CHANGE initiative

PATHWAYS FOR INDUSTRIAL DECARBONIZATION

SMEs (SMALL AND MEDIUM ENTERPRISES) UNDER BANGLADESH SMALL AND COTTAGE INDUSTRIES CORPORATION (BSCIC)

- Transitioning SMEs Toward Low-Carbon Production Systems
- Policy and Financing Barriers in Bangladesh's Industrial Sector
- Role of BSCIC in Enabling Green Industrial Transformation
- Technology Adoption and Energy Efficiency Strategies

Dhaka, Bangladesh
2026

PATHWAYS FOR INDUSTRIAL DECARBONIZATION
SMEs (SMALL AND MEDIUM ENTERPRISES) UNDER BANGLADESH SMALL AND COTTAGE INDUSTRIES CORPORATION (BSCIC)

Change Initiative is a Bangladesh-based research and advocacy organization focused on designing practical, nature-smart, and policy-driven solutions for sustainable development. This study explores decarbonization pathways for SMEs under BSCIC, integrating technological, financial, and governance reforms to enable scalable low-carbon industrial transition.

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BSCIC -	Bangladesh Small and Cottage Industries Corporation
BCR-	Benefit Cost Ratio
CAPEX -	Capital Expenditure
CETP-	Central Effluent Treatment Plant
CNC-	Computer Numerical Control
DoE -	Department of Environment
ESCO-	Energy Service Company
IDCOL -	Infrastructure Development Company Limited
IE3 / IE4 -	International Efficiency Class 3 / 4 Motors
IRR-	Internal Rate of Return
GDP-	Gross Domestic Production
KII-	Key Informant Interview
kWh -	Kilowatt-hour
NPV-	Net Present Value
MtCO2e-	Million Tons of Carbon Di Oxide Equivalent
MW -	Megawatt
MWh -	Megawatt-hour
OPEX -	Operational Expenditure
PPA -	Power Purchase Agreement
PV -	Photovoltaic
SCADA -	Supervisory Control and Data Acquisition
SME -	Small and Medium Enterprise
SPV -	Special Purpose Vehicle
tCO_2e -	Tonnes of Carbon Dioxide Equivalent
UNIDO -	United Nations Industrial Development Organization
VFD -	Variable Frequency Drive
VSD -	Variable Speed Drive

Executive Summary

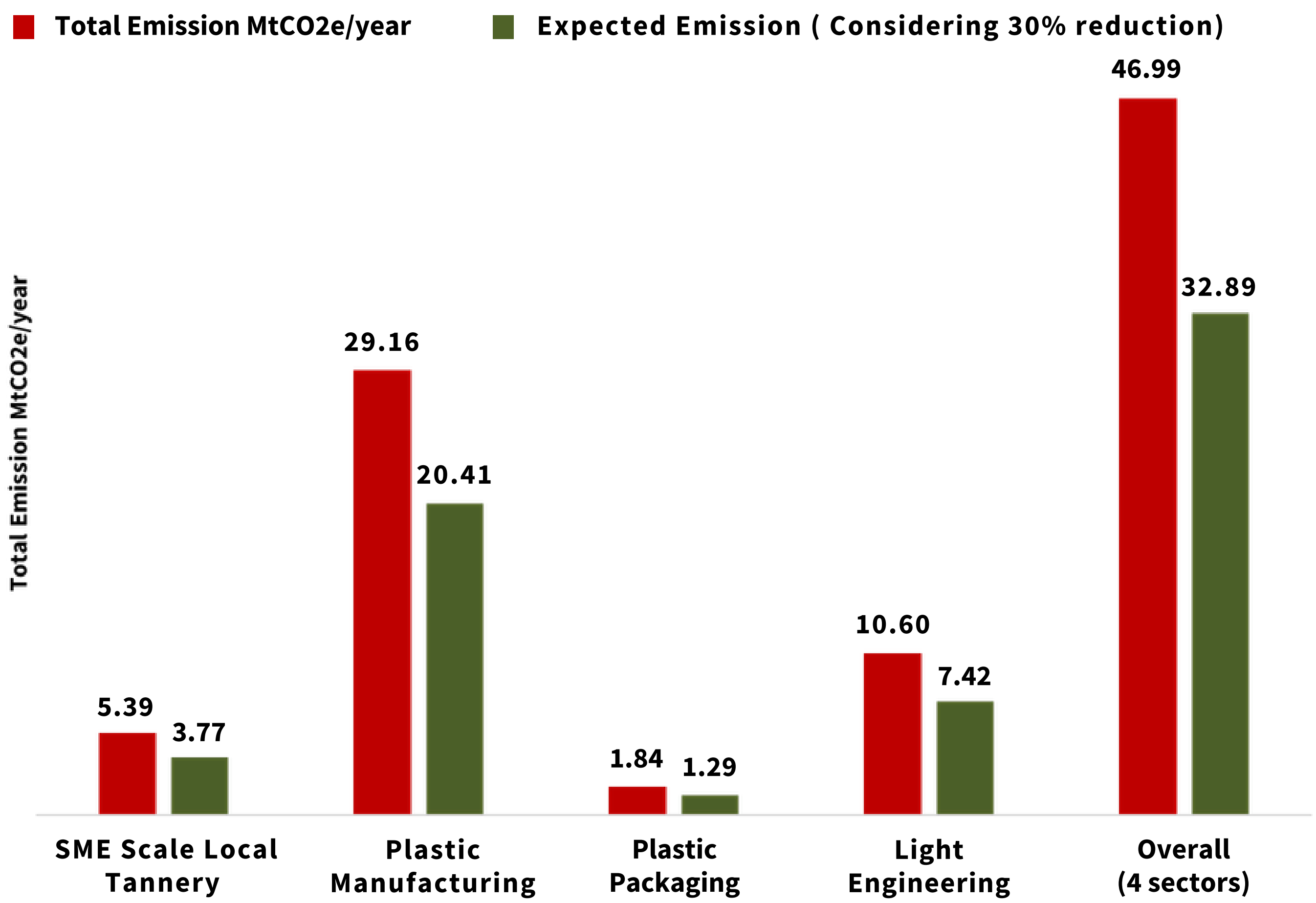
Global industry is shifting due to decarbonization, where emissions now affect market access, finance, and competitiveness. In Bangladesh, this is crucial for SMEs, which make up over 90% of industries, employ about 85% of workers, and contribute 25–30% of GDP, yet face energy and technology limits. Around 95.16% of power comes from fossil fuels, so SMEs rely heavily on them, making them a major and growing source of emissions.

Bangladesh's NDC 3.0 (Third Nationally Determined Contribution) targets a 69.84 $MtCO_2e$ reduction from the energy sector by 2035, highlighting urgent action. This report uses field data from BSCIC clusters, combining energy assessments, emissions baselines, techno-economic, solar, and financing analysis to identify practical SME decarbonization pathways.

SME-based industrial clusters represent a major share of emissions, with significant but concentrated reduction potential

Analysis of four key SME sectors, tannery, plastics manufacturing, packaging, and light engineering, shows combined emissions of approximately 46.99 $MtCO_2e$ per year, accounting for about 11.23% of national emissions and 40.12% of industrial emissions.

Technical and process-based interventions could reduce emissions by approximately 14.1 $MtCO_2e$ annually, with sector-specific reduction potentials ranging from 15% to 49%.



Targeted technological advancement of high-load systems offers immediate and scalable emission reduction opportunities

Across all analyzed sectors, production is almost entirely electricity-driven, and energy use is highly concentrated in motor-driven systems and continuous-load processes.

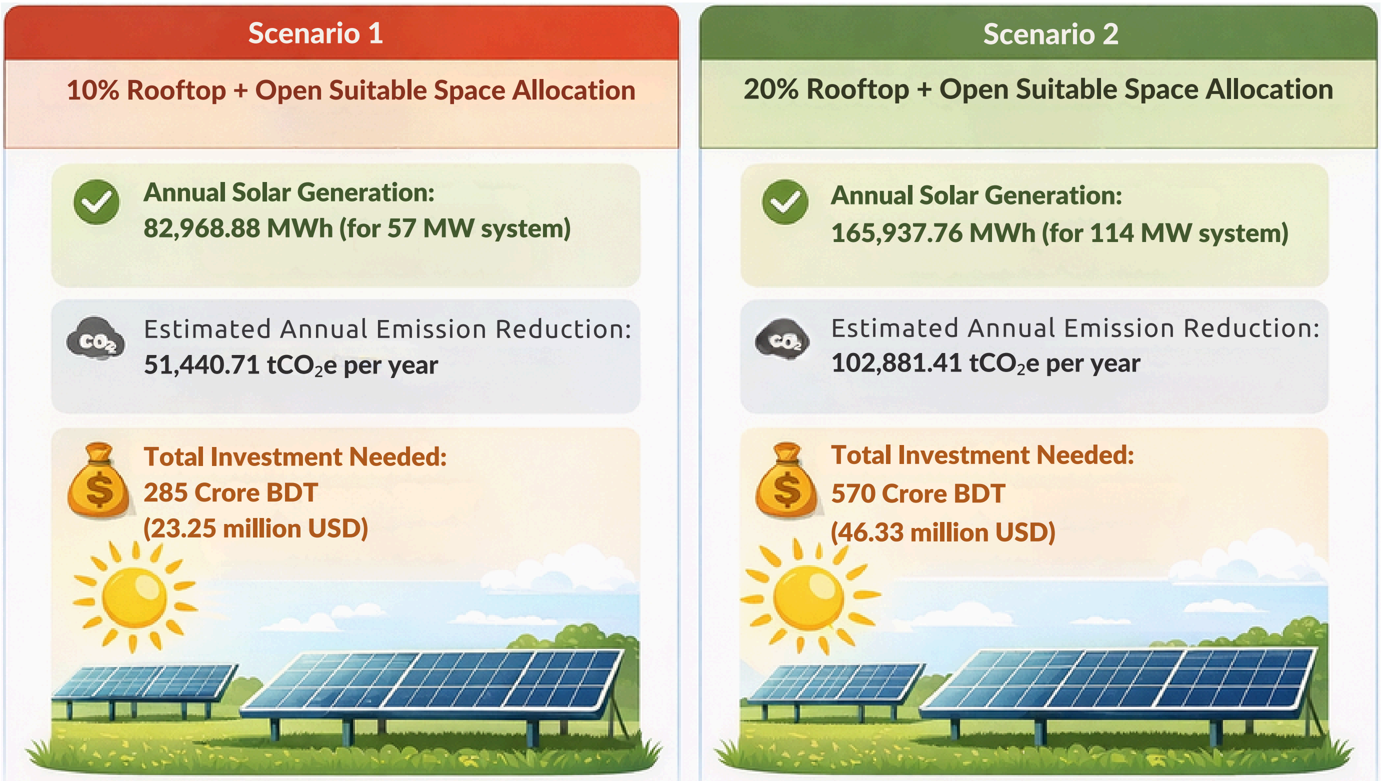
Industry	Recommended Low-Emission Technologies	Process Optimization	Emission Reduction Potential (tCO_2e/month)	Emission Reduction Potential (%)
SME Scale Local Tannery	IE3/IE4 motors, servo machines, auto drum control	Dewatering, Short-float tanning (reduces water and drum rotation time)	2.23-3.77	19-33
Plastic Manufacturing	Electric molding, inverter chillers, inverter compressors	Temperature optimization, heat recovery	1.97-2.97	33-49
Light Engineering	Servo presses, IE3/IE4 motors, Computar Numerical Control(CNC) machines	Batch scheduling, standby control	1.21-1.99	19-31
Plastic Packaging	LED-UV curing technology, Variable Frequency Drive (VFD) motors, digital printing	Job sequencing, auto shutdown	0.78-1.50	15-28

These upgrades can be further enhanced through operational improvements, including batch scheduling, idle shutdown, preventive maintenance, and process optimization, enabling immediate emission reductions without major structural changes.

Installation of solar panels at the industrial estate level offers the largest structural opportunity for emission reduction

Allocating 10% of BSCIC estate rooftop and open space to solar PV could generate approximately 82,969 MWh annually, reducing emissions by 51,440 tCO_2e, with an estimated investment of BDT 285 crore.

Solar PV Investment Scenarios

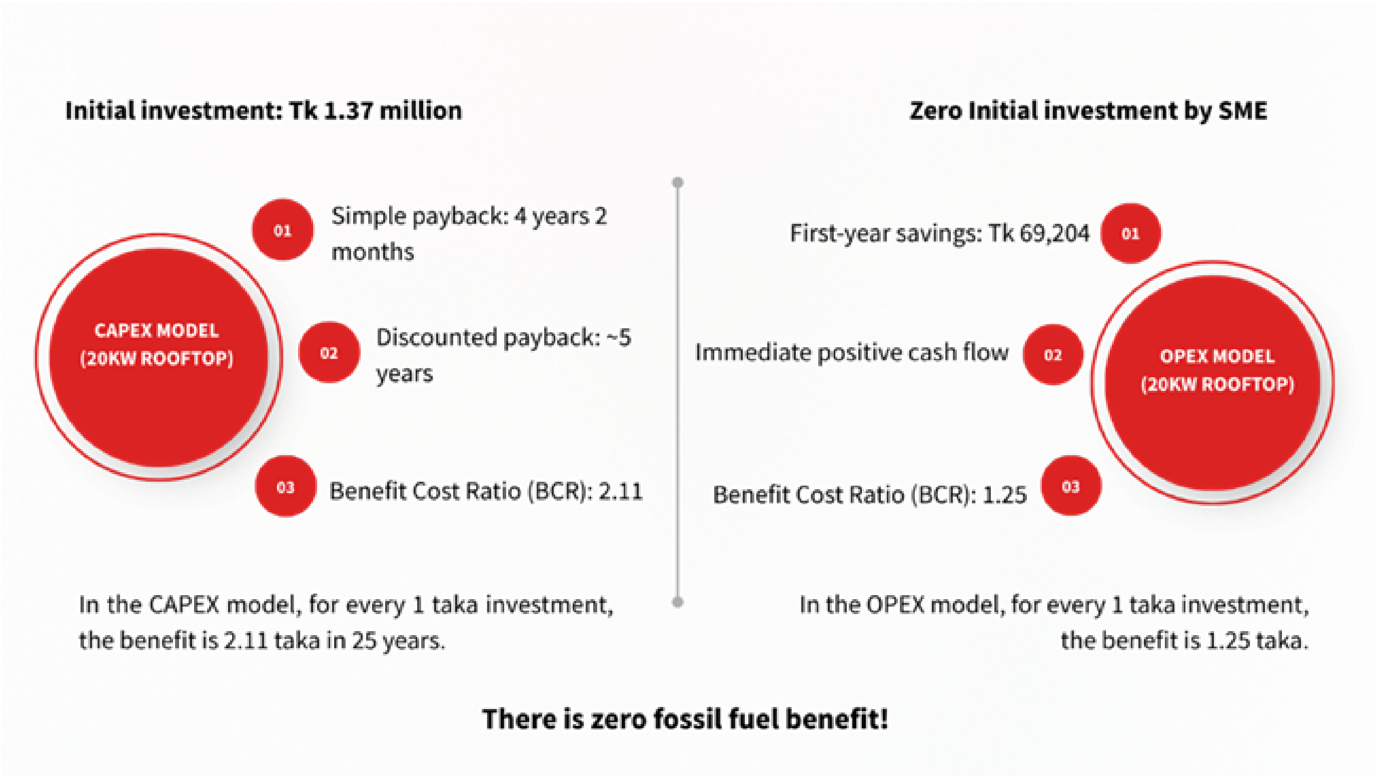


5 crore BDT (0.4 million USD) Investment Required for Per MW Solar Installation

Expanding this to 20% could increase generation to over 165,000 MWh and reduce emissions by 102,881 tCO_2e annually, requiring approximately BDT 570 crore. This also have potential to generate up to 0.4 million USD additional revenue through the carbon market.

Decarbonization is economically feasible, but adoption depends on financing structure .

Rooftop solar and energy efficiency improvements are financially viable, with CAPEX models delivering strong returns, including a payback period of approximately 4.2 years, and a cost-benefit ratio is 2.11.



However, upfront capital remains a key barrier. OPEX models remove this barrier through zero initial investment and immediate annual savings (~Tk 69,204), making them more accessible for SMEs.

Accelerating SME decarbonization requires a shift toward cluster-based systems, inclusive financing, and coordinated institutional frameworks

The main barriers are structural, not technological-limited finance, lack of standardized energy data, outdated machinery, and weak institutional coordination, creating a gap between national climate goals and industrial realities. Addressing this requires three linked shifts: moving from individual factory upgrades to cluster-based solutions like shared solar and joint energy planning; developing more accessible financing models such as OPEX, concessional funds, and SME-focused loans to reduce upfront costs; and strengthening institutions for better coordination, standardized energy audits, and centralized data systems within BSCIC estates.

Priority Roadmap for BSCIC

Top Priority (Immediate Impact)

1. Fast-Track Rooftop Solar & Net Metering

- Pre-approve solar designs for BSCIC factories
- One-window clearance inside BSCIC authority
- Simplify net metering for cluster-based connections

2. SME financing window (BSCIC-Focused)

- Dedicated refinance scheme for BSCIC units
- Low-interest loans + partial credit guarantee
- Solar leasing models (no heavy upfront cost)

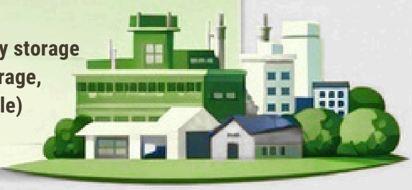
3. Energy Effficiency + Renewable Bundle

- Mandatory energy audits in selected estates
- Subsidies for efficient motors, compressors, lighting
- Combine with solar packages to reduce system size and cost

Medium Priority (High Impact)

4. Pilot BSCIC Clusters

- Select 3-5 estates as “Green BSCIC Zones”
- Shared solar plants + battery storage
- Common facilities (cold storage, waste-to-energy where viable)



5. Technician Training & Maintenance Network

- Train local youth within/near estates
- Certification programs for solar technicians
- Create on-call maintenance teams for each estate

Lower Priority (Still Important)

6. Sector Identification

- Do quick mapping, but don’t delay implementation
- Use findings to fine-tune financing and technology support

1. Introduction

1.1 Background

Global greenhouse gas emissions reached about 53.2 gigatons of CO_2-equivalent in 2024, with nearly three-quarters from fossil fuels (European Commission, 2025). Power (30%), industry (25%), and transport (15%) are the main sources, and fossil fuel emissions have grown by nearly three-quarters since 1990, while natural systems absorb very little-highlighting the urgent need for reduction. Meanwhile, 142 countries and 1,185 large companies have committed to net zero (Net Zero Tracker, 2023), and changing global supply chains now require smaller firms-especially in the U.S. and EU-to measure and cut emissions (UNCTAD, 2024), putting strong pressure on developing countries like Bangladesh where small firms play a major role but have limited capacity to respond.

Small and medium enterprises (SMEs) are central to Bangladesh's industrial economy. Defined by employment, investment, and turnover (SME Foundation, 2013), small firms employ about 50 people, while medium firms can employ up to 300. SMEs make up over 90% of industrial units, provide around 85% of industrial jobs, and contribute 25–30% of annual GDP (State of Economy, 2025), showing their key role in driving economic growth and industrial production.

The Bangladesh Small and Cottage Industries Corporation (BSCIC), founded in 1957, supports SMEs through industrial estates, infrastructure, and technical and financial assistance (BSCIC, 2024), while the SME Foundation promotes entrepreneurship through finance and capacity building. BSCIC now manages over 80 industrial estates where thousands of SMEs operate in sectors like leather, light engineering, plastics, food processing, ceramics, and metalworks, forming major industrial clusters in Dhaka, Gazipur, Narayanganj, and Chattogram.

SMEs remain important but still rely on old machines, low automation, and limited modern technology. For example, Bangladesh has about 3,000 plastic factories, 98% of which are SMEs, contributing around 1% of GDP and employing nearly 500,000 people (Islam, 2014). However, the sector faces a shortage of skilled labour, weak testing facilities, and ineffective certification systems. The light engineering industry, known as the "mother industry," also suffers from outdated machinery, low funding, and weak institutional support. Overall, SMEs struggle with costly and unreliable energy, limited finance, poor technical skills, weak research support, and low environmental awareness, making it harder for them to adopt cleaner technologies and compete globally. The main energy source in SME clusters is grid electricity, much of which is generated from fossil fuels. In 2022, about 95.16% of Bangladesh's electricity came from fossil fuels, leading to high indirect industrial emissions (BPDB, 2026). Coal-based power alone emits around 1,892 kg of CO_2 per MWh, making electricity use highly carbon-intensive. According to NDC 3.0, total national emissions in 2022 were 252.04 million tons of CO_2-equivalent, with nearly 49% coming from the energy sector. As industrial growth and energy demand increase, emissions are expected to rise further. Studies also show that industrialization and urbanization increase emissions, while renewable energy and cleaner technologies can help reduce them.

Despite Bangladesh's commitments under the Paris Agreement, NDC 3.0, and the National Adaptation Plan, progress at the SME level remains limited. Most factories lack emission measurement and reporting systems, with weak coordination and limited access to affordable green finance. BSCIC and the SME Foundation can support cluster-based solutions, shared infrastructure, and financing. This study connects national climate goals with industrial practice by developing an emissions baseline, identifying barriers, and proposing low-carbon pathways for SMEs in Bangladesh.

1.2 Rationale

SMEs, which fall under BSCIC industrial cluster, are significant contributors to manufacturing economy in Bangladesh producing components, leather, plastics, packaging and other products, both to the domestic market and to the global market. The national industrial policy and NDC 3.0 of Bangladesh show that enhancing the efficiency of industrial energy and greater utilization of renewable energy sources are the priorities to reduce emissions and keep the economic growth (MoEFCC, 2025). Nevertheless, most of the SMEs continue to rely on old machines, ineffective production processes and grid electricity that is powered by fossil fuel, hence resulting in high-energy prices, low-level production, and rising carbon emissions.

SMEs are under growing pressure from rising electricity tariffs, fuel price volatility, and stricter environmental rules. With limited capital, they struggle to invest in modern or energy-efficient technologies, which raises production costs and reduces competitiveness in local and export markets. However, rooftop solar and energy-efficient machines can lower long-term costs, improve profits, increase production capacity, and create more jobs, especially in SME industrial clusters. Despite BSCIC and the SME Foundation, SMEs still lack sector-specific decarbonization planning. Most factories have no energy audits, renewable energy feasibility studies, or expert support, and reliable data on energy use and emissions is missing, making it hard to set priorities or design effective investment plans.

This study fills these gaps by developing emissions baselines for SME clusters, assessing renewable energy options, and identifying upgrade pathways for sectors like tannery, light engineering, plastics, and packaging. It shows that decarbonization can reduce costs, improve competitiveness, and support jobs, while guiding policy and climate finance in Bangladesh.

1.3 Scopes and Limitations

This study focuses on SMEs in BSCIC industrial clusters-especially tannery, light engineering, plastics, and packaging-as field visits and interviews with BSCIC, the SME Foundation, and the Department of Environment show these sectors have high electricity use and emission potential. It estimates energy consumption, develops a carbon emission baseline, and assesses renewable energy and energy-efficient technologies to reduce costs and emissions. This research has several limitations, only selected SME clusters were studied, so the findings may not represent all BSCIC industrial estates in Bangladesh. However, the selected sectors reflect typical SME production patterns, so the results still provide useful insights for future decarbonization planning.

1.4 Study Objectives

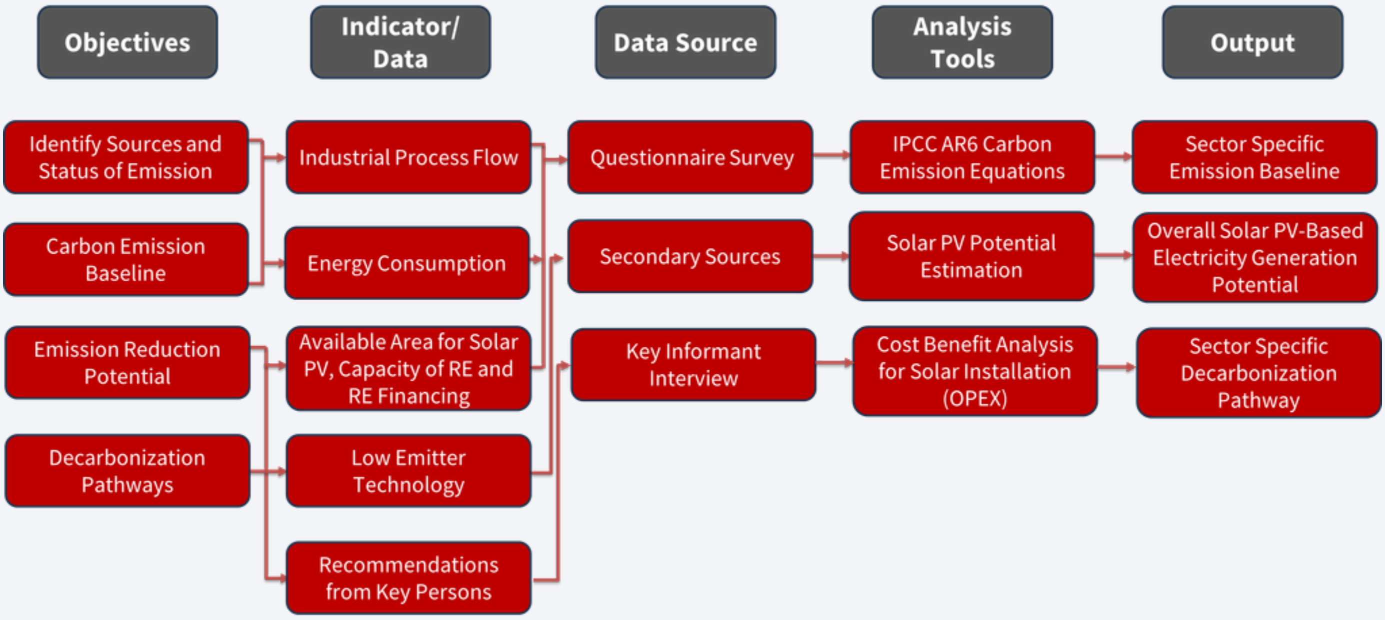
- Identify the sources and status of carbon emissions from selected SME clusters under BSCIC.
- Create a baseline and establish a benchmark for measuring and reporting carbon emissions.
- Identify Emission Reduction Potential
- Develop sector-specific decarbonization strategies to reduce carbon emissions for SME's Under BSCIC.

2. Methodology

This study has a mixed data collection approaches for all the analysis of carbon emission baseline, just transition overview and solar based decarbonization planning ranging from field visits, qualitative data collection, quantitative data collection, Key Informant interviews and desk reviews. Data collection and analysis of decarbonization pathways were collected in four sectors- tannery, light engineering, plastics manufacturing, and packaging, based on secondary data, consultation with the stakeholders and the fact that these sectors consumed significantly high amounts of energy in BSCIC clusters. These industries are commonly found in industrial estates, are very dependent on production with electricity, and demonstrate great possibilities of decreasing emissions by becoming energy efficient and adopting renewable energy.

2.1 Analytical Framework

Figure 1: Analytical Framework

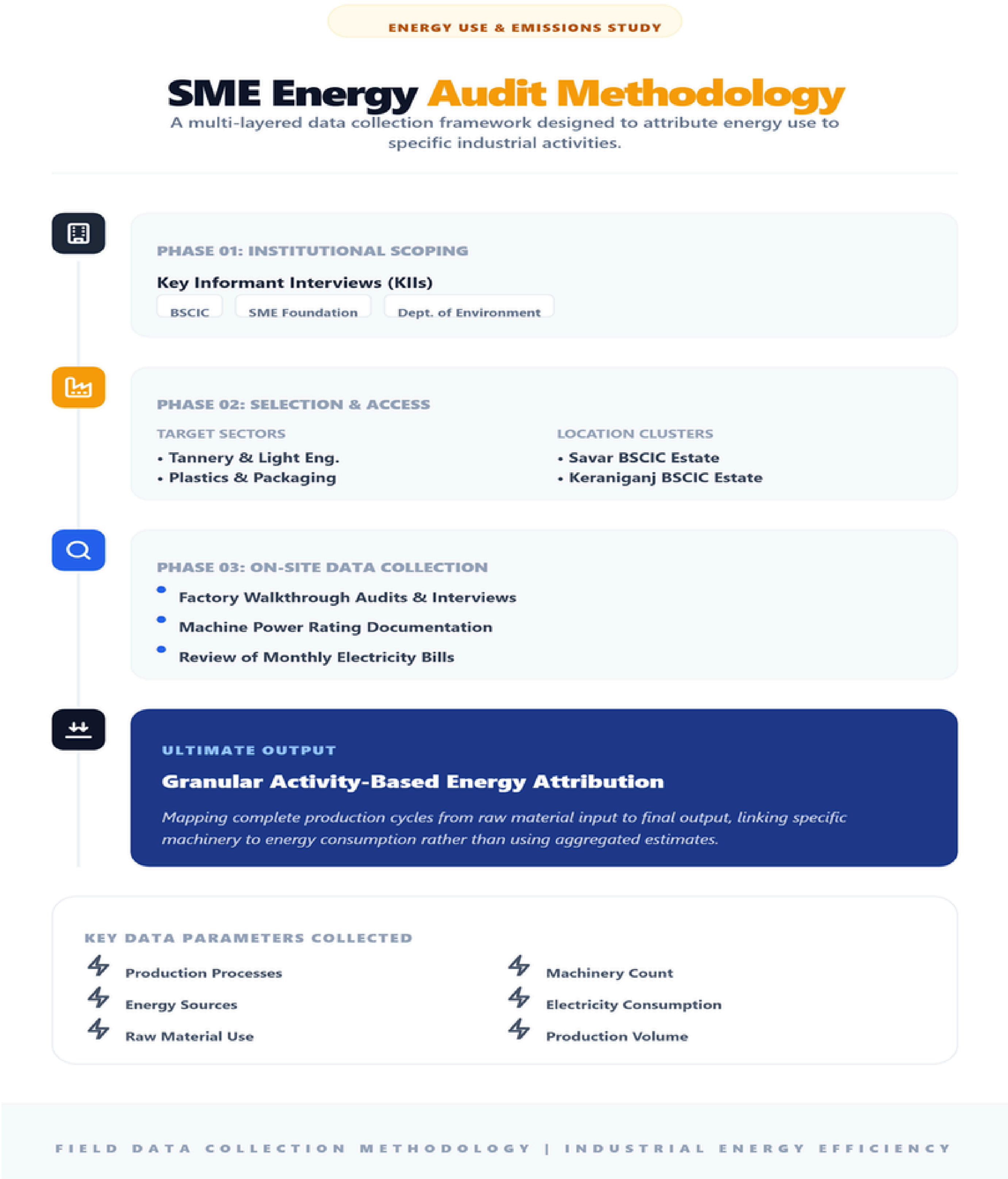


2.2 Carbon Emission Baseline Development

2.2.1 Field Visits and Primary Data Collection

Key Informant Interviews (KIIs) were conducted with stakeholders involved in SME development, industrial management, energy systems, financing, and environmental compliance, identifying tannery, light engineering, plastics, and packaging as high energy- and emission-intensive sectors. Field visits were carried out in selected SMEs in Savar and Keraniganj BSCIC Industrial Estates (with BSCIC permission), where structured questionnaires on production, machinery, and fuel/electricity use were used alongside factory walkthroughs, interviews with managers and technical representatives, and recording of machine power ratings to approximate equipment level energy demand.

Figure 2: Methodological Flowchart



Electricity bills were also reviewed to verify reported consumption and cross-check energy use data. The data collection covered production processes, process-wise machinery, number of machines, energy sources, monthly electricity consumption, raw material use, and production volume. For each factory, the complete production process was mapped from raw material input to final output, linking each process step with its corresponding machinery, enabling energy use to be attributed to specific industrial activities rather than relying on overall estimates.

2.2.2 Process Mapping and Energy Consumption Assessment

For each factory, the full production process was mapped from raw material to final output, linking each step with the machines used to track energy use. Energy consumption was estimated using a bottom-up approach at the machine level, using data on motor power, number of units, operating hours per day, and operating days per month collected during field visits. Monthly electricity use was calculated for each machine and assigned to specific process steps, then aggregated to estimate total factory consumption. Electricity use per unit of production was also calculated to compare across factories and sectors. Monthly energy use (kWh) for each machine was calculated as:

$$Energy\ Consumption = Machine\ Power \times Operating\ Hours \times Load\ Factor \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

$$Energy\left(\frac{\mathrm{kWh}}{\mathrm{month}}\right) = Power\ (KW) \times Operating\,\frac{hours}{day} \times Operating\,\frac{days}{month} \times Numberof\ Machines \ldots\ldots(2)$$

Carbon Emission Calculation

Carbon emissions were estimated using Bangladesh's national grid emission factor of 0.62 tCO_2e per MWh. Total electricity consumption was converted from kilowatt-hours to megawatt-hours and multiplied by the emission factor to calculate carbon emissions.
Total electricity consumption (kWh) was converted to MWh and multiplied by the emission factor to estimate:

$$CO_2\ emissions\ (tCO_2e) = Electricity\ Use\ (MWh) \times Grid\ Emission\ Factor \ \ldots\ldots\ldots\ldots(3)$$

2.2.3 Data and Variables

The data and variables sourced from various primary and secondary data sources used in analysis of this report are listed in Table-1.

Table 1: Sources of Data

Indicator / Data	Assumed Value	Unit	Data Source
Production volume	_	ton/month	Field visit
Number of machines	_	count	Field visit
Motor power	_	kW	Machine catalogue Alibaba Raviraj Engineering
Operating hours	_	hour/day	Field Visit
Electricity consumption	_	kWh/month	Calculated
Electricity per unit production	_	kWh/ton	Calculated
Grid emission factor	0.62	tCO_2e/MWh	DoE
Carbon emission calculation method	_	_	IPCC AR6
Machine energy share for each sector	_	%	Calculated
Solar system capacity	620	Watt	KII
Grid/Commercial Tariff	12	Tk/unit	KII
BSCIC Area	_	sqft	BSCIC website
OPEX/PPA solar tariff	9.6	Tk/unit	KII
Daily energy generation	79	unit	KII
Project Lifetime	20	Years	IRENA (2021), Renewable Power Generation Costs
Module Degradation Rate	0.5% per year	% per year	Jordan & Kurtz (2013), Progress in Photovoltaics
Annual O&M Cost	1-2% of OPEX (1.5% used)	%	IRENA (2021), Renewable Power Generation Costs
Discount Rate	10%	%	World Bank (Energy Project Appraisal Practices, South Asia); Bangladesh Bank Green Finance Guidelines
Residual Value	5-15% of OPEX (10% used)	%	Asian Development Bank (2019), Guidelines for Economic Analysis of Projects

2.2.4 Cost Benefit Analysis:

Net Present Value (NPV)

NPV measures the present value of total benefits minus total costs over the project lifetime.

$$NPV = \sum \frac{Cash\ Flow_t}{(1+r)^t} - Initial\ Investment \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (4)$$

Where r = discount rate (10%)

Internal Rate of Return (IRR): IRR represents the discount rate at which NPV becomes zero. It indicates the effective return of the investment.

$$0 = \sum_{t=1}^{T} \frac{Cash\ Flow_t}{(1+IRR)^t} - Initial\ Investment \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (5)$$

Where,

t = each individual year
T = the final year of the project
IRR is the discount rate that makes NPV = 0.

Simple Payback Period

$$\text{Payback Period} = \frac{Initial\ Investment}{\text{Annual Net Cash Flow}} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (6)$$

Discounted Payback Period

$$\text{Discounted Payback} = \text{Time when} \sum_{t=1}^{n} \frac{Cash\ Flow_t}{(1+r)^t} \geq \text{Initial Investmet} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (7)$$

Cost Benefit Ratio (BCR):

$$BCR = \frac{Present\ Value\ of\ Benefits}{Present\ Value\ of\ Costs} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(8)$$

If BCR>1, the project is financially viable.

Annual O&M Cost

$$O\&M_t = \alpha \times CAPEX \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (9)$$

Where:

$\alpha = 1.5\%$ (used value)

2.2.5 Solar PV Potential Estimation

The estimation of solar PV-based electricity generation potential was carried out by applying a land-allocation approach to the total BSCIC zone area in each division, where either 10% or 20% of the available land was assumed to be suitable for PV deployment. The usable land area was then converted into installed capacity using a fixed land-to-capacity factor, and annual electricity generation was derived from the resulting capacity using standard operating hours and an assumed capacity factor. Accordingly, the calculation can be expressed as:

$$E = A \times s \times \alpha \times 8760 \times CF \quad \ldots\ldots \quad (10)$$

E= annual electricity generation (MWh/year)
A = total zone area (acres)
s = share of land allocated to solar PV (10% to 20%)
α = space-to-capacity conversion factor (MW/acre)
8760 = hours in a year
CF= capacity factor.

This framework enables a comparative assessment of divisional solar generation potential under two alternative land-use scenarios.

3. Sector Profile and Industrial Process Mapping

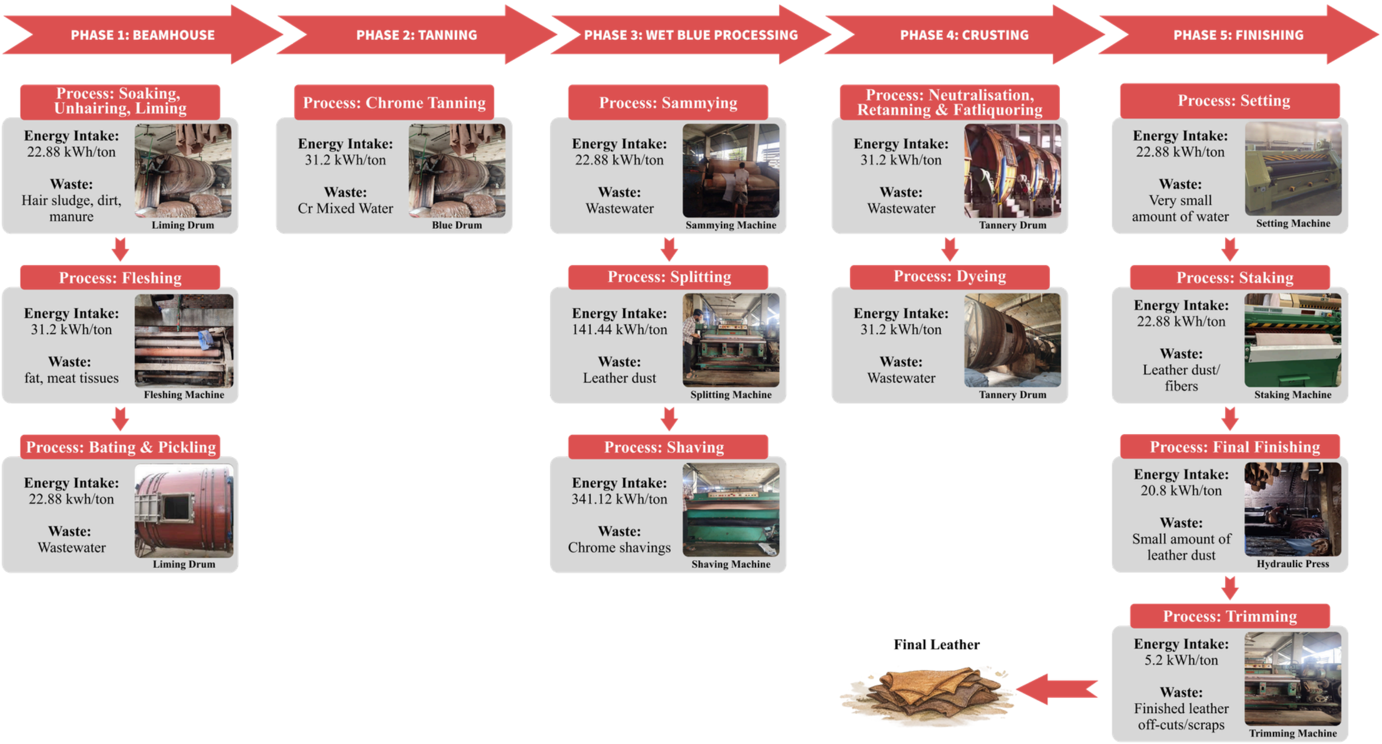
BSCIC hosts over 82 industrial estates across Bangladesh, accommodating a large number of enterprises, including 6,842,884 cottage, 859,318 small (small enterprises: 25-99 employees and 5-10 crore tk assets), and 7,106 medium industries (medium enterprises: 100-250 employees and 10-30 crore tk assets). This study focuses on high-emitting SMEs due to their critical role and greater potential for scalable decarbonization interventions.

3.1 SME Scale Local Tannery Industries

The SME scale local tannery sector in Bangladesh supplies leather for domestic products such as belts, bags, shoes, and garments, as well as for export markets.

Energy consumption in tanneries is almost entirely electricity-driven and concentrated in a few high-load mechanical processes. For a representative factory processing around 25 tons of hide per month, total electricity use is approximately 18,694 kWh, or about 748 kWh per ton.

Figure 3: Industrial Process Flowchart of a SME Scale Local Tannery



Source: Authors Calculation (Annex-1)

Among all stages, the shaving process is the most energy intensive. It consumes about 8,528 kWh per month, equivalent to 341.12 kWh per ton, accounting for nearly 46% of total electricity use. This is due to continuous operation and high motor capacity required for precision thickness control. The splitting process follows, using around 3,536 kWh per month (141.44 kWh per ton), bringing the combined share of these two stages to nearly 65% of total energy demand.

In contrast, wet processing stages such as tanning and dyeing each consume around 31.2 kWh per ton, indicating lower energy intensity. This distribution clearly shows that energy use is concentrated in a limited number of mechanical operations.

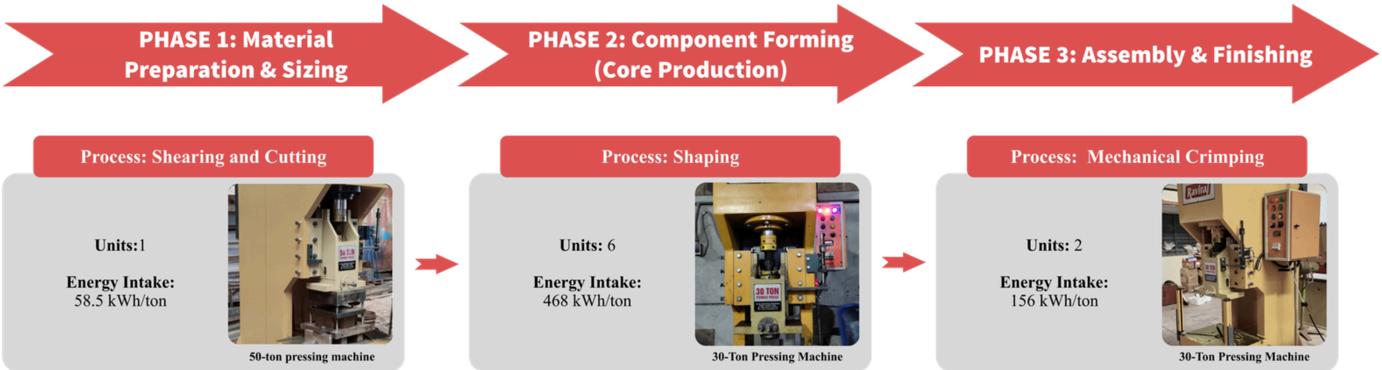
3.2 Light Engineering Industries

The light engineering industry in Bangladesh is a small- and medium-scale manufacturing sector that produces components, spare parts, and hardware for construction, furniture, agriculture, and household markets. It is often called the “mother industry” because it supports many other sectors through basic metalworking.

Production follows three main stages: shearing and cutting, shaping (bending and forming), and mechanical assembly (crimping). Metal sheets are first cut using a 50-ton press, then shaped by 30-ton presses through bending and edging, and finally assembled into finished products through crimping, followed by manual inspection and packaging

For producing around 15 tons per month, total electricity consumption is approximately 10,237.5 kWh, equivalent to 682.5 kWh per ton. Energy use is highly concentrated in the shaping stage. Shaping processes alone consume about 7,020 kWh per month (468 kWh per ton), accounting for nearly 69% of total electricity use, due to continuous operation of multiple presses. In comparison, mechanical crimping uses around 2,340 kWh per month (156 kWh per ton), while shearing and cutting consume only 877.5 kWh per month (58.5 kWh per ton).

Figure 4: Industrial Process Flowchart of a Light Engineering Factory



Source: Authors Calculation (Annex-2)

The process is fully mechanical and powered by electricity. Factories use scrap or imported metal sheets from Dhaka, Chittagong, or overseas. No water, chemicals, or fuel are used, so direct emissions are very low. Production usually runs two shifts, about 12 hours daily.

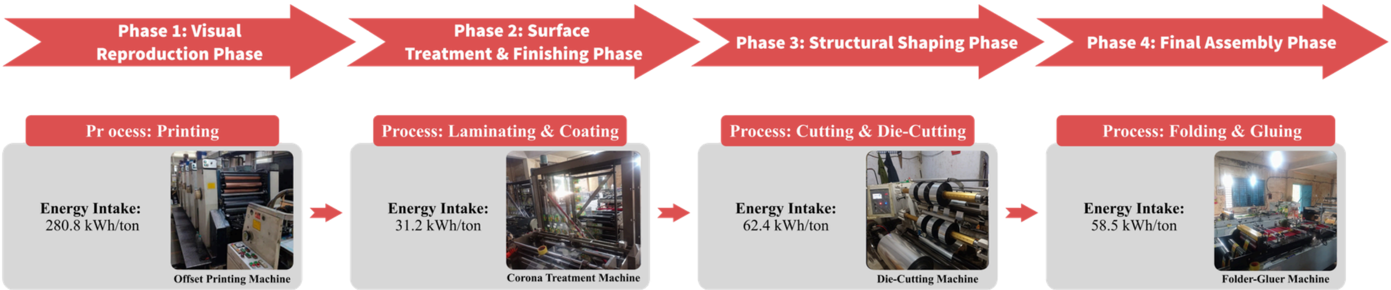
3.3 Plastics Manufacturing Industries

The plastics manufacturing sector in Bangladesh consists of small and medium factories producing items like disposable spoons, plates, hangers, packaging materials, and industrial accessories.

Production starts with virgin plastic pellets such as PP, ABS, and HIPS, mostly imported from China and bought locally from dealers in areas like Chawkbazar. Small factories usually use about 8–10 tons of raw material monthly. Pellets are mixed with colour pigments in a mixer, then fed into the injection moulding machine. Inside the machine, plastic is melted and injected into mould s using a rotating screw system. Products are cooled by a chiller with circulating water, then ejected. Extra plastic is crushed and reused for non-food products, while food-grade items use only virgin material.

For producing around 10 tons per month, total electricity consumption is approximately 9,800 kWh, equivalent to about 980 kWh per ton. Energy use is highly concentrated in two core processes. The chiller system is the largest consumer, using around 5,850 kWh per month (585 kWh per ton), accounting for nearly 60% of total electricity use due to continuous operation for temperature control. The injection molding process follows, consuming about 3,900 kWh per month (390 kWh per ton), or roughly 40% of total electricity use. In contrast, resin preparation consumes only 47.76 kWh per month (4.78 kWh per ton), representing a negligible share.

Figure 5: Industrial Process Flowchart of a Plastic Manufacturing Factory



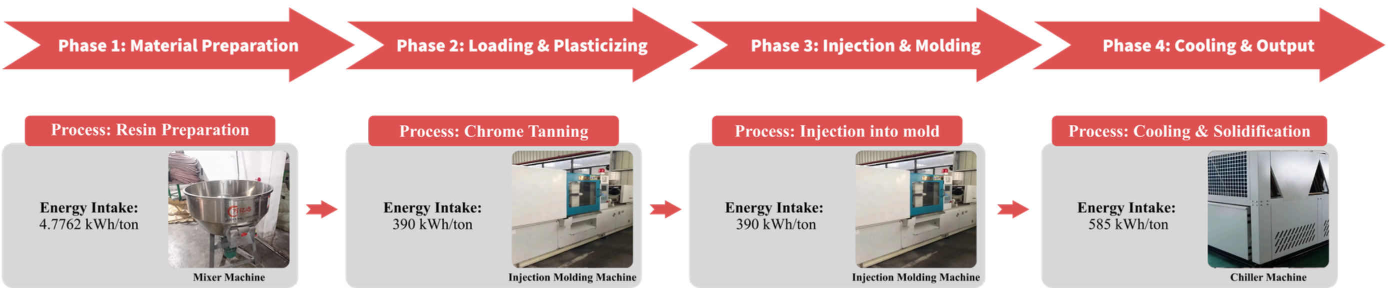
Source: Authors Calculation (Annex-3)

Overall, plastics factories use most electricity for melting, molding, and cooling, so injection molding and chilling systems are key targets for efficiency. Better scheduling, and installation of rooftop solar can be an effective solution. Improving these can reduce costs and carbon emissions while supporting sustainable growth in the plastics sector.

3.4 Packaging Industries

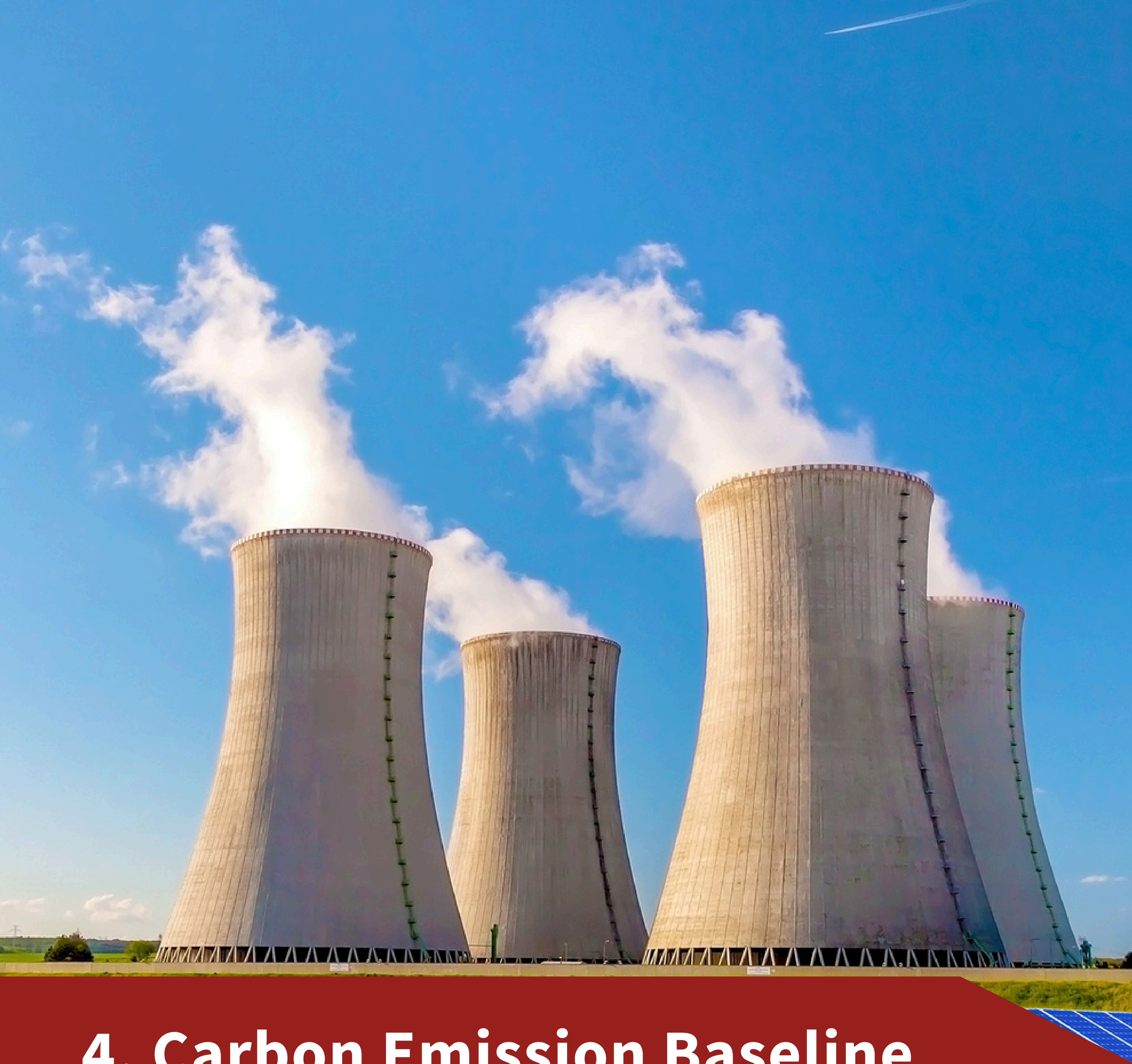
The packaging industry in Bangladesh is a growing SME sector serving food, consumer goods, pharmaceuticals, garments, and e-commerce, producing cartons, boxes, labels, and printed packaging mainly through electricity-driven printing and mechanical finishing processes. Production usually follows three stages: printing, cutting, and folding/gluing. Paper sheets are first printed using offset machines with 4–10 colors, sometimes followed by laminating or surface treatment. Sheets are then die-cut into shape and finally folded and glued into boxes. Paper waste is collected for recycling, and ink mixing is often done manually in small factories.

Figure 6: Industrial Process Flowchart of a Plastic Packaging Factory



Source: Authors Calculation (Annex-4)

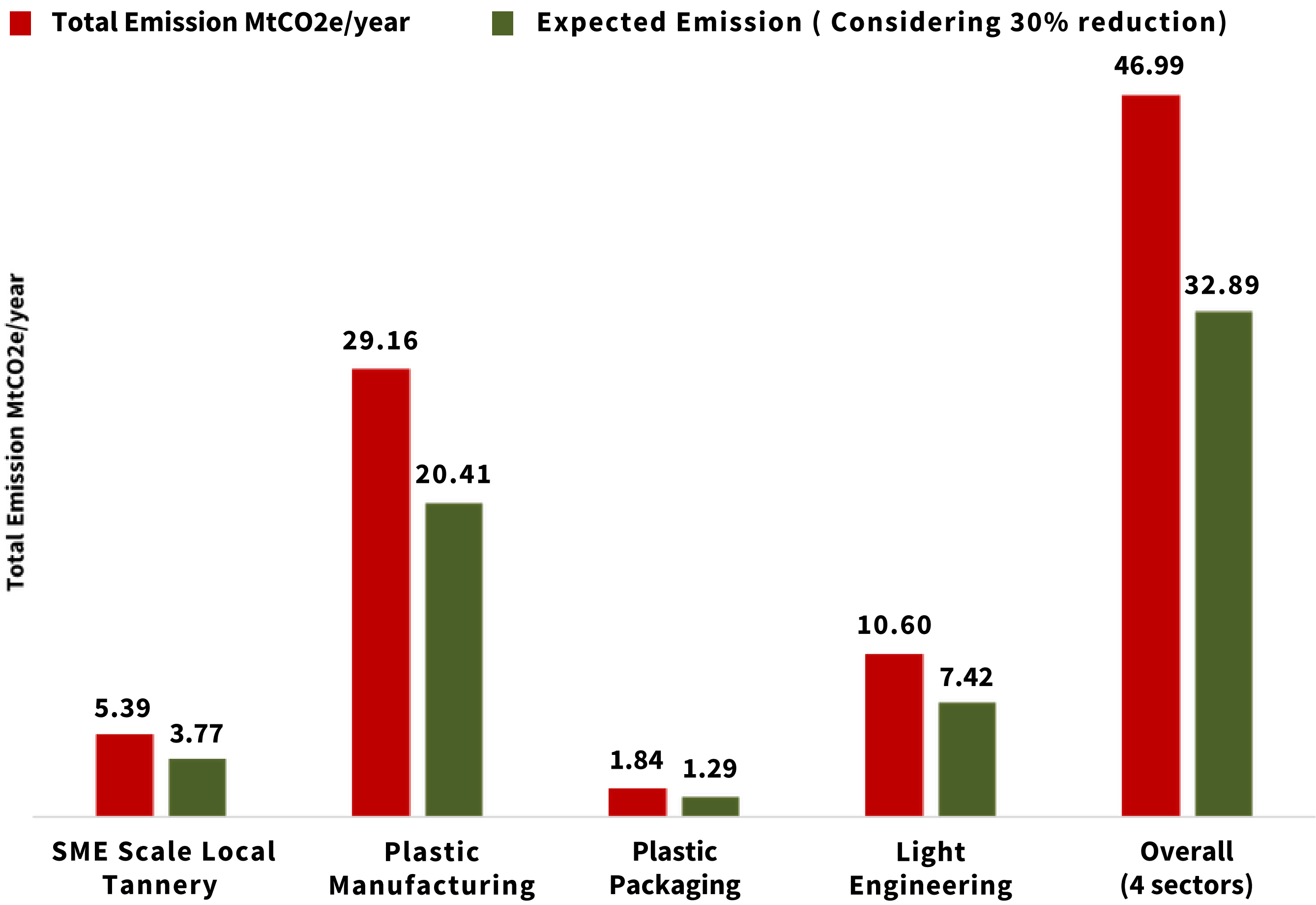
For producing around 20 tons per month, total electricity use is about 8,658 kWh (432.9 kWh/ton). The printing stage is the most energy-intensive, using 5,616 kWh/month (280.8 kWh/ton), about 65% of total consumption. Cutting and die-cutting use 1,248 kWh/month (62.4 kWh/ton), folding and gluing use 1,170 kWh/month (58.5 kWh/ton), and surface treatment and laminating use 624 kWh/month (31.2 kWh/ton). Overall, energy demand is dominated by printing and finishing processes.



4. Carbon Emission Baseline

The carbon emission baseline analysis shows clear differences in emission levels across the selected SME sectors under BSCIC. Among them, plastic manufacturing records the highest emissions at 29.16 $MtCO_2e$/year, reflecting its heavy reliance on energy-intensive processes and fossil-fuel-based electricity. With a 30% reduction aligned with international standards, emissions in this sector could decrease to 20.41 $MtCO_2e$/year. Light engineering is the second highest emitter at 10.60 $MtCO_2e$/year, which could be reduced to 7.42 $MtCO_2e$/year. SME-scale local tannery contributes 5.39 $MtCO_2e$/year, with a potential reduction to 3.77 $MtCO_2e$/year.

Figure 7: Sector Specific Emission Intensity



Source: Authors' Calculation

In comparison, plastic packaging shows the lowest emissions at 1.84 $MtCO_2e$/year, which could decline to 1.29 $MtCO_2e$/year after reduction measures.

Overall Emissions Contribution and Reduction Potential of Four SME Sectors

4 sectors: 46.99 MtCO2e/year
- 11.23% of national emissions
- 40.12% of industrial emissions (Manufacturing + IPPU)

Reduction potential: 14.097 MtCO2e/year
- 16.4% of NDC target
- 0.03% of total emissions

5. Emission Reduction Potential

5.1 Technical and Process based Emission Reduction Potential by Sector

Technical reduction potential is the maximum possible emission reduction using existing technologies, better practices, and process improvements, assuming no major change in production levels.

A cross-cutting finding across all sectors is that a large share of industrial electricity demand is driven by motor systems. Global evidence shows that electric motors and motor systems represent a major share of electricity consumption, and that new and existing technologies can typically reduce motor-system energy demand by about 20 - 30 %with feasible payback periods (IEA 4E). In addition, variable speed drives can deliver significant savings where loads vary over time, with typical savings reported in the range of 15-40 % in variable-load applications, and higher savings possible in appropriate pump and fan systems. (Energy Institute).

Baseline reference for technical potential assessment

The technical reduction potential is interpreted against the monthly electricity and emission baselines developed for representative process lines/factories in each sector:

Figure 8: Baseline Reference for Technical Potential Assessment

Sector		Dominant electricity loads (share of total electricity consumption)
	SME Scale Local Tannery	Shaving 45.6%, Splitting 18.9%
Light engineering	Light Engineering	Shaping presses ~68.6%
	Plastics	Chiller ~59.7%, Injection moulding ~39.8%
Packaging	Packaging	Offset printing ~64.9%

Source: Authors Calculation (Annex -5)

5.1.1 SME Scale Local Tannery Sector

Tannery electricity use is concentrated in shaving and splitting machines, which account for about two-thirds of total consumption, showing the main emission reduction potential is in these high-load machines. Key measures include replacing inefficient motors with IE3/IE4 high-efficiency motors and adding VFDs, as used in European plants, can reduce emissions by 10-15% (1.16-1.74 tCO_2e/month) and match speed to demand without reducing output. Further gains can come from BAT-based improvements like better machine condition, mechanical dewatering (samming) to remove more water before drying, and short float tanning to reduce water, heat, and drum time can deliver 8-10% reduction (0.93-1.16 tCO_2e/month). Waste management is also important, as tannery waste (fleshing, trimmings, sludge, chromium residues) can increase methane emissions and wastewater treatment energy use if poorly managed.

Several internationally used waste management technologies can reduce emissions while maintaining production capacity:

- Anaerobic digestion of tannery organic waste (such as fleshing and sludge) to produce biogas, which can be used for heat or electricity generation within the facility.
- Solid waste valorization, where collagen-rich leather waste is converted into biogas, biofertilizer, or industrial by-products such as gelatin and protein hydrolysates.

- Chrome recovery and reuse systems, which reduce chemical consumption and lower wastewater treatment energy demand.
- Improved segregation of solid waste streams, allowing organic waste to be treated separately from hazardous waste and enabling energy recovery options.

Further gains can be achieved by introducing automated drum control systems and optimizing drum loading and cycle time management, contributing an additional 5-8% reduction (0.58-0.93 tCO_2e/month). Overall, the tannery sector can achieve a total emission reduction of 19-33%, equivalent to 2.23-3.77 tCO_2e/month.

5.1.2 Light Engineering Sector

Since production relies on motor-driven mechanical work, emission reduction depends on improving press systems and motor equipment; internationally, Servo presses technology is widely used, replacing conventional presses with digitally controlled motors that use energy only when needed, reducing electricity use during idle or partial-load operation. This upgradation can reduce emissions by 10-15% (0.64-0.95 tCO_2e/month).

Upgrading standard efficiency motors to premium efficiency IE3 or IE4 motors, together with improved drive and control systems, can reduce motor losses and emissions reduction of 6-10% (0.38-0.64 tCO_2e/month). Retrofitting with variable speed drives lets motors match load demand instead of running at constant speed, reducing idle electricity use.

Additionally, transitioning from manual machining control to CNC-based energy-optimized systems and implementing smart power management practices can contribute 5-8% reduction (0.32-0.51 tCO_2e/month). In total, this sector shows a reduction potential of 19-31%, or 1.21-1.99 tCO_2e/month.

Process optimization measures further enhance these technical improvements without affecting production capacity. These include batch-based production scheduling, idle shutdown of presses and auxiliary equipment, preventive maintenance to reduce mechanical losses, and operator training to improve load management and machine operation efficiency.

5.1.3 Plastics Manufacturing Sector

Within the assessed sectors, plastics manufacturing has the highest decarbonization potential due to its energy-intensive systems. A major opportunity is upgrading injection molding machines: many SMEs still use conventional hydraulic machines with fixed-displacement pumps that consume power continuously, while servo-hydraulic or all-electric machines use energy only when needed and can reduce electricity use by 20-35% reduction (1.21-2.12 tCO_2e/month), depending on configuration. Cooling systems also offer savings, as upgrading chillers with variable-speed compressor technology can adjust cooling to demand and reduce energy use by 10-15% reduction (0.61-0.91 tCO_2e/month). Improvements in compressed air systems, including the use of energy-efficient inverter compressors and leakage control with pressure optimization, can further reduce emissions by 5-8% (0.30-0.48 tCO_2e/month). Process optimization measures further reduce electricity demand without affecting production capacity. These include cycle-time optimization, chiller setpoint adjustment, maintenance and insulation of chilled water circulation systems, and reducing defect rates through improved process parameter control.

Altogether, the sector can achieve a total reduction of 33-49%, equivalent to 1.97-2.97 tCO_2e/month.

Figure 9: Sector Wise Technical and Process based Emission Reduction Potential

Industry	Recommended Low-Emission Technologies	Process Optimization	Emission Reduction Potential (tCO_2e/month)	Emission Reduction Potential (%)
SME Scale Local Tannery	IE3/IE4 motors, servo machines, auto drum control	Dewatering, Short-float tanning (reduces water and drum rotation time)	2.23-3.77	19-33
Plastic Manufacturing	Electric molding, inverter chillers, inverter compressors	Temperature optimization, heat recovery	1.97-2.97	33-49
Light Engineering	Servo presses, IE3/IE4 motors, Computar Numerical Control(CNC) machines	Batch scheduling, standby control	1.21-1.99	19-31
Plastic Packaging	LED-UV curing technology, Variable Frequency Drive (VFD) motors, digital printing	Job sequencing, auto shutdown	0.78-1.50	15-28

Source: Authors' Calculation (Annex-6)

5.1.4 Packaging Sector

Technical emission reduction in the packaging sector comes from improving printing and auxiliary motor efficiency. LED-UV curing technology, replacing conventional UV systems, uses less electricity, produces less heat, and reduces startup and standby energy use and can reduce emissions by 8-12% (0.43-0.64 tCO_2e/month). Further savings can be achieved by upgrading printing press motors to high-efficiency motors with variable speed drives, which adjust power use to production load and reduce idle consumption can further contribute 5-8% reduction (0.27-0.43 tCO_2e/month). Process improvements-such as better job sequencing, fewer reprints through improved calibration, and standby protocols with regular maintenance can also reduce 4-6% (0.21-0.32 tCO_2e/month). Overall, the sector demonstrates a total emission reduction potential of 15-28%, equivalent to 0.78-1.50 tCO_2e/month.

5.2 Solar PV-Based Emission Reduction Potential

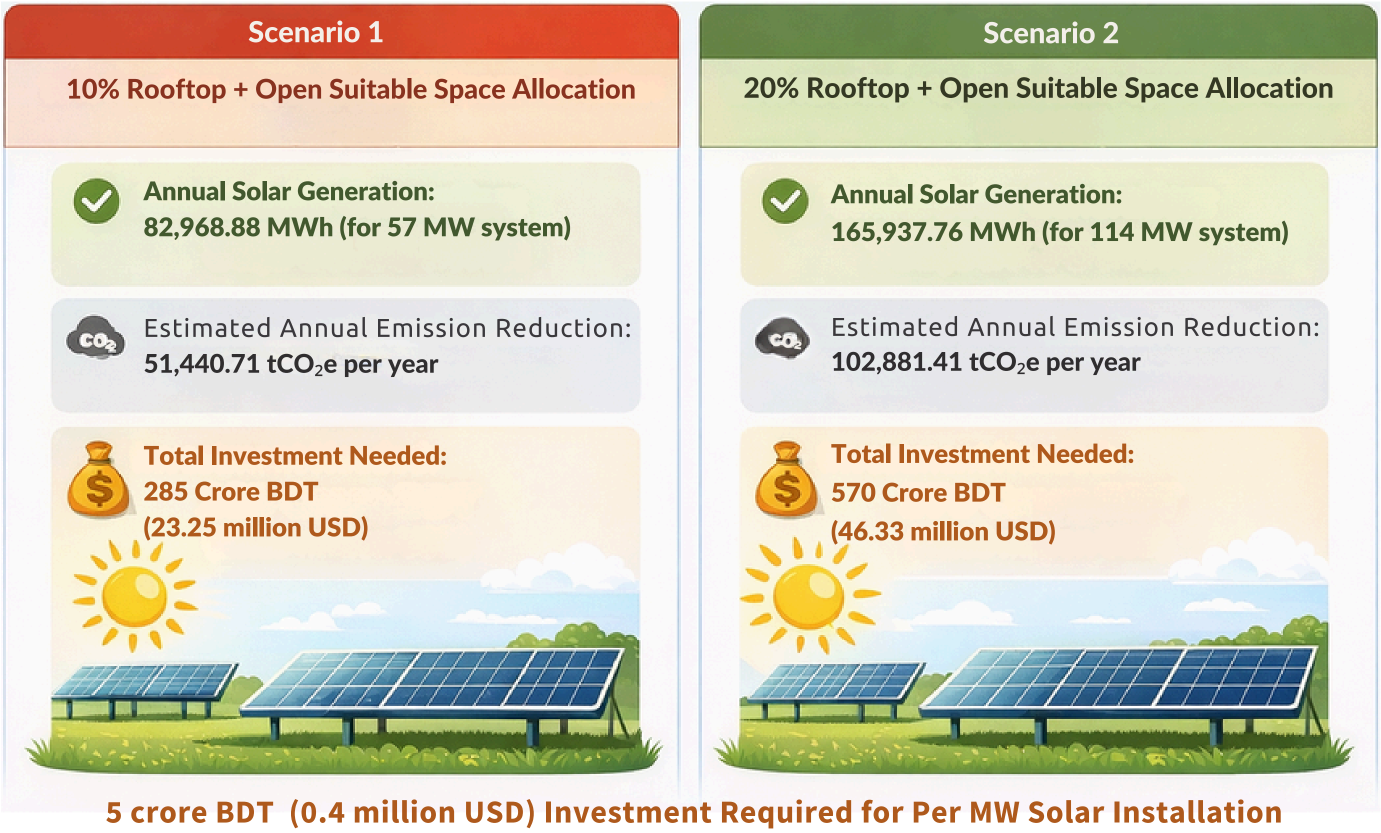
Solar photovoltaic deployment across BSCIC industrial estates represents the largest structural emission reduction opportunity identified in this study. Since all assessed SME sectors are electricity-driven, replacing fossil fuel-based grid electricity with on-site solar generation directly reduces indirect carbon emissions.

To assess large-scale feasibility, two land-use scenarios were analyzed across major BSCIC zones:

- **Scenario 1:** 10 % of Rooftop + Open Suitable Space Allocation to solar PV
- **Scenario 2:** 20 % of Rooftop + Open Suitable Space Allocation to solar PV

The installed capacity and annual electricity generation under both scenarios are summarized below.

Figure 10: Solar PV-Based Emission Reduction Potential



Source: Authors' Calculation (Annex-7)

National renewable energy planning must distinguish between installed capacity and actual electricity consumption, because MW targets alone do not reflect real generation or emissions outcomes (Change Initiative, 2025).

Solar deployment within BSCIC estates provides multiple co-benefits:

1. Direct reduction of indirect emissions from grid electricity
2. Reduced exposure to rising electricity tariffs
3. Improved competitiveness in carbon-sensitive export markets
4. Enhanced eligibility for renewable energy finance and climate funds
5. Alignment with national renewable energy and NDC targets

Cluster-based solar deployment also allows shared infrastructure models, including:

- Centralized ground-mounted solar parks
- Rooftop solar aggregation models
- Hybrid net-metering systems

5.2.1 Cost Benefit Analysis of Installing Solar PV at the BSCIC Industrial Estate

The 20 kW CAPEX system requires an approximate investment of Tk 1,373,900 and around 1,250 sq.ft of rooftop or open space. The system achieves a simple payback period of 4.2 years, with a discounted payback of around 5 years. Furthermore, the Cost Benefit Ratio of 2.11 confirms that the project generates more than double the economic value relative to its cost. Even after accounting for annual module degradation and operation and maintenance expenses, the system remains financially robust, making rooftop solar a viable and strategic investment option for industrial SMEs under BSCIC clusters.

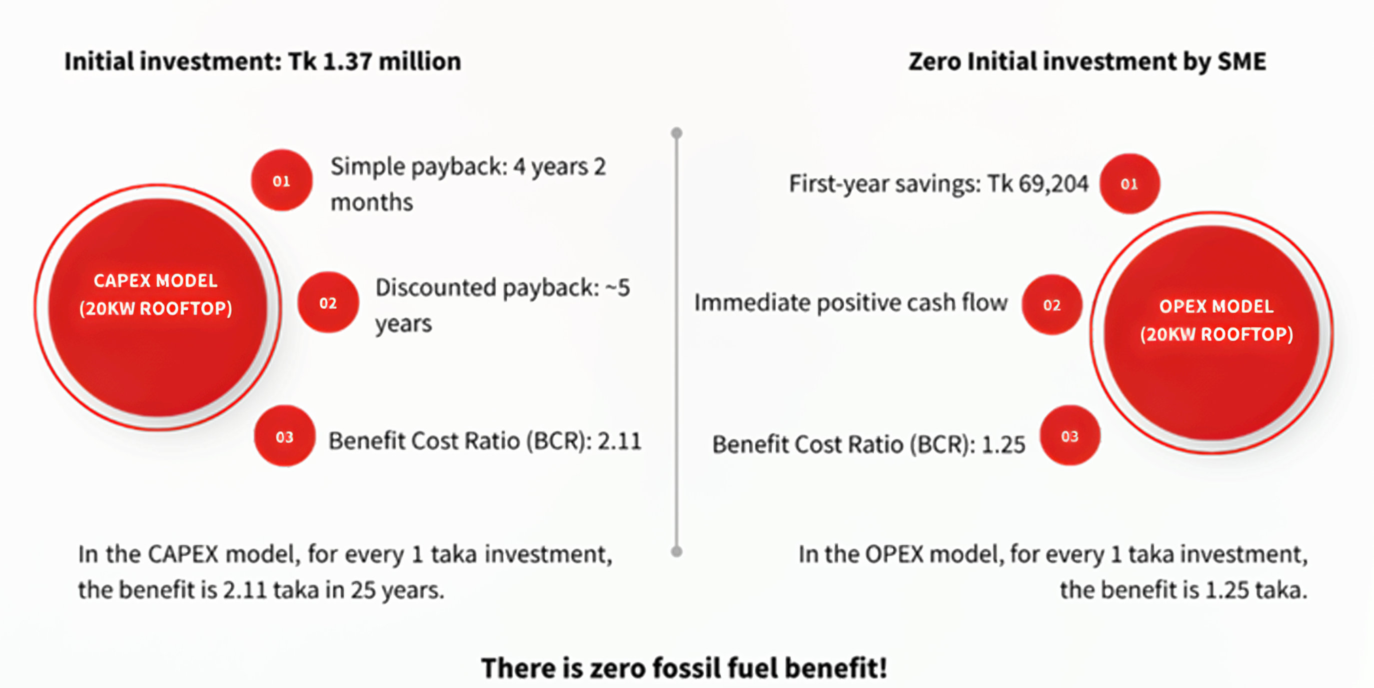
5.2.1.1 20KW On-Grid Rooftop Solar Project Description (CAPEX):

The 20 kW CAPEX system requires an approximate investment of Tk 1,373,900 and around 1,250 sq.ft of rooftop or open space. The system achieves a simple payback period of 4.2 years, with a discounted payback of around 5 years. Furthermore, the Cost Benefit Ratio of 2.11 confirms that the project generates more than double the economic value relative to its cost. Even after accounting for annual module degradation and operation and maintenance expenses, the system remains financially robust, making rooftop solar a viable and strategic investment option for industrial SMEs under BSCIC clusters.

5.2.1.2 20KW On-Grid Rooftop Solar Project (OPEX Model)

For the OPEX model, the economics changes completely. The SME does not buy the system. A third-party developer installs, owns, operates, and maintains the rooftop solar plant, and the SME simply purchases the generated electricity under a long-term power purchase arrangement (PPA).
Since there is no upfront investment, SMEs start benefiting immediately through reduced electricity costs. In the first year alone, the system generates savings of Tk 69,204, with continued positive cash flow over time despite minor reductions due to module degradation. The cost-benefit ratio of 1.25 confirms that savings exceed payments, making this model financially attractive and low-risk for SMEs.

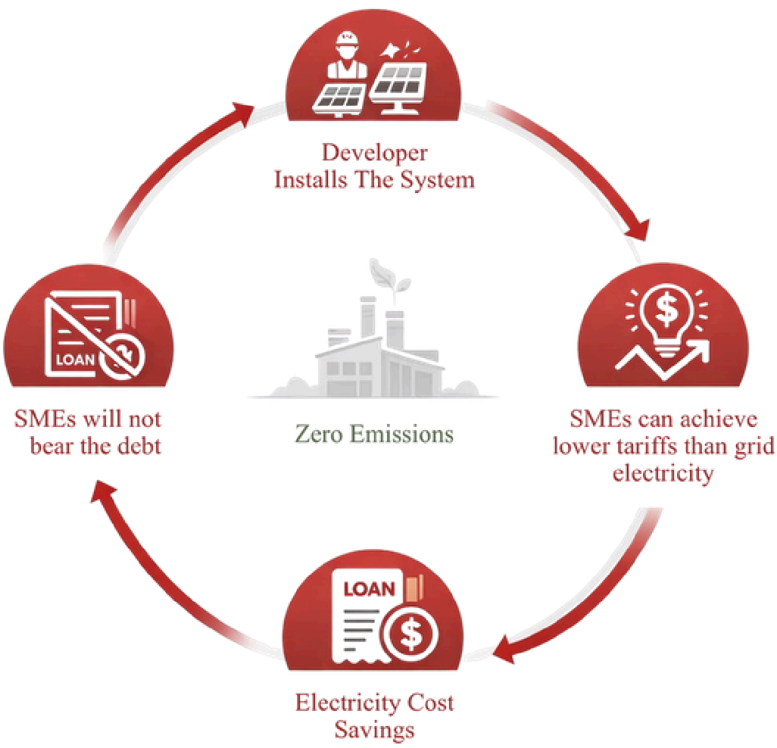
Figure 11: Cost-Benefit Analysis of Solar PV Installation



Source: Authors Calculation (Annex-8 to 12)

From a practical SME perspective, the OPEX model may be more scalable in BSCIC clusters where firms face capital constraints, limited access to affordable finance, or reluctance to commit large upfront investment. The CAPEX model produces stronger returns for firms that can invest, but the OPEX model offers instant savings, no upfront burden, outsourced maintenance, and lower adoption friction, making it a highly suitable pathway for broader solar uptake among industrial SMEs.

Figure 12: The OPEX Solar Power

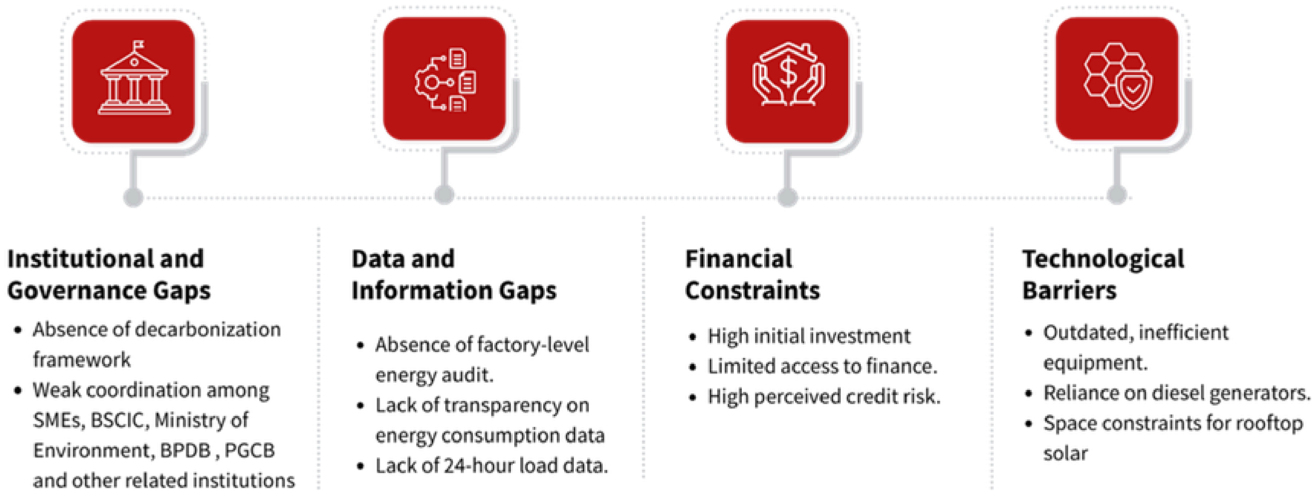


6. Barriers and Constraints to Emission Reduction

Despite significant technical potential, emission reduction in BSCIC SMEs faces multiple structural, financial, technological, and institutional barriers.

Technology is not the only constraint to emission reduction in BSCIC SMEs, but data, finance, governance, and regulatory gaps are also present. The factories lack a factory-level carbon accounting system, and energy consumption data is usually incomplete or non-transparent. BSCIC-wide emission registry is not provided, and most of the estates do not have 24-hour profile data, which complicates grid planning and integration of renewables. Such information

Figure 13: Barriers and Constrains of emission reduction in BSCIC-SMEs



Financial constraints hinder SME decarbonization, as high-cost efficient machines and solar systems are unaffordable, and long-term low-interest loans are limited. SMEs are seen as high-risk borrowers, so they prioritize working capital over efficiency upgrades. Although Bangladesh Bank has four refinancing schemes worth BDT 15.5 billion and a USD 200 million green technology fund, these have not yet driven large-scale SME renewable investment (Change Initiative, 2023). Technical and institutional barriers persist, with SMEs relying on outdated machines, boilers, and motors and using diesel generators during outages. Energy management skills are weak, there is no BSCIC-specific decarbonization framework, and crowded estates limit rooftop solar. Energy audits are not mandatory; ownership is fragmented or rented, and weak enforcement of environmental rules reduces improvement incentives. Policy and system constraints also limit renewable adoption. Centralized grid design, net metering limits, and wheeling charges reduce viability of distributed solar. SCADA systems are rare, limiting energy monitoring. Most SMEs focus on short-term survival with low awareness of efficiency gains and limited export carbon pressure. Overall, decarbonization in BSCIC clusters needs coordinated policy, finance, and technical support beyond technology alone.

6.1 SME Decarbonization as the Foundation of Bangladesh’s Energy Sovereignty

Bangladesh faces a structural contradiction: despite near-universal electricity access, SMEs still suffer from load shedding, unstable supply, and rising costs, showing that access without reliability is not development. Global evidence shows solutions-India’s SME rooftop solar cuts electricity costs by 30–50% (ET Edge Insights), Vietnam’s DPPA enables direct renewable energy purchase for global competitiveness (World Resources Institute), Germany uses localized energy systems for price stability, and China invests in battery storage for energy autonomy. These cases show a global shift toward decentralized, reliable, and cost-efficient industrial energy systems.

Table 2: Comparative Summary: Economic & Energy Performance (2025-2026)

Country	Primary RE Driver	Economic Benefit	Energy Benefit
China	Massive investment in **battery storage** (up 69% in 2025)	Cost reduction through transition from coal-fired thermal power	Storage-driven energy Autonomy/Sovereignty
India	Rooftop Solar / KUSUM	30-50% Cost Reduction	Decentralized Grid Relief
Germany	Onshore Wind / Solar	Price Shock Resilience	Localized Energy Trading
Vietnam	DPPA / Rooftop PV	Export Market Compliance	Reduced Grid Peak Load

Bangladesh is still dependent on fossil fuels and imports, weakening its economy. Air pollution reduces life expectancy by over 5 years and costs about 5% of GDP. With the EU Carbon Border Adjustment Mechanism, carbon costs now affect trade. SMEs supplying export chains (buttons, zippers, leather, light engineering) face rising carbon risks, threatening garments of exports unless decarbonization happens. on-constrained global economy.

SMEs make up 90% of industrial units, 80% of jobs, and 45% of manufacturing value added, but only 25% of GDP vs Indonesia (59%), Vietnam (45%), and Cambodia (58%) (FREIHEIT, 2024). Despite ~6% annual growth, high energy costs and weak systems limit them. Energy transition is essential to reach 32%+ GDP contribution. The evidence from this report is unequivocal. Rooftop solar potential is high: 57 MW in BSCIC estates at 10% use, up to 114 MW, and 3,000–5,000 MW nationally within a year. This challenges the 2030 20% renewable target and shows rooftops are an untapped energy resource. Energy costs are 10–20% of SME expenses; even a 20% reduction boosts margins and export competitiveness in leather, plastics, and light engineering. This reshapes industrial cost structure, not just energy use. The barrier is not capital but weak deployment systems. Duty drawbacks and carbon taxes on transport could finance renewables. The issue is policy design, not funding availability. Adoption depends on incentives: higher tariffs for heavy users, integrated financing, and tax benefits. Failure is due to weak system integration, not lack of awareness. Central to this transition is the emergence of the ESCO-driven OPEX model. Evidence from global markets shows that SMEs prefer models where upfront capital expenditure is eliminated. Under an OPEX structure, SMEs pay for electricity as a service, often at rates lower than grid tariffs. This aligns incentives across developers, financiers, and users. In Bangladesh, the immediate savings potential of approximately 70,000 BDT per SME under such models is significant. It represents liquidity, resilience,and survival. However, the ESCO ecosystem in Bangladesh remains underdeveloped. The regulatory framework may exist on paper, but the market is functionally absent. Without deliberate state intervention to create, de-risk, and scale ESCOs, the OPEX model will remain theoretical.

The transition must also be understood through the lens of employment and structural change. The promise of creating one crore of jobs cannot be fulfilled through traditional industrial expansion alone. Automation is already reducing labor demand in the garment sector. The future of employment lies in decentralized, SME-driven ecosystems. Transitioning 1.3 million diesel pumps, scaling rooftop solar, and building localized operation and maintenance networks can create new categories of skilled employment. A jst energy transition is not merely about reducing emissions. It is about redistributing economic opportunities.

The question is not about renewable energy. It is about sovereignty. Bangladesh’s current energy model is import-dependent, price-volatile, and externally exposed. True energy security cannot be achieved under such conditions. Energy sovereignty, built on solar and wind, offers a fundamentally different trajectory. It is decentralized, locally controlled, and immune to global supply shocks. The Russia-Ukraine crisis exposed the vulnerabilities of import-dependent systems. Bangladesh missed thatopportunity due to governance failures and systemic inefficiencies. The current moment presents a second chance. The long-term energy transition should be framed not only as energy security but also as energy sovereignty, where decentralized renewable systems reduce exposure to imported fuel shocks and strengthen local resilience (Change Initiative,2026).

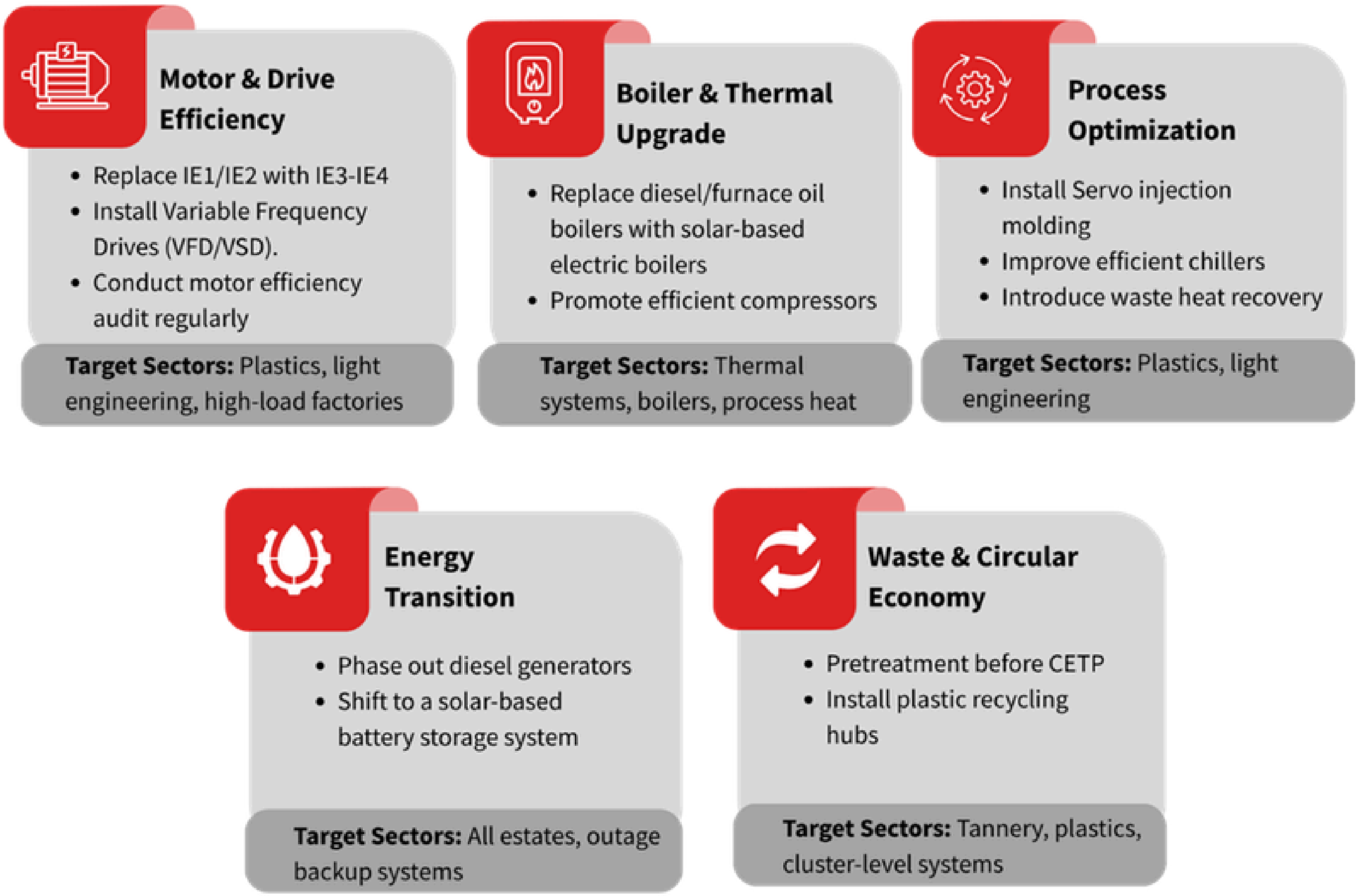
Energy is the lifeline of the economy. If energy remains externally controlled, the economy stays vulnerable; if locally generated and controlled, it becomes sovereign. SME-led renewable energy is not just sectoral reform but the foundation of a new economic architecture. The evidence is clear, the opportunity is immediate, and the only question is whether Bangladesh will act with urgency?

7 Decarbonization Pathways:

7.1 Technological

Decarbonization in BSCIC-SME clusters need a shift from scattered efficiency actions to integrated energy management. Emission reduction mainly comes from improving electrical and thermal systems, especially in plastics, light engineering, and tannery sectors. However, results depend on both technology use and better operational efficiency. Many SMEs lose energy due to outdated machines, poor load management, and idle operation, creating low-cost opportunities for immediate savings. Gradual electrification and moving away from diesel generators toward grid and solar systems are also important. Diesel generation costs about 30 BDT per unit, while solar with battery storage costs around 14 BDT per unit.

Figure 14: Technological Pathways

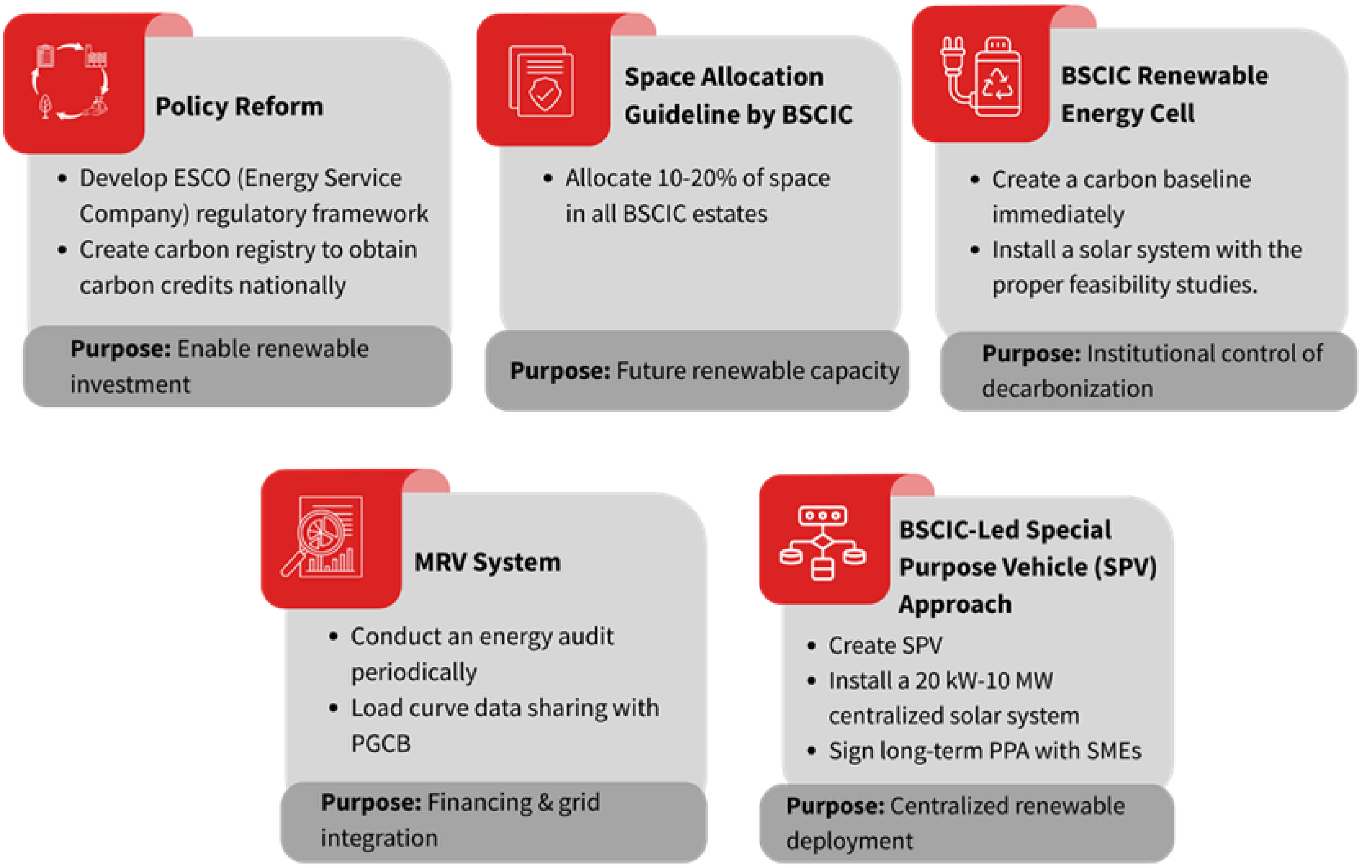


In parallel, the integration of circular economy practices at the cluster level can reduce material intensity and associated indirect emissions. Overall, the technological pathway should be understood as a combined shift toward energy efficiency, electrification, and resource optimization, aligned with sector-specific energy use patterns.

7.2 Structural and Governance Reform

The effectiveness of technological interventions is contingent upon the presence of a robust institutional and governance framework. In the current context, the absence of a dedicated coordinating mechanism within BSCIC limits the scalability and coherence of decarbonization efforts. Establishing a centralized institutional structure is therefore essential to oversee energy planning, data management, financing coordination, and sector prioritization.

Figure 15: Structural and Governance Reform



Policy and regulatory alignment are equally important to facilitate the transition. Existing limitations in net metering, energy sharing, and service-based energy models constrain the adoption of innovative solutions. Addressing these gaps will be key to mobilizing private investment and accelerating the low-carbon transition.

7.3 Just Energy Financing

A major barrier to decarbonization of BSCIC SMEs is the limited access to appropriate financing. Existing financing systems, particularly from IDCOL and commercial banks, are largely structured for large-scale projects and do not align with the scale, capacity, and operational realities of SMEs. As a result, SMEs face difficulties in accessing credit for renewable energy and efficiency investments, slowing down adoption despite clear economic benefits.

Table 3: Customer-Side Financial Indicators for 20 kW Solar (OPEX Model)

	Current Problems	Recommended Solutions
For IDCOL and Other Financing Agencies	• Loan process is complicated and takes too long	• Make the process simple, fast, and standardized
	• Absence of localized systems for SMEs	• Place banking agents inside BSCIC estates
	• No Investment products made for energy transition in SME	• Design flexible and SME-friendly renewable energy loans
	• Banks see SMEs as risky due to perceived high credit risk	• Combine grants + concessional loans to reduce SME risk
	• Application process is manual and scattered	• One-stop system for SMEs to apply, track and access financing
For IDCOL	• Financing is only designed for large projects (1 MW+), not SMEs	• Introduce small loans (10-50 lakh) specially for SMEs
	• SMEs cannot apply directly, need aggregation	• Create easy cluster-based financing for BSCIC estates

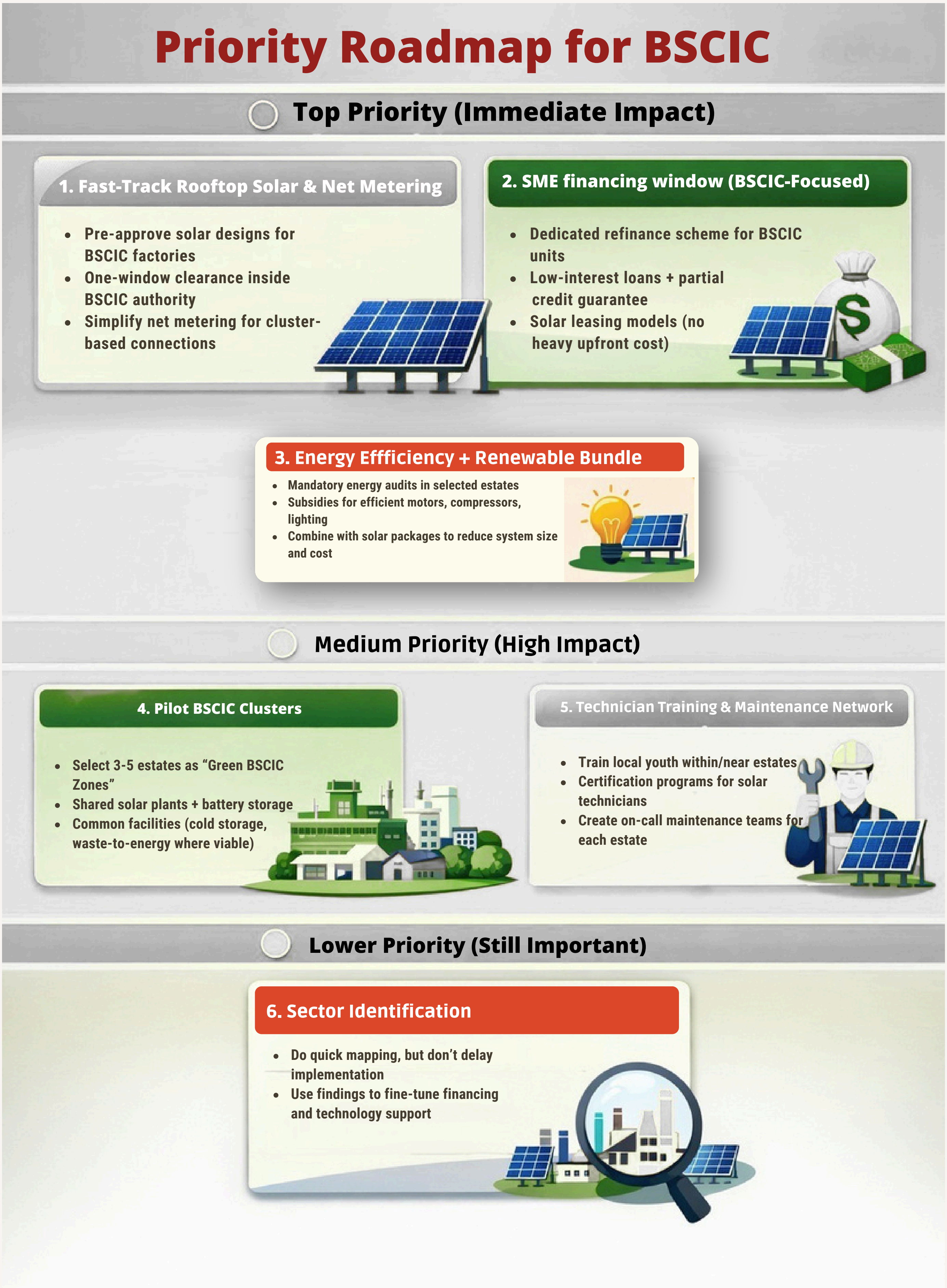
This financing gap is not only a matter of capital availability, but also system design. Without SME-focused financial products, simplified access mechanisms, and risk-sharing arrangements, the transition to low-carbon technologies remains constrained. Addressing this requires a shift toward more inclusive and adaptive financing frameworks that can support decentralized, small-scale investments within industrial clusters.

Such reforms can enable broader participation of SMEs in renewable energy adoption and accelerate the overall decarbonization of BSCIC estates.

8 Recommendation

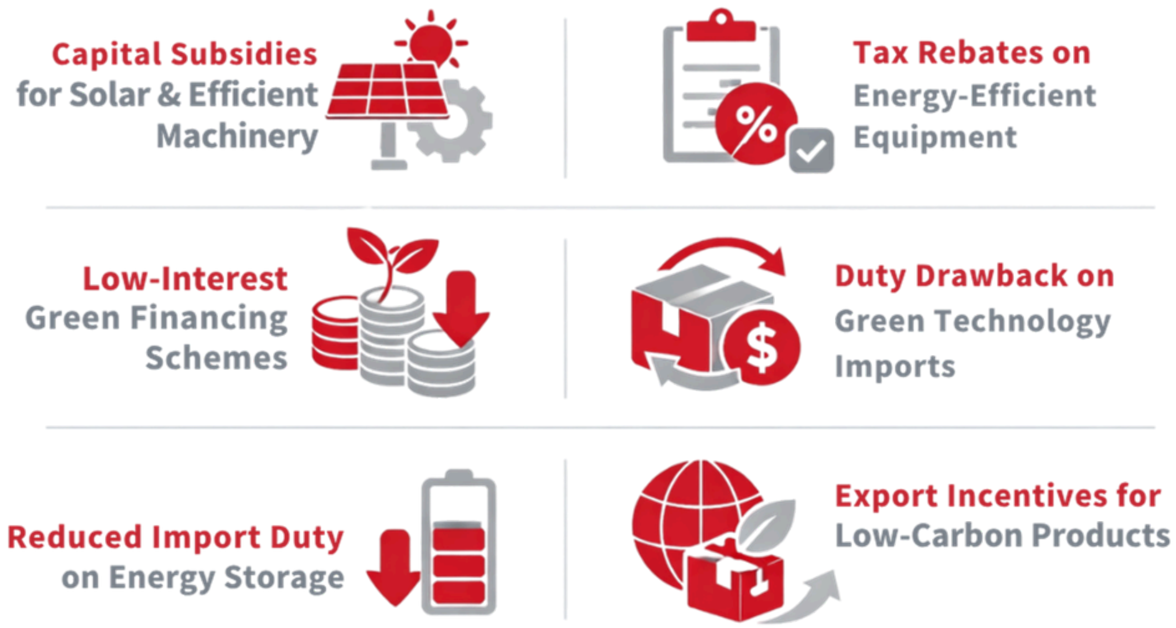
Based on the findings from the emission baseline, techno-economic analysis, and financing models, decarbonization of SMEs under BSCIC is both achievable and financially viable. Solar PV adoption and energy efficiency improvements offer immediate cost savings and emission reductions, while financing and implementation barriers remain the key challenges. Therefore, priority should now focus on practical, scalable actions that can accelerate adoption and ensure long-term sustainability across BSCIC industrial estates.

Figure 16: Priority Roadmap for BSCIC



Public stakeholders are essential for SME decarbonization by creating supportive policy, financial, and regulatory conditions. Governments should provide targeted capital subsidies for solar and energy-efficient machinery, tax rebates to reduce clean technology costs, reduce import duties on green technologies, and offer export incentives for low-carbon products to improve competitiveness. These fiscal and policy tools are globally recognized as key drivers of renewable energy adoption and industrial decarbonization.

Figure 17: Recommendations for Related Public Stakeholders

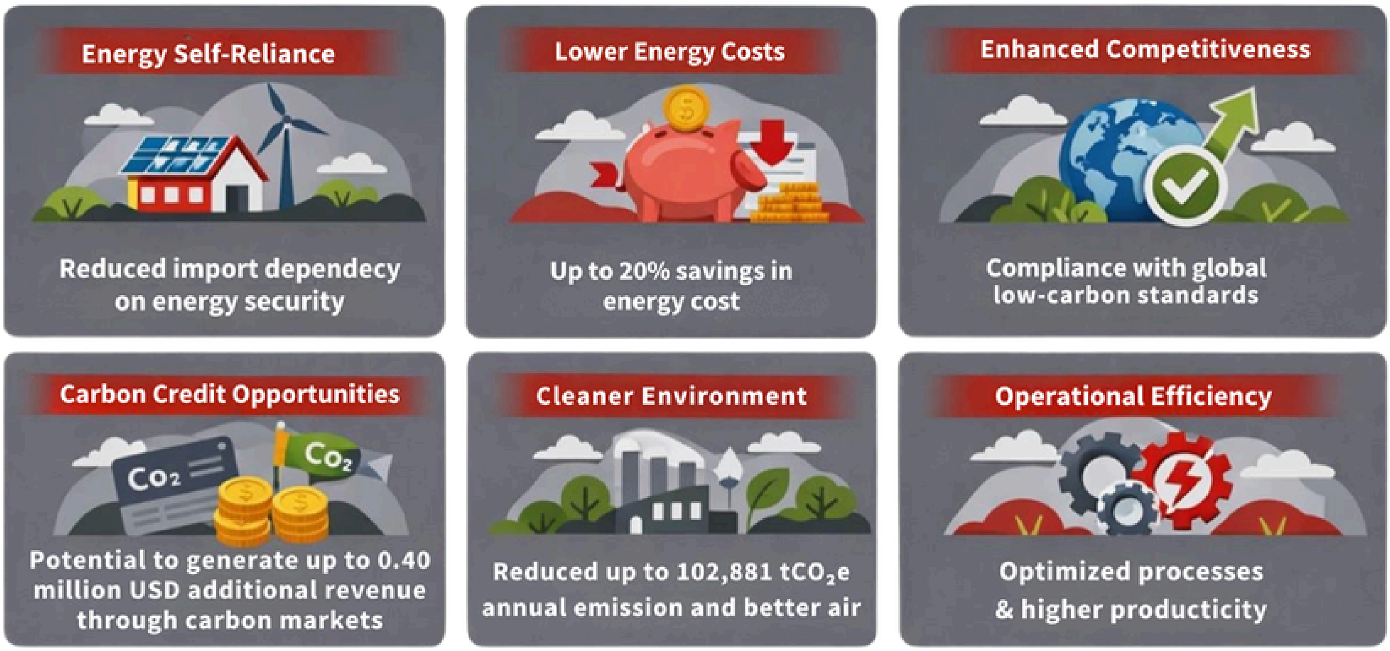


For detailed recommendations, see annex

9 Conclusion

This research aimed to study whether it is possible to achieve meaningful decarbonization of small and medium industries under the control of BSCIC without interrupting production and imposing extra financial pressure on the owners of factories. The results indicate that SMEs are individually small, but a large portion of industrial electricity consumption and hence they have a significant contribution to the emission profile in Bangladesh. The analysis of the base line assessment in the tannery, light engineering, plastics, and packaging industries reveals that most of the emissions are because of the use of electricity as a driving force in carrying out mechanical processes, especially motor system, press, injection moulding, chiller, printing equipment. Since these loads are concentrated within limited high consumption machines, efficiency enhancement can be targeted in a few machines to achieve a measurable decrease in emission without lowering production. Frequently, the cost of electricity may be reduced through upgrading motors and better process control as well as reducing idle running, which is significant to the SMEs, having limited capital. It implies that decarbonization in SME clusters cannot be regarded merely as a compulsory measure but as an economic prospect that could enhance competitiveness, stabilize the cost of operations, and provide stable employment in industrial estates over the long term.

Figure 18: Projected Outcomes of Nature Smart Industrial Transition



It is also revealed in the study that the greatest structural emission reduction potential is in substituting fossil-fuel-based grid electricity with renewable energy, especially solar PV on an estate level. Partial solar implementation in the areas of BSCIC will be able to compensate for substantial quantities of indirect emissions and cushion factories against escalating electricity costs. Technical potential, however, will not guarantee transition only. According to the field assessment, SMEs are characterized by several impediments such as inaccessibility to accessible energy data, inaccessibility to low-cost finance, the presence of archaic machinery and absence of integrated planning at the estate level. The individual factories will not be willing to invest in the low-carbon technologies unless they are financially favorable and supported by the institutions. Thus, further development will be based on cluster-based solutions, including shared solar systems, aggregated financing, obligatory energy audits, and a special mechanism of green transition within BSCIC. When these measures are put in place, decarbonization of SME can develop into an option that will help minimize emissions, reduce the cost of production, and enhance the competitiveness of the industrial sector in Bangladesh and serve the national climate pledges.

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Annex

1: Energy Use and Carbon Emission of a SME Scale Local Tannery

Process	Machine	Electricity consumption per month (kwh)	Carbon Emission tCO2/month
Soaking, Unhairing, and Liming	Liming Drum	572	354.64
Fleshing	Fleshing Machine	780	483.6
Bating & Pickling	Liming Drum	572	354.64
Chrome Tanning	Blue Drum	780	483.6
Samming	Samming Machine	572	354.64
Splitting	Splitting Machine	3536	2192.32
Shaving	Shaving Machine	8528	5287.36
Neutralisation, Retanning & Fatliquoring	Tannery Drum	780	483.6
Dyeing	Tannery Drum	780	483.6
Setting	Setting Machine	572	354.64
Staking	Staking Machine	572	354.64
Final Finishing (Pressing)	Hydraulic Press	520	322.4
Trimming	Trimming Machine	130	80.6
	Total		**11590.28**

2: Energy Use and Carbon Emission of a Light Engineering Factory

Process	Process Machine	Electricity consumption per month (kwh)	Carbon Emission tCO2/month
Shearing and cutting	50 ton pressing machine	877.5	544.05
Shaping (Flanging, Bending)	30 ton pressing machine	7020	4352.4
Mechanical Crimping	30 ton pressing machine	2340	1450.8
	Total		**6347.25**

3: Energy Use and Carbon Emission of a Plastic Manufacturing Factory

Process	Process Machine	Electricity consumption per month (kwh)	Carbon Emission tCO2/month
Resin Preparation	Mixer Machine	47.76	29.61244
Feeding into hopper, Plasticizing (melting + mixing), Injection into Mold	Injection Molding Machine	3900	2418
Cooling & Solidification	Chiller system	5850	3627
	Total		**6074.61**

4: Energy Use and Carbon Emission of Plastic Packaging Factory

Process	Process Machines	Electricity consumption per month (kwh)	Carbon Emission tCO2/month
Printing	Offset Printing Machine	5616	3481.92
Laminating & Coating	Corona treatment Machine	624	386.88
Cutting & Die-Cutting	Die-Cutting Machine	1248	773.76
Folding & Gluing	Folder-Gluer Machine	1170	725.4
Total		**8658**	**5367.96**

5: Baseline Reference for Technical Potential Assessment

Sector	Baseline electricity use (kWh/month)	Baseline emissions (tCO_2e/month)	Dominant electricity loads (share of total)
SME Scale Local Tannery	18,694	11590.28	Shaving 45.6%, Splitting 18.9% (combined ~64.5%)
Light engineering	10,237.50	6074.61	Shaping presses ~68.6%
Plastics	9,797.80	5367.96	Chiller ~59.7%, Injection molding ~39.8%
Packaging	8,658	6347.25	Offset printing ~64.9%

6: Sector Wise Technical and Process based Emission Reduction Potential

Sector	Existing High-Emission Technology	Low-Emission Technology (Used Globally)	Process Optimization Technique	Reduction Potential (%)	Estimated Emission Reduction (tCO_2e/month)
SME scale local Tannery	Conventional shaving machine with standard motor	IE3/IE4 high-efficiency motor shaving machines with Variable Frequency Drive (VFD) used in modern EU tanning plants	Mechanical dewatering (advanced samming) before drying to reduce drying energy demand	10-15%	1.16-1.74
	Conventional splitting machine	Energy-efficient splitting machines with servo motor control used in Italian and German leather plants	Short-float tanning technology (reduces water and drum rotation time)	8-10%	0.93-1.16
	Conventional tanning drum control	Automated drum control systems with efficient motors	Optimized drum loading and cycle time management	5-8%	0.58-0.93
	Total Emission Reduction			**19-33%**	**2.23–3.77**

Sector	Existing High-Emission Technology	Low-Emission Technology (Used Globally)	Process Optimization Technique	Reduction Potential (%)	Estimated Emission Reduction (tCO_2e/month)
Light Engineering	Conventional hydraulic/mechanical press	Servo press systems widely used in automotive and precision manufacturing industries	Batch production scheduling and idle shutdown automation	10-15%	0.64-0.95
	Standard efficiency electric motors	IE3/IE4 premium efficiency motors (IEA high-efficiency motor standard)	Preventive maintenance and lubrication management for machining equipment	6-10%	0.38-0.64
	Manual machining control	Computer Numerical Control (CNC) machining systems with energy-optimized control	Machine standby power control and smart power management	5-8%	0.32-0.51
	Total Emission Reduction			**19-31%**	**1.21-1.99**
Plastic Manufacturing	Hydraulic injection molding machine	Servo-hydraulic or all-electric injection molding machines widely used in Japan and Europe	Optimized mold temperature and reduced idle heating cycles	20-35%	1.21-2.12
	Constant-speed industrial chiller	Variable-speed inverter chillers used in modern plastic manufacturing plants	Cooling system temperature optimization and heat recovery	10-15%	0.61-0.91
	Conventional air compressor	Energy-efficient inverter compressors	Compressed air leakage control and pressure optimization	5-8%	0.30-0.48

Sector	Existing High-Emission Technology	Low-Emission Technology (Used Globally)	Process Optimization Technique	Reduction Potential (%)	Estimated Emission Reduction (tCO_2e/month)
	Total Emission Reduction			**33-49%**	**1.97-2.97**
Packaging / Printing	Conventional UV curing system	LED-UV curing technology used in modern offset printing presses	Optimized print job sequencing to reduce machine startup losses	8-12%	0.43-0.64
	Conventional printing motor drive	High-efficiency motor with VFD control	Automated standby shutdown of printing equipment	5-8%	0.27-0.43
	Manual process setup	Digital printing process automation systems	Calibration optimization to reduce reprints and material waste	4-6%	0.21-0.32
	Total Emission Reduction			**15-28%**	**0.78-1.50**

7: Potential of Scaling up Solar System (Rooftop + Open Suitable Space) in BSCIC Industrial Estates

Division	BSCIC Zone Area (acres) (Rooftop + Open Suitable Space)	10% of space for potential solar power system		20% of space for potential solar power system	
		Potential Installed capacity- MW (Mega Watt)	Potential Electricity Generation- MWh (Mega Watt hour) per year	Potential Installed capacity (MW)	Potential Electricity Generation (MWh) per year
Khulna	173.38	4.95	7232.42	9.91	14464.85
Chattogram	339.71	9.71	14170.76	19.41	28341.52
Dhaka	665.23	19.01	27749.59	38.01	55499.19
Barisal	221.02	6.31	9219.69	12.63	18439.38
Rangpur	147.37	4.21	6147.43	8.42	12294.87
Rajshahi	323.89	9.25	13510.84	18.51	27021.68
Sylhet	118.38	3.38	4938.14	6.76	9876.27
Total	**1988.98**	**57**	**82968.88**	**114**	**165937.76**

8: Financial Performance Indicators for 20 kW On-Grid Rooftop Solar (CAPEX Model)

20KW On-Grid Rooftop Solar				
Instrument	**Capacity**	**Quantity**	**Per Unit Cost (TK)**	**Total Cost (TK)**
Solar Panel	620 Watt	32	12,400	396,000
On-Grid Inverter	20KW	2 (Lifetime 12 years)	145,000	290,000
Cable & Accessories	-	-	10	198,400
Mounting Structure (best one)	-	-	8	158,720
Survey & Design	-	-	-	10,000
Transportation	-	-	-	16,000
Installation	-	-	-	30,000
EPC Charges	-	-	25% of total cost	274,780
Total Cost				**1,373,900**
Area Required	1250 sq.ft	-	-	-
Capacity Factor	5 hrs a day	79.00 Unit	-	-
Per Unit Commercial Bill	12 Tk	-	-	-
Gross value of generated electricity	346,020 TK	Per year	-	-

9: Cost Benefit Analysis Result for 20 kW On-Grid Rooftop Solar (CAPEX Model)

Component	Formula / Basis	Calculation	Result	Interpretation
Net Cash Flow (Year 1)	Annual Savings – O&M	346,020 – 20,609	Tk 325,411	Net financial benefit in the first year
Cash Flow Trend	0.5% annual module degradation	Gradual decline in generation	-	Slight reduction in output each year
Simple Payback Period	CAPEX / Net Annual Cash Flow	1,373,900 / 325,411	4.2 years	Investment recovered in approximately 4.2 years
Discounted Payback Period	10% discount rate applied	Discounted cash flow method	≈ 5 years	Payback considering time value of money
Present Value of Benefits	25-year discounted savings	-	Tk 2,895,000	Total present value of lifetime benefits
Initial Investment	Total CAPEX	-	Tk 1,373,900	Upfront capital expenditure
Net Present Value (NPV)	PV Benefits – CAPEX	2,895,000 – 1,373,900	Tk 1,521,100	Positive NPV confirms financial viability
Internal Rate of Return (IRR)	IRR where NPV = 0	-	≈ 23%	Significantly higher than prevailing lending rates
Cost Benefit Ratio (BCR)	PV Benefits / PV Costs	2,895,000 / 1,373,900	2.11	Benefits are more than twice the investment cost

10: Financial Performance Indicators for 20 kW On-Grid Rooftop Solar (OPEX Model)

Instrument	Capacity	Quantity	Per Unit Cost (Tk)	Total Cost (Tk)
Solar Panel	620 Watt	32	Developer-financed	0 (for SME)
On-Grid Inverter	20 kW	2	Developer-financed	0 (for SME)
Cable & Accessories	-	-	Developer-financed	0 (for SME)
Mounting Structure	-	-	Developer-financed	0 (for SME)
Survey & Design	-	-	Developer-financed	0 (for SME)
Transportation	-	-	Developer-financed	0 (for SME)
Installation	-	-	Developer-financed	0 (for SME)
EPC Charges	-	-	Developer-financed	0 (for SME)
	Total Initial Cost to SME			**0**

11: Cost Benefit Analysis Result for 20 kW On-Grid Rooftop Solar (OPEX Model)

Item	Value
Area Required	1,250 sq.ft
Capacity Factor	5 hrs a day
Daily Energy Generation	79 units
Commercial Grid Tariff	Tk 12/unit
Solar OPEX/PPA Tariff	Tk 9.60/unit
Annual Gross Value of Generated Electricity(at grid tariff)	Tk 346,020
Annual Payment to Solar Developer	Tk 276,816
Annual Gross Savings to SME	**Tk 69,204**

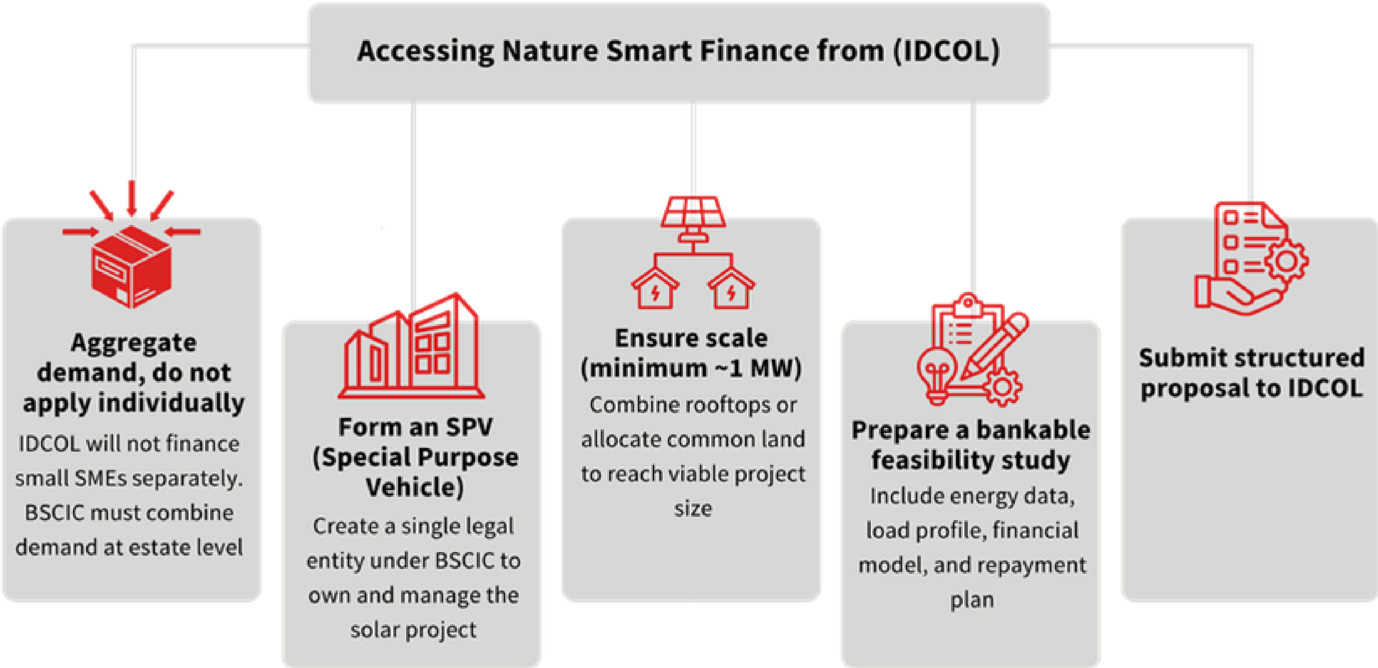
12: Customer-Side Financial Indicators for 20 kW Solar (OPEX Model)

Component	Formula / Basis	Calculation	Result	Interpretation
Net Cash Flow (Year 1)	Avoided Grid Cost – PPA Payment	346,020 – 276,816	Tk 69,204	Immediate annual bill saving in the first year
Cash Flow Trend	0.5% annual module degradation	Gradual decline in energy output	-	Slight reduction in annual savings over time
Simple Payback Period	Initial Investment / Annual Savings	0 / 69,204	Immediate / Not Applicable	No upfront capital to recover
Discounted Payback Period	Discounted cash flow method	No upfront investment	Immediate / Not Applicable	Positive cash flow starts from year 1
Present Value of Benefits	Discounted avoided grid purchases over 25 years	-	Tk 3,027,097	Lifetime value of electricity offset
Present Value of OPEX Cost	Discounted PPA payments over 25 years	-	Tk 2,421,678	Lifetime present cost of purchasing solar power
Net Present Value (NPV)	PV Benefits – PV OPEX Cost	3,027,097 – 2,421,678	Tk 605,419	Positive lifetime economic gain to SME
Internal Rate of Return (IRR)	Not meaningful with zero upfront equity by SME	-	N/A	IRR is not useful from the customer perspective here
Cost Benefit Ratio (BCR)	PV Benefits / PV OPEX Cost	3,027,097 / 2,421,678	1.25	Benefits exceed payments by 25%

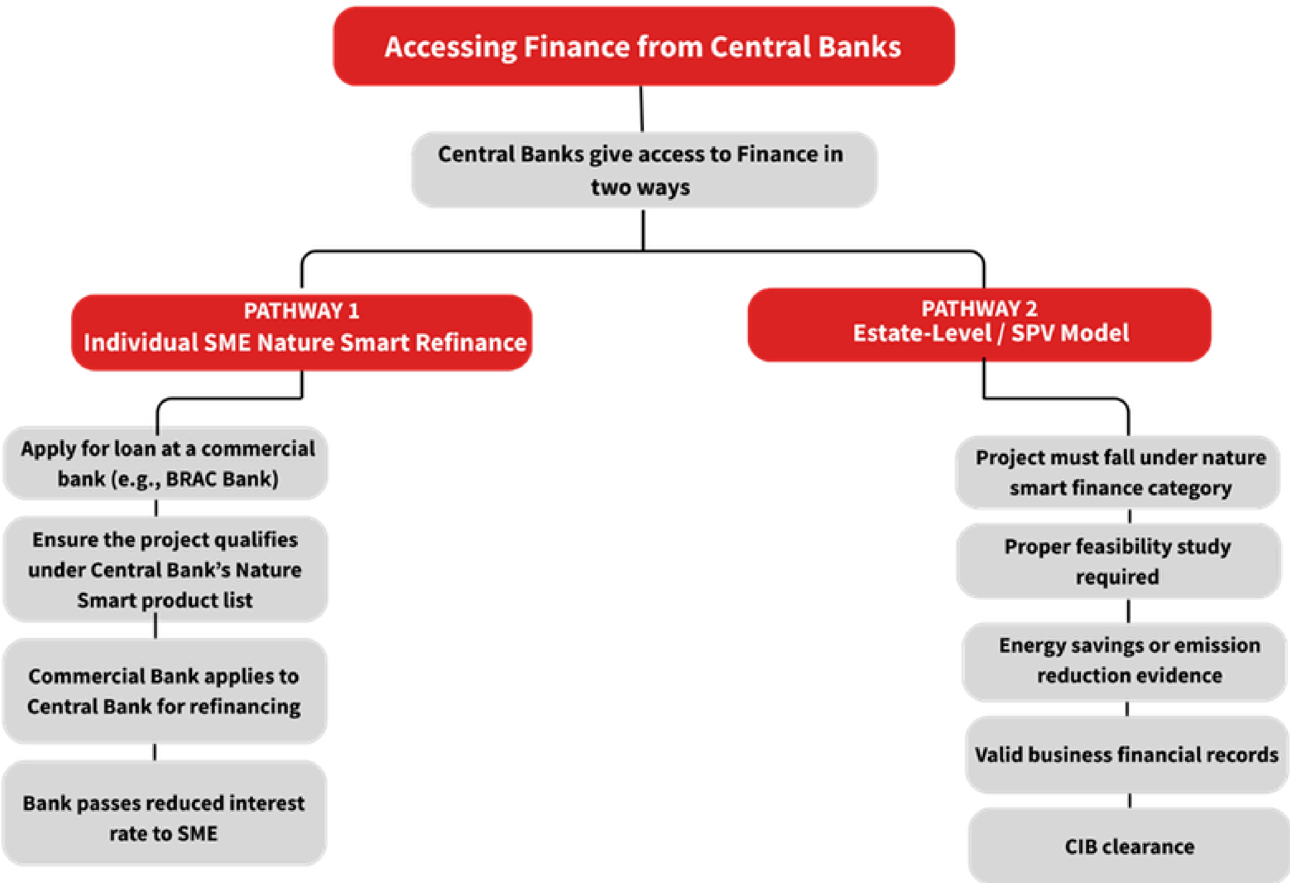
13: Comparative Summary: Economic & Energy Performance (2025–2026)

Country	Primary RE Driver	Economic Benefit	Energy Benefit
China	Massive investment in battery storage (up 69% in 2025)	Cost reduction through transition from coal-fired thermal power	Storage-driven energy Autonomy/Sovereignty
India	Rooftop Solar / KUSUM	30-50% Cost Reduction	Decentralized Grid Relief
Germany	Onshore Wind / Solar	Price Shock Resilience	Localized Energy Trading
Vietnam	DPPA / Rooftop PV	Export Market Compliance	Reduced Grid Peak Load

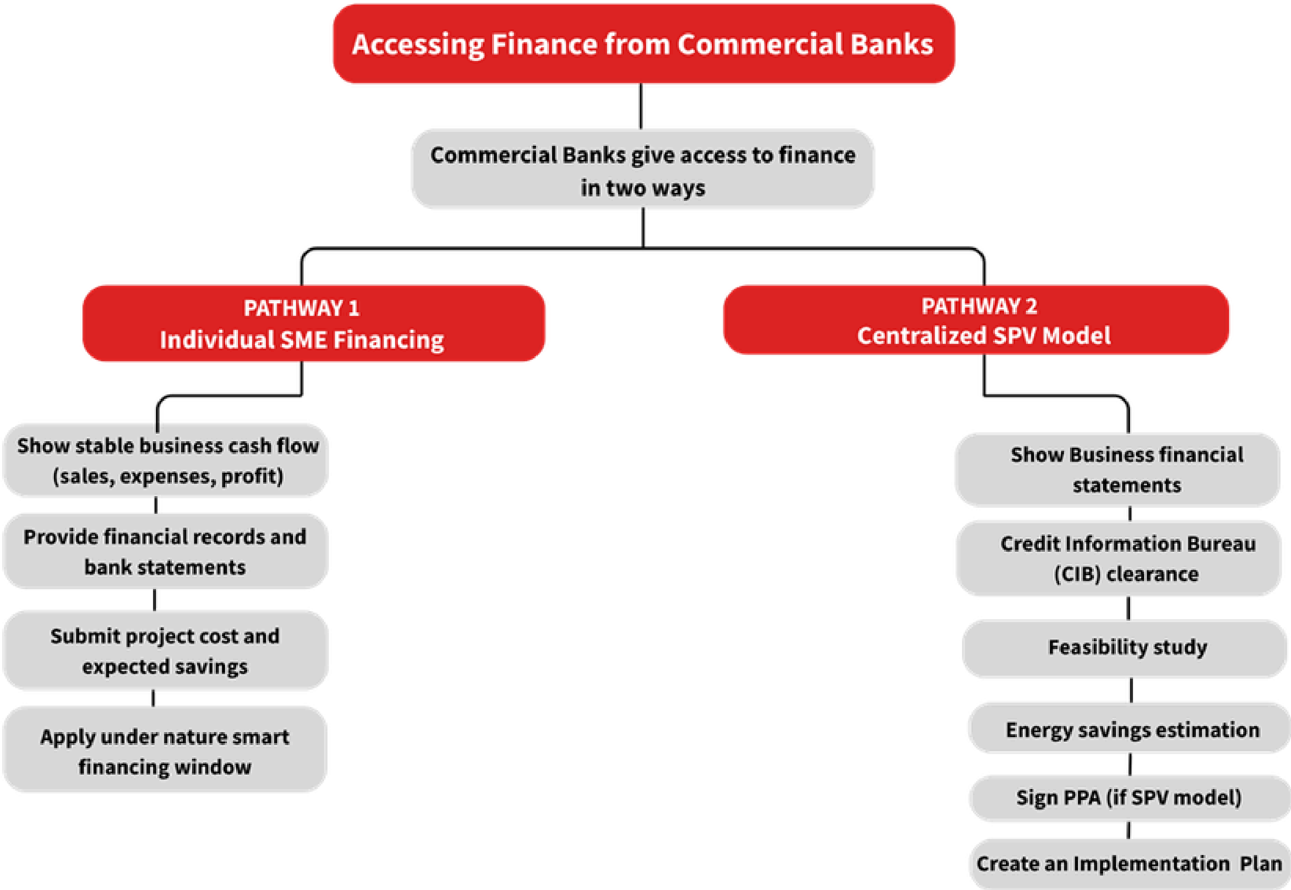
14. Existing strategies to access renewable energy finance from financial agencies



15. Existing Financing Structure of Central Banks



16. Existing Financing Structure of Commercial Banks



17: Detailed Recommendation

Intervention Area	Key Actions	Lead Institutions	Expected Outcome
Immediate (0-12 Months)			
Institutional Setup	Establish BSCIC Green Cell	BSCIC	Dedicated institutional unit to coordinate decarbonization initiatives
Pilot Selection	Select one pilot industrial estate	BSCIC	Identification of pilot site for renewable energy deployment
Energy Assessment	Conduct detailed energy audits of top 20% high-energy-consuming units	BSCIC, UNIDO and other Energy Auditors	Identification of priority efficiency interventions
Data Collection	Collect 24-hour load profile data	BSCIC, Distribution Utilities	Reliable electricity demand data for solar planning
Industrial Categorization	Categorize industries by emission intensity	BSCIC, DoE	Sector prioritization for decarbonization measures
Renewable Feasibility	Conduct technical feasibility study for 1 MW centralized solar	BSCIC, Solar Consultants	Bankable solar project concept
Financial Engagement	Initiate discussions with IDCOL, Bangladesh Bank, and BRAC Bank	BSCIC	Identification of financing pathways
Institutional Structuring	Draft SPV structure legally	BSCIC, Legal Advisors	Legal framework for centralized renewable investment
Short-Term (1-3 Years)			
Renewable Energy Deployment	Form BSCIC Green SPV	BSCIC	Institutional vehicle for solar project development
Power Purchase Agreements	Sign aggregated PPAs with SMEs	BSCIC, SMEs	Guaranteed demand for solar electricity
Financing Mobilization	Secure IDCOL financing	BSCIC, IDCOL	Capital mobilization for solar investment
Solar Installation	Implement 1–3 MW solar pilot	SPV, Solar Developers	Operational renewable energy supply

Intervention Area	Key Actions	Lead Institutions	Expected Outcome
Energy Efficiency Programs	Introduce refinancing schemes for IE3 motors, VFDs, and boiler upgrades	Bangladesh Bank, Commercial Banks	Improved industrial energy efficiency
Monitoring Infrastructure	Develop central monitoring and carbon database	BSCIC	Improved energy and emission tracking
Regulatory Reform	Advocate virtual net metering and sanctioned load reform	BSCIC, Power Division	Improved regulatory environment
Stakeholder Engagement	Conduct stakeholder consultation forum	BSCIC, Industry Associations	Increased industry participation
Long-Term (3-10 Years)			
Solar Scaling	Scale solar aggregation across multiple estates	BSCIC, SPV	Large-scale renewable deployment
Capacity Expansion	Expand solar capacity to 5–10 MW per estate where feasible	BSCIC, Solar Developers	Increased clean electricity supply
Storage Integration	Introduce battery storage as costs decline	SPV, Technology Providers	Improved grid stability and reliability
Carbon Markets	Develop carbon credit participation mechanism	BSCIC, DoE	Access to carbon finance
Smart Grid Systems	Integrate SCADA-enabled smart inverter systems	Utilities, BSCIC	Improved grid management
Land Planning Reform	Mandate solar land allocation in new BSCIC estates	BSCIC, Ministry of Industries	Renewable-ready industrial estates
Export Compliance	Develop export-linked green compliance standards	Government, Industry Associations	Improved competitiveness in global markets
National Alignment	Align SME decarbonization with Vision 2041 clean energy targets	Government of Bangladesh	Long-term low-carbon industrial transformation

Detailed Recommendation

Priority Order for BSCIC

- Fast-track rooftop solar & net metering
- Green SME financing (BSCIC-focused)
- Energy efficiency + renewable bundle
- Pilot BSCIC clusters
- Technician training & maintenance network
- Sector identification (supporting step, not leading)

Top Priority (Immediate impact)

1. Approve fast-track rooftop solar & net metering

This is the quickest win for BSCIC estates.

- Most factories already have usable rooftop space
- Reduces load shedding impact immediately
- Cuts electricity bills for SMEs

Action:

- Pre-approve solar designs for BSCIC factories
- One-window clearance inside BSCIC authority
- Simplify net metering for cluster-based connections

2. Launch a targeted SME financing window (BSCIC-focused)

Finance is the biggest barrier for BSCIC entrepreneurs.

Action:

- Dedicated refinance scheme for BSCIC units
- Low-interest loans + partial credit guarantee
- Solar leasing models (no heavy upfront cost)

3. Bundle energy efficiency with renewable adoption

Many BSCIC factories waste energy due to outdated equipment.

Action:

- Mandatory energy audits in selected estates
- Subsidies for efficient motors, compressors, lighting
- Combine with solar packages to reduce system size and cost

Medium Priority (High impact but slightly slower)

4. Set up pilot green industrial clusters (inside BSCIC estates)

BSCIC is already cluster-based-this is a natural fit.

Action:

- Select 3–5 estates as “Green BSCIC Zones”
- Shared solar plants + battery storage
- Common facilities (cold storage, waste-to-energy where viable)

5. Train technicians & build local maintenance networks

Without maintenance, systems fail and trust is lost.

Action:

- Train local youth within/near estates
- Certification programs for solar technicians
- Create on-call maintenance teams for estate

Lower Priority (But still important)

6. Identify top energy-stressed SME sectors
This is useful, but for BSCIC:

Many estates already host known energy-intensive sectors (light engineering, food processing, plastics, textiles)

Action:

- Do quick mapping, but don’t delay implementation
- Use findings to fine-tune financing and technology support

18. Table: List of KII

Background of the informant	Informant	Designation	Interview date
Government Official	A	Deputy Director	9/10/2025
	B	Executive Engineer (In. Ch.)	9/11/2025
	C	PR Officer and Industrial Estate Coordinator	27/11/2025
	D	Project Director	9/10/2025
	E	Deputy Manager (Cluster Development)	21/10/2025
	F	Deputy General Manager (Training and Capacity Building, Planning, Monitoring and Evaluation)	24/1/2026
	G	Executive Engineer	15/01/2026
Academician	H	Professor and Dean of Engineering	26/01/2026
Financial Institution	I	Senior Assistant Vice President, ICS Program	19/02/2026
	J	Head of Sustainable Finance	1/3/2026
Private Sectors	K	National Project Coordinator	5/3/2026
	L	Director	11/3/2026
	M	Senior Vice President	6/1/2025
	N	CEO	20/02/2025

19. Survey Questionnaire

Decarbonization Pathways for SME's under BSCIC

Section 1: Factory Information

Factory Name

____

Location

- [ ] Keraniganj Industrial Estate
- [ ] Savar Industrial Estate
- [ ] Tongi Industrial Estate

Sector

- [ ] Tannery
- [ ] Light Engineering
- [ ] Plastics Manufacturing
- [ ] Packaging Industries

Year of Establishment

____

Plot Size

____

Section 2: Industrial Process & Production

Working Days per month

____

What are the main products manufactured?

____

Monthly input of raw materials (tons)

____

What is your average monthly production quantity? (tons)

____

List the main production steps

____

Section 3: Energy Usage

What is the source of electricity?

- ◯ Fossil Fuels
- ◯ In house Renewable Energy

What is the RE type?

If you do not have RE system, please mention the reasons.

Average monthly electricity consumption (kwh)

Section 4: Technological Advancement

What are the machineries used in the production system?

Have you updated any machineries in last 5 years?

- ◯ Yes
- ◯ No

If yes, how many?

Have you received any technical support from these organizations?

- ☐ BSCIC
- ☐ SME Foundation
- ☐ NGO
- ☐ Vendors
- ☐ Others

Section 5: Workers, Labour & Skills

Do the factory have any Occupational Health and Safety maintenance system?

- ◯ Yes
- ◯ No

What are the OHS procedures used here?

- ☐ Security Surveillance
- ☐ Use Equipment, Machines, and Tools as Intended
- ☐ Wear Personal Protective Equipment (PPE)
- ☐ Implement Comprehensive Training Programs
- ☐ Inspect Your Facility Regularly
- ☐ Others

Please Mention the reason

Are workers provided with safety equipment?

- ◯ Yes
- ◯ No

What kind of safety equipment are provided for the workers?

- ☐ Personal Protective Equipment (PPE)
- ☐ Fire Safety Equipment
- ☐ First Aid Equipment
- ☐ Electrical Safety Equipment
- ☐ Others

If No, please mention the reason

Has any training been provided on new machines or technologies?

- ◯ Yes
- ◯ No

If Yes, how many workers received training tied to specific machines/roles?

If No, please mention the reason

Section 6: Rights & Social Protection

Is there any record of workplace accident in the factory?

- ◯ Yes
- ◯ No

What kind of accidents?

- ☐ Slips and Falls
- ☐ Ear Damage from Excess Noise
- ☐ Injuries From Machinery
- ☐ Falling Objects
- ☐ Fatigue and Dehydration
- ☐ Others

What type of measure is taken to prevent accidents?

- ☐ Hazard Identification
- ☐ Awareness Training
- ☐ Incident Monitoring
- ☐ Others

Women worker employed

- ○ Yes
- ○ No

Are they being paid equally?

- ☐ Yes
- ☐ No

If No, please, mention the reason

Are vulnerable or informal workers included in safety and wage protection?

- ○ Yes
- ○ No

If No, please mention the reason

Does the company allow workers to submit complaints?

- ○ Yes
- ○ No

If No, please mention the reason

Section 7: Environment & Waste Management

What type of waste is mainly generated from the production?

- ☐ Solid Waste
- ☐ Liquid Waste
- ☐ Both

Are the solid wastes categorised into recyclable-hazardous-organic categories?

- ☐ Yes
- ☐ No

How are they being managed?

- [ ] Assessing Current Waste Streams
- [ ] Conduct comprehensive waste audit
- [ ] Recycling and Reusing Materials
- [ ] Develop clear policies and procedures
- [ ] Reusing Packaging Materials
- [ ] Others

How liquid waste/effluent is treated before disposal?

- ○ No treatment
- ○ Segretion
- ○ ETP
- ○ Characterization
- ○ Disposal
- ○ Recycle and Reuse

Section 8: Adaptation & Resilience

What are the shock that disrupted the factory in the last 12 months?

- ○ Heatwave
- ○ Power Outage
- ○ Water Shortage
- ○ Supply Disruption
- ○ Others

Is there backup system for power?

- ○ Yes
- ○ No

What are the backup system used in that case?

- [ ] Diesel Generator
- [ ] Natural Gas Generator
- [ ] Others

If No, please mention the reason

____

Are workers informed about emergency or disaster procedures?

- ○ Yes
- ○ No

If No, please mention the reason

Section 9: Finance & Capacity

Does the factory have capacity to invest in renewable energy?

- ◯ Yes
- ◯ No
- ◯ I don't know

If No, what are the main barrier for access to finance for implementing RE?

- ◯ High Interest
- ◯ Uncertain development cost
- ◯ Paperwork
- ◯ Lack of awareness
- ◯ Lack of Long-term Financing

Are you interested in solar or renewable transition financing?

- ◯ Yes
- ◯ No

Section 10: Future Decarbonization Intent

What should be the decarbonization intent for your factory?

- ◯ Technology Upgradation
- ◯ Switch to Renewable energy
- ◯ Use of low-carbon raw materials
- ◯ Recycling
- ◯ No plan till now
- ◯ Others

In which area do the factory interested in training or technical assistance for decarbonization?

- ◯ Energy Efficiency
- ◯ Waste Management
- ◯ Renewable Energy Transition
- ◯ Others

CHANGE initiative

PATHWAYS FOR INDUSTRIAL DECARBONIZATION

SMEs (SMALL AND MEDIUM ENTERPRISES) UNDER BANGLADESH SMALL AND COTTAGE INDUSTRIES CORPORATION (BSCIC)