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India

USED BEVERAGE CARTON (UBC) MANAGEMENT STUDY FOR INDIA

Prepared for
Tetra Pak India Pvt Ltd

www.ace-uk.co.uk/images/pictures/Sorted_cartons.jpg

The Energy and Resources Institute

...towards global sustainable development

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Abbreviations	
BMC	Bhubaneswar Municipal Corporation
CPPRI	Central Pulp & Paper research Institute
EPR	Extended Producer Responsibility
GMC	Guwahati Municipal Corporation
HDPE	High Density Poly-ethylene
JMC	Jammu Municipal Corporation
KMC	Kolkata Municipal Corporation
KMC*	Kurnool Municipal Corporation
MSW	Municipal Solid Waste
NNN	Nagpur Nagar Nigam
OCC	Old Corrugated Containers
RCF	Recycled Cellulose Fiber
SMC	Srinagar Municipal Corporation
SDG	Sustainable Development Goals
TERI	The Energy and Resources Institute
TPIPL	Tetra Pak India Pvt. Ltd
UBC	Used Beverage Carton
WP	Waste Paper

Preface

In India, Tetra Pak was among the first carton packaging companies started in the year 1987. The main focus of Tetra Pak is to provide safe food which is accessible and sustainable in nature to benefit lives of many. Tetra Pak is actively involved and has taken up various initiatives to ensure protection of food as well as future of the people (aligning its activities towards SDGs). With the sole purpose to understand the management of used beverage carton, Tetra Pak appointed The Energy and Resources Institute (TERI) to undertake this study. We laud the efforts of corporates like Tetra Pak who come forward voluntarily to commission such comprehensive studies.

Tetra Pak is consistently being proactive for safeguarding environment and has been involved in many cities to set up collection centres for Used Beverage Cartons (UBCs) as well as raising awareness among public through information, education and capacity building programs. This is a third report in the series by Tetra Pak to help understand management of UBCs and evaluate recycling rates in Indian subcontinent, after years 2011 and 2015. Every report has extended its horizon as well as number of stakeholders for interaction to assess collection and recycling of UBCs. Tetra Pak has been doing voluntary EPR for more than 15 years now and has been continuously working with recyclers across South Asian region to develop solutions, technologies and applications. Through constant interactions and tie ups with recyclers to develop solutions, technologies and applications of UBCs, Tetra Pak has always tried to bring up the level of active sorting of UBCs and reduce mixed waste recycling. Thus, making recycling of UBCs more effective, efficient and economical.

The span of this study was spread in 20 selected cities of India and 03 cities of Kathmandu, Sri Lanka and Bangladesh. This particular report specifically talks about 20 Indian cities. Compared to the earlier study conducted by TERI on UBC management (also called Post-consumer carton management) for Tetra Pak it was observed that recycling rate was about 29% in 2011, about 43% in 2015 and is now increased to about 54% in 2019.

We hope this type of study will definitely help Tetra Pak to formulate appropriate strategies to enhance the recycling rates of UBCs and help achieve SDGs. This report will also be helpful to policy makers, urban local bodies, think tanks, NGOs and waste processors to understand the scenario of UBCs management and it's potential.

Dr Ajay Mathur
Director General
The Energy and Resources Institute

Executive Summary

Beverage cartons allow distribution of liquid & food products at ambient temperature or under refrigerated conditions by extending shelf life of foods and beverages. A beverage carton is majorly made up of 75% paperboard, 4% aluminium and 21% polymers, thus categorizing these cartons as paper-based packaging. Paperboard used in beverage carton is a valuable raw material that can be easily recycled for making new paper-based products. Aluminium present in the carton is very thin and similar to human hair. It helps in creating a barrier for oxygen, flavours and light. Polymer acts as an inner layer which seals the liquid and acts as an adhesive to aluminium, fibre and external layer as well to keep out the moisture. These paper-based cartons are fully recyclable.

In India, Tetra Pak was among the first carton packaging companies started in the year 1987. It created a lot of job opportunities. The company brought in newer technologies that were customized for Indian markets. The main focus of Tetra Pak is to provide safe food which is accessible and sustainable in nature to benefit lives of many. Tetra Pak India is way ahead of many countries and is one of the fastest growing markets globally.

Tetra Pak offers a wide variety of openings and closures for the cartons, which are bio-based caps made up of HDPE (High Density Poly-ethylene) which is derived from sugarcane. Tetra Pak is one of the first among all other companies to use bio-based HDPE. This is helping improve the environmental performance of packaging, making recycling much more convenient and therefore is economically beneficial.

In India, Tetra Pak is leading and is the first manufacturing company for beverage cartons. Over the last 30 years many packaging formats have been introduced and advanced in different sizes and these packages are kept at different prices so they could suit different consumer requirements.

Tetra Pak is actively involved to ensure that its cartons don't end up in landfill from last 15 years and has taken up various initiatives to make sure the cartons are collected, sorted and recycled and ensure protection of food as well as future of the people (aligning its activities with the SDGs). With the sole purpose to understand the management of used beverage carton, Tetra Pak appointed TERI to undertake this study and help them formulate appropriate strategies to enhance the recycling rates of UBCs.

The paper-based beverage cartons manufactured by Tetra Pak are fully recyclable and out of the overarching 161,000 Tonnes per day of Municipal Solid Waste our urban cities generate, they form only a miniscule part. Tetra Pak is consistently being proactive for safeguarding environment and has been involved in many cities to set up collection centres for Used Beverage Cartons (UBCs) as well as raising awareness among public through various information, education and capacity building programs. This is a third report of its kind within this decade by Tetra Pak to help evaluate recycling rates of UBCs, after year 2011 and year 2015. Every report has extended its horizon as well as number of stakeholders for interaction.

Tetra Pak has been fulfilling extended producer responsibility (EPR) voluntarily for more than past 15 years now and has been continuously working with recyclers across South Asian region to develop solutions, technologies and applications for UBCs. Through

constant interactions and tie ups with recyclers to develop solutions, technologies and applications of UBCs, Tetra Pak has always tried to bring up the level of active sorting of UBCs and reduce mixed waste recycling. Thus, making recycling of UBCs more effective, efficient and economical.

This study was undertaken with the overarching objective to explore the perceptions of waste generators and waste collectors on UBC management, and evaluating the quantity of UBCs collected for recycling with mixed waste paper through scrap dealers,. The span of this study is spread across 20 cities of India and 03 cities of Kathmandu, Sri Lankaand Bangladesh. This particular report specifically talks about 20 Indian cities.

Sub Objectives of this study:

- Study the current quantum of UBC getting procured/ retrieved at the waste dealers' level for further recycling with mixed waste paper.
- Understand the value chain and economics involved in UBC collection and recycling.
- Assess the actual quantum of UBC reaching the paper mills which recycle paper from low grade paper waste.
- Understanding the composition of paper waste and quantity of UBC reaching dumpsites in the surveyed cities.
- Gauge, what critical stakeholders (low grade paper waste dealers and recycling paper mills) believe, is needed to upscale collection and recycling.

Methodology consists of selecting cities with highest beverage carton sales and spread across South, North, East and West regions of the country and conducting primary field surveys with various stakeholders as Waste generators (10/city), Waste collectors (20/city), Small scale scrap dealers (14/city), Large scale waste dealers(07/city), Dumpsite (03/city), Paper Mill (1/region). Local survey agencies were identified in each of the project city to carry out on ground data collection and survey. Reputed NGOs/ agencies active in the field of solid waste management were selected for the study with help from Tetra Pak India Pvt Ltd (TPIPL)

For the selected study area i.e. the selected city, detailed secondary data collection in relevance to waste management and waste characterization was carried out. Under the guidance and monitoring of TERI research staff, primary survey was conducted through questionnaire seeking information from all the major stakeholders involved in the management of the UBC including the consumers (from different socio-economic backgrounds), waste collectors, different levels of waste / scrap dealers (small and large scale waste paper dealers) spread across the city. This study also included surveys at recyclers / paper mills using mixed waste paper as raw material to understand the fate of UBCs getting mixed with it. Survey also involved evaluation of UBC reaching the disposal site (Landfill) in the selected city.

The key findings of the study are as follows:

The study revealed that UBCs are being collected by rag pickers, small scale waste paper dealers, and large scale dealers and are then sent to recycling units. The outcomes of the study revealed the percentage of dealers dealing with UBCs and are depicted in figure below.

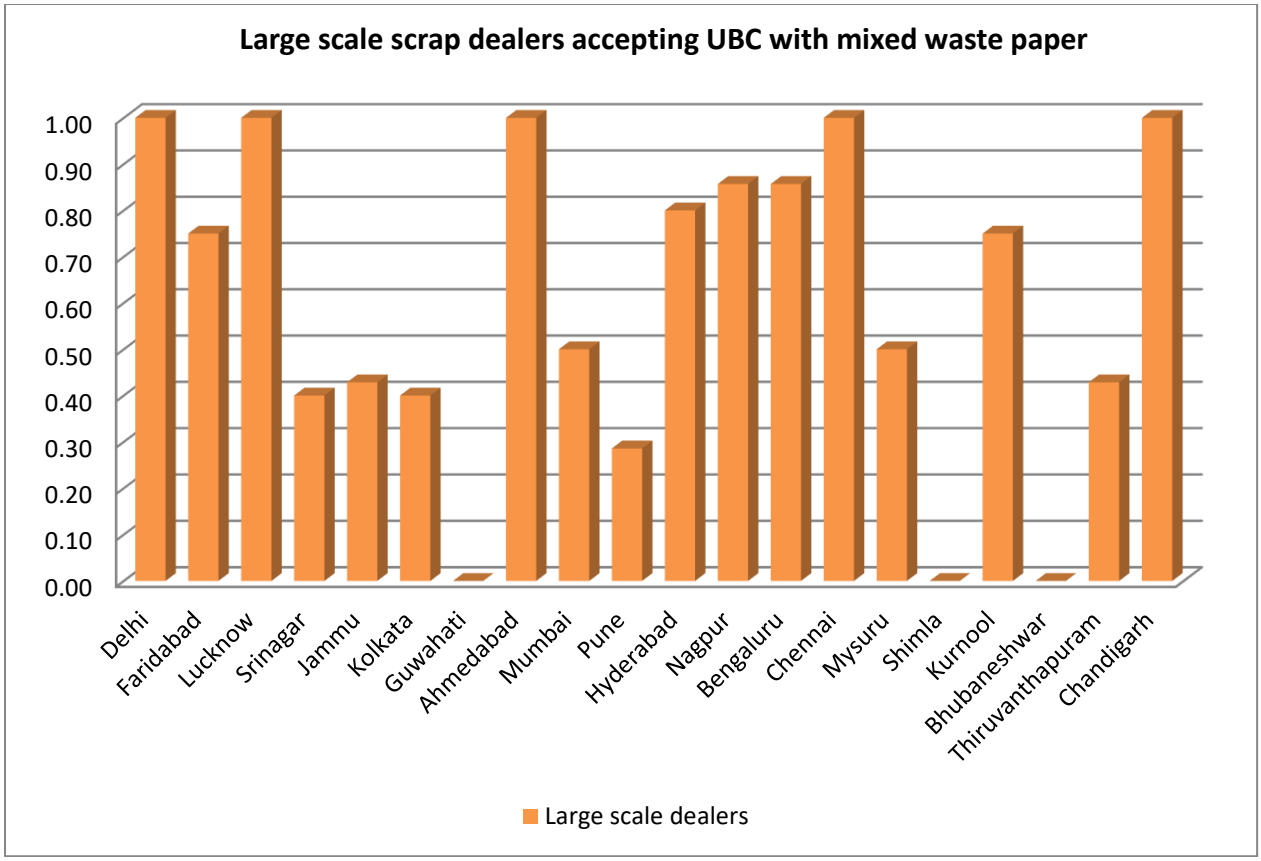

Figure 1 Fraction of Large scale scrap dealers accepting UBCs in the survey cities

It was found that in cities like Ahmedabad, Chandigarh, Chennai, Delhi and Lucknow 100% of dealers were accepting UBCs.

Figure2 depicts average UBCs found with mixed waste paper bales at respective cities.

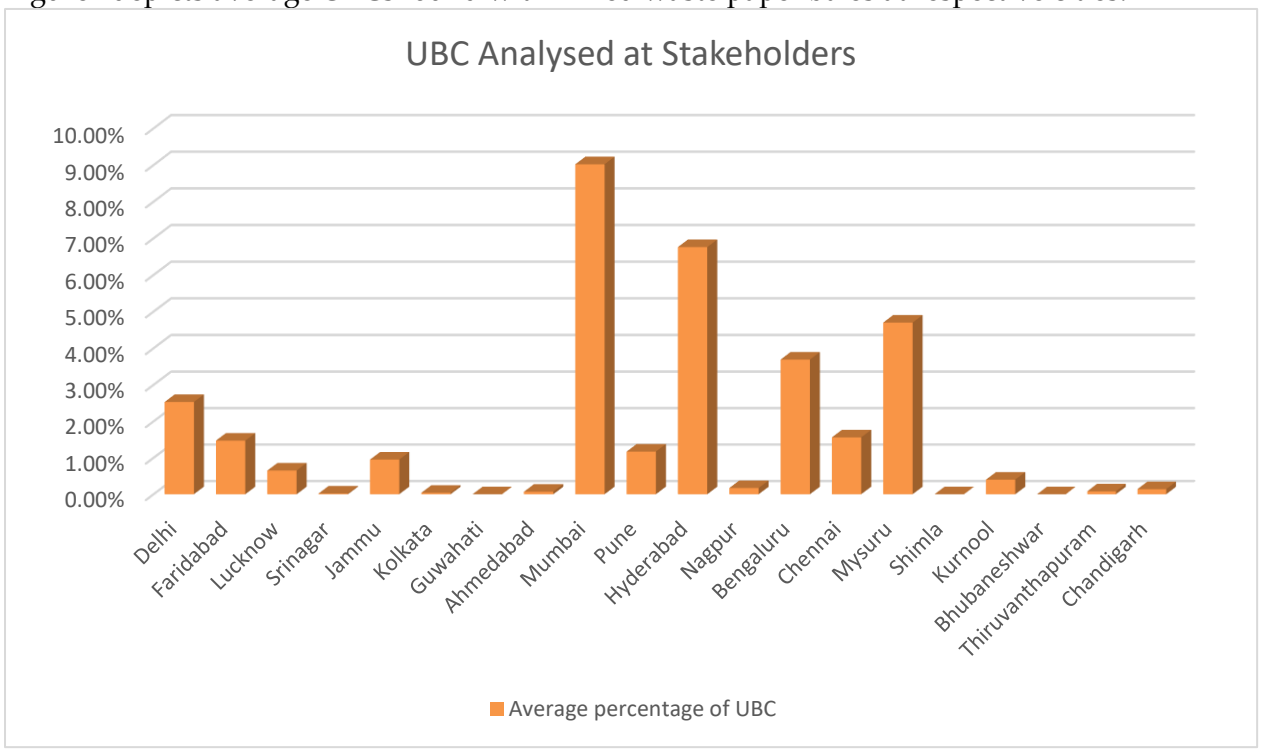

Figure 2 UBC found with mixed waste paper at dealers in the survey cities

The figure 3 depicts recycling rate with limitation of 100% recycling revealed after surveying various cities.

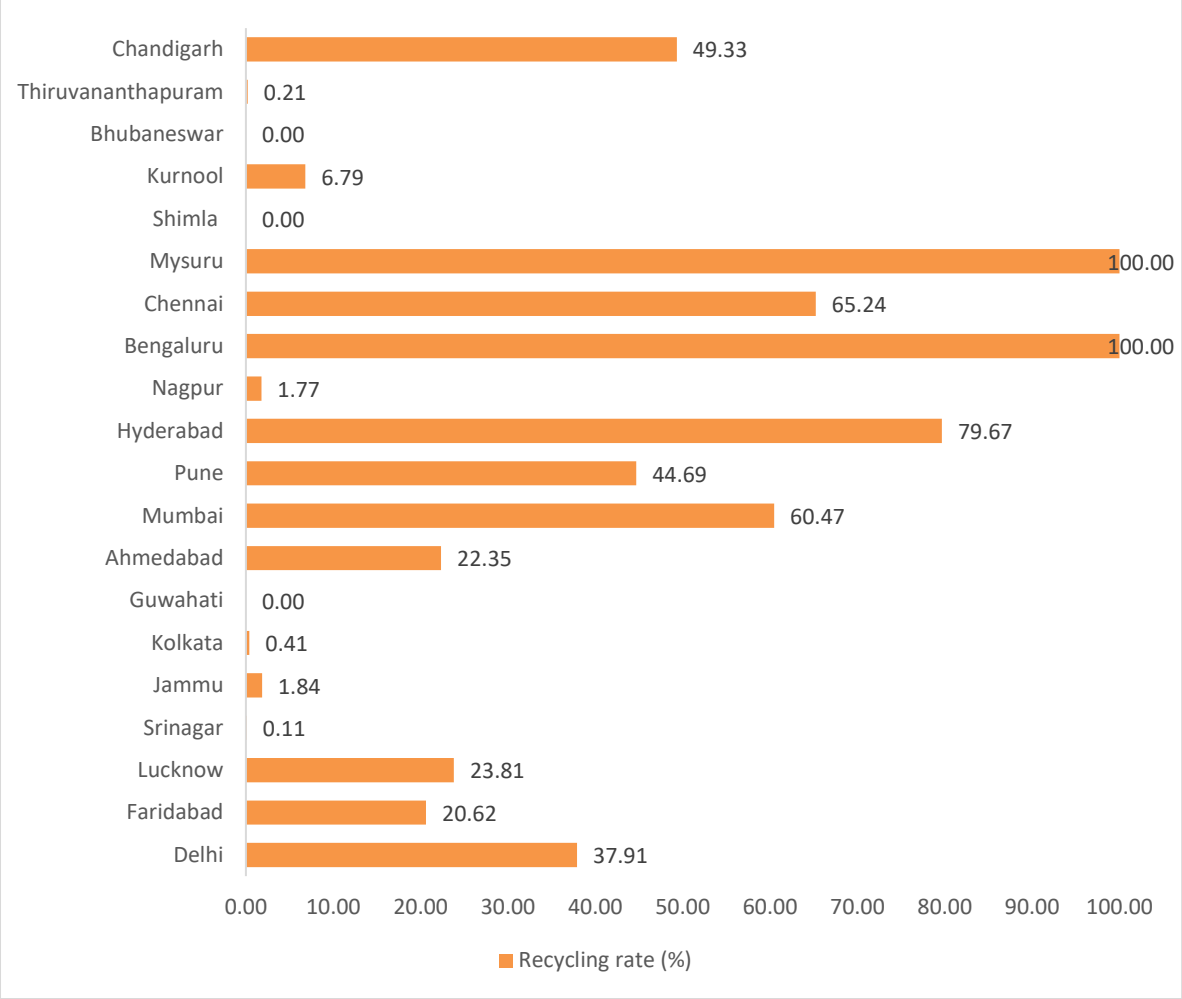

Figure 3 Recycling rates of UBCs in the survey cities by informal sector

The study also showed that 60% of the paper mills surveyed were involved in collecting UBCs from dealers but none of them dealt with UBCs separately. Compared to the earlier study conducted by TERI on Post-consumer carton (also called UBCs now) management for Tetra Pak it was observed that

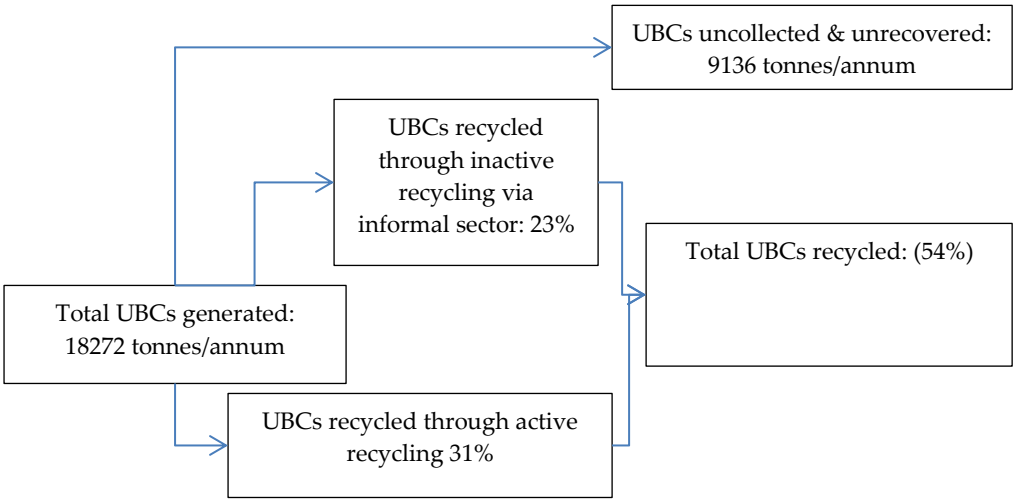

Figure 4: UBC management in India

recycling rate was about 29% in 2011, about 43% in 2015 and is now increased to **about 54% in 2019.**

It was thus clear that recycling rates have increased due to interventions of Tetra Pak, by virtue of working with numerous recyclers and associations to develop solutions, technologies and applications of UBCs. Due to these interventions, the quantity of UBCs going along with mixed paper has reduced and separate collection and recycling of UBCs have been achieved especially in cities like Delhi, Ahmedabad, Mumbai, Pune, Hyderabad, Bengaluru, Chennai, Chandigarh, Mysuru, and Faridabad.

Few of the key recommendations of the study which can be beneficial and help in further improving the recycling rate of UBCs are as follows:

1. As compared to the 2015 study, UBCs collected by informal sector in cities of Ahmedabad, Hyderabad and Bengaluru has reduced and viz a viz UBCs entering into formal active recycling has increased. This indicates the impact of interventions by Tetra Pak to make UBCs sustainable. There is a further need to get the UBCs into active recycling chain as this will not only increase the market potential but will also reduce the number of stakeholders involved in recycling chain. This will increase the price value for those on the front end of the recycling value chain i.e. waste collectors.
2. In cities of Jammu, Kolkata and Guwahati; an urgent attention is required, as due to the lack of acceptance of UBCs by paper mills, the amount of UBCs collected by informal sector has substantially reduced. Active UBC collection and tie ups with recycling units can help push UBCs collection and recycling in these cities again.
3. Pertaining to other surveyed cities, acceptability of UBCs via paper mills is the first key imperative that can help improve the UBCs acceptability among waste dealers. This will require information, education and capacity building activities with paper mills along with a strong business case depicting profitability scenarios through fibrous contents of paper based UBCs.
4. A separate collection centre for UBCs should be made which should be linked with material recovery facilities (existing/coming up under the Solid Waste management rules 2016) to facilitate active recycling of UBCs
5. More awareness among waste generators, waste collectors, small and large scale waste dealers can help in segregation of UBCs at source along with straws, however this should be a concerted effort by each stakeholder in the value chain i.e. government, NGOs, industry, etc
6. Higher prices of UBCs can effectively drive the informal recycling and increase recycling rates. Higher prices can be achieved in two ways a) by reducing the chain for collection and recycling and b) Upcycling UBCs through different products and interventions like sheets being used for making mobile toilets/ material recovery facilities etc.
7. The management of UBCs should be further studied and successful lessons should be replicated at other places
8. Such an exercise (to study the management of UBCs in major cities and identify the recycling rates) may be repeated in every 03 years to reassess the improvement in recycling rates and plan interventions and strategies.

1 Introduction

1.1 About Beverage Cartons

Beverage cartons allow distribution of liquid & food products at ambient temperature or under refrigerated conditions by extending shelf life of foods and beverages. These cartons usually help in preserving the freshness, flavours and nutritional value of beverages and food products at the time of transportation, when they are put to sale or at home. A beverage carton is majorly made up of 75% paperboard, 4% aluminium and 21% polymers, thus these cartons are categorized as paper-based packaging category. Paperboard used in beverage carton is a valuable raw material that can be easily recycled for making new paper-based products. Aluminium present in the carton is very thin and similar to human hair. It helps in creating a barrier for oxygen, flavours and light. Polymer acts as an inner layer which seals the liquid and act as an adhesive to aluminium, fibre and external layer as well, to keep out the moisture. These paper-based cartons are fully recyclable. Re-pulping methods are used for separating out the paperboard and other layers.

1.2 Beverage Carton Consumption in India

In India, Tetra Pak was among the first carton packaging companies started in the year 1987. It created a lot of job opportunities. The company bought in newer technologies that were customized for Indian markets.

The main focus of Tetra Pak is to provide safe food that is accessible and sustainable in nature to benefit lives of many. Tetra Pak India is way ahead than many countries and is one of the fastest growing markets globally.

1.2.1 Different types of Tetra Pak packages

New packaging materials and formats have been introduced for storing different types of food and beverages. Different types of Tetra Pak packages have been listed in Figure 5. These new packages have a new format with additional materials like caps and closures.

These packages are way more attractive and excellent functionality in boosting consumer appreciation. They come in different shapes and have been designed while keeping consumer choices in mind. Tetra Pak offers a wide variety of openings and closures for the cartons which are mainly bio-based caps made up of HDPE (High Density Poly-ethylene) which is derived from sugarcane. Tetra Pak is one of the first among all other companies to use bio-based HDPE. This is helping improve the environmental performance of packaging, making recycling much more convenient and therefore is economically beneficial.

Figure 5: Different types of Tetra Pak packages

1.2.2 Share of Tetra Pak Market in India

Currently, Tetra Pak manufactures many different packages that are used for different purposes. In India, one of the brands "Nandini" has been using Tetra Pak cartons which help in providing safe liquid milk to the remote areas in southern part of India.

Paper boat adopted Tetra Pak aseptic cartons for storing their juices. Other innovations are being done continuously in packaging which is why the product is more appreciated by the customers.

In India, Tetra Pak is a leading and first manufacturing company for beverage cartons. Its manufacturing plant is located in Chakan. Over the last 30 years, many packaging formats have been introduced and advanced in different sizes and these packages are kept at different prices so they could suit different consumer requirements.

Table 49 reflects the sales figure of Tetra Pak cartons in 2018 in the surveyed cities.

1.2.3 List of Products using Beverage Cartons

Table 1 represents the list of products for which beverage cartons are manufactured and used forpackaging.

Table 1: List of few products for which used beverage cartons are manufactured

S.No	Sector	Product
1.	Dairy	UHT milk Pasteurized & ESL milk Cream Fermented dairy products Concentrated and condensed milk Milk powder Other dairy products Recombined milk Flavoured & formulated dairy products
2.	Beverages	Juice

S.No	Sector	Product
		Still drinks
		Particle drinks
		Carbonated soft drinks
		Soy
		Tea
		Coconut water
3.	Prepared food	Soups
		Tomato
		Baby food
		Sauces
		Fruit preparations
		Desserts
4.	Ice Cream	Spread
		Sticks
		Cones
		Sandwiches
		Cup & bulk
		Bar & bite
		Specialities
		Consumables – Danice
5.	Cheese	Cheddar
		Edam & gouda
		Pasta filata
		Other cheese varieties
		Whey
		Emmental

(Source: Tetra Pak)

In recent years, there is an increased usage of the packages for products like cheese, ice cream and milk powder.

1.3 Manufacturing Process of Beverage Cartons

The beverage cartons undergo various stages of production before they finally reach the supermarkets and then eventually to the consumers. One of the most important & major components of carton is paperboard which is generally made from wood pulp. First the pulp is washed and then combined together to form multiple layers using a paperboard machine. Its smoothness, stiffness and thickness is checked using the control processes present. On the basis of the size of carton, distribution system (whether chilled or ambient) and shelf life of product to be made, different grades of paperboard is available. Tetra Pak Beverage cartons are composed of 75% paperboard, 21% polymers, and 4% Aluminium.

1.4 Post-consumer Recycling

Tetra Pak is actively involved and has taken up various initiatives to make sure the cartons are collected, sorted and recycled. It is observed that when recycling value chain works well,

it helps in preventing littering, saving resources and also reducing the climate impact. In the packaging, Tetra Pak uses high quality raw materials that makes the food safe. Once packaging is completed, the waste needs to be collected using simple techniques and then recycled. Most of the packaging material (up to 75%) is made from strong fibre papers which can be recycled several times into different paper products. Polymers including the straws, which are integrated part of beverage cartons, are also fully recyclable and can be converted into several useful products. Figure 6 depicts the recycling process for Used Beverage Cartons (UBCs).

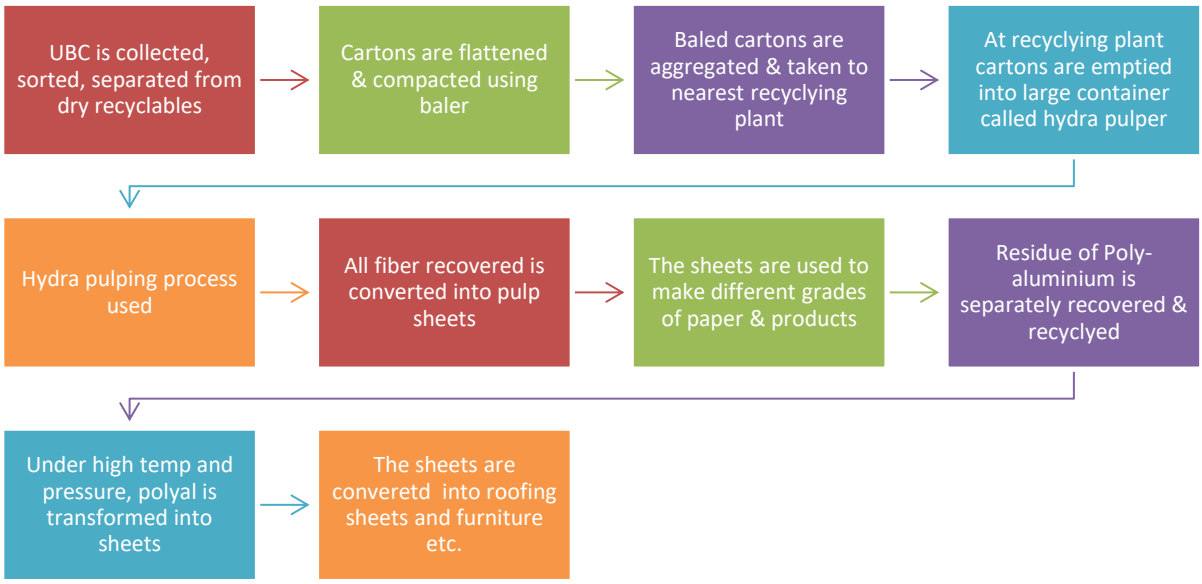

Figure 6: Recycling process of cartons (Source: Tetra Pak)

1.4.1 Sustainability Requirements

The generation of modern solid waste has caused large environmental impacts. With respect to this viewing project and related agendas through the lens of sustainability which plays a significant role, both in managing present situation and also taking care of the future, a few good research studies have been conducted which have investigated this issue of used cartons and their relevant impact on the environment if not recycled properly.

Tetra Pak strongly believes in sustainability and related preventive measures and focuses on 3 major aspects "Food, People & Future". The company ensures protection of food and future of the people and aligns its activities towards the Sustainable Development Goals (SDGs) (Table 2.) Various works have been done over the past years in this direction. For providing a sustainable environment to people, there is a need to come up with new ways and ideas which includes understanding the needs and interests of consumers. There is a need of helping people and communities to carry out their business, markets and supply chains with a sustainable and environment conscious approach.

Table 2: List of SDGs being followed

Tetra Pak carton sustainability requirement	SDGs being Followed																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
safety-quality-availability																	
Employing diverse workforce																	
Reduces food waste																	
Protects people future																	

2 Objective

The paper-based beverage cartons manufactured by Tetra Pak after use are fully recyclable and out of the overarching 161,000 Tonnes per day of Municipal Solid Waste our urban cities generate, they form a miniscule part. Tetra Pak is consistently being proactive for safeguarding environment and has been involved to set up collection centres for Used Beverage Cartons (UBCs) in many cities along with raising awareness among public through various informative, education and capacity building programs. This is a third report of its kind within this decade by Tetra Pak to help evaluate recycling rates of UBCs, after year 2011 and year 2015. Every report has extended its horizon as well as number of stakeholders for interaction.

Tetra Pak is doing voluntary extended producer responsibility (EPR) for more than past 15 years now and is working with recyclers across South Asian region to develop new solutions, technologies and applications. Through constant interactions and tie ups with recyclers to develop solutions, technologies and applications of UBCs, Tetra Pak has always tried to bring up the level of active sorting of UBCs and reduce mixed waste recycling. Thus, making recycling of UBCs more effective, efficient and economical.

The overarching objective of this study is to explore the perceptions of waste generators and waste collectors on UBC management and further explore the quantity of UBCs getting collected for recycling with mixed waste paper through small and large scale scrap dealers, in the 20 selected cities (Table 3) and to determine the recycling rates of UBCs in these cities.

Sub Objectives:

- Study the current quantity of UBCs getting procured/ retrieved at the waste dealers' level for further recycling with mixed waste paper.
- Understand the value chain and economics involved in UBC collection and recycling.
- Assess the actual quantity of UBCs reaching the paper mills which recycle paper from low grade paper waste.
- Assess the quantity of pulping rejects from low grade paper waste at paper mills.
- Understanding the composition of paper waste and quantity of UBCs reaching dumpsites in the surveyed cities.
- Gauge what critical stakeholders (low grade paper waste dealers and recycling paper mills) believe is needed to upscale collection and recycling.

Table 3: List of cities selected for UBC Management study

S.No	City	State/Country
1	Ahmedabad	Gujarat
2	Bangalore	Karnataka
3	Bhubaneswar	Odisha
4	Chandigarh	Punjab
5	Chennai	Tamil Nadu
6	Delhi	Delhi
7	Faridabad	Haryana
8	Guwahati	Assam
9	Hyderabad	Telangana

S.No	City	State/Country
10	Jammu	J&K
11	Kolkata	West Bengal
12	Kurnool	Andhra Pradesh
13	Lucknow	UP
14	Mumbai	Maharashtra
15	Mysuru	Karnataka
16	Nagpur	Maharashtra
17	Pune	Maharashtra
18	Shimla	Himachal Pradesh
19	Srinagar	J&K
20	Thiruvananthapuram	Kerala

3 Methodology

Methodology consists of selecting cities with highest beverage carton sales and are spread across South, North, East and West regions of the country. Figure 7 describes the overall study components:

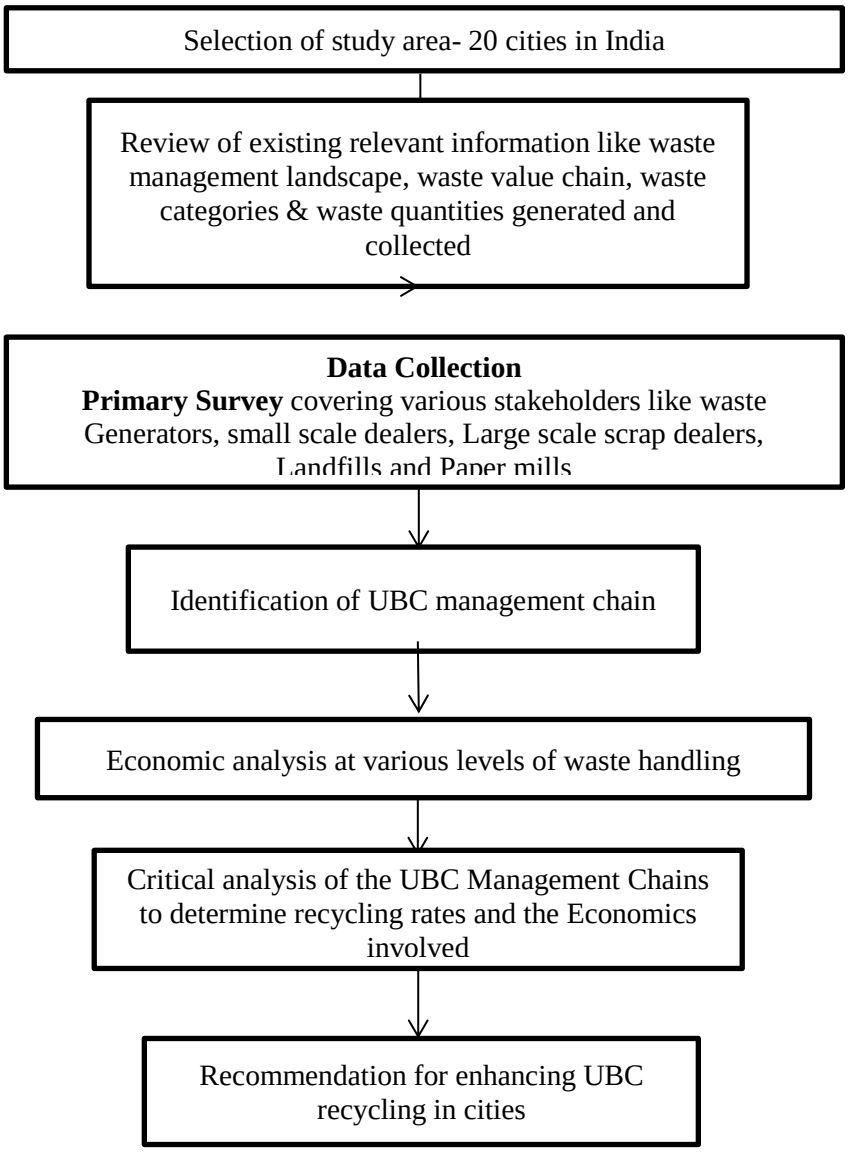

Figure 7: Study Approach for assessing UBC Management

The UBC management study helped in arriving at recycling rates via field surveys (waste generator, waste collector and waste dealers & paper mills) and secondary research. The study also collected information from each city on economics of UBC/mixed paper managed. The results of the study are reported ahead.

The analysis at dumpsite helped to evaluate the percentage of paper waste and UBCs reaching the disposal site.

3.1 Identification of the Survey Agencies

Survey agencies were identified in each of the project city to carry out on-ground data collection and survey. Reputed NGOs and research agencies active in the field of solid waste management were selected for the study with help from TPIPL.

Table 4 lists down the names of cities and local survey partners.

Table 4: List of local partner Agencies

S. No.	City	Survey Agencies
1.	Ahmedabad	Nepra Environmental Solutions
2.	Bengaluru	Sahaas Zero Waste
3.	Bhubaneswar	(SGR)Shree Ganesh Recycling Pvt Ltd
4.	Chandigarh	Gurditta Informatics
5.	Chennai	Sahaas Zero Waste
6.	Delhi	Development Links Foundation
7.	Faridabad	Development Links Foundation
8.	Guwahati	SRG Consultancy
9.	Hyderabad	Sukuki Exnora
10.	Jammu	Human Welfare Voluntary Organization
11.	Kolkata	SRG Consultancy
12.	Kurnool	Dalit Bahujan Resource Centre
13.	Lucknow	Aim Trust
14.	Mumbai	Bismillah & Co.
15.	Mysuru	Isha Fiber & Fuel Source
16.	Nagpur	Centre for Sustainable Development
17.	Pune	Shriman Enterprises
18.	Shimla	Waste Warriors
19.	Srinagar	Human Welfare Voluntary Organization
20.	Thiruvananthapuram	Green Worms

3.2 Data collection

For the selected study area i.e. the selected city, detailed secondary data collection in relevance to waste management and waste characterization was carried out. This involved going through available literature and research papers about MSW management in these cities.

Primary survey was conducted through questionnaire, seeking information from all the major stakeholders involved in the management of the UBC including the consumers (from different socio-economic backgrounds), waste collectors, different levels of waste / scrap dealers (small and large scale waste paper dealers) spread across the city. This study also included surveys at recyclers / paper mills using mixed waste paper as raw material to understand the fate of UBCs getting mixed with it. Survey also involved evaluation of UBC reaching the disposal site (Landfill) in the selected city.

For estimating UBC recycling rates - total waste generation, physical composition, waste collection and informal sector recovery were taken into consideration. This also included

percentage of respondents at scrap dealer levels dealing in UBCs. Table below reports the sample size selected per city.

Table 5: Sampling for the proposed study

Stakeholder	No of samples	Remarks	Total sample size
Waste generators	10/city	Spread in various areas of city	200
Waste collectors	20 /city	Spread in various areas of city	400
Small scale scrap dealers	14/city	Spread in various areas of city	280
Large scale waste dealers	07/city	Spread in various areas of city	140
Dumpsite	03/city	Three samples trucks from residential, commercial and institutional areas	60
Paper Mills	1/region	Spread across various regions of India	4

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The data collection formats have been attached as annexures to this report for readers' reference.

4 Survey Findings

To identify the status of UBC management & recycling in various cities, this study has been taken by TERI and has been funded by Tetra Pak India Pvt Ltd.

The study has now covered major regions of Southern Asia, but this document reports the findings from selected 20 cities in India only. This chapter depicts the findings/suggestions from various stakeholders including waste generators, waste collectors, waste dealers, surveyed dumpsites and paper mills in those selected 20 cities in India.

4.1 Ahmedabad

Waste Generator

In different areas of Ahmedabad, 10 surveys were conducted at waste generator levels, mostly from hospitals, hotels and market place. The quantity of waste generated from these generators was around 450kg to 7000 kg per month which included 18kg to 1200kg per month of dry waste and around 1.5 kg to 150 kg per month of UBCs. About 90% of the generators were involved in segregating the waste generated at their place into dry and wet waste; but only 10% of the waste generators reported segregating UBCs.

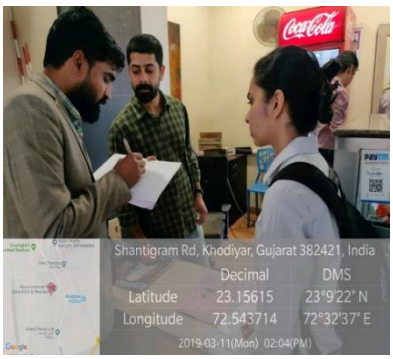

Figure 8: Snap of waste generator interviewed during survey.

The reasons that were mentioned by the people surveyed for not segregating the UBCs were:

1. Lack of awareness
2. Current practices of disposing UBCs as dry waste or with mixed waste
3. There wasn't any such demand from the waste collector/no separate market.

The average price at which the waste is given for recycling of mixed paper was found to be 5-6 Rs/kg, for cardboard 9 Rs/kg, and for dry waste 3-4 Rs/kg.

The UBCs generated were disposed of as dry waste, or mixed with paper waste. In some cases it was taken by an agency or collected by the Ahmedabad municipal corporation as mixed waste. At around 10% of the stakeholders, it was found that the UBCs are stored separately and given to a separate UBC waste collector.

When asked about the reasons for discouragement in segregation of UBCs, lack of awareness was the major cause followed by the fact that UBCs were collected as mixed waste. Time constraints was also one the reasons why people don't segregate UBCs from dry waste.

Most of the people were willing to segregate and dispose of the UBCs for a healthy environment but they demanded a strict implementation of the rules and initiatives to be taken by the Municipal Corporation and to keep a separate dustbin for UBCs. Public awareness campaign was suggested to create awareness regarding segregating waste and UBCs

Waste Collector

About 20 waste collectors were interviewed during the survey in Ahmedabad who were all rag pickers and collected paper, plastic, glass (90%) and metal (80%). About 95% of them collected waste from streets, 90% from waste bins, 88% from markets and 20% from households.

UBCs were collected in 95% of the cases but were mixed with paper/cardboard. The reason stated by the collectors for not collecting UBCs separately was that there was no buyer/market for UBCs.

Around 70kg to 3000kg of mixed paper waste was collected per month and was sold to recycle at the cost of 01-10 Rs/kg. Around 1.3 kg to 60 kg of UBCs was collected per month and was sold at an average of 2 Rs/kg.

The UBCs were mostly collected from commercial or business establishments (65%), lower income localities (50%) and from upper and middle class localities (45%).

In about 80% of the conditions the UBCs found were soiled, in 15% of conditions the UBCs were clean ad ready for sale.

When asked about the reasons that discourage them from dealing with UBCs, the following reasons were mentioned:

1. No buyers
2. Not paid enough
3. Less weight of the cartons
4. More labor required

A good amount of payment or increased incentives was the only point reported for improvement of UBCs collection and recycling process and how they can be motivated to indulge in UBCs collection.

Small scale waste dealer:

Fourteen of the small scale dealers were surveyed across the city. They were dealing in residential, commercial and institutional areas. There were around 3 to 25 rag pickers/kabadi walas providing materials to each of these dealers. The average mixed waste paper handled by these dealers was around 4000 to 14000 kg/month. The mixed paper purchase price was reported around 2-12Rs /kg whereas the selling price was around 3-13Rs/kg.

In 78% of cases, around 5kg to 300kg of UBCs per month were collected with mixed paper, the rest were either not interested or didn't collect it due to multilayer packing. The sources of procurement were rag pickers and intermediate kabadi walas. The selling price of UBCs was found to be around 1 to 4 Rs/kg.

In maximum cases, UBCs that were collected contained leftover juice and sometimes soiled and the cartons were not processed before selling. These collected UBCs were later sold to larger dealer along with mixed paper.

Factors pointed out for not dealing with UBCs were:

1. Less price due to contamination
2. No awareness
3. No market

4. Lack of man power
5. Larger scale industry doesn't accept the UBCs.

When asked on how the collection of UBCs can be improved, the dealers suggested following:

1. There should be a proper market established for UBCs
2. Improved incentives
3. By avoiding contamination
4. Spreading awareness
5. Improving board quality
6. Laminated layer should be replaced so paper mill accepts it

Large scale scraps dealers:

Seven large scale dealers were surveyed, who were dealing in residential, commercial and institutional areas. About 17-70 kabadi walas and 3 - 1800 rag pickers were contributing to each of these dealers. The amount of mixed paper waste collected was around 06 – 250 MT/month. Around 10-200kg/month of UBCs were collected along with the other mixed paper but few were not dealing in this due to contamination problem which reduces the value of mixed paper board.

The purchase price of mixed paper was 2- 10 Rs/kg whereas the selling price was 3-12Rs/kg. The UBCs were sold along with the paper. The conditions in which the UBCs were procured were mostly with leftover juice and soiled. In some cases they get clean UBCs that were ready for sale.

UBCs were not processed before selling and once collected, they are either sold to recycle, or along with mixed paper to large dealers.

Figure 9: Snap of waste dealer interviewed during survey

On asking the discouragements in collecting UBCs for recycling, the following points were indicated:

1. No market
2. Less price
3. No awareness
4. Contamination
5. Lack of man power
6. Non acceptance of UBCs by paper mill

Some of the suggestions from large scale dealers for improving the collection rates for recycling of UBCs were as under:

1. Improved collection system
2. Increase in market
3. Spreading of awareness
4. Acceptance of UBCs
5. Improving board quality
6. Laminated layer should be replaced so paper mill accepts it

The bale analysis done at dealers have been depicted in Table below.

Table 6: Scrap dealers of Ahmedabad

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large scale scrap dealer	208	0.136	0.065%
	181.25	0.046	0.025%
	90.65	0.03	0.033%
	69.45	0	0.000%
	73.25	0	0.000%
	86.75	0.03	0.035%
	24	0.4	1.667%
Sub Total	**733.35**	**0.642**	**0.088%**
Small scale scrap dealer	126.06	0.064	0.051%
	84	0.28	0.333%
	68	0	0.000%
	25.65	0	0.000%
	40	0.045	0.113%
	26	0	0.000%
	48.1	0	0.000%
	40	0	0.000%
	39.2	0	0.000%
	51.25	0	0.000%
	70.5	0	0.000%
	50	0.04	0.080%
	20.55	0	0.000%
	44.95	0	0.000%
Sub Total	**734.26**	**0.429**	**0.058%**

Dumpsite analysis

In the month of March, 2019, at Vastral RTS site, dumpsite analysis was conducted, capturing waste bought from institutional, commercial and residential area. On the daily basis the trucks made around 3-4 trips for waste collection. The analysis revealed that out of 671.8 kg of waste analysed, average weight of mixed paper was 4.52kg and around 0.0623 kg of UBCs. This analysis was done using quartering technique for sample selection. The dumpsite analysis done at the site have been depicted in **Error! Reference source not found.**

Table 7: Dumpsite analysis of Ahmedabad

Truck details	Area and route covered	Waste analysed (kgs)	Paper Found (kgs)	UBCs found (kgs)	Comments
GJ 27X 0205	Ramol, east zone, Vastral RTS	761.7	3.9	0	Takes 3-4 trips per day

Truck details	Area and route covered	Waste analysed (kgs)	Paper Found (kgs)	UBCs found (kgs)	Comments
GJ 02X 9043	Vastral East zone, Vastral RTS	781.9	6.66	0.046	Takes 3-4 trips per day
GJ 02X 3092	Indrapuri south zone, Vastral RTS	471.8	3	0.008	Takes 3-4 trips per day
Percentage			0.67%	0.003%	

4.2 Bengaluru

Waste Generators

About 10 waste generators were interviewed in Bengaluru city which generated somewhere about 80-8000 kgs of waste every month and no one segregated the waste generated. The UBCs which were found to be generated at around 10-200 kg/month was also not segregated by anyone. When asked for reasons for not segregating UBCs at their premises they informed that no one buys UBC, and hence it is disposed off with the municipal solid waste.

Figure 10: TERI team conducting dumpsite analysis

Mixed paper and cardboard was sold at about INR 5-6 / kg.

When asked on what discourages waste generators to segregate UBCs they responded as follows:

1. No awareness about segregating of UBCs
2. Foul smell and attraction to insects and rodents

A good market value for collected UBCs, more awareness, and availability of scrap dealers have been some of the points indicated as the motivation which can aid UBC segregation.

Waste Collectors

There were 19 rag pickers and 2 door to door waste collectors surveyed during the study. These collectors were involved in collecting plastics, papers, glass and even some reported collecting metals for recycling.

About 61% of the respondents collected UBCs with mixed paper waste. However, one collector was collecting the UBCs separately from distilleries. The reasons stated from the rest of the collectors for not collecting the UBCs were:

1. No one gives UBCs to them for recycling
2. No buyer/market

3. Not interested as there is no incentive.

The collectors dealing in UBC estimated UBC collection in range of 5 – 1000 kg per month which was sold at around 2-6 Rs/kg to large scrap dealers. These UBCs were mostly found in the regions of commercial or business establishments, upper and middle class localities. The respondents reported that in about 42% of the cases the UBCs were found clean and ready for sale, around 38% of the cases they were soiled and 14% of the times the cartons had leftover juices in them.

The mixed paper waste that was collected was of about 50-1000 kg per month which was sold at 4-6 Rs/kg.

Upon asking about the fate of UBCs, the stakeholders informed that there are no buyers in market and even if there are, the value is very low. Some even complained about the foul smell and insects and rodents infestation. Lack of connections between the collectors and the waste dealers was seen as the most important factor that restricted the further collection and segregation of UBCs.

Respondents suggested that segregation at source is needed and a proper connection between different stakeholders is the key to proper segregation and collection of UBCs. Also, a good price and market for UBCs is required to motivate various players in recycling business to get UBCs collected for recycling. Some even suggested that a contract must exist with shopkeepers so as to collect the waste directly in large quantities. Adequate amount of awareness is needed in this city for this to happen.

Small scale waste dealers

About 14 small scale dealers were interviewed in different areas of Bengaluru. These dealers were capturing various residential and commercial areas and number of intermediate kabadi's or rag pickers contributing to each of them ranged from 03-08.

The average mixed waste paper collected by each of these dealers varied from 100 kg/month to 3000 kg /month. Only 28% of the small scale dealers reported dealing with UBCs and the rest who were not dealing with UBCs stated less price and low quantity as the reasons of not collecting it. A few of them dealt only with metal scraps.

The amount of UBCs was reported around 4-1800kg/month. The UBCs received were found to be clean and ready for sale. The purchase price of which was around 4-5 Rs/kg and were sold at 6-7 Rs/kg. These were not processed before selling to larger dealer.

The purchase price of mixed paper was 3-5 Rs/kg and was sold at 4-8 Rs/kg as stated by the stakeholders.

The discouraging factors that were stated by the dealers were as follows:

1. Not getting enough of UBCs
2. Storage issues
3. Not enough connections
4. Lack of awareness
5. Low profit

Stakeholders reported that improvement of connections and the collection mechanism were the points that were found to be lacking and were necessary for motivating the stakeholders involved.

Large scale scrap dealers

About 7 large scale waste dealers were interviewed, each having a turnover of about 4-150000 kgs of waste paper every month. A large number of small scale waste dealers and rag pickers (4-100) were supplying materials to each of these waste dealers. Purchase price of mixed paper waste was indicated in range of INR 4- 7.5/kg and a selling price from INR 4-11/kg.

Around 85% of large scale dealers reported dealing with UBC along with mixed paper. Around 42% of the respondents dealing with UBCs reported the conditions of pack as soiled and other 42% reported that the packs were clean and ready for sale.

The stakeholders that were involved in UBCs collection and segregation sold the packs to recyclers along with mixed paper waste and one of them sold it to paper mill (ITC Coimbatore).

The only discouragement in dealing with UBCs were

1. Low quantities and hence low selling price,
2. Lack of buyers and
3. Lack of market for UBCs
4. More than 35% of Moisture content rejects the waste
5. Rag pickers are not co-operating for collection of UBCs

Awareness, profitable business, better investments and waste segregation at source were some of the ways mentioned by the stakeholders that could improve the UBCs treatment cycle.

The bale analysis done at the dealers have been depicted in Table 8

Table 8: Bale analysis of Bengaluru

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large scale scrap dealer	429*	499*	-
	175*	171*	-
	81	4.7	5.802%
Total	**81**	**4.7**	**5.802%**
Small scale scrap dealer	36.8	7.5	20.3%
	44.2	0	0.000%
	50.86	0	0.000%
	46.99	0	0.000%
	51.85	0	0.000%
	37	0	0.000%
	81.08	0	0.000%
	56.03	0	0.000%
	68.24	0	0.000%
	36	0	0.000%

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Total	**473.05**	**7.5**	**1.585%**
*separate bale for UBC were made			

Dumpsite analysis

Dumpsite analysis was done at KasaRasa Koramangala transfer station from where wastes were transferred into larger trucks to disposal sites. The survey was done on 3 vehicles bringing in waste from different locations of Bengaluru. Each of the vehicles had a target at commercial, institutional and residential areas. The number of trips accounted by the truck drivers was about 2-7 trips /month bringing in around 150-400kg of mixed waste per truck per trip.

The analysis done at the site have been depicted in Table 9

Table 9: Dumpsite analysis of Bengaluru

Truck details	Area and route covered	Truck load(Kg)	UBC load(Kg)	Comments
KA 05A 2064	Koramangala 4th block, Kasarasa	12.2	1.2	Takes 2-3 trips per week
KA 01A 7520	Koramangala 5th block, Aggregation point Koramangala	25.5	1.8	Takes 7 trips per week
KA 05A 8592	Kasarasa to Koramangala	16.15	0.4	Takes 2 trips per week
Total %			6.31%	

4.3 Bhubaneswar

Waste generators

About 10 waste generators were interviewed in Bhubaneswar who generated about 30 kg - 300 kg of waste every month. Almost all waste generators were from market area. The amount of dry waste generated was about 6.4 kg – 500 kgs per month. The amount of UBCs generated were reported to be in range of 0.5 kg– 12.6 kgs per month, however these are estimates as no one was segregating UBC at their premises.

Waste was not segregated & collected by interviewed population and was taken away by Bhubaneswar municipal corporation (BMC). The generators mentioned about 80% of respondents were not segregating UBCs while 20% of them were segregating UBCs (as part of dry waste). The reasons for not segregating UBCs were no incentives and no buyers in market. Waste generators also mentioned that UBCs were disposed with M SW waste. When asked about reasons for not segregating UBCs at their premises, waste generators informed that no one buys UBCs and are disposed through Bhubaneshwar municipal corporation (BMC) and reaches the dumpsite eventually.

Figure 11: Waste generator interviewed

The price of selling mixed waste paper was reported to be about INR 5 – 12 per kg. Cardboard value was reported to be INR 5 – 20 per kg.

The generators mentioned UBCs being disposed with municipal solid waste (MSW) and taken away by BMC.

On being asked about the reason for not segregating UBCs stakeholders highlighted that there is no benefit in collecting UBC, no incentives are provided, no developed market and buyers and minimum awareness.

Good incentives for collection of UBCs, developed market & buyers and increased awareness have been indicated as the motivational steps by the waste generators which can aid UBC segregation and collection for recyclability.

Waste collectors

About 20 waste collectors were surveyed which included 16 Rag pickers and 4 door to door collectors. The waste came from residential, institutional and commercial areas to these collectors. All the surveyed collectors were dealing in plastics (100%), papers (100%), glass (95%) and metal (100%). None of them were collecting UBCs for recycling. The reasons were no incentives, no buyers & no developed market and no awareness.

The estimated mixed paper waste collected was about 10 kg/month - 455 kg/ month. The selling price of mixed paper varied from INR 4/kg - 12/kg.

About 20% of the waste collectors collected mixed waste paper from households, 60% from streets, 80% from waste bins and 20% from other places.

Upon asking about the fate of UBC's, stakeholders informed that they do not collect UBCs separately.

The major discouragement faced by waste collectors for not collecting UBCs separately was no buyers & market, no awareness and no incentives were provided on collection.

Respondents suggested that a developed market & buyers in market and good incentives can motivate the recycling business and increase UBCs collection. This would require a proper system for waste collection.

Figure 12: small scale dealer interviewed

Small scale waste dealers

About 14 small scale dealers were interviewed in different areas of Bhubaneswar, each having a turnover of about 240kg to 4000 kgs of mixed waste paper every month. The stakeholders covered residential and commercial areas. 30- 55 door-to-door collector and rag picker supplied materials to each small scale dealers.

All the stakeholders mentioned not collecting the UBCs. The purchase price of mixed paper varied from INR 5/kg- 10/kg. However, the selling price of mixed paper varied from INR 6/kg to 15/kg.

Dealers reported that UBCs come to them via rag pickers, door to door collectors, and households along with mixed paper.

Major discouragement was no buyers and no incentives for collection of UBCs. It can be improved by providing good money for collection, creating more awareness and by developing separate market and dealers.

Large scale scrap waste dealers

About 7 Large scale scrap dealers were interviewed, each having a turnover of about 120 – 750Tonnes/month of waste paper. Stakeholders covered all areas of Bhubaneshwar received waste from residential and commercial areas of the city. A large number of large scale dealers receive supply from 15 - 760 door-to-door collector and rag pickers.

All respondents mentioned that they were not collecting UBCs. Purchase price of mixed paper was indicated in range of INR 7/kg – 20/kg and a selling price from INR 8 - 25/kg.

However, the stakeholders reported UBCs come to them via rag pickers, door to door collectors, households, and intermediate kabadis along with mixed paper.

Figure 13: Large scale dealer interviewed

Major discouragement for not collecting UBCs was no buyers in market.

According to large scale dealers, good price, awareness and developed market with enough buyers can definitely drive the UBCs recycling chain in Bhubaneshwar.

Bale analysis done at the dealers have been depicted in Table below.

Table 10: Bale analysis of Bhubaneshwar

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large scale scrap dealer	85	0	0.000%
	200	0	0.000%
	250	0	0.000%
	110	0	0.000%
	95	0	0.000%
	80	0	0.000%
	115	0	0.000%

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Total	**935**	**0**	**0.000%**
Small scale scrap dealer	40.5	0	0.000%
	50	0	0.000%
	-	0	-
	80	0	0.000%
	85	0	0.000%
	110	0	0.000%
	100	0	0.000%
	80	0	0.000%
	-	0	-
	75	0	0.000%
	80	0	0.000%
	90	0	0.000%
	76	0	0.000%
	75	0	0.000%
Total	**941.5**	**0**	**0.000%**

Dumpsite analysis

Dumpsite analysis was done at Transfer Station, Manchesar in Bhubaneswar to cover three vehicles bringing in waste from different locations and targeting commercial, institutional and residential areas. The waste collected by per truck per trip was reported to be around 2-8 tonnes.

Table 11: Dumpsite analysis of Bhubaneshwar

Truck details	Area and route covered	Truck load(Kg)	Paper load(Kg)	UBC load(Kg)	Comments
OR 19D 7902	Bhubaneshwar city, Transfer station, Manchesar	210	4.7	0.22	Takes 4-6 trips per week
OR 19E 2577	Bhubaneshwar city, Transfer station, Manchesar	195	10	0.24	Takes 3-4 trips per week
OR 05Y 9523	Bhubaneshwar city, Transfer station, Manchesar	180	6	0.032	Takes 3-4 trips per week
Total %			3.53%	0.084%	

4.4 Chandigarh

Waste generators

About 10 waste generators were interviewed i n Chandigarh city who generated somewhere about 130 kg – 500 kgs of waste every month. The amount of dry waste generated was about 60kg – 300 kgs per month. The UBCs generated by generators were reported to be in range of 0.48 – 2.4 kgs per month, however these are estimates as no one was segregating UBC at their premises.

Figure 14: Snap of waste generator interviewed during survey

Waste was not segregate d & collected by the interviewed population and was taken away by municipal body with mixed paper and other waste.

When asked the reasons for not segregating UBCs at their premises they informed that in Chandigarh no one buys UBCs and there is no incentive in UBC collection and no developed market for its selling.

The generators mentioned that UBCs were being disposed or mixed with municipal solid waste (MSW) or sometimes thrown in dustbins.

On being asked about the reason for not segregating UBCs they highlighted following reasons:

1. Lack of awareness on UBC and its segregation & collection.
2. No incentives on UBC collection.
3. Due to very less quantity, they avoid collecting UBC.
4. Time wastage.
5. No buyers in market.

A good market value for collected UBCs, proper govt. norms and a good market and incentives have been indicated as the motivational steps which can aid segregation and collection of UBCs for recycling by most of the waste generators.

Waste collectors

About 20 waste collectors surveyed, which included 3 Rag pickers and 17 door to door waste collectors. These collectors were collecting all types of dry waste including plastics, papers, glass and metal for recycling.

Figure 15: Snap of waste collector interviewed during survey.

About 95% respondents reported collecting UBCs, out of which 90% mentioned UBC getting collected with mixed paper & cardboard. 5% respondent reported UBC not getting collected at all, out of which 95% respondents mentioned the reason being no incentives on UBC collection. The collectors dealing in UBCs mentioned that UBC collection was taking place in the city but only with the mixed paper. The

collectors dealing in UBC estimated the amount of mixed paper waste about 168 kg -1560 kgs per month.

The price of selling UBCs was informed to be about INR 3/kg – 3.5/kg only and some reported that due to the low price & quantity UBC gets dumped with MSW. Mixed waste paper value was reported as about INR 2 - 8 per kg.

About 80% of the waste collectors collected the mixed waste paper from households, 5% from streets, 10% from waste bins, 15% from markets and 15% from others. Although, UBCs were reported to be coming from upper and middle income localities by only 10% stakeholders. 75% stakeholders reported that UBCs were coming from lower income localities, 15% reported UBCs coming from commercial and business establishments. However, the interviewed stakeholders reported the condition of UBCs reaching them were as 5% containing juice in it, 70% reaching them as soiled and 10% stakeholders reported clean and ready for selling UBC's being received.

Upon asking about the fate of UBCs, stakeholders informed that they sell it to the small scale dealers along with mixed waste and were not collected as there were no buyers and incentives for UBCs in Chandigarh. It was also reported that segregating UBCs is wastage of time as it requires intense labour..

The major discouragement for not collecting UBCs in waste collectors was its very light weight so waste pickers avoid collecting it. It was also reported by stakeholders that segregating UBC require intense labour and time, no space for storage and lack of awareness about UBC segregation and collection. Additionally, there is no system for getting segregated waste from generators.

Respondents suggested that more buyers in market and good incentives for UBCs can motivate in increment in collection of UBCs for recycling.. This would require a proper system for waste collection. Further the waste collectors look forward for a better price and regular business of UBCs in order to start collecting them.

Small scale waste dealers

About 14 small scale dealers were interviewed in different areas of Chandigarh, each having a turnover of about 300 kg to 700 kgs of mixed waste paper every month. The stakeholders covered residential and commercial areas. A large number of small scale dealers and Rag pickers (2 – 7) were supplying materials to each of these waste dealers.

The stakeholders mentioned that all of the dealers collected UBC. The average UBC collected by each of these dealers varied from 5kg/ month to 200kg/month. The purchase price of UBC had been indicated as INR 3.0/kg whereas price of mixed paper varied from INR 1-3/kg. . However, the selling price of UBCs to larger dealers was INR 5.0 per kg and mixed paper varied from INR 3 - 4.25 per kg.

However, dealers reported that UBCs come to them via rag pickers, door to door collectors, households, kabadis along with mixed paper. The ones dealing with UBCs mostly reported the conditions as 86% of them were soiled, 7% reported that there was leftover juice content as well. All stakeholders mentioned processing and treating of UBCs before selling them to recycling mills.

Upon asking the fate of UBCs, stakeholders mentioned that a large number of dealers sell it along with the mixed paper and few sell it seperately to large dealers. Major discouragement among small scale dealers was no proper market & buyers and lack of awareness on UBC collection. They suggested that the collection of UBC can be improved by development of market and presence of buyers, good incentives for collection and large quantity of UBCs available for collection.

Figure 16: Dumpsite in Chandigarh

Large scale scrap waste dealers

About 7 Large scale scrap dealers were interviewed, each having a turnover of about 40000 kg - 230000 kg of waste paper every month. Each of the stakeholders were mix waste paper collector. Stakeholders covered residential, commercial and institutional areas of city. A large number of small scale dealers and rag pickers (4 – 20) were supplying materials to each of these waste dealers.

All large scale dealers collected UBCs and accepted it with mixed waste paper. Purchase price of mixed paper was indicated in range of INR 3/kg – 4.4/kg and a selling price from INR 4 -6 /kg. However, the stakeholders reported UBCs come to them via rag pickers, door to door collectors, households, kabadis along with mixed paper. The ones dealing with UBC mostly reported 86% condition of pack as soiled and 14% reported of pack being clean and ready for sale.

Upon asking the fate of UBC stakeholders mentioned 85% dealers sell it along with mixed paper, and 14% sell directly to the recyclers. Major discouragement of not collecting UBCs was no buyers in market and time wastage in collection of UBC as it requires extra effort. They suggested that good price can definitely drive the UBCs recycling chain in Chandigarh.

Bale analysis done at dealers have been depicted in

Table 12

Table 12: Bale analysis of Chandigarh

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large scale scrap dealer	134	0.6162	0.460%
	300	0.3241	0.108%
	350	0.2652	0.076%
	200	0.4339	0.217%
	190	0.2252	0.119%
	230	0.3115	0.135%
	280	0.3818	0.136%
Total	**1684**	**2.5579**	**0.152%**
Small scale scrap dealer	-	-	-
	87	0	0.000%
	100	0.303	0.303%
	160	0.267	0.167%
	150	0.198	0.132%

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
	100	0.204	0.204%
	98	0.198	0.202%
	100	0.145	0.145%
	120	0	0.000%
	96	0.206	0.215%
	90	0	0.000%
	130	0.169	0.130%
	103	0.162	0.157%
	95	0.085	0.089%
Total	**1429**	**1.937**	**0.136%**

Dumpsite analysis

Dumpsite analysis was done at Nagar nigam dumpsite to cover three vehicles bringing in 1 ton of the waste per truck per trip, from different locations of Chandi garh and targeting commercial, institutional and residential areas. The dumpsite analysis done at site have been given in Table 13

Table 13: Dumpsite analysis of Chandigarh

Truck details	Area and route covered	Truck load(Kg)	Paper load(Kg)	UBC load(Kg)	Comments
CH 01GA 3907	Sector 45, Nagar Nigam CHD (Dumpsite)	1240	10.9	0.08	Takes 6-7 trips per week
CH 01GA 4176	Sector 32, Nagar Nigam CHD (Dumpsite	920	9.6	0.024	Takes 5-6 trips per week
CH 01GA 3085	Sector 43, Dhanas, Nagar Nigam CHD	970	9.1	0.048	Takes 7-8 trips per week
Total		3130	29.6 (0.94%)	0.152 (0.005%)	

4.5 Chennai

Waste generators

About 20 waste generators were interviewed in Chennai which generated about 100 kg – 17,000 kgs of waste every month. About 80% of waste generators were from market area and 20% waste generators were from institutional area.. The amount of UBCs generated were reported to be in range of 15 kg– 72 kgs per month, However these are estimates as no one was segregating UBC at their premises.

Mostly waste was not segregated & collected by interviewed population and was taken away by Chennai municipal body with mix paper and other waste. Waste generators also mentioned that they sometimes give their waste to rag pickers or burn their waste when nobody comes for collection.

Figure 17: Waste generator being surveyed

When asked for reasons of not segregating UBCs at their premises about 75% informed that no one buys UBC and 25% informed that there is no incentive on UBC collection. Although, it was also highlighted that all of the waste except the recyclables (plastics, cardboard, paper and metal) were taken away by the corporation only.

The price of selling UBCs was informed as only about INR 2/kg – 3/kg. Mixed waste paper value was reported as about INR 3 –7 / kg. Cardboard value was reported as INR 6 – 8 /kg. Some reported that UBC's are not sold separately due to its low price & quantity and hence, gets dumped with MSW.

The generators mentioned UBC being disposed/mixed with municipal solid waste (MSW) or sometimes thrown to dustbins.

On being asked about the reason for not segregating UBCs they highlighted:

1. Lack of awareness on UBC and no segregation & collection.
2. No incentives on UBC collection.

Good incentives for collected UBCs, proper policies in place and awareness have been indicated as the only motivation which can aid UBC segregation and further collection for recyclability by most of the waste generators.

Waste collectors

About 15 waste collectors surveyed, out of which there were 05 rag pickers and 10 door to door waste collectors. The waste comes from residential and commercial areas to collectors, all type of dry waste including plastics, papers, glass and metal collected for recycling except UBCs. Waste collectors mentioned UBCs alone gets rejected at both small scale scrap and large scale scrap dealer.

The collectors dealing in UBC m entioned there was UBC collection happening in the city but only with the mix paper and not separately. About 100% respondents reported collecting UBC.

The average UBC collected by each of the dealers varied from 5kg/month – 10 kg/month. The collectors dealing in UBC's estimated mixed paper waste of about 80 kg/month -150 kg/ month. The selling price of UBC's has been indicated as INR 2/kg whereas price of mixed paper varied from INR 4 - 5/kg.

Figure 18: Waste collector being surveyed

The mixed waste were procured from Households by 100%, Street by 100%, Waste bins by 100%, Markets by 40% and others by 40% of the waste collectors . Although, stakeholders mentioned UBCs were reported to be coming from upper and middle income localities by about 100%. However, interviewed stakeholders reported condition of UBCs packs reaching them with 100% containing juice in it.

Upon asking about the fate of UBC's, stakeholders informed that they sell it to the recyclers and some stakeholders didn't had an idea about its recycling potential.

The major discouragement for not collecting separately UBC is no buyers & market, no money provided on UBC segregation & collection, sometimes UBC found mixed with wet waste this creates odour as well as infestation to mosquitoes and also its very low quantity.

Respondents suggested ; awareness, buyer in market and good incentives for UBCs can motivate in collecting more UBCs for recycling. This would require a proper system to be in place for waste collection.

Small scale waste dealers

About 15 small scale dealers were interviewed in different areas of Chennai, each having a turnover of about 300 kg to 1500 kgs of mix waste paper every month. The stakeholders covered residential and commercial areas. A large number of small scale dealers and Rag picker (10 – 55) were supplying materials to each of these waste dealers.

Figure 19: Waste dealer being surveyed

The stakeholders mentioned all dealers collected UBCs. The average UBC collected by each of these dealers varied from 1kg/ month to 100kg/month. The purchase price of UBC has been indicated as INR 2/kg - 3/kg whereas price of mixed paper

varied from INR 3/kg-4/kg. However, the selling price of UBCs to larger dealers was INR 3 - 4 per kg and mixed paper varied from INR 7- 8 per kg.

However, dealers reported UBCs come to them via rag pickers, door to door collectors, households, kabadi's along with mixed paper. about 93% dealers reported that there is leftover juice content with UBCs and 7% reported the condition of UBCs as soiled .

Upon asking the fate of UBC stakeholders mentioned a large no. of dealers sell it along with mixed paper. Major discouragement is no proper market & buyers, no awareness on collection of UBC and most often pack found mixed with wet waste which is why it becomes difficult to store it. The collection of UBC can be improved by good money for collection & segregation and proper awareness.

Large scale scrap waste dealers

About 7 Large scale scrap dealers were interviewed, each having a turnover of about 45000 kg –75000 kg of waste paper every month. Stakeholders covered residential and commercial areas of city. A large number of small scale dealers and rag pickers about 45 – 65 were supplying materials to each of these waste dealers.

All large scale dealers collected UBC and accepted it along with mix waste paper.The average UBC collected by each of these dealers varied from 30 kg/ month to 120kg/month. Purchase price of UBC was indicated in range of INR 2/kg – 3/kg and a selling price from INR 5/kg - 7 /kg. Purchase price of mixed paper was indicated in range of INR 4/kg – 5/kg and a selling price from INR 10 - 11/kg.

However, the stakeholders reported UBCs come to them via rag pickers, door to door collectors, households, kabadi's along with mixed paper. The once dealing with UBC mostly reported 100% packs containing leftover juice in it.

Upon asking the fate of UBC stakeholders mentioned 100% dealers sell it along with mixed paper. Major discouragement of not collecting UBCs is no buyers in market and storage problem.

Dealers suggested that a good price and developed market with enough buyers can definitely drive the UBCs recycling chain in Chennai.

Bale analysis done at dealers have been depicted in Table 14

Table 14: Bale analysis of Chennai

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large scale scrap dealer	4.7	0.92	19.574%
	6.4	1	15.625%
	-	-	-
	5.2	1.7	32.692%
	-	-	-
	396	4	1.010%
	4.5	1.8	40.000%
Total	**416.8**	**9.42**	**2.260%**
Small scale scrap dealer	50	0.3	0.600%
	30	0.1	0.333%

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
	30	0.6	2.000%
	50	0.5	1.000%
	50	0.7	1.400%
	50	0.8	1.600%
	40	0.2	0.500%
	40	0	0.000%
	25	0	0.000%
	35	0.2	0.571%
	43	0.5	1.163%
	50	0.4	0.800%
	50	0.5	1.000%
	25	0	0.000%
	23	0.3	1.304%
Total	**591**	**5.1**	**0.863%**

Dumpsite analysis

Dumpsite analysis was done at Perunguddi dumpsite to cover three vehicles bringing in waste from different locations of Chennai . Around 2500-4500 kg of waste per truck per trip was collected, as reported by the stakeholders. The dumpsite analysis have been depicted in table below.

Figure 20: Dumpsite snap at Chennai

Table 15: Dumpsite analysis of Chennai

Truck details	Area and route covered	Total Waste Load (kgs)	Total paper Load (Kgs)	Total UBC load (Kgs	Comments
TN 04AD 2877	Zone 15, Preungudi	247.05	2.57	0.91	Takes 2-3 trips per week
TN 22CF 4893	Zone 14, Perungudi	253.99	4.97	0.64	Takes 2-3 trips per week
TN 47AV 6296	Zone 13, Perungudi	236.06	1.38	0.96	Takes 4-5 trips per week
Percentage				0.34	

4.6 Delhi

Waste generators

About eleven waste generators were interviewed, spread around the city to understand the perception on UBCs, waste generation behaviour and economics. The sample included market area as about 36% institutional sector around 45% including some hotels. The quantity of waste generated was around 30 – 1800 kgs/month. And average dry waste including cartons was found to be 60 – 700 kgs/month. The quantity of UBCs generated, as interviewed, came out to be 30 – 300 kgs/month.

Figure 21: Waste dealer Interviewed

About 90% of the waste generators reported of not segregating waste. And even 90% of UBCs were not being segregated separately, reason being there was no buyer and incentive for UBCs or in one of the case the SDMC took the waste to dustbin. Around 72% of the UBCs were getting disposed with municipal solid waste, as informed by the respondents. Per kg price of the recyclables was varying such as the mixed paper was INR 1 – 10/kg, cardboard (INR 10), plastic (INR 5 – 7/kg) and white sheet (INR 7 kg).

The UBCs generated was either dumped into dustbins or was disposed with municipal solid waste.

When waste generators were asked the reason for not collecting recyclables and UBC for recycling they responded on following points:

1. Time
2. Less awareness
3. Less quantity
4. No space

When the generators were asked on possible motivations that can enable them to segregate UBCs for recycling they responded as follows:

1. More price and incentive
2. More number of buyers

Waste collectors

About 17 waste collectors were interviewed during the survey in Delhi and these included a majority of Ragpickers (52%), door to door collectors (17%) as well as both (29%) covering Residential , Commercial areas spread across Delhi. The collectors deal with paper (94%), plastics (100%), metals (100%) as well as glass (88%). About 82% of the collectors were collecting and segregating UBCs along with municipal solid waste collection and rest of the ragpickers denied of taking UBCs for recycling as there was no incentive in UBC collection and the market for UBCs was also missing.

The average UBC collected per month ranged from 20 – 200 kg whereas the average mixed waste paper collected including UBC ranged from 0.5 – 5 tonnes/month. Per kg selling price of UBC and mixed paper was informed to be INR 2 – 7/kg and INR 1.50 – 20/kg, respectively. The source of procurement of mixed paper included households , streets , waste bins , markets, etc. It was responded that the upper and middle class localities contributed to around 35% of the UBCs, 23% from lower income localities and 23% from the commercial establishments.

Around 35% of the UBCs collected did not contain leftover juice, 41% were soiled and majority (76%) of the UBCs were clean and ready for sale..

Small scale waste dealers

Fourteen of the small scale dealers were surveyed spread across the Delhi and these were dealing with residential (42%), commercial (57%), institutional (7%) and other areas such as railway stations. The number of ragpickers/kabaddi's contributing to each of these dealers was around 04 - 25. The average mixed waste paper handled by these dealers was around 500 – 30,000 kg/month. Around 85% of dealers were collecting UBCsout of which, 64% was being sold with mixed paper whereas 21% was being sold separately. And about 28% of the dealers were not responsible for any UBCs collection.

Figure 22: large scale dealer interviewed

UBC collected per month was recorded in the range of 100 – 2,000 kgs. Per kg purchasing price of UBC and mixed paper, as informed by the dealers, were between INR 3 – 6 and INR 2.5 – 9.5, respectively. The selling price of UBC and mixed paper were recorded as INR 3 – 9 and INR 5 – 12, respectively. The source of procurement of UBCs included households (21%), ragpicker (64%), door to door collectors (35%), intermediate kabaddis (28%) and some hotels, malls and markets.

Around 35% of the UBCs collected did not contain any leftover juice, 28% were soiled and the majority (70%) of the UBCs were clean and ready for sale. It was also found that about 42% of the waste dealers did not engage in treating or processing the UBC before selling. Around 57% of the UBC was sold to a larger dealer and 5% was sold with mixed paper or plastic or even given to a recycler.

Discouraging points indicated by these dealers are as follows:

1. Less or no value for UBCs.
2. Space constraints
3. Lack of buyers.
4. Less quantity and weight of the UBCs.

When asked on how the collection of UBC can be improved, the dealers suggested the following:

1. Increase in price
2. Increase in quantity
3. High incentive

Large scale waste dealers

Seven large scale dealers were surveyed during the study, dealing in residential commercial and institutional areas. About 15 – 400 kabaddi's/ragpickers were contributing to each of these dealers. The total average mixed paper turnover for a month ranged from 15,000 – 300,000 kgs per month. Around all of the dealers collected the UBCs, out of which 42% segregated it with the mixed paper while about 57% were collecting separately.

UBC collected per month was recorded in the range of 300- 150000kgs. Per kg purchase price of UBCs and mixed paper was informed to be between INR 3 – 12 and INR 3 – 12.5, respectively. The selling price of UBCs and mixed paper was reported to be between INR 7 – 15 and INR 7 – 15, respectively. The source of procurement of UBCs included households (28%), ragpickers (28%), door to door collectors (28%) and intermediate kabaddis (28%). majority (85%) of dealers reported condition of UBCs as clean and ready for sale, however sometimes these also were reported to contain leftover juice and were soiled.

When asked the dealers if they treated or processed the UBC before selling, the majority (71%) said that they did not process the UBCs before selling while in one case, the UBCs were highly wet and then they were dried in the sunlight. About 42% of the UBCs collected were sold to a larger dealer and 42% were sold to a recycler.

On asking the discouragements for undertaking UBC recycling the following points were indicated:

1. Less weight
2. No profit
3. Low price
4. Space constraints
5. Lack of policies for company.

The suggested improvements by large scale dealers were as follows:

1. .UBCs should be in large quantity.
2. Incentive should be high.
3. Capacity building.
4. Better policies and awareness.
5. Beverage carton manufacturer should take strong steps on ground

The bale analysis done at the dealers have been given in Table 16

Table 16: Bale analysis of Delhi

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large scale scrap dealer	65	0.38	0.585%
	-	-	-
	54	0.602	1.115%
	120	2	1.667%
	104.66	0.34	0.325%
	6	3	50.000%
	-	-	-
Total	**349.66**	**6.322**	**1.808%**
Small scale scrap dealer	112	0.7	0.625%
	123	14	11.382%

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
	10	0.909	9.090%
	40	-	-
	100	7.5	7.500%
	100	-	-
	-	-	-
	-	-	-
	-	-	-
	115	0.7	0.609%
	25	0	0.000%
	106.9	2.5	2.339%
	80	0.06	0.075%
	-	-	-
Total	**811.9**	**26.369**	**3.248%**

Dumpsite analysis

Dumpsite analysis was conducted at Ghazipur dumpsite in Delhi to cover three vehicles that brought around 4-6 tonnes of waste per truck per trip from residential, institutional and commercial areas. The details have been given in the Table 17.

Figure 23: dumpsite analysis done at Ghazipur

Table 17: Dumpsite analysis of Delhi

Truck details	Area and route covered	Total Load (kgs)	Total Paper Load (kgs)	Total UBCs Load (Kgs)	Comments
DL 1GC 2947	Gokulpuri Dhalao, dumpsite Ghazipur	239	4	-	Takes 4 trip per day
DL 1GC6063	Shahdra Dhalao, dumpsite Ghazipur	247	4.5	0.072	Takes 5 trip per day

DL 1GC 2956	Seelampur dhalao, dumpsite Ghazipur	261	2	0.125	Takes 4 trip per day

4.7 Faridabad

Waste generators

About 10 waste generators were interviewed in Faridabad which generated about 150 kg – 200 kgs of waste every month. About 70% of waste generators were from market area and 30% waste generators from institutional area. On being asked it was found that only about 20% generators segregated waste into dry and wet while 80% reported of not segregating their waste. The amount of dry waste generated was about 1 kg – 1200 kgs per month.

The amount of UBCs generated were reported to be in range of 2 kg– 150 kgs per month, However these are estimates as no one was segregating UBC at their premises. When asked for reasons of not segregating UBCs at their premises about 70% informed that no one buys UBC, 40% informed there is no incentive on UBC collection. Others stakeholders highlighted that there is no awareness on UBC collection & segregation and also, it will be wastage of time.

The price of mixed paper has been indicated as INR 4/kg - 9/kg whereas price of cardboard has been indicated as INR 7 - 10/kg.

The reason reported for not segregating UBCs were

1. No money provided on UBC collection,
2. No awareness on UBC among the stakeholders, and
3. Time wastage in searching UBC packs as the quantity found is very less.

Waste generators also suggested that good rates can encourage for collecting UBCs, buyers in market and more awareness have been indicated as the motivation which can aid UBC segregation and further collection for recyclability by most of the waste generators.

Waste collectors

About 19 waste collectors were surveyed, which included both Rag pickers and door to door waste collectors. The waste comes from residential and commercial areas to collectors, all type of dry waste including plastics, papers, glass and metal were collected for recycling. About 68% waste collectors reported UBCs getting collected, in which they mentioned UBC collected mixed with paper/cardboard. Whereas some collectors reported UBCs not getting collected, as there is no buyer and market for UBC collection.

Figure 24: Interaction with waste collector

The average UBC collected by each of the collector ranged to about 30 kg/month. The collectors dealing in UBC estimated mixed paper waste of about 10 kg/month -1200 kg/ month. The selling price of UBC has been indicated as INR 1/kg - 10/kg whereas price of mixed paper varied from INR 2 - 7/kg.

The mixed waste was procured from households by 63%, street by 26%, waste bins by 84%, markets by 26%. Stakeholders mentioned UBCs were reported to be coming from upper and middle income localities. The interviewed stakeholders reported condition of UBCs packs reaching them with 31% not containing juice in it, 47% soiled packs and 84% clean and ready for sale.

On being asked the fate of UBC stakeholders mentioned they either sell it with cardboard to dealer or s sometimes with mixed waste.

The major discouragement for not collecting UBC separately wasless buyers,no space and no money on UBC segregation & collection. The collection & recycling of UBCs may improve if good price is provided for collection & segregation, and good number of buyers is present in market.

Small scale waste dealers

About 14 small scale dealers were interviewed in different areas of Faridabad, each having a turnaround of about 500 kg to 18000 kgs of mix waste paper every month. The stakeholders covered residential, institutional and commercial areas. A large number of small scale dealers and Rag picker about 1 – 16 were supplying materials to each of these waste dealers.

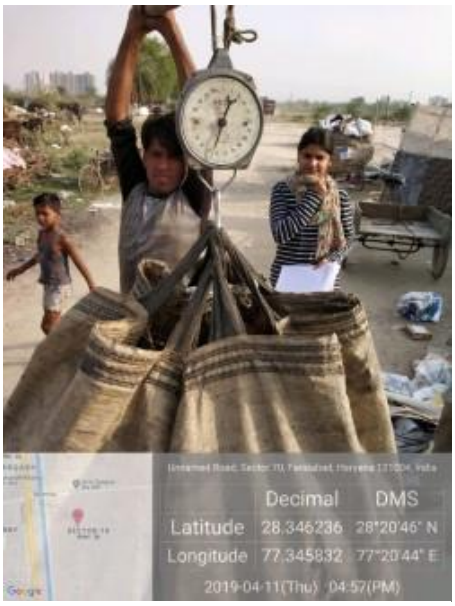

Figure 25: Analysis at dealer level

About 100% of stakeholders were collecting UBC along with mixed paper. The average UBC collected by each of these dealers varied from 7kg/ month to 1500kg/month. The selling price of UBCs to larger dealers was INR 2 per kg to 5 per kg and mixed paper varied from INR 3 per kg to 7 per kg.

However, dealers reported UBCs come to them via Households (64%), rag pickers (71%), door to door collectors (7%), intermediate kabadi's (14%) and others including hotels, shopping malls, markets and dustbin. The once dealing with UBC reported its condition with a mixed reaction and about 57% reported UBCs of not containing leftover juice, about 78% reported UBCs as soiled, and about 92% reported UBCs as clean and ready for sale.

Upon asking the fate of UBC stakeholders mentioned that about 93% sell it to large dealers and 7% sell it along with mix paper.

Major discouragement for dealing in UBCs were reported as no or less incentive for UBC, no proper market & buyers, quantity of UBC found being less, less space and no awareness on UBC collection and segregation. It was also suggested that the collection of UBC can be improved by providing good money and providing awareness on UBC collection & segregation.

Large scales scrap waste dealers

About 08 large scale scrap dealers were interviewed, each having a turnover of about 10000 kg –1000000 kg of mixed waste paper every month. The stakeholders covered residential, institutional and commercial areas of city. A large number of small scale dealers and rag pickers about 08 – 200 were supplying materials to each of these waste dealers.

About 75% large scale dealers reported of collecting UBC, out of this about one third were taking UBCs separately and rest collected it with mixed paper. The average UBC collected by each of these dealers varied from 800 kg/ month to 7000kg/month. Purchase price of UBC was indicated in range of INR 2/kg – 6/kg and a selling price of UBC varied from INR 3 - 8 /kg. Purchase price of mixed paper was indicated in range of INR 2/kg – 9/kg and a selling price of paper varied from INR 4 – 11/kg.

However, the stakeholders reported UBCs come to them via households (50%), ragpicker (62%), intermediate kabadi's (75%) and others including hotel, airport, malls, dustbins and factories. The once dealing with UBC reported its condition with about 50% not containing

leftover juice, 50% found as sometimes soiled and 87% did mentioned that these are clean and ready for sale.

Upon asking the fate of UBC large scale dealers mentioned that they sell it further to larger dealer and recyclers.

Major discouragement of not collecting UBCs was lack of awareness, low price of UBCs, no space for storage and no many buyers in market. Further Large scale dealers suggested that improved market value, good price and buyers can definitely drive the UBCs recycling chain in Faridabad.

Table 18: Waste analysed at Faridabad waste dealers

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large scale scrap dealer	-	-	
	-	-	
	-	-	
	75	0.363	0.484%
	35	0.242	0.691%
	-	-	
	27.5	0.121	0.44%
Total	**137.5**	**0.484**	**0.352%**
Small scale scrap dealer	97	0.33	0.340%
	28	0.12	0.428%
	35	0.11	0.314%
	35	0.21	0.6%
	55	5	9.09%
	200	11	5.5%
	-	-	
	-	-	
	-	-	
	50	0.34	0.68%
	39	0.118	0.302%
	41	0.22	0.536%
	107	0.368	0.344%
	-	-	
Total	**687**	**17.816**	**2.593%**

Dumpsite analysis

Dumpsite analysis was done at Transfer Station of Balabgarh in Faridabad as waste directly goes to Bhandwari landfill site from this point and no further recovery is done at Bhandwari. The analysis covered three vehicles, bringing in waste from residential areas, commercial area and institutional area. The waste collected per truck per trip was around 450 kg to 1000 kgs. The dumpsite analysis is given in

Table 19

Table 19: Dumpsite analysis of Faridabad

Truck details	Area and route covered	Total Waste Load (kgs)	Total paper load (kgs)	Total UBC load (kgs)	Comments
HR 32X 1411	Ward no.40 T.S. Ballabgarh	200	07	0.262	Takes 4 trips per day
HR 32X 1411	Ward no.38 T.S. Ballabgarh	195	6	0.161	Takes 3-4 trips per day
HR 32X 1411	Ward no.37 T.S. Ballabgarh	213	8	0.298	Takes 3 trips per day
Percentage			3.45	0.118	

4.8 Guwahati

Waste Generator

Ten waste generators were surveyed spread across the Guwahati city to understand their perception on UBCs recyclability. 20% of the stakeholders surveyed were from market and rest 80% were institutions. The waste generated from their premises was reported to be in range of 50-5200 kgs/month. About 50% of the waste generators reported segregating waste into dry and wet at source itself for further collection by municipal corporation. One of the waste generator even reported of sending the dry waste to a nearby waste dealer in charity.

None of the waste generator was segregating UBCs for recycling, as there was:

1. Neither a system in place for segregation
2. All waste generated lands up in Municipal bins to be further collected by Guwahati Municipal Corporation (GMC).
3. The quantity of UBCs generated was low and there was no scope to segregate UBCs for recycling.

None of the waste generators reported to store any recyclables like paper or cardboard for further selling to waste dealers. The UBCs generated from their premises has been reported disposed along with other waste to municipal bins only.

When waste generators were asked the reason for not collecting recyclables and UBC for recycling they responded on following points:

1. There is lack of awareness among our staff members.
2. We do not have any system in place for segregated waste collection and disposal

3. There are no guidelines issue by corporation for separate UBC segregation and as such it is dumped with other waste.

When the generators were asked on possible motivations that can enable them to segregate UBCs for recycling they responded as follows:

1. Awareness generation among generators and collectors
2. Proper guidelines by GMC for segregating and storing UBCs for recycling.
3. A proper system in place for segregation and GMC's intimation of such segregation system.
4. A good potential market for selling the segregated UBCs

Waste Collectors

About 20 waste collectors were interviewed during the survey in Guwahati and these included a mix of door to door waste collectors (55%) and ragpickers (45%) covering residential, commercial and institutional areas and spread across the city of Guwahati.

Figure 26: Snap of waste collector interviewed during survey

The collectors deal with paper (100%), plastics (100%), metals (75%) as well as glass (90%). All door to door collectors were collecting UBCs along with municipal solid waste collection and 5/9 ragpickers denied of taking UBCs for recycling as there was no incentive in UBC collection and the market for UBCs was also missing. There was no separate collection of UBCs reported by any of the surveyed waste collector in Guwahati.

Upon asking the average UBCs they collect with other waste the collectors reported per month collection in range of 2.0 – 450 kg, with an average of 47kg/month. Average mixed paper was reported to be collected as 17-5600 kgs every month with an average of 560kg. Mixed paper was reported to be sold at a price range of INR 2 – 5 per kg. The mixed paper was collected from households, streets, waste bins, markets as well as dumpsite by these interviewed waste collectors.

The source of major UBC generation was reported as from upper and middle income groups (55%), low income groups (40%) and commercial and business establishments (15%). The condition of UBCs was reported by most of the waste collectors as being soiled as this gets mixed with other waste streams.

It was also informed that the earlier buyers of UBCs have not stopped taking it as paper mills started rejecting the UBC contents. When asked on the other reasons that discourages them to segregate the following replies were obtained.

1. Lack of awareness and markets of UBCs in Guwahati.
2. Low rates of UBCs offered.
3. Lack of proper system for segregation and recycling among stakeholders

4. No system of on source collection of UBCs as once mixed UBCs become wet and unacceptable.

Waste collectors response of the ways by which collection can be improved were as follows:

1. Good market and at source collection can help.
2. Separate bins for UBCs collection can help
3. Along with proper system, awareness is also required.
4. Good number of buyers of UBCs can help as today there are only very limited buyers that give a low price.

On the motivational front waste generators response was that; awareness and a good market; guidelines by municipal corporation for collecting recyclables, separate bin collection, good price, government initiative to start recycling and more number of buyers can really motivate waste collectors to start collecting UBCs for recycling. It was also informed that due to Polyal content in UBC the paper mills have started objecting UBCs with mixed paper at Guwahati.

Small scale waste dealer:

Fourteen of the small scale dealers were surveyed spread across the city of Guwahati and these were dealing with residential, commercial and institutional areas. The number of ragpickers/kabadi's contributing these were around 4-20. The average mixed waste paper handled by these dealers was around 2000 kg/month. Surprisingly, unlike the 2015 study there was no one buying UBCs in Guwahati. The mixed paper buying prices were also indicated low and around 3-8/kg (average 5.43/kg), the mixed paper selling prices were indicated in range of 5-12/kg (average 7.714/kg). Respondents informed that the UBC market crashed two years back when paper mills stopped accepting UBC due to issues with PolyAl.

Figure 27: Snap of bale analysis done during survey.

Other discouraging points indicated by these dealers are as follows:

1. There is no buyer of UBC
2. There is no awareness among stakeholders that UBC is recyclable and no proper market for UBC recycling.
3. Most of UBCs are soiled and wet
4. PolyAl and leftover juice content discourages to deal in UBC.

When asked on how the collection of UBC can be improved, the dealers suggested following:

7. There should be a proper market established for UBC
8. Paper mills should be informed to accept UBCs
9. There should be proper market established for UBC collection and recycling

The mixed paper bales analysed did not show any UBC contents as dealers were not accepting UBCs due to further rejection by paper mills.

Large scale scrap dealers:

Seven large scale dealers were surveyed during the study, dealing in residential commercial and institutional areas. About 12-215 kabadi's/ragpickers were contributing to these dealers. The average mixed paper turnover for a month was about 248000 Kgs (ranging from 12000-1350000 Tonnes per month).

None of the large scale dealer was dealing in UBCs as there was no market/buyer available in Guwahati. Some of the dealers reported that UBCs are found in wet condition and are even not considered recyclable by them. Some of the dealers also reported that the recyclers indicate difficulty in recycling UBCs, which discourages them to buy.

The purchase price of mixed paper was indicated as 4-8 per kg and cardboard as 14-18 per kg, whereas the selling prices were 7-11/kg and 15-20 per kg respectively.

On asking the discouragements for undertaking UBC recycling the following points were indicated:

1. UBCs are difficult to recycle in mills.
2. There is no system in place
3. PolyAl is not recyclable and is an issue.
4. There is no Buyer in Guwahati for UBC.

The suggested improvements by large scale dealers were as follows:

1. UBCs should be technically improved to make them easily recyclable.
2. The paper mills should upgrade their systems to accept UBCs
3. There should be a good market in Guwahati for UBCs.

Upon analysis of mixed paper bales no UBCs were found.

The bale analysis done at dealers are depicted in Table 20

Table 20: Bale analysis of Guwahati

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large scale scrap dealer	78.95	0	0.00%
	76.1	0	0.00%
	75	0	0.00%
	88.15	0	0.00%
	102	0	0.00%
	84.25	0	0.00%
	132.8	0	0.00%
Total	**637.25**	**0**	**0.00%**
Small scale scrap dealer	91	0	0.00%

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
	67	0	0.00%
	68	0	0.00%
	56	0	0.00%
	143	0	0.00%
	58	0	0.00%
	-	-	-
	74	0	0.00%
	58.5	0	0.00%
	75	0	0.00%
	57	0	0.00%
	93	0	0.00%
	89.26	0	0.00%
	116	0	0.00%
Total	**1045.76**	**0**	**0.00%**

Dumpsite analysis

On August 04, 2019 TERI and SRG Consultants went on the dumpsite named Boragaon in Guwahati whereon three vehicles coming from Residential, commercial and institutional areas were analysed. The findings of the analysis suggest that about 1.255 percent of waste is UBC content, Indicating a high percentage of UBCs reaching dumpsite in Guwahati.

Figure 28: Snap of dump site taken during survey

Dumpsite analysis have been given in table below

Table 21: Dumpsite analysis of Guwahati

Truck details	Area and route covered	Waste Analysed (in kgs)	UBCs found (kgs)	Comments
AS01 LC1338	Maligaon, Kamkhagat, jadar, saroli	51.01	0.85	Takes 3 trips per day
AS01 GC3207	Beltala, Ganesjuri, Dispur Rajdhani	58.65	0.53	Takes 3 trips per day
JH 05 A 3077	Boragaon	44.09	0.55	Takes 3-4 trips per day
Percentage			1.25	

4.9 Hyderabad

Waste generators

About 10 waste generators were interviewed in Hyderabad which generated about 60 kg – 1700 kgs of waste every month. About 70% of waste generators were from market area and 30% waste generators from institutional area. On being asked it was found that about 17% generators segregated their waste into dry and wet while 83% reported of not segregating waste. The amount of dry waste generated was in range of about 5 kg – 1100 kg per month.

The amount of UBCs generated were reported to be in range of 0.5 kg– 30 kgs per month, However these are estimates as no one was segregating UBC at their premises. When asked for reasons of not segregating UBCs at their premises about 60% informed there is no incentive on UBC collection and others mentioned that they sell it with mixed paper.

Figure 29: Snap of waste collector being intervened during survey.

The price of UBC has been indicated as INR 2-3/kg. The price of mixed paper has been indicated as INR 2/kg - 12/kg, price of cardboard has been indicated as INR 2- 16/kg and price of dry waste has been indicated as INR 1/kg - 4/kg. On being asked about the fate of UBC's, stakeholders informed that it goes along with mixed waste.

The reason for not segregating UBCs is no money provided on UBC collection, and less quantity of UBC found.

Good rates would encourage for collecting UBCs have been indicated as the only motivation which can aid UBC segregation and further collection for recyclability by most of the waste generators.

Waste collectors

About 18 waste collectors surveyed, which included door to door waste collectors only. The waste comes from residential, institutional and commercial areas to collectors, all type of dry waste including plastics, papers, glass and metal were collected for recycling. About 44% of waste collectors reported of collecting UBCs and 55% were not collecting UBCs. The stakeholder mentioned about 5% collect UBC separately and 83% collecting UBC mixed with paper/cardboard. The reasons for not collecting UBC 77% mentioned as there are no incentives on UBC collection, 44% mentioned no buyer/market for UBC collection and rest mentioned UBC going along with mixed paper.

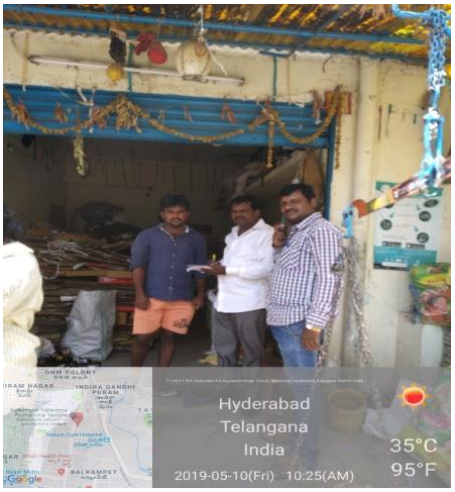

Figure 30: Snap of waste collector interviewed during survey

The average UBC collected by each of the dealers varied from 3 kg/month – 50 kg/month. The collectors dealing in UBC estimated mixed paper waste of about 10 kg/month -6000 kg/ month. The selling price of UBC has been indicated as INR 2/kg - 6/kg whereas price of mixed paper varied from INR 2 - 14/kg.

The mixed waste was procured from Households by 94%, Street by 22%, Waste bins by 22%, Markets by 5% and others by 11% including shopping malls, roads. Stakeholders mentioned UBCs were reported to be coming from 66% upper and middle income localities, 55% lower income localities and 44% commercial and business establishments. The interviewed stakeholders reported condition of UBCs packs reaching them with 38% not containing juice in it, 38% soiled packs and 33% clean and ready for sale, there were mixed reactions by some stakeholders.

On being asked the fate of UBC stakeholders mentioned they sell it with mix paper to dealer at a price of INR 2.

The major discouragement for not collecting UBC separately is less price for collection & segregation UBC and low quantity of UBC found. Waste collectors suggested that the collection & recycling of UBCs may improve if good price is provided for collection & segregation.

Small scale waste dealers

About 15 small scale dealers were interviewed in different areas of Hyderabad, each having a turnover of about 1200 kg to 450000 kgs of mix waste paper every month. The stakeholders covered residential, institutional and commercial areas. A large number of small scale dealers and Rag picker about 2 – 20 were supplying materials to each of these waste dealers.

The stakeholders interviewed mentioned that about 66% of them were collecting UBC along with mixed paper and 33% were not collecting UBC. The average UBC collected by each of these dealers varied from 5 kg/ month to 3000kg/month. The purchase price of UBCs was INR 2 per kg to 7 per kg and purchase price of mixed paper varied from INR 2 per kg to 10 per kg. The selling price of UBCs to larger dealers was INR 2 per kg to 12 per kg and mixed paper varied from INR 6 per kg to 15 per kg.

However, dealers reported UBCs come to them via Households (46%), rag pickers (53%), door to door collectors (60%), intermediate kabadi's (13%) and others (20%) including hotels, shopping malls, markets and dustbin. The once dealing with UBC reported its condition with 13% containing leftover juice, 66% soiled, and 6% clean and ready for sale.

Upon asking the fate of UBC stakeholders mentioned that about 40% sell it to large dealers and 86% sell it along with mix paper.

Major discouragement is no/less incentives for UBC, and no proper market & buyers. The collection of UBC can be improved by providing good money on UBC collection& segregation.

Large scales scrap waste dealers

About 5 Large scale scrap dealers were interviewed, each having a turnaround of about 2000 kg –1000000 kg of mixed waste paper every month. The stakeholders covered residential and institutional areas of city. A large number of small scale dealers and rag pickers about 5 – 25 were supplying materials to each of these waste dealers.

The stakeholders mentioned 80% collected UBC while 20% didn't collected UBC.The average UBC collected by each of these dealers varied from 55 kg/ month to 150000 kg/month. Purchase price of UBC was indicated in range of INR 2/kg – 6/kg and a selling price of UBC varied from INR 3 - 9/kg. Purchase price of mixed paper was indicated in range of INR 5/kg – 11/kg and a selling price of paper varied from INR 6 – 14/kg.

However, the stakeholders reported UBCs come to them via households (40%), ragpicker (40%), door to door collectors (60%), intermediate kabadi's (80%) and others (40%) including hotel, airport, malls, dustbins and factories. The once dealing with UBC reported its condition with about 20% containing leftover juice, 80% found as soiled and 20% clean and ready for sale.

Upon asking the fate of UBC stakeholders mentioned that 20% sell it to large scale dealer, 20% sell it to recyclers and 100% sell along with mixed paper..

Stakeholders reported major discouragement for not collecting UBCs as; no money provided on collecting and no buyer. These stakeholders also suggested that improved market value, good price and more awareness can definitely drive the UBCs recycling chain in Hyderabad.

Bale analysis done at the dealers have been given in Table below

Table 22: Bale analysis of Hyderabad

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large scale scrap dealer	455	27	5.934%
	465	37	7.957%
	545	25	4.587%
	535	45	8.411%
	-	-	-
Total	**2000**	**134**	**6.700%**
Small scale scrap dealer	-	-	-
	-	-	-
	-	-	-
	-	-	-
	-	-	-
	465	41	8.817%
	470	55.5	11.809%
	-	-	-
	465	33	7.097%
	-	-	-
	-	-	-
	170	0	0.000%
	95	3	3.158%
	225	4.5	2.000%
	137	1.08	0.788%
Total	**2027**	**138.08**	**6.812%**

Dumpsite analysis:
Waste coming from Residential and commercial areas was analysed at Amberjeth transfer station and from this transfer station waste goes to disposal site whereby no further recovery of material is done. The analysis of the waste collected and going to be dumped is as given in table below

Figure 31: Snap of dumpsite taken during survey

Table 23: Dumpsite analysis results from Hyderabad

S.No	Area and route covered	Waste Analysed (kgs)	Waste Paper (Kgs)	UBCs (in Kgs)	Comments
1	DD Colony and Ajeet area	11000	4000	50	3-4 trips/day
2	Lower tank bund area, LIC Colony, DBR mill	8500	3200	35	10-12 trips per day
	Percentage			0.436	

4.10 Jammu

Waste generators

About 11 waste generators were interviewed in Jammu which generated about 50 kg – 1500 kgs of waste every month. About 37% of waste generators were from market area and 64% waste generators belong from institutional area. The amount of dry waste generated was about 20 kg – 1530 kgs per month. The amount of UBCs generated were reported to be in range of 6 kg– 150 kgs per month, However these are estimates as no one was segregating waste (wet & dry) and UBC at their premises.

When asked for reasons of not segregating UBCs at their premises about 55% informed that no one buys UBC. Others stakeholders highlighted that there are no rules and regulation in place because of which generators are not willing to segregate & collect. Stakeholders further mentioned this is wastage of both time and manpower.

Upon asking about the fate of UBC's, stakeholders informed that it get disposed with MSW which is collected by Jammu municipal corporation (JMC).

The reason for not segregating UBCs is no money provided on UBC collection, no rules & regulations for waste generators in place, lack of awareness among the stakeholders and time wastage in searching UBC packs as the quantity found is very less.

Good incentives for collected UBCs, proper policies in place and awareness have been indicated as the only motivation which can aid UBC segregation and further collection for recyclability by most of the waste generators.

Waste collectors

About 25 waste collectors surveyed, out of which there are 18 rag pickers and 8 door to door waste collectors. The waste comes from residential and commercial areas to collectors, all type of dry waste including plastics 88%, papers 100%, glass 60% and metal 64% collected for recycling. Waste collectors mentioned that 32% of UBCs was getting collected, out of which about 16% respondents collected UBC separately while 12% respondents collected UBC mixed with paper/cardboard while rest 68% of UBC was not collected by the stakeholders, out of which respondents mentioned about the reasons why UBC was not collected 4% said no one return UBC, 32% said there were no incentives received on UBC collection and 28% said there were no buyer and developed market.

Figure 32: Snap of waste collector interviewed during survey

The average UBC collected by each of the dealers varied from 10kgs /month – 90 kgs/month. The collectors dealing in UBC estimated mixed paper waste of about 100 kg/month -1500 kg/ month. The selling price of UBC has been indicated as INR 1.5/kg - 5/kg whereas price of mixed paper varied from INR 3 - 10/kg.

The mixed waste were procured from Households by 76%, Street by 6%, Waste bins by 56%, Markets by 6% and others by 12%. Although, stakeholders mentioned UBCs were reported to be coming from upper and middle income localities by about 74% and commercial & business establishments by about 26%. However, interviewed stakeholders reported condition of UBCs packs reaching them with 85% already containing juice in it, 7% soiled packs and 7% clean and ready for sale.

The major discouragement for not collecting separately UBC is no buyers & market and no money provided on UBC segregation & collection. Stakeholders reported that the collection & recycling of UBCs may improve if good quantity for collection is found and there are separate bins provided for UBCs as well.

Respondents suggested awareness, buyer in market and good incentives for UBCs can motivate in recycling business to get UBCs collected for recycling. This would require a proper system to be in place for waste collection.

Small scale waste dealers

About 17 small scale dealers were interviewed in different areas of Jammu, each having a turnover of about 400 kg to 7000 kgs of mix waste paper every month. The stakeholders covered residential, institutional and commercial areas. A large number of small scale dealers and Ragpicker about 4 – 50 were supplying materials to each of these waste dealers.

Figure 33: Snap of bale analysis done during survey at dumpsite

The stakeholders mentioned about 47% collecting UBC along with mixed waste while 53% not collecting UBC due to no incentive, buyers and market. The average UBC collected by each of these dealers varied from 10kg/ month to 250kg/month. The purchase price of UBC has been indicated as INR 2/kg to 3.5/kg whereas purchase price of mixed paper varied from INR 4/kg-10/kg. However, the selling price of UBCs to larger dealers was INR 3 per kg to 4.5 per kg and mixed paper varied from INR 5 per kg to 12 per kg.

However, dealers reported UBCs come to them via rag pickers, door to door collectors, households, kabadi's along with mixed paper. The once dealing with UBC mostly reported 47% containing leftover juice.

Upon asking the fate of UBC stakeholders mentioned that about 29% sell it large dealers and 18% sell it along with mix paper others did not reply to this as they were not dealing.

Major discouragement for dealing in UBCs is no incentive, no proper market & no buyers. The dealers suggested that the collection of UBC can be improved by providing good money on collection & segregation of UBCs and also if a developed market system can be created for UBCs.

Large scales scrap waste dealers

About 7 Large scale scrap dealers were interviewed, each having a turnover of about 1200 kg –150000 kg of mixed waste paper every month. Stakeholders covered residential and commercial areas of city. A large number of small scale dealers and rag pickers about 6 – 20 were supplying materials to each of these waste dealers.

The stakeholders reported as: 43% collected UBC along with mixed waste and 57% didn't collect UBC as there is no market for selling UBCs.The average UBC collected by each of these dealers varied from 700 kg/ month to 1000kg/month.

Purchase price of UBC was indicated in range of INR 4/kg – 4.5/kg and a selling price of about INR 5 /kg. Purchase price of mixed paper was indicated in range of INR 6/kg – 12/kg and a selling price from INR 7 – 20 /kg.

However, the stakeholders reported UBCs come to them via kabadi's and others like shops, markets. The once dealing with UBC reported it contained leftover juice in it. Stakeholders mentioned on processing of UBC before sending it to recycler, Out of which 14% were found processing (cleaning UBCs), 29% were not processing it and rest 57% didn't knew about it.

Upon asking the fate of UBC stakeholders mentioned that they sell it to recyclers. Major discouragement of not collecting UBCs is no market value, no buyer and low incentive.

Hence, improved market value, good price and developed market with enough buyers can definitely drive the UBCs recycling chain in Jammu. Bale analysis done at dealers is given inTable 24

Table 24: Bale analysis of Jammu

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large scale scrap dealer	200	0	0.000%
	168.75	0	0.000%
	124	0	0.000%
	-	-	-
	432	12	2.778%
	-	-	-
	456	6	1.316%
Total	**1380.75**	**18**	**1.304%**
Small scale scrap dealer	106	0	0.000%
	-	-	-
	-	-	-
	-	-	-
	102	1.9	1.863%
	-	-	-
	-	-	-
	-	-	-
	-	-	-
	-	-	-
	-	-	-
	-	-	-
	108	0	0.000%
	-	-	-
	-	-	-
	-	-	-
	-	-	-
Total	**316**	**1.9**	**0.601%**

Dumpsite analysis

Dumpsite analysis was done at JMC dumpsite and KJMC dumpsite of Jammu to cover three vehicles bringing in 1-1.5 ton waste from different locations which targeted commercial, institutional and residential areas. The outputs of the analysis are as under table below

Figure 34: Snap of dumpsite taken during survey.

Table 25: Dumpsite analysis of Jammu

Truck details	Area and route covered	Waste Analysed (kgs)	Waste Paper (Kgs	UBCs (in Kgs)	Comments
JK02AB 8033	Tirkufa Nagar, JMC Dumpsite	214	9.5	0.571	Takes 1 trip per day
JK02AQ 4761	Bhagwati nagar, JMC Dumpsite	197	4.1	0.422	Takes 2-4 trip per day
JK02AQ 6375	Janipur main road, banditalab, abshambu road, tokapoda, KJMC dumpsite	188	11.5	0.533	Takes 2 trips per day
percentage			4.190	0.254	

The average Paper has been found as 4.19 percent and UBCs as 0.254 percent only.

4.11Kolkata

Waste Generators

About 20 waste generators were interviewed in Kolkata city which generated somewhere about 800 – 60000 kgs of waste every month. The UBCs generated by generators were reported to be in range of 1kg – 1500 kgs per month, however these were estimates as no one was segregating UBCs at their premises.

Waste was segregated by only 45% of the interviewed population for further collection by municipal body.

When asked for reasons of not segregating UBCs at their premises they informed that in Kolkata no one buys UBCs and there is no incentive for segregating and storing them. About 10% of the respondents also informed that there is no awareness among people about UBCs being recyclable.

Mixed paper was sold at a price of about INR 5 / kg and cardboard at about INR 5-10/kg. Few waste generators also reported selling whole dry waste together at a price of about INR 5/kg.

When asked on what discourages waste generators to segregate UBCs they responded as follows:

1. No awareness of UBCs being recyclable
2. Lack of system for waste segregation and selling
3. No market for UBCs in Kolkata
4. No system for segregated waste collection and lack of awareness about benefits for recycling UBCs

A good market value for collected UBCs have been indicated as the only motivation which can aid UBC segregation and further collection for recyclability by most of the waste generators.

Waste Collectors

There are 11 rag pickers and 09 door to door waste collectors surveyed. These collectors were collecting plastics, papers, glass and even some reported collecting metals for recycling.

About 80% respondents reported collecting UBCs, out of which 25% were collecting UBCs separately and rest with mixed paper. 20% collectors did not foresee any markets for UBC in Kolkata. The collectors dealing in UBC estimated UBC collection in range of 2 – 150 kg UBC per month and mixed paper waste of about 70 - 4500 kgs per month.

The price of selling UBCs was informed as only about INR 2 / kg and some even reported that due to low price UBC gets dumped with MSW. Mixed waste paper value was reported as about INR 2-5 per kg and even one stakeholder reported this as INR 6-12 per kg based on material quality.

Figure 35: Snap of waste collector interviewed during survey

The materials were procured from households by 50%, streets by 60%, waste bins by 40% and markets by 20% surveyed waste collectors. Although UBCs were reported to be coming from upper and middle income localities by about 80% of the stakeholders, 20% reported UBCs being coming from commercial establishments. However, 70% of the interviewed stakeholders reported conditions of UBCs reaching them as soiled, possibly as this is not segregated and mixes with other MSW stream, only 10% stakeholders reported clean and ready for selling UBCs being received.

Upon asking about the fate of UBCs, the stakeholders informed that there are no buyers in market and further no incentive for UBCs to be segregated in Kolkata. Some stakeholders reported that Kolkata Municipal Corporation (KMC) also opposes to segregate and store UBCs with them and they thus dispose with MSW. It was also reported that segregating UBCs is labour intensive and thus becomes unfeasible. Additionally, there is no system in place for getting segregated waste from generators.

Figure 36: Snap of bale analysis done during survey

Respondents suggested that a good price and market for UBCs can motivate various players in recycling business to get UBCs collected for recycling. Although, this will also require a proper system to be in place for waste collection. Further the waste collectors look forward for a better price and regular business of UBCs in order to start collecting them.

Small scale waste dealers

About 19 small scale dealers were interviewed in different areas of Kolkata. These dealers were capturing various residential, commercial, and institutional areas and number of intermediate kabadi's or ragpickers contributing to them ranged from 04 – 20.

The average mixed waste paper collected by each of these dealers varied from 200 kg/month to 35000 kgs /month. Only 26% of the small scale dealers reported of dealing with UBCs and the rest were not dealing with UBCs as they do not see any market/buyer in Kolkata. However, the per month collection of UBCs reported was also less and ranged from 5-24 kgs per month for each of the dealers dealing in UBC. The purchase price of UBC has been indicated as INR 1.5 - 3.0/kg whereas price of mixed paper varied from INR 2 - 6/kg. cardboard was purchased at INR 8 - 11/kg. However, the selling price of UBCs to larger dealers was INR 2.0 - 5.5 per kg (limited buyers, buying with mixed paper only) and mixed paper varied from INR 3-8 per kg. Cardboard was reported to be selling at INR 9 - 13 per kg.

However, these dealers reported that UBCs come to them via door to door collectors, ragpickers, intermediate kabadi's and even from households along with mixed paper. But, the conditions of UBC was reported as mostly soiled due to it getting mixed with other wet waste. Also, unlike the 2015 study, no one reported UBC's getting processed in Kolkata.

Large scale scrap dealers

About 10 number of large scale waste dealers were interviewed, each having a turnover of about 50000 – 210000 kgs of waste paper every month. A large number of small scale waste dealers (4-50#) and ragpickers (5-250#) were supplying materials to each of these waste dealers. Purchase price of mixed paper was indicated in range of INR 2- 7/kg and a selling price from INR 4-9/kg, and purchase price of cardboard as about INR 10-15/kg with a selling price from INR 13-19/kg.

Around 40% of large scale dealers reported dealing with UBC but along with mixed paper. None of the dealer was segregating UBCs as either there was no market for UBCs/the prices

offered for UBCs was very low. The once dealing with UBCs mostly (75%) reported the conditions of pack as soiled. About 25% respondents also reported that there is leftover juice content as well. Unlike 2015 study no one was processing UBCs and Mostly waste dealers informed that they sell mixed paper for recycling to mills.

The only discouragement in dealing with UBCs were

1. low selling price,
2. lack of buyers and
3. Lack of market for UBCs in Kolkata
4. Missing systems for UBC collection

Hence, the dealers informed that a good market wherein a sufficient number of buyers for UBCs, and a good/appropriate price can easily drive the UBC recycling chain in Kolkata.

Bale analysis done at dealers have been given in Table 26

Table 26: Bale analysis of Kolkata

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large scale scrap dealer	240	0	0.000%
	142	0	0.000%
	305	0	0.000%
	778.9	0	0.000%
	95	0.5	0.526%
	337	0	0.000%
	282	0.1	0.035%
	121	0	0.000%
	186.5	0.2	0.107%
	273.06	0.1	0.037%
Total	**2760.46**	**0.9**	**0.033%**
Small scale scrap dealer	119	0	0.000%
	112	0	0.000%
	171.9	0.1	0.058%
	120	0.25	0.208%
	119	0.15	0.126%
	114	0	0.000%
	140	0	0.000%
	160	0	0.000%
	120	0	0.000%
	252	0	0.000%
	164	0	0.000%
	149	0	0.000%
	135	0	0.000%
	136.8	0.6	0.439%
	77	0	0.000%
	223.8	0.15	0.067%

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
	186	0	0.000%
	179	0	0.000%
	107	0	0.000%
Total	**2785.5**	**1.25**	**0.045%**

Dumpsite analysis

Dumpsite analysis was done at dhapa dumping ground covering 3 vehicles bringing in around 6300-8710 kg of waste per trip from residential and commercial areas. The details have been given in the **Error! Reference source not found.**

Figure 37: Snap of dumpsite taken during survey.

Table 27: Dumpsite analysis of Kolkata

Truck details	Area and route covered	Waste Analysed	UBCs found	Comments
WB04 H0344	Garia to Dhapa and Dhapa dumping ground	40	1.9	Take 2-3 trips per day
WB03 D1217	Loreto school street to Dhapa and Dhapa dumping ground	85	1.25	Take 3-4 trips per day
WB03 D1217	Bollugunge, washing dock, dez medical to Dhapa and Dhapa dumping ground	64	0.85	Take 3-4 trips per day
	Percentage		2.11	

The quantity of UBCs found was high as 2.11 percent.

4.12Kurnool

Waste Generator

About 8 waste generators were interviewed in Kurnool which generated about 1 kg - 20 kg of waste every month. The waste generators were from market and institutional area. The amount of dry waste generated was about 1 kg – 8 kgs per month. The amount of UBCs generated were reported to be in range of 2 kg– 8 kgs per month, However these are estimates as no one was segregating UBCs at their premises.

Figure 38: Waste dealers interviewed during survey

Waste was not segregated by interviewed population and was taken away by Kurnool municipal corporation (KMC). The generators mentioned about 87% of respondents not segregating UBCs while 13% of them were segregating UBCs. The generators mentioned about selling UBCs to kabadi mixed with mix paper and also UBCs getting disposed with MSW. The reason why UBCs were not segregated were as there is no/ low incentive on its collection, no buyers in market, low quantity of packs found and no awareness. Waste generators also mentioned that UBCs also goes with MSW.

The price of selling UBCs was reported as about INR 8 per kg. The price of selling mixed waste paper was reported as about INR 9 per kg – 10 per kg. Cardboard value was reported as INR 12 per kg. Dry waste value was reported as INR 10 per kg – 12 per kg.

The generators mentioned UBCs being disposed with municipal solid waste (MSW) and sometimes after discarding UBCs pack generators burn it.

On being asked about the reason for not segregating UBCs stakeholders highlighted low/no incentives provided, less quantum of UBCs generated and zero awareness.

Good incentives for collected UBCs and awareness have been indicated as the motivation which can aid UBC segregation and further collection for recyclability by most of the waste generators.

Waste collector

During the survey, 19 waste collectors were interviewed working across the city, out of which 15 were door to door collectors and rest the rag pickers that worked around residential areas consisting of institutes, office premises (63%), waste bins (89%), malls and market (21%) and streets (84%). They were indulged in collecting waste such as paper, plastic glass and a few of them also collected metal waste. Only 31% of them collected UBCs. Most stakeholders found UBCs in

Figure 39: Waste collectors interviewed

soiled condition and were mixing them with paper/cardboard wastes. However, many of them reported to throw the UBCs as mixed waste at dump sites.

The quantity of UBCs collected was reported to be around 0kg to 6kg per month and the selling price of this was around 04 -05 Rs/kg. The amount of mixed waste paper was 3 kg to 210 kg per month and its selling price was reported as 06 - 15 Rs per kg.

The reasons mentioned by the respondents for not collecting the UBCs were majorly the lack of incentives (89%) and absence of buyer and market (63%).

When asked about the factors that prevent them from dealing with UBCs, the following reasons were mentioned:

1. No buyers
2. There isn't any profit because of the less weight.

They suggested a few ways such as, increase of price and incentives and availability of buyers that can improve the collection and recycling of UBCs and also motivate them to work for UBCs collection.

Small Scale Waste Dealers

Interviewing 14 small scale waste dealers working in the city indicated that the core reason of why they were less involved in dealing with UBCs was because of negligible profit and lack of labour. The rag pickers and kabadi walas (around 2-10 person per dealer) were the major source of waste procurement with the dealers. These collectors covered residential areas, municipality dust bins, commercial establishments, malls, streets, dump yards and hospitals.

It was reported that around 10 kg to 30000kg of mixed paper waste was collected per month. The purchase price of which was found to be around 09 -20 Rs/kg and the selling price was around 10- 20 Rs/kg.

The UBCs, as mentioned by 64% of respondents, was mostly collected along with mixed paper. The rest of the dealers gave the following reasons for not collecting the UBCs:

1. No profit
2. No labour
3. No market or buyer
4. No one brings the packs to them

The amount of UBCs that was collected per month was around 3-15 kgs which was mostly received with left over juices or in soiled conditions. UBCs are purchased and sold (without any processing and along with mixed paper) at a price of around 0-8 Rs/kg.

The key imperatives discouraging waste dealers for dealing in UBCs separately were as follows:

1. No profit
2. Lesser quantity of UBCs to deal with
3. No buyers or market specific for UBCs

The small scale dealers suggested that a good price and a competitive market for UBCs can help start a good recycling for UBCs.

Large Scale waste Dealer:

Eight large scale waste dealers were interviewed who were dealing into residential, commercial and institutional areas in Kurnool. The quantity of mixed waste paper at these dealers ranged from 30-170 tonnes per month and number of small scale dealers/ragpickers contributing to each of these dealers ranges from 10-36.

About 75% of these large scale waste dealers were collecting UBCs with mixed paper and the other half were not dealing in this since there was either no labour or lack of finance to invest in dealing with UBCs.

The purchase price of mixed paper was indicated as INR 10-32/kg and a selling price as 10-17 INR/kg.

When asked on the condition of UBC one half of the stakeholders indicated that UBCs received consisted of leftover juices and the other half said that the cartons were soiled. The UBCs were mostly sold for recycling to larger dealer with mixed waste paper..

When asked on the discouragements for not segregating and selling UBCs the dealers reported following aspects:

Figure 40: Dumpsite analysis undertaken during survey

1. There is no buyer specific to UBCs and hence goes with mixed paper.
2. Segregating UBCs will take time and hence there will be no incentive in UBC business

A good profit in the collection and recycling of UBCs was a major factor that could motivate the dealers to work in this field.

Bale analysis done at the dealers is given inTable 28

Table 28: Bale analysis of Kurnool

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large scale scrap dealer	-	-	-
	-	-	-
	-	-	-
	-	-	-
	-	-	-
	-	-	-
	101	0	0.000%
	-	-	-
Total	**101**	**0**	**0.000%**
Small scale scrap dealer	84	2.5	-
	90	-0	-
	80	-0	-
	85	-0	-
	90	-0	-
	87	2.5	-

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
	84.5	-0	-
	80	2.5	-
	81.5	-0	-
	87	-0	-
	80	-0	-
Total	**929**	**7.5**	**0.807%**

Dumpsite analysis

Dumpsite analysis was done at Kurnool dumpsite. The survey covered one vehicle that brings in around 6000 kg of waste per trip at the site from residential areas in Kurnool. The details have been given in

Table 29: Dumpsite analysis of Kurnool

Truck details	Area and route covered	Waste Analysed (kgs)	Waste paper (kgs)	UBCs (kgs)	Comments
AP21TB4113	Krishna Nagar	399	12.5	0.076	Takes 2 trips per day

4.13 Lucknow

Waste generators:

Waste generators were selected for interview, spread across various parts of Lucknow to understand the behaviour, perception and economics. Out of the 10 selected waste generators only 40% reported of segregating waste into dry and wet at their premises and none of them reported segregating used beverage cartons (UBCs) for selling to waste dealers, the generators reported UBCs getting mixed with municipal solid waste (MSW) and being collected by waste collectors for disposal.

Figure 41: Snap of waste collector interviewed during survey.

Some of the generators reported a bulk waste generators fees of INR 2000-4000 to INR 35000 per month for waste collected from their premises and were least bothered to segregate waste. However, upon asking a reason for not segregating UBCs they highlighted following points

1. Lack of market for UBC: as no one ever came to them asking for UBCs.
2. Lack of awareness among waste generators for UBC being recyclable
3. Segregating UBCs will take time and manpower and there is no incentive for collected UBCs
4. Some even reported, low quantities of UBCs generated makes it non feasible for them to segregate
5. Concerns with permission from state pollution control board to segregate and store UBCs at their premises.

Few generators indicated a selling price of mixed paper as INR 3.04 and cardboard as INR 9.01.

Figure 42: Snap of waste collector interviewed during survey.

Upon asking the waste generators of possible motivations which can enable them to participate in segregating UBCs for recycling, they suggested to have

1. a possible good number of buyers and
2. a good price for UBCs along with an awareness of recyclability of UBCs

Waste Collectors

The waste collectors interviewed covered a mix of rag pickers and door to door waste collectors (70%) and reported to dealing in paper, plastics and glass, two of them also reported of dealing in metal scrap. All of the waste collectors reported collecting UBC with mixed paper or cardboard only and reported no desperate market for UBCs in Lucknow. They were collecting somewhere 02 – 30 kgs of UBC every month and selling them with mixed paper at a price of INR 4-5 per kg with mixed paper. One collectors even reported a very low price of INR 01 per kg for mixed paper, as he was also getting a place to stay, water and electricity from his contractor.

The source of procurement of UBCs have been reported as households, streets, markets and even municipal bins. UBCs were reported of being collected from all income groups in society and mostly (80%) UBCs were reported as clean and ready for sale.

On the fate of UBCs the respondents reported, segregating UBCs has no incentive as there is no separate buyer and it is being sold with mixed coloured paper at a low price presently. There were few discouragements for segregating UBCs like:

1. Low price of UBCs
2. No specific collector for UBCs in Lucknow
3. Low quantity and no specific buyer
4. Lack of awareness of recyclability of UBCs among collectors
5. Requirement of higher manpower to segregate UBCs

There were few suggestions given by collectors to improve segregation and recycling of UBCs by waste collectors, these included:

1. Creation of a good market.
2. A good price for UBC ranging from INR 7-8/kg – INR 10-15/kg.

3. Creation of awareness at waste generator level to keep UBCs separate for selling as this becomes unfeasible to segregate UBCs after collection.
4. Creation of demand in market for UBCs and awareness among collectors and dealers of its recycling potential.

Small Scale Waste Dealers

The system at Lucknow city indicated that here the small scale waste dealers are mostly contractors (*thekedaar*), which provide a space to accommodate family of ragpicker, provide them electricity and water and in return the waste collectors/ragpickers bring in recyclables for him in segregated manner to enable him to sell further to a largescale dealer.

Fourteen small scale dealers were interviewed and assessed, the no of ragpickers/collectors contributing to each of them ranged from 5-25 in number. These dealers were having a turnover of about 1000 – 4000 kgs pf mixed paper every month, with about 50% markets of cardboards and 50% being of mixed paper.

About 86% of the small scale dealers were accepting UBCs with mixed paper and only 14% denied of accepting UBCs. However, none of them were taking UBCs in segregated manner as there was no market for UBCs in particular in Lucknow.

The purchase price of mixed paper has been indicated as INR 2-7/kg and a selling price as INR 4-6.5 /kg and INR 10/kg for cartons. However, the indicated purchase and selling price for UBCs with mixed paper has been indicated as INR 1 – 4 and INR 1.5 – 6.5 respectively. However, there is no separate market for UBC at present.

UBCs are procured from door to door collectors, rag pickers and even directly from hotels, malls and markets along with mixed paper. The conditions of UBC have been reported by about 79% respondents as clean and ready for sale.

The key imperatives discouraging waste dealers for dealing in UBCs separately were as follows:

1. Lesser quantity of UBCs to deal in
2. No buyers specific for UBCs
3. Lack of knowledge among collectors and sellers on recyclability of UBC

The small scale dealers suggested that a good price and a competitive market for UBCs along with more awareness among various stakeholders can help start a good recycling for UBCs. The indicated price by some of the dealers for dealing in UBCs in segregated manner was indicated as INR 20-25/kg. Bale analysis conducted at these dealers have been shown in Table 30.

Large Scale waste Dealer:

Seven number of large scale waste dealers were interviewed. These dealers reported dealing into residential, commercial and institutional areas in Lucknow. The quantity of mixed waste paper at these dealers ranged from 55000kgs – 120000kgs per month and number of small scale dealers/ragpickers contributing to each of these dealer ranges from 8-60 number.

All of these large scale waste dealers were collecting UBCs with mixed paper and no one indicated a separate market for UBCs in Lucknow. The purchase price of mixed paper was indicated as INR 2-4/kg and a selling price as 3-6 INR/kg. However, few dealers indicated a high selling price of good quality mixed paper at INR6-8/kg too.

When asked on the condition of UBC about 71.4% stakeholders indicated that UBCs received were clean and ready for sale. However, some also indicated that UBCs have left over juice contents.

Figure 43: Snap of bales taken during survey

When asked on the discouragements for not segregating and selling UBCs the dealers reported following aspects:

1. There is no buyer specific to UBCs and hence goes with mixed paper.
2. Segregating UBCs will take time and hence there will be no incentive in UBC business
3. There is no awareness of recycling potential for UBCs among stakeholders
4. Low quality of UBCs (turnover), low price and low level of segregation demotivates specific UBC business.
5. Recycling mills in Kashipur (U.K.) taking mixed paper should readily accept UBCs, and a competitive market should exist.

The bale analysis has been summarised in Table 30 below and shows that out of mixed waste paper analysed about 0.543% of UBCs were getting mixed for recycling.

Table 30: Bale Analysis of Lucknow

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large scale scrap dealer	227.25	1.13	0.497%
	181.15	1.14	0.629%
	225.2	3.96	1.758%
	215.3	1.16	0.539%
	219.45	1.34	0.611%
	176.4	1.3	0.737%
	258.25	2.4	0.929%
Total	**1503**	**12.43**	**0.827%**
Small scale scrap dealer	181.85	1	0.550%
	-	-	-
	179.2	0.39	0.218%
	184.75	1.35	0.731%
	255.4	0.95	0.372%
	253.5	0.85	0.335%
	235.4	1.45	0.616%
	224.9	1.25	0.556%
	250.1	1.15	0.460%
	240.7	1	0.415%
	-	-	-

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
	227.65	0.7	0.307%
	237.8	0.8	0.336%
	244.95	2.01	0.821%
Total	**2716.2**	**12.9**	**0.475%**

Dumpsite analysis

Dumpsite analysis was done at Mohan shivri village of Lucknow to cover three vehicles bringing in waste from different locations targeting commercial, institutional and residential areas. The waste collected per truck per trip was fond to be around 4-5tons. The outputs of the analysis are as under table below.

Table 31: Dump site analysis of Lucknow

Truck details	Area and route covered	Waste Analysed (kgs)	Waste paper (kgs)	UBCs (Kgs)	Comments
UP32T9042	Commercial (Raniganj chungi and Mohan Shivri village)	180	1.8	0.04	Takes 3 trips per day
UP32T1098	Residential (Barud Khana)	450	6.4	0.046	Takes 2 trips per day
UP32T4442	Residential, Commercial, Institutional (Lucknow city)	460	7	0.016	Takes 2-3 trip per day
Percentage				0.01	

Lucknow city disposes about 1200 TPD of MSW to this facility, about 7-9% of which is composted presently and rest of collected waste is processed to produce refuse derived fuel (RDF) which goes to Satti Plastics, ACC cement and Ultratech cement. Analysis at dumpsite depicted a UBC content of as low as 0.00936 percent of total MSW and a waste paper content of about 1.394 percent of MSW.

4.14Mumbai

Waste generators

About 11 waste generators were interviewed in Mumbai city which generated about 10 kg – 300 kgs of waste every month. About 100% of waste generators were from market area. On being asked it was found that about 45% generators segregated their waste while 55% reported not segregating the waste.

Figure 44: Snap of waste generator interviewed during survey.

The amount of dry waste generated was about 20 kg – 160 kgs per month and UBC's generated was reported to be in range of 0.08 kg– 30 kgs per month. Stakeholders highlighted that about 18% generators were segregating UBC, in which they mentioned that it gets disposed with MSW while about 46% of them were not segregating at all, when asked reasons of not segregating UBCs at their premises they informed that they put UBC in dustbins and Bombay Municipal Corporation (BMC) further takes away the waste.

The stakeholders mentioned that all the recyclables & UBC was going with BMC as the generators don't deal directly with waste and instead dispose their dry waste in nearby BMC dustbin.

The reason for not segregating UBCs is no awareness among generators and no incentives provided on UBC collection and segregation.

Good rates, large quantity and separate bins for UBC collection would encourage for collecting UBCs this have been indicated as the only motivation which can aid UBC segregation and further collection for recyclability by most of the waste generators.

Waste collectors

About 8 waste collectors surveyed, this included door to door waste collectors only. The waste comes from residential areas to collectors, all type of dry waste including plastics, papers, glass and metal were collected for recycling. Waste collectors reported 100% of them collecting UBCs, in which they mentioned UBC collected mixed with paper/cardboard.

The average UBC collected by each of the dealers varied from 05 kg/month – 20 kg/month. The collectors dealing in UBC estimated mixed paper waste of about 20 kg/month -125 kg/ month. It was mentioned by the waste collectors that there is no selling price for UBC and mixed paper in Mumbai as it goes with the BMC waste and there is no further selling.

The mixed waste was procured from Households by largest share. Stakeholders mentioned UBCs were reported to be coming from upper and middle income localities only. The interviewed stakeholders reported condition of UBCs packs reaching them with most not containing leftover juice in it.

On being asked the fate of UBC, stakeholders mentioned collected UBC is taken away by BMC trucks which further reaches dumpsites.

The major discouragement for not collecting UBC separately as it was collected along with MSW by the BMC. The collection & recycling of UBCs may improve if awareness is provided for collection & segregation, and good number of buyers is present in market.

Small scale waste dealers

About 10 small scale dealers were interviewed in different areas of Mumbai, each having a turnaround of about 2000 kg to 40000 kgs of mix waste paper every month. The stakeholders covered residential and commercial areas. A large number of intermediate kabadi's and Rag picker about 1 – 10 were supplying materials to each of these waste dealers.

The stakeholders mentioned about 20% collecting UBC along with mixed waste paper and 80% not collecting UBC, the reason for not collecting UBC is its very less quantity. The average UBC collected by each of these dealers varied from 3000kg/ month to 6000kg/month but along with mixed waste paper only as they reported, it was difficult to find UBCs alone. The purchase price of UBCs was INR 5 per kg and the purchase price of mixed waste paper varied from INR 5.50 per kg – INR 10 per kg. The selling price of UBCs to larger dealers was INR 8 per kg and mixed paper varied from INR 9 per kg - 12 per kg.

However, dealers reported UBCs come to them via Households, rag pickers, door to door collectors and intermediate kabadi's. The once dealing with UBC reported its condition with 20% containing leftover juice, 60% soiled, and 20% clean and ready for sale.

Major discouragement reported were: Less quantity of UBC found and low incentives on UBC collection and segregation. Waste dealers also suggested that the collection of UBC can be improved if there are more collection centres for UBC wherein people can drop in their UBC and large quantity would be collected so they can further sell it in market.

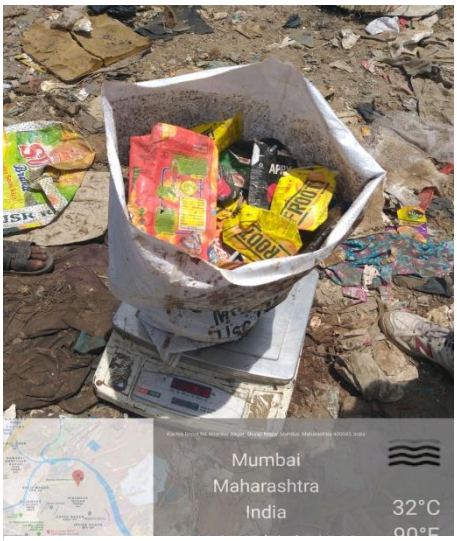

Figure 45: Snap of bale analysis done during survey

Large scales scrap waste dealers

About 10 Large scale scrap dealers were interviewed, each having a turnaround of about 35000 kg –200000 kg of mixed waste paper every month. The stakeholders covered residential and commercial areas of city. A large number of small scale dealers and rag pickers about 4 – 16 were supplying materials to each of these waste dealers.

The stakeholders mentioned 60% collected UBC, in which they mentioned they sometimes collect it along with mix paper and 40% didn't collected UBC.The average UBC collected by each of these dealers varied from 3000 kg/ month - 10000 kg/month. Purchase price of UBC was indicated in range of INR 5/kg and a selling price of UBC was about INR 8 /kg.

Purchase price of mixed paper was indicated in range of INR 5/kg – 6/kg and a selling price of paper varied from INR 5 – 8/kg.

However, the stakeholders reported UBCs come to them via households (60%), rag picker (20%), door to door collectors (20%), intermediate kabadi's (20%) and others including hotel, airport, malls, call centres and airports. The once dealing with UBC reported its condition with about 60% containing leftover juice and 60% found as soiled.

Upon asking the fate of UBC stakeholders mentioned that about 40% sell it to large scale dealer and 40% sell along with mixed paper.

Major discouragement of not collecting UBCs is low market value for UBC and less incentives for UBC collection and segregation. Hence, collection centres for UBC in the city can definitely drive the UBCs recycling chain in Mumbai.

Bale analysis performed at Mumbai have been given in Table 32

Table 32: Bale analysis of Mumbai

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large scale scrap dealer	75	14.5	19.333%
	190	26	13.684%
	180	26	14.444%
	190	25	13.158%
	-	-	-
	-	-	-
	-	-	-
	-	-	-
	130	20	15.385%
	140	22	15.714%
Total	**905**	**133.5**	**14.751%**
Small scale scrap dealer	123	0.061	0.050%
	120	0.151	0.126%
	70	0.303	0.433%
	40	0.091	0.228%
	123	0.061	0.050%
	70	0.303	0.433%
	123	0.061	0.050%
	40	0.091	0.228%
	120	15	12.500%
	120	15	12.500%
Total	**949**	**31.122**	**3.279%**

Dumpsite analysis

Dumpsite analysis was done at Deonar Dumpsite of Mumbai. The survey covered two vehicles bringing in waste from different locations which targeted commercial, institutional and residential areas. The outputs of the analysis are as under table below

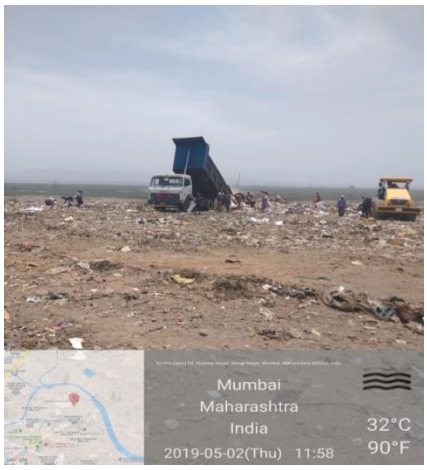

Figure 46: Snap of dumpsite taken during survey.

Table 33: Dumpsite analysis of Mumbai

Truck details	Area and route covered	Waste load Analysed (UBCs)	Paper Load (Kgs)	UBCs found (Kgs)	Comments
MH 01CV 1998	M-west ward, Deonar dump	32.58	4.95	3.37	Takes 4 trips per day
MH 01CV 1993	M ward, Deonar dump	42.82	7.1	1.93	Takes 4 trips per day

4.15 Mysuru

Waste generators:

Eleven Waste generators were selected for interview, spread across various parts of the city spread across bus stand shops, bar and restaurant, sweet shops and juice shop. The total waste generated was reported to be around 50-600 kg/month, and the total dry waste was generated in the amount of 30-540 kg/month. UBCs were generated at around 6-150kg/month and was not segregated by any of the generators except for one which sells the segregated UBCs to kabadi walas. The others normally dispose the UBCs with the municipal waste.

Figure 47: Snap of waste collector interviewed during survey

Upon asking a reason for not segregating UBCs they highlighted following points

1. Lack of market for UBC: as no one ever came to them asking for UBCs.
2. Some even reported, low quantities of UBCs generated makes it non feasible for them to segregate
3. Low incentives.

One of the generators indicated the selling price of UBCs as INR 3.0.

Upon asking the waste generators of possible motivations which can enable them to participate in segregating UBCs for recycling, they suggested to have

1. Good number of buyers
2. Awareness
3. Separate bins for easy segregation of UBCs
4. A good price for UBCs along with an awareness of recyclability of UBCs

Waste Collectors

The 24 waste collectors that were interviewed consisted of 17 rag pickers and 7 door to door waste collectors that covered streets, residential and commercial areas. They were reported to have been dealing in paper, plastics, metals and glass, and one in cloths too in households (41%), streets (66%), waste bins (45%) and markets (33%). All (except one) of the waste collectors reported collecting UBC with mixed paper or cardboard. 20% of them stated no incentives, and 12% of them stated lack of market or buyer separately for UBCs as the reason why they were not dealing with UBCs.

The mixed paper waste collected by these people was somewhat around 40-2000kg/month which was sold to the dealers at the rate of 4 – 8 INR/kg.

The UBCs collected per month was found to be around 40-150 kg/month which was sold at the rate of 3.5 - 05Rs/kg to the dealers, as stated by the collectors.

UBCs were reported of being collected from all income groups in society mostly (87%) from commercial or business establishments. The UBCs were found to be in soiled condition in 54% of the cases, and in 41% of the cases, the packs were found to have left over juice in them.

Few of the discouragements for segregating UBCs pointed out by the collectors are:

1. Low price of UBCs
2. No specific collector for UBCs
3. Low quantity and no specific buyer
4. Foul smell
5. Storage issue
6. Leftover juice and contamination and insects attack.

There were few suggestions given by collectors to improve segregation and recycling of UBCs by waste collectors, these included:

1. A good price for UBC creation of awareness at waste generator level to keep UBCs separate for selling as this becomes unfeasible to segregate UBCs after collection.
2. Creation of awareness among collectors and dealers.

Small Scale Waste Dealers

Fourteen small scale dealers were interviewed and assessed, the no of rag pickers/collectors contributing to each of them ranged from 06-45 in number. These dealers were having a turnover of about 13000 – 28000kgs of mixed paper every month. The purchase price of this was reported to be around 3-10 Rs/kg which was later sold to large scale dealer or recycles at the rate of 4.5- 14 Rs/kg.

Figure 48: Bale of UBCs at Dealers end during survey

About 28% of the small scale dealers were accepting UBCs with mixed paper which was purchased at the rate of around 3.5-5.5 Rs/kg and sold to larger dealer without processing, at the rate of 6-7 Rs/kg. These UBCs (found in soiled condition in 50% of the cases and with leftover juice in 21% of the cases) were procured from rag pickers, households and from door to door collection ..

The key imperatives discouraging waste dealers for dealing in UBCs separately were as follows:

1. Leftover juice and foul smell
2. Low density and hence low profit
3. Storage problem
4. No buyer
5. No enquiry about UBCs as no one separately asks for them.

The small scale dealers suggested that awareness, good price, proper segregation, a good market and law enforcement by government bodies for UBCs can help start a good recycling for UBCs.

Large Scale waste Dealer:

Eight large scale waste dealers were interviewed that were dealing into residential, commercial and institutional areas in Mysuru. The quantity of mixed waste paper at these dealers ranged from 100 – 800 tonnes per month which is purchased at the rate of around 4.5-15 Rs/kg and sold at the rate of around 7.5-16 Rs/kg, as stated by the dealers. The number of small scale dealers/rag pickers contributing to each of these dealers ranges from 15-100 in numbers.

Figure 49: Snap of bale analysis being done during survey at waste dealers.

Only one deals with UBCs in both ways i.e., separately and along with mixed paper. And around 80 tonnes is collected which is purchased at the rate of 7.5-9 Rs/kg and sold at 11.5 Rs/kg. This was contributing to active recycling of UBCs which was possible due to TPIPL efforts in the area. The rest of the dealers stated that smell, labour problem, storage issue and no enquiry about UBCs are the factors that prevent them from dealing in UBCs.

When the stakeholders asked on the condition of UBC indicated that UBCs received were sometimes soiled and sometimes had left over juice.

When asked on the discouragements for not segregating and selling UBCs the dealers reported following aspects:

1. Most of the UBCs found in soiled condition and sometimes have juice left inside them. This causes contamination and release of foul smell.
2. There is no proper segregation
3. Labour intensive work
4. Storage problem.

The stakeholders pointed out suggestions for improvement of collection and segregation of UBCs. These are:

1. Creation of awareness among various stakeholders
2. Procurement of the packs in clean and ready for sale condition
3. Segregation at source
4. And good rate

Bale analysis was performed at Mysuru and the observations are depicted in Table 34

Table 34: Bale analysis of Mysuru

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large scale scrap dealer	198	27.6	13.939%

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
	-	-	-
	-	-	-
	150	0	0.000%
	185	0	0.000%
	-	-	-
	-	-	-
	128	1	0.781%
Total	**661**	**28.6**	**4.327%**
Small scale scrap dealer	200	25	12.500%
	204	13.5	6.618%
	211	8	3.791%
	212	15	7.075%
	203	15	7.389%
	199	13	6.533%
	-	-	-
	120	4	3.333%
	98	2	2.041%
	-	-	-
	122	0	0.000%
	109	0	0.000%
	100	0	0.000%
	102	0	0.000%
Total	**1880**	**95.5**	**5.080%**

Dumpsite analysis

Dumpsite analysis was done at Kuppaluru dumpsite to cover three vehicles bringing in waste from different locations of Chennai and targeting commercial and residential areas. Dumpsite analysis at Mysuru is given in Table 35

Table 35: Dumpsite analysis of Mysuru

Truck details	Area and route covered	Waste analysed (Kgs)	Paper found (Kgs)	UBCs found (Kgs)	Comments
KA 09B 2326	JP Nagar	200	8.5	0.7	Takes 3 trips per week
KA 09B 2198	JP Nagar, Palya Hosuru	195	10	0.92	Takes 4 trips per week
KA 09B 1983	Kuvempunagara	190	9.3	0.65	Takes 3 trips per week
Percentage			4.75	0.388	

The UBCs were found as 0.39 percent only.

4.16Nagpur

Waste Generators

Figure 50: Snap of waste generator interviewed during survey.

Ten waste generators were interviewed, spread across the Nagpur city to understand the perception of generators with respect to UBCs. The stakeholders covered were from Markets and Institutions (10%). Average waste generation ranged from 100-900 kgs per month of which dry waste generated ranged from 50-390kg/month. The quantity of UBC generated ranged from 04 to 40 packs per day. Only 60 percent of the waste generators were segregating waste into dry and wet and none of them segregated UBCs for recycling. Mostly, waste generators indicated UBCs getting disposed along with MSW only. When asked for the reason they reported that no one buys UBC in Nagpur (40%) and there is no incentive in segregating UBCs as it takes a lot of time.

When asked of key points that discourage waste generators to segregate UBCs the following points were received:

1. UBC storage requires lot of space, which is a constraint.
2. Segregating UBCs require lot of time and very low quantity of UBCs get generated
3. UBCs are light in weight and require too much time and effort to segregate.
4. Most of the waste was reported to be taken by Nagpur Municipal Corporation (NMC) and they did not had any incentive to segregate / store UBCs.

When asked on the key points which can motivate waste generators the replies were as follows:

1. More number of buyers and good incentives.
2. Availability of time, space and good market for UBCs.
3. Awareness about recycling potential of UBCs and striker implementation of regulations.

Waste Collectors:

Twenty stakeholders including 19 rag pickers and 01 door to door collected were surveyed in Nagpur city, these were getting waste from households, markets and institutions. All the stakeholders were dealing in plastic, paper and metals. Only one of the stakeholder was collecting UBC for purpose of recycling.

Mostly UBCs in Nagpur were reported to be going with mixed waste to Nagpur Nagar Nigam (NNN). As UBCs segregation involved lot of labour and efforts and quantity of UBC generated was also less. People were not aware to segregate UBCs at source and aid in further collection for recycling. Quantity of mixed waste generation was reported as 210 – 3000kg/month with a price of about INR 8-10 per kg. Cardboard had a higher price of 12-15 per kg. One of the waste collectors also reported that if they segregate UBCs it fetches a price

of INR 6/kg. Out of the waste collectors surveyed, only 5% of the stakeholder reported of collecting and selling UBCs to small scale dealer.

UBCs were reported to be generated from upper and middle class residential areas and commercial establishments. However, most often they reported the state of UBCs being soiled and only 5% reported these UBCs as clean and ready for recycling. When asked on the reasons that discourage them of dealing in UBCs the key takeaways were:

1. No one takes UBCs- there is no buyer in market.
2. There is no awareness of UBCs being recyclable, no incentive for UBC collection and it requires too much effort to segregate UBCs.
3. The quantity of UBCs found is less.
4. There is no enough space for keep and segregate UBCs.
5. There is no profit in UBC collection as there is lot of labour involved in segregation and neither is there any buyer.

When asked on how the collection be improved, the stakeholder responded that there is a need for good incentive, good market price and more number of buyers of UBCs. Quantity of UBC should also be more for feasibility of business and dealers should also start taking UBCs. Few motivational factors suggested by stakeholders were:

1. Good incentives
2. More buyers
3. Space for segregation
4. Awareness and profits
5. Acceptability by dealers for UBCs.

Small Scale Waste dealers

Fourteen small scale scrap dealers were surveyed, spread across Nagpur city to understand the recycling/management of UBCs. Each of these dealers were catered by 02 – 20 ragpickers/kabadi's and had an average turnover of mixed paper in range of 2000 - 12000 Kgs/month.

Out of these only 02 small scale dealers were accepting UBCs with mixed waste paper. The average quantities of UBCs collected per month were 150-180kgs. The purchase price of UBCs with mixed paper was in range of 3-6 Rs/kg and selling price was in range of 12-13 Rs/kg. The purchase price of paper was informed in range of 2-11 Rs/kg depending on grade of paper and selling price was reported in range of 8-13 Rs/kg.

The source of procurement of paper were reported as households (93%), ragpickers (64%), door to door collector (100%), and hotel (7%). The condition of UBCs were reported by 71% of respondents as mostly soiled, and 28% reported these of having left over juice. Only 7% of respondents reported UBCs coming to them as clean and ready for sale.

When asked on the key points that discourage them to deal in UBCs the replies were as under:

1. Lack of space to segregate UBCs at their premises.
2. No buyers in Nagpur region
3. No existing markets for UBCs
4. Low quantity of UBCs getting generated.

Suggested improvements to facilitate recycling of UBCs were:

1. Good money for UBCs
2. More money and incentives
3. More buyers in market for UBCs
4. More awareness about UBCs

Large scale waste dealer

Seven large scale dealers were interviewed from Metha Taj Bagh area, Sataranjpura Zone, Chitanispura Zinda Chowk road, Dighori ring road and MIDC Hinga T Point area. About 15 – 100 no of kabadi's / small scale dealers were supplying material to these large scale dealers.

Average mixed waste paper handled by these large scale dealers were in range of 07 – 500 Tonnes / month and six of seven large scale dealers were accepting UBCs with mixed waste paper. Mixed paper purchase price was reported as between Rs 5 – 13/kg and selling price was 8-20 Rs/kg. This price was also reported to fluctuate depending on demand supply as well as season for the year.

UBCs were reported to have left over juice by about 28% of respondents and mostly respondents informed that UBCs they receive are soiled.

When asked about the discouragements for not dealing in UBCs the respondents replied as

1. Extra labour and time is required for UBC segregation.
2. There is lack of awareness about recycling potential of UBCs
3. It takes a lot of time to collect and segregate UBCs and moreover the quantity of UBCs is also low.
4. There is no space available to keep UBCs.
5. There is no partnership mode between ULBs and waste collectors, Municipal Corporation should collect segregated waste and send to waste dealers for recycling.

When asked on motivational factors that can help them to segregate UBCs the responses were as follows:

1. More awareness about UBCs
2. More quantity of UBCs
3. Good incentives
4. More awareness about UBCs
5. Nagpur Municipal Corporation should stop taking UBCs with mix waste and start collecting them separately for recycling.
6. Larger market for UBCs and more incentives.

Figure 51: Snap of bale analysis done during survey.

Bale analysis done at dealers is given in Table 36

Table 36: Bale analysis of Nagpur

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large scale scrap dealer	400	0	0.000%
	400	0.72	0.180%
	400	0.7	0.175%
	400	0.25	0.063%
	400	0.94	0.235%
	400	5.34	1.335%
	407.6	0.37	0.091%
Total	**2807.6**	**8.32**	**0.296%**
Small scale scrap dealer	100	0	0.000%
	100	0.4	0.400%
	100	0	0.000%
	100	0.05	0.050%
	100	0.05	0.050%
	100	0	0.000%
	100	0	0.000%
	100	0.01	0.010%
	100	0	0.000%
	100	0.15	0.150%
	100	0	0.000%
	100	0	0.000%
	100	0	0.000%
	100	0	0.000%
Total	**1400**	**0.66**	**0.047%**

Dumpsite analysis

Three trucks bringing waste from residential, institutional and commercial areas was analysed for the quantum of mixed paper and UBCs reaching dumpsite. Survey was conducted at dumpsite in month of May 2019. Table below highlights the quantity of paper and UBCs found at site.

The quantity of mixed paper found was about 9.2% and UBCs were only 0.325%. This was clear that due to low market prices and soiled UBC packs the quantity of UBCs reaching dumpsite was high.

Dumpsite analysis have been given in

Figure 52: Snap of dumpsite taken during survey

Table 37

Table 37: Dumpsite analysis of Nagpur

Truck details	Area and route covered	Waste Load (Kgs)	Paper load (Kgs)	UBCs (Kgs)	Comments
F1401	Rathee colony zone 1, Bhandewadi dumping yard	262.1	24.96	0.92	Takes 5-6 trips per day
EN0735	ITI Maidaan, Bhandewadi dumping yard	249.2	20.23	0.86	Takes 5-6 trips per day
EN0762	Phool Market, Bhandewadi dumoing yard	266.3	26.4	0.75	Takes 5-6 trips per day
Percentage			9.2	0.325	

UBCs found reaching dumpsite were 0.325% only.

4.17 Pune

Waste generator

Twelve waste generators were surveyed spread across the Pune city to understand their perception on UBCs recyclability. About 10% of the stakeholders surveyed were from institutional areas and rest 90% were from markets. About 25% of the waste generators were segregating the UBCs and a majority of them disposed the collected UBCs with the municipal solid waste and in some cases, a particular UBC collector collected it. About 75%, of the waste generators were not segregating UBCs for recycling, as there was very less quantity of it and it was reported to be disposed with the other waste. Per kg price of UBC was INR 6. per kg price of the various recyclables were reported such as mixed paper as about INR 2 – 4, and cardboard as INR 5 – 9. When asked about per kg price of mixed dry waste, the generators responded that they did not charge, rather they sent it to the Swachh Bharat Yojana.

The discouragements for dealing in UBCs were reported as :

1. Very less quantity of waste
2. Takes a lot of space

Waste collectors

About 22 waste collectors were interviewed during the survey in Pune and these included a majority of ragpickers (68%) and about 31% of door to door waste collectors, covering residential, commercial and institutional areas spread across the city of Pune.

The collectors deal with paper (100%), plastics (100%), metals (9%) as well as glass (100%). About 81% of the collectors were collecting UBCs and 29% denied of taking UBCs. In total about 68% waste collectors were taking UBCs separately whereas rest of them collected this along with mixed waste paper. Average UBC and mixed waste paper collected per month was around 30 – 150 kgs and 150 – 2000 kgs, respectively. Per kg selling price of UBC was INR 4 – 6 whereas for mixed paper was INR 2 – 12.

The sources of procurement of mixed waste paper including UBCs were households (45%), streets (54%), waste bins (36%), markets (22%) and other areas such as IT companies and hotels. Upper and middle income localities were reported to contribute around 36% of the UBC while the commercial sector was responsible for 50% of the UBCs collected. When asked about the condition of the UBCs, it was informed that around 81% were soiled, 4% did not contain any leftover juice and 54% were clean and ready to sale.

The UBCs were reported to undergo the following fate:

1. Sold to dealer
2. Sold with mixed paper
3. Sold to a shopkeeper
4. Sold to Cooperative Sanghatan

When asked the reasons that discouraged them to segregate, the following replies were obtained:

1. Less number of UBCs
2. Lot of effort for segregating.

3. More space to store.
4. Foul smell.

Waste collectors responded that with regular collection and good price UBCs collection can be improved:

Small scale waste dealers

Fourteen of the small scale dealers were surveyed spread across the city of Pune and these were dealing with residential, commercial malls and IT areas. The number of ragpickers/kabadi's contributing to each of these dealers were around 10 – 250. The total average mixed waste paper and UBCs handled by these dealers was around 1500 – 350000 kgs/month and 400 – 500 kgs/month, respectively. Around 35% of the UBCs collected were being sold with mixed paper while the rest of the dealers denied collecting it, the reason being labour shortage or not receiving sufficient quantity.

The UBC collected ranged from 220 – 800 kgs/month. Per kg purchase price of the UBC and mixed paper ranged from INR 5 – 6 and INR 2 – 4, respectively. The selling price of UBCs and mixed paper was reported to be in between INR 6 – 10 and INR 4 – 8. The sources of procurement of UBCs included 14% households, 28% ragpickers, 14% door to door collectors, some institutes and hotels.

When asked about the condition of the UBCs, the respondents reported that about 21% were soiled, 14% contained leftover juices and 28% were clean and ready for sale. The collected UBC was either sold to a larger dealer (42%), sold to a recycler (7%) or being sold with mixed paper (14%).

Discouraging points for dealing in UBCs indicated by these dealers were as follows:

1. Very less quantity.
2. Less packing bags available.
3. Space constraints as rodents damaged the bags as well as UBCs so no space to keep them separately.
4. No incentives
5. No buyer.

The dealers suggested High incentives and frequent collection of UBCs by larger dealers can improve further UBCs collection for recycling.

Large scale waste dealers

Seven large scale dealers were surveyed during the study, dealing in residential, commercial and institutional areas. About 10 – 50 kabadi's/ragpickers were contributing to these dealers. The total average mixed paper turnover for a month was about 60000 – 150000kgs per month. The collection of UBCs was done by around 28% dealers who sold it with the mixed waste. About 71% of them did not collect UBCs, the reasons being:

1. Not enough time and labour
2. Less quantity is not economical
3. Segregating charges are high.

The per month UBCs collection ranged from 50 kgs– 15,000 kgs. Per kg purchasing price of UBC and mixed paper was between INR 5 – 8 and 2 – 6, respectively. And per kg selling price of UBC and mixed paper was between INR 7 – 12 and INR 5 – 7.5, respectively. The sources of procurement of UBCs included ragpickers (42%), door to door collectors (14%), intermediate kabaddis (28%) and some shopkeepers, malls and markets.

When asked about the condition of the UBCs, the respondents reported that about 42% contained leftover juices, 28% were soiled and 28% were clean and ready for sale. Around 42% of the dealers did not process or treat the UBCs before selling. The fate of UBCs were reported by about 42% of the dealers as bieng sold to a larger dealer, 14% reported of selling to a recycler and 42% was sold with mixed paper.

On asking the discouragements for undertaking UBC collection for recycling the following points were indicated by dealers:

1. Very less quantity as compared to the other waste.
2. Extra labour is needed.
3. Storage problem

The suggested improvements by large scale dealers were as follows:

1. Increase in rates and incentives
2. Awareness

Figure 53: Snap of bale analysis done during survey.

Bale analysis performed at Pune yielded the data given in.Table 38

Table 38: Bale analysis of Pune

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large Scale Scrap Dealer	174	0.202	0.116%
	55.4	0.1	0.181%
	206	7.34	3.563%
Total	**435.4**	**7.642**	**1.755%**
Small Scale Scrap Dealer	156	0.324	0.208%
	101	0.85	0.842%
	53.85	0.65	1.207%
	131.4	1.8	1.370%
	162	0.72	0.444%
	195	0.45	0.231%
	95.7	0.71	0.742%
	178.5	0.85	0.476%
	39	0.25	0.641%
Total	**1112.45**	**6.604**	**0.594%**

Dumpsite analysis

In February, 2019 analysis was done on the Katraj depot in Pune where three vehicles each coming from residential, commercial and institutional areas were analysed. The findings of

the analysis suggest that about 751.6 kg of total waste load was present. Dumpsite analysis is given in Table 39

Table 39: Dumpsite analysis of Pune

Truck details	Area and route covered	Sample load(Kg)	Paper load Analysed (Kg)	UBC load Analysed (Kg)	Comments
MH 50 C 877	Jijamata chowk to bhartiya vidyapeeth, katraj depot	90	38.150,	0.3	Takes 4 trips per day
MH 12 GT 2274	Prabhag 38 (all wards),	160	16.150,		Takes 4 trips per day
MH 10 / AY 2246	Purty society/ dhankawali prabhag 38	210	23.25		Takes 4 trips per day
percentage			16.85	0.065	

The Quantum of UBCs found is only 0.065 percent whereas paper coming to dumpsite is as high as 16.85 percent.

4.18 Shimla

Waste generators:

About ten waste generators were interviewed, spread around the city to understand the perception on UBCs, waste generation behaviour and economics. Only 30% waste generators reported of segregating waste into dry and wet at their premises and none of them reported segregating used beverage cartons (UBCs) for selling to waste dealers. The most prevalent means of disposal of generated UBCs is via Shimla Municipal Corporation. The MSW generated is collected and transported to the Elephant Energy waste to energy plant downhill Shimla city.

The low rate of segregation of UBCs is attributed to its lesser quantity, in range of only 0.48 – 48 kg /month and further no market value for UBCs and mixed waste paper in Shimla because of unavailable market (high cost of labour and transportation). There is also no selling mechanism for the UBCs, However for recyclables, the average selling price varied from INR 8-10/kg for clean paper to INR 4-6 /kg for cardboard and INR 15/kg for big cardboard cartons (which can be reused for packing).

Figure 54: Interaction with waste dealer

Upon asking the waste generators of possible motivations which can enable them to participate in segregating UBCs for recycling, they suggested to have:

1. Source segregation via separate dustbins
2. Creation of a good market
3. Incentivising collection

Figure 55: Interaction with waste generator

Waste Collectors:

About 20 respondents were interviewed during survey comprising door to door collector and rag pickers. Out of them only 60% collect UBCs along with MSW.

The average UBC collection was not reported; however, the quantity of paper and cardboard waste handled by waste collectors was around 05 – 4000 kg/months. The prime reasons for a proportionate collectors not dealing with UBCs were:

1. There are restrictions to segregate and sell the waste by the corporations
2. The collection process is very tedious along with very no buyers
3. There are no incentives for UBCs management

The selling price for paper was found between INR 7-10/kg and for cardboard it is around INR 6-10/kg. There was a fair percentage of UBCs found clean and ready for sale.

The feedback to improve the collection and recycling of UBCs was given as:

1. Authorisation of waste segregation by the Municipal Corporation of Shimla
2. Develop a good market for UBC business
3. Incentivising UBC collection

Small scale scrap dealers

There is only a meagre proportion of personnel involved in the occasional collection of UBCs along with mixed paper. For a rare percentage encountered, these either are dumped with MSW or burned with mixed paper in winter season. The significant reason possible is the lack of a market promoting selling and recycling of UBCs. On the other side, the average mixed paper waste collected lies in the range of 100-300kg/month to as high as 18,000-20,000 kg/month by small scale dealers.

The source of procurement at the small scale dealers are rag pickers, door-to-door collectors, intermediate kabadis and households. The number of kabadi/ragpicker contributing are as high as 60 at one of dealer. Also at some of the places, procurement is directly through the waste generators like hotels, shopping malls, markets etc.

The purchase and selling price for mixed paper and cardboard is INR 2.5-10 and 7-15 respectively as the cost of transportation, storage and handling waste is very high in Shimla.

Figure 56: Interaction with waste dealers

The comments regarding the improvement in collection may be summarised as:

1. Storage and good transportation facility can enhance purchase. Also, need labour to make bales of UBCs.
2. Lack of awareness also accounts for a poor UBC market. There is a need to develop purchase and sale chain.
3. Segregation would make it easy for the waste collectors.

It was also reported at the time of survey that the cost of labour, transportation and storage is high as the city has difficult terrain and a tourist destination. The economics was such that none of the small scale dealers transported only cartons/mixed papers, rather had metals being loaded first and thereafter cartons, to substantiate the high transport costs. This was a special city where mixed waste paper recycling was very low and mostly was reported to occur during peak tourist season.

Large scale waste dealers:

Five respondents dealing in large scale waste domain were interviewed in areas of Shiva Bottle store and near Tibbetan Monastery amongst others. However none of these were found dealing in the collection of UBCs.

The quantity of mixed waste paper at these dealers ranged from 5500kg s – 40,000kgs per month and number of small scale dealers/ragpickers contributing to each of these dealer ranges from 10-25 number.

The purchase price of mixed paper was indicated as INR 4-10/kg and a selling price as 6-13 INR/kg. However, there was a complete denial on acceptance of UBCs.


Figure 57: Dumpsite analysis done at dumpsite

When asked about the discouraging factors to the stakeholders, the key-take away found are:

1. There is a need to create awareness about UBCs to enhance stakeholders participation in recycling.
2. No market for UBCs in Shimla.

The bale analysis has been summarised in Table 40 below and shows that there was a nil fraction of UBCs for recycling.

Table 40: Bale analysis of Shimla

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Large scale scrap dealer	25	0	0.00%
	35	0	0.00%
	35	0	0.00%
	18	0	0.00%
	40	0	0.00%
Total	**153**	**0**	**0.00%**
Small scale scrap dealer	-	-	-
	26	0	0.00%
	32	0	0.00%
	-	-	-
	56	0	0.00%
	25	0	0.00%
	45	0	0.00%
	52	0	0.00%
	49	0	0.00%
	45	0	0.00%
	20.8	0	0.00%
	65	0	0.00%
	92	0	0.00%
	54	0	0.00%
	35	0	0.00%
	50	0	0.00%
Total	**646.8**	**0**	**0.00%**

Dumpsite Analysis

Dumpsite analysis was done at 'Juberhatti' dumpsite with a sample size of 442 kgs from 02 trucks bringing waste from residential, commercial and institutional areas. The trucks are analysed for mixed paper and UBCs. Dumpsite analysis is given in the Table 41

Table 41: Dumpsite analysis for Shimla

Truck details	Area and route covered	Waste Analysed (kgs)	Paper found (kgs)	UBCs found (kgs)	Comments
HPOZB0743	Juberhatti	209.2	26.49	0.96	Takes 4 trips per day
HPOZB0749	Juberhatti	233.8			Takes 2-3 trips per day
Total		443	26.49	0.96	
Percentage			5.9	0.216	

The output of the analysis presented the following facts:

Out of a total waste load of 442.2 kgs, the quantity of mixed paper and UBCs were about 5.99% and 0.21% respectively. The paper content was high due to complete ban on Plastics in Shimla area and people use newspaper to collect and wrap the waste.. However, this UBC received at dumpsite/elephant energy plant is processed and goes as RDF for combustion.

4.19 Srinagar

Waste generators

About 11 waste generators were interviewed in Srinagar which generated about 7 kg - 240 kg of waste every month. About 64% waste generators were from market area and 55% were from institutional area. The amount of dry waste generated was about 7 kg – 200 kgs per month. The amount of UBCs generated were reported to be in range of 3 kg– 20 kgs per month, However these are estimates as no one was segregating UBC at their premises.

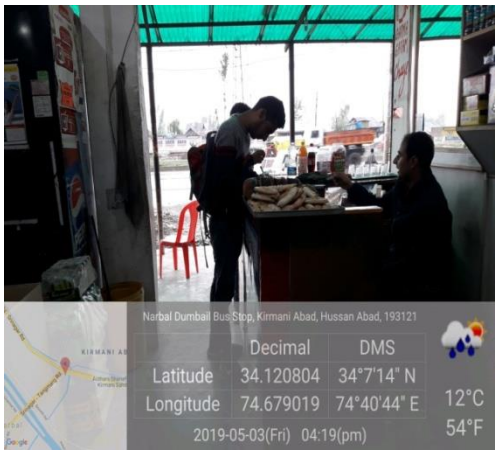

Figure 58: Snap of waste generator interviewed during survey.

Waste was not segregated & collected by interviewed population and was taken away by Srinagar Municipal Body and 82% respondents mentioned on UBC not getting collected while 18% mentioned about it being taken away with mix paper and other waste.

When asked for reasons of not segregating UBCs at their premises they informed that no one buys UBC and thus it goes with Srinagar municipal corporation (SMC) and reaches dumpsite.

The price of selling mixed waste paper was reported as about INR 4 –7 per kg. Cardboard value was reported as INR 4 – 6 per kg. Respondents reported UBC sold along with mix paper waste and not separately.

The generators mentioned UBC being disposed/mixed with municipal solid waste (MSW) or sometimes thrown to dustbins. It was also reported by stakeholders that there was ban on UBCs due to increasing pollution at tourist places.

On being asked about the reason for not segregating UBCs they highlighted most of the waste is taken away by SMC, further, there is no developed market nor any buyer of UBC collection, further segregation of UBCs take a lot of time.

Figure 59: Snap of waste collector interviewed during survey.

Good incentives for collected UBCs, developed market and buyers for UBCs have been indicated as

the motivation which can aid UBC segregation and further collection for recycling by most of the waste generators. Generators in Srinagar don't prefer to collect and sell UBC due to low incentive and often they regard this practice as a burden.

Waste collectors

About 25 waste collectors were surveyed including both Rag pickers and door to door waste collectors. The waste comes from residential, institutional and commercial areas to these collectors. Collectors reported to deal in all type of dry waste including (92%) plastics, (100%) papers, (60%) glass and (72%) metal for recycling except UBCs alone.

About 28% respondents reported collecting UBCs with mixed paper & cardboard. About 68% respondents reported of not collecting UBCs in which they said they do not collect UBC as no one returns it back, no incentive on its collection, no buyer and market for UBC collection and no space for keeping UBCs after collection for sorting.

The average UBC collected by each of the dealers varied from 5kg/month – 30 kg/month. The collectors dealing in UBC estimated mixed paper waste of about 4 kg/month -1200 kg/ month. The selling price of UBC has been indicated as INR 2/kg - 6/kg whereas price of mixed paper varied from INR 2/kg - 10/kg.

The mixed waste were procured from Households by 92%, Street by 84%, Waste bins by 8%, Markets by 92% and others including schools, colleges, hospitals, landfill. Although, stakeholders mentioned UBCs to be coming from upper and middle income localities 32%, lower income localities 2% and commercial establishments 32%. However, interviewed stakeholders reported condition of UBCs packs reaching them with 87% containing juice in it and 12.5% packs clean and ready for sale.

Upon asking about the fate of UBC's, stakeholders informed that they don't collect UBC separately and hence sell it with mix waste and UBC goes with MSW and reaches dumpsites. The major discouragement for not collecting UBC separately is no buyers & market and no incentives provided on collection.

Respondents suggested developed market & buyer in market and good incentives can motivate in getting UBCs collected for recycling. However, this would require a proper system to be in place for waste collection.

Small scale waste dealers

About 18 small scale dealers were interviewed in different areas of Srinagar, each having a turnover of about 1000 kgs to 45000 kgs of mix waste paper every month. The stakeholders covered residential, institutional and commercial areas. A large number of small scale dealers, out of which 50 door-to-door collector and 30 rag picker supplied materials to each of these waste dealers.

The stakeholders mentioned 28% dealers collected UBC along with mix waste and 73% mentioned about not collecting UBC. The reason for not collecting is neither availability of buyers and nor developed market. The average UBC collected by each of these dealers varied from 4 kg/month to 170kg/month. The purchase price of UBC has been indicated as INR 5/kg whereas price of mixed paper varied from INR 2/kg-8/kg. However, the selling

price of UBCs to larger dealers was INR 5.50/kg to 7/kg and mixed paper varied from INR 5/kg to 10/kg.

However, dealers reported UBCs come to them via malls and hotels (11%), door to door collectors (22%) , and ragpickers (67%) along with mixed paper. The once dealing with UBC reported on the condition of UBC pack 67% containing leftover juice content and 33% found soiled.

Upon asking the fate of UBC stakeholders mentioned that they sell it to large dealers and sell it along with the mixed paper.

Major discouragement is no proper market & buyers and no incentives on collection of UBC. The collection of UBC can be improved by providing good money on collection& segregation and by developing separate market and dealers.

Large scale scrap waste dealers

About 10 Large scale scrap dealers were interviewed, each having a turnover of about 55000 kg –90000 kg of waste paper every month. Stakeholders covered all areas of Srinagar and waste comes to them from residential, institutional and commercial areas of city. A large number of small scale dealers, out of which 50 door-to-door collector and 30 rag pickers supply materials to each of these waste dealers.

About 40% of large scale dealers collected UBC but accepted it along with mix waste paper while 60% of them mentioned of not collecting UBC. The reason for not collecting UBC are less incentives for collection of UBC and no buyers in market.The average UBC collected by each of these dealers varied from 10 kg/ month to 100kg/month. Purchase price of UBC was indicated in range of INR 5/kg – 9/kg and a selling price from INR 6 -12 /kg. Purchase price of mixed paper was indicated in range of INR 5/kg – 9/kg and a selling price from INR 6 - 12/kg.

However, the stakeholders reported UBCs come to them via 30% rag pickers, 10% door to door collectors, 20% households, and 20% intermediate kabadi's along with mixed paper. The once dealing with UBC reported the condition of UBC with packs containing leftover juice in it.

Upon asking the fate of UBC stakeholders mentioned that they sell it to recycler and sell it along with mixed paper. Major discouragement of not collecting UBCs is due to no buyers & developed market, and no incentive.

Hence, good price and developed market with enough buyers can definitely drive the UBCs recycling chain in Srinagar.

Figure 60: Snap of bale analysis done during survey.

Bale analysis performed at Srinagar yielded the data given in

Table 42

Table 42: Bale analysis of Srinagar

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	% of UBC
Large scale scrap dealer	-	-	-
	113	0.038	0.034%
	109	0.06	0.055%
	105	0	0.000%
	106	0	0.000%
	108	0	0.000%
	264	0	0.000%
	216	0	0.000%
	188	0.242	0.129%
	210	0.12	0.057%
Total	1419	0.46	0.032%
Small scale scrap dealer	-	-	
	-	-	
	108	0	0.000%
	-	-	-
	148	0	0.000%
	100	0.012	-
	105	-	-
	-	-	-
	113	0	0.000%
	180	0.032	0.018%
	101	0.09	0.089%
	39	0	0.000%
	-	-	-
	-	-	-
	106	0	0.000%
	100	0	0.000%
	-	0	-
	198	0	0.000%
Total	1298	0.134	0.010%

Dumpsite analysis

Dumpsite analysis was done at Srinagar dumpsite to cover three vehicles bringing in waste from different locations and targeting commercial, institutional and residential areas. The outputs of the analysis are in Table 43

Table 43: Dumpsite analysis of Srinagar

Truck details	Area and route covered	Waste Analysed (kgs)	Paper load (kgs)	UBCs load (kgs)	Comments
JK 01AB 1791	Idgah, Saida- -pura Achan	250	2.5	0.139	Takes 1 trip per day
JK 01V6837	Lal chowk, Karan nagar, saidpora achan	425	7.6	0.7	Takes 2 trip per day
JK 01AB 3144	ward no.12, Hazrat Bal saidpora achan	500	7	2.1	Takes 1 trip per day
Percentage			1.45	0.25	

The percentage of UBCs reaching dumpsite was found as 0.25.

4.20 Thiruvananthapuram

Waste generators

Ten waste generators were surveyed in different areas of Thiruvananthapuram to understand their perception on UBCs recyclability. About, 60% of the stakeholders surveyed were from market and rest 40% were from places such as theatres, shopping malls and hospital canteens. The waste generated from their premises was reported to be in range of 30000 - 60000 kgs/month, out of which the Trivandrum Mall contributed to the largest amount of waste generated in that area (Around 15000 – 32,000 kgs/month of average dry waste including cartons).

When the waste generators were interviewed if they segregated the waste or not, it was found that 30% of them were into segregation while majority (60%) of them did not segregate the waste. Around 10% of them partially segregated the waste.

Segregation of UBC separately was not done as it was mixed with paper, or burned with paper. In theatres, it was informed that the UBCs were being burnt.

When asked about the reasons of not segregating the UBCs, it was found that:

1. 10% of waste generators were giving it to the kabaddiwalas.
2. 20% respondents reported of UBCs being burnt with paper or incinerated.
3. No resale value was provided.
4. Less amount of waste was generated.
5. In case of a sweet shop, private parties took the waste together.

The UBCs were reported to be often disposed or sold in majority of the cases, while in some it was found to be burnt with paper inside an incinerator.

When waste generators were asked the reason for not collecting recyclables and UBC for recycling, they responded with the following points:

1. Less amount of waste was being generated.
2. There was no separate facility and staff.
3. No resale value was provided.
4. A good recycling facility was not established.

5. There was no proper waste management facility.

When the generators were asked on possible motivations that can enable them to segregate UBCs for recycling, they responded as follows:

1. More UBC waste generation
2. Good resale value.
3. If any official recycling unit approached them, they were ready to give.
4. If the proper facility was available.

Waste collectors

About 20 waste collectors were interviewed during the survey in Thiruvananthapuram that included a mix of door to door waste collectors (50%) and ragpickers (50%) covering residential, commercial and institutional areas spread across the city.

Figure 61: Snap of waste collector interviewed during survey.

The collectors deal with paper (100%), plastics (100%), metals (57%), glasses (28%) and E-waste (14%). Around 65% of the collectors were reported to collect UBC whereas 35% ragpickers denied of taking UBCs for recycling as there was no buyer/ market for UBC collection.

Upon asking the average UBCs they collect with other waste the collectors reported per month collection in range of 10 – 1500 UBCs. Average mixed paper was reported to be collected as 45 – 600 kgs every month. Mixed paper was reported to be sold at a price range of INR 3 – 12 per kg. The mixed paper was collected from households (46%), streets (26%), waste bins (8%), markets (13%) as well as other places such as roadsides, offices, schools, museums, etc., as revealed by the waste collectors.

The sources of major UBC generation were from the upper and middle income groups (58%), low income groups (17%) and commercial and business establishments (23%). Majority of the collected UBC did not contain any leftover juice while some were revealed to be soiled. The UBC was found to be sold with mixed paper (66%) or taken by municipal corporation/ private agencies (25%) or in some cases, it was either being grinded or burnt(8%).

When the waste collectors were asked the reason for not collecting recyclables and UBC for recycling, they responded with the following points:

1. Less resale value
2. Less availability of waste
3. No recycling facility
4. No buyer due to plastic coating.

When the ragpickers were asked on possible motivations that can enable them to segregate UBCs for recycling, they responded as follows:

1. Increased selling price
2. Better recycling facilities
3. Awareness about recycling of UBCs
4. Separate Collection of UBCs from source.

Small scale waste dealers

Fourteen of the small scale dealers were surveyed in the city of Thiruvananthapuram who were dealing with residential, commercial and institutional areas. The number of ragpickers/kabadis contributing to each of them were around 02 – 12. The average mixed waste paper handled by these dealers was around 300 – 10000 kgs/ month. The mixed paper buying prices were also indicated low and around 2.5 – 12/kg, and that of UBCs as INR 2/kg the mixed paper selling prices were indicated in range of INR 03 – 15/kg(depending on grades of paper) and UBCs as INR 2-5/kg. About 43% of respondents were taking UBCs with mixed paper.

The source of the procurement of the UBC was found to be households, ragpickers, door to door collectors and even intermediate kabaddis. Some of the UBC collected was clean and ready for recycle while some were soiled. It was revealed that there was no processing of the UBC before selling. Other discouraging points for not dealing in UBCs indicated by these dealers were:

1. No proper market
2. Less prices
3. No resale values and less profit
4. Difficulty in segregation and processing
5. No availability and buyers

When asked about how the collection of UBC can be improved, the dealers suggested that following things can help boost UBCs recycling in Thiruvananthapuram:

1. Better recycling units
2. Increase in resale value
3. Improved market
4. Separate collection

Large scale waste dealers

Seven large scale dealers were surveyed for the study, dealing in residential and commercial areas such as schools, textiles and railways. About 8 – 30 kabadis/ragpickers were contributing to each of these dealers. The average mixed paper turnover for a month was about 60 – 600 tonnes/month (Average being 209.2 tonnes/month). About 42% of large scale dealers were accepting UBCs with mixed waste paper.

Majority of the UBC was not segregated because the resale value being less whereas some of it was segregated along with mixed paper. The purchase price of UBC and mixed paper was indicated as INR 2 – 7 per kg and INR 4 – 14 per kg respectively whereas the selling prices were INR 5 – 8.5 kg and INR 12 – 17 per kg respectively.

The source of procurement of UBC to these dealers were indicated as households (by 23%), ragpickers (by 23%), door to door collectors (by 15%), intermediate kabaddis (by 15%) and others such as shops and railways contributed (by 23%). The UBCs did not contain leftover juice and it was being sold along with the mixed paper.

On asking the discouragements for undertaking UBC collection the following points were indicated:

1. Less resale values
2. Difficult collection
3. Availability of UBC was very less.
4. Transport problem

The suggested improvements by large scale dealers for improving the recyclability of UBCs were as follows:

1. Recycling process of UBC should be improved.
2. Better recycling mills should function properly.
3. UBCs should be dumped properly in specified bins and should not be thrown outside.
4. Recycling plant should be started in Thiruvananthapuram city.

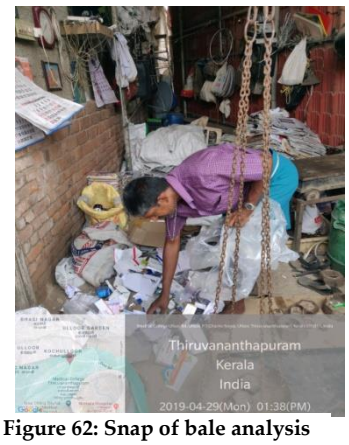

Figure 62: Snap of bale analysis done during survey.

Table 44 below highlights the bale analysis undertaken at Thiruvananthapuram at small and large scale waste dealers

Table 44: Bale analysis of Thiruvananthapuram

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
Small scale scrap dealer	196	0	0.000%
	200	0	0.000%
	173	0	0.000%
	224	0.48	0.214%
	173	0	0.000%
	173	0.24	0.139%
	208.5	0	0.000%
Total	**1347.5**	**0.72**	**0.053%**
Large scale scrap dealer	100	0	0.000%
	90	0	0.000%
	100	0.806	0.806%
	92	0	0.000%
	85	0.032	0.038%

Category	Weight of bale analysed (Kg)	UBC found in bale (Kg)	Percentage of UBC
	97	0.363	0.374%
	74.5	0	0.000%
	103	0	0.000%
	115	0.024	0.021%
	64	0	0.000%
	90	0.064	0.071%
	85	0	0.000%
	87	0	0.000%
	63	0	0.000%
Total	**1245.5**	**1.289**	**0.103%**

Dumpsite analysis

Dumpsite analysis was done at Manakchand cycle at Attakkulangara disposal site at around 10:00 A.M. along with TERI team. Dumpsite analysis at Thiruvananthapuram yielded that about 24% of waste content was mixed paper and only 0.127 percent UBCs were present, data has been given in Table 45

Figure 63: Snap of dumpsite taken during survey.

Table 45: Dumpsite analysis of Thiruvananthapuram

S.No	Waste analysed (Kgs)	Paper found (Kgs)	UBCs found (Kgs)
1	150	60	0.24
2	100	15	0.096
3	90	14	0.096
4	100	19	0.129
Percentage		24.5	0.127

5 UBC Management Chain

Figure below shows the schematic representation of the informal recycling system in India.

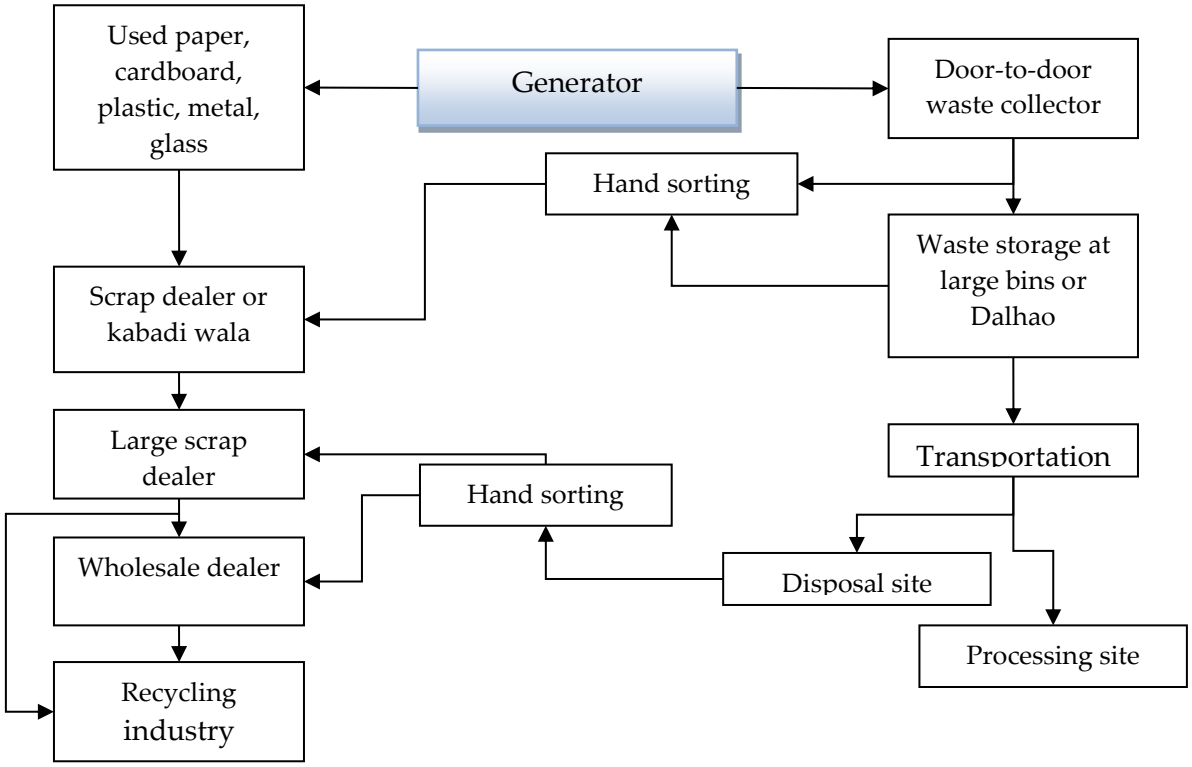

Figure 64: Schematic representation of the informal recycling system in India

The fate of UBCs varies from city to city since there are different collection and recycling systems. While some cities do not collect UBCs at all, some have very high collection and recycling rates. Awareness level and availability of markets via recycling units, decides the fate of UBCs. For cities that recycle UBCs have the following stakeholder involvement:

- *Street waste picking*: UBCs are recovered from mixed waste found on streets or extracted from community bins before collection by scavengers (ragpickers). This practice probably occurs in most of the cities where UBCs are acceptable for waste dealers.
- *Municipal waste collection crew/door to door collection crew*: UBCs are recovered along with other waste from vehicles transporting waste to Dhalao/community bin sites. This practice is widespread in almost all cities where door-to-door collection is practised.
- *Hotels and institutions*: Waste collected from airports, canteens, and hotels are sorted for UBCs and further sold to large dealers for recycling.
- *Waste picking from dumps*: Waste pickers/scavengers sort through waste before it is sent to the site for final disposal. Sorting is often carried out by communities that live on or near the dump.

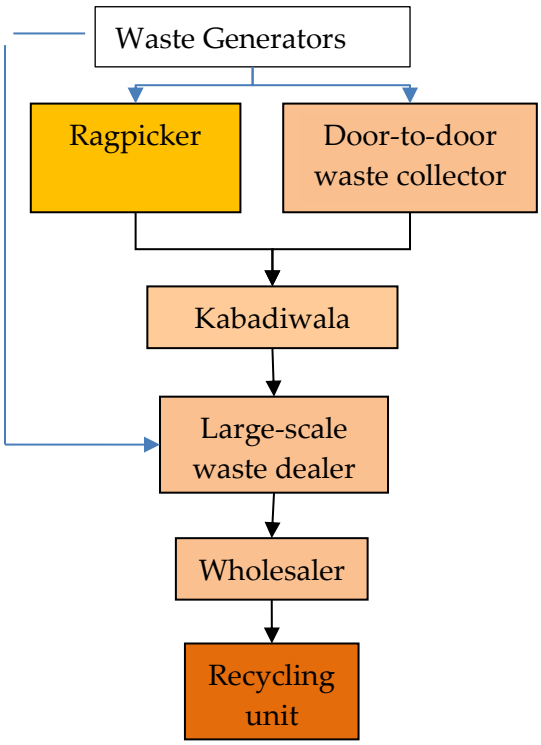

Figure 65: The recycling chain

At the top of the chain are waste generators who generate UBCs and even sell these directly to bulk waste managers/large scale dealers, second in the row are waste collectors, that is, ragpickers and door-to-door collectors. Waste pickers collect waste from streets, waste bins, Dalhao, households (generators) and dumpsites and sell these to kabadiwalas or small-scale waste dealers, who in turn give immediate monetary return for the recyclables. Similarly, door-to-door collectors segregate recyclables at the very first stage. The collected waste is sorted and sold to small-scale waste dealers or kabadiwalas.

Kabadiwalas store the small quantities of waste contributed to them by door-to-door collectors, ragpickers, and directly from waste generators at their level. After collecting an economically viable quantity of recyclable wastes, they sell these to large-scale dealers nearby. The dealers provide immediate monetary value for the waste and sometimes even pay in advance to retain their suppliers.

Dealers further categorize waste as per the grade of paper/waste for fetching maximum monetary value. They either directly sell it to the paper mills or sell it to the wholesalers depending on the terms of payment and price offered.

Recycling units purchase segregated waste to prepare various products such as Kraft, floating media paper, moulded pulp tray etc. Through consistent interventions over the past 15 years, Tetra Pak has successfully managed to reinforce paper based cartons including straws, a lucrative raw material for paper mills and recyclers. Tetra Pak has roped in multiple agencies that are engaged in collecting segregated UBCs from ragpickers and kabadiwalas in various cities across different regions of the country. Once they collect sufficient quantities, these agencies supply UBCs to paper mills these agencies are contributing in active recycling of UBCs and have also been reported in analysis of recycling

rates of UBCs. This helps in reducing the carbon footprints as well as create jobs in our country.

5.1 Survey analysis

Till date, about 550 mills in India use waste paper as primary fibre source for paper, paperboard and newsprint production. This waste paper is sourced indigenously as well as through imports. The present recovery and utilisation of waste paper by paper mills in India is 3.0 million tonnes annually, which translates to a **recovery of 27% of the total paper** and paperboard consumed. This recovery rate is very low when compared to developed countries like Germany-73%, Sweden-69%, Japan-60%, Western Europe-56%, USA-49% and Italy-45%. According to some estimates, one tonne of recycled paper saves approximately 17 trees, 2.5 barrels of oil, 4100 Kilowatt hours of electricity, 4 cubic meters of landfill and 31,780 litres of water. In other words, it has been estimated that recycling one tonne of waste paper results in saving of 70% raw material, 60% coal, 43% energy and 70 % water, as compared to making virgin paper from wood[1]

Recycled cellulose fiber (RCF)/ waste paper(WP) is best suited as a raw material for following end products – - Newsprint - Duplex board - Kraft paper. Processing of waste paper to obtain a clean stock for paper making involves a number of cleaning stages to remove contaminants present in the waste paper, such as iron clips, latex, wax, inks, etc., and one of the major technological issue is the presence of high level of contaminants in imported waste paper, which requires appropriate process configuration with state-of-the-art technologies to produce a clean stock. Majority of the mills are lacking state-of-the-art processing technologies.

The requirement of Recycled fibre/Waste Paper as a raw material is sourced indigenously as well as through imports. The availability of indigenous waste paper is inadequate, as a result mills rely heavily on waste paper imports to meet the demand of raw material. Presently around 3.0 million tons of waste paper is sourced indigenously and 4.0 million tonnes is being imported. The share of imported waste paper is 57% of total RCF requirement.[2]

The average growth rate for this segment is estimated to be 7.8%, with relatively higher growth rate for packaging products i.e. duplex board and kraft paper. Paper board and newsprint production from RCF/WP is estimated to be 11.7 million tons by the year 2025.

The production of paper, paper board and newsprint from RCF/WP based industry by 2025 would be around 11.7 million tons and to achieve this the additional raw material requirement of RCF/ WP would be around 9.3 million tons. In a scenario where waste paper recovery remains static at **the current level of 27%,** the share of imported waste paper will be 52% and would require substantial foreign exchange component in manufacturing cost. In case the waste paper recovery levels are increased to 50%, through the adoption of a well-

[1] https://dipp.gov.in/sites/default/files/DiscussionPaper_Recycling_WastePaper_21October2011%20%208.pdf
[2] http://ipma.co.in/wp-content/uploads/2018/04/wg_paper.pdf

designed mechanism, the share of indigenous waste paper will be about 90% and will result in substantial cost advantage to the RCF based mills

Of the total 653 paper mills in operation more than two thirds of the mills use RCF/waste paper as the primary fiber source, contributing about 4.72 million tons per annum or 47% of the country's total production of paper/paper board and newsprint. (Nearly 1.33 tons of recycled/waste paper is required to produce one ton of paper.)

Table below highlights the city level waste generation, collection and paper fraction data collected from secondary sources.

Table 46: City level data on waste generation, collection and paper fraction

S.No	City Name	Total waste generation (TPD)	% paper of total waste generated	MSW collection rate by ULB
1.	Delhi	9620[3]	5.6[4]	86.27[4]
2.	Faridabad	450[5]	5.6[5]	83
3.	Lucknow	1500[6]	15[7]	62.5[8]
4.	Srinagar	649[9]	15.2	91[10]
5.	Jammu	350 [12]	10.38[11]	98.5[12]
6.	Kolkata	4837[13]	6.07[14]	90[15]
7.	Guwahati	550[16]	15.35[17]	88[17]
8.	Ahmedabad	3700[18]	4.0[19]	100[4]

[3] CPCB, (2016).Consolidated annual review report on implementation of Solid waste management rules 2016: 2015-16

[4] Kumar,A,. (2016). Existing situation of MSW in NCT of Delhi, India. International Journal of social sciences. (Vol 1, (1), pp 6-17. http://ijss.publicationsupport.com/docs/paper/Volume-1/issue_1/IJSS-104.pdf

[5] http://www.hpccc.gov.in/PDF/Solid_Waste/Current%20Status%20of%20MSW.pdf

[6] https://www.researchgate.net/publication/314892686_Assessment_of_the_status_of_municipal_solid_waste_management_MSWM_in_Lucknow_-_Capital_city_of_Uttar_Pradesh_India

[7] https://www.ijser.org/researchpaper/Solid-Waste-Management-and-Characteristics-in-Lucknow-Uttar-Pradesh-India.pdf

[8] http://www.iosrjournals.org/iosr-jestft/papers/vol8-issue5/Version-2/G08524149.pdf

[9] https://www.researchgate.net/publication/322405270_Municipal_Solid_Waste_Generation_and_its_Management_a_Growing_Threat_to_Fragile_Ecosystem_in_Kashmir_Himalaya

[10] CPCB (2018), Consolidated annual review report on implementation of Solid waste management rules 2016: 2017-18

[11] http://www.ipublishing.co.in/ijesarticles/fourteen/articles/volsix/EIJES6023.pdf

[12] https://www.researchgate.net/publication/315713828_SOLID_WASTE_MANAGEMENT_IN_JAMMU

[13] http://www.indiaenvironmentportal.org.in/files/file/Solid%20Waste%20Generation%20Kolkata.pdf

[14] http://www.ipublishing.co.in/ijesarticles/fourteen/articles/volsix/EIJES6112.pdf

[15] CPCB (2017), Consolidated annual review report on implementation of Solid waste management rules 2016: 2016-17

[16] https://assam.gov.in/en/main/Waste%20Management

[17] https://link.springer.com/chapter/10.1007%2F978-981-10-7290-1_32

[18] http://www.uncrd.or.jp/content/documents/25756-3R_City-Report_Ahmedabad_ref.doc1_MSWM-Master-Plan2031.pdf

[19] https://www.ijedr.org/papers/IJEDR1704015.pdf and https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=9&cad=rja&uact=8&ved=2ahUKEwjXraHdtbjiAhVaT30KHXIfDPsQFjAIegQIAxAC&url=http%3A%2F%2Fcarbonn.org%2Fuploads%2Ftx_carbonndata%2FFile5_Ahmedabad_SWM.pdf&usg=AOvVaw2KadERgEyoT1V596Ms_vGn

S.No	City Name	Total waste generation (TPD)	% paper of total waste generated	MSW collection rate by ULB
9.	Mumbai	8250[20]	7.52[21]	100[21]
10.	Pune	3315[21]	8[22]	100[21]
11.	Hyderabad	4200[23]	7.26[24]	90[11]
12.	Nagpur	504[26]	5[25]	60[26]
13.	Bengaluru	5680 [26]	8.8[27]	92.42 [27]
14.	Chennai	6404[28]	8.38[29]	95
15.	Mysuru	402[27]	7.77[30]	98 [27]
16.	Shimla	119 [30]	20.03[31]	78[32]
17.	Kurnool	330[33]	9.7[34]	64 (210)[35]
18.	Bhubaneswar	500[36]	8[37]	66
19.	Thiruvananthapuram	450	4.78[38]	72
20.	Chandigarh	500[11]	6[39]	92.6

Further, for analysing the recycling rates of Used beverage cartons the fraction of dealers dealing in UBC were evaluated, the same is depicted in table below.

[20] http://mpcb.gov.in/muncipal/pdf/Annual_Report_MSW_2017_18_30012019.pdf
[21] http://www.seas.columbia.edu/earth/wtert/sofos/DBSSRS_Article_-_WTE_INDIA_BRIEF_Revised.pdf
[22] http://www.unep.or.jp/ietc/GPWM/data/T1/IS_2_WasteQC_Pune.pdf
[23] https://www.ijert.org/research/muncipal-solid-waste-management-using-landfills-in-hyderabad-city-IJERTV4IS020842.pdf and https://timesofindia.indiatimes.com/city/hyderabad/hyderabad-tops-in-per-capita-waste-generation/articleshow/64515720.cms
[24] http://www.seas.columbia.edu/earth/wtert/sofos/DBSSRS_Article_-_WTE_INDIA_BRIEF_Revised.pdf
[25] https://www.researchgate.net/publication/304404429_Physiochemical_Analysis_and_Economic_Potential_of_MSW_from_Nagpur_City_Opportunities_under_Swachh_Bharat_Abhiyan
[26] https://www.kspcb.gov.in/Annual%20Report%20for%20the%20Year%202016-17-29112017.pdf
[27] http://www.elcita.in/upload/waste/Waste_Characterization_Study_Report.pdf
[28] chennai.citizenmatters.in/chennais-garbage-long-journey-ahead-to-sustainable-waste-management-129
[29] http://www.cmdachennai.gov.in/pdfs/SMP/H_Chap%20VIII_Soild%20Waste%20Management.pdf
[30] https://www.researchgate.net/publication/317889229_Management_of_waste_as_resource_in_Mysore
[31] http://www.hpccc.gov.in/PDF/Solid_Waste/Urban%20Solid%20Waste.pdf
[32] http://www.shimlamc.org/file.axd?file=2012%2f6%2fMSWM+Plan.pdf
[33] https://journalajst.com/sites/default/files/issues-pdf/5460.pdf
[34] https://globaljournals.org/GJRE_Volume12/3-Municipal-Solid-Waste-Management.pdf
[35] https://journalajst.com/sites/default/files/issues-pdf/5460.pdf
[36] https://timesofindia.indiatimes.com/city/bhubaneswar/bhubaneswar-pollution-panel-penalises-bmc-for-fire-at-waste-dump-yard/articleshow/62807984.cms
[37] http://forest.odisha.gov.in/pdf/Chap_9.pdf
[38] http://cds.edu/wp-content/uploads/2017/03/Sanitation_Dileep-Kumar.pdf
[39] http://www.hpccc.gov.in/PDF/Solid_Waste/Assessment%20of%20Solid%20Waste.pdf

Table 47: Fraction of dealers accepting UBCs.

S.No.	City	Large scale dealer
1.	Delhi	1.00
2.	Faridabad	0.75
3.	Lucknow	1.00
4.	Srinagar	0.40
5.	Jammu	0.43
6.	Kolkata	0.40
7.	Guwahati	0.00
8.	Ahmedabad	1.00
9.	Mumbai	0.50
10.	Pune	0.29
11.	Hyderabad	0.80
12.	Nagpur	0.86
13.	Bengaluru	0.86
14.	Chennai	1.00
15.	Mysuru	0.50
16.	Shimla	0.00
17.	Kurnool	0.75
18.	Bhubaneshwar	0.00
19.	Thiruvanthapuram	0.43
20.	Chandigarh	1.00

Further the percentage of UBCs found at the waste dealer level via bale analysis was evaluated and were used to found the recycling rates. The table below highlights the average percentage of UBCs analysed in mixed paper bales at the dealers in various cities.

Table 48: Average UBCs found in mixed waste paper at various waste dealers

S.No	City	Small scale Dealer	Large scale dealer	Average percentage of UBC
1.	Delhi	3.252%	1.808%	2.53%
2.	Faridabad	2.593%	0.872%	1.73%
3.	Lucknow	0.479%	0.827%	0.65%

S.No	City	Small scale Dealer	Large scale dealer	Average percentage of UBC
4.	Srinagar	0.010%	0.032%	0.02%
5.	Jammu	0.601%	1.304%	0.95%
6.	Kolkata	0.045%	0.033%	0.04%
7.	Guwahati	0.000%	0.000%	0.00%
8.	Ahmedabad	0.058%	0.088%	0.07%
9.	Mumbai	3.279%	14.75%	9.02%
10.	Pune	0.594%	1.755%	1.17%
11.	Hyderabad	6.812%	6.700%	6.76%
12.	Nagpur	0.047%	0.296%	0.17%
13.	Bengaluru	2%	6%	3.69%
14.	Chennai	0.863%	2.260%	1.56%
15.	Mysuru	5.080%	4.327%	4.70%
16.	Shimla	0%	0%	0.00%
17.	Kurnool	1%	0%	0.40%
18.	Bhubaneshwar	0%	0%	0.00%
19.	Thiruvanthapuram	0.103%	0.053%	0.08%
20.	Chandigarh	0.136%	0.152%	0.14%

Considering the fraction of waste paper analysed being around 50% of paper and cardboard market share, the quantity of waste generated in each city, the fraction of paper waste being generated and the percentage of waste collected by informal sector for recycling; the informal recycling rates have been established. The informal recycling rates are given in table below.

Table 49: Recycling rate calculation for UBCs

City Name	consumption of UBC in Tonnes/ annum (2018)	Total paper generation (MSW stream) per year	Percentage of UBC in waste paper (as per analysis)	respondents dealing in PCC	waste paper recovered by informal sector (27%)	fraction assumed for waste constituting UBC that was analysed	UBC collected by informal sector	active recycling TPA	active + inactive recycling	total Recycling rate	corrected recycling rate with limitation for 100% recycling	Total MSW waste generation (TPD)	% paper of total waste generated	MSW collection rate by ULB (%)
Delhi	4602	196633	0	100%	53091	0.5	672	1073	1745	0	1745	9620	6	86
Faridabad	406	9198	0	75%	2483	0.5	14	70	84	0	84	450	6	83
Lucknow	304	82125	0	100%	22174	0.5	72		72	0	72	1500	15	63
Srinagar	387	36007	0	40%	9722	0.5	0		0	0	0	649	15	91
Jammu	397	13260	0	43%	3580	0.5	7		7	0	7	350	10	99
Kolkata	553	107166	0	40%	28935	0.5	2		2	0	2	4837	6	90
Guwahati	791	30815	0	0%	8320	0.5	0		0	0	0	550	15	88
Ahmedabad	167	54020	0	100%	14585	0.5	5	32	37	0	37	3700	4	100
Mumbai	2765	226446	0	50%	61140	0.5	1378	294	1672	1	1672	8250	8	100
Pune	577	96798	0	29%	26135	0.5	44	214	258	0	258	3315	8	100
Hyderabad	1244	111296	0	80%	30050	0.5	812	179	991	1	991	4200	7	90
Nagpur	103	9198	0	86%	2483	0.5	2		2	0	2	504	5	60
Bengaluru	4043	182442	0	86%	49259	0.5	780	2470	3250	1	4043	5680	9	92
Chennai	659	195879	0	100%	52887	0.5	413	17	430	1	430	6404	8	95

Mysuru	541	11401	0	50%	3078	0.5	36	2559	2595	5	541	402	8	98
Shimla	294	8700	0	0%	2349	0.5	0		0	0	0	119	20	78
Kurnool	85	11684	0	75%	3155	0.5	5	1	6	0	6	330	10	64
Bhubaneswar	54	14600	0	0%	3942	0.5	0		0	0	0	500	8	66
Thiruvananthapuram	170	7851	0	43%	2120	0.5	0		0	0	0	450	5	72
Chandigarh	130	10950	0	100%	2957	0.5	2	62	64	0	64	500	6	93
	18272						4245	6971	11216	61%	**54%**			

Therefore, the recycling rate for UBCs have been evaluated to be about 54%. Thus, to simplify every second carton of UBC produced gets recycled in India.

5.2 Economic Analysis

As a part of the survey, value chain was also analysed to identify the market price of mixed paper and UBCs. The price range has been analysed in table below.

The table below summaries the selling value obtained by every agent in the informal sector on account of dealing in UBCs for the survey cities.

Table 50: Summary of value obtained (in Indian Rupees per Kg) on account of dealing in UBCs.

Cities	Rag Pickers	Small scale waste dealers	Large scale waste dealers	Paper Mil
Ahmedabad	2	1.0-4.0		
Bengaluru	2.0-6.0	6.0-7.0		
Bhubaneswar				
Chandigarh	3.0-3.5	5		
Chennai	2	3.0-4.0	5.0-7.0	
Delhi	2.0-7.0	3.0-9.0	7.0-15.0	
Faridabad	1.0-10.0	2.0-5.0	3.0-8.0	
Guwahati				
Hyderabad	2.0-6.0	2.0-12.0	3.0-9.0	
Jammu	1.5-5.0	3.0-4.5	5	11-12*
Kolkata	2	2.0-5.5		18*
Kurnool	4.0-5.0	0-8.0*		
Lucknow	4.0-5.0*	1.0-6.5*		
Mumbai		8	8	
Mysuru	3.5-5.0	6.0-7.0*	11.5*	
Nagpur	6	12.0-13.0*	8.0-20.0*	
Pune	4.0-6.0	6.0-10.0	7.0-12.0	
Shimla				
Srinagar	2.0-6.0	5.50-7.0	6.0-12.0	
Thiruvananthapuram		2.0-5.0	5.0-8.50	

* UBC rate when sold along with mixed paper
\- data not available/UBCs not acceptable

It has been reported that India produced about 17.5 million metric tons of paper and board in 2018, and it used recovered fiber to produce 65 percent of that volume. Of the 13.5 million metric tons of scrap paper consumed by India's mills in 2018, 7.5 million metric tons (about 55.6 percent) was imported.*40* India's import activity in 2018 increased because of a "price incentive" caused by the declining value of mixed paper and some old corrugated container (OCC) grades on the global market, prompted by China's stricter standards for recovered

[40] https://www.recyclingtoday.com/article/indias-recycling-growth-story/

fiber imports. Experts say, "The volumes of [exported] recovered paper to India will gradually keep going up as the optimal use of installed capacities and the restart of stalled capacities gets underway".

UBCs being paper based cartons, serve as a good source of paper and are well suited to meet the growing needs of recovered paper in India. They have virgin long fibre (soft wood fibre) comparable to the fibre contained in the American OCC that can be recycled easily & multiple times as also certified by Central Pulp & Paper Research Institute (CPPRI), a leading government body.

5.3 UBCs going to the dumpsite

Table below summarizes the computations for the dumpsite.

Table 51: Summary of the sampling at the dumpsite

City	MSW Generated(TPD)	MSW Collected (%)	MSW Collectes (TPA)	UBC found(%)	UBCs found (TPA)
Ahmedabad	3700	100	1350500	0.003%	40.515
Bengaluru	5680	92.42	1916051	6.310%	120902.8
Bhubaneswar	500	66	120450	0.084%	101.178
Chandigarh	500	92.6	168995	0.005%	8.44975
Chennai	6404	95	2220587	0.340%	7549.996
Delhi	9620	86.27	3029199	0.026%	787.5916
Faridabad	450	83	136327.5	0.118%	160.8665
Guwahati	550	88	176660	1.250%	2208.25
Hyderabad	4200	90	1379700	0.436%	6015.492
Jammu	350	98.5	125833.8	0.254%	319.6177
Kolkata	4837	90	1588955	2.110%	33526.94
Kurnool	330	64	77088	0.019%	14.64672
Lucknow	1500	62.5	342187.5	0.01%	34.21875
Mumbai	8250	100	3011250	7.029%	211660.8
Mysuru	402	98	143795.4	0.388%	557.9262
Nagpur	504	60	110376	0.325%	358.722
Pune	3315	100	1209975	0.065%	786.4838
Shimla	119	78	33879.3	0.216%	73.17929
Srinagar	649	91	215565.4	0.250%	538.9134
Thiruvananthapuram	450	72	118260	0.127%	150.1902

The analysis depict that the mean value of UBCs found in MSW was 0.65% (excluding Mumbai data) with a standard deviation of 1.464 percent and best estimate of uncertainty as 0.345%. Hence we can represent the average percentage along with best estimate of uncertainty as 0.65±0.345 %

However, the amount of UBCs present in the MSW, as found by this exercise, may slightly vary as waste composition changes with season to season as well as during festivals.

5.4 UBCs at Paper Mills

The summary of the sampling carried out at paper mills is given in Table 52.

Table 52: UBCs recycling rate based on the sampling at the paper mills

Region	Name of the mill	Do you get UBCs in mixed paper?	Total paper waste sampled (in Kgs)	UBCs found (in kg)
Kolkata	Madhubate paper pulp Ltd.	Yes	2500	—
Guwahati	Eco Techpaper		5000	—
Jammu	Jammu paper pvt. Ltd.	Yes	1200-1300	—
Bhubaneswar	Khandagiripulp pvt. Ltd.		200	—
Pune	New Balaji paper board mill	Yes	1800-2000	0.6

Five paper mills were surveyed in 5 different cities and it was reported that 60% of these mills were receiving UBCs. However, none of them dealt with UBCs separately and they didn't mind getting it in mixed paper waste since UBC has virgin fibre & comes in insignificant quantities mixed with paper.

The total mixed paper waste collected and processed per month was around 200 Tonnes to 5000 Tonnes. The purchase price of mixed waste paper was reported to be 11 to 18 Rs/kg by these mills.

These mills have been involved in manufacturing products like Kraft (40% of them), floating media paper, moulded pulp tray and grey board, without the involvement of UBCs in these end products. 80% of the respondents reported that around 20kg to 60000 kgs per month of material from pulper is rejected.

When asked about the fate of these rejected material, the following response was recorded:

1. Goes to secondary manufacturers
2. Used in reprocessing of Furness
3. Gets disposed with industrial waste

The issues mentioned by the respondents for recycling UBCs separately are:

1. Processing of UBCs is a time consuming and labour intensive
2. Quantity received is less
3. Handling poly-aluminium is a challenge for them. Without right technology & systems, pulping UBCs would take more time resulting in higher costs including electricity

The respondents suggested a few suggestions that can improve the collection and recycling process of UBCs which are:

1. Up gradation of systems is essential for recycling and processing of UBCs
2. Awareness generation and stricter implementation of regulations for segregated collection of waste can increase the volume of UBCs entering the recycling stream.
3. Segregation of UBCs should be done at the source, as it helps maintain the quality of collected UBCs.

5.5 Material Balance

UBCs travels from consumers to ragpickers or door-to-door collector and thereby to kabadiwalas. The kabadiwalas sell these to large-scale dealers or wholesalers, and further go recycling. The UBCs remaining uncollected and unrecovered although in miniscule quantity move to the dumpsite. The number of UBCs entering the environment is estimated in the material balance chart given in Figure 62.

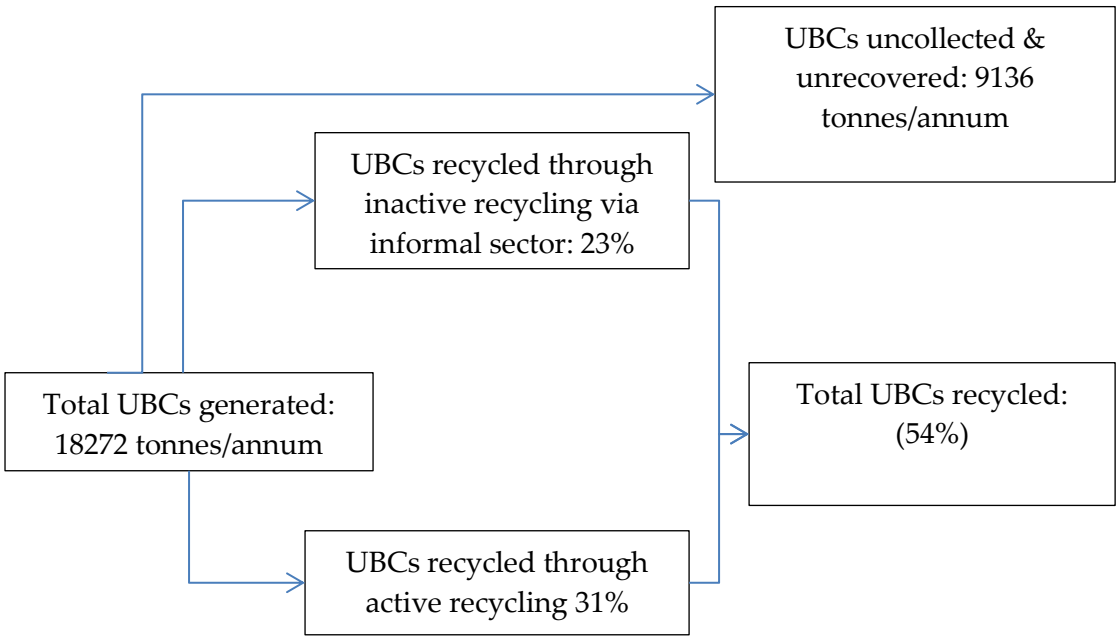

Figure 66: UBC Management in India

6 Recommendations

The recycling rates are governed by economics and are directly proportional to the presence of a good market for UBCs in the city. As per the past reports executed by TERI on UBC management, it was found that the recycling rate was 29% in 2011, 43% in 2015, and has been found to increase further to 54% now in 2019. The recycling rates have increased due to interventions of Tetra Pak working with numerous recyclers and associations to develop solutions, technologies and applications of UBCs. Due to these interventions, the quantity of UBCs going along with mixed paper has reduced and separate collection and recycling of UBCs have been achieved especially in cities like Delhi, Ahmedabad, Mumbai, Pune, Hyderabad, Bengaluru, Chennai, Chandigarh, Mysuru, and Faridabad.

Few of the key points that can be beneficial and help in improving the recycling rate of UBCs are as follows:

1. As compared to the 2015 study, UBCs collected by informal sector in cities of Ahmedabad, Hyderabad and Bengaluru has reduced and viz-a-viz UBCs entering into formal active recycling has increased. This indicates the impact of interventions by Tetra Pak to make UBCs sustainable. There is a further need to get the UBCs into active recycling chain as this will not only increase the market potential but will also reduce the number of stakeholders involved in recycling chain. This will increase the price value for those on the front end of the recycling value chain i.e. waste collectors.
2. In cities of Jammu, Kolkata and Guwahati there is an urgent attention required, as due to the lack of acceptance of UBCs by paper mills, the amount of UBCs collected by informal sector has substantially reduced. Active UBC collection and tie ups with recycling units can help again push UBCs collection and recycling in these cities.
3. Pertaining to other surveyed cities, acceptability of UBCs via paper mills is the first key imperative that can help improve the UBCs acceptability among waste dealers. This will require information, education and capacity building activities with paper mills along with a strong business case depicting profitability scenarios through fibrous contents of paper based UBCs.
4. A separate collection centres for UBCs should be made of which should be linked with material recovery facilities (existing/coming up under the Solid Waste management rules 2016) to facilitate active recycling of UBCs
5. More awareness among waste generators, waste collectors, small and large scale waste dealers can help in segregation of UBCs at source along with straws, however this should have a concerted effort by each stakeholder in the value chain i.e. govt, NGOs, industry, etc
6. Higher prices of UBCs can effectively drive the informal recycling and increase recycling rates. Higher prices can be achieved in two ways a) by reducing the chain for collection and recycling and b) Upcycling UBCs through different products and interventions like sheets being used for making mobile toilets/ material recovery facilities etc.
7. The management of UBCs should be further studied and successful lessons should be replicated at other places
8. Such an exercise (to study the management of UBCs in major cities and identify the recycling rates) may be repeated in every 3 years to assess the improvement in recycling rates.

Annexures

Questionnaire: Waste Generator

Questionnaire 1.0 (Waste Generator)		
S.No	Questions	
1	City Name	
2	Date of survey (DD/MM/YYYY)	
3	Category	Waste generator
4	Name of Interviewer	
5	Name of Supervisor	
6	Name of Candidate surveyed	
7	**Type of waste generator**	
	a. market	
	b. Institute	
8	**Address**	
9	**Contact Number /cell number**	
10	**What quantity of waste do you generate per month (kgs)?**	
11	Total average dry waste (including cartons) generated per month (kgs)	
12	What is the approximate quantity of UBC generated per month? (kgs)	
13	**Do you segregate waste?**	
	a. yes	
	b. no	
14	**Do you segregate Used beverage carton (UBC) seperately ?**	
	a. Yes	
	b. No	
15	**If answer to Question (14) is (a). How do you sell/dispose UBC?**	
	a. Sell to kabadi seperately	
	b. sell to kabadi mixed with mixed paper	
	c. gets disposed with municipal solid waste	
	d. there is a particular UBC collector that collects this?	
16	**If answer to Question (14) is (b). Why is UBC not segregated ?**	
	a. No One buys UBC	
	b. There is no incentive in UBC collection	
	c. Other.. (please specify)	
17	Per kg price of UBC you get ?	
18	Per kg price of recyclables you get?	
	a. mixed paper	
	b cardboard	
	c. UBC (if sold seperately)	

	d. what is the per kg price of dry waste (in case whole dry waste is sold together) you get?	
19	**Specify the fate of UBC you generate.**	
20	**Anything that discourages you from segregating UBCs**	
21	**What will motivate you for segregating UBCs ?**	

Questionnaire: Waste Collector

Questionnaire 2.0 (Waste Collector)		
S.No	**Questions**	
1	City	
2	Date of survey (DD/MM/YYYY)	
3	Category	Ragpicker / door to door waste collector
4	Name of Interviewer	
5	Name of Supervisor	
6	Name of Candidate surveyed (with domicile)	
7	**Type of waste collector**	
	a. ragpicker	
	b. door to door collector	
8	**Address**	
9	**Contact Number /cell number**	
11	**Name of area covered for collection of waste (also mention category: residential/commercial/institutional) and Ward and Zone of city**	
a		
b		
c		
d		
e		
f		
g		
h		
12	**What all dry waste you collect for recycling**	
	a. paper	
	b. plastic	
	c. glass	
	d. metal	
13	**Do you collect Used beverage carton (UBC)?**	
	a. Yes	
	b. No	
14	**If answer to Question (13) is (a). How do you collect UBC?**	
	a. Separate UBC collected	
	b. UBC collected mixed with paper/cardboard	
15	**If answer to Question (13) is (b). Why is UBC not collected ?**	
	a. no One returns UBC to us	
	b. there is no incentive for UBC collection	
	c. there is no buyer/market for UBC collection	
	d. other.. (please specify)	

16	Average UBC collected per month (Kgs) ?	
17	Average mixed waste Paper collected per month (including UBC) (kgs)?	
18	Per kg selling price of UBC ?	
19	Per kg selling price of mixed paper ?	
20	**Source of procurement of mixed waste paper(including UBC)**	
	a. Household	
	b. street	
	c. Waste bins	
	d markets	
	d. Others	
21	**From where do you get UBCs ?**	
	a. Upper and middle class localities	
	b. Lower income localities	
	c. Commercial or Business establishments	
22	**Condition of UBC collected**	
	a. Most do not contain leftover juice	
	b. Most often soiled	
	c. Clean and Ready for sale	
23	**Specify the fate of UBC (if collected)**	
24	**Anything that discourages you from dealing in UBCs**	
25	**Any comment on how could the collection and recycling of UBCs be improved.**	
26	**What can motivate you for collecting UBCs**	

Questionnaire: Small scale waste dealer

Questionnaire 3.0 (Small Scale Waste Dealer who supplies to large scale dealers and Quantity handled <50 Tonnes/month of mixed paper		
S.No	Questions	
1	City	
2	Date of survey (DD/MM/YYYY)	
3	Category	Small scale scrap dealer
4	Name of Interviewer	
5	Name of Supervisor	
6	Name of Candidate surveyed (with domicile)	
7	Type of waste collector	
8	**Address**	
9	**Contact Number/Cell number**	
10	**Type of area covered and zones for collection of waste (residential, commercial, institutional)**	
a		
b		
c		
d		
11	**No. of kabadi/ragpicker contributing (from which you purchase)**	
12	**Total Average mixed paper waste collected per month (kgs)**	
13	**Do you collect Used beverage carton (UBC)?**	
a	**If yes? Do you collect seperately or with mixed paper?**	
b	**If no? reason for not collecting**	
14	**UBC collected per month (kg)**	
15	**Per kg purchase price of UBC (per kg) ?**	
16	**Per kg purchase price of mixed paper (per kg) ?**	
17	**What is the selling price of UBC you get (per kg) ?**	
18	**What is the selling price you get for paper (per kg)?**	
19	**Source of procurement of UBC**	
	a. household	
	b. ragpicker	
	c. door to door collector	
	d. intermediate Kabadi	
	e. others (hotels, shopping malls, ,markets etc.)	
20	**Condition of UBC collected**	
	a. Most contain leftover juice	
	b. Most often soiled	
	c. Clean and ready for sale	
21	**Do you process/treat UBC before selling**	
	a. Yes, (if yes, what processing do you do?)	
	b. No	

22	**What do you do with the polyal if seperated (during processing)?**	
23	**Specify the fate of UBC you get?**	
	a. Sell this to larger dealer	
	b. Sell this to recycler,	
	c. Sell this along with mixed paper,	
	d. other….(please specify)	
24	**Anything that discourages you from dealing in UBC ?**	
25	**Any comment on how could the collection of UBC be improved ?**	
26	**bale analysis: (4 bales to be analysed of about 100-150 kg each)**	
	a. kg of mixed paper waste bales	
	b. kg of UBC	

Questionnaire: Large Scale Waste Dealer

Questionnaire 4.0 (Large Scale Waste Dealer- who supplies to recycler and Quantity handled ≥ 50Tonnes/month of mixed paper		
S.no	Questions	
1	City	
2	Date of survey (DD/MM/YYYY)	
3	Category	Large scale scrap dealer
4	Name of Interviewer	
5	Name of Supervisor	
6	Name of Candidate surveyed (along with domicile)	
7	Type of waste collector	
8	**Address**	
9	**Contact Number/Cell number**	
10	**Type of area covered and zones for collection of waste (residential, commercial, institutional)**	
a		
b		
c		
d		
11	**No. of kabadi/ragpicker contributing (from which you purchase)**	
12	**Total Average mixed paper waste collected per month (kgs)**	
13	**Do you collect Used beverage carton (UBC)?**	
a	**If yes? Do you collect seperately or with mixed paper?**	
b	**If no? reason for not collecting**	
14	**UBC collected per month (kg)**	
15	**Per kg purchase price of UBC (per kg) ?**	
16	**Per kg purchase price of mixed paper (per kg) ?**	
17	**What is the selling price of UBC you get (per kg) ?**	
18	**What is the selling price you get for paper (per kg)?**	
19	**Source of procurement of UBC**	
	a. household	
	b. ragpicker	
	c. door to door collector	
	d. intermediate Kabadi	
	e. others (hotels, shopping malls, ,markets etc.)	
20	**Condition of UBC collected**	
	a. Most contain leftover juice	
	b. Most often soiled	
	c. Clean and ready for sale	
21	**Do you process/treat UBC before selling**	
	a. Yes, (if yes, what processing do you do?)	
	b. No	

22	**What do you do with the polyal if seperated (during processing)?**	
23	**Specify the fate of UBC you get?**	
	a. Sell this to larger dealer	
	b. Sell this to recycler,	
	c. Sell this along with mixed paper,	
	d. other….(please specify)	
24	**Anything that discourages you from dealing in UBC ?**	
25	**Any comment on how could the collection of UBC be improved ?**	
26	**bale analysis: (4 bales to be analysed of about 100-150 kg each)**	
	a. kg of mixed paper waste bales	
	b. kg of UBC	

Questionnaire: Dumpsite Analysis

Questionnaire 5.0 (Dumpsite Analysis)		
S.No	Questionnaire	
1	City	
2	Date of survey (DD/MM/YYYY)	
3	Name of Interviewer	
4	Name of Supervisor and designation	
5	Name of ULB official present (with designation)	
6	Truck Registration Number	
7	Type of waste collected	
	a. residential	
	b. commercial	
	c. institutional	
8	Route of present waste collection	
9	Location of Survey (dump site name)	
10	lattitude & Longitude of survey	
11	Driver details	
12	Cell Number	
13	Average quantity of waste collected per truck per trip (short description).	
14	Total no of trips per day	
15	Total number of trips per month	
16	Time of survey and comment	
17	**Total waste load in kgs**	
18	**Total mixed paper load (kgs)**	
19	**Total Quantum of UBC in kgs**	
20	Other observations	

Questionnaire: Paper Mill

Questionnaire 6.0 (Paper Mill)		
S.No	Questionnaire	
1	City	
2	Date of survey (DD/MM/YYYY)	
3	Name of paper mill and contact person	
a	Paper Mills contact person designation	
4	Address	
5	Contact number and email	
6	Cell number	
7	Name of interviewer	
8	Total average mixed paper waste collected and processed per month (in kgs)	
a	Do you get UBC in mixed waste paper ? (yes/No)	
b	Do you accept UBC separately ? (Yes/No)	
9	Type of end product (paper and board manufactured by you)? (Duplex/Kraft/other… please specify)	
a	Which product do you use UBC in ?	
10	Price of mixed paper you buy (INR/kg)	
11	Price of UBC you buy (INR/kg)	
12	**Who all are your suppliers ?**	
a	**Mixed waste paper**	
b	**UBC**	
13	**Which sources contribute mixed waste paper UBC to your suppliers?**	
	a. institution	
	b. commercial	
	c. residential	
	d. other	
14	**Which region contributes ?**	
	a. Mixed waste paper	
	b. UBC	
15	Total mixed paper load in the truck (in kgs)	
16	Total quantity of UBC in kgs found in mixed paper truck at paper mill	
17	Total quantity of rejected material from pulper in a paper mill (kg/month)	
18	Total quantity of UBC rejected during pulping (kg/month)	
19	Fate of pulper rejected material	
20	Fate of UBC rejected material	
21	Other observations	
22	Anything that discourages you from dealing in UBCs	
23	Any comment on how could the collection of UBCs be improved	

About TERI

TERI is an independent, multi-dimensional organization, with capabilities in research, policy, consultancy and implementation. We are innovators and agents of change in the energy, environment, climate change and sustainability space, having pioneered conversations and action in these areas for over four decades.

We believe that resource efficiency and waste management are the keys to smart, sustainable and inclusive development. Our work across sectors is focused on; a)Promoting efficient use of resources, b)Increasing access and uptake of sustainable inputs and practices, and c)Reducing the impact on environment and climate.

Our research, and research based solutions have had a transformative impact on industry as well as communities. We have fostered international collaboration on sustainability action by creating a number of platforms and forums. We do this by translating our research into technology products, technical services, as well as policy advisory and outreach.

Headquartered in New Delhi, we have regional centres and campuses in Gurugram, Bengaluru, Guwahati, Mumbai, Panaji , and Nainital. Our 1200-plus team of scientists, sociologists, economists and engineers delivers insightful, high quality action-oriented research and transformative solutions supported by state- of-the-art infrastructure.

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