

FINDING TREASURE OUT OF TEXTILE TRASH GENERATED BY GARMENT MANUFACTURING UNITS IN DELHI/ NCR

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ABSTRACT

The concept of reverse logistics emerged within the last two decades after the immense need of waste minimization due to global warming, expensive energy, limited resources and unsustainable nature of existing fast fashion culture. Reverse logistics of waste has now been given equal importance as given to forward supply of goods to overcome the problem of waste management. Reverse logistics is a process of planning, implementing, and controlling the efficient yet cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal. Remanufacturing and refurbishing activities also may be included in the definition of reverse logistics. (Rogers & Tibben-Lembke 1998) Developed nations are working hard to deal with textile waste related problem and have introduced concepts like closed loop supply chain, take back program, extended producers responsibility, textile collection bank etc. To achieve efficient and effective reverse logistics of textile waste. Reverse logistics of textile waste generated by garment manufacturing industries in India is approximately 40 years old and it grew parallel with textile

industry. Population pressure and urge for livelihood gave birth to various hidden business related to reverse logistics of textile waste. There are various places, people and processes associated with RL of textile waste who are working silently and efficiently to solve the problem of textile waste. This paper is an attempt to explore and document various markets and stake holders related to reverse logistics of textile waste in Delhi/ NCR. Various activities in the process of reverse logistics of textile waste like collection, sorting, product recovery options (recycling, upcycling, down-cycling) has been documented. Textile waste RL network is widely spread and is providing many earning options to a segment of people but simultaneously there are various related problems like poor working conditions, un authorized market places, uncertainty which need to be worked upon for long lasting and effective reverse flow of textile waste so that we can reuse the waste material.

Keywords: *Reverse Logistics, Preconsumer Textile Waste, Upcycling, Recycling*

INTRODUCTION

Awareness for pollution less environment has become prime focus for all the countries, whether developed or not.

There is a compelling need to find modern and efficient techniques for waste management to enable saving by resources and accrue monetary benefits.

Various processes of textile industry from fiber procurement to consumption is a complex and pollution generating. (Jain et al., 2018) Industry is second largest source of pollution, 3rd largest sources of water wasting and consumes approx one fourth of chemicals produced worldwide during various processes.

The proliferation of relatively new fast fashion industry with varied and low quality products is slightly shifting towards a sustainable fashion industry like other (food, plastic, electronic) industries. Fashion industry demands a high quality and exclusively crafted products full of social, emotional and sustainable values. Similar to pre-industrial era, Fashion industry has understood the importance and urge for change because of expensive energy, limited resources and unsustainable nature of existing fast fashion culture. Karl-Johan Persson H&M's CEO stated "In order to remain a successful business, we need to keep growing, and at the same time respect the planetary boundaries." (H&M, 2014 sustainability report). (Rinaldi, 2015)

Indian textile industry: Since ancient times Indians has command over textile and textile related businesses. Industry is producing not just the variety of textiles but volume of textiles to full fills domestic and global demand with the help of organized and unorganized textile setups. According to India Brand Equity Foundation report 2018, Indian textile industry became largest producer of cotton in year 2016-17 by producing 6,106 million kg. Also it's the second largest producer of manmade fibers and filament. This industry has an important place for social and economical well

being of its citizens by providing 2nd largest employments after agriculture. Industry is growing at rapid rate; Production of raw cotton grew from 28 million bales in FY07 to 35.1 million bales in FY17. Production of yarn grew to 5,662 million Kg in FY17 from 4712 million Kg in FY11 (IBEF, 2018 REPORT). Rapid growth in the industry is good but it produces proportionate amount of textile waste which require proper waste management.

Classification of textile waste:

Pre-consumer waste: It is also called manufacturing waste and clean waste. This waste is generated during various processes of manufacturing from fiber to fashion during various operations like spinning, weaving, knitting, dyeing, garment manufacturing etc. The study of pre-consumer waste management is very important for Indian textile setups where both organized and unorganized sector is producing pre-consumer textile wastes in abundance. In organized sector there are lots of textile mills and garment production units to fulfill domestic and international demands. Whereas unorganized garment production sector is also very much flourished in India because some of the Indian attire like Sarees blouses, Petticoat and Salwar Kameez demands customized tailoring. So Boutiques and pavement tailors are working everywhere which customized the dresses as per the need.

Post-consumer textile waste: It's also called house hold waste and dirty waste. It consists of any type of garments or household article, made of some manufactured textile that the owner no longer needs and decides to discard. These articles are discarded either because they are worn out, damaged, outgrown, or have gone out of fashion. They are sometimes given to charities but more typically are disposed of into the

trash and end up in municipal landfills. Approximately 1,250,000 tons of post-consumer textile waste (4.5 kg per capita) is recycled in US annually. However, the recycled amount represents less than 25 percent of the total post-consumer textile waste that is generated. Almost half (48 percent) of the recovered post-consumer textile waste is recycled as secondhand clothing, which is typically sold to third-world nations. Approximately 20 percent of the material processed becomes wiping and polishing cloths. Finally, 26 percent of this post-consumer waste is converted into fiber to be used in products similar in nature to those manufactured from pre-consumer textile waste. (Wang. Et. al., 2003).

Textile Waste minimization: Any material which is not needed by the owner, producer or processor is waste. Generally, waste is defined at the end of the product life cycle and is disposed of in landfills. Most businesses define waste as “anything that does not create value” (BSR, 2010). In a common man’s eye anything that is unwanted or not useful is garbage or waste. However scientifically speaking there is no waste as such in the world. Almost all the components of solid waste have some potential if it is converted or treated in a scientific manner. Hence we can define solid waste as “Organic or inorganic waste materials produced out of household or commercial activities, that have lost their value in the eyes of the first owner but which may be of great value to somebody else.” (Robinson, W.D.1986). (Agrawal et.al, 2015). According to Hawley, 2006 ‘Proper waste management is equally important in textile industry because textiles are nearly 100% recyclable, nothing in the textile and apparel pipeline should be sent to the landfills. Textile waste management implies to manage waste in the way that can reduce, utilize

and suggest innovations from the waste (Hawley, 2006). It is like two way benefits of saving resources as well as following governance norms and policy (Agrawal, et.al. 2015). (Hawley, 2006)

Basic principal of waste minimization: Various R’s of textile waste management are very important tools to overcome the problem of textile waste by conserve natural resources, landfill spaces and energy. Waste problem can be controlled and minimized by following exact order of rethink/prevention, reduce/ minimization, reuse/up-cycle, recycle, energy recovery, disposal, reintroduce. Recycling, energy recovery and disposal should be of least priority as these processes are costly and harmful in nature.



Fig 1.1 Waste management pyramid

Waste management helps to reduce burden on environment by reducing energy consumption and pollutant emission. It also helps to relieve pressure on virgin materials and to enhance creative abilities. It contributes to raise economy by creating jobs, businesses. Textile waste management provides clothes for the poor, help to save natural resources, helps to connect nations, building goodwill and social progress. (Jain et.al, 2018)

To handle such a huge heap of pre and post-consumer textile waste, there is need of an efficient system which involves all

the stakeholders responsible to produce the waste i.e. Producers, managers, consumers together and along with that, system should be able to sustain socially, economically and environmentally. In recent past some new concepts like extended producers responsibility, take back programmes, open and closed loop recycling etc has emerged for efficient closed loop supply chain of the products which believe on cradle to cradle model. Closed loop supply chain includes forward and reverse flow of materials so that nothing can be wasted and utilized again and again by consumers for same of different purposes. According to Kumar et.al “Closed Loop Supply Chain Management (CLSCM) refers to all forward Logistics in the chain (like procurement of materials, production and distribution) as well as the Reverse Logistics to collect and process returned (used or unused) products and/or parts of products in order to ensure a socioeconomically and ecologically sustainable recovery”. (Kumar et.al, 2013)

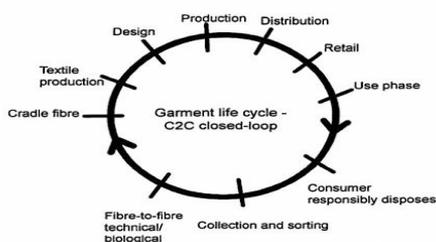


Fig 1.2 Cradle-to-cradle closed-loop supply chain. (Payne, 2015)

Reverse logistics: To achieve closed loop supply chain management the system of reverse logistics should be very strong and clear. The concept of reverse logistics emerged within the last two decades and it got more recognition both as research field and as a practice since last few years. The process of planning,

implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal. Remanufacturing and refurbishing activities also may be included in the definition of reverse logistics. (Rogers & Tibben-Lembke 1998)

There are numerous Economical (decreasing the use of raw materials, reduction of disposal costs, creation of added value for end-of-use products), legal (accountable for the recovery or correct disposal of waste) and social (environmentally responsible behaviour by companies) reasons for implementing or operating an RL system. (Rubio et.al, 2014)

Design of an RL network is based on three basic activities:

Collection of EoU (end of use) products: Collection is the first stage in the recovery process. Products are selected, collected and transported to facilities for remanufacturing (Srivastava, 2007). Three different collection options can be observed depending on whether the collection is made directly by the manufacturer or remanufacturer, through a network of distributors and retailers, or through third-party logistics providers.

Inspection and Classification (Sorting): one of the main characteristics of the product recovery management is the uncertainty associated to the recovered products, in terms of quantity (how many products will be returned), quality (about the condition of the returned products), and time (when the EoU product will be returned). These activities (inspection and classification) will determine the condition of the returned products, so an analysis of the locations and capacities of sorting centers is required. Sorting activities aiming at

reuse of textile waste is a labour intensive process that turns waste into commodities to be resold or exported (Brooks 2012). The outcome of collected material is decided by the quality and composition. However, market demand is also an important determinant for the outcome of the material (Krikke et al. 2004). (Johansson, 2015)

Recovery Process: can be considered as the key element of an RL network due to, in this phase, the economic value of the returned product being recovered through one of the following options: **Reuse:** implies very basic activities to recondition the product (cleaning, minor repairs) that do not modify their structure or their nature. **Remanufacturing/ up-cycling:** requires additional activities (disassembly, inspection, repair, and assembly) to recover the value of the returned products and give them similar qualities and technical Characteristics to the original products. **Recycling:** only the economic value of the raw materials is recovered, so the returned product loses its identity (Rubio et.al. 2014)

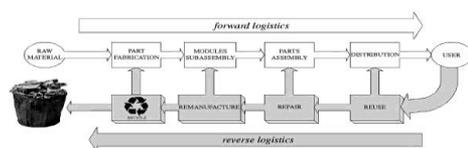


FIG 1.3 Reverse logistics process. (<http://cerasis.com/2014/02/19/wh-at-is-reverse-logistics/>)

Reverse logistics in textile industry: Documentation of reverse logistics path of both pre and post consumer textile waste is equally important like other plastic, paper and metal industries. It is essential to know reverse logistics path for effective and efficient recovery of textile waste so that nothing can be wasted. Various developed nations are putting constant efforts for complete recovery of textile waste with the help of

charity organizations, thrift shops, waste collection banks and many more so that closed loop recycling of generated textile goods can be achieved. Textile waste creates more problems for major textile producing developing nations because of bulk production and poorly imposed government regulations. Population pressure, financial crisis and urge for livelihood gave birth to many businesses related to waste management by many communities in various parts of world for example Egyptian community called “Zabbaleen” (garbage collectors in Arab language), “Catadors” in Brazil of Africa and “Jhuta” work (textile waste collection and sorting) in Bangladesh, “Wangari” community in India (Second hand clothing) are some of the communities and local businesses dedicated to collection , sorting and product recovery textile waste. Documentation and ethnographic research on reverse logistics of post consumer textile waste in India has been done by some national and international researchers (Norris, L., 2011, Abraham, N., 2011) but explorations on reverse logistics of pre-consumer textile waste is still a hidden story which is yet to be documented.

Objectives of the study:

To document reverse logistics of pre consumer textile waste generated by organised garment production units in Delhi/NCR.

METHODOLOGY

Capital of India, Delhi was selected for this study as Delhi and NCR region is a well established place for many small/ large, organized/ unorganized textile or textile waste recovery related businesses. It was also the most suitable, convenient and cost effective place to conduct this kind of study. Due to availability of authentic and vast expanse of people

involved at different parts of Delhi, the study started and continued in an exploratory mode. Links were developed through word of mouth like a snowball. One contact led to the other. To gather qualitative data about the process of reverse logistics of pre-consumer textile waste, all the places related to pre-consumer textile waste and all the stake holders with their respective roles in the process were explored. After pilot study of various markets related to pre-consumer textile waste, some places and stakeholders of the reverse logistics of pre-consumer textile waste could be shortlisted in Delhi and NCR. These were:-

Textile Waste Producers: There are very limited textiles mills in Delhi / NCR region so Organized garment production houses are the main sources of pre consumer textile waste production. Okhala textile parks, Noida Textile Park are known for export quality garment production whereas Gandhinagar and cloth market (Tank road, Karolbagh) are known places for domestic and export quality garment production units in Delhi/NCR.

Commission agents: they are the connectors between waste producers and waste recovers. They are spread all over India where textile production takes place. They get the information about the surplus waste and pass the information to waste recovers through their strong network of web and tele communication. They get fixed commission (1-2%) to buy and sell such kind of waste.

Textile waste Picker/ Collectors: Katran market (Mangolpuri), Kabadi bazaar (Harikesh nagar, Okhala), Shanti mohalla (Seelampur, Shahdara) are some of the markets known for the availability of pre consumer textile waste. Textile waste is collected from both organized and unorganized production setups.

Textile waste Sorters: collected waste is sorted by sorters into different categories according to their end product recovery.

Textile waste Retailers: surplus saleable fabric pieces and garments are sold by the pavement retailers.

Textile waste wholesalers/ Traders: they purchase similar kind of textile waste through various collectors and store them so that bulk amount of textile waste is available for various recycling or upcycling industries.

Textile waste Recyclers/Up -cyclers: these are various pre consumer textile waste recovery options through recycling (paper, drugs, shoddy, etc) or up-cycling.

Locale of the study: Certain places were selected to collect data after pilot study-

Preconsumer textile waste generation at organised level (Garment Export Houses) - Noida Textile Park, Sector 63 and Okhla Industrial area, Gandhinagar, Cloth market, (Tank road, Karolbagh).

Pre-consumer textile waste markets- Katran market (Mangolpuri), Kabadi bazaar (Harikesh Nagar, Okhala), Shanti Mohalla, (Seelampur, Shahadara), Azad market, Sarojini nagar, Janpath, etc.



	TEXTILE WASTE PRODUCERS
	TEXTILE WASTE COLLECTION PLACES
	TEXTILE WASTE SORTING PLACES
	TEXTILE WASTE RETAILING PLACES
	TEXTILE WASTE WHOSELLERS / TRADERS

Fig: .1.4 Location maps of different stakeholders of pre consumer textile waste in Delhi/Ncr

Non probability judgment and convenient sampling is used in the study as there is lack of secondary data and size of universe is not known. Complete list of subjects are also not available and desired sample size is not specify. Along with that snowball sampling is being done as most of the samples are approached after reference of the previous sample.

Semi structured interview schedule, observation, video recording along with picture clicking are being used as the main tool of data collection. Interview schedule is planned to unravel the following broad heads:-

Textile waste production and modes of waste disposal

textile waste collection places and processes

Textile waste sorting places, process and sorting criteria

Role of wholesalers and retailers

Monitory gain by each stakeholder

Problems associated with the business

Product recovery processes.

S.No	Stake Holders	Place	Sample Size
1.	A. Organised sector (Garment production houses)	(a) Noda textile park	5
		(b) Okhla Industrial Area	5
		(C) Gandhinagar	5
		(d) Cloth market (Tank Road, Karolbagh)	5
2.	Commission agents	Random markets of Delhi	5
3.	Rag pickers / collectors	(a) Katra market Mangolpuri	5
		(b) Kabadi bazaar, Harikesh Nagar Okhla	5
		(c) Shanti mohalla, Seelampur, Shahdra	5
4.	Sorters	Same as above	15
5.	Wholesalers/Traders	• Katra market (Mangolpuri)	5
		• Kabadi bazaar, (Harikesh Nagar Okhla)	5
		• Shanti mohalla, (Seelampur, Shahdra)- (Surplus all kind of pre-consumer textile waste)	5
		• Mazra village-Mangolpuri (Surplus cutting waste)	5
		• Azad market, Gandhinagar (Surplus garment waste)	5

6.	Retailers	Katra market-Mangolpuri	5
		Shanti mohalla, Seelampur, Shahdra	5
		Kabadi bazaar, Harikesh Nagar Okhla	5
		Saraji Nagar	5
		Jangpith	5
		Weekly Flea markets of Delhi	5
7.	Re-cyclers and Up-cyclers	Other random places	10

Table 1.1 various stake holders, their locations and sample size to know the reverse logistics path of pre-consumer textile waste in Delhi/ NCR.

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RESULTS

After exploring various markets and stakeholders related to reverse logistics path of pre consumer textile waste, various interesting facts came in front of us. In India Reverse logistics process grew parallel to forward logistics of textile industry. Approx 40 years back surplus fabric markets came into the existence after the growth of textile and export industries in India. Due to strict quality check there was bulk production of surplus or rejected fabrics which was of no use for those manufacturers. Cleaning of such waste was a problem for the manufacturers. Rag pickers were paid for picking and cleaning the place. Sometimes throwing into the landfills and burning were the only options to get rid off from the surplus fabric waste along with other cutting waste.

The credit to streamline textile waste not just from Delhi/NCR but from every corner of India goes to “Khateek” community of Rajasthan who engaged themselves to collect textile waste along with hair waste and plastic waste as well. “Khateek” community people came to Delhi from rural areas of Rajasthan in search of livelihood. Most of them used to do different labor works and gradually found the profit in the work of textile waste collection, sorting and trading. Initially this market was famous for ‘Katrans’ (cutting waste) only hence the place is known as “Katran market” (small cutting scraps). It was considered as the Asia’s biggest pre-consumer textile waste collection center having more than 800 shops where collection, sorting, trading and retailing work take place simultaneously. With time rag pickers started to arrange pavement shops at the slum areas of the cities to cater LIG (low income group) consumers. Market of recycling of textile waste grew in Panipat and other parts of country and these small rag pickers used to provide sorted raw materials to various industries. Gradually small rag pickers specialized them for providing specific kind of textile waste in bulk and became traders and wholesalers.

After observing growth and benefit opportunities in the business of textile waste, various people from other communities also joined the business and became specialized traders and retailers of textile waste. Textile waste related market also established at various places. Now there are various markets specific for buying special kind of textile waste in Delhi/ NCR and many communities has opted full fleshed business of surplus textile waste who are efficiently involved in the process of reverse logistics of textile waste.

Types of textile waste generated during garment construction:

1. Fabric waste: there are various reasons to produce fabric waste during garment construction. Extra fabric order to meet the garment order demand, sampling waste, rejected fabric rolls, faulty construction defects, Order cancellation and end of roll waste.etc are some of the major reasons to produce ample amount of fabric waste.

2. Cutting waste: Generations of cutting waste are mandatory in garment construction process and considered as one the most crucial process. Even efficient marker planner also produces 10 to 15% of cutting waste. poor marker planning, use of small width fabrics, inappropriate ply lay, over lapping of fabrics, poor cutting and other remnant reasons are responsible to produce textile cutting waste.

3. Garment waste: similar to fabric and cutting waste, garment waste is also generated during garment manufacturing. Surplus garment made to complete orders, rejected garments, garment sampling waste, Garments with poor fit or size, Left over single pieces and single designs out of complete set of garment style, Pirate product seized by customs, Out of fashion garments from different ware houses of different brands are some of the reasons to produce garment waste.

4. Accessories and fasteners: various kinds of production and packaging accessories are also required at the time of garment manufacturing. Production accessories include sewing thread, trims, button, zipper, fusible interlining, appliquéés, motifs, etc. Packaging accessories include care labels, brand tags, size tags; carton boxes etc. over orders and poor inventory management are the reasons to produce such kind of waste

Storage, after use and selling of generated textile waste by garment manufacturers:

Once the order is completed production units are left with all kind of textile waste (fabric, cutting, garment and accessories).

Nothing is wasted which is produced at organized level because of potential value and monetary gain in after markets. All kind of surplus textile waste is sold to the textile waste collectors.

The entire textile waste is divided into two categories. Surplus large fabric rolls of several meters, surplus garment waste and good amount of surplus accessories are kept in category one which is known as 'lot ka mall' in a local language. Cutting waste and small fabric pieces are kept in category two which is called 'Katrán or Chindi' in a local language.

'Lot ka mall' was stored into separate store rooms and sometimes fabric waste was used for in house sampling.

Records regarding Lot ka mall was generally prepared by all the production houses.

Fabric waste of Lot ka mall was sold to collectors on the bases of its weight. Whereas garment waste was generally sold on per piece bases to collectors.

Some of the big brands do not believe to sell their garment waste for brand image so many times their tags are destroyed or many times whole garment is destroyed by burning.

There was no separate collection room for 'Katrán' and generally sold to rag picker once the place was full of cutting waste.

Katrán waste was sold to the collectors on the bases of its weight.

None of the production house was found to be engaged in recovery process of cutting waste and no record was maintained regarding the selling of cutting waste

It was difficult to evaluate the amount of waste generated because it's directly proportionate to domestic and export orders.

There was no fixed standard to buy and sell textile waste. The prizes are negotiable. The main purpose of manufacturers is to clean the waste and recover the maximum prize by auction.



Fig 1.5 collection of surplus fabric and cutting waste by garment production units of Delhi/ NCR.

Collection processes of textile waste by rag pickers/collectors

Textile waste rag pickers come to all the markets related to garment construction in search of textile waste. Sometimes

factory owners call them to collect the textile waste.

Approx 2 decades back this work of textile waste collection by specialized rag pickers was not popular and these rag pickers were paid to clean the textile waste. But after the growth and

availability of various rag pickers companies arrange auction for textile waste.

For the collection of “Lot ka mall” collectors are called. Sometimes agents are involved in the process. They are the connectors between collectors and waste producers. Their commission is almost fixed 1-2%. They give information about the quality and quantity of textile waste.

Once the deal is finalized in between collectors and waste producers. Rag pickers collect the waste, packed it into the bales (50kg to 150 kg) and transport it to their respective storage areas in markets and further sort the waste into different categories.

Prizes of collected textile waste are negotiable.

For ‘Katraan’ (cutting waste), rag pickers come around factory to factory in search of waste. rag pickers collect Katraan on the bases of waste and load the bales either in rickshaw or trucks and transport it to respective collection centres (market) for further sorting.

‘Lot ka mall’ collectors are considered as superior collectors as compare to ‘Katraan’ collectors. Many lot ka mall collectors perform trading and retailing work together.

‘Katraan’ waste collectors collect the waste and further sold the waste to traders.

The collectors of textile waste collect the waste not only from Delhi/ NCR but from every corner of the country. They have mastery in the field of collection, sorting and providing materials for various recycling and up-cycling industries.

Purchasing of ‘Lot ka mall’ is generally done legally because of bulk amount in tons and expensive buying as compare to ‘Katrans’.Collectors purchase the textile waste and give 5% GST on purchase. GST, HS code for textile waste is 5202 and 5211.

Transportation charges include loading and un-loading. Transportation charges are approx 4 rs/kg/km including GS charges. With loading and unloading transportation charges includes 5 rs/kg/km plus GS charges.

For small quantity of katrans generally collectors and manufacturers don’t do legal trading because they sell ‘katrans’ time to time to traders of cutting waste. Prizes of ‘katraan are also very low as compare to ‘lot ka mall’.

The difference between both the categories can be summarized in table 4.3

S.no	Category one –“Lot ka mall”	Category 2. “Katraan/Chindi”
1.	Surplus fabric waste of several meters, garment waste and good quantity of leftover textile accessories and fasteners are included in it.	Cutting waste and small fabric cut pieces are included in it
2.	Stored in store rooms by garment manufacturing units	This waste is not stored in a proper place by manufacturers.
3.	Sometime used for in house sampling	Not used by garment manufacturers
4.	Given to collectors once the order is finished	It is given to collectors/rag pickers time to time to clean the place
5.	Sometimes agents are involved in selling work of such waste.	Generally no agents are involved in the process.
6.	Buying, sorting and selling of this waste is done on a large scale by bigger collectors/Rag pickers	Performed by small collectors. They come around in search of cutting waste and ask to garment manufacturers for the waste time to time.
7.	Bigger collectors collect such waste from every corner of India. There work place is not limited to Delhi/NCR only.	Collection areas of ragpickers are divided and they collect waste from local markets.
8.	For loading and unloading of such waste proper help of bigger transportation is required.	They load such waste in a wooden wheel cart and rickshaw.
9.	Business of lot ka mall is done legally and 5 % GST is paid.	Purchasing of Katrans by small collectors is not legal.
10.	Most of the collectors also perform sorting and wholesaling work.	This waste is sorted and further sold to the traders of specific kind of textile waste
11.	After sorting and reconditioning such waste are sold to various textiles waste retail markets for further product recovery.	This waste is mainly used in various recycling and up-cycling industries for product recovery.
12.	This waste has more market value in fabric and apparel aftermarkets.	This waste has no direct after use so does not sold in aftermarkets.

Table 1.2 differences between ‘Lot ka mall’ and ‘Katrans/Chindi’.



Fig.1.6 Collection, transportation and storage of textile wastes FIG

Sorting of textile waste:

Collected textile waste is sorted and further categorized to evaluate their values in aftermarkets. The sorting process is as follows-

It is a very complicated, difficult and unpredictable work and there are no fixed standards and sorting criteria.

Roughly, waste produced by garment production houses is sorted on the bases of its size and quality.

Sorting work is done manually and with time sorters have become expert.

They have good knowledge about the quality of textile waste.

Sorting work is performed by both male and female workers. Some of them work as daily wages worker and get 250rs/day with two time tea and lunch. Some of them work as monthly wages workers and get and approx 7000/ month, two time tea and lunch.

Sorting work of textile waste are mainly female dominated work because of fixed place and less physical activity. Female members of collector's family also help in sorting work of textile waste.

Sorting of each kind of textile waste (fabric, cutting, garment and accessories) has differ sorting criteria which are as follows.

1. Fabric sorting on the bases of quality

Grade 1 – Export quality: These are the best fabric materials specially customized for export orders. Quality of fabric, dyeing printing and other embellishments are made according to export standard. Most of the fabric in this quality are of wide open width fabric (1m <, >1.5 m). Their value in surplus fabric market is also high. Good quality of cottons and other natural fibers are generally included in it. Availability of such surplus fabrics is directly proportionate to export orders.

Grade 2- Normal quality: these are the routine fabrics made to full fill domestic and export demands. Generally includes all kind of fabrics (Synthetics, blends, natural etc).

Grade 3- Minor defective: minor construction and handling defective fabrics are included in grade 3.

Grade 4- Major defective- these are the major defective pieces due to construction, dyeing, printing and other embellishments. In a local language these fabrics are known as “Lippa Putta” because of remarkable or visible defect in fabrics.



MORE VALUABLE

Fig: 1.7 Sorting of fabric waste on the bases of its quality.

2. Fabric sorting on the bases of size:

Large fabric rolls: in local language it is called “Big Fants”. These are the large surplus fabric pieces. These fabric pieces are sorted according to their grades and then sold to apparel aftermarkets. Their prizes are coated according to their grades. Export quality of surplus textile waste is generally sold to small garment manufacturers and boutique owner for their construction. Remaining fabric rolls are sold by specialized textile waste traders and retailers into textile waste markets and weakly flea markets. Katran market, Shanti mohalla and Kabadi bazaar are the places in Delhi/ NCR where such kind of surplus fabric rolls can be purchased on deeply reduced prizes.

Fabric cut pieces more than 1 m: in local language they are known as “Fants”. These pieces are available in abundant in various flea markets of textile waste. Generally these pieces are purchased on the bases of weight. Cotton printed Fants can be purchased at prizes 250Rs/Kg to 500 Rs/Kg. prizes of fants are negotiable.

Fabric cut pieces less than 1 m: in local language they are known as “Rags”. Rags are also available in the textile waste markets and sold to the consumers. rags which are not g sealable are send to various recycling industries for product recovery. Cotton, cotton hosiery rags are generally used for wiping and polishing clothes by various industries.

3. Cutting waste sorting on the bases of size: After sorting colored cutting waste are bleached some times and converted into grey goods. Sorted textile waste is then packed, baled and sold to traders/wholesalers or recyclers of textile waste

Leftover Selvedge waste: in local language this type of waste is known as “Patta”. Patta is further used for various small garment construction for example-Patta is used for piping, patching or for making pockets etc.

Left over Cutting waste: after cutting of fabric, waste generated other that selvedge waste is called cutting waste. Most of the manufacturers don’t use selvedge waste so that waste also becomes cutting waste.

4. Cutting waste sorting on the bases of fabric type and color:

Pure white cotton waste: it is one of the most valuable cutting waste (katrans) because of its wide recycling options. This cutting waste also used as raw materials for various industries like paper, medical, agriculture etc. its value is high in textile waste market and available at prizes aprox 10Rs to 15 Rs /Kg.

Pure white knitted/ hosiery waste: recycling opportunities of cotton pure white knitted waste is similar to woven pure white cotton waste but these Katrans are more desirable because of comparatively easy recycling process and more fleece extraction. For example - Same weight of knitted cutting waste will give more cotton fleece after shredding as compare to woven cutting waste. This waste is cost around 15Rs to 25Rs/Kg.

Coloured cotton waste: these are the dyed or printed cotton cutting waste. In local language they are called “Kachaa” cutting waste because dyeing on cotton waste can easily be removed by bleaching. these cutting waste are cost around 2Rs to 3 Rs/Kg

Bleached/ grey cotton waste: these are the bleached cutting wastes which were coloured earlier. They are having yellow or cream tone. This waste cost around 8Rs-10Rs/Kg. For bleaching these katrans are dipped into large pits. These pits are approx 10 by 10 feet wide and 5 feet deep and called 'Haudi' in local language. These pits are filled with water, bleaching agents and hydrochloric acids (HCL) (Namak wala Tejab). Katrans are dipped for approx 1 to 2 days for decolourization. After decolourization katrans are filtered, washed in water and sun dried. The entire bleaching process cost approx 4 Rs to 5 Rs/kg.

Woolen cutting waste: These cutting wastes are made from knitting technique and generated during manufacturing of hosiery garments. These cutting waste are available at cost 4Rs-5 Rs/Kg.

Cotton denim waste: Cotton denim wastes are similar to cotton coloured waste. Denim cutting wastes are recycled to get similar colour yarn. These waste are available at 5Rs -10Rs/kg

Synthetic waste: synthetic cutting waste can be made from any synthetic textile fibre or blends. These cutting waste are called 'Pakka' in local language because of difficult or no bleaching of synthetic cutting waste. these waste are available at 1Rs -2 RSs/kg

Cutting waste for incineration: it is the least preferred options but there are cutting waste which does not go into any recycling or upcycling chain are generally used as burning fuel in boilers. The costing of such cutting waste is 50 paisa to 1 Rs/kg.

Garment waste sorting : garment waste are generally sorted into kinds apparel, girls clothing, boys cloths, ethnic women wear, western women wear, home linen, gents wear , purses, footwear's etc. apart from this broad sorting . There are garment waste which are not eligible for selling in retail markets because of none

rectifiable problems and sorted separately for various recycling and down-cycling.

7. Textile accessories and fasteners sorting: accessories and fasteners are sorted into stitching threads, buttons, tags, care labels, embroidery patches, elastics, laces, trims and many more.





FIG 1.8 Sorting of textile waste by female member of collectors at Katran market, Mangolpuri, Delhi, India

Product recovery of generated textile waste:

Collected textile waste gets the second life by reselling, up-cycling, down cycling and recycling by various markets and industries. The descriptions of textile waste recovery by each option are as follows.

1. Product recovery of textile waste by reselling: most of the 'Lot ka mall' are available in various fabric and garment aftermarkets for reselling which is reused by various LIG consumers and up-cycling designers. Traders and

pavement retailers are the stakeholders who made retailing of textile waste possible. Katran market (Mangolpuri), Shanti mohalla (Shahadara, Seelampur), Kabadi bazaar, (Harikesh nagar, Okhala) are the places in Delhi/NCR where all the activities related to textile waste recovery (collection, sorting, trading, retailing) runs parallel. one can buy all kind of textile waste from these markets. Azad market (surplus Garment waste) and Mazra village (cutting waste) in Delhi/NCR are wholesaling and trading markets. Sarojini nagar, Janpath and weakly flea markets in Delhi/ NCR are always available for buying surplus garment waste.



Fig 1.9 pavement surplus textile waste shops at various textile waste retail markets of Delhi.

2. Product recovery by up-cycling and down-cycling- it is one of the oldest

forms of textile waste recovery. Intentionally or un-intentionally textile waste up-cycling was done in India due to financial crisis and Lack of resources. Now various household, craft related and contemporary textile waste up-cycling practices can be seen in day to day life. Up-cycling or reuse refers to an existing product being used again within the same production chain. For centuries, end products were repurposed after they have reached the end of the use in one product. There are a variety of methods in which reuse occurs. The used product can be disassembled and then reassembled into a new and possibly different product. Contemporary up-cycling designers have immersed in recent past due to potential growth in the field of sustainability and eco conscious consumers. They are using variety of preconsumer textile waste in their own unique way to create something unique and fashionable. There are many up-cycling brands like Doodlage, Pero, AM.IT, etc who are based on up-cycling. Textile garment and fabrics which are not up cycled and made up of cotton are generally used for cleaning and moping hence there down cycling is done.

3. Product recovery by recycling: recycling of textile waste is one of the thirist areas and there are various industrial where surplus textile waste specially cutting wastes are used as raw material. Recycling refers to the breakdown of product into its raw materials to create new products. Textile recycling may involve reclaiming pre-consumer waste or post-consumer waste. Textile products (apparel and fabrics) were broken down to the yarn stage and the yarn was used to produce different knitted or woven fabrics. In some cases, the yarns are further broken down to the fiber stage and then the fibers were re-spun into yarns to be used in new textile products. The reclaiming of fibers from woolen waste is known as Shoddy and

reclaiming raw materials from woven pre and post-consumer textile waste is known as Muggo. Panipat city of Haryana which is approx 300 km away from Delhi is considered as the “Recycling capital of world”. There are various industries where textile wastes are used as one of the prominent raw material. Paper, recycled yarn either Shoddy or Muggo, micro crystalline cellulosic powder for medical and food industry, mushroom beds for agricultures, cheap padding material in automobile industry etc are some of the uses of textile waste after mechanical and chemical means of recycling.

Problem associated with the business of textile waste Reverse logistics:

All the stake holders of this reverse logistics struggling to earn their livelihood. They are unconsciously serving a major environmental goal by reducing the landfill heap. There are hardly any policy measures not private or government intervention supporting their activities. Financial stakes are probably too low to attract third parties. These communities are doing businesses of textile waste reduction very silently and efficiently without any lime light. Their journey of waste management is not so easy and facing various problems time to time. Some of them are as follows-

Uncertainty: it is the biggest problem in the business of textile waste minimization. The production of waste is directly dependable on domestic and international orders. Less the orders lesser will be the waste and less raw materials will generate for various recycling industries. This uncertainty can also be seen in monitory gain of every stake holder. Sometimes they get good profits but sometimes they don't. Availability of same type of textile waste is also not certain.

Tough competition: In the last few years this businesses has become more

complicated and tough because of increased competition at every step. Number of various stakeholders have increased so production houses has started to do auction to sell their waste to get more profit leaving less margins and uncertainty. Various Online platforms and e-commerce sites are giving options to manufacturers and traders to sell their waste directly which are bypassing the role and profit of various intermediate stakeholders.

No Fixed place to sit: most of the markets associated with the waste selling are unauthorized. Katran market (Mangolpuri), Kabadi Bazaar(Harikesh nagar) etc are temporary pavement shops made up of canvas. They have very crude working conditions and are prove to challenges faced by non MCD (Municipal corporation of Delhi) approved markets.

Low profit margins: Approx 10 years back collectors used to get extra charges for cleaning the work place of production houses. After the popularity and growth in the recycling market, production houses have started to sell their waste to these rag pickers. Thus the dynamics of demand and supply have reversed. Selling of waste has become dean to the production houses as well. Auction of waste has decreased their profit margins and increased the uncertainty.

Scattered business places: the entire supply chain of reverse logistics business of pre consumer textile waste is scattered. Production of one type of waste takes place at one corner of India and transported to another corner of India for collection and sorting and further transported for recycling and up-cycling companies. This entire process utilized time, transportation charges, fuel etc. for example pre consumer textile waste generated by various saree, suit manufactures at Surat (Gujrat) is collected by the collectors of Katran

market which is situated in Mangolpuri, Delhi and then further distributed to various scattered pavement retailers, traders, recyclers and up-cycles throughout India.

Poor working condition: the working condition of rag pickers, collectors, sorters and their families are not so good. They have a very limited place to work with bare minimum facilities. Sometimes re processors receive wet or soiled clothes which may end up being disposed of in landfill, as washing and drying facilities are not present at sorting units.



Fig 4.12: Scattered textile waste collection places at Katran market, Mangolpuri, Delhi.

Conclusion: Increased amount of Textile creates the proportionate amount

of textile wastes which need to be minimized for both economical and environmental reasons. In India both pre and post consumer textile wastes is found in abundance. There are many communities who are directly or indirectly involved in the process of collection, sorting, recycling and upcycling (reverse logistics) of pre and post consumer textile waste. The entire reverse logistics process of pre consumer textile waste is very complicated and it's really difficult to evaluate monetary gain by each stake holders because of uncertainty, negotiable prizes and bargaining, the collection sorting, trading and retailing of such waste by collectors, sorters, agents, traders, retailers and product recoverers provides second life to all the surplus textile waste in a organized way. All the stake holders are interrelated and at times one stakeholder performs others works as well. But these old players of textile waste management are disappearing in the shadow of new technologies and ideas and facing the problem to sustain. There are intense needs to rejuvenate communities and processes with the help of new effective technologies and government, NGO support. There is need to find out the ways which have two ways benefits to both the nature and to the people involved with traditional reverse logistics businesses of textile waste in India.

Limitations of the study

The research area of textile waste management in India is so vast and undiscovered. So pre/ post consumer textile waste management can't be studied together in one research. Both the topics have many research directions which need to be focused individually.

The research area of textile waste management in India is almost undiscovered. Very few secondary data about the textile waste management are available in Indian context so it is really

difficult to estimate any statistical figures about the textile waste.

preconsumer textile wastes management process in India is a kind of case study research where qualitative data is collected through personnel interview and observations so some facts and figures can be left behind or unapproachable.

Evaluation of total surplus textile waste generated by different production houses at organised and unorganised level is not known because no records are maintained regarding waste generation.

It's difficult to estimate total number of people involved in the business of reverse logistics of preconsumer textile waste and monetary gain by each stakeholder because entire process and availability of surplus textile waste is not continues.

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