

Tannery Clusters in India and waste management practices in tannery intensive states – inventory and status

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Abstract: Clusterisation is undoubtedly the most economical, organized and self-sustaining driving mechanism for cleaner leather production. The Indian Tannery sector has particularly shown shifting trend from scattered units to clusters in recent decade with **complete homogeneity** i.e. industries involved only in tannery and allied activities. The paper gives insight into tannery clusters in India, with comparison of cluster characteristics and waste management practices in tannery intensive states.

Study identifies 113 Tannery Clusters in India, tannery intensive states being Tamil Nadu (15 Clusters), Uttar Pradesh (13 Clusters), West Bengal (7 Clusters) and Punjab (15 clusters). Other States with prominence of tannery activities are Haryana (9 clusters), Maharashtra (13 clusters), Bihar (12 clusters), Andhra Pradesh (7 clusters), Rajasthan (11 clusters), with fewer units in Gujarat (2 clusters), Karnataka (1 cluster at Bangalore), Odisha (4 Clusters), Delhi (2 clusters), Himachal Pradesh (1 cluster), Uttarakhand (1 cluster) and Goa (scattered units). Micro scale units are not considered in this study as the study pertains to small and medium enterprises.

Jalandhar (Punjab) cluster has highest number of Medium scale units and second highest number of large scale units (10) after Tamil Nadu (13), in spite of the huge difference in total number of units in the clusters (110 in Jalandhar as against 704 in Tamil Nadu). Unit wise Tamil Nadu (704) has the highest number of units involved in tannery activities, followed by, West Bengal. Calcutta Leather Complex (462), Uttar Pradesh, Jajmau (405), and Punjab, Jalandhar (110).

Tannery is the only sector with highest number of dedicated CETPs showing a strong initiative for greener indention. Study reveals that 42 % of the total number of tannery clusters in four tannery intensive states is connected to CETP. Tamil Nadu has 93.3 % of units connected to CETP, followed by Uttar Pradesh (30.8%), West Bengal (14.3%) and Punjab (13.3%).

Key Words: Clusters, cleaner practices, greener production, wet blue, EI tanning.

I. Introduction

One of the unique features of Leather Industry Sector in India is its inherent characteristic to occur in clusters right from primitive time. Tanneries have always occurred in groups particularly the slaughter houses. As per CLRI report January 2013, about **42,000** units are registered under SSI. About 75 percent of tanneries in India are small-scale units. Another 20 percent are medium sized and only 5 percent are large-scale units. Total production of leather is from small and micro sector accounting for about 60% - 65% of the total leather production in the country. The states of Tamil Nadu, West Bengal and Uttar Pradesh together account for 88% of the tannery units of the country. In recent decade Punjab has emerged as a major wet blue leather producer.

India has 10% of the world's raw material base [3]. Raw material is of fine quality with versatile bio-polymer collagen. More than sufficient productive capacity in tanning exists in India as India has the largest livestock holding country in the world with 21 percent of the world's large animals (buffalo & cow) and 11 percent of the world's small animals (goat & sheep). Leather in India is generally produced from hides or skins of milch animals such as cow or buffalo (called hides) and goat or sheep (called skins). Leather from other sources are almost rare such as snake, rhinos, cheetah, etc. in India. Study shows that state wise, Himachal Pradesh and Punjab produces the maximum number of cattle skin. West Bengal Produces maximum number of buffalo hides, Kerala and Chennai produces sheep skins, while Uttar Pradesh produces goat skins. Leather industry in Uttar Pradesh is predominantly buffalo leather based, while that in West Bengal it is predominantly cow leather based and in Punjab it is predominantly cow and buffalo leather based. In Tamil Nadu, the tanneries in Vaniyambadi, Ambur, Tricy, Dindigul processes mostly goat and sheep skins, while the tanneries in Ranipet, Pernambut, Erode and Pallavaram processes hides. Bihar leather industry is mainly goat leather based. The Indian leather industry employs about 2.5 million workforce of which 30% is women.

Segmentation within the Sector

Based on various attributes of the sector like processing capacity, raw materials, production capacity, tanning process, annual turnover and final products, the sector can be segmented as below:

Table 1 : Segmentation within the Tannery Sector

Based on Processing Capacity of Wet Salted hide / skins (kg/day) 1. Large units : > 5000 2. Medium : 2000 -5000 3. Small : <2000	Based On Tanning Process 1. Vegetable(EI) Tanning 2. Chrome Tanning 3. Other mineral tanning	Based on Raw Material 1. Hide : Bovine: cows , buffaloes 2. Skin : Goats , sheep (flayed material called 'skin')
Based on Product Manufactured 1. Tanning and finishing 2. Footwear & footwear components 3. Leather garments 4. Leather goods 5. Accessories (bags, wallets, belts, gloves) 6. Saddlery& harness articles	Based on processing activities 1. Raw Hide to Leather Product Processing Units. 2. Raw Hide to Finished Leather Processing Units. 3. Raw Hide to Wet Blue Processing Units. 4. Wet Blue to Finished Leather Processing Units. 5. Wet Blue to Leather Product Processing Units. 6. Raw to E.I Tanned Leather Units. 7. Dry (Finished leather to Leather Products) Processing Units. 8. Secondary Leather waste (eg. Shavings, fleshings, hairs etc.) processing Units which produces glue, leather boards, meat meal, etc.	Based on Annual Turnover 1. Small Scale Units : < Euro 2.25 Million 2. Medium Scale Units: Euro 2.25 – Euro 11.25 Million 3. Large Scale Units : Euro 11.25 – Euro 41.25 Million

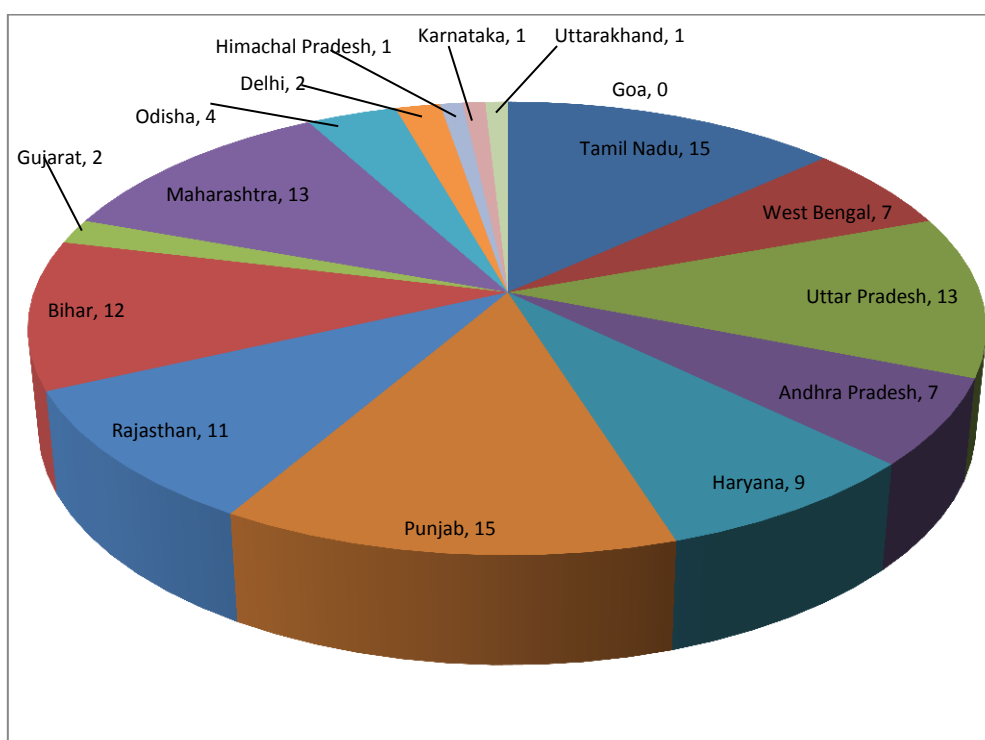
India has large institutional set up (more than 15 dedicated institutional set ups) that support the leather industry in specific areas such as product development, design and R & D. These institutions enable capability building in the industry and help it become globally competitive.

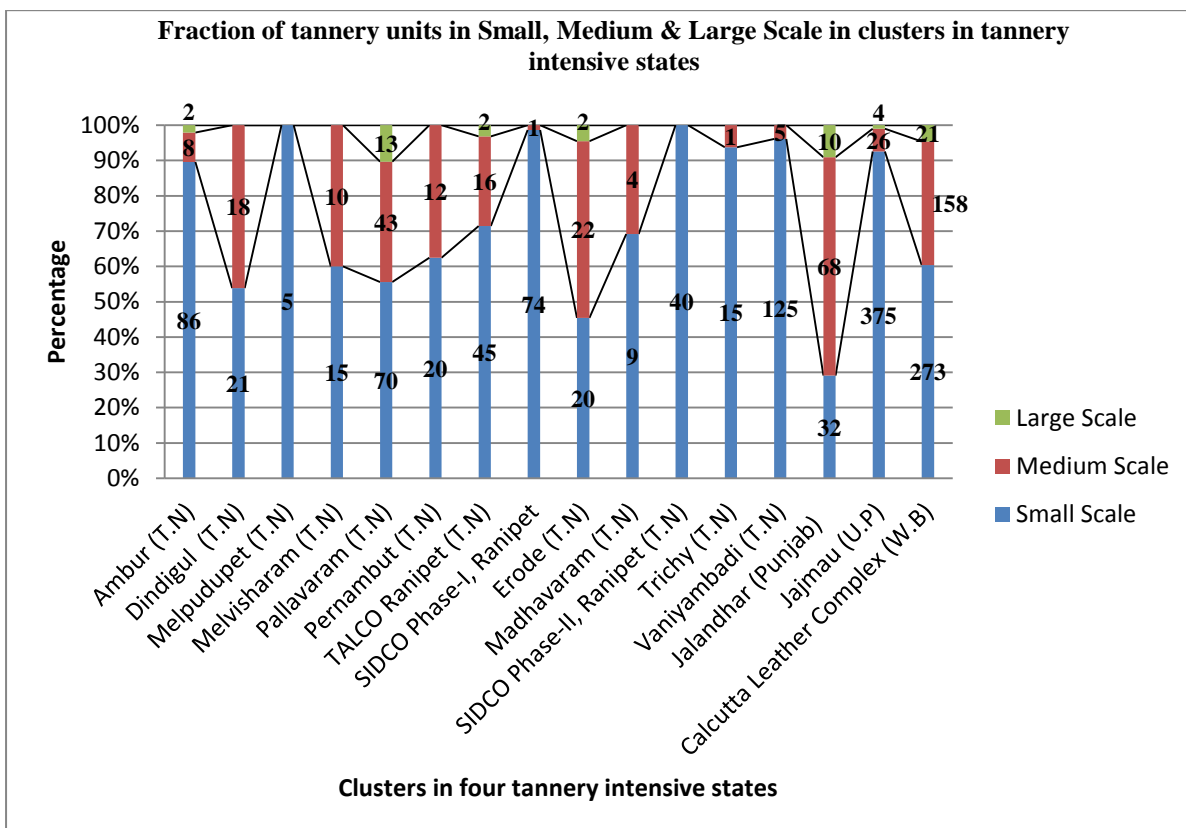
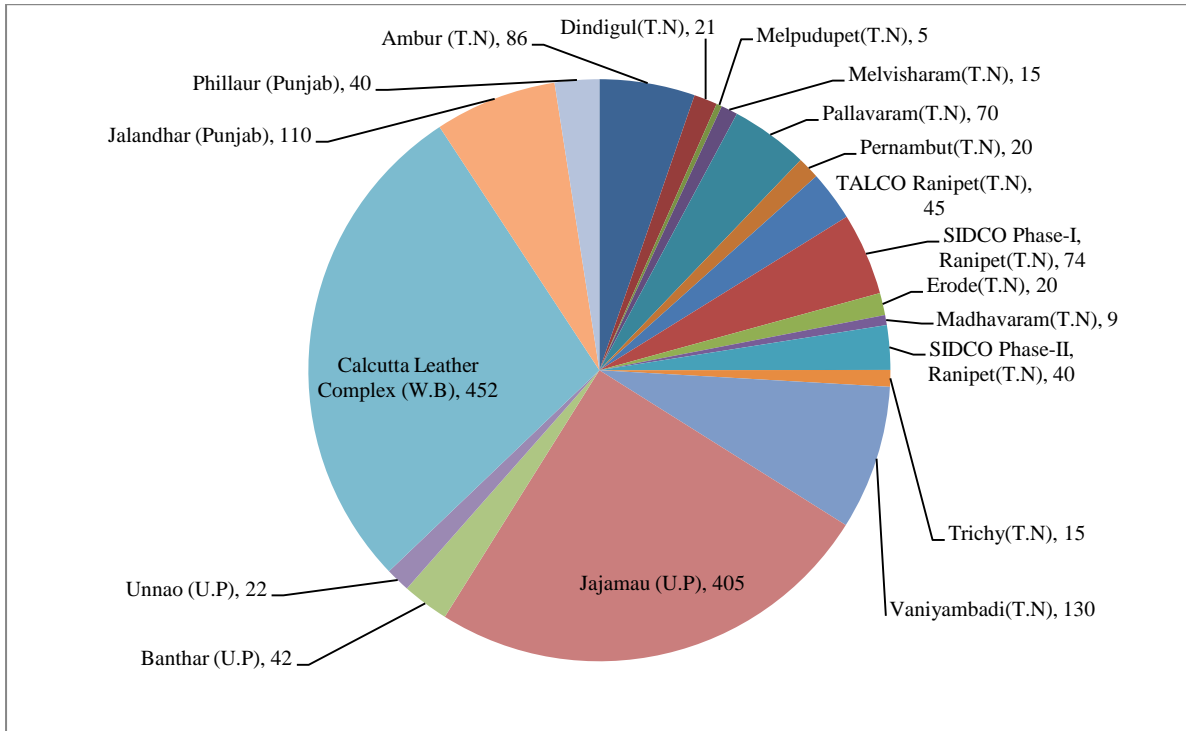
The report is based on the field visit to clusters in Uttar Pradesh, Punjab, West Bengal and report submitted by CLRI to CPCB on Tamil Nadu Cluster.

Inventory of Leather Processing Clusters in India

Tanneries have always occurred in groups often closer to slaughter houses in ‘clusters’, since ‘Clustering’ offers the benefits of easy availability of raw materials, manpower, technical knowhow, laboratory testing facilities, access to Common Treatment Facilities ex. CETP, CCRUs and is a self sustainable and self driving mechanism.

Table 2. : State-wise distribution of Tannery Clusters in India





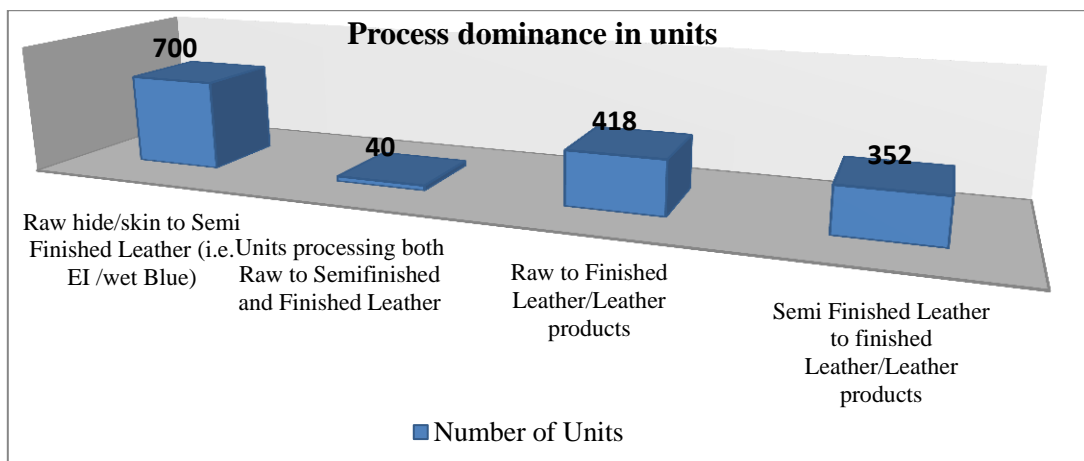
N.B: except for Tamil Nadu, other states are represented by single cluster.

A prominent observation is that Jalandhar (Punjab) cluster has highest number of Medium scale units and second highest number of large scale units (10) after Tamil Nadu (13), inspite of the huge difference in total number of units in the clusters (110 in Jalandhar as against 704 in Tamil Nadu).

Table: State-wise Comparison of processing hierarchy adopted in different clusters in tannery intensive states

Cluster Name		Process dominance in the clusters (number of units)	
TAMIL NADU			
1	Ambur	a)	Raw to Finished – 66
		b)	Semi-finished to Finished - 30
2	Dindigul	a)	Raw to E.I – 22
		b)	Raw to Wet Blue/ Raw E.I – 15
		c)	Raw to Finished– 1
		d)	Raw to Wet Blue– 1
3	Melpudupet	a)	Raw to Finished– 1 (no info. about rest 4 units)
4	Melvisharam	a)	Raw to Semi-Finished– 1
		b)	Raw to Finished– 1 (no info. about rest 23 units)
5	Pallavaram	a)	Raw to Wet Blue or Wet blue to Finished – 03
		b)	Wet Blue to Finished & E.I to Finished - 24
		c)	Wet Blue to Finished- 85
		d)	Raw to Pickle- 01
		e)	Pickle to Chamos- 01
		f)	Crust to Finished Leather- 02
		g)	E.I to Finished Leather – 10
6	Pernambut	a)	Raw to Finished - 03
		b)	Raw to Wet Blue - 02
		c)	Raw to EI - 24
		d)	Raw to Wet Blue or EI – 03
7	TALCO Ranipet	a)	Raw to Semi finished or Finished- 37
		b)	Semi-Finished to Finished- 22
		c)	Raw to Semi finished- 03
		d)	Raw to Finished- 01
8	SIDCO Phase-I, Ranipet	a)	Semi-Finished to Finished Leather- 75
9	Erode	a)	Raw to Finished Leather- 12
		b)	Raw to Wet Blue – 22
		c)	Wet Blue to Finished Leather- 02
		d)	Raw to E.I – 07
		e)	Raw to Wet Blue or E.I – 01
10	Madhavaram	a)	E.I to Finished Leather – 08
		b)	Wet Blue or E.I to Finished - 05
11	SIDCO Phase-II, Ranipet	a)	Semi-finished to Finished Leather - 40
12	Trichy	a)	Raw to E.I – 14
		b)	Raw to W.B – 01
		c)	Raw to W.B or E.I - 01
13	Vaniyambadi	a)	Raw to Finished - 130
UTTAR PRADESH			
1	Jajmau	a)	Raw to Finished – 41
		b)	Raw to W.B – 290
		c)	Wet Blue to Finished Leather – 11
		d)	Raw to E.I – 20
WEST BENGAL			
1	Calcutta Leather Complex	b)	Raw to Finished- 199
		c)	Raw to Wet Blue - 182
		d)	Wet Blue to Finished – 14
		e)	Raw to E.I – 08 (no info. about rest 49 units)
PUNJAB			
1	Jalandhar	a)	Raw Hide to Wet Blue-23.
		b)	Raw Hide to Finished Leather -20
		c)	Raw Hide to Leather Product- 09
		d)	Wet Blue to Finished Leather-10
		e)	Wet Blue to Leather Product -06
2	Phillaur	a)	Vegetable bag tanning units -38
		b)	Chrome tanning units -1
		c)	One unit does vegetable tanning followed by fat liquoring

Out of total of **1671 units identified** in Tannery intensive states of Tamil Nadu, Uttar Pradesh, West Bengal and Punjab (Except for Tamil Nadu all other three states are represented by a single cluster), only **1510 units** can be characterize based on the process dominance in the units based on the field data. Following graph represents the major tanning operations in different cluster units.



Production of Semi-finished leather (wet blue or E.I) from raw hide/skin is the predominant process in SME units, however, production of finished leather from wet blue is the major leather product in the country, which indicates that mostly large units are involved in production of Finished leather or leather products. Finished leather production is highest in Tamilnadu followed by West Bengal. Raw to Wet Blue Leather production is highest in Uttar Pradesh (Jajamau) as against Tamil Nadu which has highest leather production. After Jajamau cluster (UP) West Bengal leads in Wet Blue Leather production followed by Punjab (Jalandhar cluster) leaving Tamil Nadu at the lowest wet blue leather producing state. Tamil Nadu has highest EI tanned leather production with lowest number of percentage units involved in EI Tanning with most of them being in medium units, followed by Uttar Pradesh with highest percentage of EI units most of them being in micro, small and medium scale. In Punjab no EI tanning is practiced in Jalandhar cluster. Drum Tanning (a cleaner practice) is predominant process in Tamil Nadu, whereas other states show prominence of both pit & drum tanning operations. In Punjab there is clear demarcation of Drum tanning in Jalandhar cluster and pit tanning in Phillaur cluster.

Table: State-wise Comparison of clusters in tannery intensive states w.r.s.t raw material, process and product

Clusters in Tannery Intensive States	Tanning Practice		Tanning Method		Raw Material		Major Tannery Product			Speciality Tannery Product
	Vegetable/E.I tanning	Chrome tanning	Drum Tanning	Pit Tanning	Hide	Skin	Wet Blue	Finished Leather	Leather Products	
Tamil Nadu	√ (accounting for 30% of the total tanned leather)	√ predominant	√	X	√ used mainly in Ranipet, Pernambut, Erode and Pallavaram)	√ (used mainly in Vaniyambadi, Ambur, Trichy & Dindigul)	√ Erode is the India's Largest center for 'wet blue' leather production)	√	√	-
Uttar Pradesh	√ (vegetable sole leather is produced in Kanpur)	√ predominant	√	√	√ predominantly buffalo leather based)	√ (very few units)	√	√ (largest producer of finished leather and leather products)		Harness and Saddlery items, Heavy leather
West Bengal	√	√ predominant	√	√	√ predominantly cow leather based)	√	√	√ (largest producer of finished leather and leather products)		Shantiniketani leather products are specialty leather goods made out of E.I Tanned Leather
Punjab	√ (practiced in Phillaur cluster)	√ practiced in Jalandhar cluster)	√ practiced in Jalandhar cluster)	√ (practiced in Phillaur cluster)	√ (both cow and buffalo leather based)	√ (very few units)	√ Jalandhar is the largest producer of wet blue after Erode)	√	√	Jootisand Mozdis in vegetable tanned leather with colorful threads.

Waste management Practices:

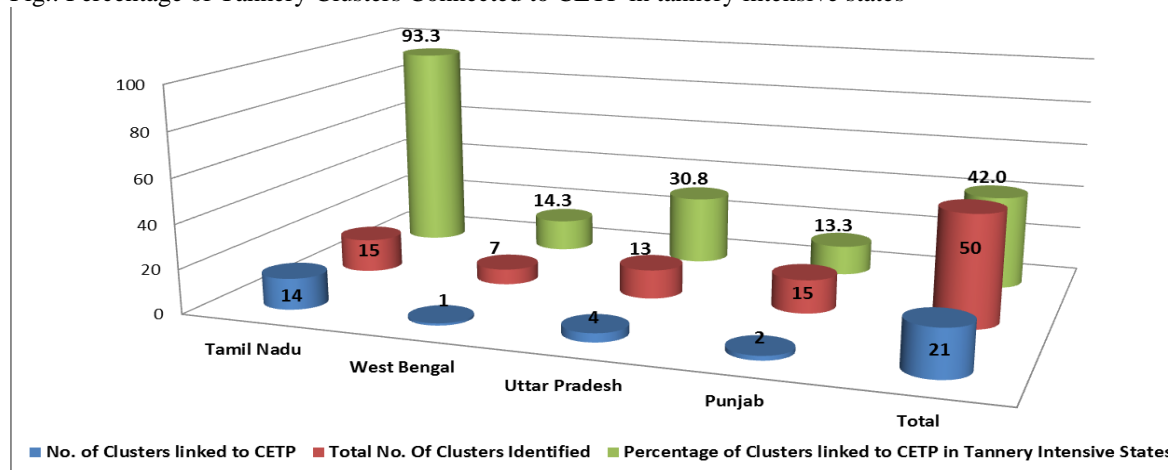
Waste water: Pre-treatment & CETPs

The concept of Common Effluent Treatment Plant (CETP) was developed to achieve end-of-pipe (EoP) treatment of combined wastewater at lower unit cost than could be achieved by individual industries and to

facilitate discharge, monitoring and enforcement by regulatory agencies to ensure regular satisfactory operation. The scheme promotes establishment of common facilities for treatment of effluents generated from SSI units located in clusters through financial assistance in the form of 50% subsidy on capital (25% central subsidy plus matching 25% state subsidy).

The graph below is based on CPCB’s updated data on CETPs connected to tannery clusters.

Fig.: Percentage of Tannery Clusters Connected to CETP in tannery intensive states



Karnataka has one CETP at Lidkar, Bangalore and Rajasthan has one at Jaipur. No information is available for other clusters.

Total 23 tannery dedicated CETPs have been identified in the present study of which 16 has been characterized but is beyond the preview of the present paper.

Table: Status of Tannery clusters in Tamil Nadu connected to CETP/ETP

Sl.	Tannery Clusters	No. of Units	ETP Status	CETP Status
1	Ranipet	63 + Micro scale units engaged in chemical, leather and tool making	4 units have individual ETPs.	59 units are connected to CETP
2	Ambur	96	12 units have individual ETPs	1. 56 units are connected to Thutipet CETP 2. 28 units are connected to Malligaihothe CETP.
3	Vaniyambadi	130	10 units have individual ETPs.	1. 110 units connected to Valayampet CETP 2. 10 units connected to Udayendiram CETP.
4	Dindigul	39	–	All units are connected to CETP
5	Erode	44	All the units have individual ETPs	–
6	Trichy	16	All the units have individual ETPs	–
7	SIDCO Phase II	40	–	All units connected to CETP
8	SIDCO, Phase I	87	–	
9	Pernambut	32	–	
10	Pallavaram	126	–	
11	Melvisharam	25	1 unit has individual ETP	24 units connected to CETP
12	Melpudupet	5	–	All units connected to CETP
13	Madhavaram	13	–	
14	Kelambakkam	09	All the units have individual ETPs	–
15	Chennai	1199	No information available	No information available

Comparison of Pretreatment Methods:

Before disposing effluent to CETP, member tannery units are required to pre-treat their effluent.

A comparison of the pre-treatment technologies followed in different Tannery clusters are given below in the table in the table below:

Table: State-wise pretreatment technologies adopted in different clusters

Sl.	Cluster	Pre-treatment practices adopted
TAMIL NADU		

Sl.	Cluster	Pre-treatment practices adopted
1	Ambur, Vaniyambadi	Individual pre-treatment systems with screens, collection tank, pre-settler and sludge dewatering systems. Up-gradation : a) Flow meter connected to centralized data collection system installation b) TDS meter to measure TDS concentration before conveying effluent to CETP.
2	Madhavaram, SIDCO Phase-I, SIDCO, Phase-II	Individual pre-treatment systems with mainly consisting of screens for grits removal and Flow meters (TSS is very less in effluent as the units are licensed to process only semi-finished to finished leather)
3	Ranipet	Individual pre-treatment systems with screens, collection tank, pre-settler and sludge dewatering systems. Flow meters are mandatory
	Dindigul, Melvisharam, Melpudupet, Pallavaram, Pernambut,	Individual pre-treatment systems with screens, collection tank, pre-settler and sludge dewatering systems.
UTTAR PRADESH		
5	Banthar, Jajamau, Unnao	Individual pre-treatment systems with screens, collection tank, pre-settler and sludge dewatering systems.
WEST BENGAL		
6	Kolkata	Individual pre-treatment systems with screens, collection tank, pre-settler and sludge dewatering systems.
PUNJAB		
7	Jalandhar	Individual pre-treatment systems with screens, collection tank, pre-settler and sludge dewatering systems.

Table: Summary of wastewater management intannery intensive states

Effluent Management Features	T.N	Water scarcity enforces ZLD implementation; CETPs in Tamilnadu are most modernized CETPs with MVR and R.O systems; All the units have Pre- treatment facility with flow meters.
	U.P.	Units have either individual ETPs or connected to CETPs.
	West Bengal	Calcutta Leather Complex is world's largest Integrated Leather Complex; None of the units have individual ETPs. ; All the units are connected to CETP
	Punjab	None of the units have individual ETP, all are connected to CETP for Jalandhar cluster however for Phillaur no specific information is available as most of the units are of micro scale and are connected to CETP.

Comparison of CETP Treatment Charges

Member units to CETPs are charged based on a range of parameters varying from state to state.

The table gives the basis of CETP charges in four tannery intensive states.

Table: Comparison of CETP charges in tannery intensive states

Tannery Cluster	Basis for CETP charges for member tannery units
TAMIL NADU	
Ambur and Vaniyambadi	Charges are based on the Volume of Effluent Discharged. <u>Up-gradation</u> Charges will be based on the TDS load of the effluent
Dindigul, Madhavaram, Melvisharam, Melpudupet, Pallavaram, Pernambut and SIDCO, Phase-I&II	Charges are based on the number of drums installed in the unit
Ranipet	Charges are based on the Volume of Effluent Discharged
UTTAR PRADESH	
Banthar and Unnao	Charges are based on the Volume of Effluent Discharged
Jajamau	Charges are based on the number of drums installed in the unit
WEST BENGAL	
Kolkata	Charges are based on the licensed processing capacity of the tanneries.
PUNJAB	
Jalandhar	Charges are based on the processing capacity of the tanneries

Variation in CETP charges

There is wide variance amongst clusters regarding the basis for charging CETP membership fee, there is a need to harmonize amongst them for the following reasons:

- Licensed capacity may be much larger than the current processing capacity as units may be underutilizing their capacity (as in Calcutta Leather Complex) so do not give exact estimation of Pollution Load.
- Numbers of drums installed may not give correct effluent load due to under functioning (drums installed but not utilized) or mal-functioning (effluent may be leaked off from damaged drums).
- Volume of Effluent Discharged though gives a clearer picture of effluent load, but however it does not clearly qualitatively estimates effluent for quality treatment. If effluent somehow gets diluted, it gives

quantitatively greater effluent load. Lesser effluent volume may contain more pollutants in concentrated dilutions. So the methodology is biased.

Only logically correct method for unbiased and proportionate financial burden is the charges based on TDS load of the effluent as it is the most important pollution parameter in case of tanneries. More polluter pays more.

Comparison of Chromium Management Practices

As per Charter on Corporate Responsibility for Environmental Protection (CREP, 2003) for Leather Industry, implementation of individual or Common Chrome Recovery Systems (CCRS)

In Jalandhar Cluster (Punjab) though there is no common chrome recovery system, several unit have installed individual chrome recovery units. During survey it has been reported that individual Chrome recovery units are economical to the tanners as the payback period is only 1.5 to 2 years and suffices 35-40% of their chrome requirement.

Table: Comparison of chrome management in tannery intensive states

Chrome Recovery Units (CCRU)	T.N	All are connected to Common Chrome Recovery Unit (CCRU). There is no individual Chrome Recovery Units.
	U.P.	Units have either individual CRU or are members of CCRU in Kanpur
	W. Bengal	All the units are connected to CCRU in Kolkata leather complex.
	Punjab	All units have individual Chrome Recover Units in Jalandhar cluster. No Common Chrome Recovery Unit is present.

Comparison of disposal of treated wastewater

Tannery operations are water intensive hence water conservation is important particular in regions having acute water scarcity.

The Tamil Nadu Pollution Control Board has directed tannery CETPs to reuse treated waste water by installing MBR & RO. However study shows that presently most of the treated waste water is being disposed off as per information compiled in Table below.

Table: Disposal of treated effluent in tannery intensive states

TAMIL NADU		WEST BENGAL	
CETP	Disposal of treated waste water	CETP	Disposal of treatedwaste water
Dindigul	On land (HRTS system) & Sengankulam tank of CETP	Calcutta Leather Complex	Disposed to Bay of Bengal through storm water drain joining Vidyadhari River
Pallavaram	Adyar River		
Madhavaram	MulakkadaiNullah	UTTAR PRADESH	
Ranipet	Palar River through nallah	CETP	Disposal of treatedwaste water
SIDCO-Phase I	On land (Irrigation) &Ponnai Lake	Banthal	Treated waste water is conveyed to river Ganges through 10 kms long canal.
SIDCO-Phase II	Information not available	Jajamau	Waste water from tanneries is treated along with sewage by UP Jal Nigam
Melvisharam	On land (Green belt) &Palar River	Unnao	Treated waste water is conveyed to river Ganges through municipal drain
Pernambut	On land (HRTS system) &Nullah	PUNJAB	
Vaniyambadi	Palar River	CETP	Disposal of treatedwaste water
		Jalandhar	Treated Waste water is released into river Sutlej through Kalasingha drain.
		Phillaur	STP-Phillore

Comparison of Solid Waste Management Practices

Different solid wastes generated from tanneries are mostly used up except for the Sludge which is a major solid waste going for incineration.

Table: Solid waste management practices in tannery intensive states

Solid Wastes	Tamil Nadu	Uttar Pradesh	West Bengal	Punjab
Trimming	Major percentage taken away by the raw hide suppliers Sold to Glue manufacturers	Same as Tamil Nadu	Same as Tamil Nadu	Same as Uttar Pradesh
Salt	Partly reused for curing Rest Sold to raw hide merchants			
Hair	Disposed off as solid waste			
Fleshings & Pelt Trimmings	Sold to glue manufacturer sold to chicken feed manufacturer			
Lime Sludge	Sold on truck load basis for construction activities Used for filling up low lying areas	Same as Tamil Nadu + Used by Labors for construction of huts	Sold on truck load basis for construction activities	Same as Uttar Pradesh
Organic waste from Vegetable Tanning	Used in boilers after drying Sold to be used as fuel in brick kilns	Same as Tamil Nadu		

Vegetable Tanned Trimmings	Used for making leather boards Larger cuttings used for Footwear manufacturing & repair			
Chrome Shavings	Used for making leather boards Biomethanation of Chrome free shavings	Used for making leather boards Sold as fertilizer	Same as Uttar Pradesh	Same as Uttar Pradesh
Chrome Trimmings	Used for making Leather Boards	Used for making Leather Goods Sold to Fertilizer manufacturers		Used for making leather boards
Buffing dust	Disposed off as MSW	Same as Tamil Nadu + As Fuel for Boilers	Used for filling low lying areas Partly used as fuel in boilers in few tanneries	As Fuel for Boilers
Pre-Treatment Sludge	Disposed off in SLF	Partly stored within premises Dumped near tannery cluster	Stored within premises and sent off to SFL	Same as Uttar Pradesh

From the table below it is observed that most of the solid waste management practices are almost uniform across the clusters in the tannery intensive states.

II. Conclusion and Future Prospects

From the study it found that most of the tannery activities are concentrated in clusters. Caulterization provides a very beneficial tool for overall growth of the sector in a sustainable and self driving mechanism. Tanneries show a prominent shift towards the adoption of cleaner practices in recent decades with highest number of dedicated CETPs. 42% of clusters studied are connected to dedicated CETPs. There is data lacunae on the clusters in other states and further study need to be taken up.

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