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Post-Consumer Tetra Pak Cartons (PCCs) Management

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The Energy and Resources Institute

...towards global sustainable development

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Executive Summary

Tetra Pak is a multinational company that develops, manufactures, and markets systems for processing, packaging, and distributing food products. Tetra Pak cartons are primarily made from paper. A Tetra Pak carton is composed of 75% paperboard, 20% polyethylene, and 5% aluminium. As part of environmental initiatives, Tetra Pak has undertaken various activities for collecting and recycling Post-Consumer Tetra Pak Cartons (PCCs) and is working with non-governmental organizations (NGOs) and waste pickers to segregate PCCs.

The overarching objective of this study is exploring the collection and recycling practices of PCCs and the current quantum of Tetra Pak cartons procured/ retrieved by waste dealers. Also to assess the actual quantum of PCC reaching paper mills that recycle paper from low-grade paper waste and fate of pulping rejects. Value chain and economics in collection and recycling was also studied. These studies also helped in understand the quantity of PCCs reaching dumpsites. Ultimately this predicts the needs to upscale collection and recycling: economics, awareness, infrastructure, and so on.

The survey design was comprehensive and exhaustive enough to capture the overarching scope and facilitate the objectives of the study. Survey partners were identified in each of the identified cities for conducting survey as per the scope given to them. The survey partners were asked to take photographs and film the critical parts of the sampling exercise. TERI professionals visited each survey partner in their respective city to guide the survey teams and supervise the exercise.

The study revealed that the PCC are collected by ragpickers, small scale waste paper dealers, large scale dealers and sent to recycling units. The outcomes of the study revealed the percentage of respondents dealing and PCC and have been depicted in figure 1. Kolkatta, Guwahati and Hyderabad revealed that 100% of the respondents at all three levels were dealing in PCC

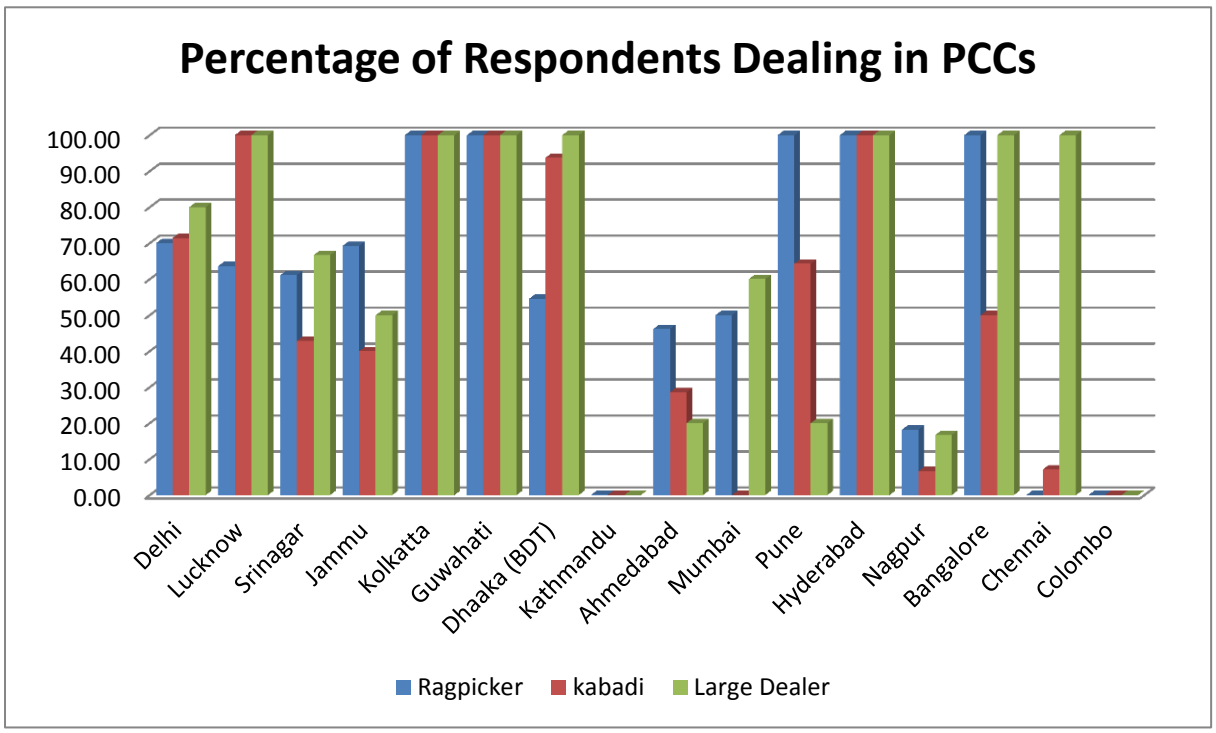

Figure 1: Respondents dealing in PCC at survey cities

Samples at large scale waste dealers were analyzed as per the scope of survey and revealed more than 10% fraction of PCC in waste paper bales in cities of Bangalore, Dhaka. The possible reasons for high fraction of PCC in these two cities is attributed to high price and acceptability for recycling of PCC in both the cities which even attracts small waste dealers from outside city to sell PCCs to large scale dealers. The analysis results are shown in figure 2.

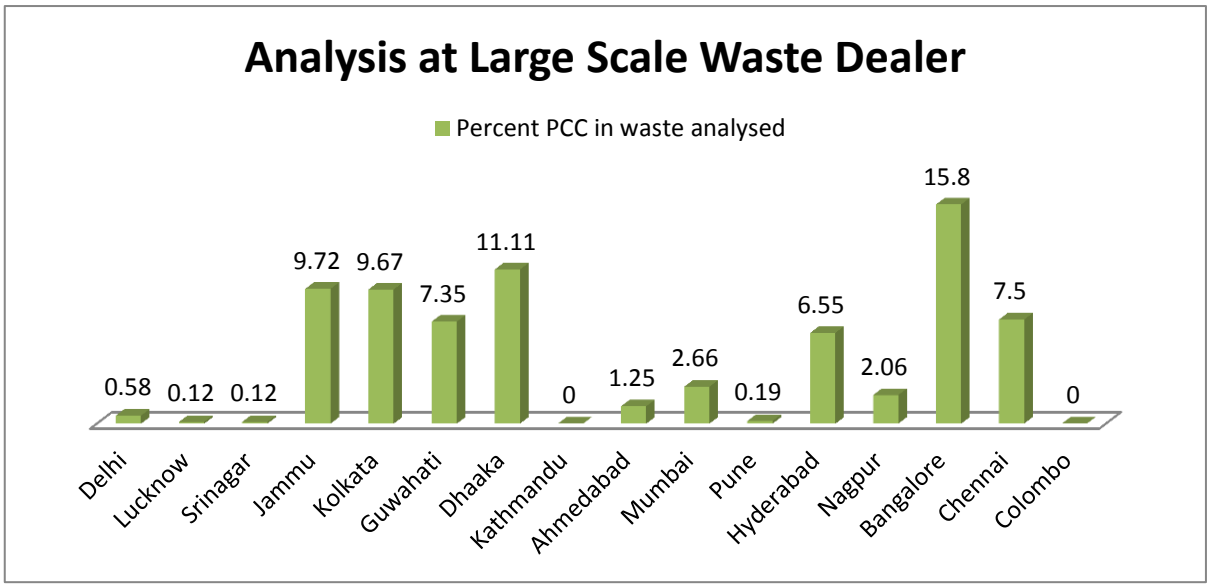

Figure 2 Percentage of PCC analyzed at large scale waste dealer level.

Survey revealed that in cities of Kolkata and Guwahati PCC was treated before selling by separating aluminium and paper and aluminium was sold at a high price of Rs 45 to Rs 60 per Kg. The recycling rates were worked out with two scenarios of 26% and 29% recovery rates by informal sector revealing an overall recycling rate of 42.85 percent and 45.52 percent respectively. The results are as in figure 3 and figure 4.

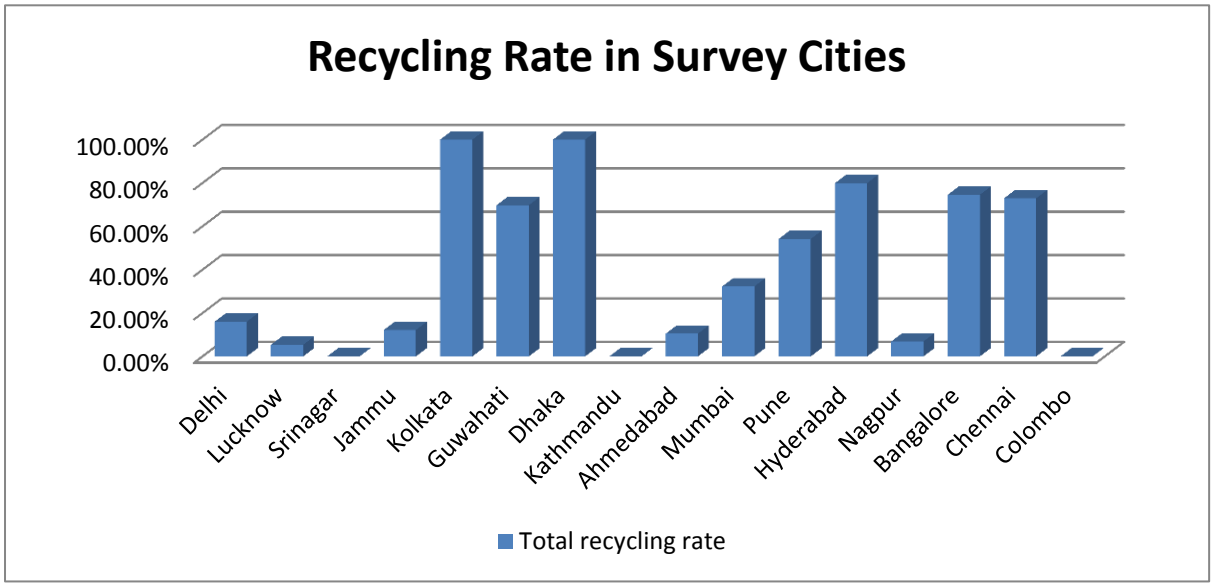

Figure 3: Recycling rate with 26% recovery by informal sector

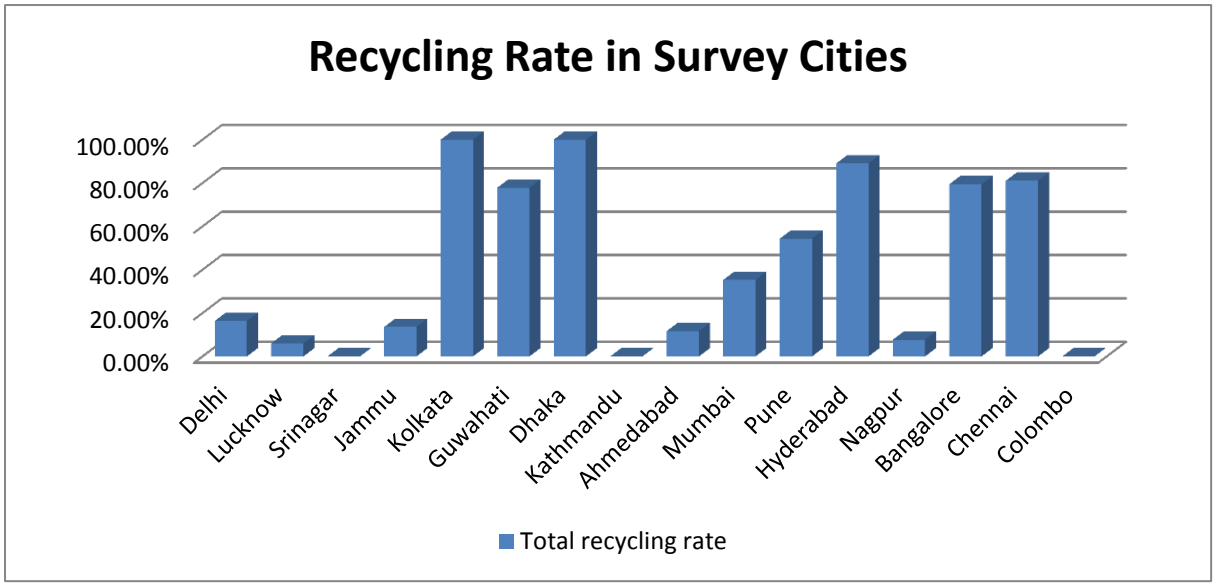

Figure 4: Recycling rate with 29% recovery by informal sector

Study also revealed that PCCs reaching paper mills was 0.36 percent of the total paper received by the mill. On an average PCCs reaching dumpsite was 0.343 percent of total waste reaching dumpsite.

Based on the study conducted TERI recommends the following:

1. PCC management can be effectively increased in cities with no or low market by developing markets in these cities. Active recycling has significant contribution in the overall recycling of PCCs. Hence, efforts should be made to upscale the capacity of the existing collection centres and to install more such centres in other cities.
2. PCC management can be more efficient if the chain is small and there is better price in the market for the collectors.
3. Awareness among recyclers about the potential for using PCCs is important. This should be done by highlighting statistics and case studies of mills consuming PCCs for paper production.
4. R&D should be carried out for efficient technologies for separating paper from PCCs and usage of polyethylene and aluminium recovered thereafter. Paper mills and recyclers should also be involved so as to create a better market.
5. Kolkata, Guwahati, Hyderabad and Chennai reported the highest informal recycling rate for PCCs. Many ragpickers in Kolkatta and Guwahati reported that they separated paper and aluminium from the PCCs before selling them to kabadiwalas. The management of PCCs should be further studied and lessons should be replicated at other places along with proper environmental pollution control measures.
6. Such an exercise (to study the management of PCCs in major cities and identify the recycling rates) may be repeated in every 3 years to assess the improvement in recycling rates.

Post-Consumer Tetra Pak Cartons (PCCs) Management

Background

Tetra Pak is a multinational company that develops, manufactures, and markets systems for processing, packaging, and distributing food products. Along with DeLaval and Sidel, it is one of the three companies in the Tetra Laval Group, a private corporation of Swedish origin and headquartered in Switzerland. Tetra Pak develops a range of packages that protect both the nutritional value and the taste of the products inside. It produces packaging materials for fruit drink brands such as Tropicana, Real, Active, Frooti, Slice, and Mazaa as well as for milk and milk products for companies such as Amul and Nestle. Its corporate office in Gurgaon takes care of the South Asian market comprising India, Bangladesh, Sri Lanka, and Nepal. In 2014, about 1441 million litres of products in around 5893 million Tetra Pak packages were sold in the South Asian market.[1]

Tetra Pak cartons are primarily made from paper. A Tetra Pak carton is composed of 75% paperboard, 20% polyethylene, and 5% aluminium. As part of environmental initiatives, Tetra Pak has undertaken various activities for collecting and recycling Post-Consumer Tetra Pak Cartons (PCCs) and is working with non-governmental organizations (NGOs) and waste pickers to segregate PCCs. With the aim to ensure that PCCs are retrieved and recycled responsibly and that no carton ends up at the landfill, Tetra Pak conducted several studies in the past. These studies revealed PCC recycling rate of 28.78 percent to 35.07 percent in year 2011.

Introduction

The overarching objective of this study is exploring the collection and recycling practices of PCCs in the cities given in Table 1.

Table 1 Survey cities under the study

S.No	City	S.No	City
1	Delhi	9	Ahmedabad
2	Lucknow	10	Mumbai
3	Srinagar	11	Pune
4	Jammu	12	Hyderabad
5	Kolkata	13	Nagpur
6	Guwahati	14	Bengaluru
7	Dhaka	15	Chennai
8	Kathmandu	16	Colombo

[1] http://www.tetrapak.com/in/about-tetra-pak/tetra-pak-sam/facts-and-figures

The sub-objectives of the study are as follows:

- Study the current quantum of Tetra Pak cartons procured/retrieved by waste dealers.
- Assess the actual quantum of Tetra Pak cartons reaching paper mills that recycle paper from low-grade paper waste.
- Assess the quantum of pulping rejects from low-grade paper waste in paper mills.
- Understand the value chain and the economics involved in the collection and recycling of Tetra Pak cartons.
- Understand the composition of paper waste and the quantity of Tetra Pak reaching dumpsites in the surveyed cities.
- Gauge what is needed, according to critical stakeholders (low-grade paper waste dealers and recycling paper mills), to upscale collection and recycling: economics, awareness, infrastructure, and so on.

Methodology

The overall approach of the study is depicted in figure 5.

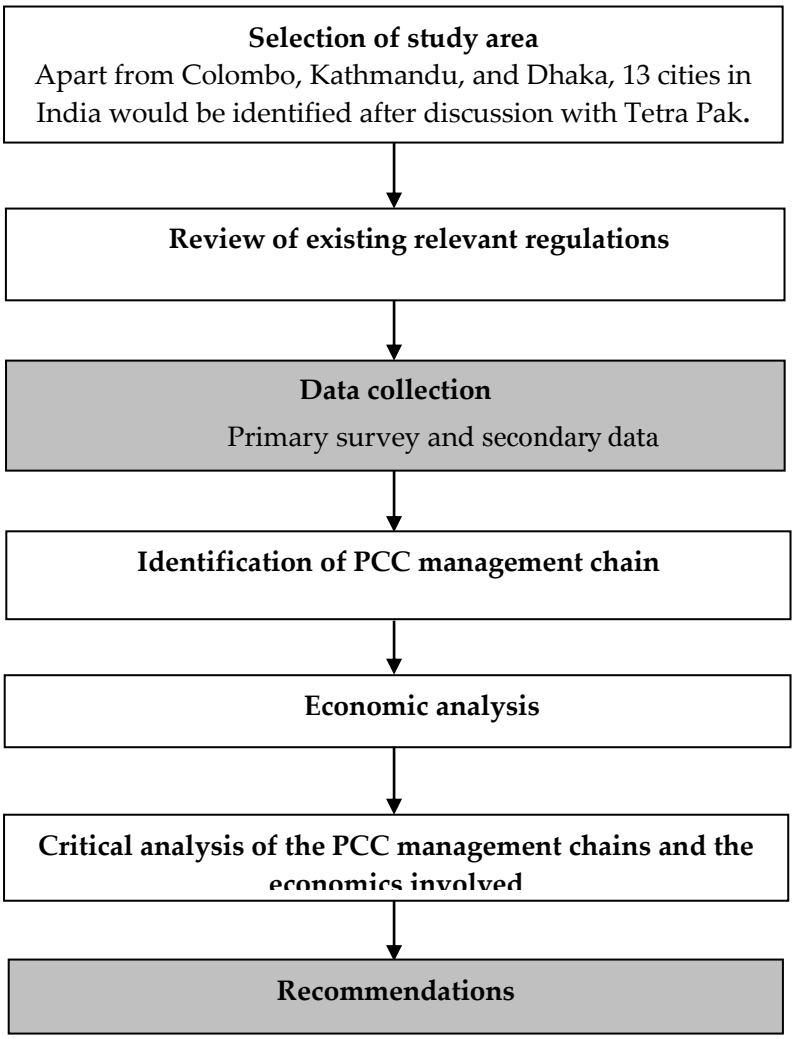

Figure 5 Overall approach of the study

The overall study components would comprise the following activities:

Review of Existing Relevant Regulation

Although the present environmental regulations cover many waste streams such as municipal solid waste, e-waste, and plastic waste (especially thin poly bags), there is no coverage of wastes such as PCCs. Therefore, a regulatory mechanism is required to facilitate the segregated collection and recycling of PCCs to minimize their present environmental footprint.

Primary Survey

Design of the Survey

The survey design was comprehensive and exhaustive enough to capture the overarching scope and facilitate the objectives of the study. Survey partners were identified in each of the identified cities and were provided with the following scope of work.

Questionnaire Survey

The scope of the work included a questionnaire survey of the key stakeholders—ragpickers, small and large kabadiwalas (junk dealers), low-grade paper waste dealers, waste-paper-based paper mills, and trucks carrying waste to dumpsites. The sample size was 33 and included at least 10 ragpickers, 14 small and medium-level waste dealers, s, 5 large-scale low-grade paper waste dealers, and 1 waste-paper-based paper mill as well as 3 trucks reaching dumpsites each from residential, commercial, and institutional areas. The Energy and Resources Institute (TERI) prepared the questionnaire after an exhaustive deliberation with Tetra Pak and provided it to survey partners. The questionnaire is attached as Annexure 1 in this report.

Analysing PCCs in Mixed Solid Waste

A sampling exercise was designed for each city with the following scope:

- Five large-scale low-grade paper waste dealers to be identified in the city and 2 bales (1 bale = 100 kg) to be checked to find the quantum of PCCs in each.
- One landfill site to be identified in the city; three truckloads of municipal solid waste (from residential, institutional, and commercial areas) brought to the landfill/dumpsite to be checked and sorted out to find the quantum of PCCs in each.
- One waste-paper-based paper mill to be identified around the city; few bales from one truckload of waste paper brought to the paper mill to be checked and sorted out to find the quantum of PCCs in the truckload.

The survey partners were asked to take photographs and film the critical parts of the sampling exercise. TERI professionals visited each survey partner in their respective city to guide the survey teams and supervise the exercise.

Survey Partners

Delhi—Development Links Foundation

The Development Links Foundation is an NGO registered under the Societies Registration Act 1860. It is an initiative to create synergy between various components, resources, and stakeholders of the society for sustainable development through the formation of networks and links.

Lucknow—Mohd. Salman (Independent Partner)

Mohd. Salman is a young entrepreneur who has been working in the field of waste management and recycling since 2007. He is associated with the dealer network of waste paper and plastic recycling and was earlier associated with Arsh Industries, Kanpur. Since a year, he has been working independently as a supplier to many waste paper and plastic recycling industries. He has also worked with various organizations in conducting market research on waste paper and plastic recycling.

Jammu and Srinagar—Human Welfare Voluntary Organization

The Human Welfare Voluntary Organization is a not-for-profit, non-governmental, non-political organization. It aims to build a just society, invoke volunteerism, strengthen communities, and promote effective governance, sustainable living, and sustainable environment through inclusive and right-based approach for the long-term solution to the present world problems.

The organization has been working since the last 6 years for the welfare of the vulnerable and marginal sections of the society in Jammu and Kashmir. Besides the regular charity-based work, the organization has been working with migrant waste pickers and local safai karamcharis and has trained members of their unions. The organization has conducted a research on the urban waste management in Srinagar with the support of Delhi-based Chintan Environmental Research and Action Group. It has also conducted a study to assess the condition of female domestic workers in the informal sector.

In the pursuit of creating sustainable living within the rural setup, the organization has initiated a farm extension school where farmers are exposed to good agricultural practices and is evaluating possibilities for creating self-sustained model solar energy villages. The organization works with people who are unable to care for themselves and lends a hand to in the overall development of their physical, social, mental, and spiritual aspects of life. It rallies around those who are individually unable to accomplish their goals without any additional help and resources.

Kolkata and Guwahati—SRG Consultancy

Established in February 1996, the SRG Consultancy Marketing Planning Services conducts studies in various fields with the support of a panel of expert consultants in different disciplines both in the public and private sectors.

It has the experience of administering the predesigned questionnaire as well as computing the raw data on behalf of a group of globally famous economists. Some of the well-known figures who have assigned survey work to SRG include Dr Arpita Mukherjee and Prof Nisha Taneja, ICRIER, New Delhi, India; Dr Vijaya C. Ketti, Chairman, Indian Institute of Foreign Trade, New Delhi, India; Prof Esther Duflo, MIT, USA; Prof Abhijit Banerjee, MIT, USA; Prof Rohini Pandey, Yale University, USA; Prof Maitrish Ghatak,

London School of Economics, UK; Prof Raghabendra Chattopadhyay, Indian Institute of Management, Kolkata, India; Prof Erica, Harvard University, USA; Prof Lori A. Beaman, Northwestern University, USA; Prof Jeremy Magruder, University of Calfornia, Berkley, USA.

SRG has in-house computer facilities for processing and analysing field data and preparing reports.

Dhaka—Training Research Education for Empowerment

Based in Dhaka, Bangladesh, Training Research Education for Empowerment (TREE) conducts small-scale research on environment, training and advocacy campaigns, and educative programmes for the local community and schools. TREE was set up in October 1999 to mobilize support for examining processes that perpetuate poverty and identifying solutions for improving the quality of life.

In the 15 years of its sustainable development journey, TREE has worked with various local and international organizations in the areas of water and environment, including Global Water Dance, a US-based international organization; the Knowledge Lab Center, UK; and TERI, India. TREE also works for the Government of Bangladesh and has partnership with various research and educational institutes such as Jahangirnagr University. In association with Grameen Shakti, TREE has assisted Jahangirnagr University in developing a sustainable solid waste management and resource recovery system at the university campus.

Kathmandu—WATO Nepal

WATO NEPAL is a community-based NGO established in 2000. Since its inception, the organization has been involved in a number of environment preservation projects, particularly community park development and urban tree plantation. It has also carried out a number of surveys for the identification and preparation of a database of polluted sites across Nepal, different types of wastes and pollutants, and their adverse impact on the environment and human health as well as the application of possible remedies. WATO implemented one such waste management approach in the industries near the Dhobikhola River. These industries applied a cleaner production approach that focused on reducing, reusing, and recycling waste for minimizing the impact of industrial pollution in the river system. In the last 15 years, the organization has partnered with various local and international organizations, government offices, corporate houses, and local people and has a successful track record of accomplishing all the projects it has undertaken to date.

The organization has a mission to develop a strong network of concerned stakeholders, increase environmental consciousness among people, and encourage local initiatives in environmental conservation. This can be achieved through collective action, raising awareness on environmental issues, and fully involving communities in addressing their local problems.

Ahmedabad—Nepra Environmental Solutions

Nepra Environmental Solutions is a consultancy firm that explores the underlying needs of the green industry and provides highly productive up-to-date information. The firm responds to request for data that address both the explicit and implicit needs of clients.

Nepra runs the platform EnvironXchange.com, which connects the entire environment industry. The platform integrates green trade, helping the environment, waste, and recycling

industries to target the right people and enhance their business. It reinforces awareness and knowledge about the less recognized green companies, local and global environmental regulations, and other environmental news and updates.

Mumbai—Sampurn(e)arth Environment Solutions Pvt. Ltd

Sampurn(e)arth Environment Solutions Pvt. Ltd envisions a world where waste is transformed into utilizable resources without exploiting people or the planet. It works towards breaking the non-cyclic process of waste management, which currently involves extraction, production, consumption, and dumping or landfilling, resulting in greenhouse gas emissions, groundwater pollution, and an ever-increasing strain on natural resources.

It provides end-to-end decentralized waste management solutions for housing societies, corporate houses, townships, school and college campuses, and so on. A decentralized system saves considerable transportation costs and eliminates related emissions.

Sampurn(e)arth provides the following services:

- Waste audit
- Designing a customized waste management system
- Installing the waste management system
- Operation and maintenance of the system
- Enhancing environmental awareness
- Consultancy related to the above services

It also provides solutions for both biodegradable (food waste, horticulture waste) and non-biodegradable wastes. Biogas plants compost biodegradable waste, while non-biodegradable wastes are channelized to recycling units, leaving a very small percentage of waste going to the dumping grounds and creating zero-waste situations.

For clients generating large quantities of dry waste, in appreciation of the responsible, environment-friendly initiative, customized products such as notepads and envelopes made of recycled paper are supplied.

Sampurn(e)arth is involved in various capacities at the biogas plants located in the Tata Institute of Social Sciences, SEEPZ, Tata Power's Thermal Power Station, Bhabha Atomic Research Centre, Tata Institute of Fundamental Research, Tata Consultancy Services, and Shatabdi Hospital (an MCGM-run hospital). It is involved in the collection and management of recyclable waste from reputed corporate entities such as Axis Bank, Mahindra & Mahindra, Reliance Corporate Park, Bajaj Electricals, Ernst & Young, Mahanagar Gas, Adlabs, and L&T Powai.

Pune—Shriman Enterprises

Shriman Enterprises is a proprietary waste paper management firm operating in and around Pune city. It mainly trades in Kraft and colour paper along with Road Sweep(RS) Mr Shabbir Shaikh, the proprietor of Shriman, has successfully run board mills and has provided consultancy for setting up board mills. Besides paper trading, Shriman Enterprises also provides hydraulic machines for paper pressing.

Hyderabad—Sukuki Exnora

Sukuki Exnora is a registered NGO specialized in providing useful and innovative solutions for solid waste management. It provides innovative and practical solid waste management solutions to the Municipal Corporation of Hyderabad and other agencies. It is also associated with the Andhra Pradesh Pollution Control Board and Administrative Staff College of India for providing training.

Nagpur—Centre for Sustainable Development

The Centre for Sustainable Development (CFSD), a non-profit organization, is registered under the Societies Registration Act 1860 and Bombay Public Trust Act 1950. CFSD started in 2004 with the vision to facilitate participatory and sustainable development processes that would make human settlements equitable living environments where the community has access to health, education, housing, basic infrastructure, and livelihood options irrespective of their social and economic status. Its main working areas are urban development, empowerment of women, youth, and children, health, education, environment, advocacy, and study and research work. In the social field, CFSD provides the following services:

- Organize trainings and workshops for the capacity building of community-based organizations in slums.
- Form self-help groups in slums and conduct regular monthly meetings.

It is an active member of the Alliance of Indian Waste Pickers, a network of more than 30 organizations working with waste pickers. It is also engaged with the Nagpur Municipal Corporation to implement the awareness campaign for Swachh Nagpur Abhiyaan.

Bengaluru and Chennai—Sahaas Waste Management Pvt. Ltd

Saahas Waste Management Pvt. Ltd provides professional services to all waste generators, including companies, apartment complexes, institutions, and communities as well as demonstrates how waste can be converted into resources. The not-for-profit organization continues to focus on building capacities of public institutions such as municipal corporations as well as support progressive policies around waste management. Saahas also guides the delivery of services, which ensures the implementation of legislations and regulations around waste.

Across Bengaluru, Saahas programmes convert 7 tonnes of waste every day into a range of resources. It plans to work with all stakeholders to bridge this gap as quickly as possible. Since 2013, it has also started operations in Chennai. Saahas was awarded the social entrepreneurship award at the 4th Annual Forum of Action for India (AFI) held in Bengaluru from 31 January to 1 February 2015.

Colombo—Sevanatha Urban Resource Center

Sevanatha Urban Resource Center (SEVANATHA) was established in 1989 as a local NGO in Colombo, Sri Lanka. It was first registered in 1994 with the Department of Social Services of the Government of Sri Lanka under Registration No. 0146 - 20/ 05/ 1994 and later the registration was updated with the National Secretariat for NGOs under Registration No. L 35701-08/ 11/ 2001. It was founded by a group of grassroots Human Settlement Sector Activists who initiated activities to make a contribution towards urban community development. SEVANATHA has expanded its activities by opening up a window of opportunities for the poor and other urban stakeholders by implementing innovative participatory development approaches. It has contributed to break the barriers that prevent

the urban and rural poor in accessing information, institutions, resources, and social networks. It has transformed a large majority of urban and rural poor into an able and confident section of the Sri Lankan society, which can reap the benefits of development and achieve stable social and economic status. The best practices generated by SEVANATHA in the field of community development, urban service improvement, and environment improvement positively contributed to the national policies in relevant sectors.

Seevanathan has a mission: "While improving the capacity and skills of its own staff, SEVANATHA is committed to revitalize and enhance the capacities and creativity of urban and rural poor in Sri Lanka." Since its inception, SEVANATHA has being implementing programmes and projects with communities in collaboration with donors and government institutions in Sri Lanka in the following focus areas:

- Community empowerment and community institutional building.
- Promotion of participatory development tools.
- Stakeholder consultation to promote good governance principles and partnerships among local actors.
- Community-based infrastructure improvement activities.
- Information and experience sharing among urban stakeholders.
- Networking among local and regional development partners.
- Urban solid waste and environment management.
- Child focus environment education and awareness.
- Housing support services for poor families in urban and rural sectors.

Table 2 gives the list of identified survey partners in each surveyed city with their contact details.

Table 2: Details of survey partners

S. No.	City	Survey Partner	Team Leader	Contact Number	E mail
1	Delhi	Development Links Foundation	Mr. Sagir	9891282648	sagir.najm@gmail.com
2	Lucknow	Independent partner	Mr. Salman	9935544132	salmanraje9916@gmail.com
3	Srinagar	Human Welfare Voluntary Organization	Mr. Tahir Massud	9419013162	tahirmassud@gmail.com
4	Jammu	Human Welfare Voluntary Organization	Mr. Tahir Massud	9419013162	tahirmassud@gmail.com
5	Kolkata	SRG Consultancy	Mr. Prasid Chakraborty	9830233191	srgprasid@rediffmail.com, srgprasid@gmail.com
6	Guwahati	SRG Consultancy	Mr. Prasid Chakraborty	9830233191	srgprasid@rediffmail.com, srgprasid@gmail.com
7	Dhaka	Training Research Education for Empowerment (TREE)	Mr. Shahid I. Mallick	00880181908 8334, 00880277921 01	tree_bd@yahoo.com
8	Kathmandu	WATO Nepal	Mr. Prajwol Gurung	00977985100 2747	prajwolgurung@gmail.com
9	Ahmedabad	Nepra Environmental	Mr. Sandeep Patel	9924143113	s.patel@letsrecycle.in,

S. No.	City	Survey Partner	Team Leader	Contact Number	E mail
		Solutions			h.jesingh@letsrecycle.in
10	Mumbai	Sampurn(e)arth Environment Solutions Pvt. Ltd	Mr. Jayanth N	9920199120	jayanth.sespl@gmail.com
11	Pune	Shriman Enterprises	Mr. Shabbir	9422002041	shriman.enterprises@gmail.com
12	Hyderabad	Sukuki Exnora	Major ShivaKiran	9849047827	majorkiran@gmail.com
13	Nagpur	Centre for Sustainable Development	Ms. Leena Buddhe	9372391202	cfsdindia@gmail.com/l_buddhe@yahoo.com
14	Bengaluru	Sahaas	Ms. Wilma/ Ms. Divya	9880124921	wilma@saahaszerowaste.com, divya@sahaas.org
15	Chennai	Sahaas	Ms. Wilma/ Ms. Divya	9880124921, 9845218290	wilma@saahaszerowaste.com, divya@sahaas.org
16	Colombo	Sevanatha Urban Resource Center	H.M.U.Chularathna	0094777708089	chula.sevanatha@yahoo.com

Major Findings of the Survey

Delhi

Questionnaire Survey

Ragpickers and Door-to-Door Collectors

The survey covered 10 ragpickers and door-to-door collectors from four areas: Khadar, Sukhdev Vihar, Zakir Nagar, and Taimoor Nagar. Of the 10 ragpickers and door-to-door collectors, seven are from Khadar area. Ragpickers from the Khadar area cover a vast area of South Delhi, including Nehru Place, Lajpat Nagar, Chirag Delhi, Defense colony, Sarita Vihar, Shaheen Bagh, Abual Fazal, Batla House, Jasola, Sukhdev Vihar, New Friends Colony, Sriniwas Puri, and Mohan Cooperative area. The remaining three ragpickers and door-to-door collectors were selected from Sukhdev Vihar, Zakir Nagar, and Taimoor Nagar each. The survey covered four ragpickers and six door-to-door waste collectors. Of the 10 respondents, only seven collect PCCs along with paper and sell them at different prices. The price of PCCs ranged from `2–3 per kilogram and that of paper ranged from `5–6 per kilogram. The rates of cardboard (gatta), duplex, and road swipe wastes are `4, `3, and `1 per kilogram, respectively. The three ragpickers who do not collect PCCs informed that if sometimes they get two or three packs of PCCs, they mix them with duplex board to increase weight. When asked why they do not collect Tetra Pak cartoons, they said that waste dealers were not interested in buying PCCs and that the rate of PCCs was very low compared to other wastes. Besides, PCCs occupy large space and have very less weight.

Figure 6: Ragpicker survey in Delhi

Ragpickers collect paper, plastic, tin, iron, cardboard, PCCs, and other recyclable waste materials from streets, markets, and colonies. These waste workers collect between 130 and 160 kg of wastes per day. Of these, 30–40 kg includes paper waste, duplex, gatta, and road swipe. Apart from these, only seven ragpickers and door-to-door collectors gather and segregate around 400–500 g of Tetra Pak cartoons per day. Low quantity and profit margins discourage many of the respondents from collecting PCCs. When asked for ways to improve the collection efficiency of PCCs, the respondents suggested increased price and a wider market for encouraging PCC collection.

Small- and Medium-Level Kabadiwalas

Fourteen small- and medium-level kabadiwalas were surveyed in Delhi, which include one each from Taimoor Nagar, Sukhdev Vihar, Noida, and Zakir Nagar and 10 from Khadar. Most of them collaborate with 6–25 rikshawalas and ragpickers for collecting waste. Some have trucks for picking up waste from hotels, malls, market complexes, hospitals, corporate offices, and railway stations.

The respondents procure around 17.5 tonnes of waste paper per month. Two of the respondents said that they did not collect PCCs because of the availability of very small quantity as well as the presence of leftover organic contents. However, four other respondents used to collect PCCs separately since they could procure 30–700 kg of PCCs per month. Further, respondents who collect waste from hospitals could procure a large quantity of PCCs per month (1200–1500 kg) out of the total paper waste of 22,000–41,000 kg per month. PCCs are bought at a price of `4–7 per kilogram, and the price of paper waste ranges from `7–12 per kilogram. Other rates at which these kabadiwalas buy paper waste are as follows: `8–9 per kilogram for gatta, `5–6 per kilogram for duplex, and `2–3 per kilogram for road swipe. The PCCs collected by the respondents sometimes contained leftover juices. Many of the respondents sold the PCCs to large dealers at the price of `4–10 per kilogram and made a net profit of `2–5 per kilogram. The average percentage of PCCs analysed in bales at the respondents' place was 1.1%, and when waste was received from railway stations (Rajdhani Express), the percentage of PCCs in waste paper increased to 10%.

Figure 7: Bale analysis conducted at large-scale waste dealer

The respondents provided the following suggestions to improve the collection of PCCs:

- Due to the less quantity of PCCs received and low rates provided by waste dealers, the collection efficiency is less; however, this can be increased by overcoming these two issues.
- PCC requires large storage spaces, and due small quantity received every day it has to be stored till a truck load is available for transporting and this discourages from dealing in PCC. However, frequent collection and increased quantity can improve collection efficiency.
- Due to the less quantity of PCCs purchased and sold, the net income from PCCs is less and this discourages some small and medium level dealers to deal in PCCs.

Large-Scale Low-Grade Waste Paper Dealers

Five waste dealers were analysed during the survey, and the average quantity of wastes per dealer was 280 tonnes per month. Three of the respondents collected PCCs separately as well as along with paper waste, and one did not deal with PCCs at all. Another one used to collect PCCs along with paper only. The average price of PCCs purchased was `3–7 per kilogram and that of paper was `8–12 per kilogram. Around 4% of the PCCs collected by the respondents did not have leftover juices. PCCs collected were sold to large scrap dealers at `7–9 per kilogram. Analysis of two bales from each of the respondents as given in Table 3 revealed that PCCs constituted only 0.58%. The dealers were discouraged because of the low quantities of PCCs, and they suggested better pricing for efficient collection.

Figure 8: Truck analysis at Delhi site

In addition, two large contractors who collect waste from the IGI Airport were also surveyed. They collected waste from the airport on a contractual basis and sold the recyclable wastes. They sold PCCs at `6.5 per kilogram and paper at `11–14 per kilogram. Density and limited quantity discouraged them from dealing with PCCs.

Table 3: Survey output at waste dealer analysis at Delhi

Name of Respondent	Classification	Wastepaper analysed in Kgs	PCC found in Kgs
Santu Bhai	Large scale waste paper dealer	50 10	0.18 0.18
Munna	Large scale waste paper dealer	45 50	0.04 0.03
Sujjaldin Bhai	Large scale waste paper dealer	100	1.43
Vijay	Large scale waste paper dealer	50	0.18
Anwar	Large scale waste paper dealer	40 40 40	0.18 0.10 0.14
Average PCC analysed			0.58%

Dumpsite Analysis

Three trucks were analysed, one each from residential, commercial, and institutional areas. It was found that wastes were segregated at the level of waste collector and dalhao, and as a result, very low quantity of waste paper reached the dumpsite. The results of the analysis are given in Table 4.

Table 4: Truck analysis carried in Delhi

Truck number	Total waste load	Total paper load	Total quantum of PCCs	Route
DL-1GC 0839	5740	Nil	0.16	Shahdara, Newusmanpur, Bhramapuri, Northgouda, Mohala subash.
DL-1GC 1013	6180	Nil	0.10	Laxmi Nagar, Lalitapark, Ramesh Park, Kishan Gunj, Jawahar Park
DL-1GC 0842	5100	Nil	Nil	Mayur Vihar, Tirlokpuri, Kalyanpuri, Motherdairy, Vinod nagar

Only 0.0015% of the wastes found at the dumpsite was PCCs.

Paper Mill Analysis

Paper Mill 1: Anand Duplex Board Ltd

Address: 9th Km., Mawana Road, Village Saini, Meerut, Uttar Pradesh

The Anand Group of Companies consists of Anand Duplex Ltd and Anand Triplex Board Ltd. They have a combined installed production capacity of around 140,000 million tonnes of paper per annum, with production units spread over approximately 220,000 square yards and a combined turnover of around `175 crore.

The production capacity of Anand Duplex is about 3000 tonnes per month. The paper mill informed that it is not using PCCs because of issues of rejects in the pulper with PCCs. It is presently purchasing raw materials that have less rejects during pulping.

When asked about the disposal methods of rejects from the pulper generated from other wastes, the respondent informed that the rejects were sold to other recyclers who could extract other useful materials from them.

Paper Mill 2: Khanna Paper Mill

Address: Fatehgarh Churiya Road, Amritsar, Punjab

Quantum of paper recycled: 27,000 MT/ month

Type of paper and board manufactured: Writing, printing, and packaging

The mill informed that it procured only segregated waste paper from specified contractors and did not accept PCCs. The mill's pulper released about 1% of plastic waste, which was sold to plastic recycling mills. It processed both imported and domestic waste paper and none of the wastes brought to the paper mill had PCCs.

Figure 9: Bale analysis done at Khanna Paper Mill

Figure 10: Bale analysed at Khanna Paper Mill

Lucknow

Questionnaire Survey

Ragpickers and Door-to-Door Collectors

Eleven surveys were conducted at the door-to-door collector and ragpicker level, and the surveys revealed that seven of the total respondents used to deal in PCCs. They used to collect PCCs along with paper and segregate them for selling to kabadiwalas. The average price they got from the kabadiwalas was `5–7 per kilogram. The average quantity of waste paper recycled by each respondent was 1800 kg per month. PCCs were collected from houses, streets, and even waste bins. The source of PCCs was upper and middle class localities and commercial markets. The PCCs collected by the respondents had no leftover juice content. Compared to other recyclable materials, the respondents got very low amount of PCCs in the waste they collected. Due to this low availability, a few of the respondents were not collecting PCCs.

Figure 11: Ragpicker surveyed in Lucknow

Small-Scale Low-Grade Waste Paper Dealer

Figure 12: Waste dealer analysed in Lucknow

Fourteen surveys were conducted in Lucknow at the small-scale waste dealer level, and all the respondents collected PCCs along with waste paper. The average quantity of waste paper procured by each of the respondents was about 15.3 tonnes per month. The purchase price of paper along with PCCs was between `5-`8 per kilogram, and the selling price was between `6.5- `9.0 per kilogram. PCCs were procured from high and middle class, lower class localities and from market places. The sources of PCCs for the kabadiwalas (small-scale waste dealers) were ragpickers, households, and sometimes fellow kabadiwalas. When asked for ways to increase the efficiency of PCC collection, the respondents suggested that PCCs should be segregated from road sweep and more awareness should be raised among ragpickers about the value of PCCs. Some of the respondents also suggested increasing the prices of PCCs for better collection.

Large-Scale Low-Grade Waste Paper Dealer

Five surveys were conducted at the large-scale dealer

level. The average quantity of paper bought by each respondent was 136 tonnes per month. PCCs were bought by all the five respondents mixed with paper and at a price of `8.25–8.50 per kilogram. The collected PCCs were sold either to large-scale waste dealers at `8.5–9.0 per kilogram or to paper mills at `10.50 per kilogram. The respondents received waste from ragpickers, intermediate kabadiwalas, and commercial markets. The specifics of bales analysed from each kabadiwala are given in Table 5.

Table 5: Survey output at waste dealer analysis at Lucknow

Name	Weight of bale analysed (in kg)	PCCs found in the bale (in kg)
Saif	75	0.12
Rasheed	86	0.16
	38	0.10
Aminul Bhai	75	0.10
	45	0.02
Subhash	125	0.12
	80	0.06
Shakeel	65	0.06
	35	0.01
Average PCC analysed		0.12 %

Dumpsite Analysis

The results of dumpsite analysis of three trucks are given in Table 6.

Table 6: Truck analysis carried in Lucknow

Truck details	Truck route	Quantity of waste (kg)	Quantity of paper (kg)	Quantity of PCC (kg)
UP 32 AN 5476	Sitapur Road to Mohan Road	9170	121	0.35
UP 32 AN 6365	Gomti Nagar to Mohan Nagar	9965	342	0.10
UP32 AN 9717	Alambagh to Mohan Road	8555	223	0.10

The quantity of PCCs in the wastes reaching the dumpsite was about 0.002%.

Paper Mill Analysis

Name of Paper Mill: R D Paper Mill
Address: Akbarpur Barrajod, Kanpur Dehat
Quantity of paper collected per month: 1500–1800 tonnes
Quantity of road sweep consumed per month: 700 tonnes
Quantity of waste analysed: 1500 kg
Quantity of PCCs found: 0.33 kg

Hence the quantity of PCCs found in the paper mill was 0.002%. The wastes from the pulper, which is about 10% of the total quantity of materials recycled, were sent for thermal heat recovery at the boiler section of the mill. The paper mill reported that the low volume of PCCs did not encourage it for setting up a separate recycling facility for PCCs. Hence, if the volume of PCCs was increased, they could set up a separate facility for PCC recycling.

Srinagar

Questionnaire Survey

Ragpickers and Door-to-Door Waste Collectors

Eighteen surveys were conducted at the door-to-door waste collector and ragpicker level. Only 11 of the respondents used to collect PCCs, that too along with paper and cardboard. The price offered to these collectors was `2–4 per kilogram. The collectors procured 0.9 kg of PCCs per day. They collected PCCs only to increase the weight of paper cartoons, and there was no specific buyer of PCCs in the market. Some of the respondents were discouraged by PCCs in waste paper because dealers were deducting prices owing to the presence of poly-aluminium inside the packs. The aluminium found inside PCCs has no market and is regarded as waste. All respondents collected PCCs from streets; nine respondents collected PCCs from dustbins, and only two collected PCCs from households during door-to-door collection. Two of the respondents used to collect PCCs from commercial areas such as hotels and markets. When asked for ways to increase PCC collection, the respondents suggested specific dealers for PCCs and increased market price.

Small-Scale Waste Dealers

Fourteen small-scale waste dealers (kabadiwalas) were surveyed. Eight of them did not collect PCCs as there was no incentive for PCC collection and the poly-aluminium inside the PCCs made them unsellable to waste paper dealers. The six kabadiwalas who collected PCCs used to mix them with cardboard to increase weight and were given a price of `6–7 per kilogram. These respondents were also discouraged because of the absence of specific dealers for PCCs and the poly-aluminium inside, which made PCCs nonsalable as separate material. Many of the kabadiwalas suggested a higher rate of PCCs for efficient collection.

Figure 13 Dumpsite analysis at Srinagar site

Large-Scale Waste Dealer

Three large-scale waste paper dealers were surveyed from areas such as Padshahi Bagh, H M T Industrial Area, and Maharaj Gunj. The average quantity of waste paper bought by these respondents was 37.3 tonnes per dealer. Two of the dealers used to buy waste paper containing PCCs at `6 per kilogram. The quantity of PCCs was as low as 6 kg per month (on average). Mostly, PCCs were brought to the dealers by ragpickers and door-to-door collectors. One of the waste dealers did not buy PCCs since there was no further buyer and the aluminium inside PCCs was not sellable. The bales analysed from the respondents contained zero to 0.12% PCCs with an average of 0.046 %. Waste paper along with PCCs and cardboards were sold further to larger dealers outside the region at `8 per kilogram.

Table 7: Waste Dealer Analysis at Srinagar

Name of Respondent	Classification	Wastepaper analysed in Kgs	PCC found in Kgs	Remarks
Farooq Ahmad	Large scale waste paper dealer	0.00	0.00	PCC rejected at dealer level
Mohammad Kabir	Large scale waste paper dealer	199.75	0.25	Paper and cardboard were sold in mixed form
Ali Mohammad Dar	Large scale waste paper dealer	0.00	0.00	No PCC found in cardboard and paper at dealer level
Shaidul	Large scale waste paper dealer	85.00 92.00	0.00 0.00	Dealer don't deal with PCC
Tasleem Arif	Large scale waste paper dealer	79.00 86.00	0.00 0.00	Since mill don't accept PCC due to aluminium foil no PCC accepted by dealer
Average PCC analysed			0.046%	

Dumpsite Analysis

Figure 14: Dumpsite analysis at Srinagar site

Three trucks having waste from different regions were analysed for paper and PCCs. The routes covered by the trucks are as follows:

- Rajbagh, Regal Chowk, Lal Chowk, and Amira Kadal
- Nehru Park, Bulward, Dalgate towards Bullward
- Soura, Buchra, and New Colony

Table 8: Truck analysis at dumpsite in Srinagar

Truck number	Total waste load (kgs)	Total paper load (Kgs)	Total quantum of PCCs (Kgs)
JK01L2270	6230	23	4
JK01L0318	1220	21.5	11.5
JK01AA1867	2625	9	3

The percentage of PCCs found in the wastes reaching the dumpsite was 0.18%.

Jammu

Questionnaire Survey
Ragpickers and Door-to-Door Waste Collectors

Thirteen surveys were conducted at the door-to-door waste collector and ragpicker level. Nine of the total respondents collected PCCs. Only one of the respondents used to collect PCCs separately. The respondents collected 1150 kg of waste paper and 126 kg of PCCs per month. PCCs were sold at `2–3 per kilogram, and paper waste was sold at `2–5 per kilogram. About 77% of respondents collected PCCs from upper and middle class localities as well as commercial establishments. About 88% of respondents collected PCCs from lower income localities also. Around 22% of respondents used to get PCCs without any leftover juice content. The respondents said that low incentives and fewer buyers in market discouraged them from dealing in PCCs. They also said that having a buyer particularly for PCCs would further improve PCC collection in the region.

Small-Scale Low-Grade Waste Paper Dealer

Ten surveys were conducted at the level of small-scale low-grade dealers (kabadiwalas). Six of the respondents did not buy PCCs because of poor incentive and very few large dealers buying PCCs. Four of the respondents buying PCCs also complained about very few dealers accepting PCCs. Price offered by these respondents for PCCs was `1.5–5.0 per kilogram. PCCs were not bought separately and were found mixed with low-grade or high-grade paper. Price of PCCs with low-grade paper was `1.5–3.0 per kilogram and that with high-grade paper was `5 per kilogram. All of them bought PCCs along with paper, and paper was bought at `5–6 per kilogram. The average quantity of paper bought by the respondents was 14,800 kg per month per respondent, and the quantity of PCCs bought by them was about 166 kg per respondent per month. When asked about ways to improve PCC collection, the respondents replied that there were very less buyers in the market and very low price for PCCs, which discouraged many stakeholders. They also pointed out a need for a specific buyer of PCCs who can encourage and spread awareness about PCC collection. The poly-aluminium layer inside PCCs was discouraging for some of the respondents as the PCC prices were reduced because of the layer.

Figure 15 Rag picker Survey in Jammu

Figure 16: Waste analysis done at dumpsite in Jammu

Large-Scale Low-Grade Waste Paper Dealers

Only one large-scale waste dealers surveyed used to purchase PCCs at `2–3 per kilogram and sell them to recycling mills at `4 per kilogram. The other dealer was not buying PCCs since he did not find dealing in PCCs profitable. Bales were analysed at the waste dealer level, and the results are given in Table 9.

Table 9: Waste dealer analysis at Jammu site

Name	Category	Weight of bale (Kgs)	Weight of PCCs found in bale(Kgs)
Abdul Rahim	Large-scale waste dealer	99.57 99.34	0.425 0.660
Praveen Kumar	Large-scale waste dealer	88.50 83.80	11.50 16.20
Rohit Sharma	Large-scale waste dealer	90.70 84.90	9.30 15.10
Sugan Khan	Large scale waste dealer	125.00 116.00	0.00 0.00
Suman Khan	Large scale waste dealer	87.00 83.00	0.00 0.00
Average PCC analysed			5.55%

On an average, 5.55% of PCCs was found with waste paper analysed at the waste dealer level.

Dumpsite Analysis

Three trucks, one each from residential, commercial, and institutional areas, were analysed, and the average percentage of PCCs found in the dumpsite was 0.067%. Waste paper was found to be around 0.24% only.

Table 10: Dumpsite analysis at Jammu site

Truck details	Area and route covered	Analysis details	Comment
JK02AE5491	Commercial areas (Parade Ground, Gummat and Ragunath Bazaar)	Truck load: 6000 kg; paper load: 15.6 kg; PCC load: 4.6 kg	Takes three trips per day and works from 9:00 a.m. to 2:00 p.m.

Truck details	Area and route covered	Analysis details	Comment
JK02AE5492	Residential areas (Janipur Colony and Muthi)	Truck load: 5000 kg; paper load: 9.10 kg; PCC load: 2.2 kg	Takes four trips a day and works from 9:00 a.m. to 4:00 p.m.
JK02A2651	Institutional areas (Trikutnagar, Gandhi Nagar, Shastrinagar and Satwari Airport)	Truck load: 7000 kg; paper load: 19.4 kg; PCC load: 5.3 kg	Takes four trips a day and works from 9:00 a.m. to 3:00 p.m.

Paper Mill Analysis

Two paper mills were covered under the survey, and the findings are as follows:

Paper Mill 1:

Name of paper mill: Jammu Paper Pvt. Ltd
Location: Badi Brehmena, SIDCO Complex
Phone: 01923220316
Average waste paper purchased: 1500 tonnes per month
Manufactured: Duplex Paper
Paper load analysed: 6 tonnes
PCC found as nil.
Comment: The paper mill did not deal in PCCs at all, and no PCC was found mixed with the waste paper that was analysed. When asked on the fate of rejects from Pulper machine, mill informed the same is sold to recyclers outside Jammu for recycling.

Paper Mill 2:

Name of paper mill: Cardboard Box Factory
Location: Muthi, Jammu
Average waste paper purchased: 30 tonnes per month
Manufactured: cardboard
Paper load analysed: 1170 kg
PCCs found as 6.63 kg
Comment: Around 6%–10% of materials are rejected in the pulper, and most of these go into the waste pit made by the recycling unit. The respondent informed that the poly-alumina layer inside PCCs was a reject and this deteriorated the quality of cardboard manufactured. Hence, the mill avoided buying PCCs. At the paper mill, the quantity of PCCs found was 0.566%.

Kolkata

Questionnaire Survey

Altogether 30 players were surveyed, including two paper mills and three dumping trucks at the dumpsite, with a pre-designed questionnaire. Ragpickers and kabadiwalas were selected randomly from the areas where they were engaged in larger numbers. The Dhapa dumping ground under the Kolkata Municipal Corporation was chosen for the survey and sampling.

Ragpickers and Door-to-Door Collectors

Of the 10 ragpickers surveyed, all of them collected PCCs. Four of them collected PCCs separately, and the rest collected PCCs along with paper. The average quantity of paper waste collected by the surveyed ragpickers was about 1475 kg per month. PCCs were collected from households (35%), streets (52%), and community bins (13%). All the ragpickers said that most of the PCCs came from upper and middle class localities and about one-fourth came from commercial centres. They said that about 50% of the collected PCCs were soiled and contained leftover content, which caused problems in handling and storage. Most of them sold PCCs after mixing these with other paper wastes. However, some of them sorted out PCCs from other waste paper and cleaned them before selling to kabadiwalas. The ragpickers were paid `3–5 per kilogram for PCCs and `4–5 per kilogram for paper by the kabadiwalas. Some of the ragpickers highlighted the need for higher prices and separate collection bins for improving the collection efficiency of PCCs.

Small-Scale Low-Grade Waste Paper Dealers

Figure 17: Survey of kabadiwala in Kolkata

All of the nine kabadiwalas surveyed collected PCCs. The average paper waste collected by them was about 5200 kg per month. Eight of the respondents collected PCCs along with paper. About 14% of the procurement was from households, and 77% was from ragpickers; the remaining procurement was from door-to-door collectors. All of them indicated that most of the collected PCCs were from upper and middle class localities and from commercial and business areas. All the kabadiwalas said that 52% of the PCCs were devoid of any leftover content. Of the nine kabadiwalas surveyed, two of them separated poly-aluminium from the PCCs and sold them at `45–55 per kilogram. All the kabadiwalas sold the PCCs separately to large-scale paper waste dealers and recyclers at the rate of `3–6 per kilogram. About eight of nine kabadiwalas sold directly to paper mills also at `4–6 per kilogram. The average profit made by the kabadiwalas ranged between `0.5 and `2 per kilogram (the average being `1 per kilogram). Hence, the average expenditure on dealing in PCCs (storing, segregating, and transporting) was about `0.87 per kilogram. Many of the kabadiwalas indicated that the collection efficiency could be significantly improved if they could earn higher profits on PCCs.

Large-Scale Waste Paper Dealer

Six large-scale low-grade waste paper dealers were surveyed. The average per month quantity of waste paper sold by these dealers was about 19,000 kg. All the dealers used to buy PCCs along with paper waste, and only two used to buy PCCs separately. The purchase price for PCCs offered by them was `3–5 per kilogram and that of paper waste was `4.50–8.00 per kilogram. All the six waste dealers sold the separated aluminium from the PCCs at `10–60 per kilogram to earn extra profit. The waste paper dealers suggested that collection efficiency could be increased if the selling price of the product was increased. The average percentage of PCCs found in the bales analysed was 9.67%. These waste dealers used to sell PCCs to paper mills at `4–8 per kilogram.

Figure 18 Survey at waste dealer level in Kolkata

Table 11 gives the summary of sampling results from low-grade paper waste dealers.

Table 11: Sampling results from paper waste dealers in Kolkata

Name of large-scale dealer	Type of unit	Quantum of waste paper sampled (in kg)	Quantum of PCCs found (in kg)
Dealer 1	Low-grade waste paper dealer	100	11.60
Dealer 2	Low-grade waste paper dealer	100	3.0
Dealer 3	Low-grade waste paper dealer	100	17.0
Dealer 4	Low-grade waste paper dealer	100	7.10
Average PCC analysed			9.67%

The average quantity of PCCs found in waste paper was about 9.67%. This percentage is high since the region also received PCC waste from nearby regions due to the potential market.

Dumpsite Analysis

Table 12 gives the summary of waste sampling carried out at the dumpsite.

Table 12: Summary of waste sampling at the dumpsite in Kolkata

Truck number/area	Total waste load (in kg)	Total PCCs (in kg)
WB 65 B-0157 (residential and commercial)	8500	0.30
WB 65 B 6187 (residential and commercial)	8500	0.35

The

Average quantity of PCCs found at the dumpsite was 0.004% of the total municipal solid wastes received at the site.

Paper Mill Analysis

Paper Mill 1:

Madhubati Paper Mill, Kolkata: The mill had a production capacity of 300 tonnes per day and mainly manufactures cartons and boards.

Address: Vill-Madhubati, Po-Maheshrekha, Uluberia, Howrah, West Bengal, Pin-711303

The mill procured 9300 Tonnes of raw materials every month and produced about 6% wastage per month. Along with paper, PCCs were also recycled, which constituted about 0.8% of the raw materials received. The rejects from the pulper were about 200 g per kilogram of raw materials. Only dry PCCs were taken up for recycling. The paper mill informed that the major problem it faced during PCC recycling was leftover content, which discouraged labourers since they got infected once in the past. So PCCs needed to be dried completely before recycling, and since many kabadiwalas had space constraint, they did not deal in PCCs.

Paper Mill 2:

Emami Paper Mills Ltd, Balgopalpur, Balasore, Odisha-756020

Contact person: Mr MBS Nair (Director Operation)

Phone: 06782-275551152

Email: mbsnair@emamipaper.in

Figure 19: Survey at Emami Paper Mills Ltd in Balasore

The mill had a production capacity of 14,000 tonnes per month. The mill manufactured newsprint, writing and printing paper. The raw materials consisted of approximately 14,000 tonnes of waste paper and 6000 tonnes of wood pulp. The bale of waste paper analysed had no PCCs but only newspapers, magazines, and cartons. The paper mill informed that about 4 tonnes of materials were rejected from the pulper every day, which were used as fuel for boiler. When asked about reasons for not buying PCC waste, the paper mill informed technology constraints.

Guwahati

Questionnaire Survey

Altogether 33 players were surveyed, including one paper mill and three dumping trucks at the dumpsite, with a pre-designed questionnaire. Ten ragpickers were selected randomly from Fancy Bazaar, Rehebazar, Binapani, Kachari, Ulubari, Station Area, Atgao, and Electric Office Atgaon. About 19 kabadiwalas were surveyed from areas where they were engaged in larger numbers. In addition, the Bardagaon dumping ground was chosen for survey and sampling.

Ragpickers and Door-to-Door Collectors

All of the 10 ragpickers surveyed collected PCCs along with paper. They collected about 432 kg of paper waste per month. They collected PCCs from households (21%), streets (60%), and community bins (19%). All the ragpickers informed that they collected most of the PCCs from commercial centres (about 61%). The upper and middle class localities contributed about 22%, and the remaining came from lower income areas. All the surveyed ragpickers said that about 87% of the collected PCCs were not soiled and did not contain leftover content. Most of them informed that they mixed PCCs with other paper waste before selling. However, some of them sorted out PCCs from other waste paper and cleaned them before selling to kabadiwalas. The kabadiwalas paid the ragpickers `5–6 per kilogram for PCCs and `6–8 per kilogram for paper. Some ragpickers pointed out that the price of PCCs should be increased for improving collection efficiency.

Figure 20 Survey at waste dealer level in Guwahati

Small-Scale Low-Grade Waste Paper Dealers

Of the 14 kabadiwalas and 5 low-grade waste paper dealers surveyed, the kabadiwalas collected and sold 3471 kg of waste paper per month and all the 14 collected PCCs along with paper. The price of PCCs was `6.5–12.0 per kilogram and that of paper waste was `7–15 per kilogram. Ragpickers contributed about 82.5% of paper waste, households contributed about 10.7%, door-to-door collectors contributed about 6.1%, and the intermediate kabadiwalas contributed the rest. The upper and middle class areas contributed about 35.7% of paper waste, and the lower income areas contributed only 16.4%. The remaining major share of paper waste came from market places and business establishments. Most of the PCCs (63.5%) collected by the kabadiwalas were free from any leftover content and were not soiled. None of the small kabadiwalas treated PCCs before selling them further. All of them reported that they sold paper waste along with PCCs to large-scale dealers and recyclers at `7–15 per kilogram. Paper mills also bought from small-scale kabadiwalas at `6–15 per

kilogram. When asked about what discourages them from dealing in PCCs, many of the kabadiwalas informed that no one wanted PCC separately because there was no separate collection and recycling facility and that the demand was decreasing owing to the absence of PCC recycling facility in the region. The net profit made by the kabadiwalas was `1–3 per kilogram.

Large-Scale Low-Grade Waste Paper Dealers

Five large-scale low-grade waste paper dealers were also surveyed. They sold about 9240 kg of waste paper per month. Four of the dealers used to buy PCCs along with paper waste, and only one of the five dealers bought PCCs separately. The purchase price of PCCs offered by them was `6–10 per kilogram and that of paper waste was `9–12 per kilogram. Two of the five waste dealers separated aluminium from PCCs and sold them at `55–60 per kilogram to make extra profit. The waste paper dealers recommended development of a recycling industry to increase PCC recycling. They informed that in the absence of firm rates for PCCs, dealing in PCCs was a risky business. Table 13 gives the summary of sampling results from low-grade paper waste dealers.

Figure 21: Survey at dumpsite in Guwahati

Table 13: Sampling results from paper waste dealers in Guwahati

Name of large-scale dealer	Type of unit	Quantum of waste paper sampled (in kg)	Quantum of PCCs found (in kg)
Dealer 1	Large dealer of low-grade waste paper	100	7.40
Dealer 2	Large dealer of low-grade waste paper	100	13.20
Dealer 3	Large dealer of low-grade waste paper	100	6.0
Dealer 4	Large dealer of low-grade waste paper	100	5.8
Average PCC analysed			7.35%

Hence, on an average, PCCs constituted about 7.35% of the total waste paper managed by low-grade paper waste dealers. The net profit indicated by the waste paper dealers was `1–3 per kilogram.

Dumpsite Analysis

Table 14 gives the summary of waste sampling at the dumpsite.

Table 14: Summary of waste sampling at the dumpsite in Guwahati

Truck number/area	Total waste load (Kgs)	Total waste paper (kgs)	Total PCCs (Kgs)
As-OIFC2243 (residential)	5500	200	50
As-01-DC3000 (commercial)	8500	200	100
As-01-GC3245 (residential and commercial)	650	50	40

The average quantity of PCCs found at the dumpsite was 1.30% of the total municipal solid waste received at the site.

Dhaka

Questionnaire Survey

Ragpickers and Door-to-Door Collectors

Bangladesh had minimal waste collection facilities and most of the waste was dumped in open lands. The ragpickers and door-to-door collectors in Dhaka mainly collected bottles, broken glass, paper, iron, plastic, PCCs, ploybags, and cloth from households and streets. They also collected waste materials from local waste hubs.

Figure 22: Ragpicker survey in Dhaka

Eleven ragpickers and door-to-door collectors were surveyed in the Dhaka City Corporation area (Gulshan, Niketon, Link Road, Merul Baddha, Middle Badda). They collected about 360 kg of wastes per month. Of the six respondents who used to collect PCCs, only one collected PCCs along with paper and the remaining five collected PCCs separately. They sold the PCCs at BDT 5–10 per kilogram (1 BDT = `0.84). Waste paper was sold at BDT 2–15 based on the classification. The amount of PCCs collected by the respondents ranged from 2 kg to 50 kg per month. Two of the respondents were not dealing in PCCs as there was no market for PCC. Two responded absence of incentive discourages them from dealing in PCC. Other respondents not dealing with PCC reported absence of market for PCC as a reason for not collecting PCCs. The respondents who collected PCCs got them from streets, households, and waste bins. PCCs were collected from upper and middle class colonies as well as lower income colonies. A few of the respondents also got PCCs from commercial establishments. Two of the respondents reported that they sometimes found leftover content in the collected PCCs. The issues discouraging collection of PCCs were low price, absence of buyers, and requirement of excess labour in sorting. When asked about the measures for improving PCC collection, the respondents highlighted higher market price and better segregation of PCCs.

Figure 23: Ragpicker survey in Dhaka

Small scale Waste Dealers

Sixteen surveys were conducted at the low-grade paper waste dealer level. The average quantity of waste paper collected by these dealers was 3600 kg per month with as high as 9000 kg per month and as low as 500 kg per month. Fifteen of the respondents used to buy PCCs separately at BDT 10–20 per kilogram with an average price of BDT 14.70 per kilogram. Waste paper price ranged from BDT 2 to 16 per kilogram. The average quantity of PCCs collected by these waste dealers was about 130 kg per month. The respondent not dealing

with PCCs was finding it difficult to maintain stock due to low workforce. All the respondents collected wastes from upper, middle, and lower income colonies as well as market places. Twelve respondents reported that they got clean PCCs without any leftover content, and four informed that they sometimes got PCCs with leftover contents. All the respondents used to sell paper and PCCs to large-scale dealers at BDT 18–25 per kilogram. The net profit made by these kabadiwalas ranged from BDT 5 to 10 per kilogram. A few waste paper bales were analysed, and results are given in Table 15.

Table 15: Waste dealer analysis in Dhaka city

Name of respondednt	Classification	Wastepaper analysed (in kg)	PCCs found (in kg)
Md. Khokon Gazi	Low-grade paper waste dealer	28	2
Md. Ismail Hossain	Low-grade paper waste dealer	28	2
Md. Ali	Low-grade paper waste dealer	26	4
Md. Nazrul Islam	Low-grade paper waste dealer	28	2
Md. Abu Hanif	Low-grade paper waste dealer	46	4
Mostafa	Low-grade paper waste dealer	40 45	5 10
Saddam Hossain	Low-grade paper waste dealer	46	4
Md. Akram Ali	Low-grade paper waste dealer	28	2

The average percentage of PCCs found with the kabadiwalas was 11.11%.

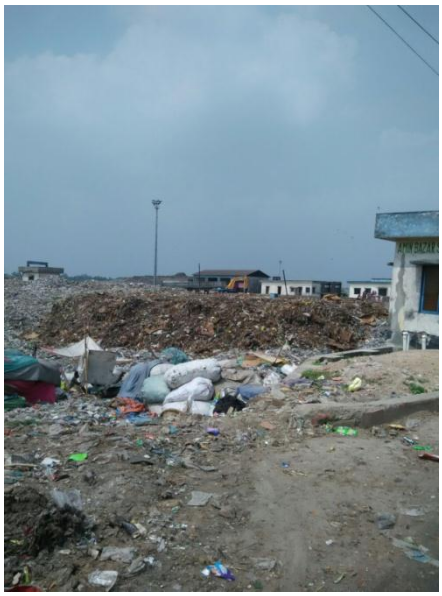

Figure 24: Dumpsite analysis in Dhaka

Large-Scale Low-Grade Waste Paper Dealer

Three large-scale low-grade waste paper dealers were surveyed. These dealers bought wastes from 40–50 small-scale dealers. The respondents bought 15–100 tonnes of waste paper per month. All of them collected PCCs separately at BDT 12–20 per kilogram. Each dealer sold about 5200 kg of PCCs per month. Most of the PCCs collected by the respondents did not have leftover content. One of the dealers resold PCCs further to an even larger dealer, whereas the other two respondents sold PCCs to paper mills at BDT 30–40 per kilogram, making a net profit of BDT 10–20 per kilogram.

Table 16: Waste Dealer analysis in Dhaaka

Name of respondednt	Classification	Wastepaper Sold per month (in kg)	PCCs sold per month (in kg)
Md Milon	Big Dealer	15000	600
Md Monju Fakir	Big Dealer	30000	5000
Md Sonai Fakir	Big Dealer	100000	10000
Average PCC analysed			10.76%

PCCs analysed at dealer level was about 10.76 % out of paper waste business.

Dumpsite Analysis

Three trucks were analysed for PCCs at Agargaon, Banani, and Gulsan areas carrying waste from residential and commercial areas. The survey report is given in Table 17.

Table 17: Dumpsite analysis in Dhaka city

Question	Answer	Comments
Truck details	Dhaka Metro sha 11-1243	Carrying waste from residential and commercial areas (driver no 1715254830)
Areas covered (give the name of the area and a short description of the area in context of the exercise)	Agargaon and Taltola	Residential and commercial areas
Total waste load (in kg)	6000	Empty truck load = 7000 kg
Total paper load (in kg) (an estimate will do)	10	Based on analysis done at site
Total quantum of PCCs (in kg) (must be precise and based on actual weight)	1	Based on analysis done at site
Other observations		Truck conducts three trips per day
Question	**Answer**	**Comments**
Truck details	Pori-10	Collecting waste from residential and commercial areas (driver no 1974578474)
Areas covered (give the name of the area and a short description of the area in context of the exercise)	Banani, Badda	Residential and commercial areas
Total waste load (in kg)	6000	Empty truck load = 7000 kg
Total paper load (in kg) (an estimate will do)	12.5	Based on analysis done at site
Total quantum of PCCs (in kg) (must be precise and based on actual weight)	1	Based on analysis done at site
Other observations		Truck conducts three to four trips per day

Question	Answer	Comments
Truck details	Dhaka Metro sha 11-1250	Carrying waste from residential and commercial areas (driver no 1927436178)
Areas covered (give the name of the area and a short description of the area in context of the exercise)	Gulsan, Rampura	Residential and commercial areas
Total waste load (in kg)	6500	Empty truck load = 7000 kg
Total paper load (in kg) (an estimate will do)	15	Based on analysis done at site
Total quantum of PCCs (in kg) (must be precise and based on actual weight)	1.5	Based on analysis done at site
Other observations		Truck conducts three trips per day

Kathmandu

Questionnaire Survey

Ragpickers and Door-to-Door Waste Collector

Twelve surveys were conducted at the ragpicker and door-to-door waste collector level. Door-to-door collectors were either employees of private contractors or government employees responsible for collecting waste from households and markets. Of the 12 respondents, only one used to sell PCCs at Nepali Rs 5 per kilogram. Rest of the respondents collected PCCs as part of their duty and send these to the transfer station where recyclables were sorted out and sold to kabadiwalas. They envisaged no monetary value for PCCs and acknowledged that PCCs ultimately end up in landfills. Two of the respondents informed that there was a market for PCCs earlier since it was collected for recycling, but now PCCs had no demand and were not recycled. Some of the respondents were discouraged from collecting PCCs since detaching poly-aluminium from the packs was labour intensive and not cost effective. Some informed that the volume of PCCs was low and storing PCCs for a long time generated foul smell.

Figure 25: Door-to-door collector survey in Kathmandu

A few respondents informed that caps of PCCs were recycled. One of the respondents narrated a case study in which a noodle company used to give a new packet of noodles in exchange for 12 empty packets. This encouraged people to keep empty noodle packets clean, and collectors were enthusiastic about packets found in wastes. He suggested that this model could be replicated for PCCs as well.

In Kathmandu, paper was sold at Nepali Rs 5–15 per kilogram and cartoon was sold at Nepali Rs 7–8 per kilogram.

Small-Scale Waste Dealer

Eleven surveys were conducted at the small-scale waste dealer level. Only one of the respondents used to buy PCCs at Nepali Rs 6 per kilogram. The remaining respondents informed that there were no buyers of PCCs in the market and that dealers deducted money for mixing PCCs with other paper waste. Some of the respondents also informed that one person used to buy PCCs earlier at Nepali Rs 5.5–6.0 per kilogram, but now he had discontinued. Paper was bought at Nepali Rs 6–11 per kilogram and cartons at Nepali Rs 6–8

per kilogram. Many respondents used to mix a few PCCs with waste cartons to increase weight. However, dealers started reducing price for mixing PCCs with other waste. When asked for ways to increase collection, the respondents informed that they normally received advance for what the dealers wanted to get collected and that no dealer was interested in buying PCCs. Hence, if recycling facilities were created and a demand was generated in the valley, PCCs could be collected and sold.

Large-Scale Waste Dealer

Five dealers were surveyed, and the average quantity of waste paper procured by each respondent was 200 tonnes per month. The respondents bought paper at about Nepali Rs 10–11 per kilogram. They spent Nepali Rs 1 per kilogram on transport and Nepali Rs 1 per kilogram on balling. The respondents made a profit of about Nepali Rs 1 per kilogram on paper.

None of the respondents were dealing in PCCs. They informed that paper mills rejected any PCCs found mixed with cartons and deducted the weight of the PCCs from that of the cartons. They also informed that paper mills in the valley had no technology for recycling PCCs. There was no market for PCCs, and as per state laws, since PCCs were not recyclable in the country, these cannot be sold to other countries. Labour cost was very high, and profits were nominal. Hence, manual extraction of poly-aluminium from PCCs was not economically feasible.

Table 18: Waste dealer analysis at Kathmandu

Name of Respondent	Classification	Wastepaper analysed in Kgs	PCC found in Kgs	Remarks
Shambu Prasad Jaiswal	Large scale waste paper dealer	0.00	0.00	If PCC comes mixed with carton it is rejected by paper mills and cost for same is deducted. Hence none of the dealer used to accept PCC.
Suresh Jaiswal	Large scale waste paper dealer	0.00	0.00	
Prakash Kumar Jaiswal	Large scale waste paper dealer	0.00	0.00	
Subhash Bartaula	Large scale waste paper dealer	0.00	0.00	
Saroj Shreshtha	Large scale waste paper dealer	0.00	0.00	
Average PCC analysed			0.00%	

Dumpsite Analysis

Figure 26: Survey done at the dumpsite in Kathmandu

In Kathmandu Valley, wastes collected from different parts of the city were brought to a transfer station, from where these are transported to the Sisdol landfill site situated at Okharpauwa VDC in the Nuwakot District of Nepal. Many ragpickers at the landfill site segregate recyclables from the incoming waste and sell these to dealers at Nepali Rs 10 per kilogram.

Table 19 provides the results of the analysis done at the Sisdol site in Nepal. The site is 25 km away from the valley.

Table 19: Results of truck analysis at Sisdol dumpsite

Truck details	Waste load (kg)	PCC load analysed (kg)	Other observations
BA2KHA3570 (Tata: large-size vehicle)	2000	15	All the trucks operated by the municipality load waste from the collection centre, where the wastes collected from different parts of the city are segregated before being transported to the Sisdol landfill site. Kathmandu city is not explicitly divided into residential, commercial, or industrial areas. While industrial areas are very insignificant, almost all regions of Kathmandu have both residential and commercial complexes.
BA2KHA1115 (Nissan: medium-size vehicle)	1800	8	

The analysis done at the dumpsite revealed that the total percentage of PCCs found in the municipal solid wastes was 0.6% only.

Ahmedabad

Questionnaire Survey

Ragpickers and Door-to-Door Collectors

Thirteen ragpickers and door-to-door waste collectors were surveyed. The average quantity of waste paper collected by them was 175 kg per month, with the highest collection of waste paper being 500 kg per month. Seven of the 13 respondents did not collect PCCs, and six of them collected PCCs along with paper. The price of paper waste was `10–12 per kilogram, whereas the price offered for PCCs was only `1–4 per kilogram. All the six respondents used to collect PCCs from streets and waste bins, and two of them also used to collect PCCs from households. The respondents gathered PCCs from upper and middle class societies as well as commercial places. They did not collect PCCs from lower income societies. All the six respondents did not find any leftover content in the collected PCCs. The issue that discouraged the respondents was the lack of profit from selling PCCs since the price was very low. The respondents who did not collect PCCs considered these as waste.

Figure 27: Survey of kabadiwalas in Ahmedabad

They informed that there was no market for PCCs and that the plastic recycling market was more profitable.

Low-Grade Waste Paper Dealer

Fourteen kabadiwalas were surveyed, and the average quantity of paper waste collected by them was 705 kg per month. Only four of them used to purchase PCCs, and the rest regarded PCCs as waste since there was no market or incentive for dealing with PCCs. The respondents dealing in PCCs received very small quantity, around 2–20 kg per month. Two of them collected PCCs separately at `1 per kilogram, and the other two collected PCCs along with paper at `10 per kilogram. PCCs were sourced from upper and middle class households by door-to-door collectors. None of the respondents found leftover content in the PCCs, and none of them used to treat PCCs before selling. The bales analysed from some kabadiwalas had 2.5 kg of

Figure 28: Site for waste dealer analysis in Ahmedabad

PCCs in 300 kg of waste paper. Similarly, 0.5 kg of PCCs was found in 10 kg of waste paper. The PCCs collected by the respondents were sold at `2–3 per kilogram. When asked about the reasons for not dealing in PCCs, the respondents replied that there were no market value and hence no profit for PCCs.

Large-Scale Low-Grade Waste Paper Dealers

Five surveys were conducted at the low-grade waste paper dealer level in areas such as Bodakdev, Sattadkar, Gurudwara Tholtey, Yejalpur, and Shakti Park Estate. The average quantity of waste paper purchased per dealer was 4.36 tonnes, with the highest being 10 tonnes per month. Only one respondent used to buy PCCs separately from ragpickers and kabadiwalas at `2 per kilogram. Paper was bought at `10 per kilogram. He used to sell the PCCs to larger scrap dealers at `4 per kilogram. Yet the quantity of PCCs collected was very low. Four of the respondents did not buy PCCs since they saw no profit. Bale analysis indicated only 1.25% PCCs in waste paper.

Table 20: Waste Dealer analysis in Ahmedabad

Name of Respondent	Classification	Wastepaper analysed in Kgs	PCC found in Kgs	Remarks
Narau Bhai	Large scale waste paper dealer	100 100	1.50 1.00	
Dharmesh bhaI	Large scale waste paper dealer	0.00	0.00	Not dealing in PCC
Badal	Large scale waste paper dealer	0.00	0.00	Not dealing in PCC
Ganesh Bhai	Large scale waste paper dealer	0.00	0.00	Not dealing in PCC
Paras Bhai	Large scale waste paper dealer	0.00	0.00	Not dealing in PCC
Average PCC analysed			1.25%	

Dumpsite Analysis

Analysis of six trucks revealed that PCCs constituted about 0.03%–0.25% of the total waste received at the dumpsite with an average of 0.16%.

Table 21: Dumpsite analysis in Ahmedabad

Truck details	Quantity of waste (in kg)	Quantity of paper waste (in kg)	Quantity of PCCs (in kg)
GJ-1-DX375 (commercial and institutional)	3840	547.8	4.55
GJ-27-UI921 (residential and commercial)	3140	659.21	7.82
GJ-1-GA535 (residential and commercial)	3860	609.2	5.25
GJ 9Z-3556 (institutional)	305	40	0.1
GJ 1DV 760 (commercial)	480	80.8	0.96
GJ 4W 4920 (residential)	295	44	0.35

Paper Mill Analysis

Paper Mill 1:

Maruti Industries, Mehsana Nagar
Capacity: 30 tonnes per month
Product Manufactured: Stationary, album, notebook, and paper
Contact person: Mr Dinesh Bhai (9825881276)
The mill generated 1–1.5 tonnes of pulping rejects every month, which it sold to potential buyers who further sorted out plastic and aluminium. It did not find dealing in PPCs profitable. No PCC was found in the waste bales analysed at the paper mill.

Mumbai

Questionnaire Survey

Ragpickers and Door-to-Door Waste Collectors

Figure 29 Ragpicker survey in Mumbai

In Mumbai, survey was carried out at with 10 respondents of which five used to collect PCC. two used to collect PCC separately and three used to mix this with coloured paper. PCC was sold at a price of Rs 5 to Rs 7 per kilogram to scrap dealer. Those mixing PCC with paper used to sell at a price of Rs 2 – Rs 2.50 per kilogram. The monthly average quantity of paper collected by the respondents was 168 kg per month. when asked for reasons which discouraged the respondents from collecting PCC, few suggested that scrap dealers don't buy PCC separately and market is very poor for PCC. Some even told that they were collecting PCC as coloured paper and are not aware of PCCs.

Low-Scale Waste Paper Dealer

Thirteen surveys were conducted at the kabadiwala level. The average quantity of waste paper procured by the respondents was about 375 kg per month. None of the low-scale waste paper dealers purchased PCCs since there was no demand. When asked about their interest in collecting PCCs, many respondents were not aware of the potential for recycling PCCs. A few respondents informed that there was no profit since prices were very low and hence they were not interested in PCCs.

Large-Scale Low-Grade Waste Paper Dealer

Of the five large-scale scrap dealers surveyed, only three used to buy PCCs. The average quantity of waste paper recycled by the respondents was 145 tonnes per month. Two of the respondents used to collect PCCs separately as well as along with paper, and one respondent used to collect PCCs only along with paper. The price of PCCs was `5 per kilogram and that of paper was `4.0–4.5 per kilogram. The average selling price of PCCs was `7–9 per kilogram. PCCs were sold to large-scale dealers (wholesalers) or paper mills for recycling. Two of the respondents who were not dealing in PCCs were discouraged because of the low price and small market size. The average

Figure 30: Waste dealer analysis in Mumbai

quantity of PCCs found in the waste bale was 2.66%.

Table 22: Waste dealer analysis in Mumbai

Name of Respondent	Classification	Wastepaper business in Kgs	PCC business reported in Kgs	Remarks
Javed	Large scale waste paper dealer	24000	75.00	Business turn
Rajesh	Large scale waste paper dealer	45000	2000.00	Business turnover
Md Akram	Large scale waste paper dealer	0.00	0.00	Rejects PCC as less profit
Ramu Seth	Large scale waste paper dealer	8000	43.00	Business Turnover
Eklaq Ashfaq	Large scale waste paper dealer	0.00	0.00	Only cardboard and paper scrap does not take PCC

Dumpsite Analysis

Three trucks were analysed at the Deonar dumping ground. One truck each from institutional, residential, and commercial areas was analysed during the survey. Analysis results are given in Table 23.

Table 23: Dumpsite analysis in Mumbai

Truck details	Area covered	Weight of waste loaded (in kg)	Quantity of waste paper (in kg)	Quantity of PCCs (in kg)
MH03CE8191	Institutional area (Chembur Naka and Govindi)	7000	3000	20
MH02CE8180	Commercial area (Lakshmi Narayan market, Durga Mata Mandir Market, airport, and hotels)	9000	1250	40
MH02CE8179	Residential area (Akruti building and Kurla)	7000	900	15
Average PCC analysed				0.32%

The percentage of PCCs found in the wastes reaching the dumpsite was about 0.32%.

Figure 31 depicts the collected PCC during the analysis at Deonar dumping ground.

Figure 31: Dumpsite analysis in Mumbai

Pune

Questionnaire Survey

Ragpickers and Door-to-Door Waste Collectors

Ten ragpickers and door-to-door waste collectors were surveyed. Eight of them collected PCCs separately, and only two collected PCCs along with paper. The respondents collected about 4944 kg of paper waste per month. The average quantity of PCCs collected was 124 kg per month. Waste paper was sold at `1–4 per kilogram, whereas respondents from the institutional area used to sell wastepaper at a high price of `40 per kilogram. A possible reason for this high price was the availability of white paper and bond paper in these areas.

Figure 32: Waste dealer analysis in Pune

These respondents sold PCCs at `5–10 per kilogram, with an average price of `6.5 per kilogram. One respondent informed that the price was higher before monsoon and that it varied from season to season. The source of PCCs was households for 50% of respondents, streets for 20% of respondents, waste bins/dalhaos for 30% of respondents, and institutional areas and commercial markets for 30% of respondents. All the respondents informed that upper and middle class colonies contributed PCCs, and three respondents also used to collect PCCs from commercial and institutional areas. All the respondents found the collected PCCs free from leftover content. When asked for suggestions to further increase the collection efficiency of PCCs, the respondents suggested the following:

- With increased price of PCCs, segregation and collection could be easily increased.
- Since the quantity was less, it was difficult to collect PCCs separately, but with increased value, collection could be achieved.
- Since the density of PCC is less this requires large volume for storage and discourages waste dealers due to increased handling cost.

Small-Scale Low-Grade Waste Paper Dealers

Fourteen small-scale kabadiwalas were surveyed. The average quantity of waste paper collected by the respondents was 17,660 kg per month. Only four of the respondents used to purchase PCCs separately, and five respondents used to buy along with paper. Five

respondents did not deal in PCCs, yet some of them used to get PCCs mixed with waste paper. The average quantity of PCCs collected was 1336 kg per month per kabadiwala. Three of the respondents used to get PCCs from households, and six used to get them from ragpickers and door-to-door collectors. Three ragpickers used to get PCCs from commercial markets also. Four respondents found PCCs to be free from leftover content, whereas six respondents sometimes found leftover content as well as PCCs chewed by rats. The price of PCCs ranged from `8 to `12 per kilogram. The respondents used to buy PCCs at `5–10 per kilogram. The net profit varied from `1 to `3 per kilogram. The analysed bales revealed that PCCs constituted 0%–4.1% of the total wastes, with an average percentage of 1.10%. When asked about reasons for not dealing in PCCs, the respondents raised issues such as rodent infestation, requirement of large storage space, and very low collection quantity. Some respondents mentioned low profits as the reason for not collecting PCCs.

Figure 33: Waste truck analysis in Pune

Large-Scale Low-Grade Waste Paper Dealers

Five large-scale low-grade waste paper dealers were surveyed from Kandwapuri, Dattawadi, Karbapeth, Devachi Uruli, and Gultakadi. Four respondents did not buy PCCs due to the following reasons:

- Due to small quantity it takes time to complete a truck load and requires space to store.
- PCC smells due to left over juice contents
- materials with PCC are often pressurised by dealers and mills for low prices.

The PCC content analysed at bales with waste dealers is as under

Table 24: Waste dealer analysis at Pune

Name of waste dealer	Quantity of bale analysed (in kg)	Quantity of PCCs found (in kg)	Percent of PCCs
Imtiyaz	94.6	0.28	0.30
Vilas	108	0.34	0.31
Javed	108.1	0.06	0.06
Irfan	106.2	0.11	0.10
Sameer	108.8	0.2	0.18
Average PCC analysed			0.19%

The average quantity of PCCs found at the waste dealer level was 0.19%. One of the five respondents used to sell PCCs along with paper at `4–6 per kilogram and sold further to large-scale dealers at `11 per kilogram.

Dumpsite Analysis

Sampling and analysis were done at the dumpsite. The results obtained for truck analysis are given in Table 25.

Table 25: Dumpsite analysis in Pune

Question	Answer	Comments
Truck details	MH-12 EB 2273	Analysed at Katraj Depot. Driver Rajram Pawar (9096564992)
Areas covered (give the name of the area and a short description of the area in context of the exercise)	Swaminagar	Swaminagar is a residential colony from where the truck loads waste.
Total waste load (in kg)	800	Empty truck load = 4000 kg
Total paper load (in kg) (an estimate will do)	68	Based on analysis done at site
Total quantum of PCCs (in kg)(must be precise and based on actual weight)	0.75	Based on analysis done at site
Other observations		Truck conducts two trips per day, and even more sometimes
Question	**Answer**	**Comments**
Truck details	MH 42 F 9887	Loading waste from residential colony; serving 25 trolleys of waste. Analysed at Katraj Depot. Driver Lakhan Jadhav
Areas covered (give the name of the area and a short description of the area in context of the exercise)	Trimurthi Chowk, Maharana Chowk, Phale Corner, Bharatiya Sawant Corner	
Total waste load (in kg)	1085	Total load = 4285 kg and empty weight = 3200 kg
Total paper load (in kg)(an estimate will do)	75 kg	Based on actual analysis
Total quantum of PCCs (in kg)(must be precise and based on actual weight)	3 kg	Based on actual analysis
Other observations		

Question	Answer	Comments
Question	**Answer**	**Comments**
Truck details	MH 12 TR AVX 816	Waste collected from institutional area. Collection time between 2–3 p.m.
Areas covered (give the name of the area and a short description of the area in context of the exercise)	Bhartiya Vidyapeeth with 28 colleges	
Total waste load (in kg)	700	Total weight = 5100 kg and empty weight = 4400 kg
Total paper load (in kg)(an estimate will do)	115	Based on actual analysis
Total quantum of PCCs (in kg)(must be precise and based on actual weight)	1.75	Based on actual analysis
Other observations		

Hence, the total waste received at the dumpsite had about 9.98% paper and 0.21% PCCs.

Paper Mill Analysis

Name and address of paper mill: Shri Balaji Paper Board Mill, Sawalwadi, Uruli Devachi
Manufactured product: Sundry Grey Board Mill with capacity of 2000 kg per day
Total average waste paper consumed 35000 kg per month
Bale analysis: Total weight load in truck—1500 kg
Total weight of PCCs found: 1.330 kg
Quantity of rejected materials from the pulper: 33 kg in full day after drying and there is no rejection from pulper
Comments of paper mill: PCCs are not useful for paper manufacturing due to technology constraint and should be exchanged after sorting with waste paper.
Thus, the quantity of PCCs found at the paper mill was 0.09%.

Hyderabad

Questionnaire Survey

Ragpickers and Door-to-Door Waste Collector

Ten ragpickers and door-to-door waste collectors were surveyed during the study in Hyderabad. All of them used to collect PCCs along with paper waste. The PCCs and paper were together sold at `1.5–4.0 per kilogram. Most of the respondents found it difficult to separately collect PCCs since the quantity found was less and the price was similar to that of paper waste. Two respondents reported finding soiled PCCs as well as leftover content. The average quantity of paper waste collected by each of these respondents was 533 kg per month. Low density of PCCs and less price discouraged the collection of PCCs. Ragpickers and door-to-door collectors also informed that they collected PCCs from upper, middle, and lower income areas as well as commercial markets.

Figure 34: Ragpicker analysis in Hyderabad

Small-Scale Low-Grade Waste Paper Dealers

Thirteen kabadiwalas and low-grade waste paper dealers were surveyed. None of the kabadiwalas/waste dealers bought PCCs separately. They bought PCCs only mixed with paper waste at `2 per kilogram. The quantity of PCCs found in waste paper bales was 2%–9.6%, with an average of 4.31%. The paper waste containing PCCs was mostly sent to recyclers, who further sold to paper mills. When asked for suggestions to improve segregation, some of the respondents informed that since the price of PCCs was same as that of paper, they did not get any encouragement in segregating PCC. Only if a higher price was offered,

Figure 35: Waste dealer analysis in Hyderabad

they could segregate PCCs. None of the respondents used to treat PCCs prior to selling, and all of them informed that PCCs obtained by them were free from leftover content and were not soiled.

Large-Scale Low-Grade Waste Paper Dealers

Five surveys were conducted at the large-scale waste dealer level. All the respondents used to buy PCCs along with paper at a very low price of `1.5–2.0 per kilogram. The average turnover of each of the respondents was 188 tonnes of waste paper per month. They were provided with waste paper by 10–150 low-grade dealers, kabadiwalas, and ragpickers. The PCCs they received were free from leftover content. The PCCs were very low in quantity and were sold to recyclers without any profit. The quantities of PCCs found in mixed bales analysed are given in Table 26.

Table 26: Waste dealer analysis in Hyderabad

Name of waste dealer	Type of dealer	Weight of bale analysed in Kgs	Quantity of PCC found in Kgs
Prem Raj	Large scale waste paper dealer	70	5
Dilip	Large scale waste paper dealer	50	3
Krishna	Large scale waste paper dealer	60	4
Govardhan	Large scale waste paper dealer	60	5
Raju	Large scale waste paper dealer	50	2
Average PCC analysed			6.55%

The quantity of PCCs found in mixed paper was about 6.55%. When asked about ways to improve PCC collection, the suggestions were increase in price of PCCs and establishment of a separate market.

Dumpsite Analysis

Figure 36: Dumpsite analysis in Hyderabad

Three trucks bringing waste from residential, commercial, and institutional areas were analysed for PCCs. Mixed waste samples were analysed from the trucks. It was observed at the dumpsite that paper wastes coming through compactors were picked up by ragpickers, and PCCs were mixed with coloured or mixed paper waste and sold at `1 per kilogram. Hence, PCCs were not ending up at

the dumpsite since these are integrated into the informal recycling chain.

Table 27: Dumpsite analysis in Hyderabad

Truck number	Total waste load (in Kg)	Waste analysed (in kg)	Total quantum of PCCs (in kg)
AP09X9040 (driver Ramesh, 9948463987)	3000	3000	0
AP11X7443 (driver Zafar Ali, 9392998013)	8000	1000	5
AP29H1428 (driver Yunus, 9866403049)	20000	300	7.5

Analysis found 0.29% of PCCs in the waste bought to the dumpsite.

Nagpur

Questionnaire Survey

Eleven ragpickers/door-to-door collectors, fifteen low-grade waste paper kabadiwalas, six large-scale low-grade waste paper dealers, and four trucks were surveyed in Nagpur.

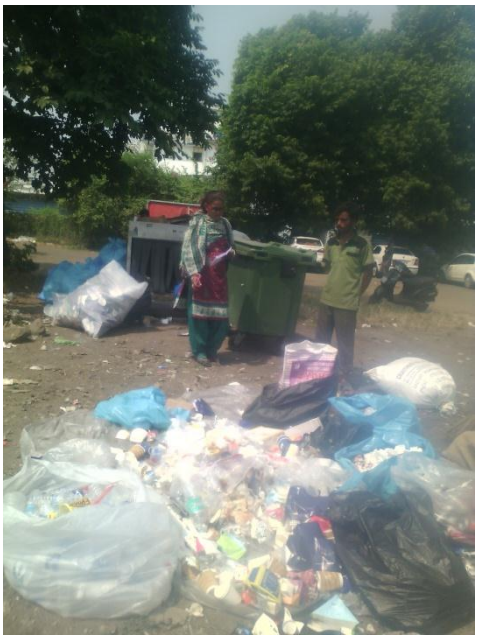

Figure 37: Waste dealer analysis in Nagpur

Ragpickers and Door-to-Door Waste Collectors

The ragpickers and door-to-door collectors surveyed used to collect waste from both residential and commercial areas and collected on an average 33 kg of paper waste every day. Only two of the respondents collected PCCs along with paper, and nine of them did not collect PCC. The PCCs collected were sold at about `4 per kilogram. PCC collection in Nagpur was not significant due to the lack of incentives. The respondents informed that they did not find any leftover content in the PCCs or soiled PCCs. Also they used to sell the PCCs along with paper waste to kabadiwalas. Table 28 gives the reasons for not collecting PCCs by the respondents.

Table 28: Response from rag pickers/door-to-door waste collectors in Nagpur

S.No	Ragpickers/door-to-door waste collectors	Reason for not collecting PCCs
1	Seeta Fulsinge	Collects 10–15 kg of waste from open spaces every day but does not collect PCCs as there is no special buyer.
2	Laxman Sadel	Collects waste from open spaces, roads, and shops in the area. Gathers 25–30 kg of waste per day, but does not collect PCCs because kabadiwalas do not buy PCCs.
3	Pravin Bhende	There is no market for PCCs, and hence the collected PCCs are sold to kabadiwalas along with waste paper.
4	Iqbal Hussain	Collects waste from 250–300 households and shops every day. Waste contains only 5–10 PCCs since kabadiwalas do not buy PCCs. Since PCCs are not segregated, these go to the dumpsite along with other waste.
5	Parwati Pendam	Collects 10 kg of waste per day; finds one or two PCCs but does not collect them since there is no buyer for PCCs.
6	Suresh Meshram	Kabadiwalas do not buy PCCs, hence sells them along with paper waste. Collects waste from 300–400 households, and only waste from 7–8 households contains PCCs. Collected PCCs are not segregated and sent to dumpsite.
7	Mohd. Shakil	Collects 8–10 kg of waste per day from streets and bins. Since there is no buyer, PCCs are not collected.
8	Suresh Bhave	Does not segregate PCCs since there is no buyer.
9	Pravin Karwate	Collects waste from 250–300 households every day. Waste

S.No	Ragpickers/door-to-door waste collectors	Reason for not collecting PCCs
		contains only 2–5 PCCs. As kabadiwalas do not buy PCCs, segregation is not done. PCCs go to dumpsite along with other wastes.
10	Raghunath Nathe	Collects 12–15 kg of waste but does not collect PCCs since there is no buyer.
11	Pradip Jiwtode	Collects waste from door to door. Collected waste is disposed directly into the dumpsite without segregation.

Small-Scale Low-Grade Waste Paper Dealers

Surveyed kabadiwalas informed that the average quantity of waste paper sold by them was 3735 kg per month. Of the 15 surveyed, only one used to buy PCCs along with paper waste. The price offered by him for paper was about `7–8 per kilogram. The respondents informed that there was no market for PCCs in Nagpur and that sometime they sold the caps of PCCs with plastic and threw away the PCCs. They raised other issues such as finding soiled and foul-smelling PCCs and absence of recycling units in Nagpur. They also highlighted the need for awareness to demonstrate the value of PCC recycling.

Large-Scale Low-Grade Waste Paper Dealers

Six large-scale low-grade waste paper dealers were surveyed in Nagpur from areas such as Cotton Market, Jaitalal Road, Manewada Chowk, Kamal Chowk Road, Pandharabadi Road, and Kamla Basti. Only one of the respondents used to buy PCCs along with paper at `3–4 per kilogram. PCCs came mainly from households, door-to-door collectors, and intermediate kabadiwalas. The PCCs collected were mostly free from leftover content. The reasons for not buying PCCs by the other respondents are as follows:

- No one sold Tetra Pak PCCs to them, may be due to very less quantity.
- For collecting PCCs, the quantity should be large and as such no one bought PCCs separately.
- There was no separate collection of PCCs by ragpickers or kabadiwalas due to the lack of potential market.
- Lack of awareness about the potential value of PCC recycling was a reason for the non-availability of a recycling market.
- PCCs were found in small quantities and sold at a very low price. Susceptibility to smell during storage was also a reason for avoiding PCCs.

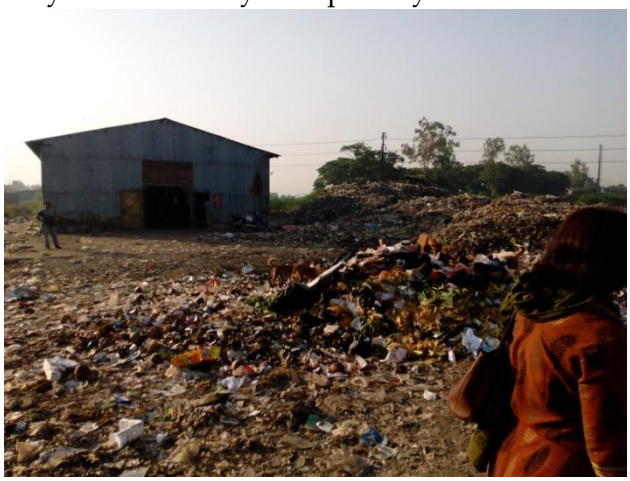

Figure 38: Dumpsite survey in Nagpur

Table 29: Waster dealer analysis in Nagpur

Name of Large Scale Dealer	Type of Unit	Quantum of waste paper sampled (in KG)	Quantum of PCCs found (in kg.)	Remarks
Alok Shinde	Large dealer of low grade waste paper	0.00	0.00	No market for PCC with this dealer
Ramesh Sewatkar	Large dealer of low grade waste paper	100 100	3.0 3.0	Comes mixed with paper
Satram Sahu	Large dealer of low grade waste paper	100 100	1.50 0.75	Sometimes even less quantity
Parmod Washmare	Large dealer of low grade waste paper	0.00	0.00	No one returns PCC as no market exists
Jakir Shekh	Large dealer of low grade waste paper	0.00	0.00	Not available in large quantity and does not deal in PCC
Average PCC analysed			2.06%	

The average quantity of PCCs found with the low-grade dealers was 2.06%.

Dumpsite Analysis

Table 30 gives the summary of waste sampling at the dumpsite.

Table 30: Summary of waste sampling at the dumpsite in Nagpur

Truck number/area	Total waste load (in kg)	Total waste paper (in kg)	Total PCCs (in kg)
MH 40 Y9515 (residential and commercial)	5250	25	1.50
MH 31 DS 4189 (institutional)	2500	10	0.50
MH 31 CQ 8534 (residential and commercial)	7000	30	2.00
MH 31 CQ 1674 (residential and commercial)	5330	30	2.00

The average quantity of PCCs was 0.03% of the total municipal solid waste received at the dumpsite. The average quantity of paper waste was about 0.47% of the total waste received at the dumpsite.

Bengaluru

Questionnaire Survey

Ragpickers and Door-to-Door Collectors

Eleven surveys were conducted in Bengaluru covering ragpickers and door-to-door collectors. The average quantity of waste paper collected was 520 kg per month. All of the respondents used to collect PCCs separately as well as along with paper. The selling price of PCCs was `2–4 per kilogram and that of paper was `4–7 per kilogram. The average quantity of PCCs collected was 325 kg per respondent. The source of PCCs was from streets, waste bins, and dalhaos covering residential and commercial areas. The condition of PCCs depended on the source of procurement. Mostly PCCs received from wine shops were clean. The collected PCCs were sold to scrap dealers, who further sent these for recycling. When asked about ways to increase collection efficiency, the respondents suggested increased price to generate more income. One of the respondents informed that PCC prices had been stagnant for a long time whereas prices of other scraps had increased.

Figure 39: Ragpicker analysis in Bengaluru

Small-Scale Low-Grade Waste Paper Dealer

Fourteen surveys were conducted at the small-scale waste dealer level. The monthly turnover of waste paper and cartoons was about 39 tonnes per respondent. Half of the respondents did not deal in PCCs due to the lack of profit. One of these respondents who used to collect PCCs earlier had now stopped after suffering loss. Six of the seven respondents dealing in PCCs used to collect these separately from households, ragpickers, and intermediate kabadiwalas. The price of PCCs ranged from `3 to `8 per kilogram. Five of the respondents used to find leftover contents in PCCs, whereas two respondents used to get clean PCCs. The respondents who got clean PCCs were offered a higher price of `7–8 per kilogram. The collected PCCs were further sold to large-scale dealers at a profit of `1.0–1.5 per kilogram without any treatment. When asked about ways to increase the collection efficiency of PCCs, some of the respondents suggested higher price as a motivation.

Large-Scale Low-Grade Waste Paper Dealer

Five surveys were conducted with large-scale waste dealers. All the respondents collected PCCs separately. The average quantity of waste paper collected by these dealers was more than 233 tonnes per month per respondent. The average quantity of PCCs collected by these respondents was 39.5 tonnes per month. The average price at which these respondents used to buy PCCs was `4–6. Since all the respondents received PCCs after segregation, no bale analysis was done for mixed paper from these dealers. Waste PCCs were bought by these

Figure 40: Kabadiwala analysis in Hyderabad

dealers from small-scale dealers. A few of the respondents reported getting soiled PCCs during the rainy season. All the respondents used to further sell PCCs to dealers who gave better price. Two of the respondents used to sell PCCs to Sahaas, and Saahas used to sell these to paper mills. Sahaas bought PCCs at `10–11 per kilogram in the form of bales. If Sahaas collected loose PCCs from intermediate kabadiwalas, the offered price was `5 per kilogram. Sahaas further sold these PCCs to paper mills at `11.80 per kilogram. When asked about the problems faced, the respondents highlighted low income as a disadvantage of collecting PCCs and suggested that collection efficiency could be improved if a higher price was offered in the market.

Table 31: Large scale dealer analysis at Bangalore

Name of Large Scale Dealer	Type of Unit	Quantum of waste paper purchased per month (in Tonnes)	Quantum of PCCs purchased per month (in .)	Remarks
Ajay Kumar	Large dealer of low grade waste paper	200	10	PCC is sold in separate bales and not mixed with RS or cardboard
Babu	Large dealer of low grade waste paper	100	30	
Madhu	Large dealer of low grade waste paper	350	90	
Bilal	Large dealer of low grade waste paper	400	17.5	
Maula	Large dealer of low grade waste paper	200	50	
Average PCC analysed			15.8%	

The fraction of PCC business was found to be 15.8 percent.

Dumpsite Analysis

Table 32: Truck analysis in Bengaluru

Truck details	Waste in truck (in kg)	Quantity of PCCs (in kg)
Truck 1 (residential)	13,500	5.60
Truck 2 (commercial)	3,500	3.18
Truck 3 (institutional)	2,500	0.50

Hence, PCCs constituted about 0.00475% of the total waste received at the dumpsite.

Paper Mill Analysis

Name of paper mill: Badrak Aids Pvt. Ltd

Address: Bommenahalli, Barandur Post-577245, Bhadravathi Taluk, Shimoga District

Three bales each from three trucks were analysed and no PCC was found in the bales.

Table 33: Analysis at paper mill

Truck number	Gross weight (in kg)	Truck weight (in kg)	Load weight (in kg)	Sample 1 weight (in kg)	Sample 1 PCC weight (in kg)	Sample 2 weight (in kg)	Sample 2 PCC weight (in kg)	Sample 3 weight (in kg)	Sample 3 PCC weight (in kg)
KA 19 5460	17,090	6,940	10,150	37	0	19	0	15	0
KA 21 B 8811	17,730	7,180	10,550	39	0	14	0	27	0
KA 14 A 4128	16,250	6,460	9,790	44	0	29	0	28	0
Total	51,070	20,580	30,490	120	0	62	0	70	0

Figure 41: Bales analysed at the paper mill

Chennai

Questionnaire Survey

Ragpickers and Door-to-Door Collectors

Figure 42: Kabadiwala surveyed in Chennai

Twelve surveys were conducted at the ragpicker and door-to-door waste collector level. The average quantity of waste paper collected by the respondents per month was about 1000 kg per respondent. None of the respondents used to collect PCCs since kabadiwalas did not purchase these. If more than 2–3 packs of PCCs were found with the waste paper, the kabadiwalas reduced the price or removed the PCCs. Hence, the absence of market was the major reason for non-collection of PCCs in Chennai. The collected PCCs were mostly soiled and less in quantity. Hence, a better market price and sufficient quantity could drive the collection more efficiently.

Small-Scale Low-Grade Waste Paper Dealers

Fourteen surveys were conducted at the small-scale waste dealer level. Only one of the respondents used to purchase PCCs both separately and along with paper. The price of PCCs he used to give was `6–7 per kilogram. The average quantity of PCCs he used to get per month was about 400 kg, but his turnover for paper was about 6500 kg per month. The price of paper was higher at `8–10 per kilogram. He used to sell the collected PCCs to recycling units and paper mills. The other respondents gave the following reasons for not dealing in PCCs:

Figure 43: Large-scale waste dealer analysed in Chennai

- Lack of awareness about PCC recycling market.
- No money in return for PCCs.
- Price deduction if more than 2–3 packets were found.
- Less volume of PCCs; high volume could not be recycled.
- No separate market for PCC recycling.
- Could be collected if large dealers bought PCCs.

The respondents also informed that PCCs found by them were mostly soiled.

Large-Scale Low-Grade Waste Paper Dealers

Four surveys were conducted at the large-scale waste paper dealer level, and the average waste paper turnover per respondent was 16,500 kg per month. All the respondents collected PCCs. Two of them collected PCCs separately, and two collected along with paper waste. The average price of PCCs given to intermediate kabadiwalas and ragpickers was

about `4–7 per kilogram and the price for paper was `7–15 per kilogram. None of them had a direct buyer of PCCs, and they mixed PCCs with coloured paper in the ratio of 5%–10% before selling to paper recycling units. On an average, the respondents handled 1–2 tonnes of PCCs per month, and most of the PCCs did not have leftovers or were not soiled. When asked about ways to improve PCC collection, they gave the following suggestions:

- There is no market in Chennai for PCCs due to lack of awareness about PCC recycling.
- There is no profit in PCCs as these are sold with coloured paper.
- There should be regular collection of PCCs and advance money should be given to kabadiwalas for collecting PCCs.

Table 34: Large scale dealer surveyed at Chennai

Name of Large Scale Dealer	Type of Unit	Quantum of waste paper purchased per month (in Tonnes)	Quantum of PCCs purchased per month (in .)	Remarks
Mano waste mart	Large scale waste paper dealer	18	1.75	Sends PCC mixed with coloured paper
Senthil	Large scale waste paper dealer	30	1.0	
Sonu	Large scale waste paper dealer	7.5	0.37	
Laurence	Large scale waste paper dealer	10.5	1.25	
Average PCC analysed			6.6%	

The average PCC found is 6.6 percent

Figure 44: Large Scale waste dealer analysed in Chennai

Colombo

Questionnaire Survey

Ragpickers and Door-to-Door Waste Collectors

Surveys were conducted at the ragpicker/ door-to-door collector level, and all 10 of the respondents did not collect PCCs. The average quantity of waste paper collected by the respondents was about 340 kg per month. They did not collect PCCs separately and sometimes mixed PCCs with other wastes to increase weight. The waste purchasing centres did not purchase PCCs from them. When asked about ways to improve PCC collection, the respondents gave the following suggestions:

- Establishment of a market for PCCs at the kabadiwala and dealer levels.
- Awareness among waste collectors about the value of PCCs.
- Publicity/awareness among recyclers and recognition of the recycling potential.

Small- and Medium-Level Waste Dealers

Figure 45: Survey at the waste dealer level in Colombo

Fourteen small- and medium-level collection centres were surveyed with an average waste paper turnover of about 1820 kg per month per respondent. None of the respondents used to collect PCCs and considered these as waste. Other recyclable materials such as cardboard, paper, metal, and plastic were collected by the respondents. When asked about the reasons for not buying PCCs, they highlighted lack of local and international market as well as awareness among stakeholders, and huge labour requirement for sorting poly-aluminium from PCCs. When respondents were asked for ways to improve PCC collection, they gave the following suggestions:

Figure 46: Waste analysis at dumpsite in Colombo

- Creation of a local market for purchasing PCCs with attractive prices.
- Creation of awareness among stakeholders on the economic value of PCCs can improve PCC collection and recycling.

Two bales of 100 kg were analysed at each of the respondents and no PCC was found, which confirmed that PCCs were not bought by low-grade waste dealers.

Large-Scale Waste Paper Dealers

Five surveys were conducted at the large-scale waste paper dealer level. The respondents were collecting waste paper at an average of 36,000 kg per month per respondent. The number of kabadiwalas or low-level

dealers associated with them was 13–26. None of the respondents collected PCCs as there

was no market and demand for PCCs in the region. Two bales (100 kg) analysed from each of the respondents showed no PCC. Some of the respondents informed that they required a large number of labourers to segregate poly-aluminium from PCCs and thus regarded PCCs as waste. They also informed that only when there was a market and awareness among stakeholders for PCC collection and recycling, then only separate collection could happen. One of the respondents even used to import waste paper for recycling.

Table 35: Analysis at waste dealer in Colombo

Name of Large Scale Dealer	Type of Unit	Quantum of waste paper purchased per month (in kgs)	Quantum of PCCs purchased per month (in kgs .)	Remarks
APS Nagaraj	Large Scale waste paper dealer	100 100	0 0	No market
R Rajendra	Large Scale waste paper dealer	100 100	0 0	No market
P Selvaraj	Large Scale waste paper dealer	100 100	0 0	No buyer available I region
Mr Dilruk	Large Scale waste paper dealer	100 100	0 0	No awareness in region for PCC market
Mr Palitha	Large Scale waste paper dealer	100 100	0 0	No local or international market
Average PCC analysed			0.00%	

Dumpsite Analysis

Three truck loads were surveyed at the Kardiyana dumpsite in Colombo.

Table 36: Truck analysis for waste at the dumpsite

Truck details	Waste load (in kg)	PCCs in waste load (in kg)	Paper waste (in kg)	Percentage of PCCs in total waste
Reg No: 49-6550 (residential)	920	1.5	8.0	0.16
Reg No: RD 7120 (residential)	3830	2.5	14.5	0.06
Reg No: 49-6548 (commercial and institutional)	1240	4.0	18.0	0.32

The percentage of PCCs found at the dumpsite was 0.13% of the total municipal solid waste reaching the dumpsite.

PCC Management Chain

Figure 47 shows the schematic of the informal recycling system in India.

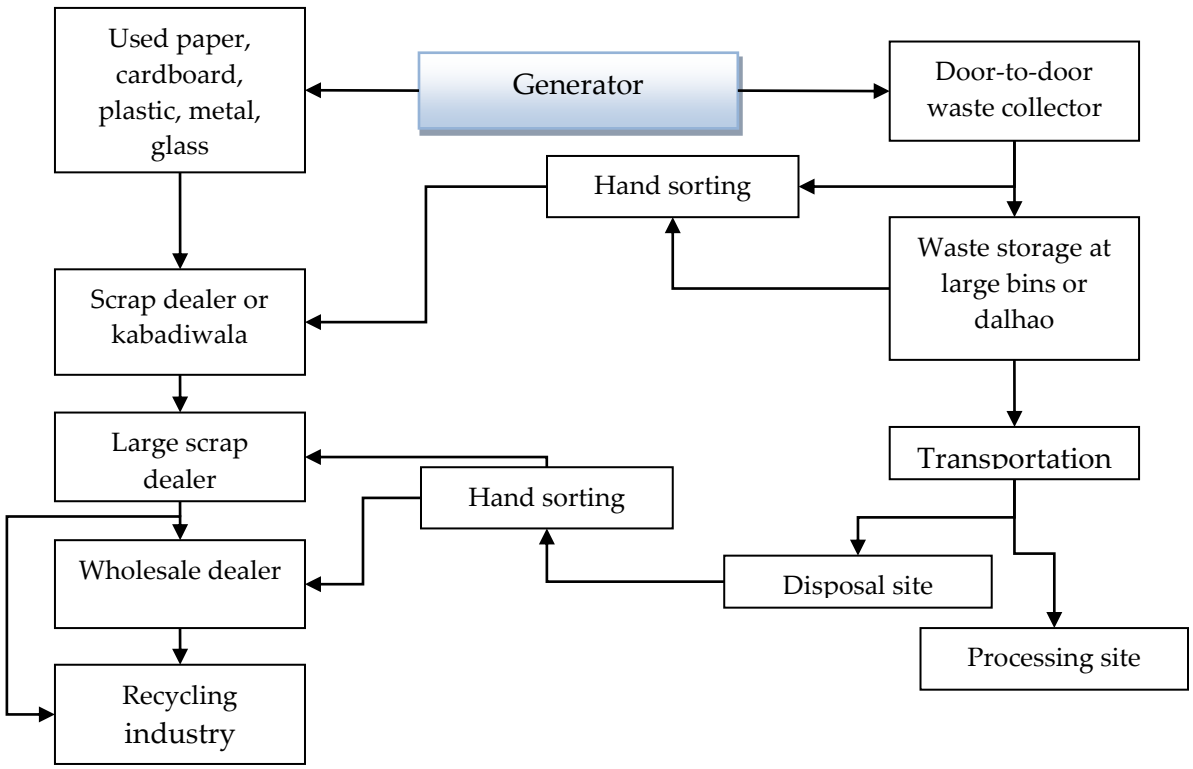

Figure 47: Schematic representation of the informal recycling system in India

The fate of PCCs varies from region to region since there is separate collection and recycling in some cities and some cities do not collect PCCs at all. Depending on the awareness level and availability of recycling units in the region, the fate of PCCs changes. For cities that recycle PCCs have the following stakeholder involvement:

- *Street waste picking*: PCCs are recovered from mixed waste found on streets or extracted from communal bins before collection by scavengers (ragpickers). This practice probably occurs in most of the cities and is common across South Asia.
- *Municipal waste collection crew*: PCCs are recovered along with other waste from vehicles transporting waste to disposal 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 PCCs and further sold to large dealers, which go for recycling.
- *Waste picking from dumps*: Waste pickers/scavengers sort through wastes before these are sent to the site of final disposal, which is generally an open space in entire South Asia. Sorting is often carried out by communities that live on or near the dump.

Figure 48 shows the recycling chain.

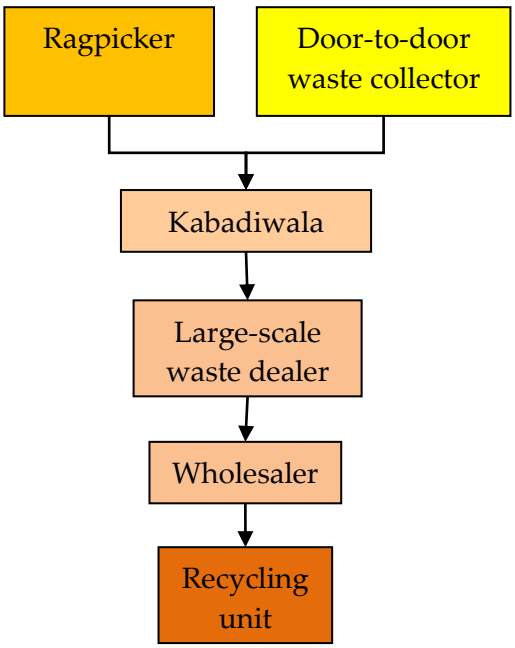

Figure 48: The recycling chain

At the top of the chain are waste collectors, that is, ragpickers and door-to-door collectors. Waste pickers collect waste from streets, waste bins, dalhao, 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 even sometimes 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 to paper mills or sell to wholesalers depending on the terms of payment and price offered.

Recycling units purchase segregated wastes to prepare various products such as newsprint, duplex, and so on. In some cities, Tetra Pak has roped in a few agencies that are collecting segregated PCCs from ragpickers and kabadiwalas. Once they collect sufficient quantities, these agencies supply PCCs to paper mills.

Economic Analysis

Table 37 summarizes the selling value obtained (including transport) by every agent in the informal sector on account of dealing in PCCs for the surveyed cities.

Table 37: Summary of value obtained (in Indian rupees per kilogram) on account of dealing in PCCs

Cities	Ragpickers	Small kabadiwalas (retailer)	Medium kabadiwalas (stockist)	Paper waste dealer (wholesaler)	Paper mill
Delhi	2.0–3.0	4.0–7.0	3.0–7.0	7.0–9.0	—
Lucknow	5.0–7.0	5.0–8.0	6.5–9.0	8.0–9.0	10.25–10.50
Srinagar	4.0	6.0–7.0	6.0	8.0	—
Jammu	2.0–3.0	1.5–5.0	2.0–3.0	4.0	—
Kolkata	3.0–5.0	3.0–6.0	3.0–5.0	4.0–8.0	4.0–8.0
Guwahati	5.0–6.0	6.50–12.0	6.0–10.0	7.0–15.0	6.0–15.0
Dhaka (BDT)	5.0–10.0	10.0–20.0	12.0–20.0	18.0–25.0	30.0–40.0
Kathmandu	—	—	—	—	—
Ahmedabad	1.0–4.0	2.0–3.0	2.0–3.0	4.0	—
Mumbai	5.0–7.0	—	—	5.0	7.0—9.0
Pune	5.0–10.0	8.0–12.0	4.0–6.0	11.0	—
Hyderabad	1.5–4.0	2.0	1.5–2.0	2.0	—
Nagpur	4.0	7.0–8.0	3.0–4.0	—	—
Bengaluru	2.0–4.0	3.0–8.0	5.0–10.0	10.0–11.0	11.80
Chennai	—	6.0–7.0	4.0–7.0	—	—
Colombo	—	—	—	—	—

-- Not available / Not applicable.

Material Flow Analysis

Methodology

Literature review was done to obtain the figures for the overall municipal solid waste generation in each of the 16 cities. Total paper waste generation figures were then obtained for each of the cities based on the previous studies. It was found from the literature that the informal sector collects between 26% and 29% of the total paper waste generated in India[2,3]. Based on these, the total quantity of waste paper recovered by the informal sector for both the scenarios is computed. Based on the collection efficiency of municipal solid waste, the quantity of waste reaching dumpsites is evaluated and shown in Table 39.

[2] http://reclaystewardedge.com/insights/thought-leadership/the-new-paper-chase-the-challenges-opportunities-and-solutions-to-increasing-paper-recovery-in-developing-countries/

[3] http://pubs.iied.org/pdfs/8124IIED.pdf

Literature Review

Useful findings from the literature are listed in Table 38. It was found from the literature that the informal sector collects between 26% and 29% of the total paper waste generated in India.

Table 38: Data retrieved from literature review

Cities	Total waste generation (tonnes/day) (A)	Percentage of paper waste out of total MSW generated (B)	Total paper waste generation (tonnes/day) (C = B×A)	Waste paper recovered by the informal sector [2] (@26%) (tonnes/day) (D1 = 26%×C)	Waste paper recovered by the informal sector (@29%) (tonnes/day) (D2 = 29%×C)	MSW collected by ULB(%) (E)	MSW going to the dumpsite (tonnes/day) (F = E×A)
Delhi	8390[4]	5.6[5]	553.74	166.12	221.50	83.43[6]	6,963.7
Lucknow	1534[7]	15[8]	230.10	69.03	92.04	62.5[9]	1,196.52
Srinagar	530[10]	6.8[11]	50.80	15.24	20.32	70[12]	545.31
Jammu	400[13]	11.62[14]	36.34	10.90	14.53	73.7[15]	413.66
Kolkata	5372[16]	7.40[17]	397.53	119.26	159.01	70[18]	3,760.4
Guwahati	750[19]	14[20]	105.00	31.50	42.00	58[21]	405
Dhaka	4634[22]	5.63[23]	255.50	76.65	102.20	50[24]	3,832.5
Kathmandu	523.8[25]	7.5[26]	44.59	13.38	17.84	70[27]	419.2
Ahmedabad	4000[28]	5.28[29]	216.60	64.98	86.64	100[30]	2,318

[4] (cpcb 2015) consolidated annual report on implementation of MSW rules 2000
[5] http://www.ijss.publicationsupport.com/docs/paper/Volume-1/issue_1/IJSS-104.pdf
[6] (cpcb 2015) consolidated annual report on implementation of MSW rules 2000
[7] http://www.iosrjournals.org/iosr-jestft/papers/vol8-issue5/Version-2/G08524149.pdf
[8] http://www.iosrjournals.org/iosr-jestft/papers/vol8-issue5/Version-2/G08524149.pdf
[9] http://www.iosrjournals.org/iosr-jestft/papers/vol8-issue5/Version-2/G08524149.pdf
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[13] http://jmc.nic.in/forms/swm.pdf
[14] http://isindexing.com/isi/papers/1410333569.pdf
[15] (cpcb 2015) consolidated annual report on implementation of MSW rules 2000
[16] http://timesofindia.indiatimes.com/city/kolkata/Only-one-tenth-of-waste-recycled-in-Kolkata-Study/articleshow/22876645.cms
[17] http://timesofindia.indiatimes.com/city/kolkata/Only-one-tenth-of-waste-recycled-in-Kolkata-Study/articleshow/22876645.cms
[18] http://www.ncbi.nlm.nih.gov/pubmed/19070474
[19] http://www.krishisanskriti.org/vol_image/03Jul20150207274.pdf
[20] http://www.krishisanskriti.org/vol_image/03Jul20150207274.pdf
[21] http://www.krishisanskriti.org/vol_image/03Jul20150207274.pdf
[22] http://www.env.go.jp/recycle/3r/en/asia/02_03-3/06.pdf
[23] http://kitakyushu.iges.or.jp/docs/mtgs/seminars/theme/swm/presentation/3%20Dhaka%20(Paper.pdf
[24] http://ro.uow.edu.au/cgi/viewcontent.cgi?article=1716&context=scipapers
[25] http://www.ncbi.nlm.nih.gov/pubmed/20880627
[26] http://www.ncbi.nlm.nih.gov/pubmed/20880627
[27] https://www.researchgate.net/post/Solid_Waste_Management_A_Problem_to_the_Capital_City_of_Nepal_Waste_is_said_to_be_a_mirror_of_society_since_waste_generation_and_disposal_reflect_a_range_of_aspects_of_that_society_such_as_its_econom
[28] http://www.egovamc.com/Downloads/SWM/AMC_SWM_Profile_English.pdf
[29] http://www.iitk.ac.in/3inetwork/html/reports/IIR2006/Solid_Waste.pdf
[30] (cpcb 2015) consolidated annual report on implementation of MSW rules 2000

Cities	Total waste generation (tonnes/day) (A)	Percentage of paper waste out of total MSW generated (B)	Total paper waste generation (tonnes/day) (C = B×A)	Waste paper recovered by the informal sector [2] (@26%) (tonnes/day) (D1 = 26%×C)	Waste paper recovered by the informal sector (@29%) (tonnes/day) (D2 = 29%×C)	MSW collected by ULB(%) (E)	MSW going to the dumpsite (tonnes/day) (F = E×A)
Mumbai	7025[31]	15[32]	931.60	279.48	372.64	96[33]	8,151.5
Pune	2100[34]	8[35]	217.92	65.38	87.17	100[36]	1,906.8
Hyderabad	3800[37]	8.13[38]	373.67	112.10	149.47	90[39]	4,741.68
Nagpur	800[40]	8.5[41]	32.50	9.75	13.00	100[42]	474.5
Bangalore	3500[43]	9[44]	333.00	99.90	133.20	85[45]	2,220
Chennai	4500[46]	8.38[47]	322.50	96.75	129.00	73[48]	3,650
Colombo	700[49]	7.97[50]	119.55	35.87	47.82	75[51]	1,125

Computation of Recycling Rate

Discussion with various large scale dealers revealed that the PCCs analysed at the dealer level are only from carton and road sweep in which these get mixed, constituting about 50% of the waste paper dealers' business. Thus, a fraction of 0.5 has been induced for calculating the quantum of PCCs getting recycled. Secondly, the fraction of stakeholders (i.e ragpickers,

[31]http://www.mcgm.gov.in/irj/go/km/docs/documents/MCGM%20Department%20List/City%20Engineer/Deputy%20City%20Engineer%20(Planning%20and%20Design)/City%20Development%20Plan/Solid%20Waste%20Management.pdf
[32]http://www.mcgm.gov.in/irj/go/km/docs/documents/MCGM%20Department%20List/City%20Engineer/Deputy%20City%20Engineer%20(Planning%20and%20Design)/City%20Development%20Plan/Solid%20Waste%20Management.pdf
[33]http://www.mcgm.gov.in/irj/go/km/docs/documents/MCGM%20Department%20List/City%20Engineer/Deputy%20City%20Engineer%20(Planning%20and%20Design)/City%20Development%20Plan/Solid%20Waste%20Management.pdf
[34] http://mpcb.gov.in/muncipal/pdf/MSW_AR_2014-15.pdf
[35] http://www.isca.in/rjrs/archive/iscsi/59.ISCA-ISC-2011-8EnvS-45.pdf
[36] http://research.ijcaonline.org/volume100/number10/pxc3898184.pdf
[37] http://www.pppinindia.com/pdf/ppp_position_paper_solid_waste_mgmt_112k9.pdf
[38]http://appcb.ap.nic.in/main/Telangana%20State%20Action%20Plan%20of%20MSW%20prepared%20by%20MA&UD%20Dept..pdf
[39]http://appcb.ap.nic.in/main/Telangana%20State%20Action%20Plan%20of%20MSW%20prepared%20by%20MA&UD%20Dept..pdf
[40] http://planningcommission.nic.in/reports/genrep/rep_energyvol2.pdf
[41] http://www.nswaienvis.nic.in/DataBank/downloadfiles/pdf/Nagpur.pdf
[42]http://www.nmcnagpur.gov.in/en/component/content/article/1-latest-news/47-vision-for-the-city.html
[43]http://bbmp.gov.in/documents/10180/512162/City+Statistics+New+Microsoft+Office+Word+Document.pdf/148f685d-58cd-402c-9c5c-bccb344eda2d
[44] http://218.248.45.169/download/health/swm.pdf
[45] http://kspcb.gov.in/MSW%20Annual%20Report%20%202013-14%20.pdf
[46] http://www.chennaicorporation.gov.in/departments/solid-waste-management/index.htm
[47]http://www.cmdachennai.gov.in/Volume3_English_PDF/Vol3_Chapter09_Soild%20Waste%20Management.pdf
[48]http://www.cmdachennai.gov.in/Volume3_English_PDF/Vol3_Chapter09_Soild%20Waste%20Management.pdf
[49] http://www.environmental-auditing.org/Portals/0/AuditFiles/lk253eng03ar_ft_solidwastemgmt.pdf
[50] http://www.humanitariansrilanka.org/WMA_%20problem_in_Sri_Lanka.pdf
[51] www.jerad.org/ppapers/dnload.php?vl=4&is=4&st=900
India recovery rate 27%-
http://reclaystewardedge.com/insights/thought-leadership/the-new-paper-chase-the-challenges-opportunities-and-solutions-to-increasing-paper-recovery-in-developing-countries/

small scale scrap dealers and large scale scrap dealers) dealing in PCC has also been considered to work out the PCC fraction being recycled by the informal sector. These figures have been shown in Table 39. This stake holder fraction takes care of the market share of PCCs market to give a closure representation of the recycling rates. Thus, a percentage of PCCs getting recycled has been arrived for both the scenarios of 26% and 29% for PCC recycling by the informal sector.

Table 39: Percentage of respondents dealing in PCC

City	Ragpickers	Kabadiwalas	Dealers	Average percentage
Delhi	70.0	71.4	80.0	73.8
Lucknow	63.6	100.0	100.0	87.9
Srinagar	61.1	42.9	66.7	56.9
Jammu	69.2	40.0	50.0	53.1
Kolkata	100.0	100.0	100.0	100.0
Guwahati	100.0	100.0	100.0	100.0
Dhaka (BDT)	54.5	93.8	100.0	82.8
Kathmandu	0.08	0.0	0.0	0.0
Ahmedabad	46.2	28.6	20.0	31.6
Mumbai	50.0	0.0	60.0	36.7
Pune	100.0	64.3	20.0	61.4
Hyderabad	100.0	100.0	100.0	100.0
Nagpur	18.2	6.7	16.7	13.8
Bengaluru	100.0	50.0	100.0	83.3
Chennai	0.0	7.1	100.0	35.7
Colombo	0.0	0.0	0.0	0.0

Table 40 summarizes the computation of recycling rates according to the assumption that the informal sector recovers 26% of the total waste paper generated.

Table 40: PCC recycling rate for the scenario when informal sector recovers 26% of the total waste paper

Cities	Consumption of Tetra Pak in tonnes per annum (for 2014)	Waste paper generation (tonnes/ annum) (table 39, C x 365) II	Percentage of PCCs in waste paper (III= I X II)	Waste paper recovered by the informal sector @ 26% (tonnes/ annum) (Table 39, D1 x 365) IV	Fraction assumed for waste constituting PCCs that were analysed at dealers V	Respondents dealing in PCC (%) (Table 39) VI	PCCs in paper waste collected at waste dealer level (%) (Survey findings) VII	PCCs collected by the informal sector (tonnes/year) (VIII=IV x V x VI x VII)	Informal recycling rate (%) IX = (VIII / I)x100	Active recycling (tonnes/ annum) X (secondary data by client)	Active recycling + inactive recycling (XI= VIII + X)	Total recycling rate (%) XII
Delhi	3408	171492	1.99	44588	0.5	73.81	0.58	95	2.80	450	546	16.01
Lucknow	214	83987	0.25	21836	0.5	87.88	0.12	12	5.38		12	5.38
Srinagar	550	13155	4.18	3420	0.5	56.88	0.046	0	0.08		0	0.08
Jammu	533	16965	3.14	4411	0.5	53.08	5.55	65	12.18		65	12.18
Kolkata	733	145098	0.50	37725	0.5	100.00	9.67	733	100.00		733	100.00
Guwahati	525	38325	1.37	9965	0.5	100.00	7.35	366	69.75		366	69.75
Dhaka	592	95226	0.62	24759	0.5	82.77	10.76	592	100.00		592	100.00
Kathmandu	880	14345	6.13	3730	0.5	0.03	0	0	0.00		0	0.00
Ahmedabad	377	77088	0.49	20043	0.5	31.58	1.25	40	10.49		40	10.49
Mumbai	1841	384619	0.48	100001	0.5	36.67	2.66	488	26.49	106	594	32.25
Pune	679	61320	1.11	15943	0.5	61.43	0.19	9	1.37	358	368	54.14
Hyderabad	1216	112763	1.08	29318	0.5	100.00	6.55	960	78.97	11	971	79.90
Nagpur	134	24820	0.54	6453	0.5	13.84	2.06	9	6.89		9	6.89
Bengaluru	4663	114975	4.06	29894	0.5	83.33	15.8	1968	42.21	1507	3475	74.54
Chennai	601	137642	0.44	35787	0.5	35.71	6.62	423	70.44	15	438	72.94
Colombo	2212	20363	10.86	5294	0.5	0.00	0	0	0.00		0	0.00
Total	19155.5	1512181		393167				5760		2448	8208	42.85

Table 41 summarizes the computation of the recycling rate assuming that the informal sector collects 29% of the total waste paper generated.

Table 41: PCC recycling rate for the scenario when the informal sector recovers 29% of the total waste paper

Cities	Consumption of Tetra Pak in tonnes per annum (for 2014) I	Waste paper generation (tonnes/ annum) (table 39, C x 365) II	Percentage of PCCs in waste paper (III= I X II)	Waste paper recovered by the informal sector @ 26% (tonnes/ annum) (Table 39, D1 x 365) IV	Fraction assumed for waste constituting PCCs that were analysed at dealers V	Respondents dealing in PCC (%) (Table 39) VI	PCCs in paper waste collected at waste dealer level (%) (Survey findings) VII	PCCs collected by the informal sector (tonnes/year) (VIII=IV x V x VI x VII)	Informal recycling rate (%) IX = (VIII / I)x100	Active recycling (tonnes/ annum) X (secondary data by client)	Active recycling + inactive recycling (XI= VIII + X)	Total recycling rate (%) XII
Delhi	3408	171492	1.99	49733	0.5	73.81	0.58	106	3.12	450	557	16.33
Lucknow	214	83987	0.25	24356	0.5	87.88	0.12	13	6.00		13	6.00
Srinagar	550	13155	4.18	3815	0.5	56.88	0.046	0	0.09		0	0.09
Jammu	533	16965	3.14	4920	0.5	53.08	5.55	72	13.59		72	13.59
Kolkata	733	145098	0.50	42078	0.5	100.00	9.67	733	100.00		733	100.00
Guwahati	525	38325	1.37	11114	0.5	100.00	7.35	408	77.79		408	77.79
Dhaka	592	95226	0.62	27616	0.5	82.77	10.76	592	100.00		592	100.00
Kathmandu	880	14345	6.13	4160	0.5	0.03	0	0	0.00		0	0.00
Ahmedabad	377	77088	0.49	22356	0.5	31.58	1.25	44	11.70		44	11.70
Mumbai	1841	384619	0.48	111539	0.5	36.67	2.66	544	29.55	106	650	35.31
Pune	679	61320	1.11	17783	0.5	61.43	0.19	10	1.53	358	369	54.30
Hyderabad	1216	112763	1.08	32701	0.5	100.00	6.55	1071	88.09	11	1082	89.01
Nagpur	134	24820	0.54	7198	0.5	13.84	2.06	10	7.68		10	7.68
Bengaluru	4663	114975	4.06	33343	0.5	83.33	15.8	2195	47.08	1507	3702	79.41
Chennai	601	137642	0.44	39916	0.5	35.71	6.62	472	78.57	15	487	81.06
Colombo	2212	20363	10.86	5905	0.5	0.00	0	0			0	0.00
Total	19156	1512181		438533				6272		2448	8720	45.52%

The quantity of PCCs getting collected by the informal sector exceeded by 2.5 times and 2.07 times compared to PCCs consumed in city of Kolkata and Dhaaka respectively, due to ingression of PCCs from neighbouring cities. Theoretically, this should not be more than consumption of PCC and hence the same correction has been made for calculation purposes.

PCCs at Paper Mills

The summary of the sampling carried out at paper mills is given in Table 42.

Table 42: PCC recycling rate based on the sampling at the paper mills

Region	Name of the mill	Type of exercise	Total paper waste sampled (in kg)	PCCs found (in kg)	PCCs in waste
North	Anand Duplex Ltd, Meerut	Reiky Survey	—	—	Nil
North-West	Khanna Paper Mill, Amritsar	Analysis	4,000	0.00	Nil
North	Jammu Paper Pvt. Ltd, Jammu	Analysis	6,000	0.00	Nil
North	Cardboard Box Factory	Analysis	1,170	6.63	0.57%
North	R D Paper Mill	Analysis	1,500	0.33	0.002%
East	Madhubati Paper Mill, Kolkata	Analysis	—	—	0.8%
East	Emami Paper Mills Ltd, Balasore	Analysis	2,000	0.00	Nil
West	Maruti Industries, Ahmedabad	Analysis	—	—	Nil
West	Shri Balaji Paper Board Mill, Pune	Analysis	1,500	1.33	0.09%
South	Badra Pack Aids Pvt. Ltd	Analysis	252	0.0	Nil
Average percentage of PCCs getting recycled in mills (only ones that accept PCCs have been considered)					0.36

The paper mills surveyed disclosed that rejects from pulper (including polythene and aluminium) have different fates in different mills. Some of the large paper mills used to recover thermal energy which was further used by the boilers. Some of the paper mills used to sell the pulper reject which was a raw material for plastic recycling units. One of a paper recycling unit revealed that they used to dump pulper rejects in a waste pit constructed by them for the same purpose.

PCCs Going to Dumpsite

Table 43 summarizes the computations for the dumpsites.

Table 43: Summary of the sampling at the dumpsites

Cities	Total MSW going to the dumpsite (tonnes/annum)	Fraction of PCCs in MSW sampled at the dumpsite (%)
Delhi	2554919	0.001
Lucknow	349944	0.002
Srinagar	135415	0.180
Jammu	107602	0.067
Kolkata	1372546	0.004
Guwahati	158775	1.300
Dhaka	845705	0.019
Kathmandu	133882	0.600
Ahmedabad	1460000	0.160
Mumbai	2461560	0.320
Pune	766500	0.210
Hyderabad	1248300	1.740
Nagpur	292000	0.030
Bengaluru	1085875	0.048
Chennai	1199025	NA
Colombo	191625	0.130
Average percentage of PCC reaching dumpsite		0.343

The samples of the waste sampled at the dumpsites were all taken from three truckloads of municipal waste in the same season of the year, and hence the amount of PCCs present in the municipal solid waste, as found by this exercise, may not be the actual representation. The composition of waste changes with changing season and festivals during the year. Hence, it is recommended that a sampling exercise should be performed at one city and waste samples should be taken from different trucks bringing waste from different areas and at different times of the year to get a closer representation.

Material Balance

PCC waste 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 these further go for recycling. The PCCs remaining uncollected and unrecovered move to the dumpsite. The number of PCCs entering the environment through dumpsites is estimated in the material balance chart given in Figure 49.

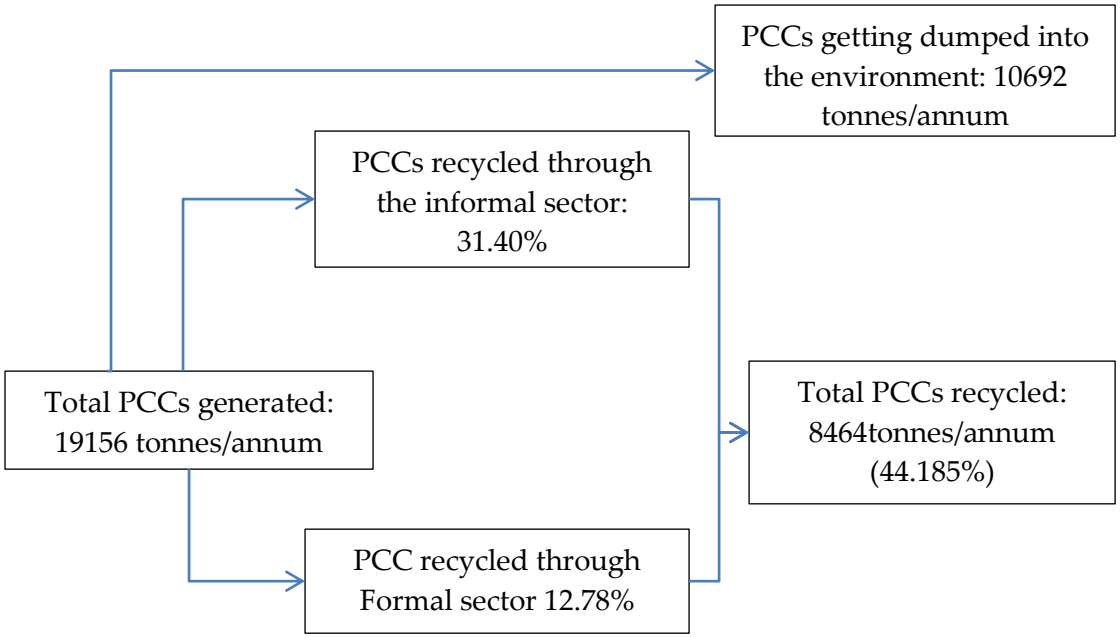

Figure 49: Material flow diagram for average waste paper recycled by the informal sector

Recommendations

1. PCC management can be effectively increased in cities with no or low market by developing markets in these cities. Active recycling has significant contribution in the overall recycling of PCCs. Hence, efforts should be made to upscale the capacity of the existing collection centres and to install more such centres in other cities.
2. PCC management can be more efficient if the chain is small and there is better price in the market for the collectors.
3. Awareness among recyclers about the potential for using PCCs is important. This should be done by highlighting statistics and case studies of mills consuming PCCs for paper production.
4. R&D should be carried out for efficient technologies for separating paper from PCCs and usage of polyethylene and aluminium recovered thereafter. Paper mills and recyclers should also be involved so as to create a better market.
5. Kolkata, Guwahati, Hyderabad and Chennai reported the highest informal recycling rate for PCCs. Many ragpickers in Kolkatta and Guwahati reported that they separated paper and aluminium from the PCCs before selling them to kabadiwalas. The management of PCCs should be further studied and lessons should be replicated at other places along with proper environmental pollution control measures.
6. Such an exercise (to study the management of PCCs in major cities and identify the recycling rates) may be repeated in every 3 years to assess the improvement in recycling rates.

Annexure 1: Waste Collectors Questionnaire

Project : Tetra Pak PCC management	Waste Collectors (ragpickers, door-to-door waste collectors)	September 2015

Name of Interviewer (INT): _____

Name of Supervisor (SUP): _____

1. General Information		
1.1	Name of candidate surveyed	
1.2	Type of waste collector (ragpicker, door-to-door waste collector)	
1.3	Address	_____
1.4	Contact number, if any	_____
	Cell number:	

2. Size		
2.1	Total area covered for collection of waste (consider all types of waste)	Area name/locality
	1.	
	2.	
	3.	
	4.	
	5.	
	6.	
	7.	
	Others…	
2.2	Total average paper waste collected per month (in kg)	_____kg

3. Collection Pattern			
3.1	**Do you collect Tetra Pak© Post Consumer Cartons (PCC)?**		
If Yes		**If No**	
If yes?	**Do you collect separately, or along with paper** **_____(separately)** **_____(along with paper)** **Per kg price of PCC_____** **Per kg price of Paper_____** **_____kg of PCC collected per month**	**Why not?**	**No one returns PCCs to us…..1** **There is no incentive to us…..2** **Other (specify)……..3**
3.2	**Source of procurement (can be more than 1)** **1. Households_____** **2. Street____** **3. Wastebins/dalhao____** **4. Other (specify)____**		
3.3	**Do you get PCC only from upper and middle class localities? _____** **Do you collect PCC from lower income localities? _____** **Do you collect PCC from commercial/business establishments/market places? _____**		
3.4	**Condition of PCC collected** **Most do not contain left over (juice etc)_____** **Most often soiled PCC containing left over _____**		
3.5	**Specify the fate of PCC collected** **_____** **_____**		
4.0	**Anything that discourages you from dealing in PCCs**		
5.0	**Any comment on how could the collection of PCCs be improved**		

Project : Tetra Pak PCC management	Waste dealer (low-grade paper waste dealers/kabariwala)	September 2015

Name of Interviewer (INT): _____

Name of Supervisor (SUP): _____

1. General Information		
1.1	Name of candidate surveyed	
1.2	Type of waste dealer (kabadiwala/low-grade paper waste dealer)	
1.3	Address	_____
1.4	Contact number, if any	_____
		_____
	Cell number:	

2. Size			
2.1	Type of area covered for collection of waste (low/middle/high)	Area name/locality	Number of smaller kabadiwala/ragpicker contributing in each location
	1.		
	2.		
	3.		
	4.		
	5.		
	6.		
	7.		
	Others…		
2.2	Total average paper waste collected per month (in kg)	_____kg	
3. Collection Pattern			
3.1	Do you collect Tetra Pak© Post Consumer Cartons (PCC)?		

If Yes		If No	
If yes?	Do you buy PCC separately, or along with paper waste? 1._____(separately) 2._____(along with paper) Per kg price of PCC_____ Per kg price of Paper_____ _____kg of PCC collected per month	Why not?	No one returns PCCs to us……..1 There is no incentive to us……..2 Other (specify)……..3
3.2	Source of procurement (can be more than 1) 1. Households_____ 2. Ragpickers_____ 3. Door-to-door collector_____ 4. Intermediate kabadiwala_____ 4. Other (specify)____		
3.3	Do you get PCC only from upper and middle class localities? _____ Do you collect PCC from lower income localities? _____ Do you collect PCC from commercial/business establishments/market places? _____		
3.4	Condition of PCC collected Most do not contain left over (juice etc)_____ Most often soiled PCC containing left over _____		

	Do you treat PCC before selling it (Separate aluminium from paper) Any other? **If yes – 1. Why?** **_____** **2. What do you do with the aluminium?** **_____**	
3.5	**Specify the fate of PCC collected**	
	Is it handed over to larger scale scrap dealer? If yes, do you get money in return? _____ price/kg	
	Is it sent for recycling along with other paper items, collected by you to recyclers? If yes, do you get money in return? _____price/kg	
	Is it handed over to paper mill in your area? If yes, do you get money in return? _____price/kg	
3.6	**What net profit do you make on account of dealing in PCCs?** **_____ per kg**	
4.0	**Anything that discourages you from dealing in PCCs**	
5.0	**Any comment on how could the collection of PCCs be improved**	
6.0	**Analysis of 2 bales:** **Kg of paper in a bale:** / **Kg of tetra pack in a bale:** _____ / _____ _____ / _____	

Project : Tetra Pak PCC management	Truck Analysis	September 2015

Name of Interviewer (INT): _____

Name of Supervisor (SUP): _____

1. General Information		
1.1	Truck registration number	
1.2	Type of waste collected by truck (residential/commercial/institutional). Note: one in each category required to be surveyed	
1.3	Route of present waste collection	
1.4	Location of survey	_____
1.5	Driver details: Contact address and number	_____ _____
	Cell number:	

2. Size		
2.1	Name of region covered for collection of waste (typically for the waste to be analysed)	Av.quantity and a short description
	1.	
	2.	
	3.	
	4.	
	5.	
	6.	
	7.	
	Others…	
2.2	Total no of trips per day	
2.3	Total no of trips per month	

	3.0 Analysis		
	Question	Answer	Comments
3.1	**Time of Collection** (indicate time. For example: 3 am to 6 am)		
3.2	**Total Waste Load** (in kg)(attach weigh bridge report)	Weight of filled truck_____ Weight of empty truck_____ Total waste Load_____	
3.3	**Total Paper Load** (in kg)		
3.4	**Total quantum of PCCs** (in kg) (must be precise and based on actual weighing)		
3.5	**Other Observations**		

Project : Tetra Pak PCC management	Paper Mill	September 2015

Name of Interviewer (INT): _____

Name of Supervisor (SUP): _____

1. General Information			
1.1	Name of paper Mill & Contact person		
1.2	Type and capacity of paper Mill		
1.3	Address		
1.4	Contact number and email		
	Cell number:		
2. Size			
2.1	Total average paper waste collected per month (in kg)	_____kg	

3. Analysis			
	Question	Answer	Comments
3.1	Types of paper and board manufactured		
3.2	Quantity of RS consumed in the mill(tones/month)		
3.3	Total Paper Load in the Bales/truck (in kg)		
3.4	Total quantum of PCCs (in kg) (must be precise and based on actual weighing)		
3.5	Total quantity of rejected material from pulper in a paper mill (approx. in kg per kg of raw material). PCC rejects if any during pulping in kg per kg of PCC?		
3.6	Fate of pulper rejected material in question 3.5?		
3.7	Other Observations		
3.8	Anything that discourages you from dealing in PCCs.		
3.9	Any comment on how could the collection of PCCs be improved.		