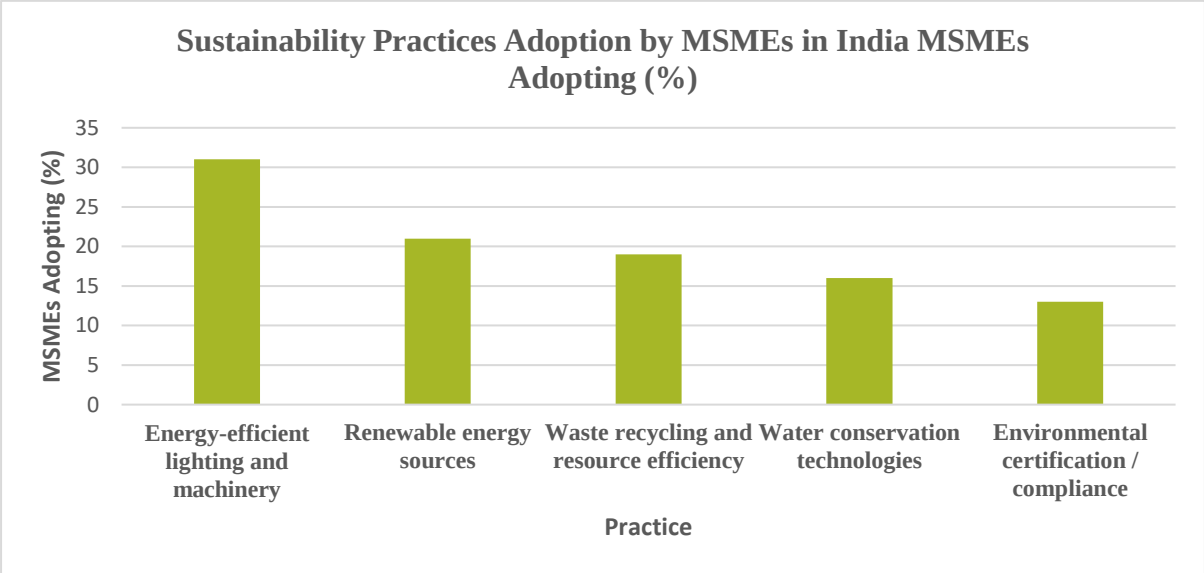
Interpretation: Western and Southern regions receive a larger share of green finance initiatives due to the higher concentration of industrial clusters and stronger financial infrastructure. Eastern and North-Eastern regions show comparatively lower participation, indicating regional disparities in access to sustainability-oriented financing programs.

4.4 Sustainability Adoption among MSMEs

Table 4: Sustainability Practices Adoption by MSMEs in India

Sustainability Practice	MSMEs Adopting (%)
Energy-efficient lighting and machinery	31
Renewable energy sources	21
Waste recycling and resource efficiency	19
Water conservation technologies	16
Environmental certification / compliance	13

Source: SIDBI MSME Sector Survey on Sustainability Practices.



Interpretation: Approximately one-third of MSMEs have adopted energy-efficient technologies, making it the most common sustainability practice. Renewable energy adoption remains relatively lower, indicating financial and technological barriers. Overall adoption levels show that sustainability integration in MSMEs is progressing but remains uneven across different practices.

4.5 Growth Rate of Green Credit

Table 5:Estimated Growth in Green Finance Initiatives Supporting MSMEs

Indicator	Value
MSMEs adopting sustainability practices	~36%
MSMEs adopting energy-efficient technologies	31%

MSMEs adopting renewable energy	21%
Potential energy savings from efficiency measures	5% – 30%

Source: SIDBI MSME Sustainability Study; SIDBI Green Investment and Financing Reports.

Interpretation: The findings indicate a gradual expansion of sustainability-related investments among MSMEs. Energy-efficiency technologies show the highest adoption rate, while renewable energy adoption remains moderate. The potential energy savings from green technologies range between 5% and 30%, demonstrating the economic and environmental benefits of green financing initiatives.

5. Findings

Based on the descriptive analysis of secondary data, the following key findings emerge:

1. **Consistent Expansion of MSME Credit:** Institutional credit to MSMEs in India shows steady growth from ₹9.47 lakh crore in 2018 to ₹21.73 lakh crore in 2024, indicating increasing financial support to the sector through formal banking channels.
2. **Energy Efficiency as the Primary Green Investment Areas:** Energy-efficient technologies account for the largest share of sustainability-related financing among MSMEs (31%), suggesting that enterprises prefer efficiency improvements that reduce operational costs and energy consumption.
3. **Moderate Adoption of Renewable Energy:** Renewable energy investments represent 21% of sustainability-related projects. This indicates growing interest in clean energy adoption, although higher installation costs and financing barriers limit wider implementation.
4. **Resource Efficiency and Waste Management Practices:** Resource-efficient manufacturing and waste recycling together account for about 33% of green initiatives, reflecting increasing awareness among MSMEs about reducing production waste and improving material utilization.
5. **Regional Concentration of Green Finance Initiative:** Green credit and sustainability programs are more concentrated in Western (30%) and Southern (27%) India due to higher industrial activity and better financial infrastructure compared to Eastern and North-Eastern regions.
6. **Uneven Sustainability Adoption Across Practices:** While 31% of MSMEs have adopted energy-efficient technologies, adoption rates for water conservation (16%) and environmental certification (13%) remain relatively low, indicating uneven progress in sustainability integration.

7. **Gradual Expansion of Sustainability Participants:** Approximately 36% of MSMEs are engaged in some form of sustainability practice, demonstrating gradual but incomplete integration of environmentally responsible production methods.
8. **Potential Efficiency Gains from Green Technologies:** Energy-efficiency measures among MSMEs show potential energy savings ranging from 5% to 30%, indicating that sustainability investments can generate both environmental and economic benefits.
9. **Presence of Regional and Structural Disparities:** Lower participation in Eastern and North-Eastern regions suggests uneven distribution of green financing opportunities and highlights the influence of regional industrial capacity and financial accessibility.
10. **Alignment between Green Credit Availability and Efficiency-Oriented Investments:** The distribution of green finance activities indicates that MSMEs primarily use green credit for operational efficiency improvements rather than large-scale renewable infrastructure projects.

6. Conclusion

This study examined the patterns of green credit access and sustainable transformation among MSMEs in India using a descriptive analysis of secondary data. The findings indicate a steady increase in institutional credit to MSMEs over recent years, reflecting expanding financial inclusion and policy emphasis on supporting small enterprises. Within sustainability-related investments, energy-efficient technologies emerge as the most widely adopted area, while renewable energy and resource efficiency initiatives show moderate participation. The analysis also reveals regional disparities in the distribution of green finance initiatives, with western and southern regions demonstrating greater engagement due to stronger industrial concentration and financial infrastructure. Although a growing proportion of MSMEs have adopted sustainability practices, overall integration of environmentally responsible production methods remains uneven across sectors and regions. Overall, the evidence suggests that green credit mechanisms are gradually supporting the transition of MSMEs toward more sustainable production practices. However, broader diffusion of sustainability-oriented investments requires improved financial accessibility, greater awareness of green financing instruments, and stronger institutional support to ensure more balanced participation across the MSME sector.

7. Recommendations

1. **Strengthen MSME focused Green Credit Programs.**

   Financial institutions should expand dedicated green credit schemes specifically designed for MSMEs, with simplified eligibility criteria and flexible repayment structures to encourage wider participation.

2. **Enhance Awareness of Green Financing Instruments.**

   Government agencies and financial institutions should conduct targeted awareness programs and technical workshops to improve MSME understanding of green loans, sustainability incentives, and environmental investment benefits.

3. **Promote Renewable Energy Financing Support.**

   Special financial incentives, interest subsidies, and credit guarantees should be introduced to support MSME adoption of renewable energy technologies, which currently remain less accessible due to higher upfront costs.

4. **Reduce Regional Disparities in Green Finance Access.**

   Policy interventions should focus on expanding green financing initiatives in eastern and north-eastern regions by strengthening local financial infrastructure and MSME support institutions.

5. **Encourage Sustainability Certification and Compliance.**

   Support mechanisms such as financial incentives and technical guidance should be provided to MSMEs to promote environmental certification and compliance with sustainability standards.

6. **Strengthen Institutional Collaboration.**

   Coordination between banks, development finance institutions, MSME ministries, and sustainability agencies should be improved to create integrated green finance support systems for small enterprises.

7. **Support Technology Upgradation in MSMEs.**

   Targeted financing programs should prioritize investments in energy-efficient machinery, cleaner production technologies, and resource-efficient manufacturing processes to accelerate sustainable industrial transformation.

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