



WORKING PAPER

Analyzing the Policy Landscape for Supporting the Clean Energy Transition in Small and Medium Enterprises in India

T.S. Gowthami, Kajol, and Niharika Tagotra

CONTENTS

Highlights1

Executive summary 2

Background 3

Multilayer clean energy policy mapping, assessment, and observations 9

Recommendations and the way forward 18

Appendix A 21

Appendix B23

Appendix C24

Endnotes26

References26

Acknowledgments28

About the authors28

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HIGHLIGHTS

- Small and medium enterprises (SMEs) are integral to the Indian economy. To achieve an economy-wide clean energy transition, it is necessary to address the barriers and challenges faced by SMEs, which need energy security but achieve it today through fossil fuels.
- If SMEs are to take advantage of clean energy measures and invest in the transition, they will need policy consistency; government backing; awareness of the benefits of clean energy, such as cost savings; and a supportive regulatory environment.
- Success stories, trust-building, and peer influence motivate SME participation in clean energy schemes. Effective communication and regular monitoring are essential.
- Discussions with government institutions, nodal agencies, and financial institutions reveal awareness gaps among SMEs about clean energy policies. The transition speed depends on resources such as financial support, renewable energy integration, and workforce training.
- For a successful transition to clean energy, the following are crucial: reduced interest rates, engagement with investors, and collaboration among SMEs, together with regulatory reforms, increased transparency, and funding for risk-sharing strategies.
- Coordinated efforts among government agencies, industry associations, and stakeholders are essential for fostering sustainable development and innovation in the clean energy sector.

EXECUTIVE SUMMARY

Background

In India, the micro, small, and medium enterprise (MSME) sector plays a significant role, contributing to 45 percent of the country's manufacturing output and 40 percent of its total exports. This sector is responsible for approximately 25 percent of the overall energy consumption within the industrial sector (MoMSME 2016). According to the annual report for 2015–16 (MoMSME 2016) released by the Ministry of Micro, Small, and Medium Enterprises (MoMSME), the cumulative count of active enterprises, including both registered and unregistered ones, in the MSME sector stood at 361.76 lakhs (36.1 million). The projected energy consumption in the SME sector showed a steep increase of more than 100 percent and a subsequent increase in CO₂ emissions from 30 million tonnes in 2016–17 to 72.17 million tonnes in 2029–30 (TERI 2022). The Government of India has policies for SMEs, such as the Solar Energy Scheme for Powerloom Sector and the Technology Upgradation Fund Scheme. Although these schemes aim to reduce emissions and the energy intensity of the sector (directly or indirectly), uptake has been slow. Similar measures include the following:

- **Make in India with Zero Defect and Zero Effect:** This initiative uses tax breaks to incentivize sustainable domestic manufacturing by helping participating SMEs constantly upgrade the quality of their products without damaging the environment.
- **Technology Upgradation and Quality Certification's Zero Defect and Zero Effect (ZED) Certification Scheme, A Scheme for Promotion of Innovation, Rural Industry and Entrepreneurship (ASPIRE), Credit Linked Capital Subsidy for Technology Upgradation (CLCSS), and Design Clinic for Design Expertise to SMEs:** These programs help SMEs adopt clean technology and sustainably upgrade their businesses.
- **Manufacturing Competitiveness and Sustainability Initiative (MCSI):** This scheme provides incentives for solar rooftop technology investment or upgrades.

State governments have announced similar programs. However, SMEs typically resist integrating renewable energy and energy efficiency practices, primarily because cost implications and extended payback periods may lead them to prioritize other business needs. That is, given their limited capital resources, clean energy adoption is not a sufficiently high priority for SMEs. Understanding the challenges of SMEs through intensive and high-quality stakeholder consultations is key to developing effective policies, schemes, and strategic implementation plans. This will help pave the way for a more sustainable energy landscape within the SME sector.

About this paper

The energy transition entails a shift from fossil fuels to cleaner and more sustainable energy sources, aligning with India's global commitments to mitigate climate change. A major conundrum arises from the fact that clean energy technologies have a higher up-front cost than conventional technologies, although over the lifetime of the asset the total costs are lower because the fuel cost is “free” (if it is sunshine or wind, for example). However, the hurdle is created by the high up-front cost. All or part of this cost to switch, which is the up-front cost, is expected to be borne by the SME. The research question we are addressing in this paper is to understand the most impactful way in which to offer an intelligently designed subsidy to assist and encourage the SMEs to make this up-front switch faster. They will do so neither because of the global public good of a cleaner environment nor because their personal investment will help India to reach its NDCs sooner, but only when the economics for their own business become more compelling if they use clean energy. That is, if they see that a shift to clean energy technology raises their company's profitability and that its business growth is propelled by energy cost savings and better energy security, then they will be motivated to make that switch. Accelerating this process across millions of SMEs will lead to an increase in investment in clean energy technologies by SMEs.

This paper delves into policies, schemes, and programs geared toward bolstering energy efficiency, fostering the adoption of clean energy sources, and mitigating SMEs' carbon footprint, whether through direct implementation or indirect facilitation. The existing body of work on the energy transition in SMEs focuses largely on financial and technological impediments, whereas this paper explores the impact of clean energy policy uptake and the resulting benefits for SMEs. This paper undertakes a comprehensive review of the policies announced by the central government and state governments for SMEs over the period 2010–20 and analyzes them by developing a quantitative and qualitative assessment framework. The paper also examines previous policies to learn from ministry officials and state nodal agencies about initiatives in selected states (Haryana, Rajasthan, Gujarat, Tamil Nadu, and Himachal Pradesh) that have helped steer the energy transition in SMEs.

This paper contributes to the current understanding of policy dynamics and the energy transition within SMEs. It aims to provide valuable insights for decision-makers striving to achieve a successful energy transition within the SME sector. It does so by assessing the policies introduced to support the energy transition in SMEs, focusing on emission reductions and other benefits such as reduced energy costs and improved energy accessibility. The paper aims to serve as a useful primer to guide policymaking in the future.

Key findings

- Governments, both the central government and state governments, are embracing the shift toward clean energy. This steadfast commitment is clearly mirrored in schemes and programs specifically intended to uphold environmental preservation and encourage sustainable development. These schemes are currently being revised to embrace and advance the adoption of clean energy technologies, energy efficiency, and renewable energy sources.
- A small set of schemes explicitly focus on promoting the adoption of clean energy and energy-efficient technologies and practices through direct financial incentives, grants, or subsidies and technology upgrades. Nevertheless, considerable challenges, such as lack of awareness, exist, necessitating swift action to accelerate the uptake of clean energy solutions. The reduction in subsidies and incentives, especially for schemes directed at clean energy initiatives, is a consequence of multiple factors, such as the impact of COVID-19, economic downturns, market volatility, global political complexities, and surging energy costs. These factors have widespread repercussions for SMEs across different sectors. Currently, SMEs' priorities revolve around stimulating business expansion and creating jobs as part of their pandemic recovery efforts. This has slowed down the rate of clean energy adoption by SMEs.
- Among SMEs, a substantial awareness gap persists concerning available schemes. Even given sufficient awareness, the procedures for applying for incentives and grants, receiving incentives, and accessing grants are perceived to be burdensome.
- Integration of central schemes with state initiatives amplifies the support provided, boosts adoption, and leads to observable outcomes. Conversely, uptake of stand-alone state-specific programs is limited.
- A comprehensive and robust framework that systematically evaluates the effects and outcomes of the clean energy transition is an integral component of policy and scheme guidelines.
- **Tailored financial incentives:** Assess resources allocated and subsidies granted for clean energy provisions, develop specific financial incentives for SMEs, and collaborate with banks for favorable energy lending and investment terms.
- **Trust-building initiatives:** Establish transparent practices and demonstrate accountability in overseeing schemes. Create online portals where every transaction and submission is digitally captured to provide much-needed transparency in the process, thereby building the confidence of indirect stakeholders. Highlight successful past experiences and endorsements from peer SMEs to help foster trust and encourage participation in the clean energy transition.
- **Collaboration:** Implement cluster-level programs on energy efficiency within industries or regions. This is a highly effective measure that encourages collaboration and resource sharing among SMEs to help them collectively invest in energy-saving initiatives. Working at the cluster level to address a multitude of firms that use largely similar technologies is an efficiency improvement. One important way in which the government can improve the efficiency of its own subsidy expenditure is by ensuring that it works through SME clusters and thereby reaches more individual enterprises while lowering the transaction cost of its efforts.
- **Regular monitoring and evaluation:** Establish a robust system for continuous monitoring and evaluation of scheme outcomes. Feedback mechanisms will help identify areas for improvement and build SME confidence.
- **Data sharing assurance:** Address SME concerns about sharing commercial data (with their competitors) by ensuring data security and clearly communicating how the information will be used, anonymized, and protected.

Note: The numbering system followed in this working paper is the Indian numbering system. Typical values that are used are lakhs (1 lakh = 100,000 and is written 1,00,000 in the Indian place value system) and crores (1 crore = 10 million and is written 1,00,00,000 in the Indian place value system).

Recommendations

- **Policy coordination:** Engage the central government and state governments, policymakers, and industry associations to encourage the adoption of clean energy policies among SMEs. This can be done by consulting select stakeholders to better understand why such measures are not being adopted today. Ensure regulatory stability, streamline application processes, and improve communication.

BACKGROUND

Introduction

India's goals and commitments

At the COP-26, the Prime Minister of India laid out a Panchamrit strategy for mitigating climate change, which included the goals of reducing the total projected carbon emission by one billion tonnes between 2021 and 2030 and reducing the carbon intensity of the gross domestic product (GDP) by 45 percent by 2030 from 2005 levels, in an effort

to achieve the target of net zero emissions by 2070 for the country (PIB 2022). The importance of SMEs to the Indian economy and their carbon-intensive activities make decarbonizing the small and medium enterprise (SME) sector a key pillar of achieving India's COP-26 commitments and the broader net zero goals. Over the last decade, the central government and state governments have announced a series of policies and initiatives aimed at helping the sector grow sustainably, but the reaction has been mixed, and some programs have attracted little or no uptake, likely because they were prepared without sufficient consultation with pertinent stakeholders.

Emission trends for micro, small, and medium enterprises (MSMEs)

MSMEs play a significant role in India's economy, with over 63 million enterprises contributing to the employment of around 111 million, accounting for 45 percent of the total manufacturing output and 40 percent of the country's exports (BEE 2019). MSMEs in India are found within specific geographic clusters specializing in the production of similar and/or linked products. These clusters are dispersed across the nation and play a crucial role in meeting the domestic demand, often operating as complementary suppliers of components to larger industries or original equipment manufacturers (OEMs). Out of a total of 63 million enterprises, approximately one-third—that is, about 19.7 million (31 percent)—come under the manufacturing category, whereas the remaining come under the service and trade sectors (BEE 2019).

According to the 2021 Biennial Update Report (BUR) of India, the MSME sector in India is still widely using cheaper and outdated technologies and processes, which results in higher energy consumption (MoEFCC 2021). This sector is characterized by a resource-intensive technology profile and consumes about 25 percent of the total energy consumed by the industrial sector in India. Studies indicate a 6.8 percent year-on-year growth in energy consumption, including both thermal and electrical energy consumption, during 2012–13 to 2019–20. The projected energy consumption for MSMEs shows a steep increase (by more than 100 percent) from 30 million tons of oil equivalent (toe) in 2016–17 to 72.17 million toe (Mtoe) in 2029–30 (FMC and GIZ 2018).

In the 12th Five Year Plan (from 2012 to 2017), the Bureau of Energy Efficiency (BEE) had set a target for reduction in energy consumption by 5.75 percent of the energy used in the energy-intensive manufacturing SMEs, which is equivalent to 1.75 Mtoe (MoP 2011). The BEE, under the BEE-SME Program of the XIIth Plan (2012–17), however, achieved energy savings of only 381.25 toe and emissions reduction of 750 toe/year (BEE n.d.-b), falling substantially short of the target.

Lack of data regarding energy usage patterns and emission levels within the SME sector hinders accurate assessments and targeted interventions. It is crucial to address this data deficiency in order to enable informed decision-making and implement tailored initiatives to foster sustainable practices within this sector.

Obstacles to adoption of clean energy and energy-efficient technologies

The sector's informality presents numerous obstacles for SME stakeholders aiming to invest in energy-efficient technologies and non-fossil fuel energy sources. The challenges include limited technical capabilities, lack of awareness about the available formal financing options, and misconceptions regarding low-carbon pathways. These barriers must be addressed to bridge the demand gap for the transition to energy-efficient practices. Further, a mere 16 percent of Indian SMEs secure financing through formal banking channels, and the credit deficit for SMEs in India stood at around US\$240 billion (approximately INR 16.66 trillion) in 2018. This preexisting financial shortfall poses an additional impediment to the sector's transition efforts (TERI 2022). Among the many reasons why banks regard SMEs as high-risk borrowers, the overriding one is that banks are unable to assess whether the SME will be in business long enough to repay a loan. Unless banks are supported through a suitable (non-bureaucratic and easy-to-access) risk-sharing arrangement, it is highly unlikely that they will increase their lending to SMEs in the near future.

Potential to reduce energy use and emissions

The energy audits conducted in SME units and the cluster profile reports indicate that significant improvement opportunities in energy efficiency exist in these clusters. A set of sector-specific technologies (SSTs) and cross-cutting technologies (CCTs) have been identified that can lead to a minimum potential savings of 1.14 Mtoe, or about 16 percent of the total energy consumption of the clusters/subsectors covered. The energy savings potential in the entire SME sector is significantly higher because the data for several subsectors and clusters are not readily available (TERI n.d.). The key SME subsectors characterized by significant energy consumption encompass food processing, textiles, pulp and paper, chemicals, glass and ceramics, brick kilns, foundries, sponge iron, steel rolling, forging, pharmaceuticals, rubber and plastics, leather, and cement. The report *Enabling Emission Reductions in the SME Sector in India* proposes that using specific technologies strategically within critical SME sectors can yield optimal energy savings of up to 70 percent (FMC and GIZ 2018). It also highlights the deployment of established technologies such as energy-efficient lighting and variable frequency drive motors across unique SME subsectors. This emphasizes the potential for significant energy reduction through technology

adoption (FMC and GIZ 2018). However, the lack of energy data for the majority of Indian SME clusters hinders the effective implementation of these recommendations and the establishment of a robust energy consumption baseline, which are crucial factors in advancing energy efficiency initiatives and policies (Biswas et al. 2018). Innovative business models such as sharing or renting appliances on a pay-per-use or a rent-to-own basis are also needed, and third-party investors have to be identified so that they will offer this technology as a service (i.e., as a Technology as a Service [TaaS]). Most SMEs will be hard-pressed to invest directly in ownership of the technology, and it may also not be necessary for them to own it outright from the start in order to derive the benefits of energy cost savings and greenhouse gas emissions reduction.

Gaps in existing policies and programs

There are compelling economic incentives for more widespread use of clean technology (e.g., decreasing solar tariffs compared to the traditionally high grid electricity costs for industrial users), specific financial arrangements, and a vigorously expanding market. However, adoption of renewable energy such as rooftop solar energy has predominantly been restricted to sizable industrial enterprises and institutions. The significant opportunity within the SME sector has remained largely unexplored due to the perceptions of high risk associated with SME creditworthiness and business prospects, and the very high transaction costs of dealing with numerous small firms that are unable to provide reliable data on their financial health. Only a handful of initiatives, such as the Zero Defect and Zero Effect (ZED) scheme and the BEE SME program, reach across diverse SME sectors under the guidance of energy specialists. These initiatives have not taken root yet; that is, if they were removed, the benefits would cease immediately. However, most policies and programs aimed at fostering clean energy, whether directly or indirectly, are typically confined within the purview of specific ministries. These initiatives often operate independently, lacking cohesive collaboration with other organizations and departments dedicated to advancing clean energy goals.

Scope and objectives of the paper

Introduction

This paper analyzes the initiatives announced by the central government and state governments of India over the last decade to spur SMEs' transition to clean energy, encompassing energy efficiency, renewable energy, and reduced carbon footprints. It develops a quantitative and qualitative framework to assess these policies and initiatives, their uptake, implementation, and benefits to SMEs. The paper further

identifies the factors that have determined the effectiveness of individual initiatives and schemes. The overall objective is to serve as a useful primer to guide policymaking in the future.

This paper focuses on formal clusters of SMEs, excluding micro enterprises and informal SME clusters due to lack of data. It identifies gaps in implementation and makes recommendations while building on the available body of work.

Research questions

The study aims to address the following research questions:

- How effective are the existing state and central government policies and incentives to promote renewable energy and the clean energy transition in SMEs in India?
- What can be done to improve the uptake, implementation, and effectiveness of such policies and avoid unintended consequences?

Our primary aim is to provide a comprehensive understanding of the prevailing landscape of clean energy policies for SMEs in India and of the government policies aimed at fostering renewable energy and facilitating the clean energy transition within SMEs in India. Our aim is also to identify the existing gaps and offer some suggestions as to how they may be addressed, so that government-funded incentives can better deliver the desired outcomes. Wherever possible, we recommend designing targeted pilots of initiatives to address the gaps before rolling them out on a larger scale.

Methodology

We followed a mixed methodology approach, which included conducting a comprehensive review of policies introduced by the central government and state governments in select states and SME sectors over the past decade. We examined publicly available announcements on the websites of relevant ministries and state nodal agencies. Additionally, inputs from state nodal agencies, SME owners, industrial associations, and allied stakeholders were taken to gain insights into initiatives that have facilitated the energy transition among SMEs in the selected states. Our engagement with stakeholders extended to SME owners who have taken up energy efficiency measures, are currently considering them, or have actively participated in energy efficiency programs organized by different agencies. The identified policies and schemes were categorized based on the target sectors, intervention methods, and their specific contributions to different facets of the clean energy transition. These facets encompass the promotion of awareness, the enhancement of capacity-building efforts, the advancement of technology, and the facilitation of financial support (see Figure 1).

Figure 1 | Analytical framework employed for the research



Note: SME = small and medium enterprise.

Source: WRI authors.

Mapping clean energy policies for the SME sector

We conducted a thorough review of the policies and schemes concerning clean energy solutions within the SME sectors in the states of interest and at the central level. It is crucial to clarify that the purpose of this study is not to evaluate or directly compare specific policies. Instead, we aim to identify opportunities and strategies that can successfully promote and accelerate the adoption of clean energy in SMEs. The impact of policies is evaluated as follows:

- Examine the efficacy of current clean energy policies and schemes by analyzing their outcomes using available data from government sources, state development agencies, the District Industries Commissioner (DIC), and so on.
- Assess the knowledge gaps among SMEs regarding the available clean energy initiatives.
- Identify the key drivers and barriers influencing SMEs' decisions to adopt clean energy solutions.
- Explore opportunities and strategies to enhance the integration of clean energy interventions within the SME sector, including improving our understanding of the basic risk mitigation strategies required by commercial lenders if they are to address this untapped market segment.

- Evaluate the coherence and coordination of diverse clean energy interventions across various regions and industries to maximize their positive effects on SMEs.

The central government and state governments have developed a systematic set of initiatives that encompass policies, schemes, and programs for promoting clean energy in the SME sector. Table 1 categorizes the policies and approaches to interventions in the SME sector and the states considered for the study.

The key objective of conducting the mapping exercise is to understand the complete array of current policies, schemes, incentives, and programs relevant to the promotion of clean energy practices. This involves a systematic and meticulous process of identifying and elaborating on diverse policy tools, governmental initiatives, and support mechanisms that have been strategically devised to encourage and facilitate the widespread integration and adoption of clean energy solutions.

Assessment of clean energy policies and schemes

The assessment process involved a comprehensive examination of existing policies and schemes to understand their scope, objectives, and intended beneficiaries. The primary goal was

Table 1 | Policy landscape mapping the clean energy intervention modalities in the SME sector

CENTRAL GOVERNMENT		STATE GOVERNMENT
Intervention modalities		
Targeted measures	Intermediary support	Sector-specific measures
Direct clean energy interventions across all sectors of SMEs	Schemes and programs for SMEs across all the sectors, which include clean energy components	Sector and subsector clean energy interventions by specific ministry

Note: SMEs = small and medium enterprises

Source: WRI authors.

to determine how these policies are specifically tailored to facilitate the transition to cleaner energy sources and reduce carbon emissions in SMEs. A systematic approach was used to understand and evaluate the effectiveness of policies, schemes, and programs and the policy levers of clean energy solutions (Ginoya et al. 2021). Three key levers, namely Policy Frameworks, Resource Allocation, and Coordinating Mechanisms, were used to analyze direct and indirect impacts on SMEs. Effective policy implementation relies on well-defined policy frameworks that outline scope, objectives, required resources, intended outcomes, and roles. Adequate resource allocation, encompassing human, financial, and technological aspects, establishes a robust foundation for implementation through transparent financial procedures. Further, coordinating mechanisms are essential to seamlessly integrate the clean energy transition across departments and disciplines, and such mechanisms require a structured implementation process within the policy framework that incorporates continuous monitoring, evaluation, and feedback for achieving successful outcomes.

Stakeholder engagement

We engaged with central and state-level policymakers, industry associations, cluster leaders, industries (SME owners), and other allied stakeholders to seek their inputs on the uptake, awareness, and disbursement of policies and schemes. Through semi-structured and informal conversations, we analyzed the on-ground impact of clean energy policies. The objective of these discussions was to gain valuable perspectives on the effective uptake of policies and schemes, levels of awareness of the stakeholders, and an understanding of the available financial mechanisms. These engagement sessions took the

form of semi-structured interviews, which fostered open-ended conversations, exchange of opinions, and feedback. These conversations also gave stakeholders the opportunity to offer invaluable recommendations based on their expertise and practical experience. We value the integration of a variety of perspectives into the policymaking process, recognizing that stakeholders often bring unique insights and practical knowledge that can significantly enhance the effectiveness and sustainability of policy implementation.

Clean energy technologies have emerged as a pivotal aspect of the energy transition, and the extent to which SMEs embrace these technologies largely hinges on their beliefs as to how substantially and immediately these technologies can lower their energy bills, when balanced against loan payments and other costs of gaining access to such technologies. In addition, willingness to adopt these technologies is related to their beliefs regarding climate change, mitigation, and adaptation measures. After discussions with SME owners, industry associations, and employees from different industries, the team identified the key factors that have a significant impact on the clean energy ecosystem within the SME sector (see Table 2 and Figure 2).

Impact assessment

We followed a combination of quantitative analysis (energy consumption, cost savings, reduced greenhouse gas emissions, and access to finance) and qualitative research methods to assess both the direct and indirect impact of policies on SMEs. The goal is to provide evidence-based insights into how these initiatives positively influence SMEs' economic, environmental, and social aspects.

Table 2 | Key factors in clean energy adoption: Summary of discussions with key stakeholders

KEY FACTORS	HIGHLIGHTS OF DISCUSSIONS
Adoption of clean energy measures by SMEs	The discussions and engagements highlighted diverse energy efficiency measures and technology adoptions such as replacement of fans and lighting; installation of variable frequency drives (VFDs) and automatic power factor control (APFC) panels; replacement of motors, boilers, and related machinery; and adoption of solar and wind energy at their factory complexes. However, adoption is limited to a few SMEs.
Uptake of union government and state schemes	The responses were mixed: some SMEs had joined central and state-sponsored interest subsidy schemes on renewable energy or energy efficiency adoption, whereas others had not joined any schemes.
Awareness of and information on implementing clean energy and energy efficiency solutions	SMEs primarily relied on local bank branches as their main source of information and assistance for clean energy financing, and some respondents mentioned utilizing online portals for financing inquiries.
Loan products for implementing clean energy technology	The majority of SMEs chose working capital, personal, or term loans for their business needs, and only a few SMEs had obtained a term loan specifically for renewable energy technologies such as a solar rooftop plant. Further discussion revealed that the interest rates for clean energy technology loans ranged from 7.9% to 10%. Financial institutions requested collateral in the form of property, buildings, and plant machinery as security for financing clean technologies. SMEs indicated that they had been given information about the terms and conditions of loans and the application process by bank officials.

Table 2 | Key factors in clean energy adoption: Summary of discussions with key stakeholders (cont'd)

KEY FACTORS	HIGHLIGHTS OF DISCUSSIONS
Documents required for credit facilities	Various documents were required by financial institutions, including Goods and Services Tax (GST) certificates, 3-year balance sheets, Credit Information Bureau (India) Limited (CIBIL) reports, account statements, SME certificates, and projected profitability statements for the next 3 to 5 years, irrespective of whether the enterprise pursued clean energy technology or not.
Clean energy finance	SME owners opined that they would adopt clean energy solutions provided there were subsidies or financial incentives. Also, the responses primarily indicated loan amounts (related to clean energy or energy efficiency implementation) ranging from INR 15 lakhs to 2 crores, with one SME specifying INR 52 lakhs specifically for clean energy technology. The responses primarily indicated loan tenures unrelated to clean energy initiatives that ranged from 5 to 10 years. One SME specified a 5-year tenure specifically for clean energy technology.
Energy services company (ESCO) for implementing energy efficiency and renewable energy measures	The majority of the SMEs had not used the services of an ESCO for implementing energy efficiency measures or a renewable energy service company for solar rooftop or ground mount system implementation.

Note: MSME = micro, small, and medium enterprise; SME = small and medium enterprise.

Source: WRI authors.

Figure 2 | Summary of discussions with SME owners, industry associations, and nodal agencies on uptake of clean energy schemes

SME owners	<ul style="list-style-type: none"> ■ SME owners in the northern region were less aware about the policies pertaining to clean energy in their states than those in the southern region. ■ SME owners raised concerns regarding the number of documents required to enroll in the schemes. ■ Most SMEs depend on their bank branches for finance to implement clean energy measures; none depend on energy service companies and renewable energy service companies.
Industry associations	<ul style="list-style-type: none"> ■ Association leaders raised a concern over the lack of demonstration projects. There is a need for effective approaches to minimize risks and maximize the adoption of new technologies in SMEs by creating more pilot projects. ■ Not many industries have shown interest in obtaining a ZED certificate, because the demand by buyers for a certified product is limited. ■ Obtaining finance for setting up and running a business is a higher priority than investing in clean energy technology. ■ SMEs rely more on peer-to-peer learning and word of mouth for adoption of new schemes.
Nodal agencies	<ul style="list-style-type: none"> ■ The schemes of nodal agencies have been very effective and they receive multiple inquiries, but the pace of adoption is slow. ■ Despite several training and awareness program, SMEs lack enthusiasm for renewable energy and energy efficiency. ■ The policies are well devised to provide emergency funds and aid development of infrastructure and facilities.

Note: SME = small and medium enterprise.

Source: WRI authors.

MULTILAYER CLEAN ENERGY POLICY MAPPING, ASSESSMENT, AND OBSERVATIONS

Central policies and schemes

The Government of India has recognized MSMEs as the primary drivers of sustainable economic development within the country (MoMSME 2020b). A multitude of initiatives, including policies, schemes, and financial mechanisms, formulated in partnerships with banks, financial institutions, and public and private organizations, have been rolled out for the benefit of these entities. At present, the MSME Champions Scheme (formerly known as CLCS-TUS) has been created by merging all six components of the previous Technology Upgradation Scheme (TUS) for a duration of five years, spanning 2021–22 to 2025–26. The new MSME Champions scheme comprises three key components: MSME-Sustainable (ZED), MSME-Competitive (Lean), and MSME-Innovative

(for Incubation, IPR, Design, and Digital MSME). Appendix A details the number of MSMEs with ZED certification in India (26,000 in 2022). However, the number of MSMEs registered in the MSME ZED portal (MoMSME n.d.-a), including in the Udyam Assist Platform (UAP) portal, as of August 2023 was 22,586,154 units. The staggering number of MSMEs in India gives an idea of how much capacity has to be built up and the adoption of ZED certification scaled up.

Tables 3 and 4 present a comprehensive mapping of clean energy interventions and their alignment with existing policies and schemes. This mapping aims to serve as a valuable tool for understanding the synergies and integration between clean energy initiatives and the broader policy framework.

Table 3 | **Central interventions for the clean energy transition in SMEs**

SCHEME, POLICY, OR PROGRAM	TIMELINE	INTERVENTION MODALITIES	CLEAN ENERGY OBJECTIVES	NATURE OF ASSISTANCE TO SME	OBSERVATION
MINISTRY OF MICRO, SMALL, AND MEDIUM ENTERPRISES					
Micro and Small Enterprises—Cluster Development Programme (MSE-CDP)	2007, 2019 (revised)	Intermediary support	One of the objectives of this scheme is to promote green and sustainable production processes and products.	Financial assistance (grants) for establishing or upgrading Common Facility Centres (CFCs) and infrastructure development in clusters.	In 2021, the National Planning Commission reported a consistent 30% annual growth rate in disbursement. ^a The scheme covers 80% micro and 20% small enterprises, with provisions for common renewable energy generation (solar, wind, bio) technology centers in clusters.
Credit-Linked Capital Subsidy Scheme—Technology Upgradation Scheme	2000	Targeted measure	Technology upgrades for improved productivity, quality of product, and energy conservation in machinery.	Financial assistance for obtaining credit and loan. SMEs can get a capital subsidy (~15%) on credit taken for technology upgrades.	In 2018, 83.8% of SME owners obtained loans for technology upgrades, with 16.2% seeking funds for energy-saving purposes. ^b Loans were used mostly for electrical equipment and partly for thermal and renewable energy technology.
MSME Sustainable (ZED) Certification	2016	Intermediary support	Encourage and enable SMEs to manufacture quality products using the latest technology and tools to constantly upgrade their processes.	An SME unit will get a subsidy on the cost of certification in accordance with the following structure: Micro Enterprises: 80% Small Enterprises: 60% Medium Enterprises: 50%.	Considering the number of SMEs registered on the Udyam portal, the number of SMEs that have obtained ZED certification is very small (see the ZED certification table in Appendix A). Stakeholders opined that ZED certification is an important initiative and that a mandate system is needed to speed up scheme adoption.

Table 3 | **Central interventions for the clean energy transition in SMEs (cont'd)**

SCHEME, POLICY, OR PROGRAM	TIMELINE	INTERVENTION MODALITIES	CLEAN ENERGY OBJECTIVES	NATURE OF ASSISTANCE TO SME	OBSERVATION
Technology and Quality Upgradation (TEQUP) – an NMCP scheme	2010– 2017, 2019 (revised)	Targeted measure	Capacity building, implementing energy-efficient technologies (EETs) in SMEs.	Financial support for organizing awareness programs, 25% of the project cost for implementation of EETs, grants for establishing carbon credit aggregation centers (CCAs).	Energy efficiency cuts costs, and emissions-sector-specific EET certification and greater SME awareness are needed for knowledge transfer on emerging technologies (see the TEQUP table in Appendix A).
MINISTRY OF TEXTILES					
Solar Energy Scheme for Powerloom Sector	2017	Targeted, subsector specific	Promotion of solar photovoltaic (PV) plants to alleviate the problem of power cuts and power shortage faced by decentralized power loom units.	Financial assistance or capital subsidy for installing grid-connected (without battery backup) and off-grid solar PV (with battery backup) systems to meet the energy requirements of small power loom units having up to eight looms.	The subsidy rates in the Solar Energy Scheme for Powerloom Sector changed, with revised guidelines in 2018 leading to reduced subsidies within a year. A comprehensive analysis is needed to understand the factors, including market conditions, influencing this reduction and its impact on implementation and outcomes.
Sustainable and Accelerated Adoption of efficient Textile technologies to Help small Industries (SAATHI) (Ministry of Power)	2017	Subsector specific	Sustain and accelerate the adoption of energy-efficient textile technologies in the power loom sector and cost savings due to the use of this technology.	Energy Efficiency Services Limited (EESL) will replace inefficient electric motors with energy-efficient motors, resulting in energy and cost savings.	Highly efficient devices save energy and costs, and EESL is repaid from energy cost savings over 4–5 years via an aggregation model, eliminating up-front capital needs. Improved efficiency covers payments, benefiting units with reduced costs and repayment time frames.
Technology Upgradation Fund Scheme (TUFS) and Amended Technology Upgradation Funds Scheme (A-TUFS)	1999 2007 2011 2013 2016	Intermediary support	Promotes conversion of existing looms to better-technology looms to improve quality and productivity.	It is a credit-linked subsidy program aimed at promoting capital investment in textile manufacturing as part of the Government of India's Make in India and Zero Defect and Zero Effect initiatives.	Stakeholder engagement occurs through the Technical Advisory-cum-Monitoring Committee and the Information Technology Centre, which offer vital technical guidance. Equipment claims are verified via inspections, and subsidies are disbursed after installation through the i-TUFS portal. By March 31, 2022, ATUFS had 14,389 subsidy applications, anticipating an investment of INR 69,160 crores with a provisional subsidy of INR 4,962.99 crores. ^c
Comprehensive Powerloom Cluster Development Scheme (CPCDS)	2008	Intermediary support	Development of clusters with about 5,000 decentralized power looms, supporting infrastructure, common facilities, technology upgrades, etc.	The funding will be in the ratio of 40:60, in which the government grants per cluster may constitute a maximum of 40% (with a ceiling of INR 70 crores) and the remaining 60% to be raised by a special purpose vehicle through various stakeholders.	Mobilization of grant and funds by preferential channelization or dovetailing is available under various schemes of the central government and state governments. Some of these schemes that can be used are the Technology Upgradation Funds Scheme and the Industrial Infrastructure Upgradation Scheme (IIUS) of the Department of Industrial Policy & Promotion, Schemes under the Ministry of MSME. ^d

Table 3 | Central interventions for the clean energy transition in SMEs (cont'd)

SCHEME, POLICY, OR PROGRAM	TIMELINE	INTERVENTION MODALITIES	CLEAN ENERGY OBJECTIVES	NATURE OF ASSISTANCE TO SME	OBSERVATION
BUREAU OF ENERGY EFFICIENCY'S (BEE'S) NATIONAL PROGRAM ON ENERGY EFFICIENCY AND TECHNOLOGY UPGRADATION OF MSMEs					
BEE-SME	2007	Targeted measure	To improve the energy efficiency of the SME sector in India by accelerating the adoption of EETs, knowledge sharing, capacity building, and development of innovative financial mechanisms.	Energy use and technology analysis. Capacity building and outreach awareness. Implementation of energy efficiency measures. Development of innovative financing mechanisms. ^e	BEE's efforts to boost India's SME sector's energy performance reveal limited nationwide acceptance, with entrepreneurs facing challenges such as risk aversion, paperwork complexities, and a lack of awareness about incentives.
BEE-United Nations Industrial Development Organization (UNIDO)-Global Environment Facility (GEF)	2011	Targeted measure	Increase the capacity and demand for energy efficiency products and services.	Promoting energy efficiency and renewable energy in selected SME clusters in India.	This initiative conducts energy audits in SMEs, establishes energy baselines, recommends technologies, and facilitates implementation while also aggregating demand to lower energy efficiency costs through economies of scale.
BEE-GEF-World Bank (through SIDBI)	2010	Targeted measure	Building capacity and awareness, increased investment in energy efficiency and knowledge management.	Increase demand for energy efficiency investments in the target SME clusters and build their capacity to access commercial finance.	The program benefited cluster units with energy savings and CO ₂ reduction. It established dedicated financing for energy efficiency projects and concluded successfully after a 10-year period.
Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE) (through GEF, SIDBI, and WB)	2016	Intermediary support	PRGFEE is a risk-sharing mechanism to give participating financial institutions (PFIs) partial coverage of the risk involved in extending loans for energy efficiency projects.	PRGFEE guarantees 50% of the loan amount or INR 10 crore per project, whichever is less. PRGFEE support has been provided to SMEs.	Promotes an increased level of investment in energy efficiency projects, especially through energy service performance contracting delivered through energy service companies.
Facility for Low Carbon Technology Development	2018-21	Targeted measure	Promote innovation in low carbon technology solutions that address the existing technology gaps in Indian industrial and commercial sectors.	The project provides financial assistance to the winners to validate their innovation and demonstrate its efficacy (performance) in actual field conditions.	The target of the project is to get 120 innovative technology validation ideas and 40 commercialized innovations. These ecosystem hubs will also involve more stakeholders, including financiers, who will help sustain clean technology innovation and offer policy suggestions.

Note: SME = small and medium enterprise.

a. NPC 2021.

b. Labour Bureau 2021.

c. Ministry of Textiles 2023.

d. Ministry of Textiles n.d.-a.

e. BEE n.d.-b.

Source: WRI authors.

Table 4 | Interventions by national institutions for the clean energy transition in the SME sector

PROGRAM	YEAR	INTERVENTION MODALITIES	KEY FEATURES	NATURE OF ASSISTANCE TO SME	OBSERVATION
SMALL INDUSTRIES DEVELOPMENT BANK OF INDIA (SIDBI)					
JICA – SIDBI ^a Financial Assistance Scheme	2014	Targeted measure	The Japan International Cooperation Agency (JICA) has extended a Line of Credit SIDBI for financing energy-saving projects in SMEs.	The financial assistance to SMEs is through SIDBI, SFCs, and NBFCs.	Promote energy-saving investments in machinery to cut energy use and CO ₂ emissions, and boost profitability while maintaining environmental responsibility.
4E (End to End Energy Efficiency Scheme)	2014	Targeted measure	Promote energy efficiency in SMEs, including technology upgrades.	Provide financial aid, not exceeding 50% of the total project cost, for capital expenses such as equipment, machinery, rooftop solar, and energy efficiency measures.	Technical consultants are engaged at a reasonable cost for energy savings. Retrofits are recommended for existing systems. Technology upgrades and new equipment installations are also covered.
GOVERNMENT-WIDE INTEGRATED PROGRAM					
National Manufacturing Competitiveness Programme (NMCP)	2007	Intermediary support	NMCP serves as the overarching program to boost SME competitiveness, addressing technology access and energy cost reduction.	Promoting information technology and communication tools in the SME sector, design clinic schemes, and technology upgrade schemes.	Enabling Implementation of Quality Management Standards and Quality Technology Tools (QMS/QTT) for SMEs. Technology and quality upgrade support for MSMEs. Awareness generation regarding EET and credit-linked subsidy for EET projects (25%) are provisions included in the NMCP for Clean Energy.

Note: NBDCs = non-banking financial companies; SFCs = state financial corporations; SME = small and medium enterprise.

a. The Small Industries Development Bank of India (SIDBI) is the apex financial institution that provides concessional financial products or risk mitigation instruments to SMEs and coordinates energy efficiency programs with international partners such as the World Bank, GEF, and UNIDO (The World Bank 2016).

Source: WRI authors.

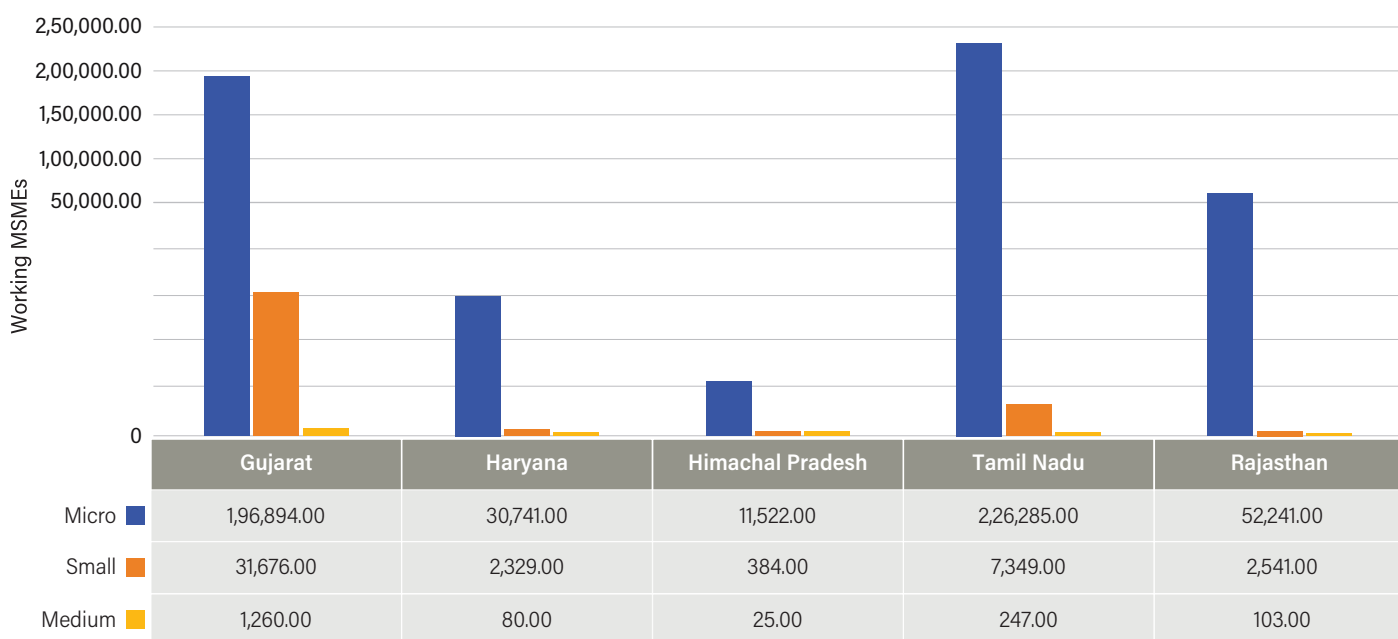
State-level policies and schemes

State governments play a significant role in supporting SMEs, as they have the flexibility to tailor policies to their specific regional needs and requirements (see Figure 3). Some states have been particularly proactive in creating favorable ecosystems for SME growth. For example, FaMe TN (Facilitating MSMEs of Tamil Nadu), an autonomous agency of the Government of Tamil Nadu, is a facilitating ecosystem with supportive pillars across regulatory, financial, technological, organizational, and marketing domains for nurturing MSMEs. At the state level, district industrial centers were set up across the country for promoting central-government-specific policies such as the Credit Guarantee Fund Trust Scheme, Credit-linked Capital Subsidy Scheme for Technology Upgradation, National Manufacturing Competitiveness

Programme, Marketing Assistance Scheme, and Lean Manufacturing Scheme. These separate state-level institutes are set up for creating awareness and to coordinate and monitor implementation of Government of India initiatives, schemes, and programs. This study looks at the schemes and policies in five key states where the WRI team has a presence: Haryana, Gujarat, Tamil Nadu, Rajasthan, and Himachal Pradesh.

Table 5 summarizes state-specific policies, schemes, and initiatives in addition to central government policies and schemes and cluster, skill, and infrastructure development initiatives that encourage collaboration and resource sharing among SMEs in specific states and sectors.

Figure 3 | State-wise distribution of estimated number of working MSMEs by type of enterprise



Note: MSME = micro, small, and medium enterprise.

Some of the dataset is not available and is thus incomplete. Data on informal and unregistered MSMEs are not available.

Source: MoMSME n.d.-b.

Table 5 | State-level interventions for the clean energy transition in SMEs

SCHEME	YEAR	INTERVENTION MODALITIES	KEY FEATURES FOR CLEAN ENERGY INTERVENTIONS	NATURE OF ASSISTANCE TO SME	OBSERVATION
HARYANA					
Mini Lean Cluster Scheme	2014	Targeted measure	Enhance SME competitiveness by using lean manufacturing techniques, reducing waste, and improving productivity.	A minimum of eight units is required to form a mini cluster; there is no maximum limit. The state government provides up to 80% financial support for enhancing access to technologies, which is capped at INR 2 lakhs per unit.	Twenty-five clusters with over 6,000 SMEs identified for support under the Micro & Small Enterprises – Cluster Development Programme (MSE-CDP) with financial backing for common facilities and infrastructure. Dovetailing of central and state schemes enables institutional strengthening.
Assistance for Environment Compliance Scheme	2019	Intermediary support	Industrial development and the associated growth should not damage the ecology and the environment. To implement the concept of “Zero Effect.”	SMEs can receive up to 50% financial support, limited to INR 25 lakhs, for setting up effluent treatment plants and air pollution control devices. Higher subsidies are available on a case-by-case basis for units adopting zero effluent discharge.	Although explicit clean energy objectives are not defined, this scheme acts as an enabler for SMEs to mitigate climate change.

Table 5 | State-level interventions for the clean energy transition in SMEs (cont'd)

SCHEME	YEAR	INTERVENTION MODALITIES ^a	KEY FEATURES FOR CLEAN ENERGY INTERVENTIONS	NATURE OF ASSISTANCE TO SME	OBSERVATION
Energy Audit Scheme	2015	Targeted measure	Identify energy-intensive areas, measure actual usage, compare with the minimum requirements, and propose efficient energy optimization methods.	Provides 75% reimbursement for energy audit costs (up to INR 2 lakhs) and 50% subsidy for capital equipment expenses (up to INR 20 lakhs) to eligible SMEs for energy conservation measures.	Promotes Swachh Haryana through green and clean technologies, waste minimization, and recycling.
Haryana—Credit Linked Advance Technology Adoption Scheme	2019	Intermediary support	Acquire the latest technology and upgrade existing technology.	Subsidy at 50% on the cost of adopting technology from recognized national institutes subject to a maximum of INR 25 lakhs.	The state promotes awareness of Government of India schemes for SME technology adoption schemes such as Credit Linked Capital Subsidy Scheme (CLCSS), Technology & Quality Upgradation Support to MSMEs (TEQUP), lean manufacturing, and Zero Defect and Zero Effect (ZED).
Haryana State Renewable Energy Scheme	2019	Targeted measure	Adoption of renewable energy by the SME sector.	State offers 5% interest subsidy, up to INR 5 lakhs/year for three years, for adopting renewable energy.	Importance of the clean energy transition is recognized through explicit provisions.
GUJARAT					
Scheme of financial assistance for energy and water conservation	2015	Targeted measure	Encourage energy and water conservation in industries.	Fifty percent cost support for energy and water audits and environmental compliance in an enterprise, up to a limit of INR 50,000, and 20% cost support for equipment, with a maximum of INR 20 lakhs separately in each case.	The operative period of the scheme shall be from September 4, 2018, to December 31, 2023. Extension of this scheme beyond 2023 will help faster adoption of energy saving practices.
Scheme to assist environmental management	2015	Targeted measure	Adopt cleaner production technology, reduce resource consumption, and improve environmental management.	SMEs can receive up to 35% of machinery costs, capped at INR 35 lakhs, under the scheme, while large projects can get up to 10% support for plant and machinery with the same ceiling.	The scheme promotes cleaner production, resource optimization, and waste reduction, but may lead to increased energy use for meeting standards.
Assistance in encouraging green practices and environmental audits for SMEs	2020	Targeted measure	Promote green practices and environmental reporting from 2020 to 2025.	Assistance of up to 75% of the fees of auditing services of up to INR 50,000 per audit, whichever is less, once during the operative period of the scheme.	Activities such as setting up an environment management system and installing an online Continuous Stack Emission Monitoring system (CSEMS) are eligible for assistance.

Table 5 | State-level interventions for the clean energy transition in SMEs (cont'd)

SCHEME	YEAR	INTERVENTION MODALITIES	KEY FEATURES FOR CLEAN ENERGY INTERVENTIONS	NATURE OF ASSISTANCE TO SME	OBSERVATION
TAMIL NADU					
Scheme for Promotion of Energy Audit & Conservation of Energy (PEACE)	2019	Targeted measure	Assessing the energy savings potential of the SME sector.	Grant (25% up to INR 2 lakhs for cost of upgrading machinery and equipment to improve energy efficiency after audit) Incentive or subsidy of 50% (up to INR 75,000 for the energy audit cost).	The objective of this scheme is to create awareness and educate SMEs about the advantages of new technologies for saving energy. Stakeholders opined that majority of SMEs prioritized business as usual.
Additional capital subsidy for promotion of cleaner and environment-friendly technologies	-	Targeted measure	To assist enterprises that install environment-friendly technology, reduce their financial burden of plant and machinery procurement.	Subsidy provided for 25% of eligible plant and machinery (only environment-friendly plant and machinery) cost, up to a maximum of INR 25 lakhs.	This scheme represents a focused effort to encourage sustainable business practices and production process.
RAJASTHAN					
Promotion of solar thermal collectors	2011	Targeted measure	The Energy Department mandates solar water heating systems in industrial buildings.	Loan Assistance from Indian Renewable Energy Development Agency (IREDA), financial institutions, and commercial banks.	The Rajasthan Solar Policy 2010 promotes solar steam systems for various industrial uses, including hot water, steam, pre-heating, drying, steam pressing, laundry, and space conditioning, contributing directly to a clean energy transition in industrial processes.
HIMACHAL PRADESH					
Assistance for access to technology, competitiveness, innovation, and quality certification	2019	Targeted measure	Access to technology, innovation, and quality, including equipment used in manufacturing.	Reimbursement of 50% of expenses incurred is subject to a maximum of INR 5 lakhs per enterprise.	Himachal Pradesh's industrialization is recent, offering a clean energy start with innovative solutions tailored to its hilly terrain.
Support for energy audit	2019	Targeted measure	Provision to adopt energy-efficient systems and processes.	Seventy-five percent of the cost of conducting an energy audit, with a maximum limit of INR 5 lakhs.	Given the topography of Himachal Pradesh, energy demand and supply, and transportation constraints, energy savings play an important role.
Assistance for the use of green fuels	2019	Targeted measure	To fuel the manufacturing process with gas or solar power, or to use it as an alternative power backup during the manufacturing process.	Reimbursement of 50% of the cost incurred, subject to a maximum of INR 3 lakhs per enterprise.	There is strong commitment from the Government of Himachal Pradesh to adopting clean energy sources.

Note: MSME = micro, small, and medium enterprise; X = not available.

a. See Table 1.

Source: WRI authors.

Assessment and learning from policy mapping

Many schemes are launched with well-defined implementation guidelines and project cycles covering identification, approval, execution, monitoring, and evaluation. Additionally, several schemes undergo performance assessments, such as the Comptroller and Auditor General of India's audits of major national initiatives, which provide actionable recommendations based on their performance. Nevertheless, a distinct gap exists: the lack of a standardized framework for gauging the real-world impact of these schemes, including their influence on the clean energy transition. This gap is of paramount importance in evaluating the effectiveness and long-term sustainability of these endeavors. To ensure successful outcomes, a thorough assessment of three crucial components is necessary: a governance structure, institutional frameworks, and coordination mechanisms (see Figure 4).

Good governance structures, robust institutional structures, and effective and timely coordination ensure that the various interventions for the clean energy transition complement each other rather than duplicating efforts, leading to optimal use of resources and maximizing the impact. This not only

streamlines processes but also minimizes bureaucratic hurdles, reducing delays and administrative burdens. The positive outcome of such coordination is cohesive and well-coordinated implementation of projects, which enables better support for beneficiaries and broader and more sustainable outcomes. Figure 5 represents the working mechanism of a successful implementation of a scheme.

Impact assessment for the clean energy transition

A substantial data gap persists, especially in terms of SME participation in schemes, energy consumption and savings analysis through billing, and the implementation of emission reduction strategies within industrial complexes. Limited data availability poses challenges for conducting a thorough impact assessment.

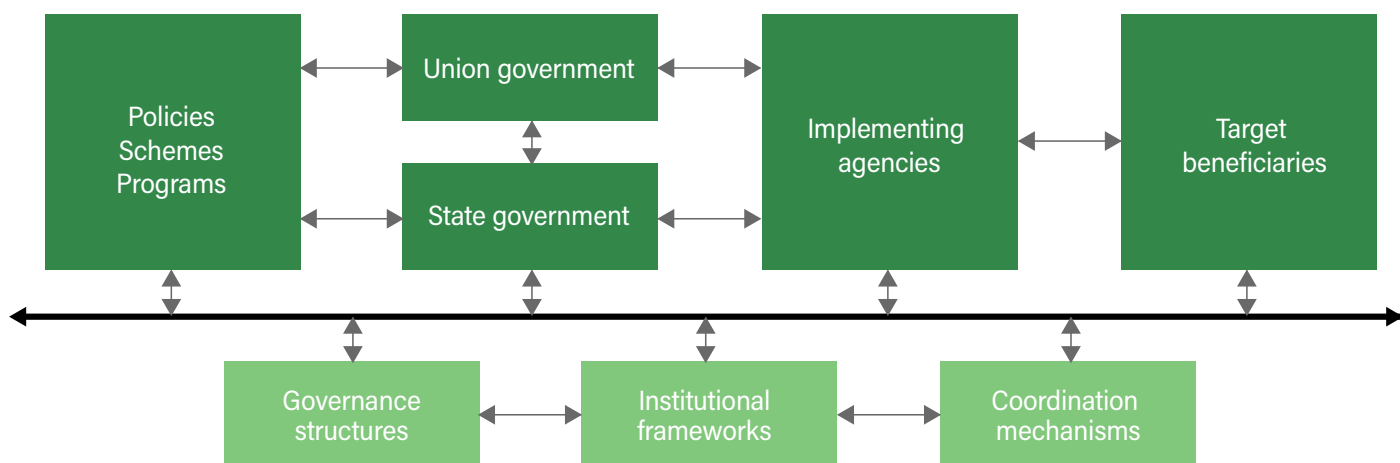
We find that the primary motivation that leads SMEs to participate in programs is financial benefits. SMEs rely on advisory support to understand the varied advantages offered by a program, such as market access, cost savings, capacity building, and networking opportunities, which significantly shape their decisions to actively participate in it.

Figure 4 | **Assessment and learning from policy mapping**

<p>Governance structure</p>	<p>Division of responsibilities at various levels is crucial for decision-making, policy formulation, and overall management of the implementation process. For example, the report Guidelines for Comprehensive Powerloom Cluster Development Scheme^a has detailed the important role of state governments in the successful execution of the project. Some of the guidelines facilitate the formation of Cluster Co-ordination Groups (CCGs) under the concerned District Collector and play the role envisaged in the guidelines; namely, the creation of a single-window system for facilitating all clearances.</p>
<p>Institutional frameworks</p>	<p>Institutional arrangements such as organizations, structures, rules, and regulations arranged well in a complex web of different departments at all the levels of government play a crucial role in facilitating result-oriented implementation of a policy or scheme. Their collaborative efforts ensure proper representation, alignment with objectives, regional significance, specialized expertise, and national and state-level insights.</p>
<p>Coordination mechanisms</p>	<p>Effective coordination involves synchronizing various components, managing communication, and addressing any conflicts or overlaps. Aligning similar goals of various schemes, projects, or initiatives and their seamless integration at all levels of government is necessary. For example, the MSE-CDP scheme aims to address the needs of industries through well-defined clusters and geographical areas and coordination at the state to cluster level.</p>

Source: WRI authors. a. Ministry of Textiles n.d.-b.

Figure 5 | Working mechanism of a successful implementation of a scheme



Source: Adapted from "Guidelines for Comprehensive Powerloom Cluster Development Scheme" (Ministry of Textiles n.d.-b).

Multiple schemes have significantly impacted the Indian SME sector's clean energy transition (see Appendix C). The Micro and Small Enterprises Cluster Development Programme (MSE-CDP) has boosted cluster productivity by 10–15 percent and reduced manufacturing costs, leading to a 20–30 percent increase in the turnover of beneficiary units. The CLCSS has approved over 1,500 technologies, potentially reducing energy consumption and environmental impact, although there is a need for better data on energy savings. The MSME Sustainable (ZED) Certification Scheme, TEQUP, Solar Energy Scheme for Powerloom Sector, Sustainable and Accelerated Adoption of efficient Textile technologies to Help small Industries (SAATHI), and textile sector schemes such as TUFs and ATUFs aim to promote energy efficiency and technological upgrades. The BEE-SME Programme, BEE-UNIDO-GEF Programme, BEE-GEF-World Bank Program, Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE), and Facility for Low Carbon Technology Development have been instrumental in driving energy savings and emissions reductions in SMEs (see Appendix C).

However, it is important to consider the vast number of SMEs in the country, along with the prevailing issue of a lack of awareness among most of these enterprises about the available schemes. Additionally, accessing these schemes and deriving their benefits can be a challenging and intricate process for SMEs. The existence of data gaps further compounds the problem, because it hampers the comprehensive assessment of the actual outcomes of these schemes. Moreover, the absence of mandatory mechanisms for continuous monitor-

ing and evaluation of the schemes' uptake and performance exacerbates these challenges, making it difficult to ensure their effective implementation and impact assessment.

Performance assessment of policies

Whereas central schemes undergo thorough performance evaluations and auditing processes, such as those conducted by the Comptroller and Auditor General (CAG), state policies receive comparatively limited attention in terms of performance assessment (see Appendix C). This marked variation in data availability between central and state policies emphasizes the urgency of implementing more robust assessment methodologies to provide a comprehensive evaluation of the effectiveness of state initiatives to promote the clean energy transition.

Effective catalysts for the clean energy transition in SMEs

The effectiveness of these interventions lies in their ability to address the unique challenges, requirements, and opportunities present within different subsectors of the SME industry. This tailored approach ensures that clean energy initiatives are aligned with the specific needs and characteristics of individual subsectors, making the transition more efficient and feasible. As a result, clean energy adoption in the SME sector has gained momentum, contributing to reduced environmental impact, increased energy efficiency, and ultimately, sustainable economic growth. A notable case in point is CLCSS for technology upgrades, initiated in 2000. Despite

providing a capital subsidy that is modest in comparison with certain other programs, its sustained effectiveness and significant influence is an indication of successful outcomes.

The BEE programs, which are a direct intervention across all sectors of SMEs, have emerged as champions in the SME arena, making substantial contributions to the achievement of enhanced energy efficiency within SME clusters. Intermediary support schemes (see Table 1) in India have indirectly incorporated elements of clean energy promotion, despite not having explicit clean energy objectives. For instance, the ZED certification initiative, although not directly concerned with clean energy, is important for SMEs. Another example is MSE-CDP, initiated in 2007 and revised in 2019. Although its primary goal is cluster development, one of its objectives is to promote green and sustainable production processes and products. Further, it encourages the setup of energy management cells under CFCs (see Appendix C) and supports common renewable energy generation projects. These intermediary support programs facilitate the utilization of grants and funding from a range of central and state government initiatives. Although their primary objectives are not explicitly tied to clean energy, these programs play a significant role in advancing energy efficiency and the clean energy transition (see Appendix C).

Financing the energy transition in the SME sector

The rollback and reduction of subsidies and incentives for various schemes, especially those connected to the clean energy transition, such as Solar Energy Scheme for Powerloom Sector, is driven by multiple factors. Among these, the impact of COVID-19, economic downturns, market instability, global political challenges, and rising energy prices are prominent, with significant repercussions for SMEs across all sectors. Presently, the primary focus is on fostering business development, employment generation, and other such larger development goals, with the clean energy transition in the SME sector moving at a snail's pace. Energy policies must now contend with business policies to mobilize finance. Initiatives such as public-private partnerships, which harness both government and private sector resources for clean energy projects, and advocacy of green financing instruments such as customized loans help SMEs adopt clean energy technologies. Tax incentives and subsidies enhance the financial attractiveness of clean energy investments. These strategies, underpinned by effective policies and a favorable regulatory environment, aim to mobilize the financial resources SMEs need in order to transition to clean energy, ultimately promoting sustainability and economic growth.

RECOMMENDATIONS AND THE WAY FORWARD

An important development is the substantial number of schemes that are currently being revised to accommodate and promote clean energy technologies. Both the central government and state governments are demonstrating a strong commitment to adopting cleaner alternatives and sustainable practices. This commitment is evident in the inclusion of clauses dedicated to safeguarding the environment and promoting eco-friendly practices within their revised schemes. However, our analysis shows that only a small fraction of schemes such as the Sustainable ZED certification scheme, the Solar Energy Scheme for the Powerloom Sector, and the BEE SME programs are explicitly designed to promote the clean energy transition in the SME sector. The existing schemes (see Tables 1, 2, and 3) do offer direct financial incentives, grants, and subsidies aimed at encouraging the adoption of efficient technologies and practices that lead to energy savings. However, challenges such as lack of awareness, a lengthy and time-consuming documentation process, a longer payback period for investment in renewable energy, and gaps in sector-specific skills and the technical know-how of energy efficiency measures all need to be addressed to increase SME participation, implement schemes, and accelerate clean energy adoption. In addition to the initiatives already being undertaken by the central government and state governments, we recommend prioritizing the points described in the following subsections.

Recommendations

Tailored financial incentives

SMEs are challenged by limited access to finance, especially in terms of inadequate financing for business operations, expansion, and working capital, because they have limited collateral and credit history, which hinder their growth and clean energy adoption. However, stakeholders have recommended several steps that can be taken to improve the access to finance for SMEs:

- Analyze and assess resource allocation decisions, especially subsidy reductions. Prioritize sectors with significant potential for the clean energy transition and job creation. Develop targeted financial incentives, such as grants, subsidies, and low-interest loans, that are specifically designed to help SMEs adopt energy-efficient technologies and clean energy.
- Work with banks and financial institutions to provide favorable terms for energy-related investments by SMEs. At present, bankers have an inadequate understanding of energy efficiency technologies and their associated

energy savings, which should allow repayment of the loan sought for acquiring the technology. Therefore, an additional intervention for capacity building of bankers regarding clean energy technologies (including making them aware of the impact of central and state government financing schemes that give banks access to risk-sharing mechanisms) is also needed to address the obstacle posed by the lack of access to finance. Favorable financial terms will encourage SME participation and also encourage financial institutions to consider energy performance when assessing the creditworthiness of SMEs, which can incentivize clean energy efficiency investments. At the same time, developing effective tools or resources such as knowledge portals will help financial institutes and banks conduct comprehensive risk and cost assessments. We observed in our discussions that SMEs lack awareness about existing financial incentives and subsidies. SMEs must be given information to help them weigh the potential benefits against the perceived risks of adopting energy-efficient practices and investing in renewable energy, and this applies equally to credit decision-makers at banks. A glaring gap at present is that the government's financing support to SMEs is not perceived by banks as the risk-sharing mechanism that it effectively is. When governments provide financial support to SMEs, they are reducing the amount of loan they need. This reduction in loan requirement automatically increases the SMEs' capacity to repay the bank for the smaller loan that it will now take. Therefore, the government incentive system and the commercial lender are "co-financing" the clean energy technology, and both have a stake in its success. However, there is no mutual understanding and dialogue between the state lenders and commercial lenders in the way that should normally happen among co-financiers. This gap should be urgently addressed through a coordinated approach between state and central programs for clean technology adoption by SMEs, commercial lenders wishing to promote "sustainable development," and the SMEs themselves. If commercial lenders have legitimate concerns such as the speed and timeliness of disbursements of public sector financial support, and so on, that could interfere with, for example, their own credit decision-making process, there should be a well-recognized platform at the state level through which to communicate such concerns and derive mutually acceptable and beneficial solutions.

Policy coordination and dissemination

From our conversations with SME owners and through policy analysis, we understand that there is often a struggle to navigate complex schemes and policies. SMEs delay their participation in schemes because of the lengthy and demanding documentation and grant application procedures.

- Discussion with industries and industrial associations highlighted the fact that implementing departments should proactively facilitate policy adoption among SMEs and drive scheme uptake through SME engagements. There is a need for a stable regulatory and policy environment that demonstrates government backing for the adoption of clean energy measures by SMEs. The focus should be on consistency in policies and fostering an environment that is conducive to SMEs.
- There is a need to simplify the application process for obtaining incentives, grants, and approvals related to energy efficiency projects, by establishing single-window clearance mechanisms to streamline regulatory processes for SMEs and creating a platform for sharing best practices and lessons learned among different states and clusters.

Effective communication and implementation support

Although SMEs are aware of the schemes and policies that are directly linked with business expansion, their awareness of clean energy is relatively low, and clean energy adoption is not their priority.

- SMEs need to be aware of the cost-saving benefits of using clean energy and how they can access it, and education and training programs should be available to help them make the transition. Therefore, it is important to emphasize the immediate cost-saving benefits of energy efficiency measures. However, advisory services at an enterprise level are needed to work out savings compared to the previous twelve months' energy expenditure and the corresponding payback period of switching to a new technology. SMEs often have limited budgets, so showcasing how energy efficiency can reduce operational expenses in the short term can be a compelling argument, provided that affordable, individual advisory services can be provided at the enterprise level.
- SMEs are a diverse group with varying needs based on factors such as size, sector, location, and growth stage. Tailor-made communication strategies need to be devised in order to address their specific needs and challenges through various channels such as awareness campaigns to educate them about the benefits of energy efficiency, renewable energy, and sustainable practices. The communication strategies should make it a point to link clean energy measures and initiatives with other tangible and intangible impacts.
- Several publications have indicated that implementing cluster-level programs that focus on energy efficiency within specific industries or regions is highly effective in encouraging collaboration and resource sharing among

SMEs in order to enable them to collectively invest in energy-saving initiatives. Both state and national institutes should focus on collaborations with research institutions in order to develop and disseminate affordable and scalable energy-saving solutions and develop technology hubs or centers that give SMEs information, guidance, and access to energy-efficient technologies relevant to their industry. There is also scope for innovative business models at the cluster level where third-party investors may be incentivized to provide clean technology and collect “rent to own” payments under an operational expenditure (OPEX) model, thereby avoiding the need for up-front investment costs by SMEs. Appropriate risk mitigation mechanisms would be required to assure third-party investors and their commercial lenders; therefore, how existing government financing schemes can be modified to support a third-party aggregator or investor who would be the borrower of a large number of clean technology devices (rather than extending one loan at a time) should be explored as a priority. Pursuing SME loans one at a time will not achieve the clean energy transition goal within the short timelines available.

Continuous monitoring and review of policies

Ensuring robust monitoring requires the integration of monitoring and evaluation methodology and budget components into the program design. Additionally, it is crucial to make the submission of performance and impact data by beneficiaries a mandatory condition for accessing subsidies. During our analysis, we learned from discussions that unlike central policies, state-specific schemes are in silos. Creating better energy policies for SMEs requires a collaborative effort between government bodies, industry stakeholders, state nodal agencies, financial institutions, banks, and SMEs. By addressing barriers, raising awareness, providing incentives, and fostering innovation, the clean energy transition in SMEs can be accelerated and aligned with the country’s overall energy security goals. Also, cost versus results data are a big missing piece that makes it difficult to assess the effectiveness of schemes. Research should explore the availability of high-quality data for SMEs encompassing metrics such as energy consumption, reduced greenhouse gas (GHG) emissions, utilization of schemes, and the financial resources accessible to them. Regulatory frameworks are currently dispersed across multiple departments. A coordinated approach, possibly through the establishment of a single window for regulations, digitalization, and energy management systems could streamline monitoring and common data collection points, thereby enhancing regulatory efficiency.

The way forward

- Developing effective policies for SMEs is a complex task, and several research gaps need to be addressed to ensure well-informed and impactful policies. The successful implementation of policies in SMEs relies heavily on the willingness and proactive efforts of government agencies, state development agencies (SDAs), and implementing departments to promote and facilitate the adoption of these policies. Further, the engagement and participation of commercial lenders is vital, because it is they who will meet a significant portion of the financing requirement that remains after the state agencies have made their contribution. The dedication of state agencies in driving the uptake of these schemes is pivotal to ensure the active engagement of SMEs in various initiatives, and a legitimate platform must also be created to include commercial lenders as a legitimate key stakeholder. Regular monitoring and evaluation of schemes, coupled with feedback mechanisms, enable areas for improvement to be identified, which enhances the confidence and trust of SMEs in actively participating in these initiatives. Also, motivating SMEs to participate in schemes is a multifaceted challenge that demands a clear focus on conveying the short- and long-term benefits of such initiatives. This calls for comprehensive and effective communication strategies that highlight the positive impact of adopting schemes and obtaining finance for the energy transition on the growth and sustainability of SMEs.
- The improved effectiveness and impact of schemes will play a pivotal role in determining the future participation of SMEs in them. Further research should focus on linking the findings of this paper with empirical evidence on service delivery outcomes. Addressing the policy gaps requires both vertical and horizontal interdisciplinary collaboration between different stakeholders, such as commercial lenders, risk mitigation experts, academia, policymakers, industry experts, and SME representatives. By filling these gaps, policymakers can design more effective and targeted policies that support faster growth, innovation, and the clean energy transition in SMEs.

APPENDIX A

Small and medium enterprise (SME) schemes and policies over the years

Table A1 | **ZED certification outcome**

ZED CERTIFICATION	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
MSMEs registered	10,963	22,251	23,070	23,493	23,948	26,000
Bronze	9	80	2	131	131	1381
Silver	14	96	3	132	132	42
Gold	8	46	5	62	62	41
Diamond	0	2	x	4	4	x
No rating	7	114	x	174	174	x

Note: MSME = micro, small, and medium enterprise; X = data unavailable; ZED = Zero Defect and Zero Effect.

Source: MoMSME n.d.-d.

Table A2 | **TEQUP program outcomes**

YEAR	PRODUCT CERTIFICATION	ENERGY-EFFICIENT TECHNOLOGIES	AWARENESS PROGRAMS CONDUCTED
2015-16	86	105	78
2016-17	366	300	198
2017-18	x	x	x
2018-19	Total number of beneficiaries: 63		
2019-20	Total number of beneficiaries: 1,188		
2020-21			
2021-22		x ^a	
2022-23			

Note: TEQUP = Technology and Quality Upgradation; X = data unavailable.

a. Data unavailable. Operational guidelines of the following schemes were under examination and recently redesigned; therefore, the schemes are in inactive mode pending their finalization.

Source: MoMSME n.d.-d.

Table A3 | **Quantum of subsidy for Solar Energy Scheme for Powerlooms, 2017 (INR)**

S.NO	CAPACITY IN TERMS OF KILOWATT PEAK (KWP)	MAXIMUM COST OF EQUIPMENT AND COMPONENT ELIGIBLE FOR SUBSIDY		MAXIMUM SUBSIDY	
		FOR ON-GRID SOLAR POWER PLANT	FOR OFF-GRID SOLAR POWER PLANT	FOR ON-GRID SOLAR POWER PLANT	FOR OFF-GRID SOLAR POWER PLANT
1	4 kWp (typically suitable for four looms)				
	General @50%	450,000/-	550,000/-	225,000/-	275,000/-
	SC @75%			337,500/-	412,500/-
	ST @90%			405,000/-	495,000/-
2	6 kWp (typically suitable for six looms)				
	General @50%	600,000/-	750,000/-	300,000/-	375,000/-
	SC @75%			450,000/-	562,500/-
	ST @90%			540,000/-	675,000/-
3	8 kWp (typically suitable for eight looms)				
	General @50%	750,000/-	950,000/-	375,000/-	475,000/-
	SC @75%			562,500/-	712,500/-
	ST @90%			675,000/-	855,000/-

Note: SC = Scheduled Caste; ST = Scheduled Tribe.

Source: PIB 2019.

Table A4 | **Revised quantum of subsidy for Solar Energy Scheme for Powerlooms, 2018 (INR)**

S.NO	CAPACITY IN TERMS OF KILOWATT PEAK (KWP)	MAXIMUM COST OF EQUIPMENT AND COMPONENT ELIGIBLE FOR SUBSIDY		MAXIMUM SUBSIDY	
		FOR ON-GRID SOLAR POWER PLANT	FOR OFF-GRID SOLAR POWER PLANT	FOR ON-GRID SOLAR POWER PLANT	FOR OFF-GRID SOLAR POWER PLANT
1	4 kWp (typically suitable for four looms)				
	General @50%	280,000/-	360,000/-	140,000/-	180,000/-
	SC @75%			210,000/-	270,500/-
	ST @90%			252,000/-	324,000/-
2	6 kWp (typically suitable for six looms)				
	General @50%	420,000/-	540,000/-	210,000/-	270,000/-
	SC @75%			315,000/-	405,500/-
	ST @90%			378,000/-	486,000/-
3	8 kWp (typically suitable for eight looms)				
	General @50%	560,000/-	720,000/-	280,000/-	360,000/-
	SC @75%			420,000/-	540,000/-
	ST @90%			504,000/-	648,000/-

Note: SC= Scheduled Caste; ST = Scheduled Tribe.

Source: Ministry of Textiles 2018.

APPENDIX B

Status of Micro and Small Enterprises – Cluster Development Programme (MSE-CDP) interventions (as of September 3, 2020)

This appendix provides an overview of progress disparities among different states. In the case of Tamil Nadu, there is a balanced pattern of progress in both the number of Common Facility Centres (CFCs) and infrastructure development (ID) projects. Conversely, the industrialized state of Gujarat exhibits a skew toward a higher number of CFCs than ID projects. Additionally, skew is also noticeable in Rajasthan and Haryana toward a higher number of ID projects than CFCs. These states are leaders in industrialization, with well-defined policies. Himachal Pradesh, on the other hand, has only recently embarked on industrialization. These observed patterns can be attributed to various factors, including state priorities, policies, and the maturity level of clusters within each state.

Table B1 | **State-wise numbers of CFCs and ID projects**

STATE/UNION TERRITORY	COMMON FACILITY CENTRES (CFCs)			INFRASTRUCTURE DEVELOPMENT (ID) PROJECTS			GRAND TOTAL (CFC+ID)
	APPROVED CFCs	ONGOING	COMPLETED	APPROVED IDS	ONGOING	COMPLETED	
Gujarat	12	10	2	2	0	2	14
Haryana	8	6	2	28	0	28	36
Himachal Pradesh	1	1	0	1	0	1	2
Rajasthan	1	1	0	26	10	16	27
Tamil Nadu	43	19	24	44	13	31	87

Source: MoMSME n.d.-c.

APPENDIX C

Impact of small and medium enterprise (SME) schemes and policies

Table C-1 summarizes the impact of SME schemes and policies.

Table C-1 | **Year-wise impact of SME schemes and policies**

SCHEME, POLICY, OR PROGRAM	YEAR	IMPACT (ENERGY/COST) SAVINGS
Micro and Small Enterprises Cluster Development Programme (MSE-CDP)	2007, 2019 (revised)	The scheme boosts overall cluster productivity by 10–15%, reducing manufacturing costs and enhancing operational efficiency by about 15%. It also improves quality, on-time delivery, and production capacity, leading to a 20–30% increase in turnover. Beneficiary units see an average 35% production increase through common facilities. ^a
Credit Linked Capital Subsidy Scheme – Technology Upgradation Scheme	2000	According to the 2016 Annual Report of MSME, ^b more than 1,500 technologies under 51 products and subsectors have been approved under the scheme. Since the inception of the scheme, 38,675 units have obtained subsidy of INR 2,267.34 crores as of February 18, 2016. The 2019 Annual Report of MSMEc stated that “the scheme has led to energy reduction in terms of electricity and fuel consumption besides having a positive impact on air, water and noise pollution.” There is a huge data gap in quantifying the energy reductions achieved through this scheme. The number of beneficiaries is known: since the inception of the scheme, 62,827 MSMEs have obtained subsidy amounting to INR 3,888.12 crores as of March 31, 2019; these data include all MSMEs. Considering the energy intensity of SMEs, energy reductions must be quantified under this scheme.
MSME Sustainable (ZED) Certification	2016	Over 26,000 ^d SMEs are registered under the SME Sustainable (ZED) Certification Scheme. As many as 1,381 Bronze, 42 Silver, and 41 Gold certifications have been awarded up to now to MSMEs, and the remaining registered MSMEs are being processed for certification. Seventeen states and union territories include ZED in their industrial policies and offer additional incentives to ZED-certified SMEs. According to the annual report of the MSME ministry for the financial year 2022–23, over 26,000 MSMEs were registered under the scheme. Also, as of December 31, 2022, 17 states and union territories included ZED in their respective industrial policies and offered additional incentives to ZED-certified MSMEs. Moreover, 15 banks notified incentives to ZED-certified MSMEs in the form of concessions in processing fees and rate of interest.
Technology and Quality Upgradation (TEQUP) – an NMCP scheme	2010–17, 2019 (revised)	During 2015–17, 452 product certifications were given, 405 energy-efficient technologies were identified, and 276 awareness programs were conducted. ^e From 2020 onward, data are unavailable because the operational guidelines of the schemes are under examination and have been recently redesigned; therefore, the schemes will be in inactive mode until they are finalized. ^f
Solar Energy Scheme for Powerlooms	2017	PowerTex India had proposed targeting 480 power loom units for installation of solar plants from April 1, 2017, to March 31, 2020. INR 19.848 crores had been earmarked for the CFC component from April 1, 2017, to March 31, 2020. However, data on the performance of the scheme in terms of the number of beneficiaries are unavailable.
Sustainable and Accelerated Adoption of efficient Textile technologies to Help Small Industries (SAATHI)	2017	A 2019 report from the Bureau of Energy Efficiency (BEE) stated that this scheme for the textile subsector will result in lower energy consumption and adoption of efficient production technologies. ^g The Energy Efficiency Services Limited (EESL) procures efficient equipment for SME power looms, sparing unit owners up-front capital costs. Data gaps exist regarding the scheme’s beneficiaries and the number of energy-efficient power looms procured.
Technology Upgradation Fund Scheme (TUFS) and Amended Technology Upgradation Funds Scheme (A-TUFS)	1999 2007 2011 2013 2016	A-TUFS, launched with INR 17,822 crores in 2016, aimed to mobilize INR 95,000 crores of investments and 35 lakh jobs by 2022. By March 2022, 14,389 Unique Identification Numbers (UIDs) were issued for projects worth INR 69,160 crores. ATUFS promotes textile sector technological upgrades through subsidies. The ATUFS MSME to non-MSME ratio is 89:11 in comparison with the previous value of 30:70. ^h The frequent amendments keep the scheme relevant for SMEs. TUFS catalyzes textile investment; however, subsidy access is cumbersome, and delay impacts project timelines. The latest eligible machinery list from 2016 to 2022 needs to be revised for technology.

Table C-1 | Year-wise impact of SME schemes and policies (cont'd)

SCHEME, POLICY, OR PROGRAM	YEAR	IMPACT (ENERGY/COST) SAVINGS
Comprehensive Powerloom Cluster Development Scheme (CPCDS)	2008	This scheme was revised in December 2016 for implementation from April 1, 2017, to March 31, 2020. Under the revised scheme, government assistance for a mega cluster is limited to 60% of the project cost subject to a maximum of INR 50 crores. A total of INR 101.00 crores has been allocated to complete the ongoing projects. Since 2014–15, two power loom clusters of Erode and Ichalkaranji have been supported for removing bottlenecks in various infrastructure works. ⁱ
BEE-SME Programme	2007	During the Xth Plan (2007–12), the BEE-SME Programme performed energy audits in 1,250 SME units across 25 clusters, implementing 650 energy efficiency projects and producing 375 detailed project reports on energy-efficient technologies. ^j Capacity-building workshops were conducted in 25 clusters, and a situation analysis in 35 clusters led to substantial energy savings of 14,300 toe. In the XIIth Plan (2012–17), the program excelled with 21 demonstration projects, tailor-made Best Operating Practices, and Common Monitorable Parameters for specific industries. Multimedia tutorials and techno-economic analyses were provided alongside a National Summit on Energy Efficiency in SMEs and 35 capacity-building programs. These efforts resulted in emission reduction of 750 toe/year and energy savings of 381.25 toe by the end of the assessment. ^k
BEE-United Nations Industrial Development Organization (UNIDO)-Global Environment Facility (GEF) Programme	2011	The BEE-GEF-UNIDO Program ^l focuses on boosting energy efficiency and renewable energy in SME clusters. ^m Across 23 clusters in 5 sectors, this initiative achieved impressive results including 1,198 SME projects, 301 case studies, 300 detailed project reports, 21 pilot projects, and 7 international study tours. Collaborating with the National Productivity Council, it conducted 95 capacity-building workshops for 230 SME stakeholders, implemented 603 energy efficiency and renewable energy measures, established 12 energy management centers, trained 500 local service providers, attracted INR 23,139 lakhs of investment, and saved 20,200 tonnes of oil equivalent annually. ⁿ
BEE-GEF-World Bank	2010	The following are the achievements of this project: 1,257 Investment Grade Detailed Project Reports (IGDPRs) prepared, INR 3,191 million in direct Energy Efficiency Initiatives (EEl), 2.55 million tonnes of CO ₂ carbon emission reduction, outreach to 6,299 SME participants, training for 1,120 financial institution staff, 1,067 units implementing energy efficiency projects, 48 units with ISO 50001, 11 technology demo videos, participation of 9,000 enterprises, 590 energy conservation awards, over 750 energy auditors trained, 14 B2B vendor events, 1,120 financial personnel trained, 133 shopfloor employees trained, and 224 units benefited from the revolving fund.
Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE)	2016	Financial stakeholders noted that SMEs bear most of the risk in the clean energy transition and suggested that energy service companies adopt utility-based services for SMEs with risk support mechanisms. PRGFEE serves as a risk-sharing mechanism for banks, addressing credit risk and building the capacity of financial institutions to fund energy efficiency projects sustainably. ^o
Facility for Low Carbon Technology Development (FLCTD)	2018–21	The FLCTD, funded by GEF and executed with UNIDO and BEE, promotes energy-efficient innovations in Indian industries. Through four Annual Innovation Challenges, it received 558 submissions and successfully commercialized 59 winners and 12 technologies, helping reduce greenhouse gas emissions.

Notes: SME = small and medium enterprise; MSME = micro, small, and medium enterprise, toe = tons of oil equivalent.

Sources: a. NPC 2021. b. MoMSME 2016. c. MoMSME 2019. d. The data in the public domain is for whole MSME units, separate data for small and medium industries are not available. e. MoMSME n.d.-d. f. MoMSME 2020a. g. BEE 2019. h. Ministry of Textiles 2023. i. Ministry of Textiles 2023. j. BEE 2022b. k. BEE n.d.-b. l. GEF n.d.m. BEE n.d.-a. n. BEE 2022a. o. BEE 2015.

ENDNOTES

1. Energy efficiency is an important part of an SME's clean energy switch because without adequate energy efficiency measures, the investment will end up being oversized relative to the SME's actual energy requirements and will depress profitability. However, energy efficiency is an advisory service that is notoriously difficult for SMEs to afford, given all other competing priorities on their scarce capital. Outright grant funding to cover the cost of advisory services to SMEs on their energy leakages would seem to be the right approach in order to make a quick and wide-ranging impact on energy efficiency and the switch to clean energy sources.
2. A temple offering made with five ingredients: milk, curd, ghee, honey, and sugar.

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ABOUT THE AUTHORS

T.S. Gowthami is a Senior Project Associate for the Energy Program at World Resources Institute India (WRII). Her primary area of work revolves around clean energy transitions in MSMEs and industrial decarbonization.

Kajol was working as Senior Manager, leading the industrial decarbonization effort in India.

Niharika Tagotra is a Senior Research Specialist in the World Resources Institute India (WRII) Energy Program. Before joining WRI, she was working as Consultant (Energy Security) at the Ministry of External Affairs (MEA), Government of India. She was also the NBR Asia EDGE Fellow for the year 2021–22.

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