2023

# ENERGY & RESOURCE MAPPING OF LEATHER SECTOR IN INDIA

Sectoral Report & Policy Recommendations

GOVERNMENT OF INDIA
MINISTRY OF
POWER

# ACKNOWLEDGEMENT

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# ABBREVIATION

| AICTE | All India Council of Technical Education |
|---|---|
| **AISHTMA** | All India Skin and Hide Tanners and Merchants |
| **BEE** | Bureau of Energy Efficiency |
| **BOPs** | Best Operating Practices |
| **CETPs** | Common Effluent Treatment Plants |
| **CFTC** | Central Footwear Training Institute |
| **CLE** | Council for Leather Export |
| **CLRI** | Central Leather Research Institute |
| **EC** | Energy Conservation |
| **EE** | Energy Efficiency |
| **EESL** | Energy Efficiency Service Ltd. |
| **EMS** | Energy Monitoring System |
| **ERU** | Energy Recovery Unit |
| **GHG** | Greenhouse Gas |
| **GLCC** | Global Leather Coordinating Committee |
| **ICHSLTA** | International Council of Hide Skin & Leather Traders Associations |
| **ICT** | Council Of Tanners |
| **IFCOMA** | Indian Footwear Components Manufacturers Association |
| **IFLDP** | Indian Footwear & Leather Development Programme |
| **IFLDP** | India Footwear and Leather Development Program |
| **IFLMEA** | Indian Finished Leather Manufacturers and Exporters Association |
| **ILDP** | Indian Leather Development Program |
| **ILPA** | Indian Leather Products Association |
| **IULTCS** | International Union of Leather Technologists and Chemists Societies |
| **KPIs** | Key Performance Index |
| **MEIS** | Merchandise Exports From India Scheme |
| **MoC** | Ministry of Commerce |
| **MSME** | Micro, Small and Medium Enterprise |
| **NMCP** | National Manufacturing Competitiveness Programme |
| **OEMs** | Original Equipment's Manufacture |
| **PSBTE** | Punjab State Board of Technical Education & Industrial Training |
| **PTA** | Pallavaram Tanners' Association |
| **PMKVY** | Pradhan Mantri Kaushal Vikas Yojana |
| **SAATHI** | Sector Sustainable and Accelerated Adoption of Efficient Textile Technologies |
| **SDA** | State Designated Agency |
| **SERC** | State Electricity Regulatory Commission |
| **SIDBI** | Small Industries Development Bank of India |
| **SITDA** | South India Tanners and Dealers' Association |
| **SME** | Small & Medium Enterprises |
| **SPV** | Special Purpose Vehicle |
| **VTA** | Vaniyambadi Tanners Association |
| **ZED** | Zero Effect, Zero Detect |
| **ZLD** | Zero Liquid Discharge |

# EXECUTIVE SUMMARY

Energy efficiency represents a crucial aspect across various industries and services in today's energy landscape. With industrialization and civilization heavily reliant on finite fossil fuel sources, which pose threats to the environment, it's imperative to optimize their usage and transition towards cleaner, renewable alternatives for a sustainable future.

Recognizing the significance of energy efficiency, the Government of India established the Bureau of Energy Efficiency (BEE) under the Ministry of Power, mandated with developing policies to reduce the energy intensity of the Indian economy as per the Energy Conservation Act, 2001. BEE has undertaken numerous initiatives to promote energy conservation, transition to cleaner energy sources, provide technical and financial support, reduce carbon emissions, and intervene with energy efficiency policies.

Specifically targeting small and medium-sized enterprises (SMEs), BEE launched an SME program in 2009 to enhance energy performance by promoting energy-efficient technologies and practices. As part of this endeavour, a Study "Energy and Resource Mapping of MSME Clusters in India for the Leather sector," has been conducted on behalf of BEE in collaboration with various stakeholders, including the Council for Leather Exports, Central Leather Research Institute, and regional sectoral associations.

## **Why Leather Clusters**:

The leather industry in India is one of the oldest and most traditional sectors, dating back thousands of years. It plays a significant role in the country's economy, contributing to both exports and employment generation. The industry encompasses various segments, including raw material procurement, tanning, processing, manufacturing of leather products, and export.

Tanning, specifically, is a crucial stage in the leather production process, where raw hides and skins undergo treatment to become durable and resistant to decay. India's tannery industry is primarily concentrated in regions like Kanpur, Jalandhar, Kolkata, Pallavaram, and Vaniyambadi, among others. These clusters are known for their specialization in different types of leather and have developed over time due to factors such as availability of raw materials, skilled labor, and market demand.

The tannery industry in India faces both opportunities and challenges. On one hand, it benefits from a rich resource base, skilled workforce, and growing demand for leather products both domestically and internationally. However, it also grapples with issues such as environmental concerns related to tannery operations, regulatory compliance, technological advancements, and adverse impact of geopolitical situations in Europe or Gulf Region and global market competition.

Efforts are being made to address these challenges and capitalize on the industry's potential. Initiatives aimed at improving energy efficiency, adopting cleaner technologies, enhancing skill development, and promoting sustainable practices are being undertaken by stakeholders including government agencies, industry associations, and research institutions. These endeavors are crucial for the long-term growth and sustainability of the tannery industry in India.

Top of Form

The study is covering the leather clusters all over India and focused on five energy-intensive clusters in Kanpur, Jalandhar, Kolkata, Pallavaram, and Vaniyambadi within the leather sector. It encompassed

activities such as pre-audit workshops, detailed energy audits of over 55 tannery units, post-audit workshops, identification of energy efficiency challenges and mitigation plans, stakeholder consultations, technology assessments, policy recommendations, and implementation plans.

The report derived from this study provides valuable insights into the energy and production profiles of the tannery segment, identifies energy-saving potentials, proposes energy conservation measures, and outlines a roadmap for policy implementation. Key findings indicate substantial energy savings potential compared to global benchmarks, with recommendations for technological upgrades and green energy adoption.

Through extensive stakeholder consultations, the report has been refined to include critical elements such as sector overviews, energy-saving potentials, intervention mapping, and implementation strategies. It is aimed to serve as a comprehensive resource for evaluating energy efficiency within the leather tannery segment and lays the groundwork for future improvements in energy management practices.

According to the main findings of the study, there exists a potential for approximately 30% energy savings compared to the average performance of Indian tanneries when benchmarked against global conventional tanneries. Moreover, there is a substantial potential for around 84% energy savings when comparing the average energy consumption of Indian tanneries with that of advanced global tanneries. Despite a rise in production, the sector has shown a significant reduction in energy consumption, aligning with the Business As Usual (BAU) scenario. Additionally, there is an estimated saving potential of around 30% and 36.5% respectively for Energy Saving Proposals 1 and 2 concerning the BAU 2022 scenario.

The study team has completed all planned activities, including awareness workshops, energy audits, discussions with stakeholders, line ministries, and departments. The compiled data reflects various aspects:

- Potential energy savings in terms of tons of oil equivalent (TOE) and reductions in carbon emissions.
- Key performance indicators (KPIs) for the leather tanning and finishing processes.
- Detailed information on technologies, along with investment estimates and simple payback periods.
- A roadmap for the implementation of technology upgrades and the integration of green energy solutions.

All inputs have been thoroughly incorporated into this report in a comprehensive manner, ensuring a thorough analysis and actionable insights for stakeholders in the leather industry.

# Chapter 1: Introduction

## 1.1 Background

The Energy Conservation (EC) Act, 2001, provides for efficient use of energy and its conservation in India. The Government of India set up the Bureau of Energy Efficiency (BEE) under the provisions of the EC Act. The mission of BEE is to assist in developing policies and strategies with a thrust on self-regulation and market principles, within the overall framework of the EC Act with the primary objective of reducing energy intensity of the Indian economy.

The micro, small and medium enterprise (MSME) is also an important constituent of the Indian economy comprising of several energy intensive industries at medium & small level, such as foundry, forging, ceramics, refractory, glass, dairy, textile, paper, jaggery, leather, rice mill, tea sector, food processing units etc.

Bureau of Energy Efficiency had initiated an SME programme during the year 2009 with an objective to improve the energy performance of MSME sector. The BEE-SME programme aims to accelerate the adoption of energy efficient technologies and practices in different energy intensive SME sub-sectors through various activities. A few of concrete initiatives which have been taken by BEE in MSME sector are figured as below:


1. National Programme on Energy Efficiency and Technology Upgradation in SMEs" to address the various challenges faced by MSMEs in India.
2. Cluster-specific approach for technology deployment as demonstration projects towards creation of an enabling environment at the cluster level to aid in replications.

1. Prepared documents like Energy Conservation guidelines, Best Operating Practices, Common Monitorable Parameters, Case Studies were developed and circulated in SMEs on entire cluster.


1. Developed audio-video tutorials, also covering the techno-economic analysis to showcase the success to other SME entrepreneurs.
2. Support of UNIDO and World Bank towards the common goal of facilitating the development of the SME sector in India.

## 1.2 Project Objective

The Project objective, under the team of "Energy and Resource Mapping of MSME Clusters in India for Leather sector", is to prepare the Energy & Technology profile including more intangible objectives such as complete overview of Leather Sector whereabout at National & Global level, Technology assessment, Identification of EE measures, Benchmarking/KPIs and Resources Mapping with an aim to propose a Policy recommendation & Implementation plan.
This study would lead to identifying the current energy input scenario, establish specific energy consumption compare it with global benchmarks, propose the energy efficient technologies for reducing the energy intensity and assess the commercial aspect of cost recovery.

## 1.3 Methodology for the Study:

To meet the objective of the project following activities were undertaken in the order; the preceding activity prepared the ground for subsequent activity:

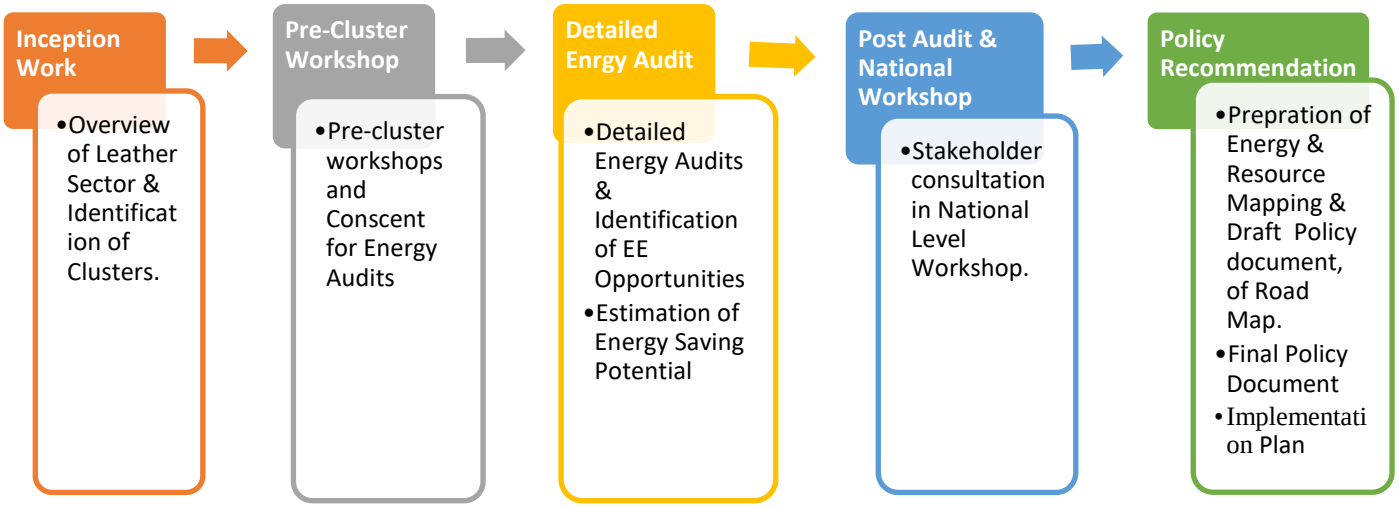



Figure 1: Methodology Adopted

### 1.3.1 Energy Audits, Process Mapping and KPI Development

**Onsite visits & Energy Audits:** Leather Industry and specially the Tannery units are a unique production units and processes involved are not the same as found in other industrial units. No two Tannery units follow the same set of processes and have their unique end products in terms of thickness, finish, mechanical properties, chemical properties, Raw Materials and Machines employed by the units. During the inception workshops basic input forms were distributed to the participating units and consent was obtained from them to carry out the Energy Audit of their units. Based on these forms the units were selected for detailed energy assessment. The selection process was guided by the following key parameters:

- Depending on the size (Capacity & Production) and energy consumption profile
- The extent of product segment/ processes undertaken

Various teams were constituted to conducted an onsite industry assessment to assess the various parameters for the identification of KPIs. The detailed energy assessments were conducted for at least 10 units in each of the clusters. Following components were covered in the Energy Audits:

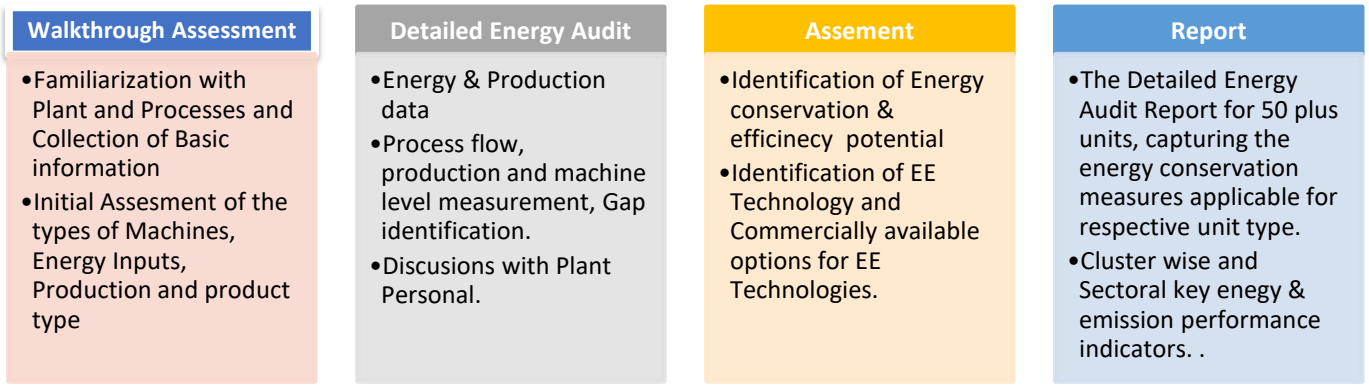



Figure 2: Detailed Energy Audit Methodology

# Chapter 2: Overview of the Leather Sector

## 2.1 History of India's Leather Industry[1]

Leather industry is one of the oldest industries and has a rich history. During the earlier times, leather production in India was primarily centered in Delhi and Agra, with skilled craftsmen and artisans producing high-quality leather goods like Shoes, Sandals, Mashaks (water liquid holding bags), Saddleries, safety bags for Arms & safety gears for soldiers.

The growth of the leather industry in India has been significantly fueled by two key factors: abundant raw materials and skilled labor. In India, animals have long been integral to households, particularly in rural areas, leading to a substantial population of cattle, buffalo, and goats. This abundance ensures a steady supply of hides and skins for the leather industry. Leveraging this resource, the Indian leather industry has been able to manufacture high-quality leather goods competitively.

Over time, the industry has undergone evolution and adaptation to meet changing market dynamics. Despite this, there was a prolonged delay in adopting new technologies and techniques to enhance production processes and efficiency. However, with advancements in leather processing and growing demand, the industry gradually embraced innovation.

Moreover, recognizing the potential for expansion, Indian leather goods began to explore new markets. This strategic move aimed to broaden the industry's reach and capitalize on emerging opportunities, further contributing to its growth and success.

Today, India is one of the world's leading producers of leather goods, with a diverse range of products including shoes, bags, belts, and jackets. The leather industry in India continues to grow and expand, driven by rising demand for leather goods both domestically and internationally. With a rich history and a strong foundation of skilled artisans and craftsmen, the future of the leather industry in India looks bright.

## 2.2 Leather Industry's Contribution to The Indian Economy[2]

The leather industry is a significant contributor to the Indian economy, with its contribution spanning over several key areas. Let's take a closer look at the impact of the leather industry on the Indian economy.
According to various industry reports, the leather industry in India generates over $13 billion in revenue annually. India is also the second-largest producer of footwear and leather garments in the world, with the leather industry accounting for 12.93% of India's total exports. The leather industry is one of the largest employers in India, providing employment opportunities to more than 4.42 million people across the country. The industry has a significant presence in states like Uttar Pradesh, Tamil Nadu, and West Bengal, where it is responsible for creating numerous job opportunities.

The leather industry is also an important source of foreign exchange earnings for India. In 2020, the industry contributed $5.5 billion to India's foreign exchange earnings, making it a critical component of the country's economy. The industry's exports include leather footwear, leather goods, and leather garments, which are in

[1] https://leatherasiaexpo.com/indias-leather-industry-history-economy-sustainability/
[2] https://www.makeinindia.com/sector/leather

high demand across the world. Overall, the leather industry's contribution to the Indian economy is significant, generating billions of dollars in revenue annually and creating millions of job opportunities across the country. With a strong foundation and a focus on innovation and technology, the industry is well-positioned to continue growing and contributing to India's economic development in the years to come.
The key highlights of Leather Industry in India:

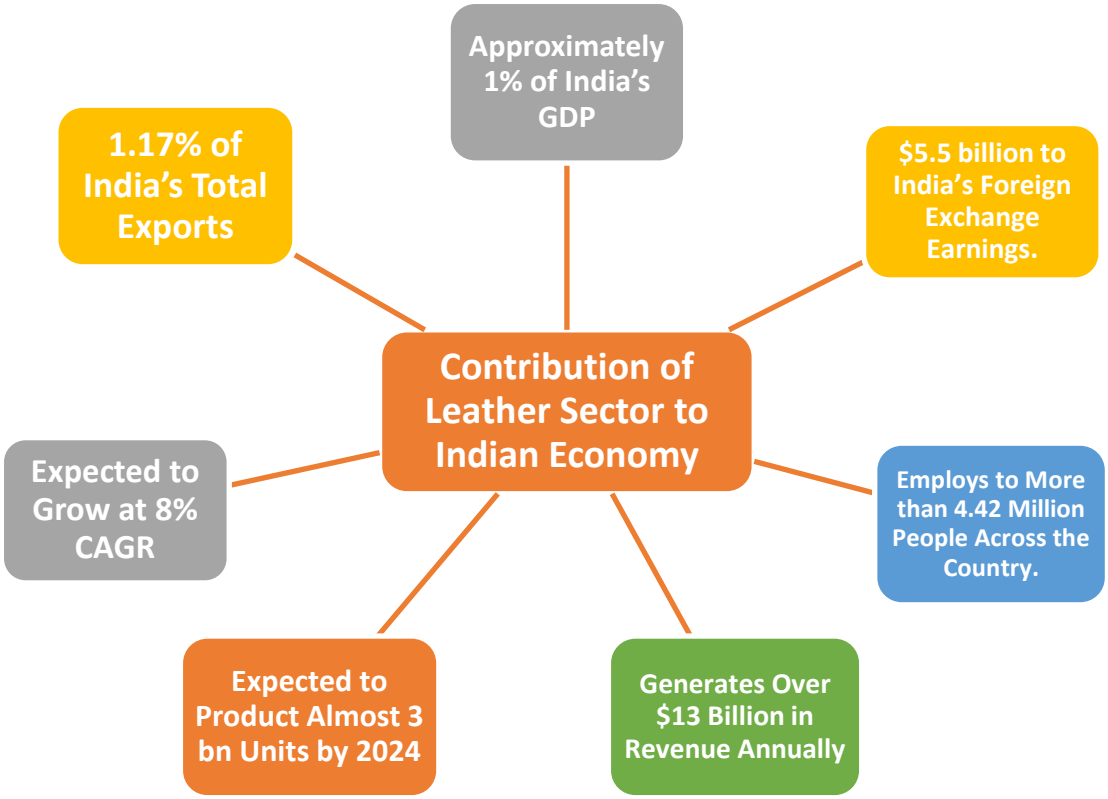



**Figure 3: Contribution of Leather Industry to the Economy**

Regarding the impetus to the Investment in the sector, India has trade agreements with Japan, Korea, ASEAN, Chile etc., and is negotiating Free Trade Agreement with the European Union, Australia etc. The Centre has notified the Indian Footwear & Leather Development Program (IFLDP) with an outlay of Rs.1700 crore for implementation during 2021- 26.

The new vision for leather research and industry during the next 25 years will focus on sustainability, net-zero carbon footprint, gaining total recyclability of leather-based materials, bio-economy of animal skin-derived products, and ensuring income parity for workers, besides brand building. Additional steps have been taken by government of India to increase the export of leather and leather products:

- About 2% across the board enhancement of duty credit scrip under Merchandise Exports from India Scheme (MEIS) for shipments made from 1 November 2017.
- GST concessions for leather industry –
  - Finished leather from 12% to 5%,

- Certain leather chemicals, leather goods, leather garments and saddlery items from 28% to 18%,
- Common Effluent Treatment Plants (CETPs) from 18% to 12%,
- Job work from 18% to 5% Footwear from 18% to 5%.

**Tanning Sector–** Annual availability of leathers in India is about 3 billion sq.ft. India accounts for 13% of world leather production of leathers. Indian leather trends/colors are continuously being selected at the MODEUROPE Congress, in the year 2020-21, Approximately, 378.23 US$ Mn value of Finished Leather export was carried out from India [3].

The major markets for Indian Leather & Leather Products are USA with a share of 17.52%, Germany 13.08%, U.K 8.88%, Italy 6.75%, France 6.67%, Spain 4.18%, Netherlands 4.22%, U.A.E 2.17%, China 2.58%, Poland 2.34%, Belgium 2.17% and Australia 2.04%.

Due to COVID condition leather industry had a big setback for various reasons, some of which that have been identified from discussions with the Tannery owners are:

- Reduction in demand
- Excessive Concern for Hygiene during COVID pandemic (leather products are not easy to wash / clean)
- Export bottlenecks due to logistic issues and steep increase in freight charges
- Sealing of leather manufacturing units in some of the clusters due to a PIL
- General slowdown in European economies.

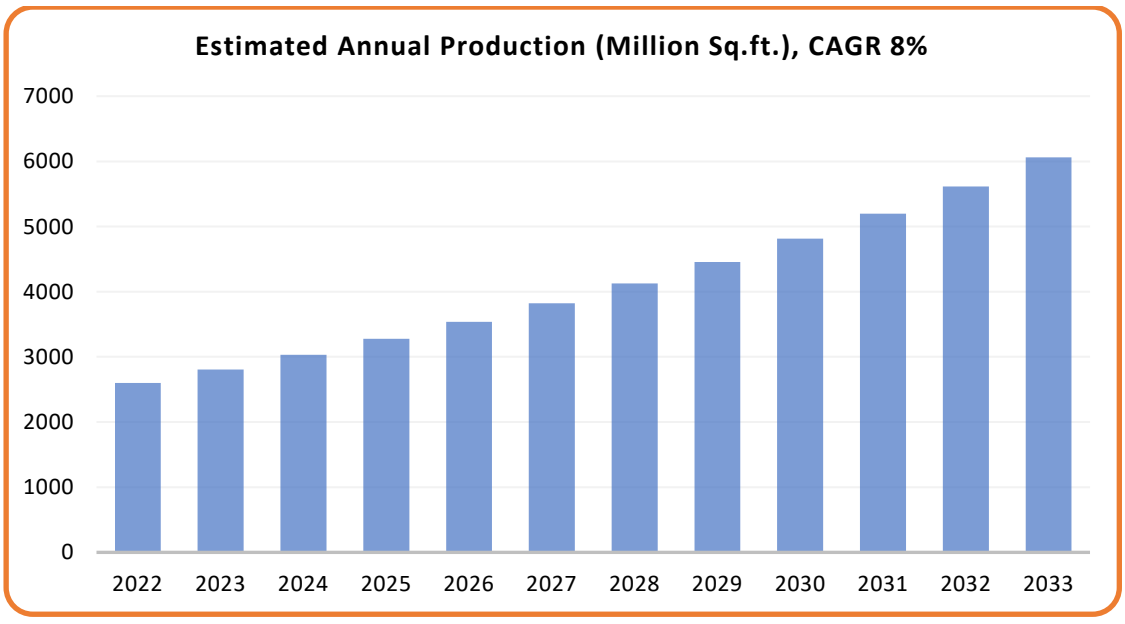



**Figure 4: Production Forecasting Till 2030 @CAGR: 8 %**

[3] https://leatherindia.org/indian-leather-industry/ (Council of Leather Export)
https://www.dsir.gov.in/sites/default/files/2019-11/3_0.pdf

Taking into account the forcasted CAGR for leather production the total production is expected to reach about 6 billion square feet by 2033 from the current level of approx. 2.6 billion square feet.

## 2.3 Nationwide Coverage of Tannery Segment

The Indian Leather market has been fragmented with about 1632 tanneries of which 801 are small scale units ,600 medium scale & 231 large tanneries[4] scale and produces over 3 billion square feet of leather per year. The tanning industry is majorly concentrated in three states viz. Tamil Nadu, West Bengal and Uttar Pradesh. Of the total number of tanneries in India, Tamil Nadu accounts for 52%, West Bengal 23% and U.P 12%. The other important states are Maharashtra, Madhya Pradesh, Andhra Pradesh and Punjab which accounts 13%. Looking from the point of view of scale of operations, the tanning industry largely exists in the MSME sector.[5] The dominant emplacement of Leather sector in India, is depicted as below:

[4] Categorisation has been done on basis of energy consumption,
Large > 500 TOE, Medium 100<500 TOE, Small < 100 TOE
[5] https://www.investindia.gov.in/sector/leather

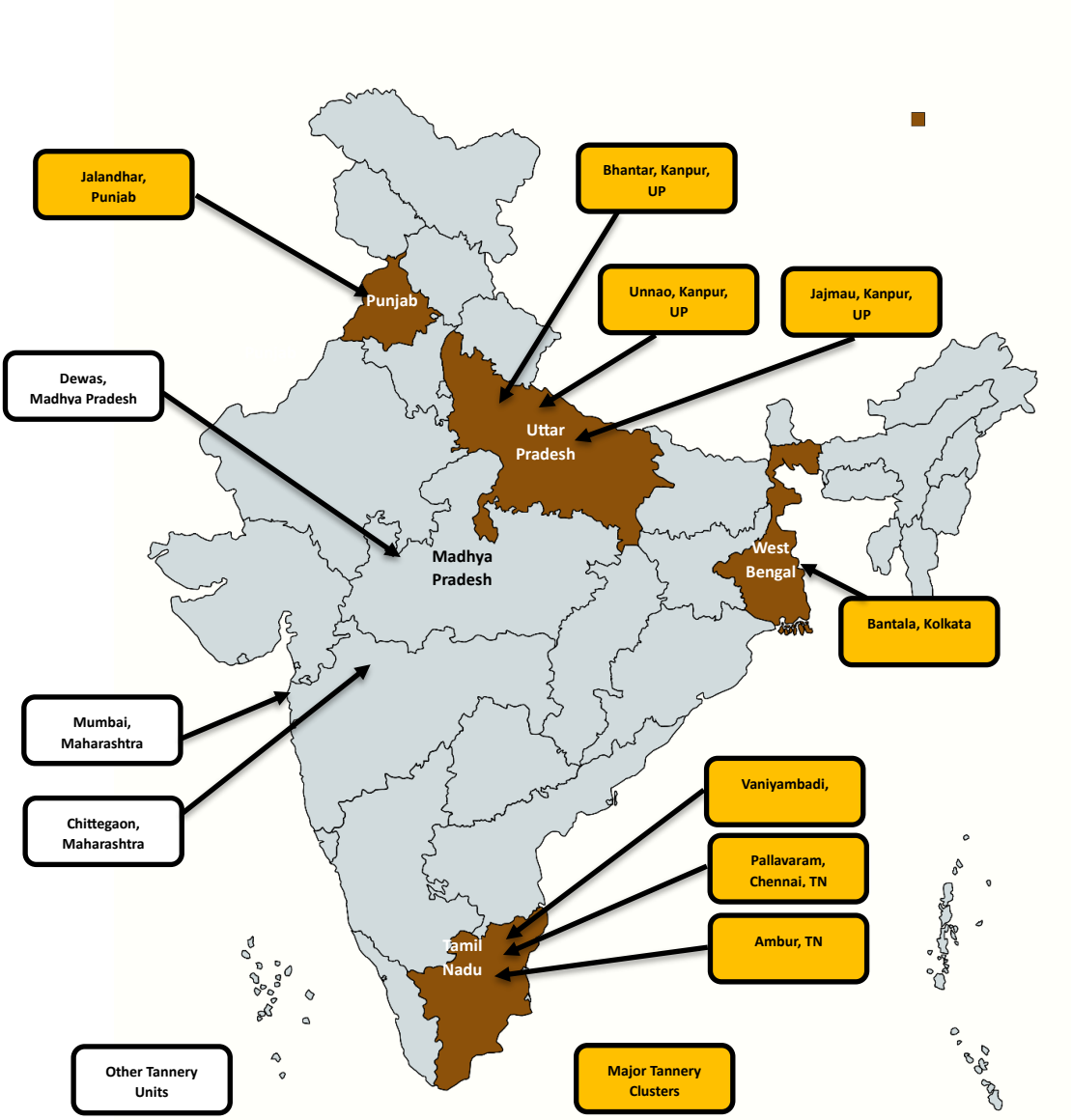



Figure 5: Leather Clusters in India

As per the prelimancy research from variuos sources clusters and number of Tannery units were listed. As per this input from CLRI there are total 1632 no. of tannery.

Table 1: List of Tanneries in India

| State | Number of Tanneries |
|---|---|
| Andhra Pradesh | 7 |
| Bihar | 5 |
| Haryana | 2 |
| Karnataka | 1 |
| Kerala | 1 |
| Madya Pradesh | 1 |
| Maharashtra | 2 |
| Punjab | 70 |
| Rajasthan | 8 |
| Tamil Nadu | 790 |
| Uttar Pradesh | 409 |
| West Bengal | 336 |
| **Total** | **1632** |

The four states in India have 98% of all the tanneries spread across the country, hence the Tannery Clusters in these states were the focus of this study. The clusters in India, covered under this study, involved in manufacturing of Finished Leather from Buff-Cow-Goat-Sheep Hides/skin are listed as below:

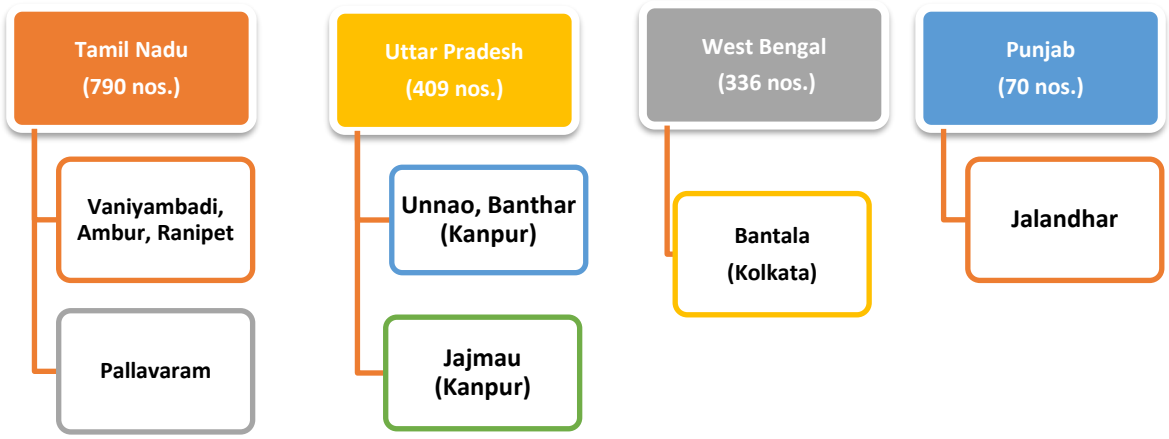



Figure 6: Selected Clusters of Tanneries

To draw an Energy and Resource Mapping of the Leather Tanning Segment, a detailed study was carried out in the give major leather clusters across the nation namely Kanpur, Kolkata, Pallavaram, Vaniyambadi and Jalandhar. These 5 clusters were identified through the primary & secondary data research, stakeholder meetings, sample site visits and % share of leather export. Furthermore, 2 additional leather cluster namely Banthar in Kanpur and Ambur in Tamil Nadu were covered in this study for the walkthrough survey & consultation. Total 10 units were selected to detailed energy audit exercise in each of identified cluster.

The Cluster and Tannery Unit selection Criteria:

**Cluster:**

- Major Leather Manufacturing Centers at National level
- No. of Units in Operation.
- % Share of Production and % share of Export.
- % Share of Energy

**Tannery Unit:**

- Process Stages and Raw Material
- Tanning Process Technology
- Production Capacity (MTA or million Sq feet)
- Fuel Mix Pattern
- With or without ZLD process
- Electrical Sanctioned Load from DISCOM (KVA)
- % Share of Electrical and Thermal Energy
- Utilization of Renewable Energy

## 2.4 Tanning Segment Classification

As per the information received from various stakeholders, CLRI, CLE etc, approx. 1632 nos. of tanneries are in operation in our country at various cluster level. So far, the classification of leather tannery units has not been done on the basis of installed capacity of leather processing or on the basis of energy consumption. In general, tanneries are classified as per the type of tanning process and category of finished leather. On the basis of stakeholder discussion, secondary data research, field visit & audit exercise in this study, the tentative tannery segment classification as follow:

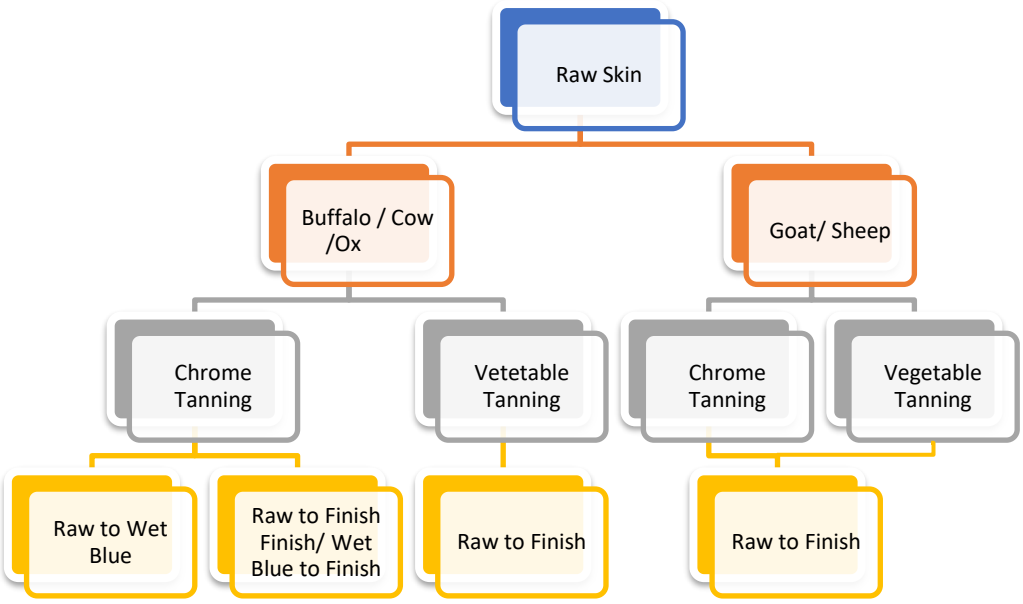



Figure 7: Tannery Claissfication

### 2.4.1 Process Flow Diagram & Description

The leather production process begins with collecting raw hides, which are then preserved. After liming and fleshing to remove impurities, the hides undergo tanning, where they are treated with tannins or other agents to prevent decay. The leather is dyed for color, subjected to fat liquoring for flexibility, and then dried. The final touches involve finishing treatments like polishing or coating. The result is a durable and versatile material with applications ranging from fashion and upholstery to accessories. The process ensures that animal hides are transformed into a resilient material suitable for various industries and consumer goods.

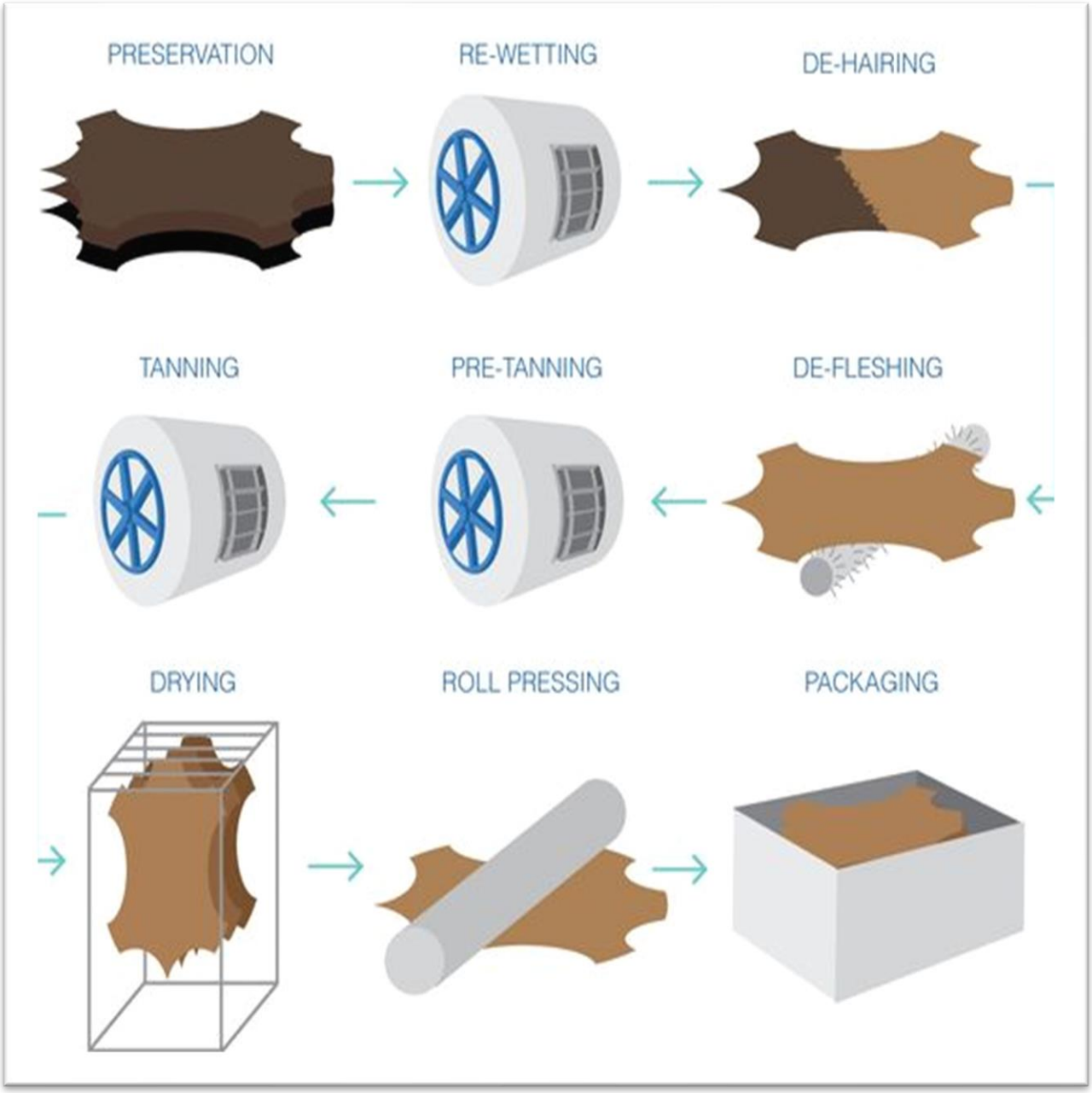



Figure 8: Process Flow Diagram

## 2.5 Selected Cluster Overview

**Overview of Kanpur Cluster:** Uttar Pradesh is the fourth largest state in India with the largest population. The state falls under the influence area of key industrial corridors such as North-South and East-West (NS-EW) Corridor and several expressways and highways, conveniently connecting it with remote parts of the country. Kanpur, a city in the state of Uttar Pradesh, holds a major industrial cluster of leather and leather products manufacturing in India. It consists of mainly small and medium business enterprises, located at the bank of the Ganga River.

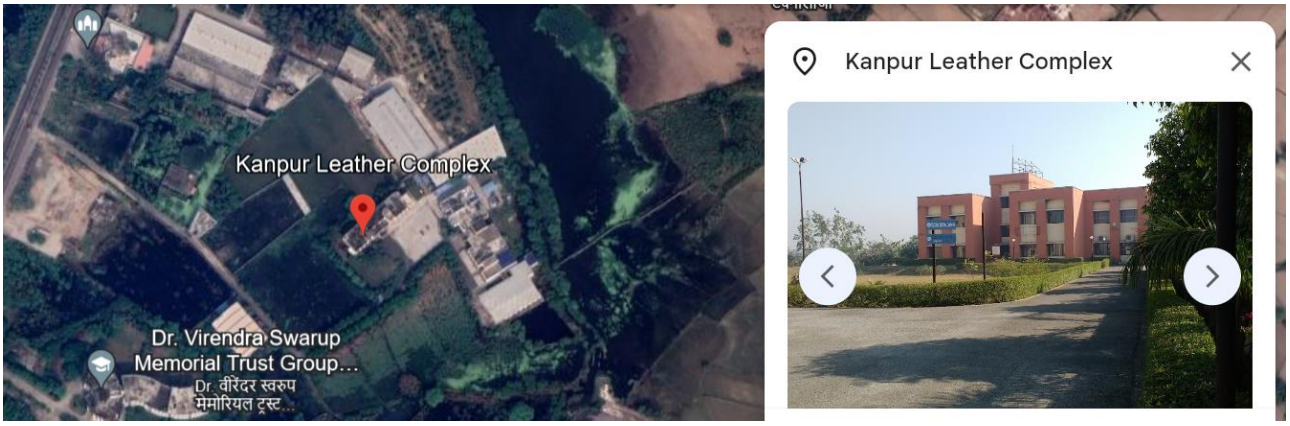



Figure 9: Kanpur Leather Cluster (Unnao)

Jajmau, Unnao & Banthar are the major leather cluster in Kanpur Region where majority of Tannery Units (more than 400 nos.) are in operation to produce the Finished leather/Semi-finished leather.

Each of the above clusters are equipped with Center Effluent Treatment Plant (CETP) to cater the State Pollution Control Board norms & regulations. The Kanpur leather industry is known for Finished Leather, sole leather, industrial shoes and saddlery products. It is the largest center of buffalo-based leather in India.

On basis of primamry & secondary data reserch, stakholder holder consultation at cluster level and team field visit, the abbreviated information pertains to the Kanpur Cluster is listed as below:

Table 2: Kanpur Cluster Information

| Particular | Details |
|---|---|
| **Category of Tannery Units** | Large, Medium & Small |
| **No. of Tannery Units in Operation** | >400 |
| **Main Sub-Clusters** | Unnao, Banthar, Jajmau |
| **Major Leather Manufacutring Process** | Raw to Finished Leather, Raw to Crust Leather, Raw to Wet Blue Leather |
| **Main Process Technology Employed** | Chrome Tanning |
| **Major Raw Material** | Buffalo Hide/Skin |
| **Main Common Effluent Treatment Plant (CETP) as per SPCB Norms & Standards** | 3 nos. (Unnao, Banthar & Jajmau)<br>1 no. in Jajmau under Commissioning |
| **Local Industrial Associations** | UP Leather Industry Association, Unnao, Kanpur |
| **Central Govt. Entity** | Council for Leather Export (CLE), |

| Particular | Details |
|---|---|
| | O/o The Regional Director, CLE, Kanpur |
| **Central Govt. Regional R&D Entitiy** | CLRI Regional Centre – Kanpur<br>O/o The Sr. Principal Scientist<br>MSME-Development and Facilitation Office,<br>107, Industrial Estate, Kalpi Road, Kanpur |
| **Education Institute** | Klc Institute Of Professional Studies<br>KLC Complex, Kanpur-Lucknow highway, District Unnao, Kanpur |
| **Source of Energy in Tannery Unit** | Coal, Firewood, Grid Power, Solar Power, Diesel |
| **Future Project in Kanpur** | Establishment of Mega Leather Cluster (MLC) Project, Ramaipur, Kanpur.<br>103 Acres of land has been acquired, 50 % of the land in both the parks are earmarked for small and medium sector units.<br>Facilities like effluent treatment plants, rain water harvesting, warehousing, raw material banks, exhibition centre, design centre & human resource development. |

**Overview of Kolkata Cluster:** The Kolkata Leather Complex is an industrial complex at Karaidanga, Bantala near East Kolkata, India. It is located 20 km from the central business district of Kolkata and has an area of about 4.5 square kilometers. The complex is intended to serve as a central leather-tanning business for Kolkata. Bantala has approximately 200 tanneries and the Kolkata one performs 22-25% of all the tanning in India. The state of West Bengal is responsible for about 55% of India's leather exports. As of 2009, about 200 tanneries were relocated to the Kolkata Leather Complex.

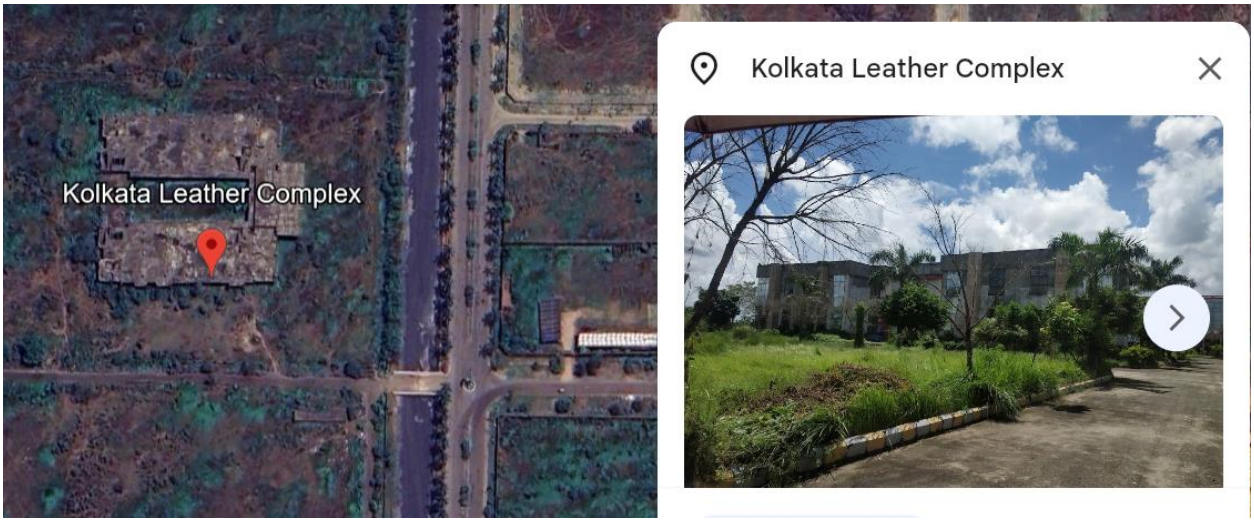



Figure 10: Kolkata Leather Cluster

The Kolkata Leather Complex is equipped with state of art tecnhology based Center Effluent Treatment Plant (CETP) to cater the State Pollution Control Board norms & regulations. The Kanpur leather industry is known for Finished Leather, Leather Goods & Apparels , industrial safety glovers products. It is the largest center of goat-based leather in India.

On basis of primamry & secondary data reserch, stakholder holder consultation at cluster level and team field visit, the abbreviated information pertains to the Kolkata Cluster is listed as below:

**Table 3: Kolkata Cluster Information**

| Particular | Details |
|---|---|
| **Category of Tannery Units** | Medium & Small |
| **No. of Tannery Units in Operation** | >200 |
| **Main Sub-Clusters** | Kolkata Leather Complex, Bantala |
| **Major Leather Manufacutring Process** | Raw to Finished Leather, Wet Blue to Finished Leather |
| **Main Process Technology Employed** | Chrome & Vegatable Tanning, Post Tanning Process |
| **Major Raw Material** | Goat & Sheep Hide/Skin |
| **Main Common Effluent Treatment Plant (CETP) as per SPCB Norms & Standards** | 1 no. in KLC |
| **Local Industrial Associations** | CLC Tanners Association, KLC, Bantala |
| **Central Govt. Entity** | Council for Leather Export (CLE),<br>O/o The Regional Director, CLE, Kolkata |
| **Central Govt. Regional R&D Entitiy** | CLRI Regional Centre – Kolkata<br>O/o The Sr. Principal Scientist<br><br>MSME-Development and Facilitation Office,<br>111 & 112, B. T. Road, Kolkata : 700 108 |
| **Education Institute** | Government College of Engineering and Leather Technology, which is affiliated with Maulana Abul Kalam Azad University of Technology, Kolkata. |
| **Source of Energy in Tannery Unit** | Coal, Firewood, Grid Power, Diesel |
| **Future Project in Kolkata** | Expansion of Calcutta Leather Complex<br>~40 Ha of land where expansion will occur with proposed leather processing capacity enhancement of about 600 MTPD. |

**Overview of Pallavaram Cluster:** Pallavaram is a suburban town of Chennai Metropolitan. It is one of the important tannery clusters in Tamil Nadu. There are nearly 129 tannery units in and around Pammal/Pallavaram area. Pallavaram Tanners' Industrial Effluent Treatment Company (PTIETC), a SPV organization promoted by the member tanneries has established a CETP for the benefit of wet operating tanneries in Pammal / Pallavaram area. The tanneries in Pallavaram area during the initial period of operations adopt different types of processes such as chrome tanning, vegetable tanning, raw to finish, semi-finish to finish operations, etc.

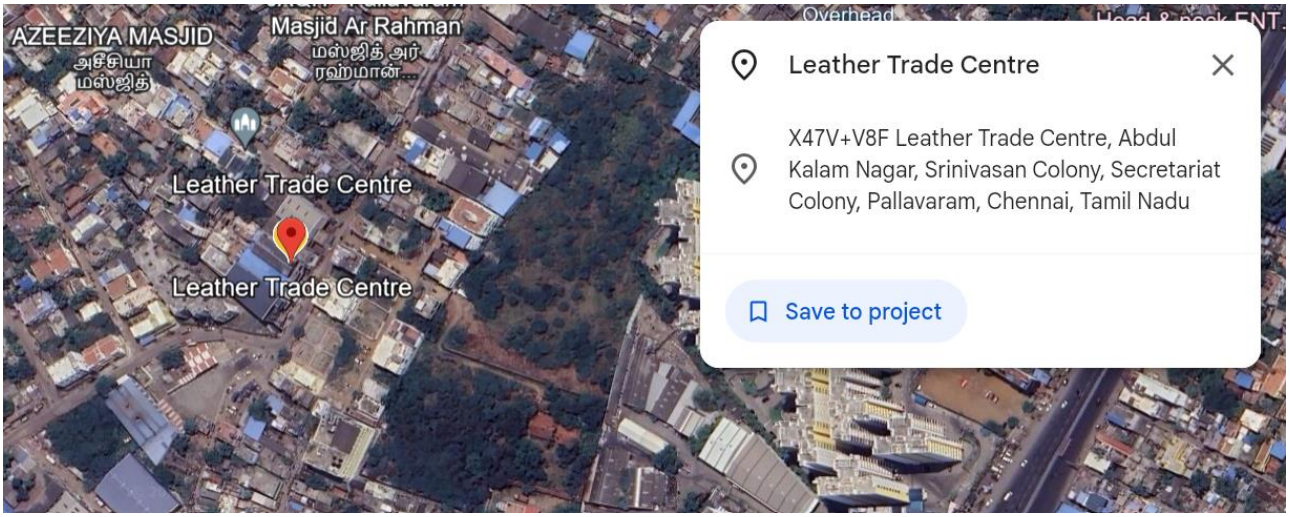



Figure 11: Pallavaram Leather Cluster

The tanneries in Pallavaram Cluster process only semi-finish to finished leather. The semi-finish leather (i.e., wet blue and vegetable tanned leather) is received from all parts of India and other countries. The 120 functional tanneries located in Pallavaram and Chromepet annually account for an estimated production of 20 crore sq. ft. of finished leathers valued at Rs.1200 crores.

On basis of primamry & secondary data reserch, stakholder holder consultation at cluster level and team field visit, the abbreviated information pertains to the Pallavaram Cluster is listed as below:

Table 4: Pallavaram Cluster Information

| Particular | Details |
|---|---|
| **Category of Tannery Units** | Medium & Small |
| **No. of Tannery Units in Operation** | ~130 |
| **Main Sub-Clusters** | Pallavaram & Chrompet, Chennai |
| **Major Leather Manufacutring Process** | Wet Blue to Finished Leather, Semi Finished to Finished Leather |
| **Main Process Technology Employed** | Post Tanning Process |
| **Major Raw Material** | Processed Buffalo/Goat/Sheep Hide/Skin |
| **Main Common Effluent Treatment Plant (CETP) as per SPCB Norms & Standards** | 2 no. in Pallavaram: Pallavaram Tanners' Industrial Effluent Treatment Company (PTIETC) at Nagalkeni & Chrompet |
| **Local Industrial Associations** | Pallavaram Tanners Association (PTA), Pallavaram Tanners Industrial Effluent Treatment Company (PTIETC). |
| **Central Govt. Entity** | Council for Leather Export (CLE),<br>O/o The Regional Director, CLE, Chennai |
| **Central Govt. Regional R&D Entitiy** | CSIR-Central Leather Research Institute<br>Sardar Patel Road, Adyar, Chennai 600 020 INDIA<br>O/o The Director, CLRI<br>The Joint Director & Head of Office,<br>MSME Development & Facilitation Office, Ministry of MSME, Govt. of India,<br>MSME Bhawan, 65/1, GST Road, Guindy, Chennai, Tamil Nadu, India - 600032 |

| Particular | Details |
|---|---|
| **Education Institute** | Institute of Leather Technology, Chennai<br>The Central Footwear Training Institute (formerly CFTC), Chennai |
| **Source of Energy in Tannery Unit** | Firewood, Grid Power, Solar & Wind Power through wheeling, Diesel |
| **Future Project in Pallavaram** | Projects that have been approved under IFLADP includes upgradation of Pallavaram CETP at Nagalkeni and Chrompet. |

**Overview of Vaniyambadi Cluster:** Vaniyambadi is an industrial town in the state of Tamil Nadu. It is one of the important leather tanning centers of India. There are about 131 tanneries operating in this town. To treat the effluent from these tanneries, a common effluent treatment plants was planned. A company "Vaniyambadi Talco environmental control system Ltd" was formed in 1986 by active tanners who are its members. The Company services the wastewater treatment needs of its member-tanneries through a Common Effluent Treatment Plant (CETP) located in Valayampet, Vaniyambadi.

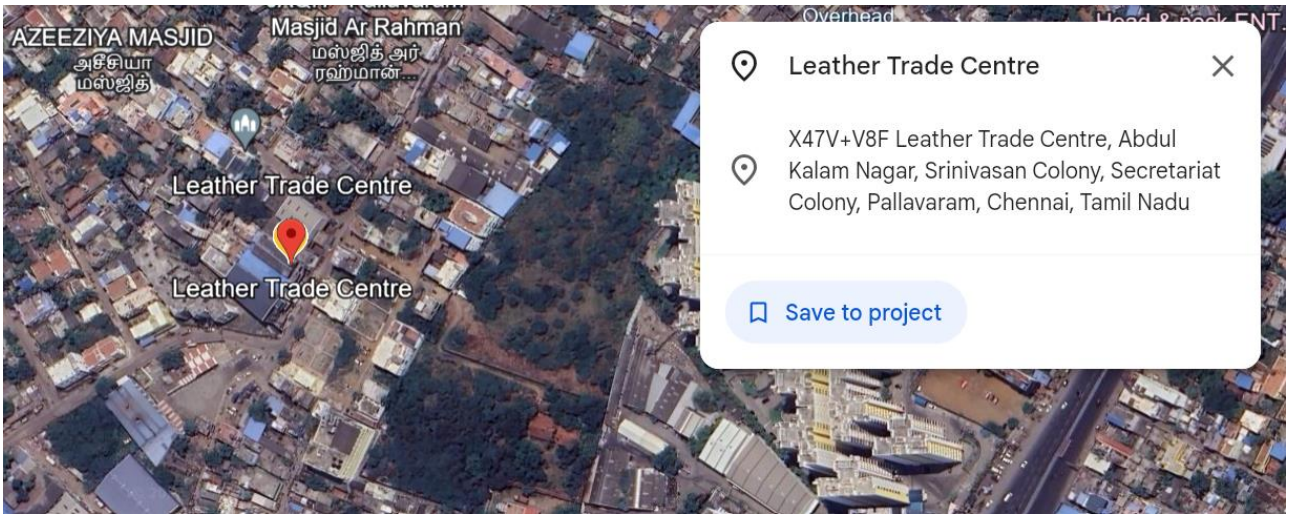



Figure 12: Vaniyambadi Leather Cluster

On basis of primamry & secondary data reserch, stakholder holder consultation at cluster level and team field visit, the abbreviated information pertains to the Vaniyambadi Cluster is listed as below:

Table 5: Vaniyambadi Cluster Information

| Particular | Details |
|---|---|
| **Category of Tannery Units** | Large, Medium & Small |
| **No. of Tannery Units in Operation** | 131 |
| **Main Sub-Clusters** | Valayampet, Vaniyambadi (Vellore District) |
| **Major Leather Manufacutring Process** | Raw to Finished, Semi Finished to Finished Leather |
| **Main Process Technology Employed** | Chrome & Vegetable Tanning, Post Tanning Process |
| **Major Raw Material** | Buffalo/Goat/Sheep Hide/Skin & Processed hides/skins imported from other clusters |
| **Main Common Effluent Treatment Plant (CETP) as per SPCB Norms & Standards** | 1 no. in Valayampet: VANITEC Ltd. |
| **Local Industrial Associations** | Vaniyambadi Tanners Association (PTA), VANITEC Ltd. |
| **Central Govt. Entity** | Council for Leather Export (CLE), |

| Particular | Details |
|---|---|
| | O/o The Regional Director, CLE, Chennai |
| **Central Govt. Regional R&D Entitiy** | CSIR-Central Leather Research Institute<br>Sardar Patel Road, Adyar, Chennai 600 020 INDIA<br>O/o The Director, CLRI<br>The Joint Director & Head of Office,<br>MSME Development & Facilitation Office,<br>Ministry of MSME, Govt. of India,<br>MSME Bhawan, 65/1, GST Road, Guindy,<br>Chennai, Tamil Nadu, India - 600032 |
| **Education Institute** | Institute of Leather Technology, Chennai<br>The Central Footwear Training Institute (formerly CFTC), Chennai |
| **Source of Energy in Tannery Unit** | Coal, Firewood, Grid Power, Solar & Wind Power through wheeling, Diesel |
| **Future Project in Vaniyambadi** | Projects to promoting circular market-based models by establishing pilot demonstrations on environmentally sustainable leather processing practices and creating capacities among SME tanneries and their industry partners for the wide scale adoption of circular practices that creates value from waste.<br>Implement by Tamil Nadu Govt. and Solidaridad |

**Overview of Jalandhar Cluster:** In Punjab, leather industry is majorly concentrated in Jalandhar comprising tanneries and manufacturers of shoes, bags, jackets, purses and belts. There are around 200 units which are engaged in the manufacturing of finished leather (dry work) & stitching and approx. 70 nos. of tanneries are engaged in finished & semi-finished leather manufacturing.

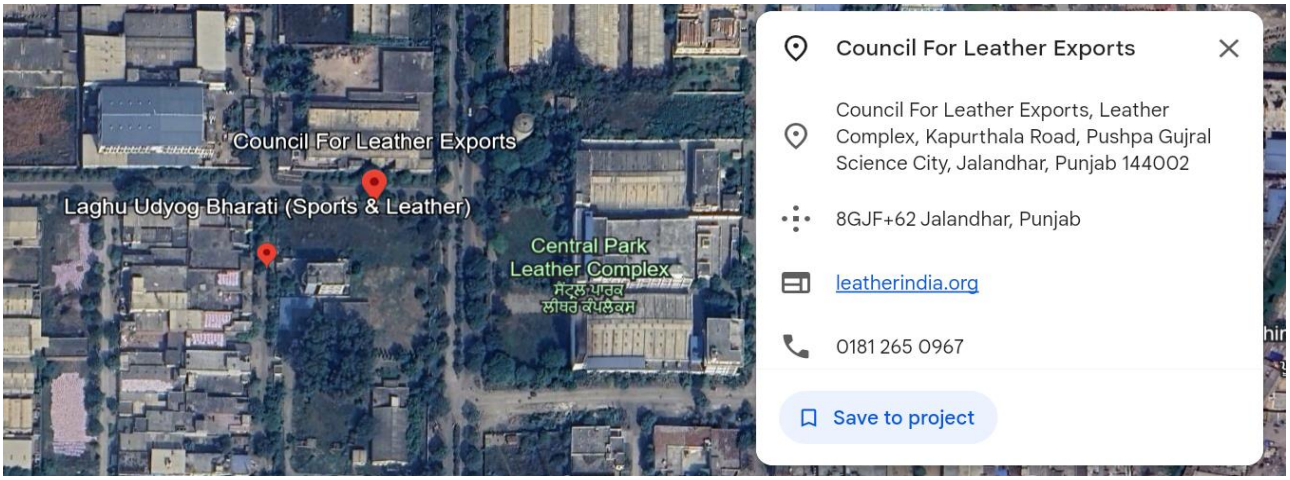



Figure 13: Jalandhar Leather Complex

On basis of primamry & secondary data reserch, stakholder holder consultation at cluster level and team field visit, the abbreviated information pertains to the Jalandhar Cluster is listed as below:

Table 6: Jalandhar Cluster Information

| Particular | Details |
|---|---|
| **Category of Tannery Units** | Medium & Small |
| **No. of Tannery Units in Operation** | ~70 |
| **Main Sub-Clusters** | Jalandhar Leather Complex |
| **Major Leather Manufacutring Process** | Raw to Finished, Semi Finished to Finished Leather, Wet Blue to Dye |
| **Main Process Technology Employed** | Chrome Tanning, Post Tanning Process |
| **Major Raw Material** | Buffalo Hide/Skin & Processed hides/skins imported from other clusters or foreign country |
| **Main Common Effluent Treatment Plant (CETP) as per SPCB Norms & Standards** | 1 no. CEPT at Jalandhar Leather Compplex |
| **Local Industrial Associations** | Punjab Leather Federation, Jalandhar |
| **Central Govt. Entity** | Council for Leather Export (CLE),<br>O/o The Regional Incharge, CFC Building,<br>Jalandhar Leather Complex |
| **Central Govt. Regional R&D Entitiy** | CSIR-Central Leather Research Institute<br>Chief Scientist, CLRI Regional Centres Nodal Officer & Scientist-in-Charge,<br>Leather Complex, Kapurthala Road<br>Jalandhar-144021<br>Micro, Small & Medium Enterprises Development Institute, Govt. of India, Ministry of MSME<br>Industrial Area-B, Partap Chowk<br>Ludhiana-141003 |
| **Education Institute** | Government Institute Of Leather & Footwear Technology, Jalandhar, Punjab<br>Established by the Government of Punjab<br>Affiliated with PSBTE & IT, Chandigarh & Approved by AICTE, New Delhi. |
| **Source of Energy in Tannery Unit** | Firewood, Grid Power, Diesel |
| **Future Project in Jalandhar** | Two common effluent treatment plants (CETPs) will be added under the smart city project to ensure the proper treatment of effluents in the complex.<br>Estimated Cost: Rs 10 crore & 50 Crore<br>Capacity: 1.5 MLD addtion & 5 MLD new |

## 2.6 Overview of Global Leather Tanning Sector

In the current landscape, the tanning industry is predominantly concentrated in Asia, with some presence in Latin America. However, there are clear indications of rapid growth within Africa, positioning it as a significant player in the sector. Countries like Brazil, Argentina, and South Korea are gradually transitioning away from the tanning segment. Projections suggest that Africa could potentially account for a substantial share of global leather production by 2035, with estimates indicating 20% of heavy leather, 30% of light bovine leather, and 40% of light leather.

This shift in the industry's geographical focus is expected to be accompanied by broader global changes, including increased investment from China and India in Africa, fostering partnerships in manufacturing and trade.

As of 2011, global production of hides was estimated at 322 million pieces (about 16 billion Sq. ft.), with much of the growth in raw hides and skins supply originating from developing countries across Latin America, South Asia, and Africa. Conversely, there has been a notable decline in supply from developed countries over the past two decades, with Europe experiencing a significant drop of 12 million pieces since 1992.

These trends underscore the potential for developing countries to experience significant growth in the availability of hides over the next two decades, signalling a fundamental shift in the global leather industry landscape. In the case of production of goat skins, global production is estimated as 434 mil pcs (approx..22 billion Sq. ft.) which recorded a growth of 185 mil pcs over period of 20 years. 95% of the global production of goat skins is from developing countries of Asia and Africa. Asian countries such as China, India, Pakistan and African Countries consisting of Nigeria, Ethiopia and Sudan have significantly contributed to the supply. It is anticipated that goat skin supply would go up in the next 20 years.

As per the **International Council of Tanners**, the leather producers, are highlighted as below:

**Table 7: Global Leather Producers (million square feet)**

| Year | 2005 | 2010 | 2015 |
|---|---|---|---|
| **Top 30 Countries** | 19445 | 20476 | 20892 |
| | 84% | 88% | 87% |
| **Others** | 3795 | 2917 | 3085 |
| | 16% | 12% | 13% |
| **World Total** | 23241 | 23393 | 23976 |

As per the statics of International Council of Tanners, bulk of the leather producing top 30 countries contribute 87% of the total world leather production and remaininh countries put togather have 13% of the total world leather prodution.

**Note:** The comparison of Indian Tanneries with the Global units is based on the data available on public domain, which is for the year 2015. The Cluster and National level energy scenario has been arrived based on the actual energy audit and data provided by CLE and CLRI which is for the year 2021/22.

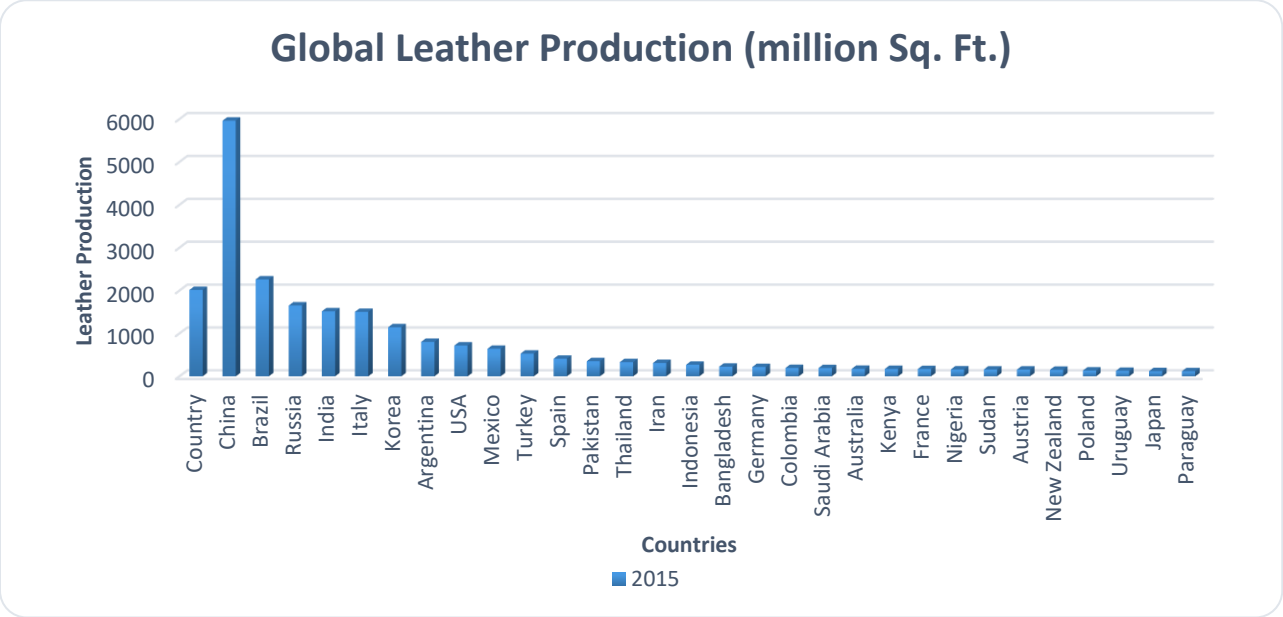



Figure 14: Global Leather Production (million Sq. ft.)

From the above entered data, it is evident to note that Asian Countries supplied approx. 50 % of Global leather where India's share in Asia was ~12 % and ~6% in Global supply. The data about the leather supply share on continental basis, is tabulated below:

Table 8: Global Leather Producers

| Leather Production (million Sq. ft.) | | | |
|---|---|---|---|
| *Country* | 2005 | 2010 | 2015 |
| **India** | 1261 | 1476 | 1516 |
| **Asia** | 10030 | 10452 | 10565 |
| **Europe** | 4801 | 4415 | 4174 |
| **Rest of World** | 7149 | 7048 | 7719 |
| **% Share w.r.t. Total Global Production** | | | |
| ***India*** | ***5.43*** | ***6.31*** | ***6.32*** |
| **Asia** | 43.16 | 44.68 | 44.07 |
| **Europe** | 20.66 | 18.87 | 17.41 |
| **Rest of World** | 30.76 | 30.13 | 32.20 |

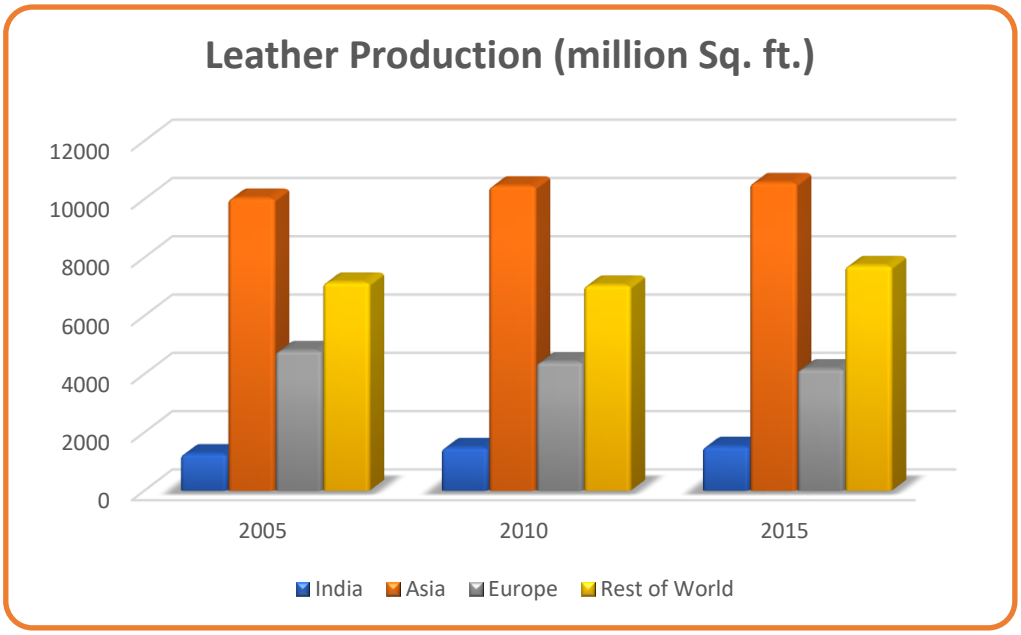



Figure 15: Global Leather Production (million Sq. ft.)

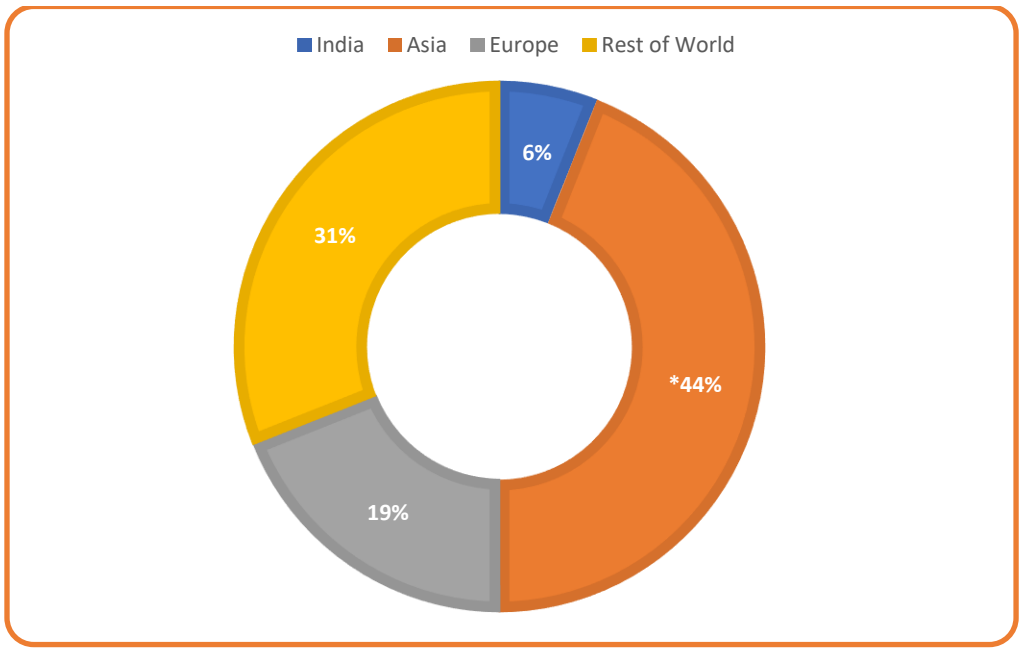



Figure 16: Global Production % Share

As indicated in above graphs; Asia is the major producer of the leather; India plus rest of Asia produces 50% of the total world production of leather. Europe contributes 19% to the world leather and rest of the world produces about 31% of the total leather output.

# Chapter 3: Sectoral Energy Mapping

## 3.1 Introduction

The segments under Leather Sector in India have vast variation on the basis of raw material, finished products, primary-secondary supply chain, geographical whereabouts etc. Each leather segment consumes the energy for routine operation, mainly electrical energy. Tannery segment requires electrical energy as well as thermal energy for routine operation as the leather production involves energy-intensive processes such as tanning, dyeing, and finishing. These processes often require significant amounts of electricity and heat.

In Tannery Units, the electrical energy is primarily supply by State Electricity Board and secondarily from DG Set. A marginal share of Solar & Wind Power is also consumed in cluster by few of the advance tannery units such as at Kanpur & Vaniyambadi Clusters. To cater for the thermal energy demand; applicable to Large & Medium Category of Tannery Units, a steam boiler of the capacity range of 1 TPH to 4 TPH or Thermic Fluid Heater range 2 lac kcal/hr. to 10 lac kcal/hr. has a dominant role while in some of the cases, Solar Air/Water Heating Systems are also employed in Kanpur & Vaniyambadi Cluster.

- ***In Large & Medium Category of Tannery Units***, to cater to the process heat demand; firewood and coal are the main fuel for steam generation in boiler as well as in coal/wood fired based thermic fluid heater (TFH). Few of the tannery units have installed the Diesel fired thermic fluid heater which has distinctive advantages over the coal/wood fired boiler and TFH.

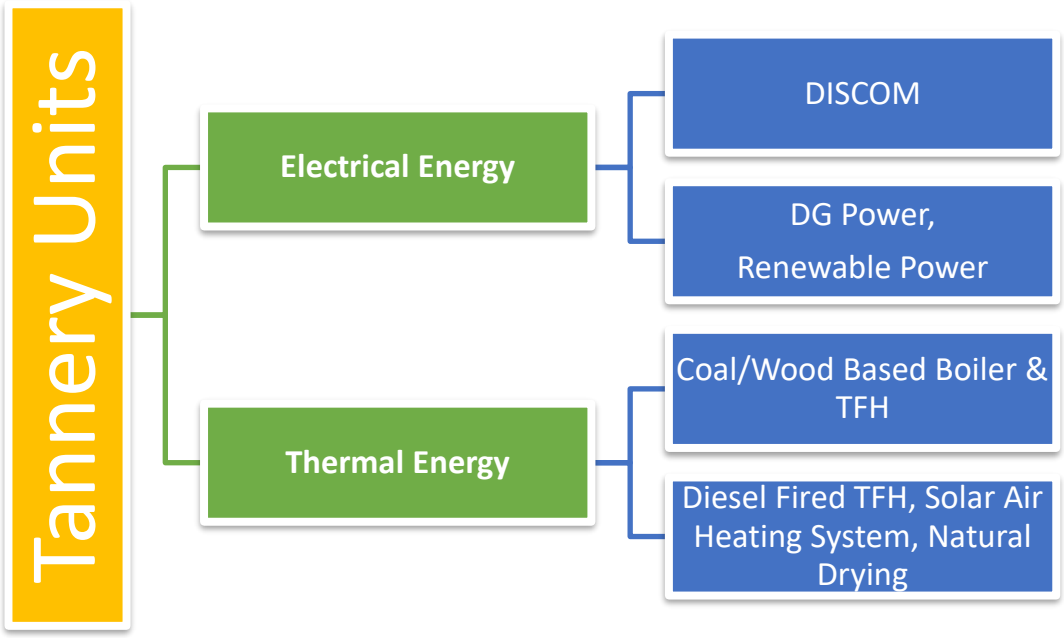



Figure 17: Tannery: Type of Energy & Source (Large & Medium Units)

❖ ***In Small Category of Tannery Units***, Electrical Energy is the only energy source to cater to the routine operations' energy demand as the thermal energy is not used in these segment's processes. Usually, these small units are manufacturing the finished leather from wet blue leather or doing the Post tanning process where thermal energy may or may not be used. To cater to the low degree of thermal energy demand, these units use the natural day sunlight and natural air using hanger conveyors for drying purpose.

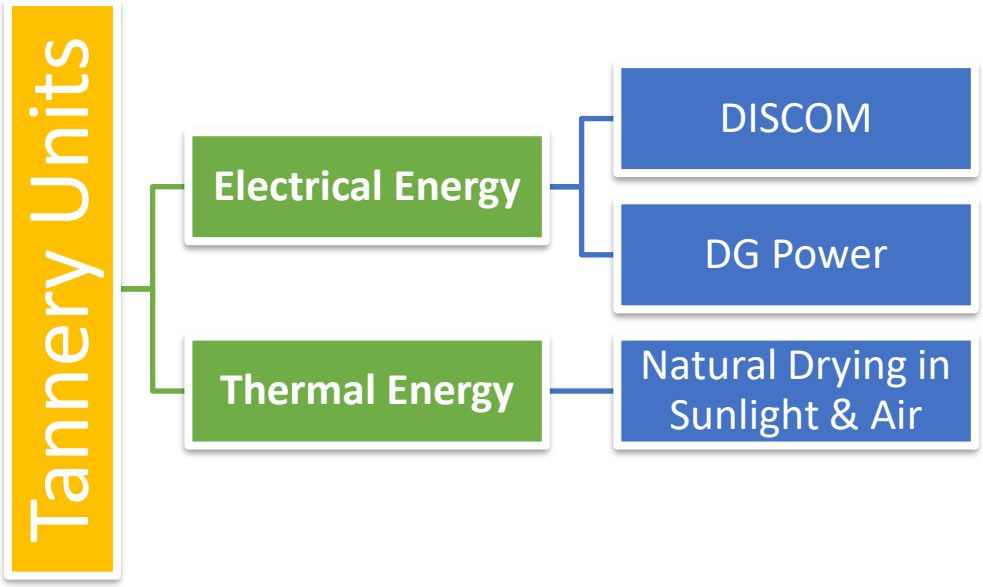



Figure 18: Tannery: Type of Energy & Source (Small Units)

❖ In Leather sector, other important factor **"Fuel Cost and its availability"** have a decisive role to determine the designated Utility equipment to cater to the thermal energy load. The Tannery units are primarily dependent of fossil fuel to feed the boilers in which Firewood has approximately 69 % share and Coal has approximately 31% share in total solid fuel demand for Steam generation / TFH. About the share of electrical energy, DISCOM power is the primary source and has approximately 81 % share, DG Power has only 2 % share in supply of electricity and the Renewable Power's share is about17 % in the sector. Over a period of time with improved reliability of Discom Power supply the use of DG sets has reduced substantially.

**Solid Fuel:** Coal – 31 %, Wood – 69 %

**Electricity:** DISCOM – 81 %, DG Power – 2 %, Renewable Power – 17 %

❖ Energy Consumption[6] in the Tanneries depends on the following factors:

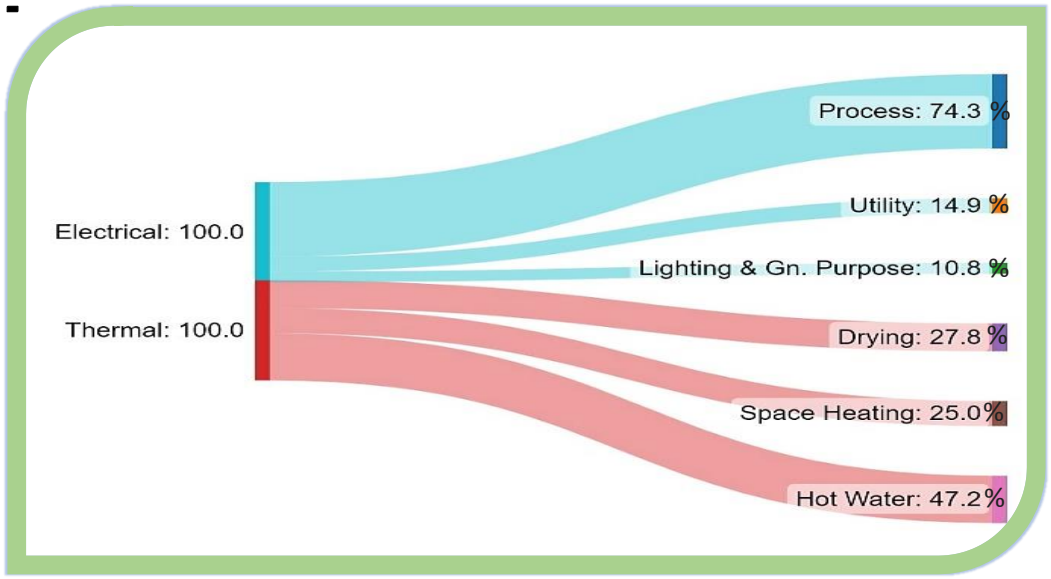
- Production methods, Capacity and Size of equipment
- Age and sophistication of electric motor controls

[6]http://wiki.zero-emissions.at/index.php?title=Information_about_hides_and_skins

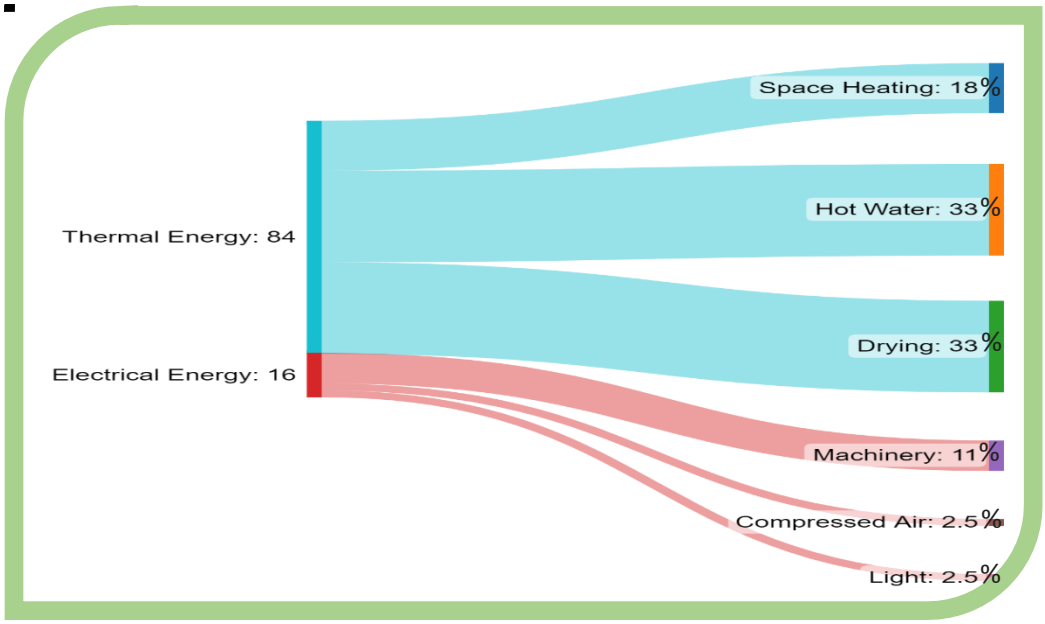
- Extent of automation in material handling viz. Hides and Skins Chemical etc.
- Drying methods used
- Heat losses from process vessels and from buildings
- Air exchange rates to meet workplace safety conditions
- Types of waste water treatment on site
- Types of waste treatment and recovery of energy from waste on site.

In consideration with above factors and energy data synthesis, it has been observed that thermal energy, in terms of TOE share is higher than electrical energy share w.r.t. total energy consumption in any typical tannery unit. The tentative energy (Eq. TOE) shares blue print as follow:

**Figure 19: Percentage Distribution Sankey Diagram in Typical Tannery Unit for Raw Hide to Finished Leather Process**

The 

above Sankey diagrams depict the Percent of total electrical and thermal energy distribution for different tannery



processes. Also, the part 2 of the diagram depicts the total energy inputs i.e 84% Thermal and 16% of the Electrical energy. This is a sample case of Tanneries that carry out Raw to Finish process and use Thermal as well as Electrical Energy.

❖ The energy intensity level in a general tanning process is illustrated as below:

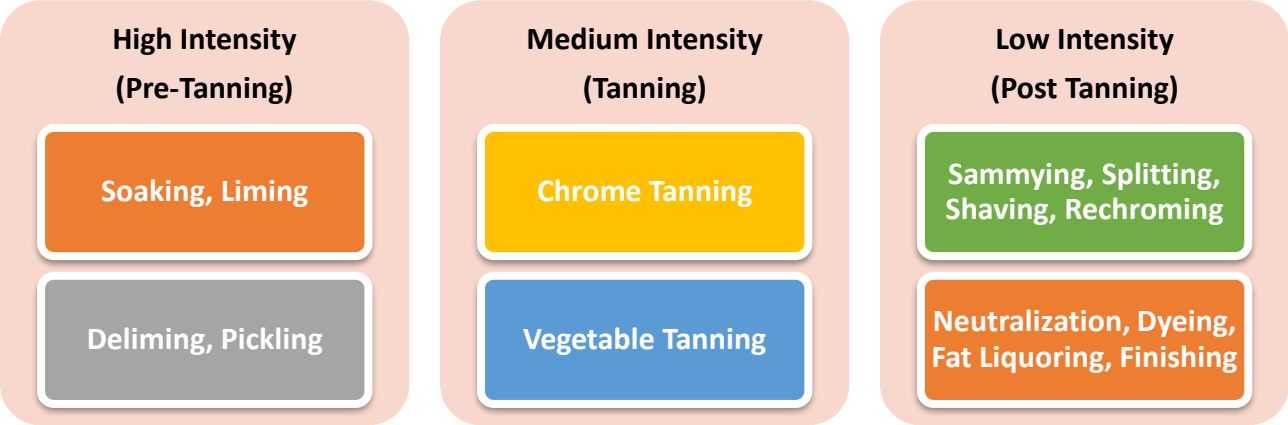



Figure 20: Energy Intensity in End-to-End Leather Processing

## 3.2 Cluster Level & Sectoral Energy Profile

Based on the field visits and data collection during detailed energy audit, followed by discussion with CLE, CLRI, Local Associations, eminent tannery units and others, it was observed that large tannery units' annual energy consumption is higher compared to medium and small size units. The variation in annual energy consumption between different tannery units at different clusters is due to various reasons related to type of Raw Hide, variation in process method, intermittent process methodology as per market demand, type of energy, geographical location, type of machinery, pre & post tanning operation etc. The classification of tannery segment on the basis of annual energy consumption as follow:

Table 9: Tannery Unit Clssification

| S.No. | Region | Category | Annual Energy Consumption Criteria (TOE)* | No. of Units |
|---|---|---|---|---|
| 1 | Kanpur Cluster | Large Unit | >500 | 61 |
| 2 | | Medium Unit | 50 to 500 | 102 |
| 3 | | Small Unit | <50 | 245 |
| | | | **Total** | **409** |
| 4 | Jalandhar Cluster | Large Unit | >50 | 18 |
| 5 | | Medium Unit | 7 to 50 | 25 |
| 6 | | Small Unit | <7 | 28 |
| | | | **Total** | **71** |
| 7 | Pallavaram Cluster | Large Unit | >50 | 59 |
| 8 | | Medium Unit | 7 to 50 | 83 |
| 9 | | Small Unit | <7 | 95 |
| | | | **Total** | **237** |

| S.No. | Region | Category | Annual Energy Consumption Criteria (TOE)* | No. of Units |
|---|---|---|---|---|
| 10 | Vaniyambadi Cluster | Large Unit | >200 | 59 |
| 11 | | Medium Unit | 50 to 200 | 138 |
| 12 | | Small Unit | <50 | 198 |
| | | | **Total** | **395** |
| 13 | Kolkata Cluster | Large Unit | >50 | 34 |
| 14 | | Medium Unit | 20 to 50 | 67 |
| 15 | | Small Unit | <20 | 235 |
| | | | **Total** | **336** |
| 16 | **Other Clusters** | -- | 50 to 200 | 184 |
| **Total** | | | | **184** |
| ***Grand Total*** | | | | **1632** |

*Based on Field Survey, Detailed Energy Audit, Stakeholder Consultation, Fuel Mix Pattern.

From above table, it can be inferred that, in terms of energy (TOE), the major share of energy consumption in leather segment is by tannery units from small category of unit and rest of share is by large & medium tannery units, since the total number of units in micro and small category is more. A total of about 800 nos. of small units are in operation and about 600 medium size units are active besides about 231 large units in leather processing / tanning segment.

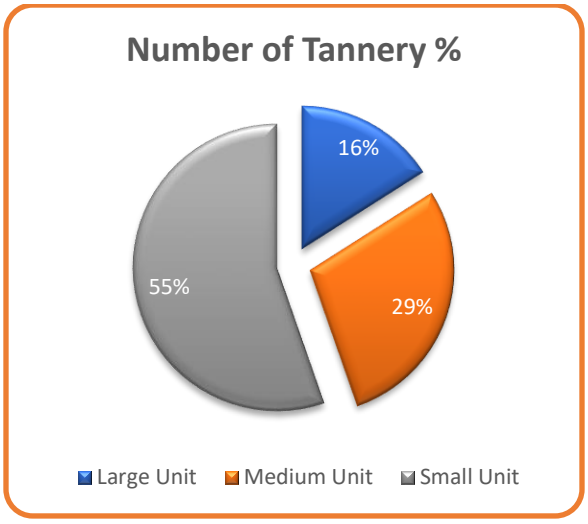



**Figure 21: Annual Energy Consumption Based: % Share of no. of Tannery**

The 1632 nos. of tannery units are scattered at various sub-cluster locations in given five clusters. As mentioned, the energy consumption patterns depend on the type of raw material, type of manufacturing & tanning process, fuel availability & cost and State Govt. norms with regard to energy distribution. The annual energy consumption details of the leather sector are as follow:

**Table 10: Sectoral Eenrgy Consumption (TOE)**

| S.No. | Cluster | Annual Energy Consumption (TOE) | | |
|---|---|---|---|---|
| | | Large Unit | Medium Unit | Small Unit |
| 1 | Kanpur | 55032 | 6503 | 318 |
| 2 | Jalandhar | 4150 | 202 | 80 |
| 3 | Pallavaram | 5509 | 665 | 204 |
| 4 | Vaniyambadi | 28249 | 9104 | 2127 |
| 5 | Kolkata | 5161 | 3341 | 3837 |
| 6 | Other Clusters | 19620 | 3963 | 1313 |
| Total Energy Consumption | | 117722 | 23778 | 7880 |

Kanpur cluster is a hub for manufacture of Shoes and Safety Shoes and many of the units are integrated units (leather & finished goods) and do collective energy accounting, thus higher SEC.

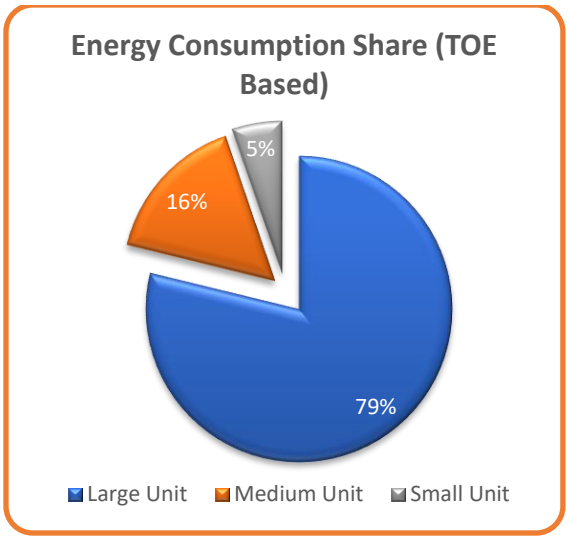



Figure 22: Sectoral Energy Consumption Share (%)

Observation: The Large units have the maximum share of energy in leather tanning segment followed by medium & small units due to the max. share of production.

In tannery operation, thermal energy is the dominant energy in prepration of leather for dying, finishing and painting and electrical energy plays a supportive role in these processes. As per energy Data synthesis pertaining to the audited tannery units across the nation, it is extimated that 27 % share of the energy is electrical energy and approx. 73 % share is of thermal energy in the total energy consumption for leather processing from Raw / Wetblue to finished leathre. Further, the energy bifurcation in a tannery as below:

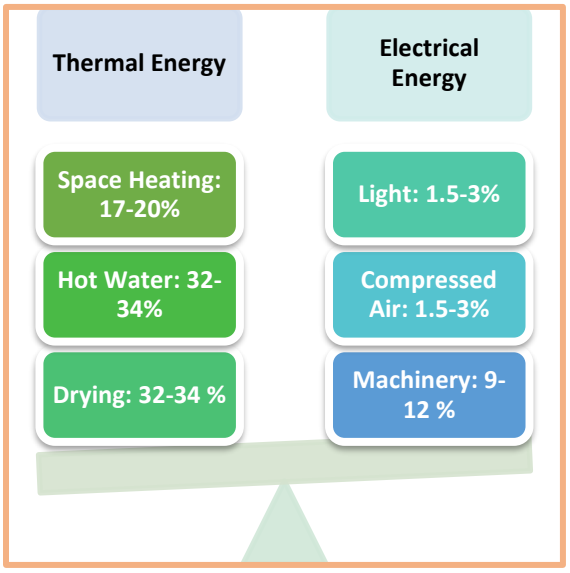



Figure 23: Energy Bifurcation

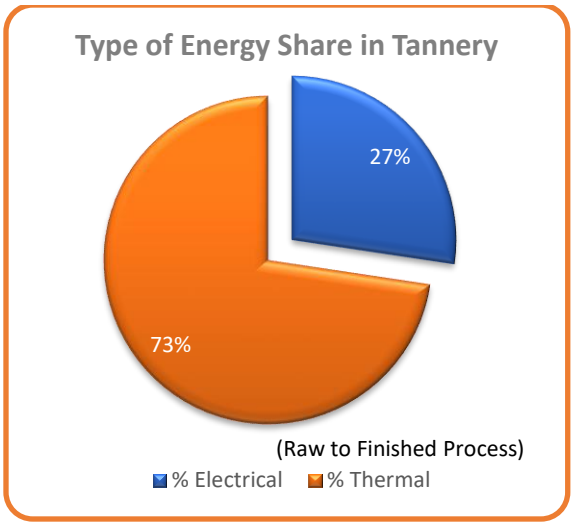



Figure 24: Electrical Share Energy in Tannery Unit

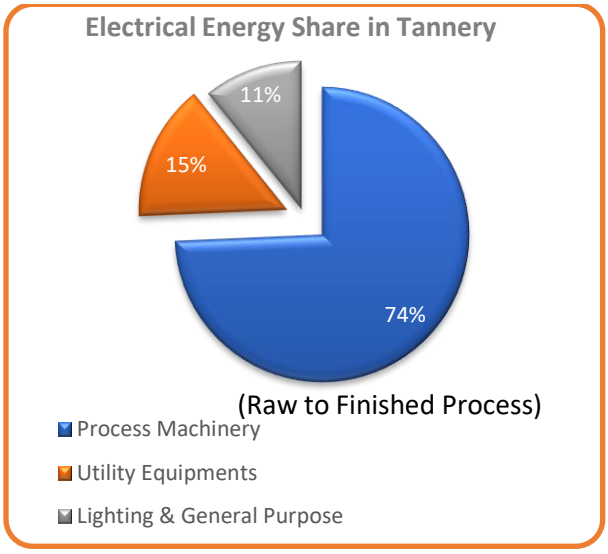



Figure 25: Electrical Energy in Tannery Unit

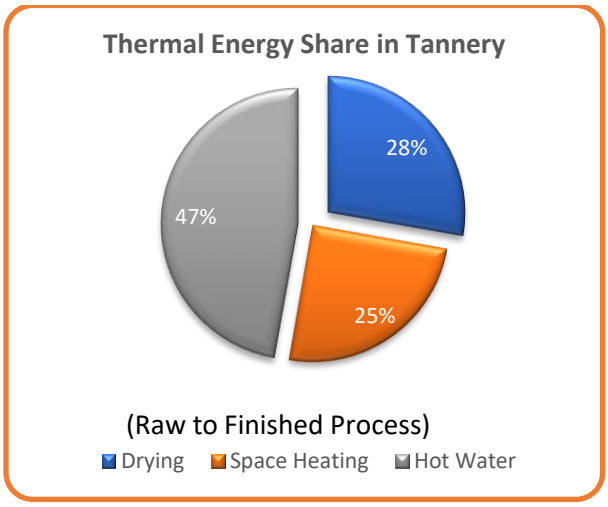



Figure 26: Thermal Energy in Tannery Unit

**Note:**

- Various process machinery in overall tanning process consumes ~74 % of total electrical energy demand. The major area of electrical energy consumption in Process Drums, Vacuum Press & Dryer, splitting machine, Sammying Machine, Buffing & Dusting machine etc.
- Requirement of hot water (~55 – 65 deg. C.) in tannery process is one of essential mandate. To fulfil this requirement, generally, a steam or hot fluid is employed for hot water. This specific need consumes ~ 47 % of total thermal energy demand.

## 3.3 Sectoral Specific Energy Consumption

In terms of specific electrical energy consumption and specific thermal energy consumption, significant variation has been observed during the audit exercise and data validation at site. The prime causes for these variations are

a) Capacity Utilization
b) Difference in process technology and no. of stages
c) Type of Raw Material Processed.
d) Source of energy, absence of thermal energy in small tannery units.
e) Market driven processing of finished leather, data validation, fuel economy etc.
f) Fuel Mix Pattern i.e., Renewable Energy + Fossil Fuel Energy.
g) Record keeping for Energy & Production Data.
h) Tannery Unit Operation with or without ZLD & ETP.

The energy performance of the Sector cluster may understand with following details:

Table 11: Sectoal Eenrgy Performance

| Cluster | Electrical SEC (kWh/Sq.ft.) | Thermal SEC (kCal/Sq.ft.) | Overall SEC (TOE/million Sq.ft.) |
|---|---|---|---|
| **Kanpur*** | 0.57 | 891 | 138 |
| **Jalandhar** | 0.16 | 266 | 40 |
| **Pallavaram** | 0.17 | 59 | 21 |
| **Vaniyambadi** | 0.23 | 131 | 39 |
| **Kolkata** | 0.26 | 338 | 56 |
| **Audited Cluster** | **0.28** | 337 | 59 |

* Thermal & Overall SEC higher w.r.t. other clusters due to the higher thermal energy share, Diesel fired THF for Heating Application, less renewable compared to other clusters etc.

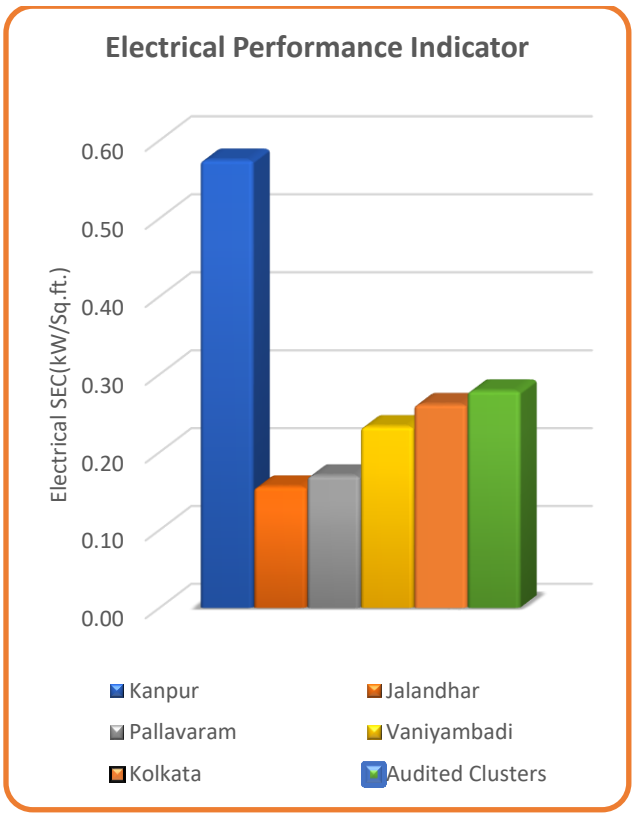



Figure 27: Sectoral Electrical Energy SEC

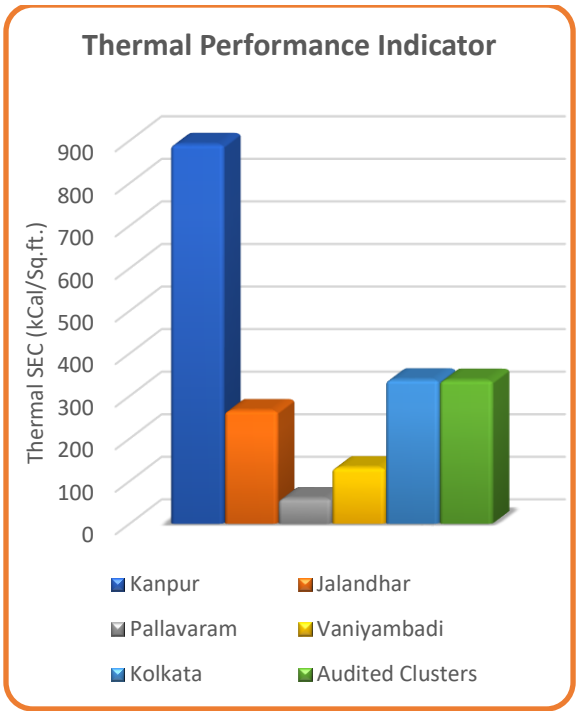



Figure 28: Sectoral Thermal Energy SEC

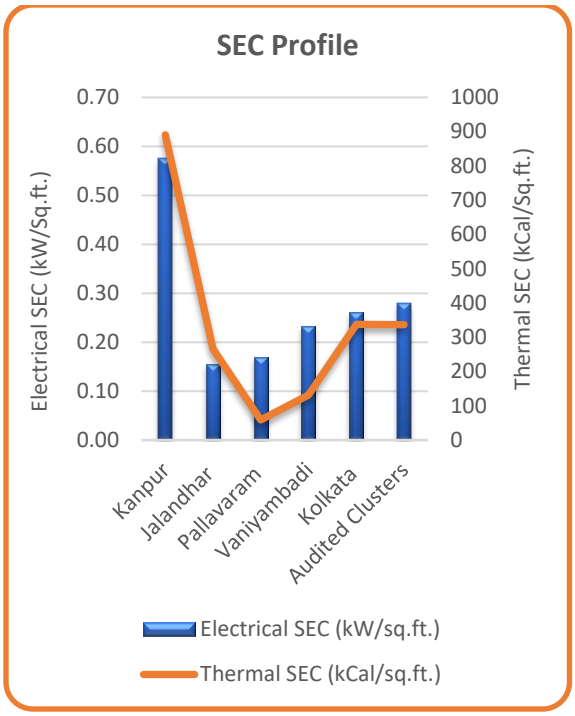



Figure 30: Sectoral Overall SEC Funnel Diagram

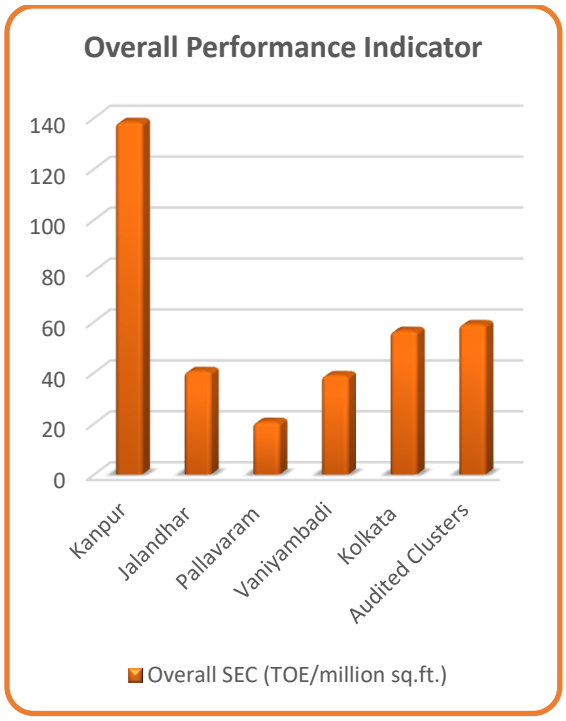



Figure 29: Sectoral Overall SEC

Termal and overall SEC for Kapur Cluster is higher due to higher use of Diesel as thermal energy input. Also electrical SEC is estimated to be higher side compared to other clusters since it has maximum use of Buffalo Skin.

Observations: The Specific electrical & Thermal Energy Consumption as well as overall SEC for Kanpur cluster is higher than rest of the clusters primarily due to higher use of Thermal energy and higher potential for saving. In Kolkata use of thermal energy is minimal and thus the SEC in terms of Kcal usage is lower compared to other clusters.

## 3.4 Sectoral Fuel Mix Pattern

As found during this study, Wood is the dominant fuel in all clusters for steam generation in boiler or for thermic fluid heating in TFH while the Coal is next in the line followed by the marginal quantity of Diesel oil to meet thermal energy demand. The landed cost of wood to the tannery unit is about 6-10 Rs. /Kg while the coal & Diesel landed cost is about 10-15 Rs. /Kg and 82-100 Rs/Lt. respectively. The dominancy of wood in the cluster is due to its ample availability, cheaper price. *The notable matter is that any kind of gaseous fuel is not employed in any cluster.*

The details of Fuel Consumption in the sector as below:

Table 12: Sectoral Fuel Consumption Details

| Cluster | Coal Qty (MT/Annum) | Wood Qty (MT/Annum) | Diesel Qty (KL/Annum) |
|---|---|---|---|
| Kanpur | 1,62,463 | 3,10,126 | 5,657 |
| Jalandhar | 0 | 2,077 | 42 |
| Pallavaram | 0 | 3,110 | 38 |
| Vaniyambadi | 5,310 | 38,983 | 3,891 |
| Kolkata | 0 | 19,329 | 100 |
| Other Clusters | 15,112 | 35,212 | 910 |
| Sectoral Total | 1,82,885 | 4,08,837 | 10,639 |

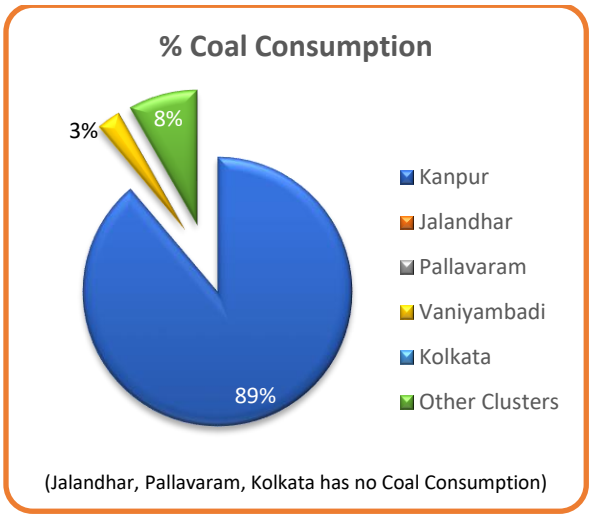



Figure 31: Sectoral Coal Consumption Details

In Kolkata, Jalandhar and Pallavaram clusters coal consumption is negligible.

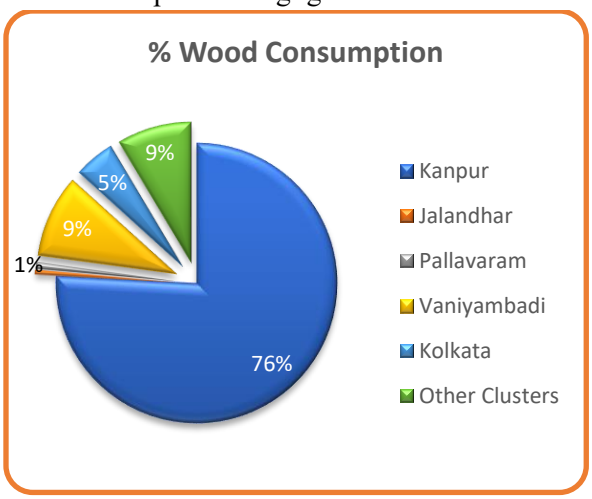



Figure 32: Sectoral Wood Consumption Details

Kanpur and Vaniuambadi have haigher wood consumption compared other clusters, since process heat use is bare minimum in other clusters. Also the above graph points towards higher potential in saving from waste heat recoveries and swithching to other sources of process heat generation in Kanpur Cluster (Unnao and Jajmau)

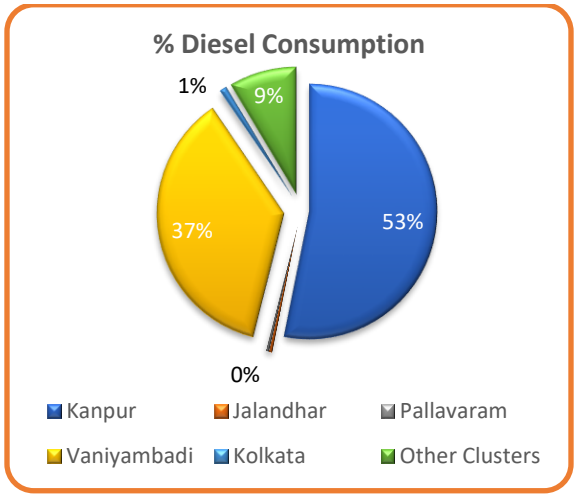



Figure 33: Sectoral Diesel Consumption Details

From above stipulated data & figures, it is concluded that Kanpur & Vaniyambadi Clusters are the most energy intensive cluster among the selected five cluster due to the max. share of leather production which extends to the max. consumption of Coal, Wood & Diesel in these cluster. The detailed fuel mix pattern may be understood with below mentioned graph.

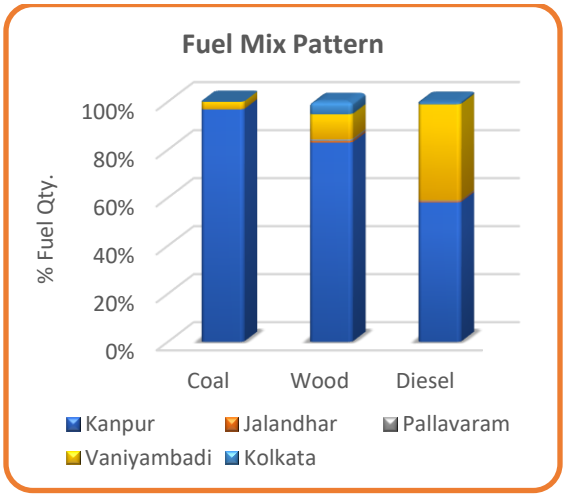



Figure 34: Sectoral Fuel Mix Pattern

In terms of Electrical Energy source, the major source is the GRID power & secondary is DG power and marginal share of Renewable Solar Power in Kanpur & Vaniyambadi Clusters. The sectoral electrical energy details as follow:

Table 13: Sectoral Electrical Energy Consumption

| Cluster | GRID Power (million kWh/Annum) | DG Power (million kWh/Annum | Renewable Power (million kWh/Annum) |
|---|---|---|---|
| Kanpur | 4217 | 129 | 0 |
| Jalandhar | 292 | 1 | 0 |
| Pallavaram | 508 | 1 | 0 |
| Vaniyambadi | 2284 | 22 | 954 |
| Kolkata | 968 | 0 | 0 |
| Other Clusters | 928 | 15 | 89 |
| Audited Clusters Consumption | 8269 | 154 | 954 |
| Sectoral Consumption | 9198 | 168 | 1042 |

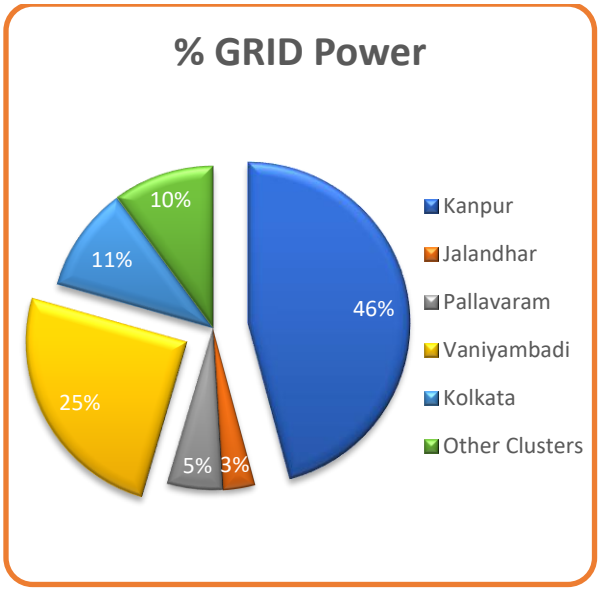



Figure 35: Sectoral GRID Energy Share

In terms of total grid power consumption Kanpur cluster has higher power consumption. One of the reasons for the same is that Kanpur has more number of integral units that are doing end to end process including the finished goods.

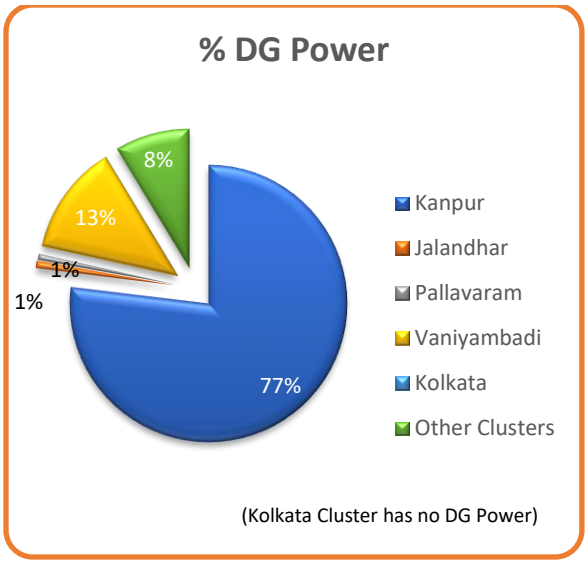



Figure 36: Sectoral DG Power Share

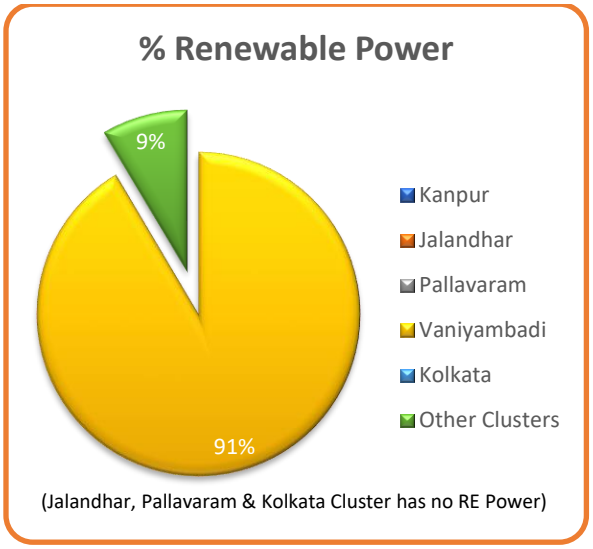



Figure 37: Sectoral RE Power Share

Overall DG power is use is very low and in most of the cluster, since grid power is reasonably stable and DG sets are used only as a standby arrangement.

Use of Renewable energy is presently limited in the Tannery units. However, some of the bigger units in Kanpur and Vaniyambadi are using renewable energy within the unit boundaries or through wheeling arrangement.

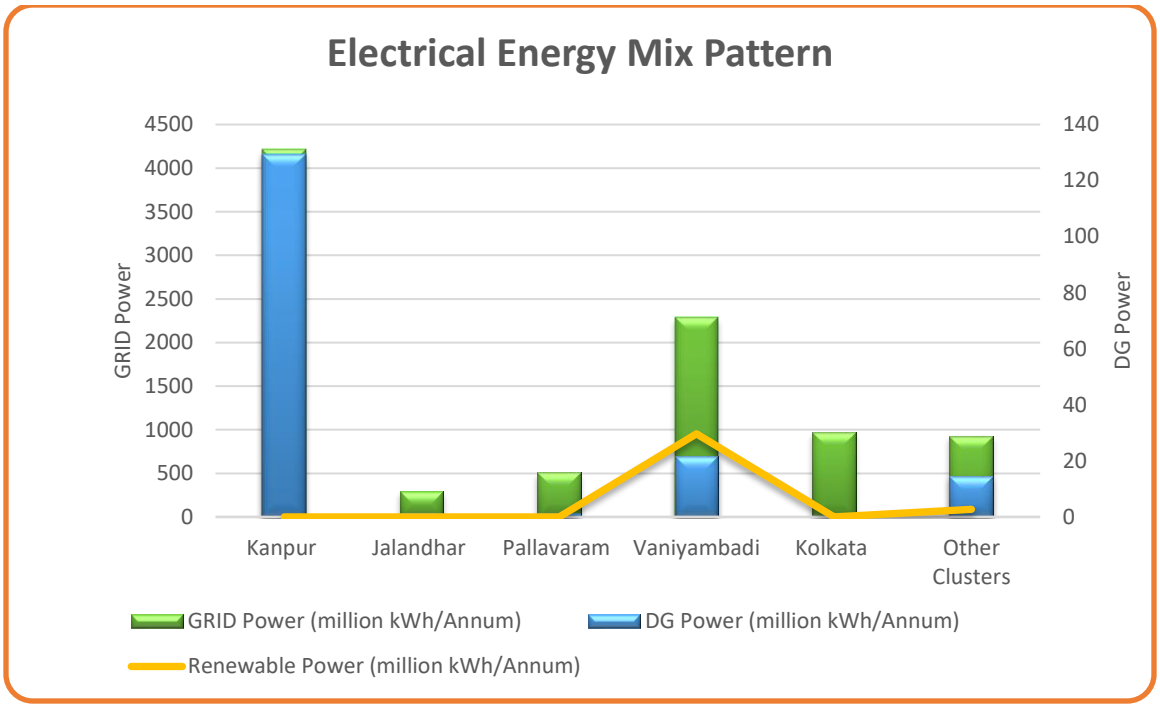



**Figure 38: Electrical Energy Mix Pattern**

## 3.5 Sectoral Energy Cost

Sectoral energy pricing involves charging different rates for energy consumption in different Leather Clusters. This sectoral pricing covers cost of electricity, cost of fuel, demand charges, cross-subsidy etc. sectors.

The electricity tariif order issed by State Electricity Regulatoy Commission at given cluster for SME units, have been examined to understand the tariff pattern, metering policy, renewable energy policy, demand charges, net metering policy, TOD tariff etc. for leather clusters at different locations and are annexed below.

All leather tanneries at Pallavaram cluster have LT supply connection whereas at Kolkata, Jalandhar, Kanpur & Vaniyambadi Clsuters, large units have HT supply connection and rest of units have LT supply connection. Each cluster has difference tariff structure for cluster-based SME units.
Continuing on the energy costing, the next area of discussion is the landed cost of different coal, wood & diesel in each cluster which has a potential impact on per unit of finished leather manufacutring. The cost of differenct fuel at cluster level as follow:

**Table 14: Fuel Cost**

| Fuel Landed Cost* | | | |
|---|---|---|---|
| **Cluster** | **Coal Price (Rs. /Kg** | **Firewood Price (Rs. /Kg)** | **Diesel Price (Rs/lt)** |
| **Kanpur** | 9.99 | 5.27 | 89.06 |
| **Jalandhar** | -- | 5.79 | 88.63 |
| **Pallavaram** | -- | 5.84 | 82.64 |
| **Vaniyambadi** | 19.03 | 8.69 | 95.55 |
| **Kolkata** | -- | 5.59 | 92.76 |
| **Sectoral Avg.** | 14.51 | 6.24 | 89.73 |

***Data provided by Tannery Unit during field audit.**

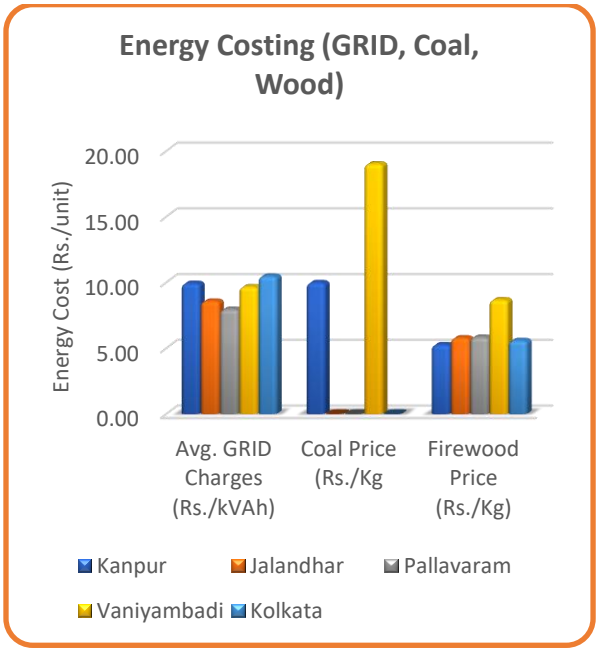



Figure 39: Sectoral Energy Costing

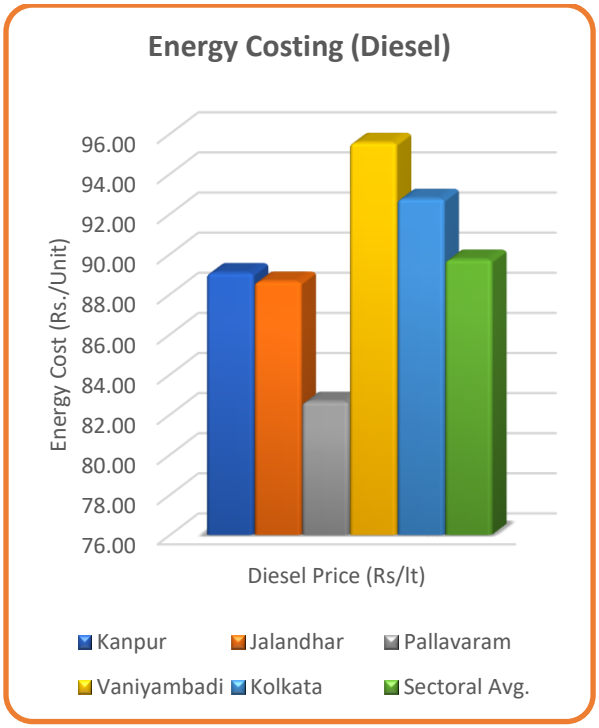



Figure 40: Sectoral Energy Costing

## 3.6 Sectoral Emission Profile

The subject of climate change & its derivatives is always debatable on global platform across the developed and developing nations. Undoubtedly, the GHG emission has been increasing with a harmful rate since the era of industrialization and modernization. On the same line, Greenhouse gas (GHG) emissions is one of the main issues related to the leather industry as perceived by the public.

As per the study conducted by "Leather Panel, UNIDO" $CO_2e$ emissions[7] for leather production process is about 2.5 kg of $CO_2e$ per square meter (0.232 kg of $CO_2e$ per square feet) of leather produced.

In case of Tannery Segment in Leather Sector in India, CO2e emissions accounting is very hard to pen-down due to the lack of monitoring & reporting system. Due to this reason, fossil fuel based direct CO2e emissions has considered in this study for calculating the Sectoral emission profile.

Based on the verified measurement and reported data during site visit, the sectoral emission details stipulated as below:

Table 16: Sectoral Emission Profile

| Cluster | $CO_2$ Emission (Kg $CO_2$/ Sq. ft) | Total $CO_2$ Emission (Tons) |
|---|---|---|
| **Kanpur** | 0.63 | 3,47,213 |
| **Jalandhar** | 0.17 | 24,883 |
| **Pallavaram** | 0.21 | 35,808 |
| **Vaniyambadi** | 0.27 | 2,21,626 |
| **Kolkata** | 0.22 | 69,264 |
| **Other Clusters** | **0.30** | **1,39,759** |

[7] Reference Abstract from the Report "Leather Carbon Footprint by UNIDO" (2017)

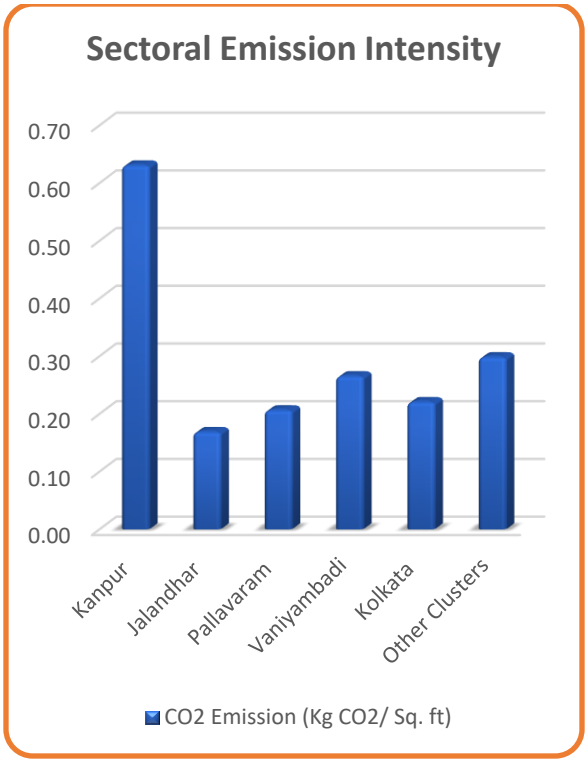



Figure 41: Sectoral Emission Intensity

Observations: $CO_2$ emission saving potential largely lies with the large tannery units at Kanpur & Vaniyambadi Cluster due to maximum share of installed capacity followed by embodied emission in finished leather.

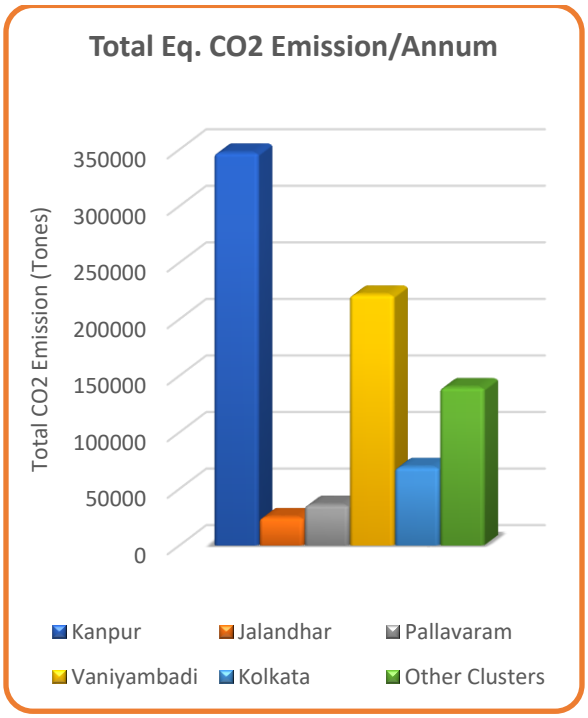



Figure 42: Sectoral Emission

Indian tanning segment have notable emission intesity and inline to the energym, higher share of emission shared by Kanpur & Vaniyambadi Cluster due to the max share of installed capacity & production in our country. As above stated UNIDO report, the emission intensity for raw to finished leather manufacturing process is about 0.23 kg CO2/Sq. ft. at global level. However, in India, it is about 0.36 kg CO2/Sq. ft in aspect of input energy only. Based on this two comparitive figures, it is found that about 23% potential exist for reduction in emission intensity in Indian Tanning segment.

But, one of the important area on this matter is the type & steps of process methodology in India. As, there are distinctive process methods depends on avaiable raw material & energy resources as well as market demend for finished product such raw to finish, raw to wet blue, raw to crust, wet blue to finish, post tanning steps etc. These process related completxity may not ressemble the true picture of actual emission intensity of the sector in India. Therefore, the above said 23 % reduction potential is an indicative only based on the wt. avg. data collected during field study. The indicative comparison for as follow:

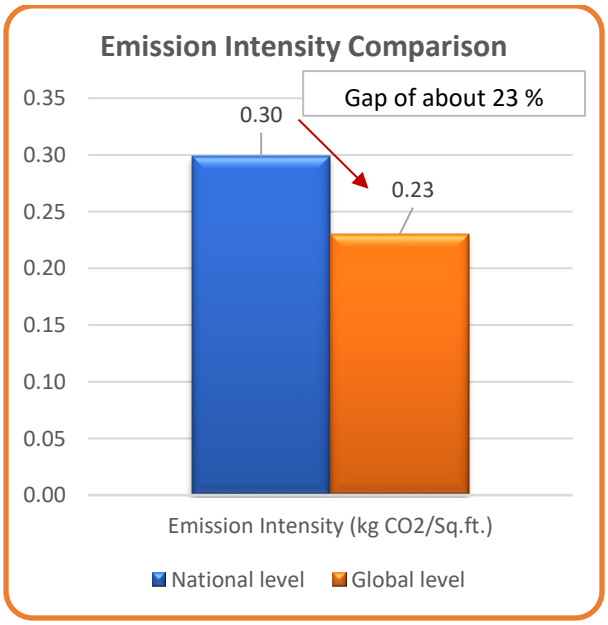



Figure 43: Sectoral Emission

## 3.7 Sectoral Benchmarking

Sectoral energy benchmarking is a process that involves comparing the energy consumption and efficiency performance of different tannery units within the same cluster across the India Leather Tanning Segment. This includes comparing energy use and other related metrics of various businesses, facilities, or organizations that operate within a particular industry. The goal of sectoral energy benchmarking is to identify best practices, areas for improvement, and opportunities for energy savings and efficiency enhancements.

Based on the site audit and data collected from tannery units, the national level sectoral SEC benchmarking of identified manufacturing process, is tabulated as below:

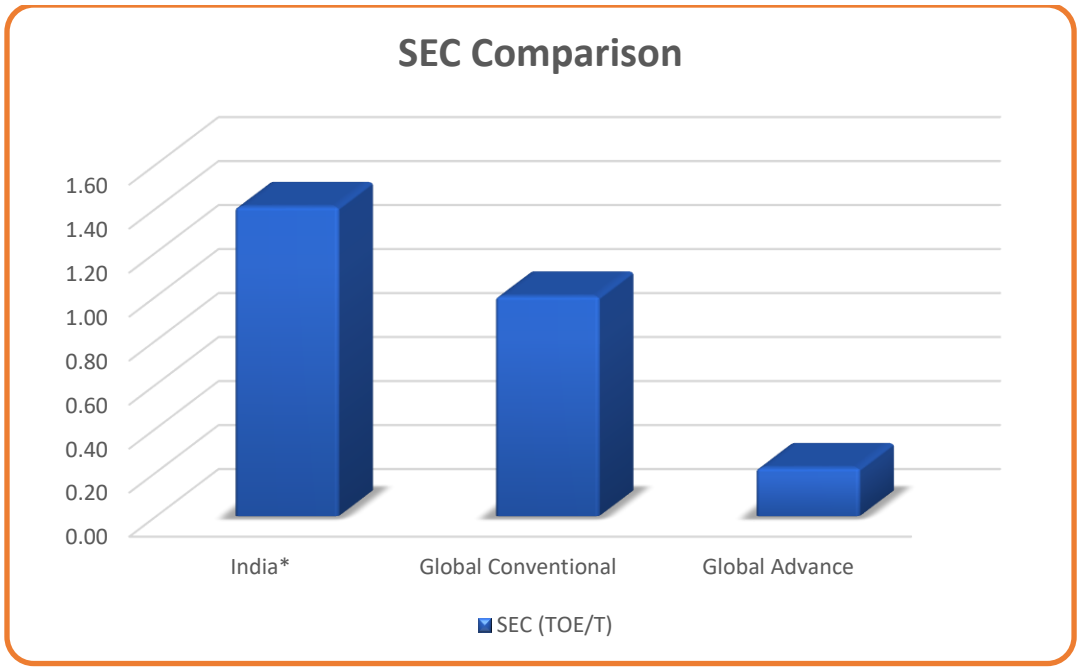
**Table 17: Sectoral SEC Benchmarking**

| Cluster | Process | Wt. Average (SEC/T) |
|---|---|---|
| **Kanpur** | (Raw to Finish) Large & Medium Tannery, E+TH | 2.30 |
| | (Raw to Finish) Small Electrical Based Tannery | 2.14 |
| **Jalandhar** | (Raw to Finish) | 0.84 |
| | (Raw to Wet Blue) | 0.13 |
| | (Wet Blue to Finish) | 0.68 |
| **Pallavaram** | (Wet Blue to Finish) | 0.25 |
| **Vaniyambadi** | (Raw to Finish) | 0.68 |
| | (Wet Blue to Finish) | 0.06 |
| **Kolkata** | (Raw to Finish) | 1.06 |
| | (Raw to Wet Blue) | 0.40 |
| | (Wet Blue to Finish) | 0.38 |

**Observation:** The tannery process in India is very distinctive in nature, majorly due to the difference in use of raw material & tanning process technology. In above table the sectoral avg. SEC figure can be compared only for the same end to end process with same type of raw skin, i.e. Buffalo, Cow, Goat or Sheep. International Benchmarking is available for Raw to Finish only.

with reference to the EU Best Available Technology Document, 2013 – the specific energy consumption for global best conventional and advance tannery is 1.0 TOE/T & 0.22 TOE/T[8] respectively. The comparison with the global tannery SEC, the India's tannery segment performance may analysis as below:

[8] https://stonestreetleather.com/pages/leather-weight-guide#:~:text=It's%20also%20good%20to%20know,how%20is%20leather%20thickness%20measured%3F




*For Raw to Hide to Finished Process, based on field audit.

**Figure 44: Benchmarking – Specific Energy Consumption**

- In comparison of avg Indian tannery SEC with global conventional tannery SEC, there is a scope of ~30% of energy savings.
- In Comparison of avg. Indian tannery SEC with global advance tannery SEC, there is a substantial scope of ~84 % of energy savings.

# Chapter 4: Mapping of Energy Efficiency Interventions

Mapping of Energy Efficiency Interventions in the leather sector is meant for identifying and implementing various technological solutions and advancements to enhance and optimize different aspects of leather production, processing, and related activities. Based on the field study, audit exercise, stakeholder consultations, networking meets with OEMs, etc., this technology mapping carried out to address the specific needs and challenges within the leather tannery sector and then mapping out appropriate technological solutions to address these issues. It's important for businesses in the leather industry to continuously assess their operations, stay updated on emerging technologies, and invest in relevant solutions to remain competitive and sustainable in today's rapidly evolving landscape.

## 4.1 Study Outcomes

The quantifiable EE measures/Technology interventions are mapped in Three categories namely Energy Conservation Measures, Best Technologies / State of Art Technologies and Solor Energy Efficiency Interventions. The list of all ENCONS applicable to the Tannery units as follow:

Table 15: List of Energy Conservation Measures

| S.No. | Energy Conservation Measures |
|---|---|
| 1 | Installation of VFD in Drum Motor |
| 2 | Replacement of Inefficient Motors with Energy Efficient Motors (IE4 Motors) |
| 3 | Pressure Optimization & air leakages arresting in Compressed Air System |
| 4 | Replacement of Conventional Lights & Fans with Energy Efficient LED Lights and BLDC Fans |
| 5 | Implementation of Cogged Belt in Motor Transmission System |
| 6 | Implementation of Energy Monitoring System (EMS) |
| 7 | Insulation Repair of Steam Network |
| 8 | Condensate Recovery from Steam Network |
| 9 | Waste Heat Recovery from Flue Gases for Water & Air Preheating |
| **S.No.** | **Best Technologies / State of Art Technologies** |
| 1 | Energy & Water saving by replacement of Old Wooden Drums with Polypropylene Drums |
| 2 | Chemical, Water and Energy saving by use of Waterless Chrome Tanning |
| 3 | Compressor Waste Heat Recovery for Process heat requirement |
| 4 | Installation of Heat Pump for Process /Drum Hot Water Requirement |
| 5 | Replacement of conventional heating with IR heating for Leather drying and Auto Spray Machine |
| 6 | Replacement of exiting thermic fluid heater / Steam Base heaters with Electrical Closed Chamber Pole Dryer for controlled Space Heating. |
| **S.No.** | **Solar Energy Efficiency Interventions** |
| 1 | Installation of Grid Connected Roof-top Solar Power Plant |
| 2 | Solar Water Heater for supplementing the hot water requirement for Process/ Drum |
| 3 | Use of Solar Air Heating to supplement the conventional Leather Drying Application and Auto Spray Machine |

To begin with, the Detailed Energy Audit Findings & Data validation with Tannery Units was followed by consultations with OEMs on above listed EE proposals. Each proposal was examined for cost benefit analysis, energy saving potential, its compatibility & Integration in existing system, ease of implementation, alignment with current government scheme/policy for leather sector and various other factors. The detailed listing of each ENCON is placed at *Annexure – 2.*

All listed EE proposals can fall under three categories based on their payback period and implementation suitability and have been considered for estimating the replication potential of each EE proposals as per below mentioned criteria:

Table 16: EE Prosposals Mapping Criteria

| Criteria 1st | Pay Back Period (Months) | Assigned Code |
|---|---|---|
| Short-Term | 02-12 | |
| Average-Term | 12 -24 | |
| Long-Term | >>24 | |
| | | |
| **Criteria 2nd** | **Description** | **Assigned Code** |
| Grade 1 | Replication Potential is <20 % | **G1** |
| Grade 2 | Replication Potential is 20-60 % | **G2** |
| Grade 3 | Replication Potential is >60 % | **G3** |

Based on above criteria, the mapping & replication potential of given EE proposals for Leather Sector as below:

Table 17: Mapping & Replication Potential Detials

| S. No. | Low Carbon Technology Based ENCONS | % Savings | Short-Term | Average-Term | Long-Term | Replication Potential Level |
|---|---|---|---|---|---|---|
| **1** | Installation of VFD in Drum Motor | 10 to 12 | | | | **G3** |
| **2** | Replacement of Inefficient Motors with Energy Efficient Motors (IE4 Motors) | 4 to 5 | | | | **G3** |
| **3** | Pressure Optimization in Compressed Air System | 2 to 4 | | | | **G1** |
| **4** | Replacement of Conventional Lights & Fans with Energy Efficient LED Lights and BLDC Fans | 1 to 2 | | | | **G1** |
| **5** | Implementation of Cogged Belt in Motor Transmission System | 4 | | | | **G2** |
| **6** | Implementation of Energy Monitoring System (EMS) | 3 to 5 | | | | **G2** |

| S. No. | Low Carbon Technology Based ENCONS | % Savings | Short-Term | Average-Term | Long-Term | Replication Potential Level |
|---|---|---|---|---|---|---|
| 7 | Insulation Repair of Steam Network | 2 to 3 | | | | G2 |
| 8 | Condensate Recovery from Steam Network | 1.8 to 3 | | | | G2 |
| 9 | Waste Heat Recovery from Flue Gases for Water & Air Preheating | 3 | | | | G2 |
| **S. No.** | **Best Technologies / State of Art Technologies** | **% Savings** | **Short-Term** | **Average-Term** | **Long-Term** | **Replication Potential Level** |
| 1 | Energy & Water saving by replacement of Old Wooden Drums with Polypropylene Drums | 55 to 60 | | | | G3 |
| 2 | Compressor Waste Heat Recovery for Process heat requirement | 2 to 3 | | | | G1 |
| 3 | Installation of Heat Pump for Process /Drum Hot Water Requirement | 15 to 18 | | | | G3 |
| 4 | Replacement of conventional heating with IR heating for Leather drying and Auto Spray Machine | 15 to 18 | | | | G2 |
| 5 | Replacement of exiting thermic fluid heater / Steam Base heaters with Electcial Closed Chamber Pole Dryer for controlled Space Heating. | 32 to 34 | | | | G3 |
| **S. No.** | **Solor Energy Efficiency Interventions** | **% Savings** | **Short-Term** | **Average-Term** | **Long-Term** | **Replication Potential Level** |
| 1 | Installation of Grid Connected Roof-top Solar Power Plant | 12 to 15 | | | | G2 |
| 2 | Solar Water Heater for supplementing the hot water requirement for Process/ Drum | 2 to 3 | | | | G2 |
| 3 | Use of Solar Air Heating to supplement the conventional Leather Drying Application and Auto Spray Machine | 17 to 20 | | | | G2 |

## 4.2 Energy Saving Potential for Proposed ENCONs

Determining the energy saving potential for above proposed low carbon, De-Carbon & Clean technology-based interventions is a part of successful implementation process. However, it requires examination of each ENCONs on various verticals such as saving potential, investment, payback period, replication potential, emission reduction potential etc. The detailed market potential assessment on these given verticals for each ENCONs under each cluster, is tabulated as below:

Table 18: Energy Saving Potential for Proposed ENCONs

| Sample Tannery | | | | | |
|---|---|---|---|---|---|
| **Particular** | **Investment (Rs. Lakh)** | **Simple Payback Period (Months)** | **Energy Savings (TOE)** | **Annual Monetary Savings (Rs. Lakh)** | **$CO_2$ Savings (MT)** |
| **Installation of VFD in Drum Motor** | Up to 6 Lakhs | 3 to 4 Years | 1.70 | 1.40 | 16.50 |
| **Replacement of Inefficient Motors with Energy Efficient Motors (IE4 Motors)** | Up to 11 Lakhs | < 4 years | 5.50 | 4.50 | 49.50 |
| **Pressure Optimization in Compressed Air System** | Negligible | Immediate | 0.20 | 0.20 | 2.00 |
| **Arresting of Air Leakage in Compressed Air System** | Negligible | Immediate | 2.00 | 1.50 | 17.00 |
| **Replacement of Conventional Lights & Fans with Energy Efficient LED Lights and BLDC Fans** | Up to 5 Lakhs | < 4 years | 0.50 | 0.20 | 2.50 |
| **Implementation of Cogged Belt in Motor Transmission System** | Up to 1 Lakhs | < 1.5 years | 1.00 | 0.60 | 7.50 |
| **Implementation of Energy Monitoring System (EMS)** | Up to 11 Lakhs | 3 to 4 years | 2.50 | 2.00 | 22.50 |
| **Installation of Grid Connected Roof-top Solar Power Plant** | Up to 51 Lakhs | 4 to 5 years | 9.50 | 8.00 | 92.00 |
| **Replacement of Old Wooden Drums with Polypropylene Drums** | Up to 91 Lakhs | 5 to 6 Years | 7.00 | 7.00 | 66.00 |
| **Water Less Chrome Tanning** | Up to 10 Lakhs | < 3 Years | 2.00 | 3.50 | 21.00 |
| **Insulation Repair of Steam Network** | Up to 8 Lakhs | < 2 years | 3.00 | 1.50 | 13.00 |
| **Solar Water Heater for Drum Hot Water** | Up to 30 Lakhs | 4 to 5 years | 6.00 | 2.00 | 27.00 |
| **Installation of Heat Pump for Drum Hot Water Requirement** | Up to 24 Lakhs | 3 to 4 Years | 9.00 | 2.50 | 40.00 |
| **Condensate Recovery from Steam Network** | Up to 15 lakhs | < 3 Years | 7.00 | 3.50 | 32.00 |
| **Waste Heat Recovery from Flue Gases for Water Preheating** | Up to 5 Lakhs | < 3 Years | 6.00 | 2.00 | 29.50 |
| **Waste Heat Recovery from Flue Gases for Air Preheating** | Up to 8 Lakhs | < 4 Years | 4.00 | 1.50 | 20.00 |
| **IR Based Electric Heating for Drying Application** | Up to 15 lakhs | < 3 Years | 44.50 | 15.00 | 204.00 |
| **Compressor Waste Heat Recovery - Energy Recovery Unit (ER unit)** | Up to 7 lakhs | 2 to 3 years | 9.00 | 3.00 | 39.50 |
| **Pole Dryer for Space Heating Application** | Up to 62 Lakhs | 4 to 5 years | 36.50 | 14.50 | 166.00 |
| **Solar Air Heating for Drying Application** | Up to 92 Lakhs | 4 to 5 years | 4.50 | 22.00 | 204.00 |

# Chapter 5: Energy & Emission Saving Potential

## 5.1 Energy & Emission Saving Potential

Since the tannery segment is one of the energy intensive segments in leather sector in our country, the scope of energy & emission saving potential is substantial. During the cluster visit for detailed energy audit, following major observations laid a strong basis for opportunities of energy & emission savings in the cluster and subsequent savings in the sector:

1. Tanning Process is a batch process undertaken by mostly unskilled manpower.
2. Most of electrical motors are very old, under loaded, inefficient, re-winded 3-4 times in an avg. 15 year of life span which together degrade the electrical SEC of the unit.
3. Old and Inefficient Wooden Drums are in operation driven by IE1/2 motors without VFDs/Fluid Coupling.
4. Advanced level Chrome Tanning process technology with chrome recovery, not adopted by majority of plants.
5. Marginal share of renewable energy for heating and electricity purpose, rely on DISCOM power which is costlier that renewable energy.
6. Lack of capacity building of tannery unit manpower towards energy efficiency & conservation.
7. Absence of Energy Monitoring system i.e., no monitoring of energy at overall as well as sub-process level.
8. Usage of old process machineries and high cost of modern machines.
9. Lack of routine operation & maintenance and preventive breakdown maintenance.
10. Fossil Fuel based Thermal Energy in place of Clean & Renewable based thermal energy system.
11. Absence of Waste Heat Recovery System.
12. Inefficient & conventional Fan-Light-AC in the tannery unit etc.

The above referred observations were the key technological base to ascertain the energy & emission saving potential in the individual tannery level as well as at cluster level. The abbreviated particulars for savings potential in two difference scenarios as follow:

**Scenario 1st (S1): Energy Conservation Measures and Maintenance practices**

Low carbon technology or say carbon reduction technology is meant for energy & emission savings wherever both are high in general, whereas, renewable technology is meant for utilizing Solar Energy for electrical & heating application. The energy & emission savings potential and its derivativities are computed based on all concerned ENCONs proposed under this scenario S1.

**Scenario 2nd (S2): Best Technologies / State of Art Technologies and Renewable Energy Efficiency Interventions**

Clean & Renewable technology interventions is meant to forefend the fossil fuel consumption in the plant and energy transition from thermal to complete electrical energy. The energy & emission savings potential and its derivativities are computed based on all concerned ENCONs proposed under this scenario S2.

The energy saving potential under the ambit of above said scenarios for cluster as well as sector, as follow:

Table 19: Energy Saving Potential

| Cluster | Energy Saving Potential (S1), TOE | Energy Saving Potential (S2), TOE | Energy Saving Potential (S1), % | Energy Saving Potential (S2), % |
|---|---|---|---|---|
| **Kanpur** | 14,862 | 27,177 | 21.71 | 39.70 |
| **Jalandhar** | 1,937 | 1,511 | 39.49 | 30.80 |
| **Pallavaram** | 2,125 | 2,951 | 30.10 | 41.80 |
| **Vaniyambadi** | 14,861 | 16,823 | 34.01 | 38.50 |
| **Kolkata** | 3,288 | 4,356 | 24.08 | 31.90 |
| **Audited Cluster** | **8,233** | **10,068** | **29.88** | **36.54** |

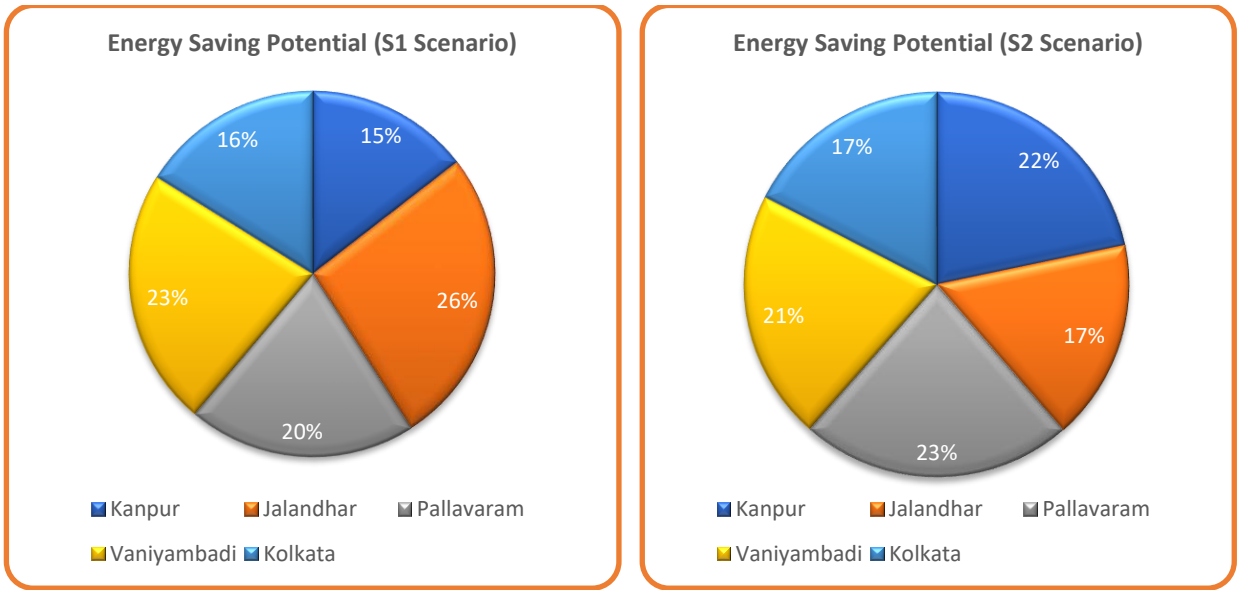



Figure 45: Energy Saving Potential (S1 & S2 Scenario)

The emission saving potential under the ambit of above said scenarios for cluster as well as sector, as follow:

Table 20: Emission Saving Potential

| Cluster | $CO_2$ Emission (million Tons) Saving Potential, S1 | $CO_2$ Emission (million tons) Saving Potential, S2 |
|---|---|---|
| **Kanpur** | 1,03,740 | 1,26,872 |
| **Jalandhar** | 7,434 | 9,092 |
| **Pallavaram** | 10,699 | 13,084 |
| **Vaniyambadi** | 66,218 | 80,982 |
| **Kolkata** | 20,695 | 25,309 |
| **Overall Sectoral** | 41,757 | 51,068 |

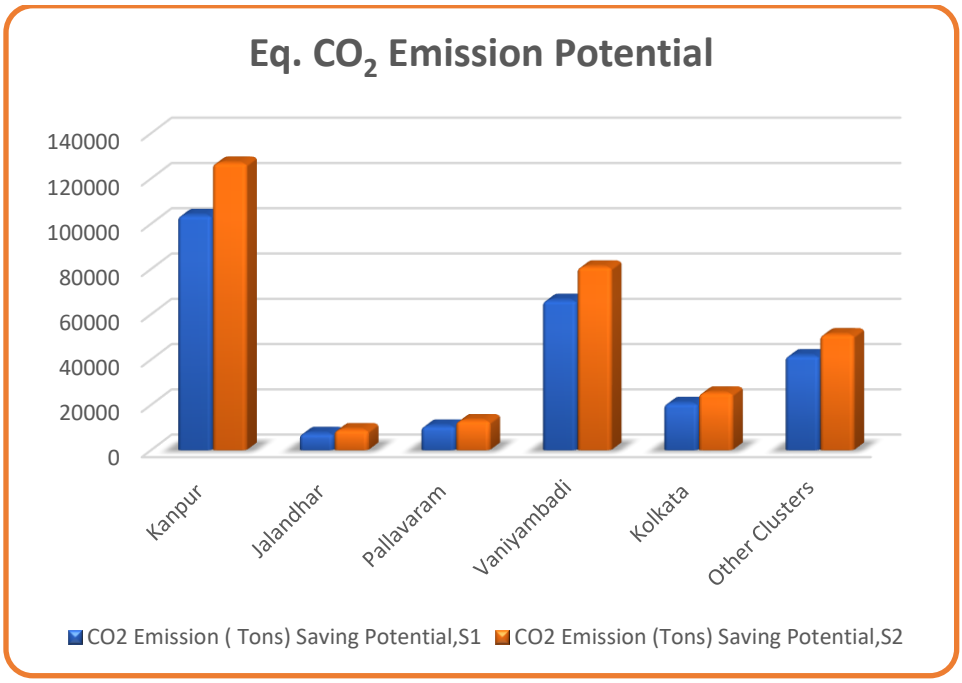



**Figure 46: Emission Saving Potential (S1 & S2 Scenario)**

Observations: $CO_2$ emission saving potential largely lies with the large tannery units at Kanpur Cluster (S1) and Pallavaram (S2) due to maximum share of installed capacity followed by embodied emission in finished leather}.

## 5.2 Sector Way Forward

A several concrete initiatives have been taken by MSME, CLE, CLRI, DPIIT, Regional Associations, large tannery unit owners in past to overcome the hurdles in the growth of leather tanning segment. In the recent times, several policy level initiatives have increased the awareness about the energy efficient process machinery, role of renewable energy, efficient thermal energy application for drying purposes in tannery process and others. To accelerate the sustainable growth Bureau of Energy Efficiency has conducted the Energy & Resource Mapping Study for Leather sector in India. With the help of this study, the present scenario of the sector may ascertain for its energy & production profile, fuel mix pattern, emission intensity, saving potential as well as future energy-emission-production profile, based on the identified saving measures in Scenario S1 & S2 as state above in section 5.1.

In this context, three pathways are being compared here (a) Business as Usual (BAU) (b) S1 and (c) S2 with respect to the baseline (CY 2022) year energy, production, energy conservation & saving measures, emission & energy intensity, specific energy consumption etc. The implementation period for proposed energy savings measures is considered at different interval in the projected years. The detailed analysis for proposed scenario as follow:

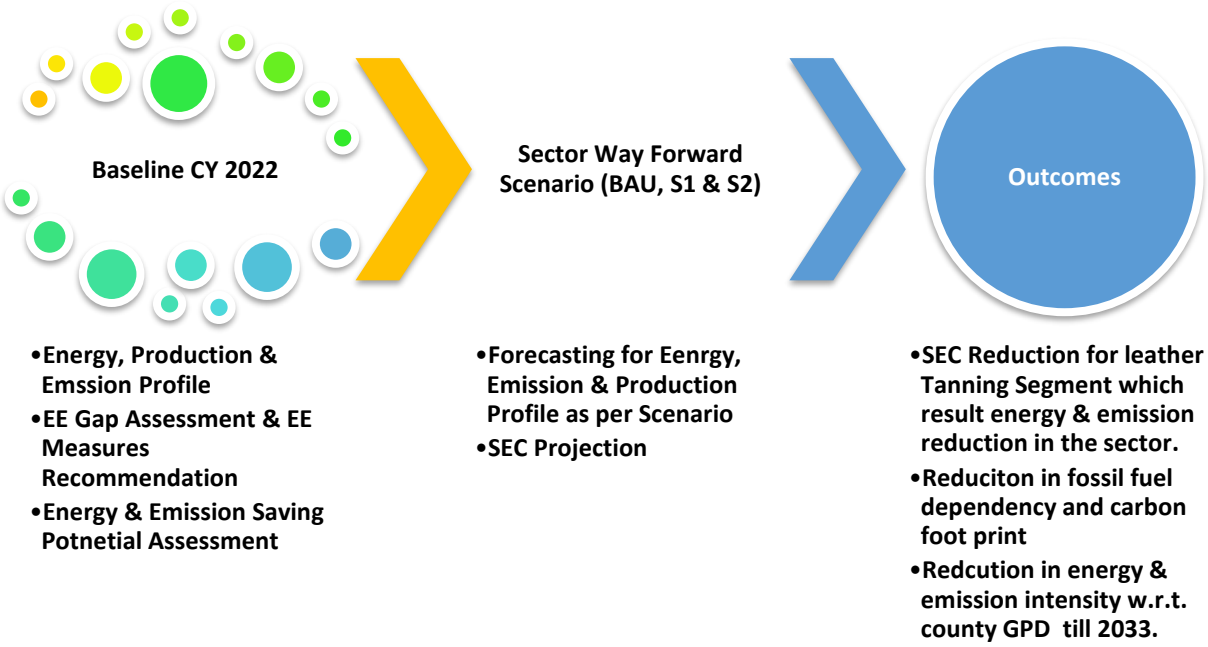



Figure 47: Sector Way Forward Method

**Energy Efficiency Potential Scenarios:**

The reference for the production data of leather tannery units has been taken from the CLE export data and data reported by tanneries during field audit which has been further projected for the total operational tanneries in given clusters. Based on the past data and future growth from Economic survey of India and CLE, an 8% CAGR (Compounded Annual Growth Rate) is considered for production growth and subsequent energy profiling of the sector from 2023 to 2033. The specific energy consumption (SEC) for finished leather manufacturing has been calculated from various energy audits conducted in the Energy and Resource mapping assignment. The SEC data has been validated by the sectoral experts and various consultations conducted.

Based on the assumption of implementation level of different proposed energy saving measures, the following three scenarios are proposed:

I. Business-As-Usual Scenario – Present estimated specific energy consumption is projected till 2033 and the production level is projected with 8 % CAGR, to get the energy consumption.
II. S1 Scenario – Saving Potential of ~30 % considered with subsequent reduction in projected SEC till 2033 by considering the same BAU production growth.
III. S2 Scenario - Saving Potential of ~37 % considered with subsequent reduction in projected SEC till 2033 by considering the same BAU production growth.

**Projections of energy-saving potential:**

Based on the consideration of implementation level of the proposed energy-efficient technologies and projection of production, the energy consumption for different years is tabulated below for complete sector:

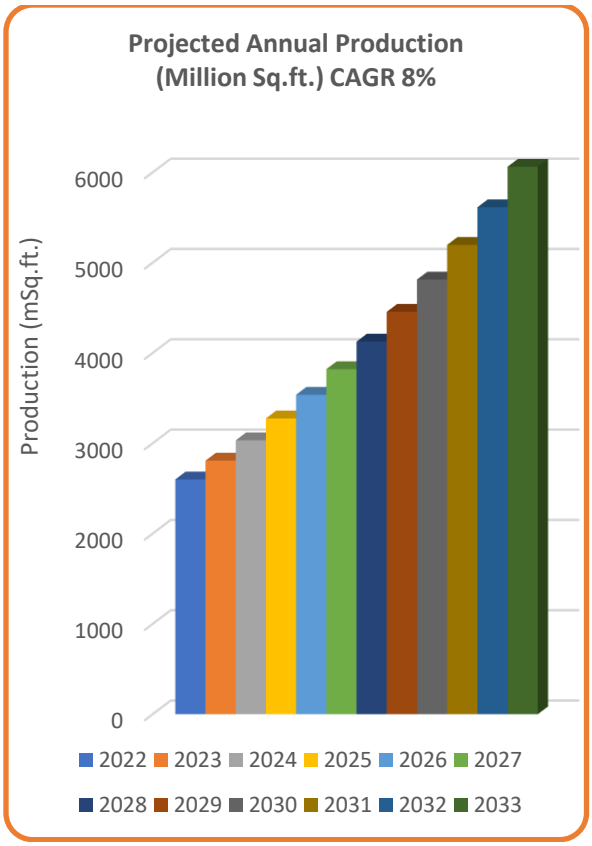



Figure 48: Projected Production FY 2022-33

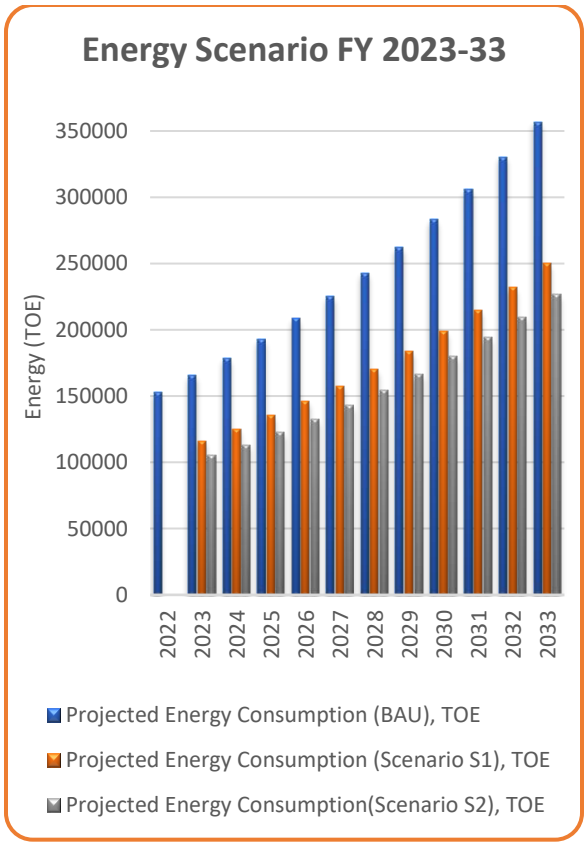



Figure 49: Energy Consumption Scenario FY 2023-33

Table 21: Sectoral Energy Consumption Projection

| Year | Projected Annual Production (Million Sq.ft.) | Projected Energy Consumption (BAU), TOE | Projected Energy Consumption (Scenario S1), TOE | Projected Energy Consumption (Scenario S2), TOE |
|---|---|---|---|---|
| 2022 | 2,600 | 153,080 | -- | -- |
| 2023 | 2,808 | 165,326 | 115,930 | 104,916 |
| 2024 | 3,033 | 178,552 | 125,204 | 113,309 |
| 2025 | 3,275 | 192,837 | 135,221 | 122,374 |
| 2026 | 3,537 | 208,263 | 146,039 | 132,164 |
| 2027 | 3,820 | 224,925 | 157,722 | 142,737 |
| 2028 | 4,126 | 242,919 | 170,339 | 154,156 |
| 2029 | 4,456 | 262,352 | 183,966 | 166,489 |
| 2030 | 4,812 | 283,340 | 198,684 | 179,808 |
| 2031 | 5,197 | 306,007 | 214,578 | 194,192 |
| 2032 | 5,613 | 330,488 | 231,745 | 209,728 |
| 2033 | 6,062 | 356,927 | 250,284 | 226,506 |

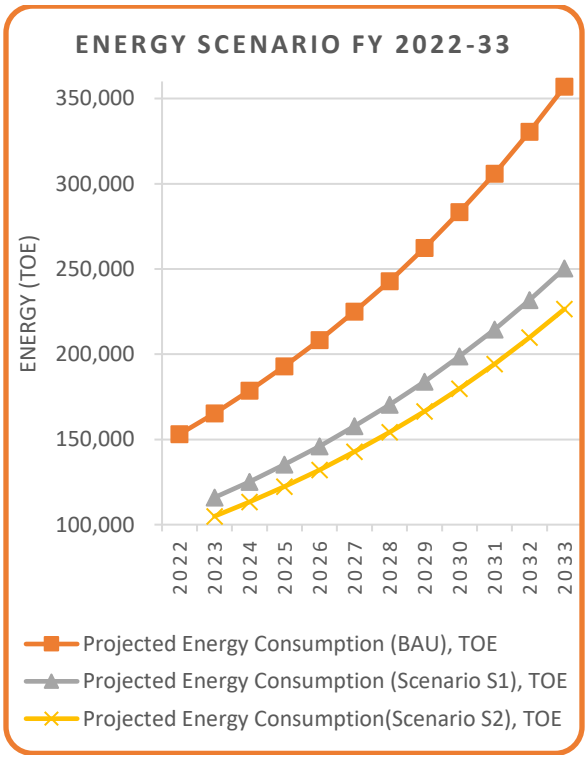



Figure 50: Energy Projected (BAU,S1 & S2 Scenario), FY 2022-33

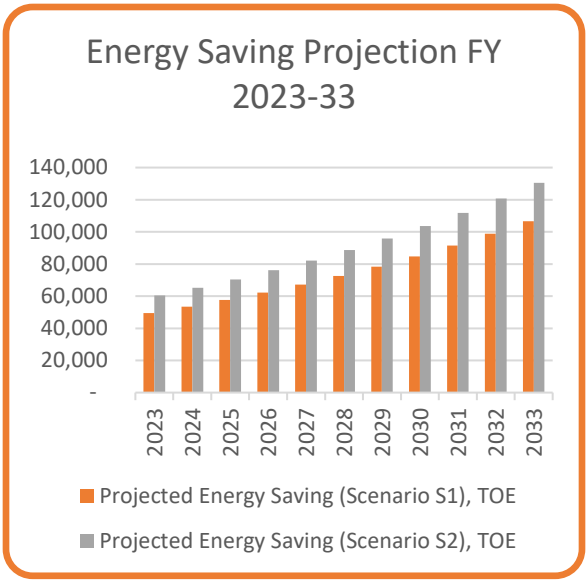



**Figure 51: Energy Consumption Projected (BAU, S1 & S2 Scenario), FY 2022-33**

**Observations: The energy consumption is expected to increase linearly w.r.t. the growth in production with BAU SEC. The energy consumption of the sector is expected to reduce significantly despite the growth of production rate due to the lower SEC in S1 & S2 scenario based on the energy savings measures implementation. Approx. 30 % and 37 % saving potential exist in the sector w.r.t. the BAU 2022 scenario for S1 & S2 scenario respectively.**

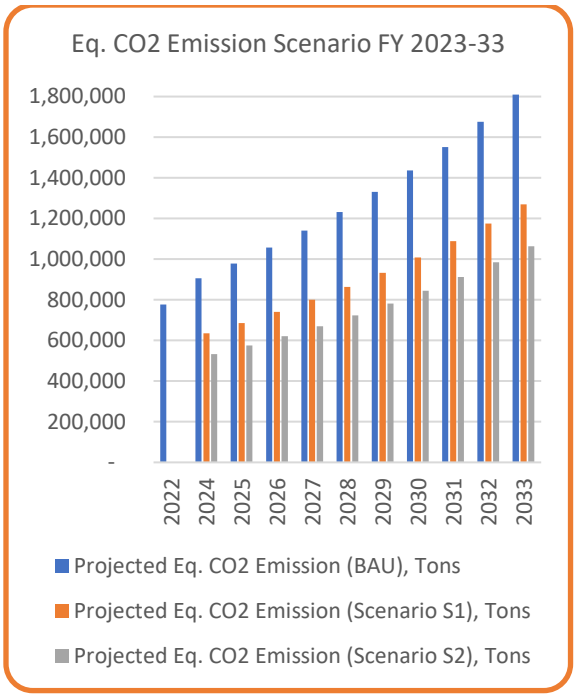



**Figure 52: Eq. $CO_2$ Emission Projected (BAU,S1 & S2 Scenario), FY 2022-33**

**Observation: The above graph compares the projected $CO_2$ emission for Business as usual (BAU) vs with implementation of two options of energy conservation measures.**

### Projections of energy-saving potential:

Based on the consideration of implementation level of the proposed energy-efficient technologies and projection of production, the $CO_2$ emissions for different years are tabulated below on the basis 5.4 & 6.6 Lakh tons of eq. $CO_2$ saving potential in S1 & S2 scenario respectively, for complete sector:

**Table 22: Sectoral Emission Projection**

| Year | Projected Annual Production (Million Sq.ft.) | Projected Eq. $CO_2$ Emission (BAU), Tons | Projected Eq. $CO_2$ Emission (Scenario S1), Tons | Projected Eq. $CO_2$ Emission (Scenario S2), Tons |
|---|---|---|---|---|
| **2022** | **2,600** | 776,438 | | |
| **2023** | 2,808 | 838,553 | 588,010 | 532,146 |
| **2024** | 3,033 | 905,637 | 635,051 | 574,717 |
| **2025** | 3,275 | 978,088 | 685,855 | 620,695 |
| **2026** | 3,537 | 1,056,335 | 740,723 | 670,350 |
| **2027** | 3,820 | 1,140,842 | 799,981 | 723,978 |
| **2028** | 4,126 | 1,232,109 | 863,979 | 781,896 |
| **2029** | 4,456 | 1,330,678 | 933,098 | 844,448 |
| **2030** | 4,812 | 1,437,132 | 1,007,746 | 912,004 |
| **2031** | 5,197 | 1,552,103 | 1,088,365 | 984,964 |
| **2032** | 5,613 | 1,676,271 | 1,175,435 | 1,063,761 |
| **2033** | 6,062 | 1,810,372 | 1,269,469 | 1,148,862 |

# Chapter 6: Policy Recommendation & Way Forward Path

## 6.1 Introduction:

The Indian Leather Industry has seen a substantial growth due to the relevant government support by means of wholistic approach-based policy interventions. Since the era of globalization, there is an immense opportunity for Indian Leather Industry due to rapid growth in demand for finished leather & goods in Europe & America continents. Keep this demand on their mind, the government of India under a number of programs for leather sector to improve ease in doing business, such as tax incentives, cluster development program, research & development program to develop the indigenous process technology to enhance the productivity and to cater the environment challenges, pilot projects, dissemination of sectoral best practices, policy provisions for purchasing the imported process machinery etc.

There were various limitations in the past for SME units and those limitations were directly/indirectly responsible for sluggish SME's business & growth. To eliminate these limitations, government has taken several important steps such as de-license the leather manufacturing sector, allowed 100% Foreign Direct Investment (FDI) & Joint Ventures (JVs), provision of subsidies on imported process machineries etc. However, these steps were not sufficient for fueling the growth of leather sector; there is very small growth in leather production capacity, primarily due to the sector's inability to attract the potential FDI & JVs and transfer of technology.

It is evident that the existing Govt. regulations and policies for Leather Sector are focused on foreign trade & business oriented and these are not integrated with subject matter of energy conservation & efficiency and increase in productivity using new technology. Making a leather tannery segment energy efficient in order to compete with the global leather tanning industry, by addressing the issues of technology upgrade along with addressing the concerns related to environment and sustainability, is a complex and challenging task. But at the same time the potential benefits are significant in terms of cost savings, environmental impact, and sustainability. Discussion & quantification of these complexities and the associated challenges are the base for Sectoral Policy Recommendations, which are based on the inception works, Stakeholders consultations and Field visits for Energy Audits. The barriers and challenges in following the energy efficiency path for Indian Leather Tanning Segment are summarized in subsequent sections of this chapter.

## 6.2 Key Challenges

Making leather tannery segment energy effective is a complex and challenging task, but the potential benefits are significant in terms of energy cost savings, environmental impact, and sustainability. Some relative roadblocks and challenges are cited as below:

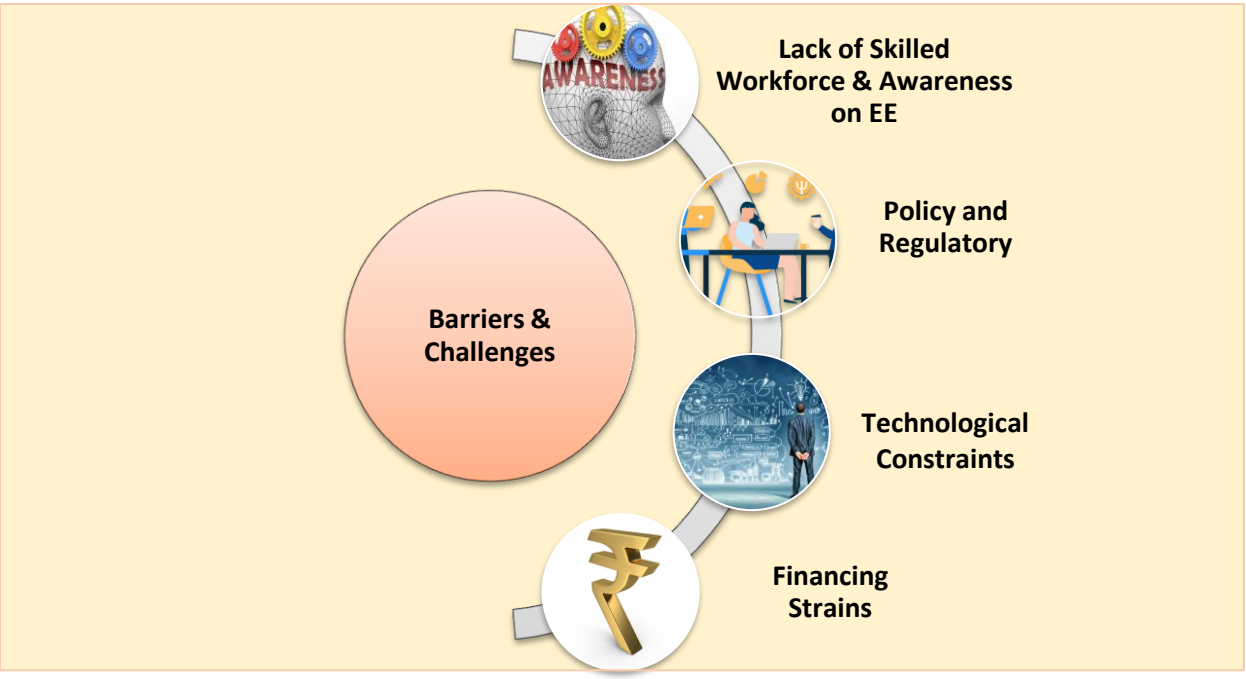



Figure 53: Key areas of Challenges in follwing EE path for leather sector

To overcome these barriers and challenges, it is essential to raise awareness about the benefits of energy efficiency, promote supportive policies and incentives, invest in research and development for innovative technologies, and facilitate access to financing and technical expertise. Collaboration between governments, industries, and communities can also play a crucial role in driving successful energy efficiency projects.

### 6.2.1 Low Sentient on Energy Efficiency

Many of the Tanneries run on business-as-usual basis and mostly in medium & small tannery unit owners are busy in dealing with the routine issues, thus do not focus on technological improvements or improving the efficiencies of the process, majorly due to the unwillingness to do so. Also, most of the workforce in the tannery unit operation is part of unorganized workforce and have come up from lowers rugs of tannery workers and many of them are not even literate which is one of the prime reasons behind the inefficient operation due to lack of awareness about EE operation. Therefore, medium & small tannery units do not operate the tannery at par with the latest developments in the sector. Thus, skill development and spreading awareness about Energy Efficiency is at the root of Technological development and improving the acceptability of Energy Efficient processes and machines.

### 6.2.2 Policy & Regulatory Framework

Leather manufacturing has significant environmental impacts and sustainability challenges. Some of the main environmental concerns associated with leather production include the use of hazardous chemicals, high water usage, air and water pollution etc. An efficient way of tannery operation can help the industries to minimize the environment impact. To address these challenges, several government policies are in force

for Leather Tanning Sector in India, but these policies are coupled with the mandatory/voluntary role of energy efficiency in the sector. Thus, an integrated policy & regulatory framework needs to be enforced, which addresses the sustainability, ease of doing business, energy efficiency, and environmental impact conjointly. Some of the present policy related barriers are highlighted as below

- Electricity Regulatory Tariff Policy of northern-Central-Eastern region, the electricity tariff are higher for industrial units and have no provision for duty exemption, incentives or exemption in tariff, Net Metering Policy for Renewable energy consumption by tannery unit.
- Sectoral policies such as Foreign Trade Policy, Indian Leather Development Program (ILDP), Leather Mega Cluster Development Program, International Corporation Scheme etc., are business-oriented or export promotion related policies/programs. The provision of energy conservation & efficiency in Tanny unit operation such as, Energy Consumption labelling, Machinery based energy efficiency standards, conducting energy audit on regular basis, mandatory installation of 4/5 star electrical appliances etc., are not addressed in sectoral policy/program, so far.
- Provision of tax incentive, tax rebate, cross-subsidy on EE projects not laid down for leather sector

### 6.2.3 Technological Challenges

In Tannery business, manufacturing the finished leather have various technological challenges specially with the unorganized tannery units operating at a medium & small-scale level. The larger tannery units are organized and have better pro-active approach to use the advance version/ newer Indigenous or imported machinery in leather manufacturing process whereas medium category units have mix of imported and Indian made machineries and rate of upgradation rate is low. Whereas, the smaller units, are running their operations with old/outdated and second-hand machinery and are not willing to upgrade the machinery and skill development of their workforce. These are the major technical barriers observed in the clusters. These barriers need to be addressed by means of top-to-bottom approach, to make the cluster tannery unit operation more efficient and sustainable. The key challenges related to technology are listed are below:

- Insufficient knowledge about the updated or state of art efficient technology.
- Tendency to focus on production based monetary assessment rather than productivity based monetary assessment which results in ignorance in energy cost benefit analysis.
- Absence to Energy Monitoring & Control system (Digital/Manual), Absence of frequent Energy Audit of the Tannery Unit which leads to inefficient unit operation without knowledge.
- High Initial Capital Demand for EE machinery compared to that of old used machines and locally sourced old technology based third-party machinery.
- Availability and Retention of skilled manpower to operate the EE Imported Machinery.
- Challenges related to new EE Machinery Procurement & Installation – No Energy Efficiency Norms.

### 6.2.4 Financial Challenges

Installing a new energy efficient technology, comes with other associated costs such as installation cost, operator's cost, Maintenance & Spares Inventory cost, Training cost, administrative overhead expenses, unit's own capacity to invest, etc. Due to all these implications, investing capital on EE project is not an

easy pathway for any tannery unit except for the tannery units which are financially sound and have anticipated thinking about the impact of energy efficiency on their day-to day business. In continuation of this, some of the financial barriers are mentioned as below:

- Lack of capital/ funds with medium and small category of Tannery Units.
- Need for financial mechanism for funding the EE projects through National & SME level banking institutes.
- Low confidence among the Financial Institutes to fund the EE projects due to their performance risk and complexity in estimated energy savings followed by monetary savings.
- Low Replication and Adoption Rate of EE projects which built a low-pitched confidence among the SME sector for investment in EE projects.

The above listed sectoral challenges are in brief only, a detailed action plan is required to address all possible financing challenges in Leather Sector. This requires effective & integrated policy framework that will lay down a result-oriented path for implementation of EE technologies to make the leather tannery segment an efficient one, to compete with the global player and be self-sustainable. Further, to overcome these barriers and challenges, it is essential to raise awareness about the benefits of energy efficiency, promote supportive policies and incentives, invest in research and development for innovative technologies, and facilitate access to financing and technical expertise.

## 6.3 Integrated Policy Framework

An Integrated Policy Framework covering the Regulatory, Institutional, Financial, Capacity Building, Knowledge Sharing and Market based policy interventions is recommended for Leather Tanning Sector to address the above-mentioned various challenges. The timeline for each of the proposed intervention is arranged into three time-spans (a)Short Term: - within 3 years (b) Medium Term: - 3 to 5 years and (c) Long Term: - 5 to 10 years. The detailed recommendation as follow:

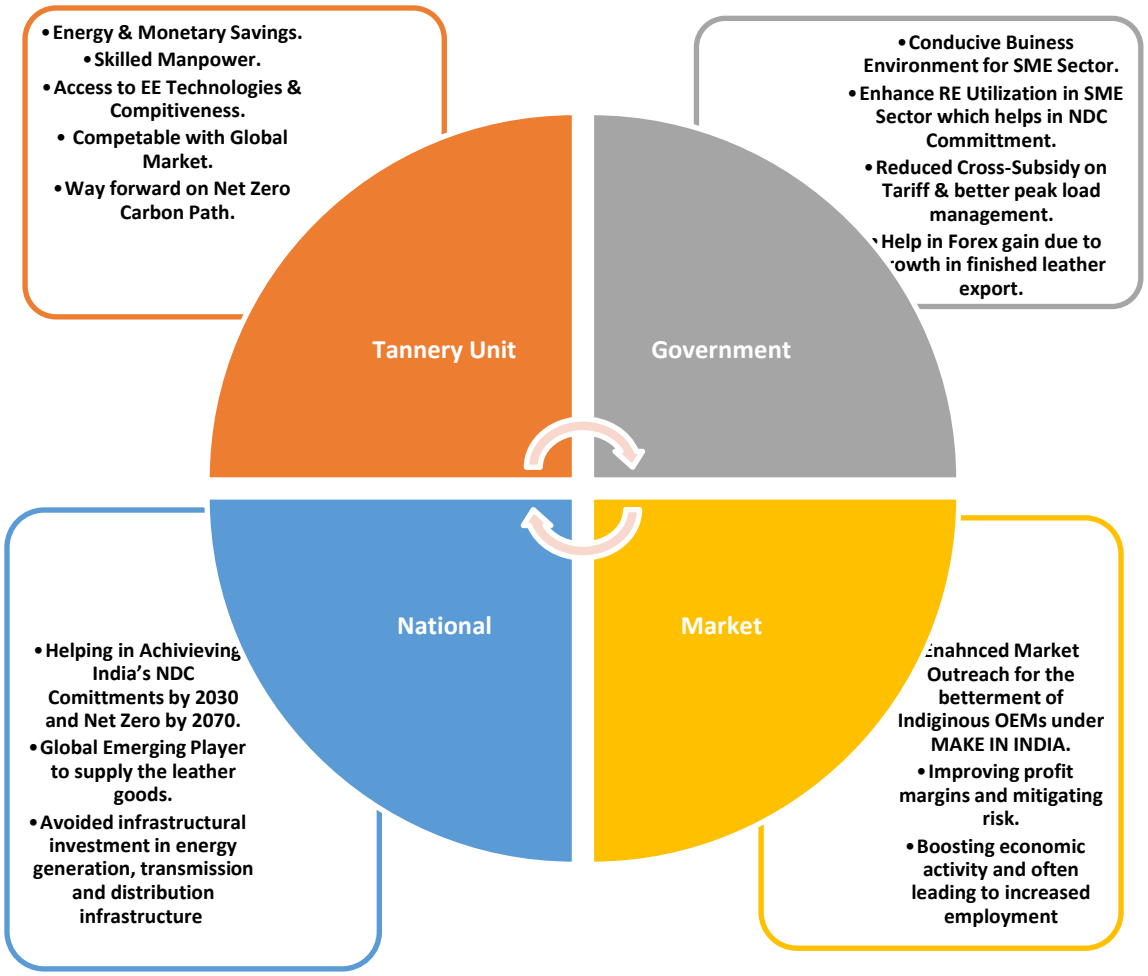
**Table 23: Policy Recommendation**

| Policy Orbit | Policy Intervention | Time Line |
|---|---|---|
| **Regulatory** | Energy Efficiency performance-based incentive scheme for Tannery Segment on Voluntary basis | Long Term |
| | National level Technological interventions- Drum Replacement, Heat Pump Installation, IR based heating, Pole Drying system. | Long Term |
| | Setting up of Solar Park at Cluster Level | Long Term |
| | Net Metering Tariff Policy in SME Clusters to promote the RE Interventions | Medium Term |
| | Incentivising use of Solar Energy for Hot Water and Hot Air, for leather processing. | Medium Term |
| | Promote use of efficient Tanning technologies in the Leather Industry | Medium Term |
| | Promoting Energy Management System (EnMS) standards. | Short Term |
| **Institutional** | Inclusion of Energy Efficiency in MSME Cluster level development programs with support of SDA. | Medium Term |
| | Enhance the role of Associations | Short Term |

| Policy Orbit | Policy Intervention | Time Line |
|---|---|---|
| | Inclusion of Energy Efficiency in the Curriculums of Leather Technology Institutes. | Medium Term |
| **Financial** | Mapping of Sectoral EE technologies and consider in Energy Efficiency Financing Platform (EEFP). | Medium Term |
| | Strengthen the ESCO and Hybrid Model for financing the EE project in Leather Sector. | Medium Term |
| | Capacity building of Financial Institutes. | Medium Term |
| | Provision of tax incentive, tax rebate, cross-subsidy on EE projects. | Medium Term |
| | Capacity Building & Awareness Outreach Program on Energy Efficiency. | Short Term |
| **Capacity Building** | Assistance for Energy Audit on regular intervals through SDA & MSME-DI | Short Term |
| | Appointment of "URJA Mitra" for Leather Clusters | Short Term |
| **Market-Based** | Trading of Energy certificates. | Long Term |
| | Emission Trading Scheme | Long Term |
| **Promotion of Energy Efficiency** | To establish an Energy Efficient Tannery Unit with state of art technology | Long Term |
| | Scaling-Up of EE/RE Technology Implementation in Leather MSME Sectors | Medium Term |

In proposed integrated policy framework, each policy orbit will have distinctive and productive gains for energy efficiency in the leather sector. However, in present scenario, leather tannery units are confronting the major challenges related to the Financial, Environment, Human Resource and on Economic fronts. With the help of above stated policy orbits, these challenges will be addresses promptly followed by medium- & long-term policy orbits which will help the policymakers to conclude the terms & conditions for this integrated policy framework. The expected holistic benefits of proposed policy interventions at four major levels as follow:

**Win-Win for Stake holders'**




## 6.4 Role of Stakeholders:

The way forward path to make the leather tannery segment an efficient industry under the ambit of proposed Integrated Policy Framework, can be implemented at three levels (a) Cluster Level (b) State Level and (c) National Level where at each level, the roles & responsibilities of stakeholder to be defined to further distributed to make the contributive environment.

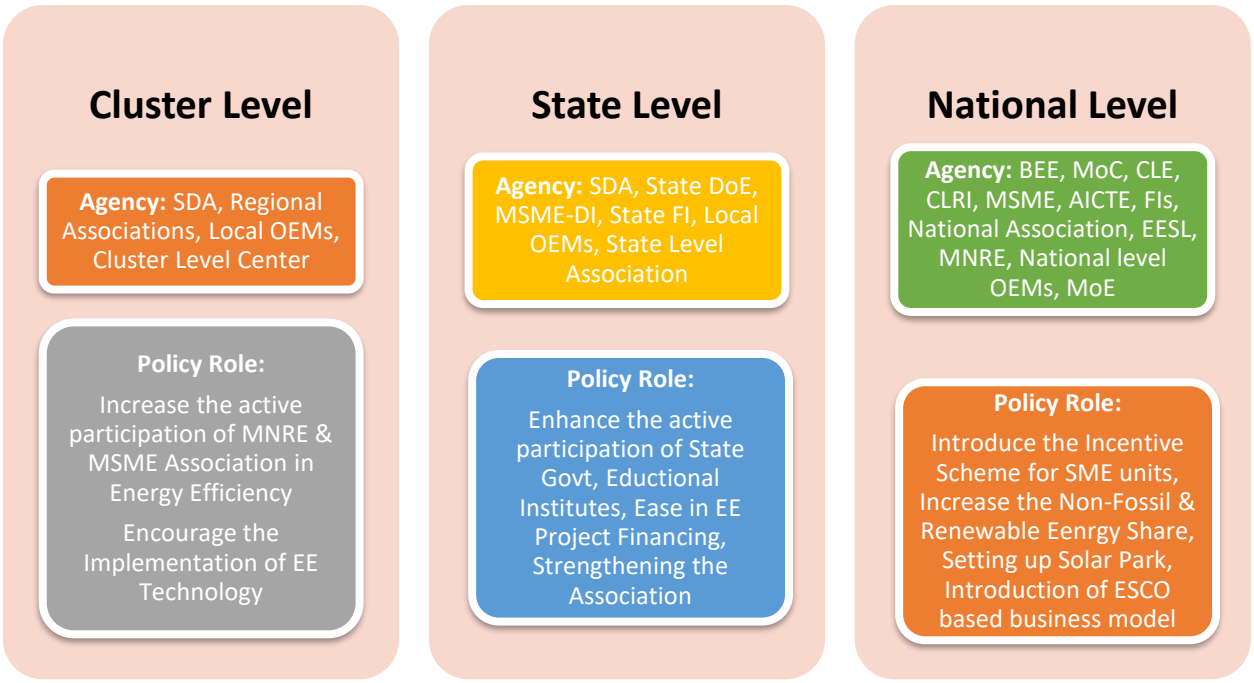



**Figure 54: Role of Stakeholders**

## 6.5 MAPPING OF POLICY FRAMEWORK

The mapping of proposed Integrated Policy Framework is required to identify the sectoral driven policies and generic policies which may applicable to other similar MSME/SME sectors also. This kind of mapping will not only accelerate the implementation of new policies for improvement in sectoral energy, production & emission profile but also provide a result-oriented pathway for existing sectoral polices.

Since, the leather tannery sector is one of the promising sector for enhancing the nation's export earnings; the mapping of this policy framework will improve the Leather Tanning Segment in terms of Skill development, Energy efficiency of machines, Energy & Emission reduction, Increase in productivity, Clean fuel penetration in the sector, capacity building & awareness about Energy Efficiency, Strengthening the OEMs network in India, promotion of ESCOs based project development model, improved competitiveness in global market etc.

### 6.5.1 Energy Performance linked Incentive Scheme (EPLIS) for Tanneries

Perform, Achieve & Trade is a successful scheme by BEE for large industries for reduction of specific energy consumption and award of tradable E-certs for excess energy savings. Similar scheme for voluntary participation may be devised for MSME/SME Sectors, with the support of sectoral associations, CLE, State government & SDA, for fixed no. of years, to incentivize Energy Efficiency improvement, by the Tannery units in Leather Sector.

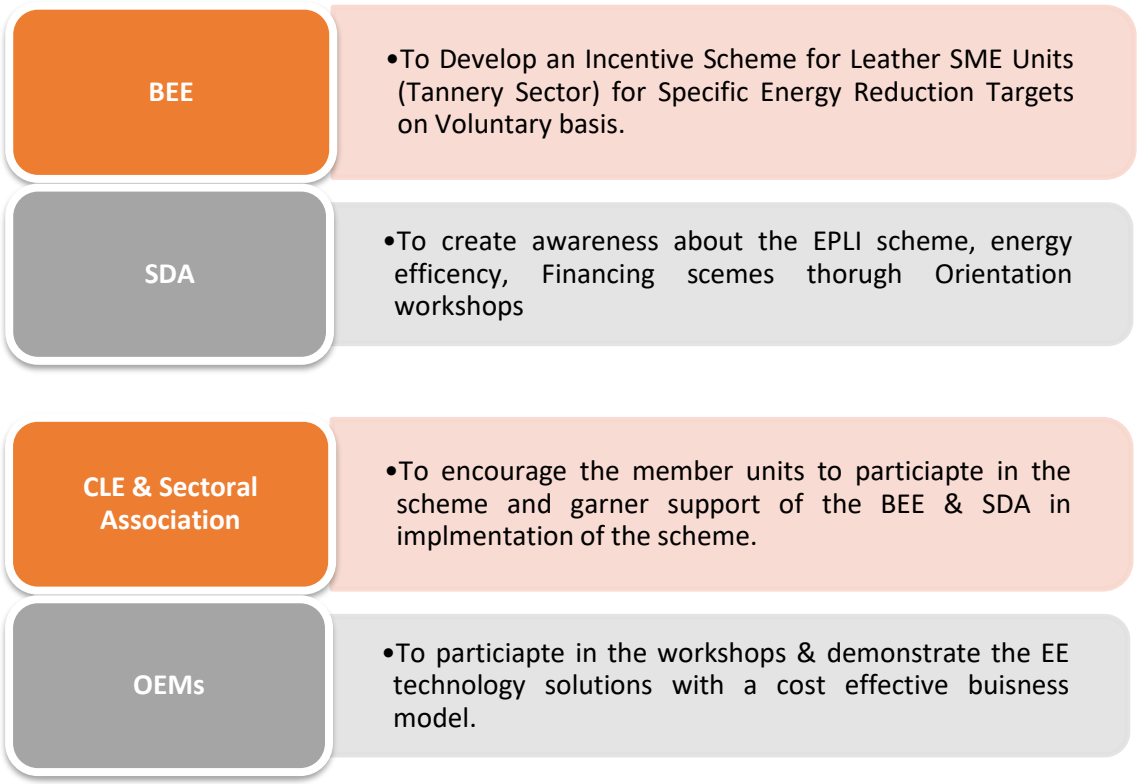
Based on "Energy & Resource Mapping Study in Leather Sector", an estimated energy saving potential of the sector is about **29 % and 37 %** in Moderate & Aggregative energy saving measures in the sector. To capture this saving potential, the EPLI scheme may be implemented without the mandatory energy

reduction target followed by incentivizing tannery units as per the energy performance evaluation from the baseline year performance.

**Key Benefits**

- Leather Tannery Segment will improve specific energy consumption followed by monetary gain due incentives & savings in energy cost.
- Faster spreading of awareness about energy efficiency in the sector and quicker adoption of EE projects, Best Operating Practices, Competitive business environment for all stakeholders, attract more investment and employment generation in the sector.

**Roles & Responsibilities of Stakeholders**




### 6.5.2 National level Technological interventions Programs for Technology upgrade

Drum Replacement Program (NLDP), Programs for Heat Pump Installation, IR based heating and Pole Drying system.

Majority of the energy usage in a tannery are for Mechanical operation of machines and Thermal Energy for heating and drying applications. Using of improved machines as mentioned above will result in saving of both Electricity and Fuel.

#### 6.5.2.1 Replacement of Wooden Drums with Polypropylene Drums (PP Drums):

Conventionally wooden drums have been in use for Tanning and Dying operations in India in almost 80 % of tannery units. The prime reason of its presence in the tannery operation is its cost & local supply &

service network. However, the wooden drum-based operation is energy-water-chemical-grain loss intensive in nature. The most optimal replacement of these drums is "Polypropylene Drum" which are commercially available in the market. The polypropylene drum have advantages over the wooden drum such as less energy, water, chemical consumption, reduced process leather loss, better control of float temperature, more load per processing cycle etc. Typically, wooden drums of average capacity use 45 KW motor for 200 kg of hide load in one cycle whereas the same hide load can be catered with a smaller 15 KW motor in the case of a PP Drum, due to its light weight & structural engineering advantages over the wooden drum. Based on the Detailed Energy audit result, it is note that by switching over to PP Drums approx. 12,000 kWh of Electrical energy can be saved annually in one drum replacement. Thus, replacement of wooden drums with PP drums has a gross energy saving of potential of about **58.75 million kWh** (considered average 3 drums in each of 1632 tannery units) and approx. **546 million rupees/annum** (considered avg. price for energy 9.29 Rs/units).

However, a capital investment of about Rs. 4500 million. will be required to replace the wooden drum at national level. Considering the investment required, energy and monetary saving potential in the tanning segment, a national level drum replacement program NLDRP is recommended for leather sector on the same line as EESL's national program to replace the inefficient old motors with IE3 motors through favorable business models and awareness creation. This Drum replacement program will bring the energy efficiency in the sector as well as lower down the manufacturing cost of polypropylene drums due to the lower gap in supply & demand.

**Key Benefits of PP Drums**

- Ease in installation of Polypropylene Drums in phases through favorable business model with an attractive payback period.
- Increase in process reliability, less O&M Cost, Improved cost of operation.
- Lower Effluent discharge due to controlled and optimal use of water and chemicals

**6.5.2.2 Program for Installation of EE Machines / Equipment – Heat Pumps, IR Heating, Pole Drying**

In tanning operation, hot water (55 – 65 ℃) is required in the process tanning drum. To cater this thermal load, tanneries use the coal/wood fired low pressure steam boilers / Thermic Fluid Heaters. In the context of replacement of these boilers with the clean technology, Heat Pump is the most feasible option to do the job. Based on audits at site, it is estimated that in a typical tannery unit **approx. 223 million kCal energy and Rs. 6 lakh monetary savings** are possible which sounds a promising path to implement the Heat Pump Installation program at national level.

Heat Pump installation to replace the fossil fuel boilers will require a capital investment of about **Rs. 800** million in Indian tannery segment. Considering the investment required, energy & monetary saving potential in the tanning segment, a national heat pump installation program is recommended for leather sector on the same line of EESL's national program. This replacement program will bring the energy efficiency in the sector as well as lower down the manufacturing cost of Heat Pump due to the minimum gap in supply & demand.

Heat (thermal energy) is used for raising the water temperature for chemical processing and attaining the desired quality and properties of leather. However, the use of thermal energy is majorly for drying applications pre and post spray painting. Natural hanger conveyers are used by most of the tanneries for

partial drying, depending on the time of the year. For larger units with higher level of production natural drying is not practical and drying is performed using high temperature steam, which is passed through radiators backed with fans for drying of leather; the process has low efficiency. Use of IR heating and Pole drying are more energy efficient and can altogether replace the use of Boilers.

**Key Benefits**

- Ease in installation of Heat Pump in phases through favorable business model with an attractive payback period.
- Heat pumps, IR Heating and Pole Drying can be installed in smaller area and minimal modifications.
- Heat pumps can potentially eliminate use of fossil fuel.
- Increase in process reliability, less O&M Cost, Improved cost of operation, reduction in energy cost.
- IR heaters and Pole dryers are more efficient in terms of energy usage, quick start stop cycle, eliminate handling of coal/ wood and exhaust gases.

**Roles & Responsibilities of Stakeholders**

| | |
|---|---|
| EESL | •To initiate the programs for Leather Tannery Segment Units for replacement of old inefficient machines with upgraded Technologies. |
| BEE | •To coordinate with EESL and SME Leather Units through SDA for Smooth implementation. |
| CLE & Sectoral Association | •To encourage the member units to particiapte in the scheme and support the BEE & SDA in implmentation of the scheme. |
| OEMs | •To particiapte in the program & demonstrate the benfits of Energy Efficent Technologies with a cost effective buisness model. |

### 6.5.3 Setting up of Solar Park at Cluster Level

During the field study across the leather clusters in India, it is observed that all the clusters have common effluent treatment plants to treat the tannery unit effluent, in order to comply with the State Pollution Control Board norms. Because of the cost and space constraints it is not feasible for individual tannery to have an inhouse CETP for effluent treatment, thus the route of common collective / Common CETP is most viable. These CETPs can use Solar Power Plant at Cluster level, to reduce use of Grid Power and switch to cleaner energy; besides saving cost of energy and cost of Effluent Treatment.

Further, Solar Power plant at cluster level can also cater to the electricity requirements of the tannery units, thus help the tanneries in reducing their carbon footprint as well. During meetings at site with sectoral associations and eminent tannery units, one of the major recommendations was, 'establishment of Solar Park at cluster level in collaboration with the Tannery Business Associations.

BEE, MNRE & CLE joint effort will be required to establish the Solar Park at Cluster level such as cross-linked capital subsidy facilities for inclusion of Solar Park setup in the leather cluster. On the basis of assessment during the study, the sector has approx. **40 MW Solar Power** Demand including the CETP load.

**Key Benefits**

- Reduction of Leather Tannery Unit carbon footprint and move towards green energy.
- Enhance renewable share in Energy mix which leads to the monetary savings as well.

**Roles & Responsibilities of Stakeholders**

| | |
|---|---|
| BEE | •To recommend the MNRE about the techno-economic viability of installation and operation of Solar Power in remote state location for supplying the power exclusively of leather cluster in the state in consultation with CLE and Leather Sectoral Associations. |
| MNRE & CLE | •To develop a suitable policy with business model to establish the solar power plant at cluster level.<br>• CLE: To assist the BEE and MNRE in implementation at cluster level. |

### 6.5.4 Net Metering Tariff policy in MSME clusters to promote the RE Interventions.

As per State Solar Policy – "Net Metering" means the methodology under which electricity generated by the Rooftop/Ground mounted Solar PV System setup in the premises of a consumer, under the CAPEX/RESCO mode, is primarily for self-consumption, and the surplus generated electricity, if any, is delivered to the distribution licensee which will be off-set against the electricity supplied by the distribution licensee to the consumer during the billing cycle. However, the net metering policy is no more applicable to MSME private Units.

During the field survey under this study, it was observed that 'ample potential is available for Solar Power Generation with-in Tannery Boundaries, proficiently in northern state leather cluster like Uttar Pradesh and Punjab'. However, the Net Metering Tariff Policy is not in applied for leather tannery units in northern states due to which tanneries have low confidence to install the roof-top solar power plant in CAPEX/OPEX mode. This Net Metering tariff policy should be considered for leather SME units also inline to other category of DISCOM consumers in the state. This will boost the investment in SME sector for renewable power as well as accelerate the off-grid solar power plant installation.

**Key Benefits**

- The surplus generated electricity, if any, is delivered to the distribution licensee which will be off-set against the electricity supplied by the distribution licensee to the consumer during the billing cycle which will result a gain in energy & monetary savings.
- Create a positive & promising path towards decarbonization of leather sector.

**Roles & Responsibilities of Stakeholders**

| | |
|---|---|
| MNRE | •To enforce the Policy for off-grid based Solar Power Plant for any individual entity by means of which entity can net-off the excess solar power also which will promote the renewable energy share at user end. |
| SERC | •To prepare and enforce the Net Metering Tariff Policy for SME Unit based consumers. |
| BEE | • To recommend the suitable policy intervention to MNRE and coordinate with SERCs through SERC to implement the same. |

### 6.5.5 Incentives for using Solar Energy for Hot Water and Hot Air, for leather processing.

For minimizing the use of Fossil Fuels to generate thermal energy for different parts of leather processing, Solar Energy can be used for Heating and Drying applications in Tannery units.

In tanning operation, hot water (55 – 65 °C) and hot air is required in the process tanning drums and Auto Spray booths respectively. To cater to these thermal loads, tanneries use the coal/wood fired low pressure steam boilers / Thermic Fluid Heaters. Bulk of this requirement can be met using solar water with insulated hot water storage tanks and Air heating to supplement the leather drying hot air requirement. Based on audits at site and as per feedback of the Tannery units that are already using Solar Energy for Heating and Drying applications, it is estimated that in a typical tannery unit **approx. 566 million kCal energy and Rs. 24.7 lakh monetary savings,** per annum, are possible with proven Solar Water and Air heating

technologies. Thus, installation of Solar Water Heating and Air Heating units can be undertaken on a program mode at national level. Use of Solar Energy to replace the fossil fuel fired boilers/ THFs will require a capital investment of about **Rs. 5000 million**. Considering the investment required, energy & monetary saving potential in the tanning segment, a national Solar Water and Air heating plants' installation program are recommended for leather sector on the same line of EESL's national program to replace the inefficient technologies/ machines through favorable business models and awareness creation. This replacement program will bring the energy efficiency in the sector as well as lower down the manufacturing cost of Solar heating appliances due increase in demand.

**Key Benefits**

- Solar Energy tapping can be done using the spare rooftop space or spare land area available with many Tanneries.
- Solar Air and Water heating can potentially eliminate use of fossil fuel.
- Increased reliability, less O&M Cost, Improved cost of operation, reduction in energy cost.
- Emission reduction and lower carbon footprint of Tannery process.

**Roles & Responsibilities of Stakeholders**

| | |
|---|---|
| EESL | •To initiate the programs for Leather Tannery Segment Units for Installation of Solar Energy use. |
| BEE | •To coordinate with EESL and SME Leather Units through SDA for Smooth implementation. |
| CLE & Sectoral Association | •To encourage the member units to particiapte in the scheme and support the BEE & SDA in implmentation of the scheme. |
| OEMs | •To particiapte in the program & demonstrate the benfits of Energy Efficent Technologies with a cost effective buisness model. |

### 6.5.6 Promote use of efficient Tanning technologies in the Leather Industry

In India, approx. 800 nos. of unorganized small category of tannery units that are in operation. In these units inefficiencies exist at machine level due to the use of old second-hand inefficient process machinery, old & outdated utility equipment's such as motors, compressors, pumps etc. To bring energy efficiency to the small tannery units and to contribute to mitigating Climate Change, supplying energy-efficient services and products, sector specific schemes are needed to promote the use of energy efficient process machinery for tanning purpose. This scheme(s) can be inline/ similar to the present SAATHI Scheme for Textile Power Looms sector. This initiative will also help to reduce the running costs and pass on the benefits to small tannery units to repay the amount incurred in adopting the energy-efficient equipment.

The proposed scheme for tannery units aims to promote the use of efficient tanning technologies in the small-scale tannery units to improve productivity, reduce the industry's environmental impact, and enhance the sector's competitiveness. The scheme will provide financial assistance to small-scale units to adopt efficient technologies by means of proposed subsidy in the capital cost of the technology.

The scheme will also have a monitoring and evaluation mechanism to ensure the adopted technologies are used efficiently and effectively. Under the proposed scheme, the implementing agency will procure energy-efficient Process machinery under MAKE in INDIA including the utility equipment and same will then be provided to the small tannery units at no upfront cost.

**Key Benefits**

- Increase the productivity and efficiency of small-scale tannery units, leading to higher output and better-quality products
- Reduction in environmental impact by reducing energy consumption, water usage, and greenhouse gas emissions.
- Cost savings for small-scale tannery units by reducing energy consumption and other resources.

**Roles & Responsibilities of Stakeholders**

| | |
|---|---|
| EESL | •To prepare the program to promote the use of efficient Tanning technologies in the Leather Industry to improve productivity, reduce the industry's environmental impact, and enhance the sector's competitiveness. |
| DPIIT | •To make a provision of subsidy for faster adoption of EE tanning process machinery/technology for leather sector. |
| BEE | • To recommend the suitable policy intervention to DPIIT and coordinate with EESL & SDA to implement the same. |

### 6.5.7 Inclusion of Energy Efficiency in the MSME Cluster Level with support of SDA

The Ministry of Micro, Small and Medium Enterprises (MSME), Government of India (GoI) has adopted the Cluster Development approach as a key strategy for enhancing the productivity and competitiveness as well as capacity building of Micro and Small Enterprises (MSEs) in the country. A cluster is a group of enterprises located within an identifiable and as far as practicable, contiguous area or a value chain that goes beyond a geographical area and producing same/similar products/complementary products/services, which can be linked together by common physical infrastructure facilities that help address their common challenges. The role of Energy Efficiency by means of awareness program, knowledge dissemination about the EE process technologies, best practices etc. are important areas which needs to be integrated under the cluster development approach.

The leather tanning segment has a potential scope of energy efficiency at unit level as well as at cluster level. The Existing infrastructure and services under MSME Cluster development program may utilize at leather clusters in Kanpur, Jalandhar, Pallavaram, Ambur, Vaniyambadi, Ranipet, Kolkata etc. and CETPs at each cluster.

**Key Benefits**

- To support the sustainability and growth of MSMEs by addressing common issues such as energy efficiency, improvement of technology, skills development, quality, market access, etc.
- To build capacity of MSMEs for energy conservation and efficiency.
- To create/upgrade infrastructural facilities in the new/existing Industrial Areas/Clusters of MSMEs for the given role.
- Promotion of low carbon/de-carbon manufacturing technology for the clusters.

**Roles & Responsibilities of Stakeholders**

| | |
|---|---|
| BEE | •To Share the EE interventions at clsuter level with MSME and Conduct the Capacity building & aware ness program at cluster level.. |
| MSME | •Incorporate the Leather Study outcomes at cluster level for implement the EE measures/interventions at cluster level developtment program including the promotion of EE/RE interventions. |
| SDA | • To support the BEE and MSME to ensure the incorporation of energy efficinecy under clsuter developtment program. |

### 6.5.8 Enhance the Role of Industry Associations in promoting Energy Efficiency

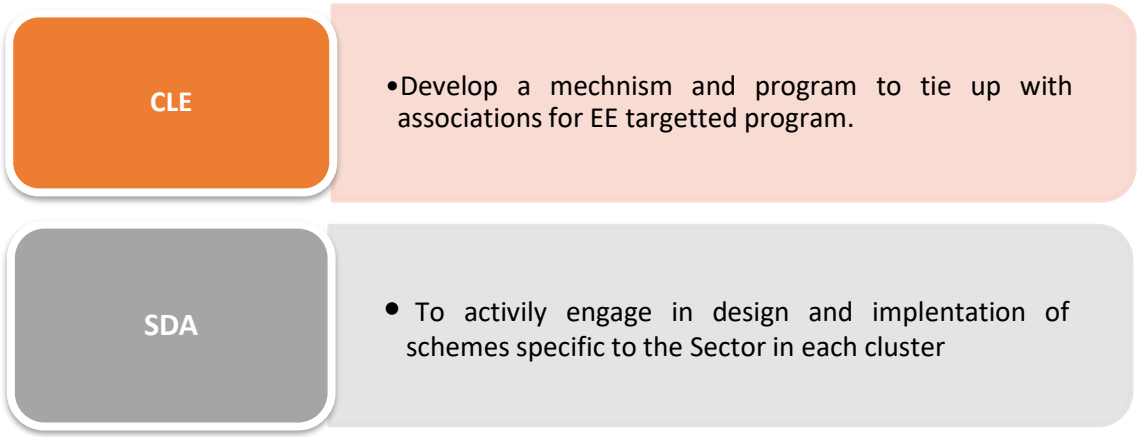
The Associations play a very important role in the Tanning and Leather processing industry and work in close coordination with CLE and CLRI at regional level. The association should be roped in for playing a

key role in implementation EE technology across all the tanneries in the clusters and beyond, for improving the efficiencies in tannery operations. Associations can play an important role in providing access to the OEMs and ESCO companies for higher penetration of EE technologies.

**Key Benefits**

- The role of MSME Associations can be leveraged to scale up energy efficient technologies
- Quick communication and easy reach out to MSME units.
- Accelerate the promotion of energy efficiency.

**Roles & Responsibilities of Stakeholders**




### 6.5.9 Inclusion of EE in the Curriculum of Leather Technology Institutes.

Energy efficiency has a promising role to reduce the sectoral energy cost, emission footprint, promotion of BATs, to create a competitive market, to achieve the global manufacturing practices etc. however, based on the site & file survey during this study, it has been observed that the role of energy efficiency is somewhat lesser known at the root level in tannery operation. The present level of all courses & training program is related to the general technical aspects only whereas the integration of these program with the knowledge of Energy Efficiency, BOPs, State of Art Technology, Role of Non-Fossil/Renewable source of energy etc. are time demand to compete in the global market for finished leather manufacturing.

All stakeholders require to pay attention to connect these missing dots in view to make a connecting path between the regular curriculum and energy efficiency. This step will help the sector to accelerate the EE adoption rate in a near future.

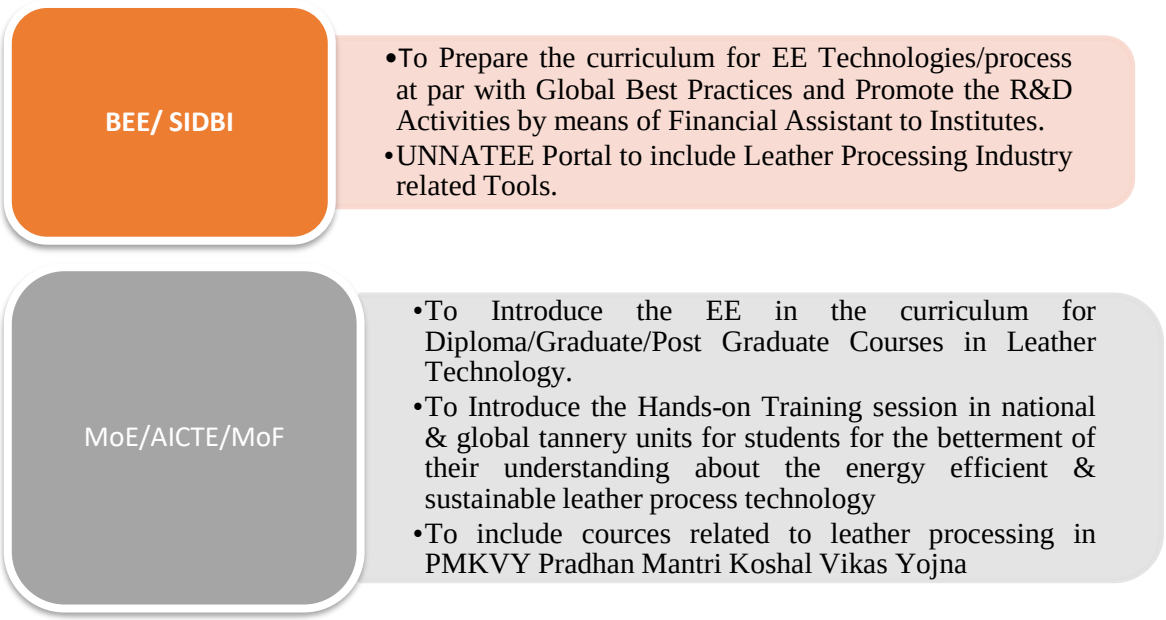
Leather Processing related Skill Development programs can be included under PMKVY and these programs can inter-stitch Energy Efficiency into the program to make EE integral part of the training and development of manpower.

**6.5.9.1 Development of Online Energy Audit Tool:** SIDBI's has Unified Navigation Tool on Energy Efficiency (UNNATEE) tools related to energy efficiency, and specific to different types of industries; on similar lines a tool for online-energy audit may be designed for Leather sector also for ensuring easy excess and encourage implementation by the Tannery units.

**Key Benefits**

- More awareness on energy efficiency among the young professionals and entrepreneurs taking Leather Manufacturing as carrier.
- Reduction in energy wastage and improvement in process efficiencies.
- A conducive environment at root level for efficient leather manufacturing process, keeping in view of global market demand.

**Roles & Responsibilities of Stakeholders**




### 6.5.10 Mapping of Sectoral EE technologies and consider in Energy Efficiency Financing Platform (EEFP).

BEE Energy Efficiency Financing Platform (EEFP) is meant to provide an interactive platform for OEMs, Financial Institutes (FIs), Project Developers (PDs), End user beneficiary Industries and other stakeholders etc. This platform helps in (a) implementing the identified Energy Efficiency projects in key industrial sectors (b) capacity building of FIs/PDs/OEMs/ESCOs/Industries and (c) enhance the awareness about the financing schemes to end user to accelerate the investment in the given industrial sector.

Under this platform, MSME units are also covered through SIDBI to promote the financing of EE projects. Since, the leather Sector is one of distinctive MSME sector from energy and national economics point of view, the inclusion of Leather Tannery by means of grading of EE projects in leather sector; will help the leather sector to adopt the EE technologies.

The process and Machines in the Leather Manufacturing process are in a sense unique and the EE project have both direct and indirect environmental impacts in terms of direct effluent and Carbon Foot print from the use of fossil fuels and Electrical Energy. The sector specific program with different modules may be designed to cover the following:

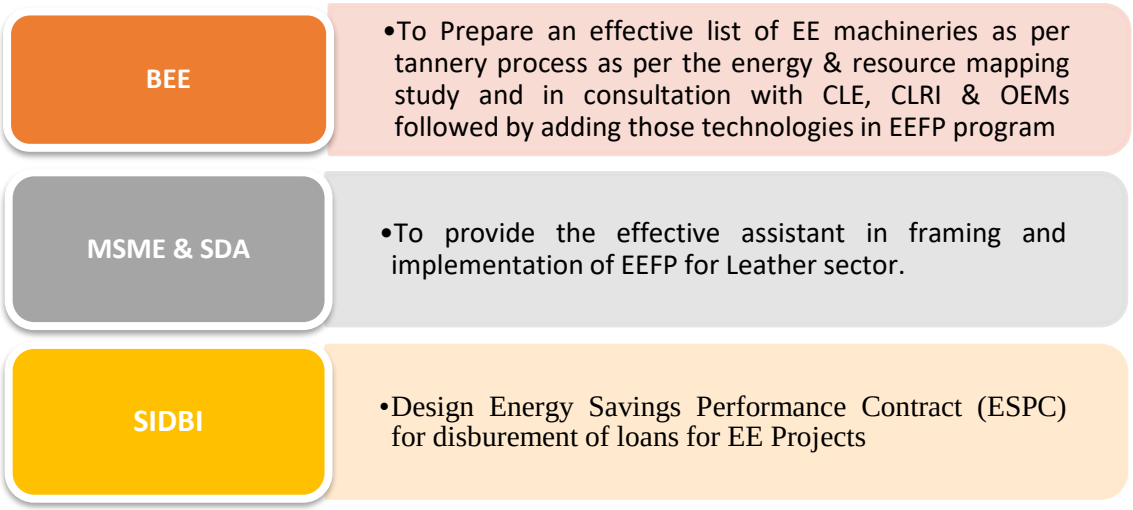
- Shift to Clean Energy (Use of low grade heat from Heat recover and use of Heat Pumps, in place of conventional Coal or Wood Fired Boilers and TGH)
- Use of Renewable Energy (Through Rooftop Solar PV Plants, Solar Air Heater and Solar Water Heaters)
- Use of new technologies to minimize waste generation and reduced water consumption.

Using the data provided in this report and the list of EE technologies provided in para below different financing modules can be designed for implementation of Energy Efficiency improvement proposals.

**Key Benefits**

- Grading of Energy Efficiency Projects for Leather Tannery Segment and awareness among the stakeholders for same.
- Ease in implementing the EE projects by PDs through SIDBI or FIs financing model.

**Roles & Responsibilities of Stakeholders**




### 6.5.11 Strengthen ESCO and Hybrid Model for EE project Financing in Leather Sector

The detailed energy audit exercise across the five clusters in tannery units has identified various Energy Conservation/Efficiency Measures (ENCONs) to reduce the tannery unit energy demand or dependency on fossil fuel-based sources. Based on stakeholder consultations, it was observed that the EE project adoption rate is low in the sector due to various reasons such as absence of institutional mechanism, financial business models, lack of awareness, high capital demand, absence of technical assistance, risk associated with the technology, lack of confidence among ESCOs to invest in EE projects for SME units, etc.

These challenges need to be addressed and strengthen the ESCOs along with favorable business model in collaboration with FIs by means of installation of Pilot projects which have better replication potential and conducting awareness workshops.

**Key Benefits**

- Create a conducive investment environment for EE projects and improve the ESCOs confidence as project developer for SME sectors.
- Co-Sharing model for tannery units, especially small tannery units where capital is a critical matter.

**Roles & Responsibilities of Stakeholders**

| | |
|---|---|
| BEE | •To conduct the round of workshops for Financial Institutes, ESCOs, Tannery Units, OEMs and others for making a conducive environment for financing the EE projects followed by parallel making of regulation for same. |
| SDA & ESCOs | •To play role of bridge between all stakeholders and to assist the BEE and Fis at state level.<br>•To provide the attractive buisiness plan under the ESCO and Hybrid business model to Tannery Units. |

### 6.5.12 Capacity building of Financial Institutes

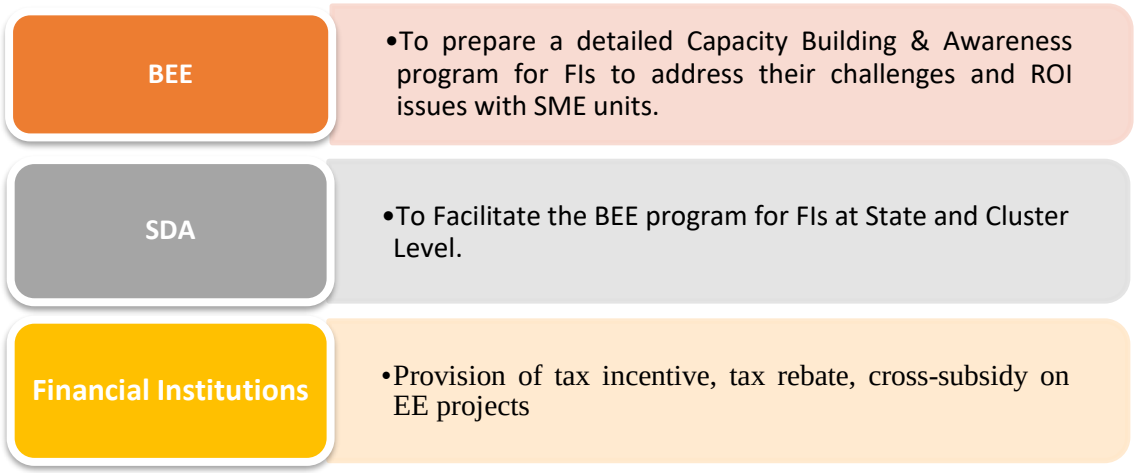
The process machinery and EE/RE interventions proposed under this study have high capital investment. The reasons behind this investment are the cost of imported machinery since the manufacturing facilities of all major & critical process machinery are limited in India, and tannery units use imported machines. The proposed EE/RE intervention are moderate in nature in terms of initial capital demand to implement the same.

With a view to make the provision of financing through FIs by means of soft loan, interest sub-intervention, project RoIs, Risk associated & mitigation measures etc., the capacity building of FIs are essential to build their confidence in implementing the EE/RE projects or in procurement of imported EE process machinery. Hence, it is recommended for capacity building of FIs, with the help of Indian Banks' Association, on Energy Efficiency Financing.

**Key Benefits**

- Create a conducive investment environment for EE/RE projects and improve the FIs confidence as project financer for SME sectors.
- Address investment challenges and ROI issues with SME units.

**Roles & Responsibilities of Stakeholders**




The SME Sectors in India is facing a significant challenge of doing the business in view to meet the current energy and environment norms and to compete with global players. The implementation of energy efficiency (EE) and renewable energy (RE) measures by Tannery units is becoming increasingly important and a number of tax incentives/rebate/cross-subsidy will be required to promote EE and RE interventions. The provision of tax incentives does play a role in decision making, various other non-tax factors drive tannery business decisions to invest in EE and/or RE projects. These businesses do not perceive the available tax incentives as effective, nor do they regard them as sufficiently motivating for businesses to change their environmental behavior.

It is highlighted that, Tax incentives have successfully encouraged EE in the many countries and, when combined with other instruments, they can also encourage RE implementation. Further, tax incentives also have the potential to encourage investment in research and development (R&D) of technologies for process & utility.

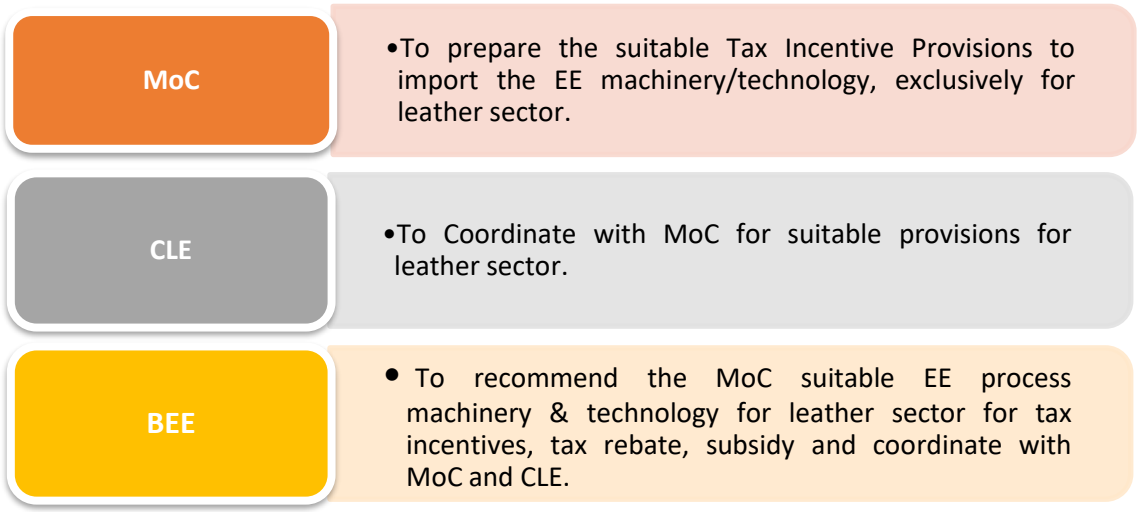
The Govt. of India has already made a provision of various incentives under "Indian Footwear Leather and Accessories Development Programme (IFLADP)" by Ministry of Commerce. Further in this program under the 'Sustainable Technology and Environmental Promotion' component, assistance could be provided for setting up a common effluent treatment plant; and support could be extended for modernization/capacity expansion/ technology up-gradation under the 'Integrated Development of Leather Sector' component. However, a specific tax or other incentives under this scheme is exclusively of leather footwear & other goods and any direct tax incentive on Tannery EE/RE projects not provided.

In view of tanning segment, the suitable Tax Incentive Provisions to import the EE machinery/technology, exclusively for leather sector to be recommended and same may be implement with the support of MoC, CLE and BEE.

**Key Benefits**

- To support the sustainability and growth of MSMEs by addressing common issues such as energy efficiency, improvement of technology, skills & quality, market access, etc.
- To build capacity of MSMEs for energy conservation and efficiency.
- To create/upgrade infrastructural facilities in the new/existing Industrial Areas/Clusters of MSMEs for the given role.
- Promotion of low carbon/de-carbon manufacturing technology for the clusters.

**Roles & Responsibilities of Stakeholders**




### 6.5.13 Capacity Building & Awareness Outreach Program on Energy Efficiency

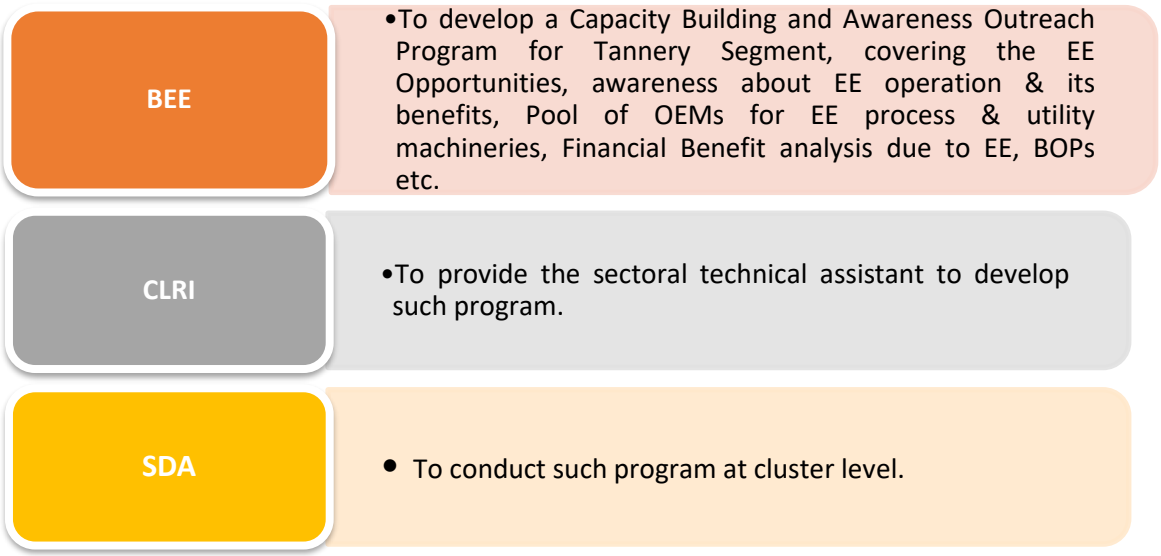
The Tannery units in leather sectors are situated in PAN India, generally close to urban or in rural area in given cluster locations. In view to enhance awareness level amongst the tannery units on energy efficiency & conservations and inform them about the virtues of adopting energy conservation, needs to be the prime objective of these programs. The media campaign comprising electronic, outdoor and print medium are generally taken by BEE through various modes for various schemes. On the same way, capacity building and awareness outreach program to be designed for leather tannery units as well, preferably at the cluster level to cover the maximum participations.

Capacity building & awareness program by means of videos of state of art technologies, compendium of best practices, detailed project reports on feasible EE/RE Interventions, physical workshops at cluster level on frequent basis, promote the S&L and LED program, etc. will help the sector to make them aware about EE and RE. further, the information about the emerging technologies with the help of CLRI may be added in this awareness program so that tannery units will also aware about the sector specific technologies.

**Key Benefits**

- Building abilities, relationships and values that will enable Tannery units, associations, organizations, groups and individuals to improve the development, utilization and performance of energy systems in an efficient and environmentally benign manner.
- Effective energy & resource management at unit and cluster level.

**Roles & Responsibilities of Stakeholders**




### 6.5.14 Assistance for Energy Audit on regular intervals through SDA & MSME-DI

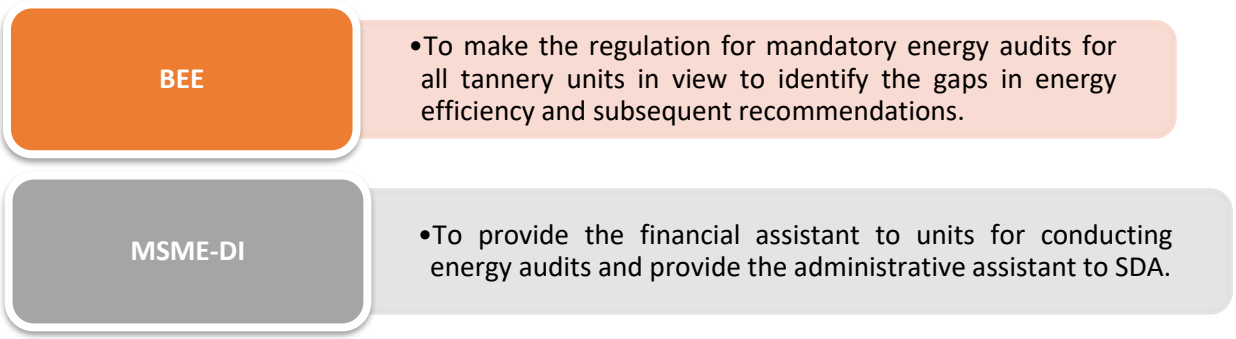
Energy Audit is one the important tool for energy management in any process/area of application. Energy Audits including the audit of Water and Compressed air attempts to balance the total energy inputs with its use, serves to identify all the energy streams in a facility and identify the direct and indirect energy wastage. It quantifies energy usage and gaps according to its discrete functions. The Energy Audit would give a positive orientation to the energy cost reduction, preventive maintenance and quality control programmes which are vital for production and utility activities. Such an audit Programme will help to keep focus on variations which occur in the energy costs, availability and reliability of supply of energy, decide on appropriate energy mix, identify energy conservation technologies, retrofit for energy conservation equipment etc. Benchmarking of Chemical & water mix vs. Leather load for each of the Chemical Process may also help in reducing the water consumption and thus save energy in water supply and effluent management. Currently there are no standardized ratio defined for the right proportion of Quantity of Chemical and Water mix usage for different stages of tanning process.

The practice of conducting energy audit by tannery units at regular intervals, found minimal during the field study and stakeholder consultation and the prime reason was lack of awareness about the audit & its benefit. The State Designated Agency and MSME Development Institute at regional/cluster level has a prominent role in this matter by means of suitable program and financial assistance for conducting energy audits.

**Key Benefits**

- Tannery Unit Energy profile and gas assessment, identification of area of improvements & recommendation of suitable EE interventions.

**Roles & Responsibilities of Stakeholders**




### 6.5.15 Empanelment of "URJA Mitra" in Leather Cluster

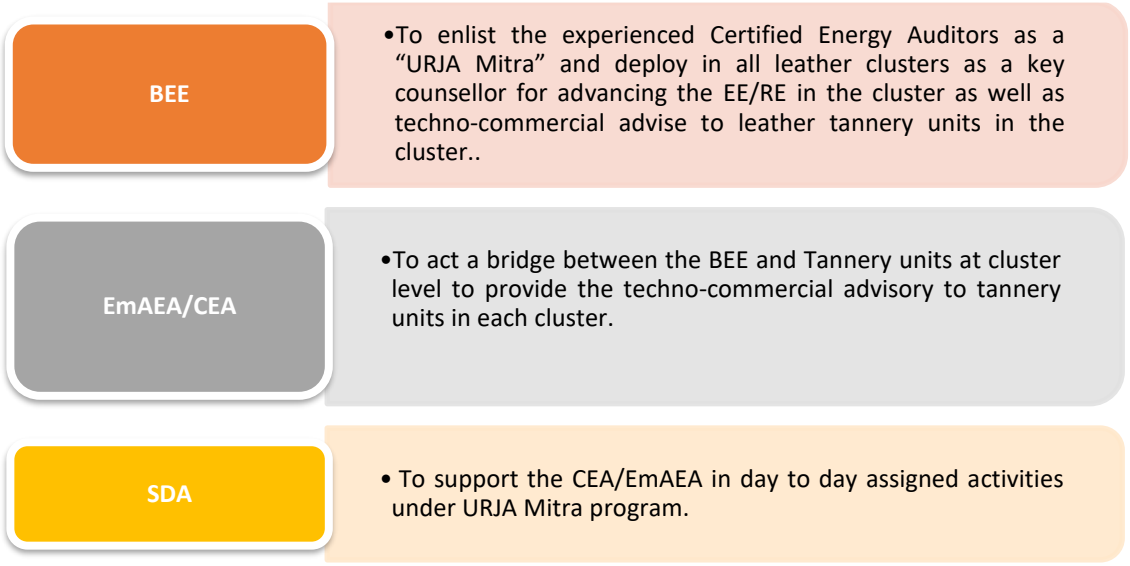
The knowledge about the energy efficiency, renewable energy, industry de-carbonization, EE interventions to improve the plant performance, present development in technology & energy transition, fuel mix advantages, Industry 4.0 etc. still lagging in SME sectors. In the absence of knowledge about these rapid changes & development, the inefficiency in the sector remains there. In order to address this knowledge related challenge, a handholding of SMEs of leather sector will be needed in the area of energy efficiency and resource efficiency along with current & future paradigm of energy. This handholding may possible by deploying the energy professionals like experienced Certified Energy Auditors as "URJA Mitra" in each cluster of leather sector.

URJA Mitra will act as a key person to promote the energy efficiency and renewable energy in the cluster as well as acts as connecting bridge between the BEE and sectoral stakeholders. Also, URJA Mitra will do the walk-through audits, detailed audits, sector specific process & utility related EE technologies with cost economics analysis, resource & vendor mapping, training program for SME persons, DRPs, knowledge dissemination programs, prepare a case study for best practices & state of art technologies etc.

**Key Benefits**

- SME Unit will get an energy consultant at cluster level base camp for energy related advisory & services.
- A common link between BEE-SDA-Sectoral Association-CLE-CLRI-Tannery Unit-Local Vendors for technical, commercial as well as govt. policy inference.
- Ease in knowledge transfer and capacity building in connection with the EE interventions.
- A single window for tannery units for energy audits and energy advisory services.

**Roles & Responsibilities of Stakeholders**




### 6.5.16 Trading of Emission and Energy certificates

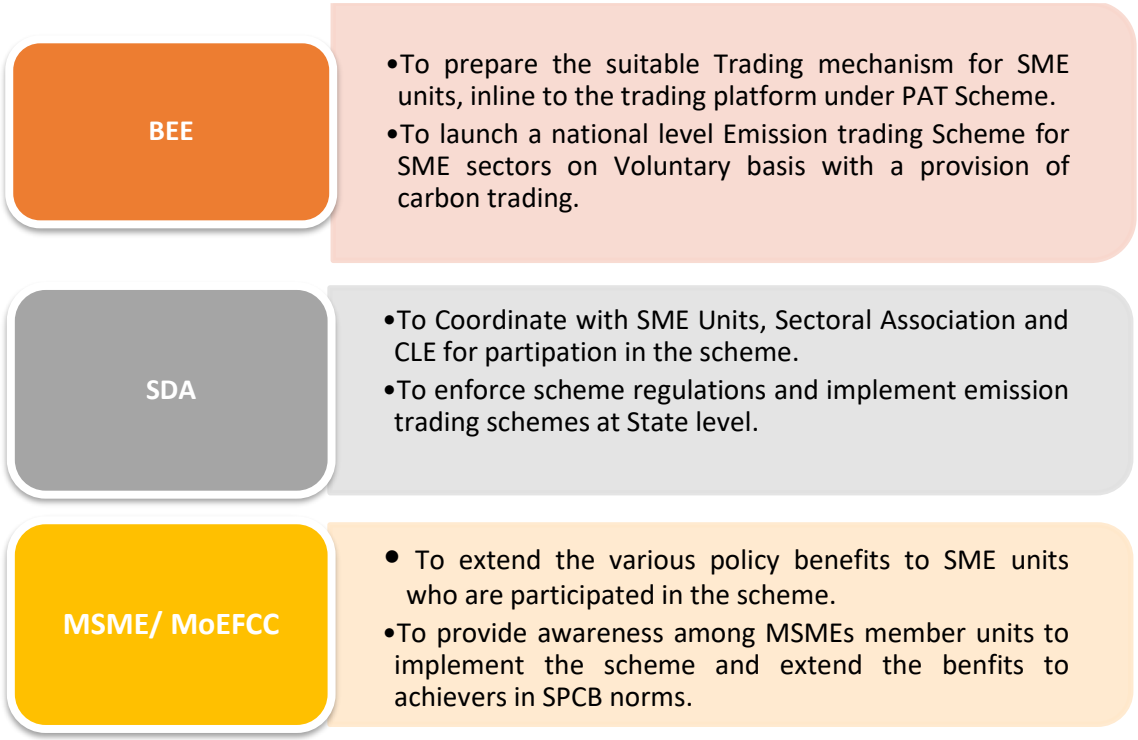
The Perform, Achieve and Trade (PAT) is a scheme which is a market-based mechanism under the National Mission on Enhanced Energy Efficiency. This is the one of its unique schemes which covers all the major Energy Intensive sectors across the India. Similar scheme may be devised for MSME/SME Sectors on voluntary basis with the support of sectoral association, CLE, State government & SDA. Inline to the PAT Scheme, energy savings certificates may issue to SME units who voluntary carryout energy reduction. Further, the provision of trading those certificates to be made on same trading platform by making the SME units as an eligible entity for trade. This will help the SME Tannery units to gain the monetary advantages due to their efforts for EE as well as encourage the other SME tannery units to participate in this scheme.

Similarly use of emission trading systems would be one of the most efficient and effective ways of promoting green growth. Emission trading systems contributes to economic efficiency by facilitating emission reductions where it is cheapest to achieve them. Emission intensive players are allowed to buy emission allowances from less intensive players (who save surplus carbon for trade). The framework for trading programs is critical due to it determining the transaction costs as well as the uncertainty and risk inherent in the trading system. There should be an emission reduction target for SME units and target achievers SME can trade with the non-achievers SME units. This will enable the SME units to implement the clean and low carbon-based energy-efficient technologies as well as renewable energy. It can be initially started as a voluntary program.

**Key Benefits**

- To encourage the SME units for implement the EE/RE projects which will result in reduction in energy cost, enhance the % share of non-fossil fuel, increase profit margin, pro-active in efficient operation, lower carbon footprint.
- Monetary gain by trading of certificates in open market and make a positive company branding towards the energy & emission intensity per unit of production.
- Reduction in GHG emissions and better GHG accounting at SME level.
- Ease to achieve the SPCB pollution norms also.

**Roles & Responsibilities of Stakeholders**




### 6.5.17 Establish an Energy Efficient Model Tannery Unit with state of art technology

While doing the sectoral benchmarking analysis under this study, it has been ascertaining that the finished leather manufacturing process is not uniform form one tannery to another, cluster to cluster and state to state due to various reasons. The process flow for raw hide to finished leather are different in terms of major variations in raw hide, fuel mix pattern, manufacturing process, type of thermal energy source, type of process machinery, state policies etc. which together causes a misty benchmarking for sectoral energy pattern.

To overcome this problem, it is recommended to establish one Energy Efficient model Tannery unit through the technical support of CLRI, OEMs, Associations and financial & admin support from BEE, CLE, MSME and State Government in given cluster, for buffalo raw hide to finished leather. The Model Tannery will be equipped with State of Art ZLD Technology and skilled trained manpower. Tannery will be operated and maintain by third-party/association/eminent tannery owner/any other as per BOT mode, till the period of 5-10 years from commencement of commercial operations. Beyond this period the unit may transfer to any private party following the due process of auction/bidding.

This tannery will be national benchmark for leather tanning sector and would be a replicable model and will have to be compatible with global best tanning operation.

**Key Benefits**

- Establish a national benchmark for energy performance and specific emissions.

- Awareness spreading about the EE tanning process technology and role model tannery for raw hide to finished leather process.
- The Tannery will become a torch bearer to change the outlook of Tannery business and attract more investments into this industry.
- Expected to create a whole new ambit of supply chain for Raw Material, Consumables for processing, Processing Machines, Testing & Quality Control and RE Solutions in the cluster.

**Roles & Responsibilities of Stakeholders**

| | |
|---|---|
| CLRI | •To design a detailed road map and action plan for establishment of advance state of art technology-based Tannery Unit including the project technical details, cost mapping, break-even point, life cycle assessment. |
| CLE | •To prepare tecno-commercial financial proposal including the business model for the same. |
| BEE | •To provide the necessary financial assistant to CLE/CLRI for establishment of EE Tannery in India as a role model for rest of operating tannery units in India.<br>•Appoint a professional body for Coordination and Monitoring of the project |
| SDA/State Govt. | •To assist the CLE, CLRI & BEE during implementation and to raise the awareness about the same through regional associations.<br>•Facilitate allocation of Land and other infrastructure of setting up of Model Tannery |

### 6.5.18 Scaling-Up of EE/RE Technology Implementation in Leather MSME Sector

To develop and promote an investment market for introducing energy conservation/efficiency measures and increase the use of EE technologies in process applications in selected energy- intensive MSME leather clusters in India. Scaling-up of EE/RE technology implementation is recommended to enhance the productivity, energy performance of the sector as well as to reduce the carbon footprints.

In scaling-up of EE/RE technology in leather cluster, there are several missing dots that needed to connect such as, absence of exhaustive EE/RE technology compendium with cost benefit analysis, support of energy professionals/agency, liaison & coordination with stakeholders at cluster level, identification of vendors, awareness & capacity building of tannery unit operation team, Case studies etc.

To ease in scaling-up of EE/RE technology implementation, it is proposed to establish the dedicated Project Management Cell (PMC) at each major cluster of leather tannery segment on full time basis for a fixed time period, which will provide energy efficiency and renewable energy implementation support and other related activities. The proposed PMC will be given fixed targets for achieving reduction in Energy Intensity and will be responsible for all concerned major activities such as preparation of technology compendium with cost benefit analysis, create investment market for EE/RE technology in the cluster, facilitation &

coordination with stakeholders (including related association & federations), Liaison with the government & financial institutions, organize awareness & capacity building programs, Implementation support to tannery units etc.

**Key Benefits**

- A detailed Technology Compendium for EE/RE technology with cost benefit analysis which may beneficial for other leather clusters and other SME categories.
- Awareness & Capacity building about the EE/RE technology which encourage the leather sector for EE activities.
- Create an investment market environment for OEMs or local vendors.
- Improvement in tannery unit & cluster energy performance which result in productivity improvement.

**Roles & Responsibilities of Stakeholders**

| | |
|---|---|
| BEE | •To identify the EE/RE technologies which may implement in identified tannery units in given clusters, based on the Resource Mapping Study in Leather Sector and provide the technical & financial assistance in implementation for scaling-up the technology demonstration and market creation. |
| IA & OEMs | •Establishment of Project Management Cell at Cluster level, mapping of suitable EE/RE technologies in respect to the capital investment & RoI and implementation support to identified tannery units.<br>•Sectoral OEMs to provide the list of EE/RE technologies which is commercially suitable and to support the IA in respect of finalization of technology for identified tannery unit as per its manufacturing process & utility requirements. |
| SDA | • To support the BEE and Implementing agency to execute the program by means of coordination with regional associations and tannery units. |

## 6.6 Implementation Roadmap for Energy Efficiency in the Leather Sector

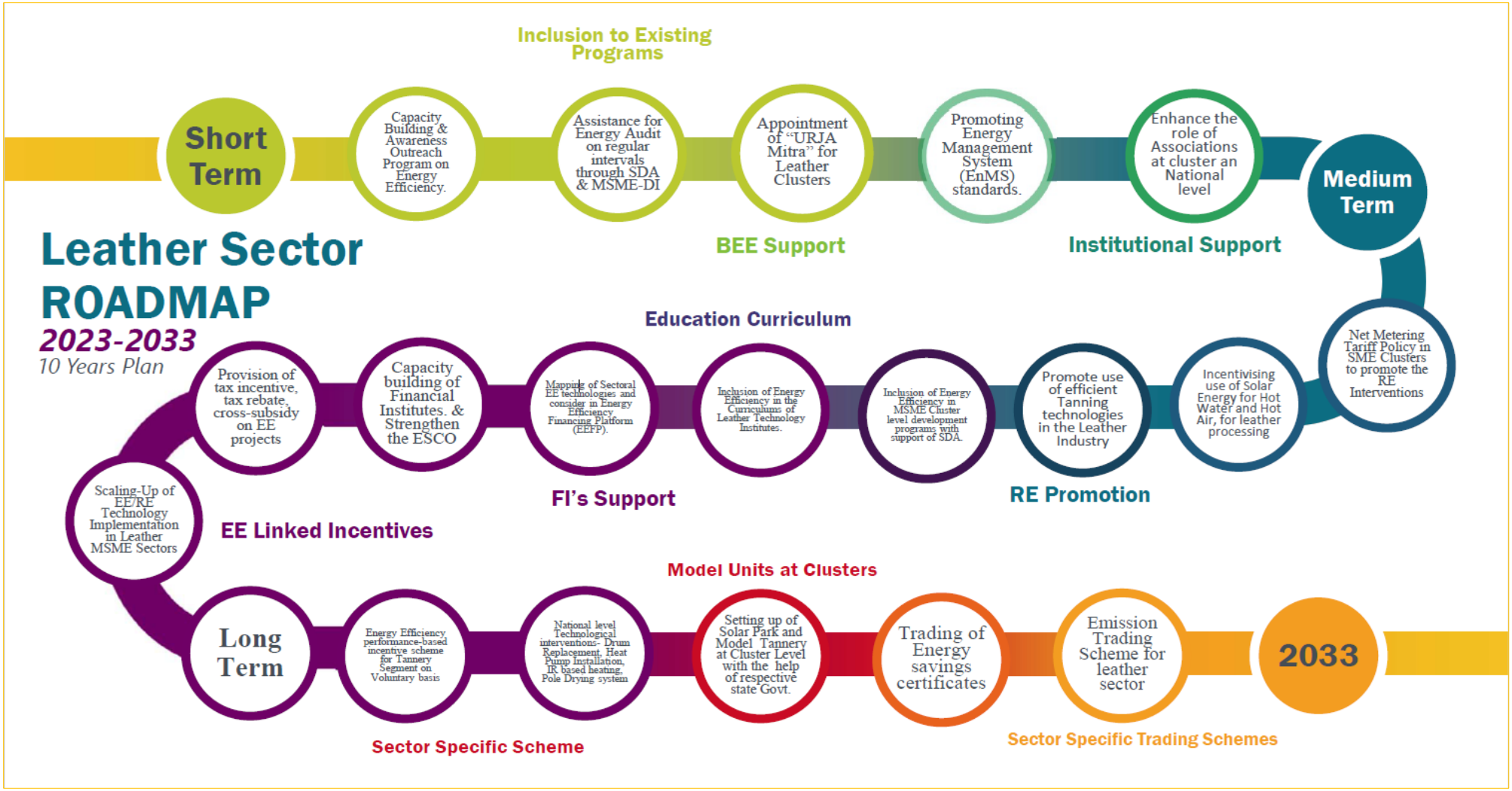



Figure 55: Implementation Roadmap for Energy Efficiency in the Leather Sector

# Annexure: 1 – Leather Process Machinery and Utility

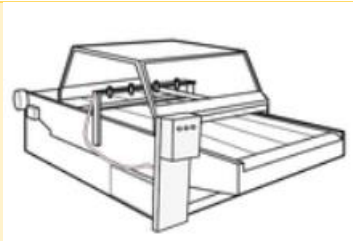
**Process Section**

- **Beamhouse Machinery**
  This machinery dedicated to raw hides processing, from the rough stage up to half-processed product (wet blue). The flow path of tanning process is a sequence of chemical operations facilitated by mechanical actions (beam house); mainly, soaking for rehydration, liming for unhearing, deliming, bating, degreasing, pickling and tanning. The process flow path is crossed by mechanical operations for size optimization: specifically: flashing, lime splitting or damp tanned (wet blue) splitting and shaving. Finally, a semi processed stable products (wet blue) is obtained.

Table 24: List of Technology/Machinery under Beamhouse Category[9]

| Machine | Description | Unit Load (HP) |
|---|---|---|
|  | **De-Salting Machine**: Machines for the mechanical removal of the exceeding salt of conservation. This operation contributes to reduce the water consumption during the rehydration phase. The machines are complete with a rotating cylindrical sieve where the raw hides are loaded to separate the salt. | 3.5 to 5.5 |
|  | **Drums (Wood, Stainless Steel, Polypropylene):** The drums are watertight cylindrical containers with variable size dimensions where the hides/skins are processed according to phase sequence of tanning process. Beam house; soaking for rehydration, liming for unhearing, deliming, degreasing. Subsequently pickling and tanning steps and finally utilized for retanning, fatliquoring and dyeing. The mechanical action on the hides, due to the rotations, maximize the skin's absorption of chemical compounds and induce the process reactions. The systems can be built using various materials: wood, stainless steel, polypropylene, etc. and fully automatized through control devices (es. rotation, temperature) | 7.5 to 55 |
|  | **Unhairing Machine:** Mechanical devices for shaving hides and skins treated with depilatory products (pastina). The systems are equipped with rotating cylinders that allow the removal of the hair through a tensile force exerted on the surface of the hides and skins. | 10 to 15 |

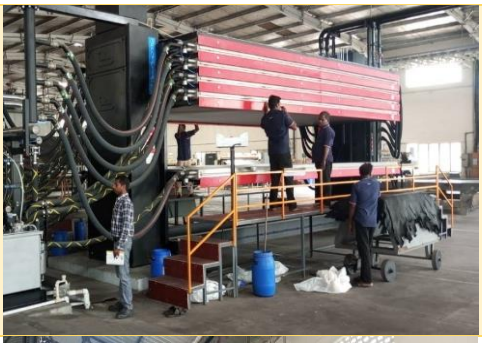
[9] https://assomac.it/en/technological-guide/tanning-machinery/a01-beamhouse-machinery/

| Machine | Description | Unit Load (HP) |
|---|---|---|
|  | **Fleshing Machine:** The fleshing process can be carried out using reciprocating machine, double introduction or continuous, single introduction. In both case the process consists of a leather passage between contrasting system such as tow rotating cylinders, one with spiral blades that operates the fleshing. The process is useful to remove the residual fleshing, and provide to make uniformity of hides' thickness. | 15 to 20 |
|  | **Shaving Machine:** Shaving is a production process for final thickness adjustment that can be done in wet phase such as in finishing stage. The machines are working on the flesh side of the hides/skins which remove the excess material and make uniform the thickness of hides/skins through the use of sharp blades mounted on a spiral rotating cylinders while the grain side faced the pressing roller. The constant sharpening of the blades is ensured by a mobile carriage of grinding wheels. | 50 to 55 |
|  | **Sammying and Stretching Press Machine:** The Sammying machines are used in the tannery to squeeze the hides/skins. The combined action of cylinders covered by absorbent material and pressure the liquid of the bath entrapped into the fibers are removed. The Sammying machine model are alternative type (two action) or continuous (single action). | 10 to 15 |
|  | **Moisturizing Machine:** Machines for humidifying: have the function to rehydrate the skin to ensure the moisture content necessary to carry out the stages of finishing. The operation can be automated through a mechanical system consisting of a series of spray nozzles and a carpet conveyor on which the leather is loaded. | 5 to 7.5 |

- **Drying Machinery**

  In leather Manufacturing process following the tanning steps, the skin should be dried to an optimum internal moisture content. This process must be carried out under controlled and reproducible environmental conditions for it to be insured the yields of the leather surface and the physical characteristics of the product. This can be achieved either by hanging the tanned leather for a few hours in the appropriate tunnels, or through vacuum driers, or by drying with toggling systems, or other dry methods, according to the type of product and of the finishing type of leather that must be obtained.

Table 25: List of Technology/Machinery under Drying Application

| Machine | Description | Unit Load |
|---|---|---|
|  | **Dry Chamber (In Batch):** Drying air-conditioned rooms in which the pieces of leather are placed on special pallet and conditioned at a controlled temperature and humidity. Forced ventilation systems provide the homogeneous diffusion of temperature and humidity that are regulated by the on-board control panels. | 5 to 7.5 HP, Steam**: ~650Kcal/kg @2.5 TPH Rate |
|  | **Toggling Machine:** Toggling frame dryers, the leathers are under tension drawn and suspended by means of special toggle clips that lock in a frame without piercing the leathers. In some cases, dryers, used for the purpose, are made up of frames that run on chain conveyors from inside to outside of the drying chamber, and each frame supports a perforated sheet metal that can be folded in order to toggles the leathers on both sides of the frame; in other cases, the frames are automatically pulled through a rail system, or they or are constructed in the manner of a continuous metal conveyor. The expansion systems can be automatic or manual, and the toggling systems also can be manual or automatic. | 5 to 7.5 HP, Steam: ~650Kcal/kg @2.0 TPH Rate |
|  | **Vacuum Dryer:** Vacuum drying is a process that consists in positioning the entire hides/skins or half hides out of metal plates, hermetically closed by a cover. The drying is achieved by a combined action of heat and pressure reduction between the floors of work, which allows to obtain the fast evaporation of water at lower temperatures. The drying conditions are adjustable according to the characteristics of the product to be processed through the control systems on board. | 55 to 90 HP, Steam: ~670Kcal/kg @3.0 TPH Rate |
|  | **Drying Tunnel with Overhead Chain:** The drying tunnel are metal boxes suspended roof of manufacturing plant to optimize the space. The leathers are placed on metal rods and are transported inside tunnel by way of a chain. The tunnel is fed to heated air at adjusted temperature and humidity. Climatic conditions contribute at the natural evaporation and conditioning while maintaining a constant degree of humidity. In addition, the handling with overhead chains used to move the product in production areas even far from each other. | 5.5 HP, Steam: ~650Kcal/kg @1.5 TPH Rate |
|  | **Conditioning System:** Systems fed with heated air with balanced temperature and humidity, equivalent to a climatic chamber to perform operations of seasoning of the product. The leather, from medium to large size, is placed on special supports or rods and inserted into the system by means of a conveying chain. The environmental conditions are kept controlled to stabilize and consolidate the chemical products used for tanning. | 5.5 to 7.5 HP, Steam: ~655Kcal/kg @2.0 TPH Rate |

****Indirect Heating though Steam**

- **Finishing Machinery**

  Establish a unique general for the finishing procedure of the product is very difficult; the steps of those operations are frequently reserved and part of the single tannery competence. However, the common elements of the finishing process are: 1) Dray milling for softening 2) Staking to make the skin flexible 3) Coating surface for final look. The last stages finishing is a combination thermal and mechanical action (heat and pressure) for the grain plating. Film Application on surface as well as polishing and grinding are performed on skins with any particular defects on grain allowing the product recovering.

**Table 26: List of Technology/Machinery under Finishing Application**

| Machine | Description | Unit Load |
|---|---|---|
|  | **Dry Drum for Milling:** Drums for dry milling to soften the leather by mechanical shaking to controlled moisture and temperature. In addition to the simple action of softening, some cleaning chemicals recipes may be used to obtain desired special fashion effects; for which the drums may be equipped by chemical dosing devices. | 35 to 50 HP, |
|  | **Rotary Staking Machine:** Softening and spreading of leather are the main aim of the staking process and also contribute effectively its yield. The rotative staking machines concept are based rotary cylinders of various types through which passes the product to be processed. Particularly apply for processing small size leather. | 5 to 10 HP, |
|  | **Dry Buffing Machine:** Cylinder machines, equipped with sandpaper or emery for the processing of leather with nubuck or suede effect, or to correct any defects on the leather grain side. Control devices with hydraulic drive are used to quickly reverse the direction of rotation of the feed roller and make it easier the manual extraction of the leather. The systems are supplemented by specific elements of dust extraction and collection in the bags. | 50 to 55 HP, |
|  | **Automized Spray Both:** Automatic spray booths for continuous production. Metallic structure equipped with spray guns on robotic arms and continuous feeding chain. The cabins are accompanied by tubs for containment and collections as well as systems that allow the dust coating. Sprayers may have various motion configurations of the spray-guns arm or rotating carousel systems | 20 to 25 HP, Steam**: ~650Kcal/kg @2.0 TPH Rate |

| Machine | Description | Unit Load |
|---|---|---|
|  | **Rotating Embossing & Iron Press:** Continuous rotary ironing, plating, embossing, polishing, and glazing machines for hide and skin leathers. The process consists in the continuous passage of leather between cylinders that press the surface, supported by through feed system. Time, temperature and pressure are adjustable according to the product to be made. | 40 to 50 HP |

****Indirect Heating though Steam**

## UTILITY Section

In the leather sector, a tannery segment is distinct in nature from other leather segments due to the sole requirment of thermal energy in tannery unit operation. In large & Medium category of units, Ususally, a steam boiler or thermic fluid heater employed in the tannery unit to cater the thermal energy load, however, some of the advance tannery units has been shifted to Electic & Renewable Mix Pathway to meet the thermal energy demand and eliminates the use of fossil fuel in unit boundary. The more details are outlined in subsequent chapters of this report.

The rest of common utlity equipments which are being employed in the plant for day-to-day routine operation, such as, Compressor, Motors, Pumps, Air Blower, Diesel Based Thermic Fluid Heater, Electric Heaters, IR Based Heaters etc. The detailed list of Utility equipments as follow:

**Table 27: List of Technology/Machinery under Utlility Section**

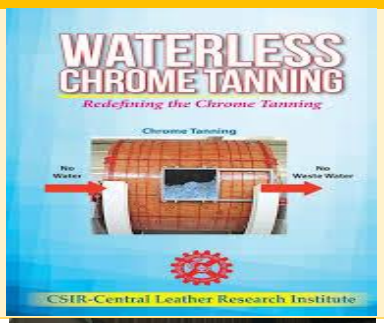
| Machine | Description | Rating/Application |
|---|---|---|
|  | **Steam Boiler:** A boiler is an enclosed vessel that provides a means for combustion heat to be transferred into water until it becomes heated water or steam. The hot water or steam under pressure is then usable for transferring the heat to a process. Water is a useful and cheap medium for transferring heat to a process. | 1 TPH to 4 TPH, Drying/Heating |
|  | **Wood/Coal/Diesel Based Thermic Fluid Heater:** A thermic fluid heater is industrial heating equipment, used where only heat transfers are desired instead of pressure. In this equipment, a thermic fluid is circulated in the entire system for heat transfers to the desired processes. Combustion process heats up the thermic fluid, and this fluid carries and rejects this heat to the desired fluid for concluding the processes. After rejecting it, this fluid comes back again to the thermic fluid heater and this cycle goes on. | 2 Lac kcal/hr. to 10 Lac Kcal/hr. Drying/Heating |

| Machine | Description | Rating/Application |
|---|---|---|
|  | **Compressors:** A compressor is a mechanical device that increases the pressure of a gas by reducing its volume. An air compressor is a specific type of gas compressor. | 15 to 55 HP, To Cater Process Compressed Air Requirements (5.5 to 7.5 Kg/$Cm^2$) |
|  | **Induction Motors:** Three-phase squirrel-cage induction motors are widely used in Tannery Units as industrial drives because they are self-starting, reliable, and economical. | 1.5 to 55 HP, For all Process Machinery and Utility Pumps. |
|  | **Air Blowers:** An Industrial Air blower is a blower, whose main function is to supply a huge flow of air or gas to the various processes in the industries. They are electric fans with wheels and blades to drive a current of air or gas from one point to another with certain specifications. | 5 to 10 HP, For Hot Air Blowing Application for drying purpose in leather finishing section. |

# Annexure: 2 – Sectoral State of Art Technology/ Renewable Energy Based Interventions

Table 28: Low Carbon Technology Based ENCONS

| | ENCONS | Approx. Investment | Payback (Months) | % Savings |
|---|---|---|---|---|
|  | Installation of VFD in Drum Motor | Rs. 6000/kW | 18 to 24 | 10 to 12 |
|  | Replacement of Inefficient Motors with Energy Efficient Motors (IE4 Motors) | Rs 7000-8000/kW | 48 to 60 | 4 to 5 |
|  | Replacement of Old Wooden Drums with Polypropylene Drums | Rs 15-25 Lakhs/Drum | 36 to 48 | 50 to 60 |
| | Energy Saving by Optimizing Water Consumption in Polypropylene Drum vs. Old Wooden Drums | | | |
|  | Pressure Optimization in Compressed Air System | Negligible | Immediate | 0.3 to 1.2 |
| | Arresting of Air Leakage in Compressed Air System | Negligible | Immediate | 1.5 to 3 |

| | ENCONS | Approx. Investment | Payback (Months) | % Savings |
|---|---|---|---|---|
|  | Waterless Chrome Tanning | Rs 12 Lac | 24 to 28 | 3 to 4 |
|  | Replacement of Conventional Lights & Fans with Energy Efficient LED Lights and BLDC Fans | Rs. 3500/unit for Fan, Rs 350/unit for LED | 25 to 36 | 1 to 2 |
|  | Implementation of Cogged Belt in Motor Transmission System | Rs. 12000/unit | 11 to 12 | 4 |
|  | Implementation of Energy Monitoring System (EMS) | Rs 6000 to 10000/Node | 24 to 48 | 3 to 5 |
|  | Insulation Repair of Steam Network | Rs. 1800-2400/Sq. meter | 6 to 8 | 2 to 3 |

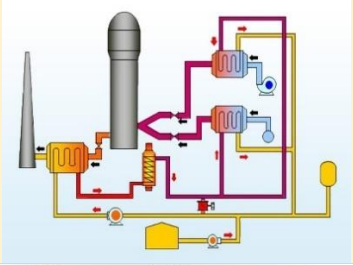
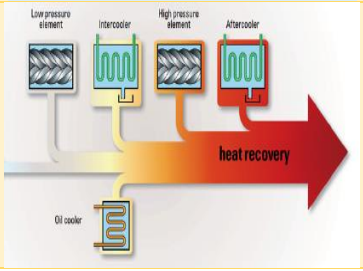
| | ENCONS | Approx. Investment | Payback (Months) | % Savings |
|---|---|---|---|---|
|  | Condensate Recovery from Steam Network | Rs. 1500/Running Meter | 24 to 30 | 1.8 to 3 |
|  | Waste Heat Recovery from Flue Gases for Water Preheating | Rs 3 to 12 Lac | 12 to 28 | 3 |
| | Waste Heat Recovery from Flue Gases for Air Preheating | Rs 2 to 8 Lac | | 2 |
|  | Compressor Waste Heat Recovery - Energy Recovery Unit (ER unit) | Rs. 10000/kW | 24 to 30 | 2 to 3 |

Table 29: De-Carbon & Clean Technology Based ENCONS

| | ENCONS | Approx. Investment | Payback (Months) | % Savings |
|---|---|---|---|---|
|  | Installation of Grid Connected Roof-top Solar Power Plant | Rs 42000/kWp | 42 to 60 | 12 to 15 |
|  | Solar Air Heating for Drying Application | Rs 30,000 per 1000 kCal/hr. unit | 18 to 24 | 17 to 20 |

| | ENCONS | Approx. Investment | Payback (Months) | % Savings |
|---|---|---|---|---|
|   | Solar Water Heater for Drum Hot Water | Rs 15 Lac/10,000 LPD | 48 to 60 | 2 to 3 |
|  | Installation of Heat Pump for Drum Hot Water Requirement | Rs. 43000/kW | 36 to 48 | 15 to 18 |
|   | IR Based Electric Heating for Drying Application | Rs. 10000/kW | 9 to 14 | 25 to 30 |
|  | Pole Dryer for Space Heating Application | Rs 42000/kW | 12 to 18 | 32 to 34 |

# Annexure: 3 - Sectoral Energy Tariff by SERCs

**Table 30: Sectoral Energy Tariff**

| Cluster: Kanpur | | | |
|---|---|---|---|
| **Details** | **Energy Charges (Rs/unit)** | **Demand Charges (Rs/unit/month)** | **TOD Charges (% Energy Charges)** |
| For HT supply up to 11 kV | Rs. 7.10 / kVAh | Rs. 300.00 / kVA / month | Summer→<br><br>05:00 hrs – 11:00 hrs: - (-)15%<br>11:00 hrs – 17:00 hrs:- 0%<br>17:00 hrs – 23:00 hrs:- (+) 15%<br>23:00 hrs – 05:00 hrs:- 0%<br><br>Winter→<br><br>05:00 hrs – 11:00 hrs<br>0%<br>11:00 hrs – 17:00 hrs<br>0% 17:00 hrs – 23:00 hrs (+) 15% 23:00 hrs – 05:00 hrs (-) 15% |
| LT Supply for SME Units | Up to 1000 kWh / month: Rs. 7.30 / kWh<br><br>Up to 2000 kWh / month: Rs. 7.40 / kWh<br><br>For above 2000 kWh / month: Rs. 7.90 / kWh | Rs. 290 / kW / month | |
| **Cluster: Kolkata** | | | |
| Industries (HT) | Summer:<br>Rs. 4.30 / kWh<br><br>Monsoon:<br>Rs. 4.35 / kWh<br><br>Winter:<br>Rs. 4.33 / kWh | Rs. 320.00 / kVA / month | 06:00 hrs – 17:00 hrs:- 4.28/4.26/4.24 Rs per kWh for Summer, Monsoon & Winter 17:00 hrs – 23:00 hrs:- 5.03/5.01/4.98 Rs per kWh for Summer, Monsoon & Winter 23:00 hrs – 06:00 hrs:- 3.64/3.62/3.60 Rs per kWh for Summer, Monsoon & Winter |
| Jalandhar Cluster | | | |
| General Industry (11 kV) | Above 100 kVA and upto1000 kVA:<br>Rs. 5.98 / kVAh | Rs. 165.00 / kVA / month | 10.00 PM to 06.00 AM (next day): 4.83 Rs/kVAh |

| Cluster: Kanpur | | | |
|---|---|---|---|
| **Details** | **Energy Charges (Rs/unit)** | **Demand Charges (Rs/unit/month)** | **TOD Charges (% Energy Charges)** |
| | Above 1000 KVA and up to 2500 kVA<br>Rs. 6.08 / kVAh<br><br>Above 2500 KVA:<br>Rs. 6.19 / kVAh | Rs. 225.00 / kVA / month<br><br>Rs. 260.00 / kVA / month | 06.00 AM to 10.00 AM: Normal rates as applicable to the respective category under relevant Schedule |
| **Pallavaram & Vaniyambadi (Tamil Nadu) Cluster** | | | |
| General Industry (LT) | 0 - 50 KW: 7.50 Rs/Unit<br><br>Above 50 - 112 KW: 7.50 Rs/Unit<br><br>Above 112 KW: 7.50 Rs/Unit | Rs. 75 / kW / month<br><br>Rs. 150 / kW / month<br><br>Rs. 550 / kW / month | N/A |
| General Industry (HT-III) | 8.50 Rs/Unit | Rs. 550 / kVA / month | 25% extra for FY 2022-23 to FY 2026-27 on the energy charges for the energy recorded during peak hours ( 6.00A.M to 10.00 A.M and evening 6.00 P.M to 10.00 P.M.)<br><br>Reduction of 5% on the energy charges for the consumption recorded during 10.00 P.M to 5.00 A.M as an incentive for night consumption. |

# Annexure: 4 - Existing sectoral MSME/govt. polices

| Category | Policy/Program | Description |
|---|---|---|
| **Financial Support** | Indian Footwear, Leather & Accessories Development Program (IFLADP) | ▪ **Sustainable Technology and Environmental Promotion (proposed outlay INR 500 crore): -** Special Purpose Vehicle constituted for each CETP would be provided assistance @ 80% of the total project cost for Northeastern Areas with industry's/beneficiary share to be 20% of the project cost and @ 70% of the total project cost for other areas with industry's/beneficiary share to be 30% of the project cost with a limit of INR 200 crore.<br>▪ **Integrated Development of Leather Sector (IDLS) sub-scheme (proposed outlay INR 500 crore): -** Assistance would be provided to the sectoral units for their modernization/capacity expansion/technology up-gradation on or after 1st January 2020 @30% to MSME units and 20% to other units. Financial assistance is being proposed to North-Eastern Areas also @40% of cost of plant & machinery to MSME units and 30% of the same to other units with additional 5% financial assistance for the domestically manufactured plant and machinery.<br>▪ **Leather Technology, Innovation and Environmental sub-scheme:** The help is provided for upgradation/installation of Common Effluent Treatment Plants (CETPs) @ 70% of the project cost. The sub-scheme also offers support to national level sectoral industry council/ association and support for preparation of vision document for Leather Footwear and Accessories Sector.<br>▪ Approval has been accorded for upgradation of twelve Common Effluent Treatment Plants (CETPs) at Dindigul, Ranipet, Ambur, Vaniyambadi, Vellore, Pallavaram, Trichy, Erode districts of Tamil Nadu, Jalandhar (Punjab) and Bantala (Kolkata). As on 15th February 2022, financial assistance amounting to INR 132 crore has been released in respect of ten CETP projects with total GOI assistance of INR 284 crore. INR 152 crore is the committed liability which would be released in the coming years. |
| **Taxation Support** | GST Concession | ▪ About 2% across the board enhancement of duty credit scrip under Merchandise Exports from India Scheme (MEIS) for shipments made from 1 November 2017<br>▪ Finished leather from 12% to 5%, |

| Category | Policy/Program | Description |
|---|---|---|
| | | ▪ Certain leather chemicals, leather goods, leather garments and saddlery items from 28% to 18%,<br>▪ Common Effluent Treatment Plants (CETPs) from 18% to 12%,<br>▪ Job work from 18% to 5% Footwear from 18% to 5%. |
| **Investment** | FDI Policy | ▪ Leather products manufacturing is allowed 100% FDI through an automatic route.<br>▪ The government of India has allowed 100% FDI in single-brand retailing in India, with a clause of 30% mandatory local sourcing.<br>▪ The Leather industry in India is de-licensed, facilitating expansion on modern lines with state-of-the-art machinery and equipment. |
| **Infrastructure** | Indian Footwear, Leather & Accessories Development Programme (IFLADP) | ▪ Graded assistance is proposed to be provided @50% of the project cost or @70% of the project cost in Northeastern areas, for land development, core infrastructure, HRD and social infrastructure, production facilities including ready to use sheds with plug and play facility, R&D support and export services excluding cost of land with maximum Government assistance being limited to INR 125 crore. |
| **Establishment & Brand Promotion** | Indian Footwear, Leather & Accessories Development Programme (IFLADP) | ▪ **Establishment of Institutional Facilities (EIF): -** Assistance would be provided as a one-time grant-in - aid for establishment/upgradation of the institutional infrastructure of Footwear Design and Development Institute (FDDI).<br>▪ **Brand Promotion of Indian Brands in the Footwear and Leather Sector: -** Central assistance would be provided 50% of total project cost subject to limit of INR 3 crore for each brand, each year for the next three years. The share of the Indian Manufacturer would be balance 50% of the project cost. |
| **Human Resource** | Human Resource Development (HRD) sub-scheme | ▪ An assistance for Placement Linked Skill Development training to unemployed persons is provided - USD 230 per person, for skill up-gradation training to employed workers - USD 76 per employee and for training of trainers - USD 3,076 per person. The Footwear Design and Development Institute (FDDI) has established itself as the premier training institute for the provision of skilled manpower in the leather industry. It has 55 training centers across India including eight branches. Another 4 branches are being set up. |

# Annexure: 5 – Challenges & Policy Interventions for ENCON Implementation

| S. No | ENCONS | Challenges | Policy interventions |
|---|---|---|---|
| 1 | Installation of VFD in Drum Motor | a) Corrosive Atmosphere resulting in malfunctioning of system<br>b) Lack of technical guidance<br>c) Capital investments | - Detailed System Energy Audits and technologies to withstand the environmental issue<br>- Introduction to cleaner processing methods<br>- Financial assistance with performance monitoring through SIDBI, BEE and other financial institutions |
| 2 | Replacement of Inefficient Motors with Energy Efficient Motors (IE4 Motors) | a) Capital Cost Constraint | - Financial assistance with performance monitoring through SIDBI, BEE and other financial institutions |
| 3 | Replacement of Old Wooden Drums with Polypropylene Drums | a) Capital Investment<br>b) Skill Development<br>c) Concerns about Quality of end product | - Financial Assistance<br>- Regular Training of Manpower through existing framework of institutes – ITIs, |
| 4 | Energy Saving by Optimizing Water Consumption in Polypropylene Drum vs. Old Wooden Drums | a) Capital Investment<br>b) Skill Development<br>c) Lack of energy and water monitoring | - Financial Assistance<br>- Training of Manpower<br>- Energy Monitoring will help in understanding the water and energy use profile compared to the production, thus knowing the SEC trend. |
| 5 | Pressure Optimization in Compressed Air System | a) Lack of Maintenance inputs<br>b) Lack of awareness<br>c) Lack of Training / skill development<br>d) Over design and incorrect orientation of compressed air supply circuit | - Improve Maintenance practices<br>- Energy and Air Audit to be done at regular intervals. |
| 6 | Arresting of Air Leakage in Compressed Air System | a) Lack of Maintenance inputs<br>b) Lack of awareness<br>c) Lack of Training / skill development | - Improve Maintenance practices<br>- Energy and Air Audit to be done at regular intervals. |
| 7 | Waterless Chrome Tanning | a) Lack of awareness<br>b) Concerns about quality of final product<br>c) Availability of material inputs | - Training programs and Hand-holding for Pilot project & further replication<br>- Improve testing facilities for the finished products.<br>- Create conducive supply chain for production inputs including chemicals and enzymes |
| 8 | Replacement of Conventional Lights & Fans with Energy | a) Lack of Awareness | - Energy conservation training programs for the shop floor and maintenance work-force |

| S. No | ENCONS | Challenges | Policy interventions |
|---|---|---|---|
| | Efficient LED Lights and BLDC Fans | | |
| 9 | Implementation of Cogged Belt in Motor Transmission System | a) Lack of Awareness | - Training supported with real life case studies. |
| 10 | Implementation of Energy Monitoring System (EMS) | a) Capital Cost<br>b) Lack of awareness<br>c) Requires modelling on Pilot Bases for sector specific design | - Financial assistance with performance monitoring through SIDBI, BEE and other financial institutions<br>- Energy conservation awareness trainings<br>- Implementation in ESCO mode. |
| 11 | Insulation Repair of Steam Network | a) Lack of maintenance and monitoring | - Detailed energy Audit for steam mapping to assess the leakages including, at boiler end and process end. |
| 12 | Condensate Recovery from Steam Network | a) In efficient design of steam network | - Detailed energy Audit for steam mapping to assess the leakages including, at boiler end and process end. |
| 13 | Waste Heat Recovery from Flue Gases for Water Preheating | a) Lack of awareness<br>b) Capital Investment | - Training of boiler professionals<br>- Detailed Boiler Audit |
| 14 | Waste Heat Recovery from Flue Gases for Air Preheating | | - Training of boiler professionals<br>- Detailed Boiler Audit |
| 15 | Compressor Waste Heat Recovery - Energy Recovery Unit (ER unit) | a) Newer Technology<br>b) Lack of awareness<br>c) Capital Investment | - Energy audits and training of shop managers.<br>- Implementation of Pilot basis and replicating it to other units of the same cluster<br>- Financial assistance with performance monitoring through SIDBI, BEE and other financial institutions or through ESSCO mode. |
| 17 | Installation of Grid Connected Roof-top Solar Power Plant (CAPEX/OPEX Mode) | a) Corrosive atmosphere<br>b) Capital Investment<br>c) Absence of Net-metering | - Improve effluent handling at Tannery level and at the level of Leather Complex.<br>- Stricter and uniform norms for level playing field<br>- Reducing dependence on Organic Chemicals, Slats and Chemicals<br>- Net metering may be implemented |
| 18 | Solar Air Heating for Drying Application | a) Capital Investment | - Financial assistance with performance monitoring through SIDBI, BEE and other financial institutions or through ESCO mode. |
| 19 | Solar Water Heater for Drum Hot Water | | |
| 20 | Installation of Heat Pump for Drum Hot Water Requirement | a) Lack of awareness<br>b) Capital Investment | - Energy audits and training of shop managers. |

| S. No | ENCONS | Challenges | Policy interventions |
|---|---|---|---|
| | | c) Technological assistance | - Implementation of Pilot basis and replicating it to other units of the same cluster<br>- Financial assistance with performance monitoring through SIDBI, BEE and other financial institutions. |
| 21 | IR Based Electric Heating for Drying Application | a) Lack of awareness<br>b) Technological assistance | - Energy assessment by the Technology providers and implementation of Guaranteed saving basis |
| 22 | Pole Dryer for Space Heating Application | a) Space requirement<br>b) Capital Investment | - Can be implemented for Tanneries in the Leather Complex unit where the lot sizes are big enough<br>- Financial assistance with performance monitoring through SIDBI, BEE and other financial institutions. |
| 23 | Fluid Coupling for Process Drum drive system. | a) Lack of awareness<br>b) Technological assistance | - Energy Audit with training of shop floor personnel<br>- Implementation after detailed load graph plotting and assessment by the technology provider |

# Annexure: 6 – SWOT Analysis for Leather Sector

## SWOT Analysis

A SWOT (Strength, Weakness, Opportunity, and Threat) analysis of the Leather Tannery Segment in way forward path to make the tannery segment efficient in terms of energy, workforce, technology, sustainability, policies, awareness etc., is provided below:

| Strengths | Weakness |
|---|---|
| ▪ Friendly govt. regulations and policies for Leather Sector are foreign trade & business.<br>▪ Adequate Raw Material at effective pricing and Traditional Tanning manpower at competitive wages.<br>▪ Cluster development program, research & development program to develop the indigenous process technology to enhance the productivity and to cater the environment challenges, pilot projects, dissemination of sectoral best practices, policy provisions for process machinery etc.<br>▪ Establishment of Common Effluent Treatment Plant at Cluster Level for medium & small tannery units.<br>▪ Strategic location of tannery business in terms of global business with promising growth rate, presence of allied industries.<br>▪ Dedicated institute for Diploma/Graduate/Post graduate course in leather processing technology & allied processes.<br>▪ Well versed sectoral association at regional & national level. | ▪ **Tendency to focus on production based monetary assessment rather than productivity based monetary assessment which results in ignorance in energy cost benefit analysis.**<br>▪ Absence of an integrated policy & regulatory framework is not there which addresses the sustainability, ease of doing business, energy efficiency, etc.<br>▪ Non-availability of indigenous technology suppliers for new and innovative technologies, shortages of process oriented skilled manpower/imported machinery operator at competitive price.<br>▪ Very minimal level of penetration of renewable energy and automation in the segment.<br>▪ **High Initial Capital Demand for EE machinery whereas low/cheap price of Indian machinery or third-party machinery.**<br>▪ **Lack of initial capital with medium and small category of Tannery Units.**<br>▪ **Absence of Financial Mechanism for funding the EE projects through National & SME level banking institutes.**<br>▪ Low confidence among the Financial Institutes to fund the EE projects due to their performance risk and complexity in estimated energy savings followed by monetary savings |

| Opportunities | Threats |
|---|---|
| ▪ Result oriented energy & emission saving potential for implementing the EE projects, Renewable energy-based projects, state-of-art technologies etc. which together reduce the cost of energy.<br>▪ Grooming the education courses in terms of EE, Utilization of RE, Best Practices, sustainability etc.<br>▪ Promising area of investment with good returns for long term.<br>▪ **Establishment of State of Art Tannery Unit as a National Benchmark and role model of existing tannery units.**<br>▪ **Unlocking the commercial potential for EE market.**<br>▪ Employment opportunity the in the sector for skilled and un-skilled both type of manpower. | ▪ Stiff Competition from other countries such as China, Bangladesh, Brazil etc.<br>▪ Rapid Change in user end trend globally which is difficult to adapt for the Indian leather industries.<br>▪ Most tanning business are family owned.<br>▪ Low Replication and Adoption Rate of EE projects<br>▪ Unhygienic working environment at unorganized sub-sector of small tannery units.<br>▪ Environmental concerns. |

# Annexure: 7- List of Stakeholder and Their Role.

- **Main Administrative Government Body:** On the horizon of the role of Leather Sector in India Economy, foreign trade & Sociology, Ministry of Commerce & Industry, Government of India notified the export promotional council named ***"Council for Leather Export (CLE)"*** in the year 1984 for entire leather & leather products industry. The Council for Leather Exports (CLE) is the single largest and Apex trade promotion organization of the strong and rapidly growing Indian leather & leather products industry. CLE is committed towards the overall development of Indian leather sector and achieve higher export growth to enhance India's share in global leather trade.

  The nucleus activities and services of CLE encompassing the Leather Sector in India are:

| Role | |
|---|---|
| | Facilitating export-import trade through redressal of various procedural hurdles by representing to authorities concerned.<br>Participating in major international leather trade fairs & specialized trade shows across the globe.<br>Mooting Delegations to overseas countries with a view to identify the sources for raw materials for augmenting availability of leather for production in India. |
| | Organizing Buyer-Seller Meets and Mega Leather Shows, B2B meetings in potential markets etc.<br>Promoting, facilitating & attracting joint ventures, technical collaborations & strategic alliances, FDIs etc into the Indian leather sector.<br>Perform facilitation and Coordination activities towards implementation of various leather sector infrastructure strengthening, Human Resource Development programmes of Government of India. |
| | Inviting Resource persons / Experts to the trade Fairs, Seminars & Workshops held in India, for exchange of information, knowledge, ideas and strategies.<br>Facilitate in availing assistance under Integrated Development of Leather Sector (IDLS) for Modernization & Technology up gradation of production units |

- **Research & Development Institute under Central Government:** The Research & Development work for any industrial sector in any economy has a vital role to play towards the continuous requisite acceleration in progress and technology upgradation for economical & sustainable growth in given sector. By keeping this view in mind, Government of India has established the ***"Central Leather Research Institute"*** under CSIR, Ministry of Science & Technology vide address CSIR-Central Leather Research Institute Sardar Patel Road, Adyar, Chennai 600 020 INDIA.

**Role**

The role of CSIR-CLRI in scientific industrial research space of India is very focused. Objective of the institute is to meet the needs of the leather and allied sectors through research, technology development and transfer, training and industrial support and formulation of policies and plan of action that ensures a technology based competitive advantage for Indian leather sector.

- **Educational Institute for Leather Sector:** The National Institute of Fashion Technology was set up in 1986, NIFT is the pioneering institute of fashion education in the country and has been in the vanguard of providing professional human resource to the textile and apparel industry. It was made a statutory institute in 2006 by an Act of the Indian Parliament with the President of India as 'Visitor' and has full-fledged campuses all across the country. Over the years NIFT has also been working as a knowledge service provider to the Union and State governments in the area of design development and positioning of handlooms and handicrafts.

**Role**

The Leather Design Program at NIFT is unique in its structure and application to the Fashion, Footwear and Accessories Industry. Initially focussed on leather products, in tune with changing times the programme now encompasses the areas of Fashion goods, Personal Lifestyle accessories and Footwear across the four campuses of Chennai, Kolkata, New Delhi and Raebareli. Emphasis is laid on the integration of design concepts with material knowledge. A multidisciplinary approach and exposure to the industry through field trips, tannery training, Craft Cluster programs, Industry internship and Graduation Projects are an integral part of the curriculum whereby students explore and innovate with materials, Techniques, Forms and components.

- **National Level Sectoral Association:**

**Agra Footwear Manufacturers and Exporters Chamber (AFMEC) – https://www.afmec.org/**

| | |
|---|---|
| ***Association Details*** | All India Skin and Hide Tanners and Merchants (AISHTMA) – http://www.aishtma.com/ |
| | Confederation of Indian Footwear Industries (CIFI) – https://www.cifi.in/ |
| | Indian Finished Leather Manufacturers and Exporters Association (IFLMEA) – https://www.iflmea.com/ |
| | Indian Leather Products Association (ILPA) – https://www.ilpaindia.org/ |
| | Tamil Nadu Leather Tanners Exporters & Importers Association – https://talteia.com/ |
| | Indian Leather Technologists' Association<br>Official Website: www.iltaonleather.org |
| ***Others*** | Solidaridad, Kanpur - It is an international network organization with partners all over the world, working in the ambit of social and environmental challenges in the Leather sector in India. |

# Annexure: 8 - List of Audited Tannery Units

| Kanpur Cluster | | | | |
|---|---|---|---|---|
| **Name** | **Address** | **Concerned Person Name** | **Email ID** | **Mobile /Landline** |
| Superhouse Ltd., Tannery No. 1 | A-1, C-1, Site-II UPSIDC Industrial Area, Unnao 209801 | Mr. Rutnesh Dubey | Info@superhousegroup.com | 515282903 9810290173 |
| Kings International | D-13 & D-19, (Site II) UPSIDC Industrial Area, Unnao - 209 801, INDIA | Mr. Amir Ausaf | inspection@kings-international.net | 7379786644 9918921401 |
| Amin Tannery Ltd | A-46/47, UPSIDC Leather Technology Park, Banthar, Unnao, 209801, INDIA | Mr. Sunil Kumar yadav | Mail.amintannery.in | 9889322310 |
| Rahman Industries limited | Akrampur Chakrampur, Kundan mod singrausi road Unnao | Mr. Mohd Anas | powerdivision@rahman-group.com | 6390646707 |
| Anwar Tennary | 175/158 Budiya ghat Kanpur | Mr. Mustakh Ahmad | anwartannery@gmail.com | 5122461307 |
| Golden Tannery | Budiya Ghat Kanpur Jajmau Uttar Pradesh 208010 | Mr Saddam Alam, Mr. Mohammad Zaid | goldentannery@gmail.com | 9906507430 |
| Seema Tanning | Sanjay Naga Jajmau Uttar Pradesh 208010 | Mr Ehsanul Haque | Seemaexports786@gmail.com | 9984983646 |
| Atesham tannery | KDA Colony Kanpur, Uttar Pradesh, 208010 India | Mr. Ahtesham Asheer | ahteshamaheer@gmail.com | 8062245347 |
| Calico Trend | Banthar Campus, Banthar, Unnao-209801, Uttar Pradesh, India" | Mr Shamim A Siddique | calicotrends@gmail.com | 9628370020 |
| Mirza International Ltd. | UPSIDC Industrial Area, Site II, Unnao - Uttar Pradesh 209 801 | Mr. Tasneef Ahmad Mirza Mr. NIRMAL SAHIJWANI | nirmal@mirzaindia.com | 5122530775 |

| Kolkata Cluster | | | | |
|---|---|---|---|---|
| **Name** | **Address** | **Concerned Person Name** | **Email ID** | **Mobile /Landline** |
| Indian Tanning Industries Pvt. Ltd. | 44, Matheswartolla road Kolkata, Zone No-80, Plot No. 599 & 600, kolkata Leather Complex Kolkata-700046 | Mr. Kelvin Juneja | ramesh@jcgroup.in | 9830075797 |
| Milan Tannery | Zone-6, Plot – 567 kolkata Leather Complex | Mr. SAURAV RATHI | MILANTANNERY@GMAIL.COM | 9830021310 |
| BUKHARA LEATHER INDUSTRIES | 6B KUSTIA ROAD, TILJALA KOLKATA Kolkata WB 700039 | Mr. ABDUL | | 9007303974 |
| Nadeem Impex | 8/1 Topsia Road South Kolkata -700046 WB India | Mr. Nadeem Sarwar | info@nadeemimpex.com | 91-9830095622 |
| GATEWAY LEATHERS PVT LTD | Zone – 1, Plot – 17, Kolkata Leather Complex, Bhojerat, 24 Parganas (South), 743502, West Bengal, India | Mr. Ramadish | gatewayleather@gmail.com | 9836452714 |
| Leather and Leather | Kolkata Leather Complex Zone-2, Plot - 184 Bantalla, Karai Danga, South 24 Parganas, India | Mr. Arif | info@leathernleather.in | +91 99030 64997 |
| CLASSIC TANNERY PVT. Ltd. | "Zone 2, Plot 129, 130 & 131, Calcutta Leather Complex, Karaidanga, 24 Parganas (South), West Bengal, 743502", India | Mr. SUBHRA Malik | classictannerypvtltd@rediffmail.com | 9831923424 |
| S.M. International | Kolkata Leather Complex Zone 6 Plot -548 & Zone - 7 ,plot - 645, Kolkata-743502, West Bengal, India | Mr. KHIRZUL BASHAR | Sabbir.ahmed@SMinternational.in | 9831867452 |
| AINUL HAQUE & BROTHERS | PLOT-146 ZONE-2, Kolkata Leather Complex, Kolkata-743502 | Mr. MAQBOOL | | 9883225571 |
| Winsome Leathers | Zone-1 Plot-14, Kolkata leather Complex, Kolkata-743502 | Mr. Supran Chaudhuri | winsome-leather@yahoo.dal.com | 9831035801 |

| Pallavaram Cluster | | | | |
|---|---|---|---|---|
| **Name** | **Address** | **Concerned Person Name** | **Email ID** | **Mobile /Landline** |
| JAHAN Leather Exports | 50, Anna Salai, R.S Complex Nagalkeni Chrompet Pallavaram-600044 Chennai | Mr. G Mohamad Jahan | md@jahan.co.in | +91-44-44073192/93 |
| Futan Leather | 191, 5A, Chromepet Pallavaram-600044 Chennai | Kapvppiam | office.fatanleathers@gmail.com | 9380645361 |
| Asian Tannery | Plot No-7 , Chromepet Pallavaram-600044 Chennai | Mr. B Chandrasekaran | rmurtiwoodland@gmail.com | 9003022366 |
| Shri Vignesh & Co | No. 191/3&4 Angalamman koil 2nd Street, Nagalkeni, Chromepet, Pallavaram | Mr. V Ramalingam | shrivigneshandco@gmail.com | 9444085383 |
| VV Tannery | 2, Thennavn Street, Akkeswar Colony, nagalkeni, Chrompet, kanchipuram, Tamil nadu | Mr. Vdhaya Kumar | Vdhaya@gmail.com | 8048361255 |
| Mercuri-1 Tanners | Door No: 28, Anna Salai, pammal, Pallavaram, 401-South2 | Mr. M. Murali Dharan | chennai1979@gmail.com | 9940030022 |
| Mercuri-2 Tanners | Door no: 27, Anna Salai, pammal, Pallavaram | Mr. M. Murali Dharan | chennai1979@gmail.com | 9940030022 |
| Rathnam Leathers | 191-B Angalamman Koil St, Nagalkeni, Chromepet Chennai-600044 | Mr. R Senthil Kumar | senthil@rathnamleather.in | 9940534775 |
| Truekem Tannery | No. 7 M.G.R .Salai, Nagalekni, Chennai Tamilnadu | Mr. D Madhu | truekem2011@gmail.com | 9940094994 |

| Vaniyambadi Cluster | | | | |
|---|---|---|---|---|
| **Name** | **Address** | **Concerned Person Name** | **Email ID** | **Mobile /Landline** |
| FARIDA PRIME TANNERY | Zubaida Building,P.Box .No.40,Ambur. Thuthipattu, Ambur | Md. Shareef | fptbengg@faridatannery.com | 8939658489 |
| SHAFEEQ SHAMEEL & CO. | 30 Venkatasamudiram Road, Ambur, Vellore, 635802, Tamil Nadu, India | Shafeeq Ahmed | shafeeq@sscgrp.com | +91 4174 244870 |
| Zubaida Tannery Industries | 4/172 Thuthipet Gudiyattam Road, Vellore Ambur-635811 | Mr. Sawood | zubaidatannery@gmail.com | 9789166741 |
| NMZ Tannery and Co. | Door No 67. NMZ House, EVK Sampath Road, Verpery, Chennai-635802 | Mr. Javed Khan | "tannery@nmzgroup.in," | 9894364143 |
| KENZA TANNERY | 90/2A Somalapuram Road, Thtuhipet, Periyavarikam Village Ambur-635811, Tamil Nadu | Mr. Zafar | kenzatanners@gmail.com | 9994619850 |
| T Abdul Wahid Tannery Unit -B | Solur Village Ambur Vellore-635802 Tamil Nadu | Mr. CY Willliam | tadnan@tawahid.com | 9894793308 |
| T ABDUL WAHID UNI-C TANNERY | Solur Village Ambur Vellore-635802 Tamil Nadu | Mr. CY Willliam | tadnan@tawahid.com | 9894793308 |
| AXA TANNERY GROUP | 1105/A6, PJ Nehru Road, Vaniyambadi, Vellore, Tamil Nadu, 635751", India | Mr. Farhan | info@axaleathergroup.com | 9786222324 |
| Performance Leather Company | 1056/B , Alangayam, C.N.A Road, Konamedu, Vaniyambadi Tamil Nadu-635751 | Mr. Asadullah Gundu | | 8807709391 |
| V.A.S Noorullah and Co. | No. 30, Kailasagiri Road, Udayendram Vaniambadi Vellore -635754 | Mr. Shakeel | accounts@vasngroup.com | 8883397050 |
| NASER TANNERY | "445 C N A Road Girusamudiram, Vaniyambadi, PIN 635751, Tirupattur District, Tamil Nadu", India | Md. Oomer Fair | tannery@naser-group.com | +91 4174 233763/64 |

| Jalandhar Cluster | | | | |
|---|---|---|---|---|
| **Name** | **Address** | **Concerned Person Name** | **Email ID** | **Mobile /Landline** |
| Punjab Hide Co.1 | 135, Leather Complex Jalandhar -144002 | Mr Ashok Sachdeva | Punjabhideco @gmail.com | 9779922072 |
| Punjab Hide Co.2 | 134, Leather Complex Jalandhar -144002 | Mr Ashok Sachdeva | Punjabhideco @gmail.com | 9779922072 |
| Regal Leather Pvt. Ltd. | 26, Leather Complex Jalandhar -144002 | Mr. Ram Murti | rmurtiwoodland@gmail.com | 9814293096 |
| Ravi Tanneries Pvt. Ltd. | 7- Leather Complex Kpt Road, Jalandhar-144002 | Pawan Kumar (Director) | ravitann@yahoo.com | 9914100953 9814106770 |
| Kapish Leather Pvt. Ltd. | 114 Leather Complex Kpt Road, Jalandhar-144002 | Mr. Asim kakria | kapishleather @yahho.com | 9814332286 |
| M/s BM Traders | 223-Leather Complex, Jalandhar -144002 | Lakhwinder Singh | bmtaders02@gmail.com | 9815350522 |
| Jay dee leather Pvt. Ltd. | 28-Leather Complex, Jalandhar -144002 | Mr. Daksh chawla | chawla.tanneries@gmail.com | 9877860000 |
| Vasu Leather Pvt. Ltd. | 1A & 2A Leather Complex, Kapoorthala Road, Jalandhar City-144002 | Mr Hira Lal Verma | Diamondredkpt@gmail.com | 9872491303 |
| A V Tanneries | 37-39, Leather Complex Kpt Road Jalandhar-144002 | Mr Sanjay Kumar | sanjaykumar3637@gmail.com | 9814632286 |
| Jalandhar Leather India. | 1-3, Leather Complex, Kapurthala Road, Jalandhar - 144 021 | Sandeep Singh (Director) | jal_leather@hotmail.com | 91-181-5051003, 2650721 |

# Annexure: 9 – List of Sectoral Stakeholders

| S.No. | Name | Address | Contact Person | Email ID | Phone |
|---|---|---|---|---|---|
| 1 | The Indian Leather Products Association (ILPA) | Suite No 6, 14th Floor, Chatterjee International Centre, 33A Jawahar Lal Nehru Road, Kolkata, West Bengal 700071 | Arpita Paul, Executive Director, 9007881474 | mail@ilpaindia.org, ilpa.bss.kolkata@gmail.com | 033-4603-7016 |
| 2 | CLC Tanners Association | CETP (Treatment Plant) Karaidanga, PO: Bhojerhat, PS: KLC 24-Parganas (S), Pin : 743502 Phone : 033 21456987 | Imran Ahmed Khan, General Secretary/ Abdul Matin, CEO Abani Kumar Ghosh, Sr GM (Tech & Envir.) | clctanners@gmail.com, secretaryclcta@gmail.com | 033 21456987 |
| 3 | Punjab Leather Federation | 51, Leather Complex, Kapurthala Road, G T Road, Jalandhar - 144001 | Parveen Kumar, president | | 1812650261, (0181) 2650261, (0181) 2650679 |
| 4 | Indian Finished Leather Manufacturers And Exporters Association | CMDA Buildings, Tower – II, Third Floor, South Wing No: 1, Gandhi Irwin Bridge Road, Egmore, CHENNAI – 600 008. INDIA | Mr. A. R. Senthil Kumar, Secretary | es@iflmea.com, iflmea@gmail.com | +91-44-2841 1055 |
| 5 | South India Tanners and Dealers Association (SITDA) | NH 46, Walajapet, Tamil Nadu 632513 | -- | -- | -- |
| 6 | Tamil Nadu Leather Tanners Exporters & Importers Association | No.69, (Old No.66), Sydenhams Road, Periamet, Chennai - 600 003. Tamilnadu, INDIA. | P.M.R.Shamshudeen, Secretary, 94440 87475 | tal_teia@rediffmail.com, talteia2@gmail.com | +91-44-2538 6914 / 2538 6915 / 4858 6914 |
| **7** | Indian Leather Technologists' Association | SANJOY BHAVAN, 3rd Floor, 44, Shanti Pally, Kasba Kolkata - 700 107 | | admin@iltaonleather.org, mailtoilta@rediffmail.com | 033 – 24413429 / 24413459, 9830052522 (GS) / 9432553949 (OSD) |
| 8 | UPPCB | Uttar Pradesh Pollution Control Board Building.No. TC-12V, Vibhuti Khand, Gomti Nagar Lucknow-226 010 | Sh. Rajendra Singh, Chief Environmental Officer | ceo2@uppcb.in | 0522-2720822, Phone : +91-522-2720831, 2720681, 2720691 |

| S.No. | Name | Address | Contact Person | Email ID | Phone |
|---|---|---|---|---|---|
| 9 | UPPCB | Kanpur : 5243, Avas Vikas, Phase-III, Sadbhavna Nagar, Kalyanpur, Kanpur-17 | Shri Amit Mishra, Regional Officer | rokanpur@uppcb.in | 0512-2510999, 7839891813 |
| 10 | CPCB | PICUP Bhawan, Vibhuti Khand, Gomti Nagar,Lucknow - 226010 Landline Number: 0522-4087600, Fax No. 0522-4087602 | Dr. R K Singh (Scientist 'E'), Regional Director | rdlucknow.cpcb@gov.in, cpcb.lucknow@gmail.com | 0522-4087601, 2721915 |
| 11 | CPCB | 'South end Conclave' Block-502, 5th & 6th Floor, 1582, Razidanga, Main Road, Kolkata-700107 Landline Number: 033-2441 6634 / 4289 / 4677 / 6003, Fax No. 033-2441 8725, Direct: 033 2441663 | Sh. M.K. Biswas(Scientist 'E'), Regional Director | mkbiswas.cpcb@nic.in | 033-24416634 |
| 12 | CPCB | BSNL Telephone Exchange, 2nd Floor, Sector -49 C, Chandigarh – 160047 | Sh. Gurnam Singh (Scientist 'F'), Regional Director | gurnamsingh.cpcb@nic.in | 7840015561 |
| 13 | CPCB | Second Floor, No.77-A, South Avenue Road, Ambattur Industrial Estate, Ambattur Taluk, Thiruvallur District, Chennai, Tamil Nadu - 600 058 Landline Number: 044-29998683, 29567019 | Smt. H. D. Varalaxmi (Scientist 'E'), Regional Director | vlaxmi.cpcb@nic.in | -- |
| 14 | PPCB | Chief Environmental Engineer, Punjab Pollution Control Board, Chief Office, Jalandhar | Er. G.S. Majithia, Chief Environmental Engineer | ceejalandhar@yahoo.com ceejal.ppcb@punjab.gov.in | 0181-2604885 |
| 15 | PPCB | Focal Point, Opp. State Bank of India, G.T. Road, Amritsar By Pass, Jalandhar | Er. Arun Kakkar, Senior Environmental Engineer | seeppcbjal@gmail.com seezojal.ppcb@punjab.gov.in | 0181-2601612 |

| S.No. | Name | Address | Contact Person | Email ID | Phone |
|---|---|---|---|---|---|
| 16 | TNPCB | Tamil Nadu Pollution Control Board, 76, Mount Salai, Guindy, Chennai - 600 032 | Dr.Jayanthi.M, I.F.S., Chairperson | tnpcb-chn@gov.in | Tel: 044 - 22353134 - 139 |
| 17 | TNPCB | Tamil Nadu Pollution Control Board, 76, Mount Salai, Guindy, Chennai - 600 032 | Dr. S. Selvan, M.E, M.B.A, Ph.D, Chief Environmental Engineer | -- | 044- 22353147 |
| 18 | WBPCB | Paribesh Bhawan 10A, Block-LA, Sector-III Bidhannagar, Kolkata-700 106 | -- | net.wbpcb-wb@bangla.gov.in | (033) 2335-9088/7428/8211/ 8861 |
| 19 | WBPCB | Mani Square, Block No. 8IT, Western Side, 8th Floor, 164/1, Maniktala Main Road, Kolkata-700 054 | -- | -- | -- |
| **Council for Leather Export under Ministry of Commerce** | | | | | |
| **S.No.** | **Name** | **Address** | **Contact Person** | **Email ID** | **Phone** |
| 20 | Council for Leather Exports | No.1, Sivaganga Road, Nungambakkam, Chennai – 600034 | Mr. R. Selvam, I.A.S, Executive Director | cle@cleindia.com | Tel: 044 48684380-84 |
| 21 | Council for Leather Exports | No.1, Sivaganga Road, Nungambakkam, Chennai – 600034 | Shri. E.L. Samson, Regional Director, | south@cleindia.com | Tel: 044 48684380-84 |
| 22 | Council for Leather Exports | Central Regional Office KLC Complex (Kanpur-Lucknow Highway) Kader Patari, Banthar, Unnao-209862 | Mrs. Pallavi Dubey, Regional Director | cleknp@cleindia.com | Telephone: 0515-2823376, Mobile No.: +91 9129887565 |
| 23 | Council for Leather Exports | 1B, First Floor, "Duckback House", 41, Shakespeare Sarani, Kolkata – 700 017 | Shri. Debasis De Regional Director | cleer@cleindia.com | Tel: +91-33-22835479/80. |
| 24 | Council for Leather Exports | Unit No.317, DLF Prime Towers, Plot No.79 & 80, Block F, Okhla Industrial Area, Phase-I, New Delhi-110 020 | Shri. Atul Kumar Mishra, Regional Director | cledelhi@cleindia.com | Tel: 011-26814501 / 502, Cell: 0-9971489936 |

| S.No. | Name | Address | Contact Person | Email ID | Phone |
|---|---|---|---|---|---|
| **Concerned Ministry** | | | | | |
| **S.No.** | **Name** | **Address** | **Contact Person** | **Email ID** | **Phone** |
| **25** | DPIIT, Ministry of Commerce | "DEPARTMENT For Promotion Of Industry And Internal Trade Udyog Bhawan, New Delhi 110011 | **Sh. Binod Kumar,** Deputy Secretary Industrial Licensing (IL), Salt, Leather and Footwear. | dd-p.t@cleindia.com | EPABX : 011-23061222, Fax : 011-23062626" |
| **26** | DPIIT, Ministry of Commerce | "DEPARTMENT For Promotion Of Industry And Internal Trade Udyog Bhawan, New Delhi 110011 | Sh. Suman Kumar, Under Secretary Industrial Licensing (IL), Industrial Entrepreneurs Memorandum (IEM), Leather and Footwear" | dd-p.t@cleindia.com | EPABX : 011-23061222, Fax : 011-23062626" |
| **Central Leather Research Institute under CSIR, Ministry of Science & Technology** | | | | | |
| 1 | Shri Abhinandan Kumar | CLRI, Kanpur, UP | Shri Abhinandan Kumar | clrikpr@clri.res.in | +91512298 6936 |
| 2 | Dr. K Sri Bala Kameswari | CLRI Kolkata | Dr. K Sri Bala Kameswari | sribalak@clri.res.in | +91 044 24437412 |
| 3 | Dr KJ Sreeram | CLRI Chennai | Dr KJ Sreeram | director@clri.res.in | +91 44 2441 0228 |
| 4 | Dr. R. Ravi sekar | CLRI Chennai | Dr. R. Ravi sekar | ravisekarclri@gmail.com | 9840251591 |
| 5 | P.S. Suresh Kumar | CLRI Chennai | P.S. Suresh Kumar | sureshkumar@Clri.ks.in | 9444764734 |
| 6 | S.V. Srinivasan | CLRI Chennai | S.V. Srinivasan | Srinivisa@yahoo.com | 9445393300 |
| 7 | DR. R. Arquidhan | CLRI Chennai | DR. R. Arquidhan | aravindhan@clri.res.in | 9840091656 |

# Annexure: 10 – ENCONs Market Potential

| Kolkata Cluster | | | | | |
|---|---|---|---|---|---|
| **Particular** | **Investment (Rs. Lakh)** | **Simple Payback Period (Months)** | **Energy Savings (TOE)** | **Annual Monetary Savings (Rs. Lakh)** | **$CO_2$ Savings (MT)** |
| **Installation of VFD in Drum Motor** | 483.59 | 22.01 | 239.93 | 295.07 | 2271.15 |
| **Replacement of Inefficient Motors with Energy Efficient Motors (IE4 Motors)** | 2265.61 | 37.40 | 655.19 | 991.11 | 6123.29 |
| **Pressure Optimization in Compressed Air System** | Negligible | Immediate | 27.92 | 35.23 | 257.31 |
| **Arresting of Air Leakage in Compressed Air System** | Negligible | Immediate | 277.71 | 340.47 | 2596.91 |
| **Replacement of Conventional Lights & Fans with Energy Efficient LED Lights and BLDC Fans** | 345.77 | 20.05 | 197.91 | 211.81 | 1735.70 |
| **Implementation of Cogged Belt in Motor Transmission System** | 126.92 | 11.69 | 119.10 | 151.15 | 1202.59 |
| **Implementation of Energy Monitoring System (EMS)** | 1336.00 | 35.13 | 64.07 | 137.34 | 760.67 |
| **Installation of Grid Connected Roof-top Solar Power Plant** | 4403.49 | 33.34 | 1314.05 | 1654.54 | 12453.88 |
| **Insulation Repair of Steam Network** | 1285.90 | 12.15 | 687.98 | 1274.87 | 3136.39 |
| **Condensate Recovery from Steam Network** | 1670.00 | 36.06 | 269.54 | 611.48 | 1329.66 |
| **Waste Heat Recovery from Flue Gases for Water Preheating** | 968.60 | 19.71 | 460.12 | 801.60 | 2088.49 |
| **Waste Heat Recovery from Flue Gases for Air Preheating** | 1336.00 | 27.00 | 459.25 | 501.00 | 2045.75 |
| **Compressor Waste Heat Recovery – Energy Recovery Unit (ER unit)** | 601.20 | 10.17 | 515.38 | 206.22 | 2563.39 |
| **Solar Water Heater for Drum Hot Water** | 5010.00 | 39.00 | 1097.35 | 1542.31 | 5666.59 |
| **Installation of Heat Pump for Drum Hot Water Requirement** | 4123.57 | 9.16 | 2098.57 | 900.38 | 10826.25 |
| **Compressor Waste Heat Recovery – Energy Recovery Unit (ER unit) (For 55 kW Compressor)** | 1503.00 | 25.42 | 561.51 | 316.77 | 2883.81 |
| **Solar Air Heating for Drying Application** | 17468.20 | 31.00 | 1994.46 | 2240.03 | 9154.94 |

| Jalandhar Cluster | | | | | |
|---|---|---|---|---|---|
| **Particular** | **Investment (Rs. Lakh)** | **Simple Payback Period (Months)** | **Energy Savings (TOE)** | **Annual Monetary Savings (Rs. Lakh)** | **$CO_2$ Savings (MT)** |
| **Installation of VFD in Drum Motor** | 214.58 | 44.78 | 44.16 | 52.23 | 380.90 |
| **Replacement of Inefficient Motors with Energy Efficient Motors (IE4 Motors)** | 325.71 | 33.60 | 114.24 | 108.63 | 1089.25 |
| **Pressure Optimization in Compressed Air System** | Negligible | Immediate | 31.66 | 31.42 | 286.42 |
| **Arresting of Air Leakage in Compressed Air System** | Negligible | Immediate | 49.07 | 43.19 | 444.58 |
| **Replacement of Conventional Lights & Fans with Energy Efficient LED Lights and BLDC Fans** | 44.64 | 38.07 | 23.96 | 20.78 | 205.25 |
| **Implementation of Cogged Belt in Motor Transmission System** | 58.13 | 22.04 | 25.32 | 29.51 | 230.39 |
| **Implementation of Energy Monitoring System (EMS)** | 594.61 | 25.56 | 103.55 | 178.20 | 987.38 |
| **Installation of Grid Connected Roof-top Solar Power Plant** | 1221.56 | 39.87 | 468.80 | 403.71 | 4001.01 |
| **Insulation Repair of Steam Network** | 226.85 | 16.71 | 136.97 | 164.63 | 628.11 |
| **Condensate Recovery from Steam Network** | 585.75 | 33.57 | 190.08 | 228.46 | 871.65 |
| **Waste Heat Recovery from Flue Gases for Water Preheating** | 301.75 | 31.77 | 266.70 | 310.16 | 1222.99 |
| **Waste Heat Recovery from Flue Gases for Air Preheating** | 124.25 | 18.18 | 49.97 | 39.04 | 229.16 |
| **Compressor Waste Heat Recovery - Energy Recovery Unit (ER unit) (For 55 kW Compressor)** | 331.33 | 17.59 | 222.37 | 231.63 | 1019.70 |
| **Solar Water Heater for Drum Hot Water** | 745.50 | 42.25 | 209.72 | 218.46 | 961.72 |
| **Installation of Heat Pump for Drum Hot Water Requirement** | 511.00 | 20.86 | 220.45 | 294.69 | 1010.91 |
| **IR Based Electric Heating for Drying Application** | 534.11 | 13.16 | 315.54 | 534.11 | 1446.94 |
| **Pole Dryer for Space Heating Application** | 331.33 | 17.59 | 222.37 | 231.63 | 1019.70 |
| **Solar Air Heating for Drying Application** | 4385.63 | 51.57 | 257.14 | 1020.54 | 1179.17 |

| Pallavaram Cluster | | | | | |
|---|---|---|---|---|---|
| **Particular** | **Investment (Rs. Lakh)** | **Simple Payback Period (Months)** | **Energy Savings (TOE)** | **Annual Monetary Savings (Rs. Lakh)** | **$CO_2$ Savings (MT)** |
| **Installation of VFD in Drum Motor** | 237.95 | 24.56 | 145.04 | 126.56 | 1381.24 |
| **Replacement of Inefficient Motors with Energy Efficient Motors (IE4 Motors)** | 751.29 | 39.42 | 289.46 | 263.13 | 2759.50 |
| **Pressure Optimization in Compressed Air System** | Negligible | Immediate | 20.01 | 18.69 | 186.96 |
| **Arresting of Air Leakage in Compressed Air System** | Negligible | Immediate | 168.57 | 157.33 | 1609.32 |
| **Replacement of Conventional Lights & Fans with Energy Efficient LED Lights and BLDC Fans** | 141.94 | 30.66 | 66.66 | 60.41 | 637.33 |
| **Implementation of Cogged Belt in Motor Transmission System** | 59.25 | 15.36 | 60.38 | 52.45 | 573.94 |
| **Implementation of Energy Monitoring System (EMS)** | 445.86 | 34.80 | 194.01 | 171.09 | 1851.22 |
| **Installation of Grid Connected Roof-top Solar Power Plant** | 2053.61 | 42.68 | 583.84 | 631.29 | 5568.58 |
| **Insulation Repair of Steam Network** | 426.60 | 21.97 | 1338.52 | 413.10 | 6137.74 |
| **Waste Heat Recovery from Flue Gases for Water Preheating** | 111.39 | 0.00 | 282.03 | 52.14 | 1289.28 |
| **Waste Heat Recovery from Flue Gases for Air Preheating** | 106.65 | 25.37 | 75.84 | 35.55 | 347.21 |
| **Compressor Waste Heat Recovery - Energy Recovery Unit (ER unit)** | 1125.75 | 36.44 | 909.95 | 710.53 | 4172.20 |
| **Solar Water Heater for Drum Hot Water** | 1777.50 | 19.06 | 1749.61 | 546.92 | 8025.22 |
| **Installation of Heat Pump for Drum Hot Water Requirement** | 1135.76 | 39.00 | 1358.57 | 319.28 | 6231.47 |
| **Compressor Waste Heat Recovery - Energy Recovery Unit (ER unit)** | 1125.75 | 39.80 | 909.95 | 710.53 | 4172.20 |
| **Pole Dryer for Space Heating Application** | 4014.09 | 0.00 | 2397.55 | 1152.67 | 10994.34 |
| **Solar Air Heating for Drying Application** | 2607.00 | 19.06 | 998.96 | 575.91 | 4581.21 |

| Vaniyambadi Cluster | | | | | |
|---|---|---|---|---|---|
| **Particular** | **Investment (Rs. Lakh)** | **Simple Payback Period (Months)** | **Energy Savings (TOE)** | **Annual Monetary Savings (Rs. Lakh)** | **$CO_2$ Savings (MT)** |
| **Installation of VFD in Drum Motor** | 1966.72 | 23.33 | 886.55 | 924.90 | 8454.88 |
| **Replacement of Inefficient Motors with Energy Efficient Motors (IE4 Motors)** | 2889.52 | 31.37 | 1096.71 | 1128.57 | 10456.95 |
| **Pressure Optimization in Compressed Air System** | Negligible | Immediate | 73.67 | 76.47 | 701.81 |
| **Arresting of Air Leakage in Compressed Air System** | Negligible | Immediate | 488.98 | 514.88 | 4664.95 |
| **Replacement of Conventional Lights & Fans with Energy Efficient LED Lights and BLDC Fans** | 601.82 | 25.10 | 295.70 | 284.85 | 2818.57 |
| **Implementation of Cogged Belt in Motor Transmission System** | 208.96 | 9.06 | 349.72 | 349.98 | 3335.00 |
| **Implementation of Energy Monitoring System (EMS)** | 1521.47 | 45.04 | 433.63 | 448.81 | 4133.29 |
| **Installation of Grid Connected Roof-top Solar Power Plant** | 9442.48 | 37.52 | 3319.76 | 3372.52 | 31654.87 |
| **Insulation Repair of Steam Network** | 2346.30 | 11.35 | 3915.28 | 2145.30 | 17955.14 |
| **Condensate Recovery from Steam Network** | 3318.00 | 19.68 | 3943.68 | 2070.32 | 18084.39 |
| **Waste Heat Recovery from Flue Gases for Water Preheating** | 737.33 | 27.26 | 954.61 | 344.49 | 4377.51 |
| **Waste Heat Recovery from Flue Gases for Air Preheating** | 526.67 | 27.40 | 636.40 | 229.66 | 2918.34 |
| **Compressor Waste Heat Recovery - Energy Recovery Unit (ER unit)** | 2238.33 | 21.75 | 4051.84 | 1455.76 | 18577.52 |
| **Solar Water Heater for Drum Hot Water** | 6912.50 | 28.02 | 6092.29 | 2493.41 | 27941.69 |
| **Installation of Heat Pump for Drum Hot Water Requirement** | 5329.26 | 30.30 | 11707.49 | 2544.98 | 53686.61 |
| **Replacement of Old Wooden Drums with Polypropylene Drums** | 21555.99 | 66.10 | 3709.73 | 3915.48 | 35364.49 |
| **Energy Saving by Optimizing Water Consumption in Polypropylene Drum vs. Old Wooden Drums** | 35717.58 | 51.07 | 19.47 | 693.30 | 229.75 |
| **Solar Air Heating for Drying Application** | 13239.04 | 0.00 | 10472.96 | 5146.82 | 47949.44 |

| Kanpur Cluster | | | | | |
|---|---|---|---|---|---|
| **Particular** | **Investment (Rs. Lakh)** | **Simple Payback Period (Months)** | **Energy Savings (TOE)** | **Annual Monetary Savings (Rs. Lakh)** | **$CO_2$ Savings (MT)** |
| **Installation of VFD in Drum Motor** | 1060.67 | 33.18 | 370.15 | 624.41 | 3513.31 |
| **Replacement of Inefficient Motors with Energy Efficient Motors (IE4 Motors)** | 2886.72 | 23.50 | 945.61 | 1086.30 | 9026.63 |
| **Pressure Optimization in Compressed Air System** | Negligible | Immediate | 84.66 | 205.73 | 827.82 |
| **Arresting of Air Leakage in Compressed Air System** | Negligible | Immediate | 451.95 | 518.61 | 4320.68 |
| **Replacement of Conventional Lights & Fans with Energy Efficient LED Lights and BLDC Fans** | 373.01 | 34.70 | 184.05 | 191.00 | 1794.28 |
| **Implementation of Cogged Belt in Motor Transmission System** | 149.97 | 11.23 | 247.45 | 322.20 | 2357.48 |
| **Implementation of Energy Monitoring System (EMS)** | 2220.29 | 14.79 | 622.09 | 793.91 | 5923.14 |
| **Installation of Grid Connected Roof-top Solar Power Plant** | 17392.95 | 34.68 | 4845.42 | 6407.67 | 46203.91 |
| **Insulation Repair of Steam Network** | 2118.62 | 11.64 | 2139.48 | 2755.84 | 9778.37 |
| **Condensate Recovery from Steam Network** | 6135.00 | 28.30 | 1883.85 | 2824.83 | 8643.81 |
| **Waste Heat Recovery from Flue Gases for Water Preheating** | 3408.33 | 30.43 | 1711.26 | 1710.98 | 7845.85 |
| **Waste Heat Recovery from Flue Gases for Air Preheating** | 2999.33 | 36.32 | 1142.34 | 1145.20 | 5229.07 |
| **Compressor Waste Heat Recovery - Energy Recovery Unit (ER unit) (For 55 kW Compressor)** | 2607.38 | 14.52 | 3063.82 | 2246.43 | 14051.60 |
| **Replacement of Old Wooden Drums with Polypropylene Drums** | 10331.85 | 24.74 | 2391.01 | 3026.60 | 22800.11 |
| **Energy Saving by Optimizing Water Consumption in Polypropylene Drum vs. Old Wooden Drums** | 0.00 | 0.00 | 8.90 | 503.52 | 136.61 |
| **Waterless Chrome Tanning** | 4771.67 | 13.67 | 1480.58 | 4914.82 | 11038.09 |
| **Solar Water Heater for Drum Hot Water** | 6135.00 | 32.80 | 3343.17 | 2700.22 | 15245.88 |
| **Pole Dryer for Space Heating Application** | 2658.50 | 14.52 | 3076.09 | 2236.21 | 14047.51 |

# Annexure: 11 – Bibliography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