



IMPROVING WASTEPAPER CIRCULARITY FOR THE PULP AND PAPER SECTOR





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1. Introduction

- **The Indian pulp and paper sector has grown from a production of 1.7 million tonnes per annum in 1980 to about 21.68 million tonnes per annum in 2020, accounting for 5 per cent of global production.**
- **The sector has improved upon its energy efficiency and shifted towards environmentally sustainable raw materials in the last few decades.**
- **The objective of this report is to improve the circularity of wastepaper by improving the recovery rate in the paper industries of India.**

The Indian pulp and paper (P&P) industry comprises of units with production capacities ranging from 5 to 1,650 tonnes per day (TPD). There are 526 paper mills operating in the country which account for 5 per cent of global production. The major raw material for the sector is wastepaper or recycled fibre (RCF), accounting for about 70 per cent of all raw material used in the industry.

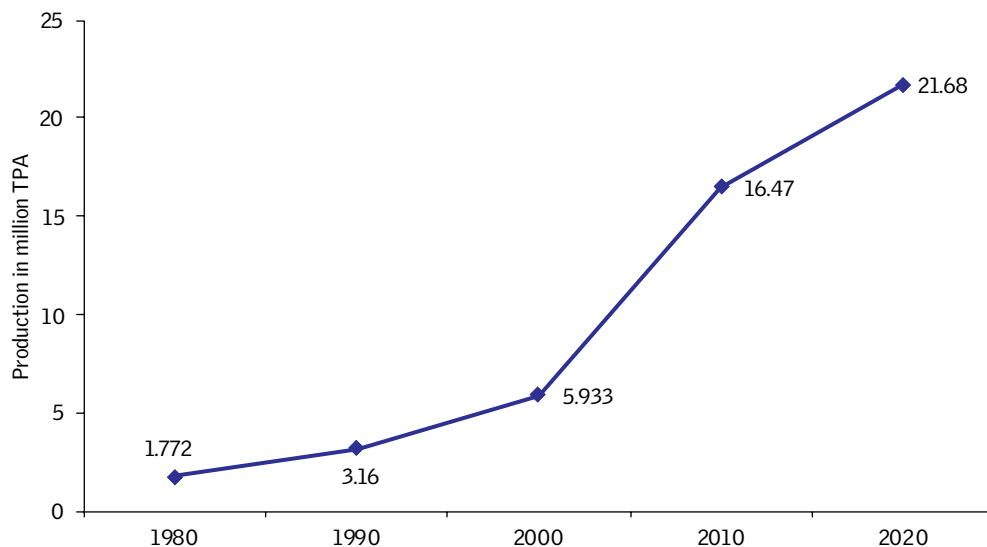
We use the term RCF only for the wastepaper which gets recycled in the paper industries and overall post-consumer wastepaper which is collected is only the potential RCF. The major products of the sector include writing and printing grade, packaging paper/paperboard and speciality paper (tissue paper, security paper, etc.).

As per CSE's analysis of the last four years, the per capita consumption of paper in India is currently around 15 kg. The global average is 57 kg and in developed countries like USA it goes as high as 300 kg.

The Indian P&P sector has grown from a production of 1.7 million tonnes per annum in 1980 to production of about 21.68 million tonnes per annum in 2020 (see *Graph 1: Paper production trend 1980–2020*).

Due to its high energy and material consumption, the sector has drawn a lot of attention from the energy security and environmental pollution point of view. During the last three decades, the changing policy focus of the government has helped the Indian P&P industry improve energy efficiency and move towards environmentally sustainable raw material.

Graph 1: Paper production trend 1980–2020 (million TPA)



Source: Indian Pulp and Paper Technical Association, Central Pulp and Paper Research Institute (CPPRI), 2020–21

Wood-based production of paper is not considered in this report. The objective here is to highlight the status of wastepaper recycling in the country, to quantify the usage of RCF as raw material in P&P industries, and to lay out the supply chains and economics of RCF usage and secondary applications of wastepaper in the country. The focus of the report is on improving the circularity of wastepaper by improving the recovery rate in the paper industries of India.

$$\text{Recovery rate of wastepaper (\%)} = \frac{\text{Wastepaper recovered to industries}}{\text{Domestic paper consumption}} \times 100$$

1.1 Circular economy in India

The circular economy is a ‘model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the lifecycle of products is extended. In practice, it implies reducing waste to a minimum.’¹ The 2022 Conference of the Parties of the UNFCCC (COP 27) also brought to fore the relevance of circular economy in mitigating carbon emissions for India while fuelling India’s growth, by ensuring responsible consumption and sustainable resource management.

The Union Government has been actively formulating policies and promoting projects to drive the country towards a circular economy. It has already notified various rules, such as Battery Waste Management Rules 2022, Plastic Waste Management Rules as amended in 2022, and e-Waste Management Rules 2022. These rules promote utilization of waste generated in line with the circular model by setting out target waste disposal standards for stakeholders.

Since its constitution, NITI Aayog too has undertaken several initiatives to ensure sustainable economic growth. Direct initiatives were taken to address the challenges in the utilization of waste as a resource and to evolve a perspective on the recycling industry in India. There has been some progress towards fly ash and slag utilization, which shows in the form of the Policy Framework on Utilization of Fly Ash and Slag, 2018–19.

To expedite the transition of the country from a linear to a circular economy, 11 committees were formed in March 2021 (see *Table 1: Focus areas under India’s circular economy initiatives*)—to be led by the concerned line ministries and comprising officials from the Ministry of Environment, Forests and Climate Change (MoEFCC) and NITI Aayog, domain experts, academics, and industry representatives—for 11 focus areas including scrap metal (ferrous and non-ferrous), gypsum, toxic and hazardous industrial waste, etc.²

However, much more needs to be done for a more formalized transition to the circular economy regime in India. With growing population, rapid urbanization,

Table 1: Focus areas under India’s circular economy initiatives

Sr. no.	Focus area	Concerned line ministry
1	Municipal solid waste and liquid waste	Ministry of Housing and Urban Affairs
2	Scrap metal (Ferrous and non-ferrous)	Ministry of Steel
3	Electronic waste	Ministry of Electronics and Information Technology
4	Lithium ion (Li-ion) batteries	NITI Aayog
5	Solar panels	MNRE
6	Gypsum	Department for Promotion of Industry and Internal Trade
7	Toxic and hazardous industrial waste	Department of Chemicals and Petrochemicals
8	Used oil waste	Ministry of Petroleum and Natural Gas
9	Agriculture waste	Ministry of Agriculture and Farmers’ Welfare
10	Tyre and rubber recycling	Department for Promotion of Industry and Internal Trade
11	End-of-life vehicles (ELVs)	Ministry of Road Transport and Highways

Source: NITI Aayog, 2021

climate change and environmental pollution, it is imperative for India to move towards a circular economy as quickly as possible.

Further, there is no mention of wastepaper among these initiatives. Wastepaper is a resource (raw material) for the P&P industries and its improved circularity in the country can ensure less dependence of the sector on imports, as well as ensuring less generation of waste in the country.

1.2 Research methodology

The primary objective of this report is to come up with recommendations to improve the circularity of wastepaper by increasing the recovery rate of wastepaper to paper industries in India.

To achieve this objective, CSE collected data from all the stakeholders including paper industries, industry associations, research organizations and individuals involved in supply chain of paper.

CSE conducted meetings with the Indian Newsprint Manufacturers Association (INMA), Indian Paper Manufacturers' Association (IPMA) and the Central Pulp and Paper Research Institute (CPPRI), Saharanpur to understand the existing status of recovery of wastepaper in the country and the prevailing limitations and challenges involved in channelizing wastepaper to industries.

Through our initial meetings with different stakeholders, we understood that apart from being used in the pulp and paper industry as raw material, there are some other applications of wastepaper as well, where it gets diverted from within the supply chain of wastepaper. This results in a lower rate of recovery for the sector.

Since the supply chain of wastepaper is majorly in the hands of the informal sector, there is almost no data available in any government report on the quantity of wastepaper diverted into secondary applications. In view of this, CSE conducted an extensive survey of each level of the supply chain. This included wastepaper application points (fruit markets, handmade paper units, etc.); formal and informal recyclers in the market; NGOs working in the waste management sector; and different experts working in the wastepaper management domain. The ground level survey helped CSE understand the scenario and estimate wastepaper consumption in secondary applications.

To understand the shares of consumption of domestic and imported wastepaper used, CSE visited a number of wastepaper-based paper industries to understand

the blend they used and the economics of the same. Additionally, the report also includes good practices which need to be highlighted so that such models can be replicated across the country.

Ten paper industries were surveyed in major paper industry belts—Kashipur, Roorkee, Muzaffarnagar and Ghaziabad—in northern India, namely Magnum Ventures, Siddhartha Paper Mills, Uttaranchal Paper Mills, Meenu Paper Mills, Bindal Duplex, Siddheshwari papers, Katyayani Paper Mills, Bahl Paper Mills, Banwari Paper Mills and Prolific Papers.

Different levels of the supply chain were also surveyed and people involved in the supply chain were interviewed to understand the quantum of wastepaper collected and costing of the same at each level. *Kabadiwallahs* collecting wastepaper from households, as well as from showrooms and shops in different regions of Delhi-NCR, were interviewed. Similarly, contractors were interviewed to understand the quantity of material received from the kabadiwallahs each day and number of kabadiwallahs tied up with them. Scrap dealers, aggregators and recyclers were also included in the survey in order to understand the quantity of wastepaper being channelized to the industries. Some formal agencies, which are collecting wastepaper from their registered clients and directly sending it to industries, were also surveyed. Formal agencies like Greenotech, Greenobin and Central Collection Hub under Waste to Wealth CSR initiative have been surveyed to identify good practices of wastepaper management and recovery to paper industries.

CSE has identified and highlighted the secondary applications of wastepaper in the report, namely—packaging of fruits and vegetables; roadside eateries; general stores and pharmacies; moulded products (egg trays, apple trays, etc.); mixed waste (MSW ending in dumpsites); handmade paper units; and record keeping. There is no data available or documented anywhere by any organization (government or private) regarding the quantity of wastepaper consumed in these above-mentioned applications. Therefore, CSE conducted surveys in fruit markets, handmade paper units, roadside eateries and general stores to estimate the quantum of wastepaper consumed in different applications. Accordingly, some assumptions were made to estimate their wastepaper consumption.

2. Profile: Pulp and paper sector

- **Wood consumption in the paper and pulp industry decreased from above 80 per cent during the 1980s to 18 per cent in 2020. The consumption of wastepaper as raw material increased by about 73 per cent in the same time period.**
- **About 92 per cent of kraft paper, 75 per cent of duplex paper and 37 per cent of writing and printing paper is manufactured through wastepaper.**
- **Inadequate availability of wastepaper leads to import of recovered paper/wastepaper to meet the growing demand for paper in the country. Fibre quality is another factor leading to import of wastepaper.**

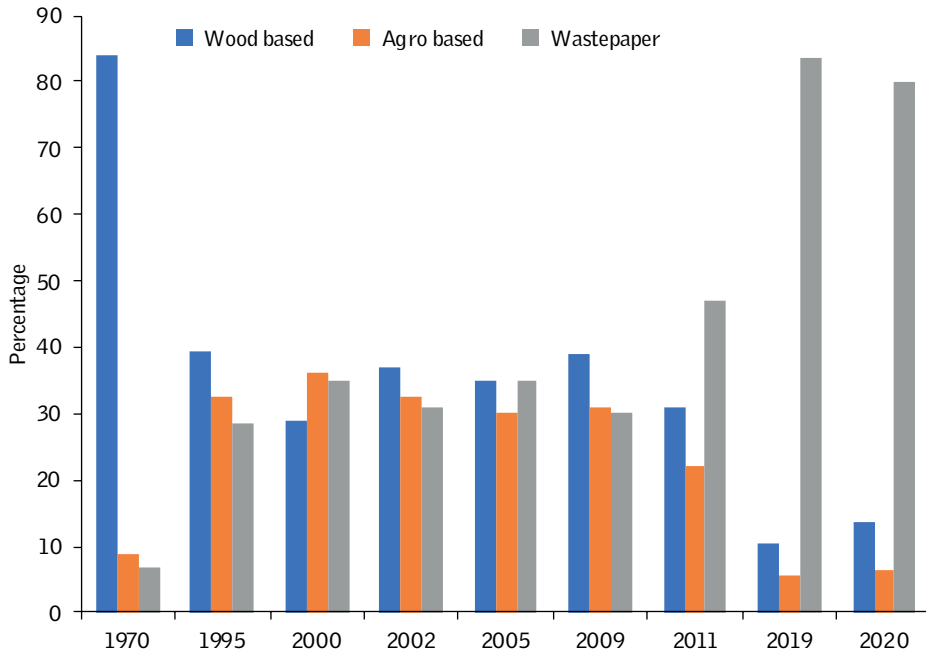
2.1 Raw material usage in the sector

The shift from wood to wastepaper or recycled fibre (RCF) has been significant in the last few decades. Wood consumption decreased from above 80 per cent during the 1980s to only 18 per cent in 2020. In the same period, the consumption of wastepaper as raw material increased by about 73 per cent. This was mainly because the regulations for wood harvesting from natural resources were made stringent, thus decreasing the availability of wood for paper making. Only the mills practising farm/social forestry can ensure the supply of wood.

With stricter environmental norms coming into effect, the mills using agro-based raw material had to compulsorily go in for chemicals recovery systems, which involves capital investment and is thus unviable for small units. Therefore, most of the small agro-based units also shifted to wastepaper. Agro-based raw material usage, which was very prominent during 1995–2011, reduced to a mere 6.4 per cent in 2020.³

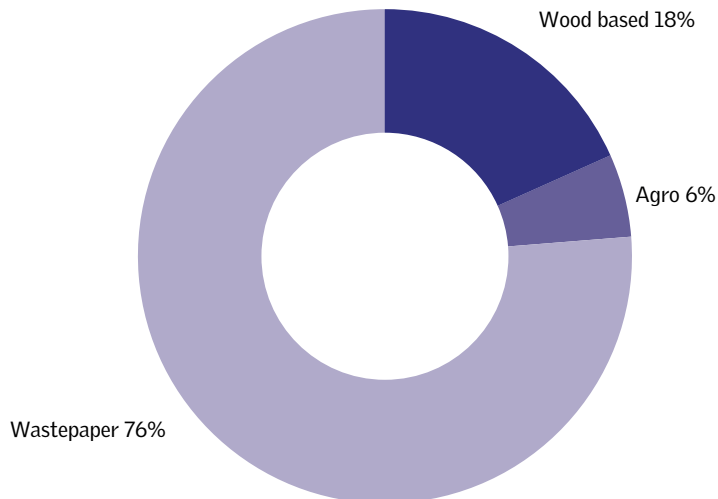
As per Central Pulp and Paper Research Institute (CPPRI), the total paper production in India during 2020 was about 21.68 million tonnes. Majority of this production is wastepaper-based (about 16.29 million tonnes), followed by 3.91 million tonnes of wood-based and about 1.16 million tonnes agro-based production.⁴

Graph 2: Trend in usage of raw material (1970–2020)



Source: Indian Pulp and Paper Technical Association, Central Pulp and Paper Research Institute (CPPRI), 2020-21

Graph 3: Raw material-based P&P production 2019–20 (in percentage)



Source: Annual report 2020-21, Central Pulp & Paper Research Institute (CPPRI)

2.2 Raw material utilization scenario in manufacturing different grades of paper

It is also important to understand the production scenario of different grades of paper based on the raw material utilization under each category. As per the production during the year 2020, the major product of the paper industry is kraft paper (55 per cent), followed by writing and printing paper (22 per cent), and duplex paper (16 per cent). Newsprint constitutes only 3 per cent of the total production, while the remaining 3 per cent is tissue paper and others.

Wastepaper is widely used as raw material for all grades of paper. All of newsprint paper production is done using wastepaper. About 92 per cent of kraft paper and 75 per cent of duplex paper is produced using wastepaper. About 37 per cent of writing and printing paper is also manufactured through wastepaper.

About 46 per cent of writing and printing paper produced is through wood. This is also known as virgin paper. Though it is less in absolute quantity, about 68 per cent of tissue paper in India is produced using wood.⁵

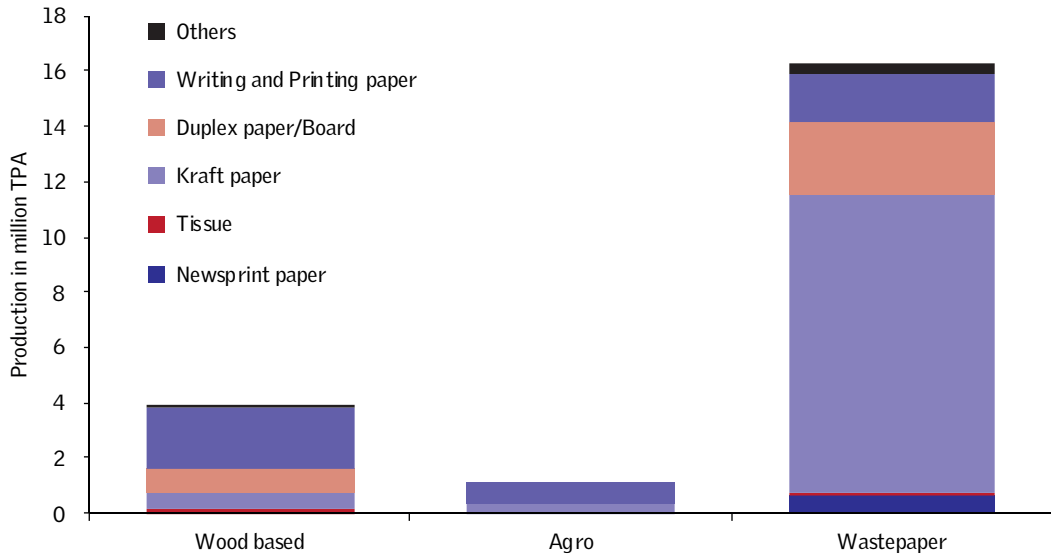
Agro-based industries use bagasse, wheat straw or bamboo. The use of agro-based raw material is very limited. It is only used in the manufacture of writing and printing paper and kraft paper in small quantities.

Use of bamboo as raw material in pulp and paper mills has reduced over the last two to three decades due to the high silica content of bamboo. Silica reduces recovery efficiency due to a phenomenon known as silica scaling. This scaling is complex in nature and is difficult to remove. Higher silica content in bamboo means more use of chemicals in the pulping process, which hampers working of recovery boilers and adversely impacts the process. High chemical usage leads to problems in disposal of lime sludge, which is not allowed to be landfilled. It can be used in cement industries subject to their being in the vicinity. Low accessibility (maximum high-quality bamboo species are mainly found in the northeast of India) and commercial viability (high transportation cost) are the other reasons due to which bamboo is not used extensively in paper manufacturing.⁶

2.3 Import of wastepaper or recycled fibre

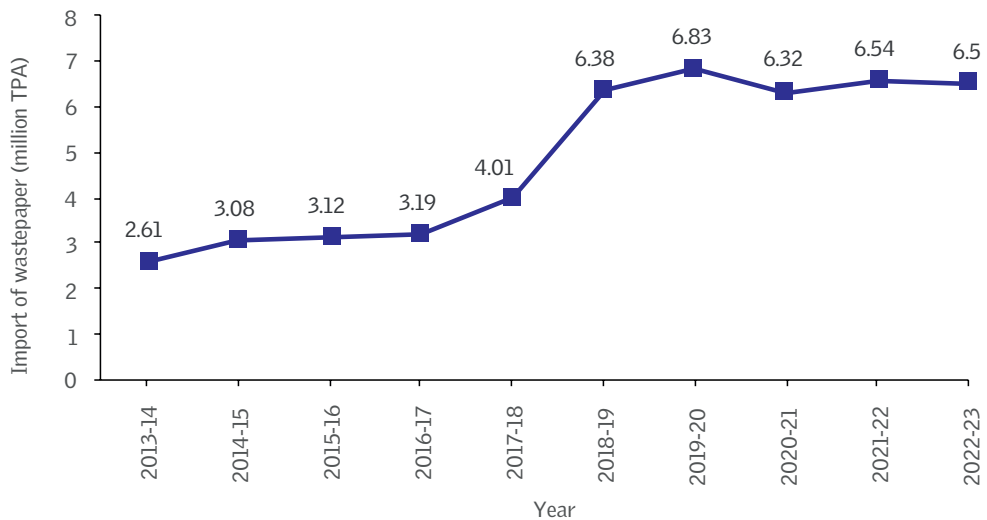
The P&P sector of the country has performed well over the years in terms of upscaling production. However, fibre quality in domestically available wastepaper is lower compared to imported wastepaper. There are also issues with availability of wastepaper. Due to these inadequacies, the import of recovered paper/wastepaper is necessitated to meet the growing demand for paper in the country.

Graph 4: Raw material used to produce different grades of paper (in million tonnes)



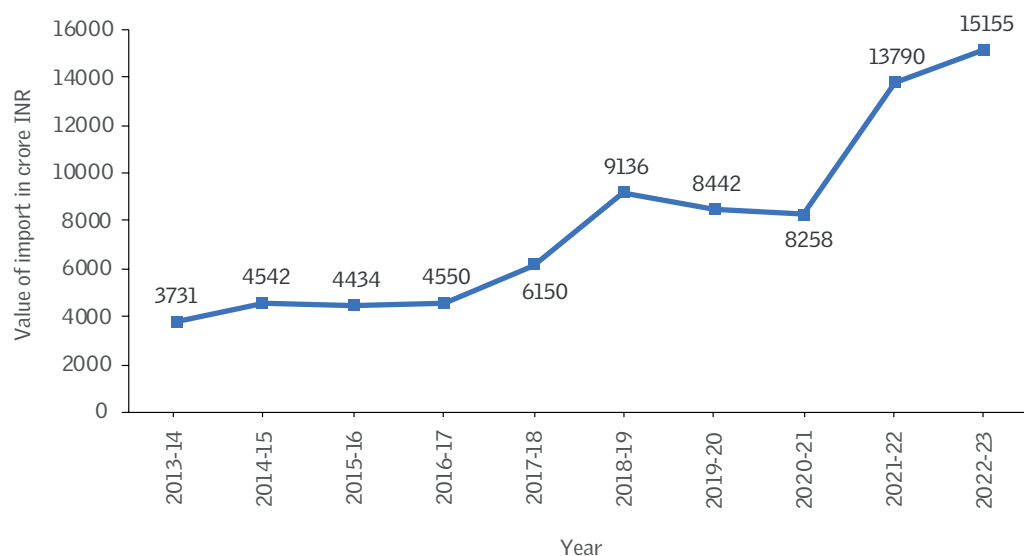
Source: Central Pulp & Paper Research Institute (CPPRI)

Graph 5: Import of wastepaper (2013–2022)



Source: Directorate General of Commercial Intelligence and Statistics (DGCIS)

Graph 6: Value of pulp and wastepaper imported into India from financial year 2013 to 2022 (in crore Indian rupees)



Source: Directorate General of Commercial Intelligence and Statistics (DGCIS)

In fiscal year 2021-22, the value of wastepaper imported into India amounted to around Rs 15,155 crore. This was a significant increase compared to the previous fiscal year, when imports were valued at about Rs 13,790 crore.⁷

Some industries import wastepaper to add to the fibre strength of their product as imported paper is made up of soft wood which has long fibres while Indian species of wood have relatively shorter fibres. The length of the fibres plays an important role in strengthening the paper and also maintains quality.

2.4 Requirement of virgin paper as raw material

The recovery of wastepaper is different for different grades. A good percentage of kraft paper and newsprint paper gets recovered. However, virgin paper is mostly consumed in the official documentation of different commercial sectors or institutes including hospitals, schools, offices, etc.

Record keeping is one of the major reasons why virgin paper is not recycled to its full potential. In general, records in government offices are kept for at least five to ten years. Most of that paper becomes brittle by the time it re-enters the supply chain and may not be useful as raw material.

As mentioned above, the quality of the paper manufactured from wastepaper depends upon the fibre content of the raw material received. Since paper can be recycled six to seven times during its lifetime, presence of at least 25 per cent virgin fibre is required so that the quality of paper does not deteriorate. This is also one of the practical reasons why paper production from wood cannot be phased out totally.

3. Circularity of wastepaper

- The collection rates of newspaper and packaging paper are high at 70 and 60 per cent respectively, while the collection rate of virgin paper is only 40 per cent.
- As per CSE's estimates, about 9 million tonnes of wastepaper is used in secondary applications. That is about 43 per cent of the total domestic consumption.
- Recycled paper has about 50 per cent lower specific energy consumption when compared to wood-based or agro-based paper production.

On average, 58 per cent of paper waste is recycled in the world. In developed nations, used papers and boards are being recycled to the maximum possible extent of 80 per cent. India spends a lot of foreign exchange on importing wastepaper, even as this raw material is becoming junk in the country.⁸

In 2004, the Centre for Science and Environment (CSE) advocated for a proper wastepaper collection, sorting and recycling system in a report on the paper sector called *All About Paper - Green Rating of Pulp & Paper Industry*. That is the only way to reduce dependence on import of wastepaper. Currently, the collection of paper itself is relatively low in India (see *Table 3: Estimated collection of different grades of wastepaper*).

Even though the collection rates of newspaper and packaging paper are high at 70 and 60 per cent respectively, the collection rate of virgin paper is only 40 per cent due to the fact that virgin paper is stored for office records. As per the table below, out of the total quantity consumed (20.12 million tonnes) about 54 per cent is getting collected (10.9 million tonnes). This is close to the world average of 58 per cent, which means that India is doing good work but there is room for improvement globally.

Table 2: Estimated collection of different grades of wastepaper (2018-19)

Paper grade	Source of generation	Quantity consumed (million tonnes)	Estimated collection (in million tonnes)	Collection percentage
Writing and Printing	Printing press, households, schools, schools, offices etc.	7.18	2.87	40
Packaging grade	Corrugated box makers, printing press, Departmental stores, supermarkets	10.31	6.18	60
Newspaper	House, office, markets, over issue	2.63	1.84	70

Source: Indian Pulp and Paper Sector, an insight for an energy efficient tomorrow, GIZ, CPPRI, July 2021

CSE's team visited several wastepaper-based industries in Ghaziabad, Rorkee, Muzzafarnagar, Meerut and Kashipur to understand the supply chain to the industries and capture the feedback of the industries on the same. The team visited kraft paper manufacturing units, writing and printing units, and duplex board manufacturing units to note the raw material blend (domestic vs imported) used in manufacturing different categories of paper. Through interactions with the industries, CSE also tried to understand the status of availability of RCF, preferences of the industry vis a vis domestic vs imported wastepaper, and the reasons for low recovery rate in India.

It is important to note here that there are no documented figures about how much of the wastepaper is recycled in the country. However, in this report CSE has tried to estimate and quantify wastepaper recovery and utilization in the paper industry.

As per CSE's survey and interactions with the industries, it is understood that to manufacture 1 tonne of RCF-based paper, approximately 1.2–1.25 tonnes of wastepaper is used, i.e., the conversion rate of wastepaper is 80–85 per cent. In a wood-based paper industry, 1 tonne of paper manufacturing consumes around 2.5 tonnes of wood.

$$\text{Conversion rate (\%)} = \frac{\text{Quantity of paper produced}}{\text{Quantity of wastepaper utilized}} \times 100$$

To understand the circularity of wastepaper in India it is important to first understand its economics and supply chain, the various stakeholders involved, and applications of wastepaper. There is also a need to investigate the legislations on wastepaper applicable in different developed countries.

3.1 Existing legislation for collection of paper

In most developed countries, wastepaper collection is an organized sector. While a wide range of legislation has specifically been developed only for packaging waste, it doesn't include other grades of paper. These legislations are in the form of directives, procurement policy guidelines or voluntary agreements.

Europe has been the frontrunner in developing a directive for packaging waste, called the European Packaging Directive and Germany is the pioneer in implementing the same. Extended Producers Responsibility (EPR) schemes are

considered major implementation tools for establishing packaging waste collection and recycling systems.

In Europe, the industry has build-up an organization in all member states to comply with obligations of Directives. Packaging Recovery Organization Europe (PRO EUROPE), which is an umbrella organization of 33 national producers. Green Dot is the registered trademark of PRO EUROPE and more than 130,000 companies use the Green Dot trademark worldwide. By contracting with the Green Dot system, the companies responsible for producing packaging entrust their takeback obligation to the scheme in return for an annual fee based on the type of packaging materials used and amount of packaging put in the market.

Germany has the Waste Management Act (1986), a Packaging Ordinance (1991) and a Voluntary Agreement of the Graphic Paper Chain (1994). In 1991, the German Government introduced the principle of producer responsibility for packaging waste and placed a legal obligation on trade and industry to take back and recycle packaging materials put into circulation by them. Consumers are required to follow sorting guidelines established by the municipalities.

In Japan there is a law for promotion of sorted collection and recycling of containers and packaging waste. Manufacturers and business entities using containers and packages have to pay a recycling fee to Japan Containers and Packaging Recycling Association (JCPRA), in accordance with the volume they manufacture or sell. Japan has managed the zero solid waste principle very effectively and minimized usage of scarce land for landfills. Japan has reached a recovery rate of 80 per cent as per the latest Sustainability Report (2022) published by the Japan Paper Association.^{9, 10}

There is no national legislation in the USA. The waste management regulations are the responsibility of each individual municipality and state government.

In India, there is no legislation or policy on wastepaper specifically. At present there is an existing legal framework for solid waste management. Management of municipal solid waste is covered under state laws pertaining to municipal governance, but all the issues relating to solid waste management are not adequately addressed therein. For example, there is no specific mention of the management of recyclables like paper, glass, etc.

3.2 Environmental aspect of circularity of wastepaper

Efforts are required to redirect post-consumer paper from the garbage cycle to the industries. It will not only result in lowering of import of wastepaper but will also considerably reduce environmental load on the ecosystem. Therefore, it is important to increase the circularity of wastepaper and improve recovery rate of wastepaper.

Though wood-based production of paper has its own significance in terms of demand and market, the process is too resource intensive when compared with RCF-based production. These are the ways in which producing paper from RCF is better than producing paper from virgin wood:

- i. Lower energy consumption: Wastepaper based industry consumes 600–800 KWh/tonne of product against energy consumption of 1,200–1,300 kWh/tonne by wood-based industry. That is 40–50 per cent less energy consumption.
- ii. Saving landfill space: Every tonne of recycled fibre saves approximately 3 cubic yards of land.
- iii. Lower steam consumption: Steam consumption in RCF-based production is also 50–60 per cent lesser than in wood-based paper production, resulting in less combustion of fossil fuels.

Recycled paper has about 50 per cent lower specific energy consumption when compared to wood-based or agro-based paper production. Increasing production and utilization of recycled paper can hence play an important role in the overall decarbonization journey of India and the world.

As per a recent study, greenhouse gas emissions from the sector in the business-as-usual (BAU) scenario will increase to around 70 million tonnes by 2040.¹¹ Whereas, in the deep decarbonization scenario, the emissions can be restricted to 35 million tonnes by 2040. The total emissions will increase by 129 per cent by 2040 in BAU scenario, while in deep decarbonization scenario the emission increase will be only 15 per cent.

Increased recycling and better sorting in mills, where production is based on recovered paper, could reduce emissions if sorting technologies and the use of collected fibres is improved.

Waste material usage promotes industrial symbiosis and reduces dependence on virgin materials. Continuous improvements in technology can further reduce environmental impacts and optimize the use of resources.

3.3 Supply chain of wastepaper

Wastepaper recycling is a big market wherein 95 per cent of the material is handled by the informal or unorganized sector. CSE has conducted a ground survey to minutely understand the supply chain of wastepaper (see *Figure 1: Supply chain of wastepaper*).

Wastepaper is collected from households, residential societies, schools, hospitals, offices, etc. by *kabadiwallahs*. Ragpickers are also part of the supply chain and each rag picker collects about 4–5 kg of paper each day. The collection of wastepaper done by a *kabadiwallah* is in the range of about 150–200 kg per day. Most of the wastepaper collected at this level is cardboard (about 60 per cent) and the rest is paper including writing and printing paper, magazines, books, etc.

The *kabadiwallahs* and rag pickers sell each day's collection to their contractor or '*thekedaar*'. Each contractor may have 10–20 *kabadiwallahs* and ragpickers associated with them. These contractors deal in each category of waste including paper, plastics, glass, etc. The contractors generally have shops with a small storage capacity and receive up to 1.5–2 tonnes of waste per day (including paper and cardboard).

Contractors segregate the waste they receive and sell to scrap dealers or aggregators. Scrap dealers and aggregators further segregate the received waste based on its quality. One scrap dealer or aggregator usually receives waste from about 5–10 contractors. Aggregators may be dealing with a specific category of waste only, whereas scrap dealers accept almost all wastes. They collect about 100–400 tonnes of waste per month.

Aggregators and scrap dealers sell to wholesalers/recyclers/suppliers, who in turn supply wastepaper to the paper industry. A recycler can supply anywhere between 200 to 6,000 tonnes of wastepaper per month to industries, depending upon the scale of their operation and their links with the scrap dealers and aggregators. In the supply chain, an aggregator can also act as the recycler for some industries.

Some formal agencies are also involved as wholesalers (supplying to industries). These agencies have fixed industries where they supply the wastepaper. Some percentage (generally 2–3 per cent) of raw material requirement is fulfilled through these agencies, and the rest through informal recyclers. The paper manufactured in the industries is supplied to the consumers through different retailers and wholesalers, which closes the loop of the wastepaper supply chain.

EXAMPLE FROM FIELD SURVEY

Quantity of wastepaper (RCF) recovered by the recycler in Faridabad

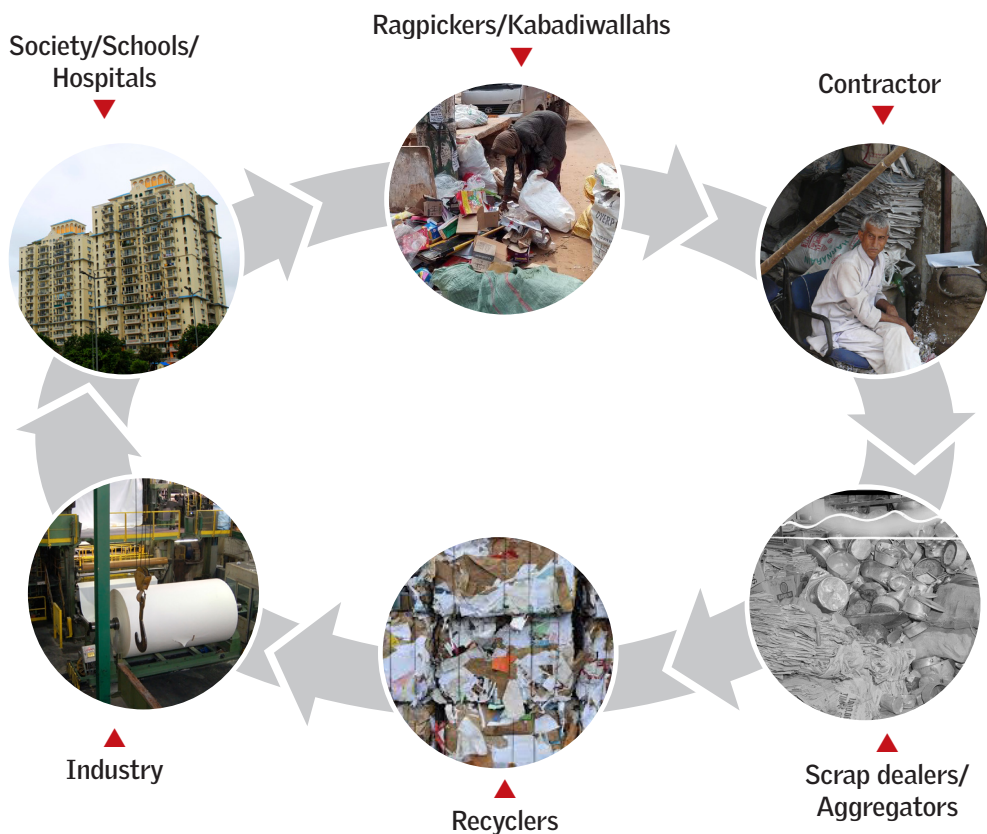
Quantity of incoming paper in a godown = 12 tonnes X 2 trucks x 30 days = 720 tonnes/month

Industry supply for 2-3 days – 15 days X 2X 12 tonnes= 360X2 tonnes/month (the recycler is associated with two paper mills)



Wastepaper (RCF) collected at recycler godown

Figure 1: Supply chain of wastepaper



3.4 Costing of wastepaper at different levels in supply chain

Wastepaper's value keeps increasing from its source till it reaches the gates of the industry.

The raw material for kraft paper industry is primarily corrugated boxes. Such industries require only 5–10 per cent of writing and printing grade RCF as raw material depending upon the quality of product required. The cost of writing and printing grade (virgin paper) waste is almost double the cost of corrugated

KRAFT PAPER MILLS IN MUZAFFARNAGAR AND ROORKEE

CSE's team visited kraft paper manufacturing mills to understand raw material sourcing and blend of domestic and imported raw material used.

Depending upon the capacity of the mill, about 100–300 tonnes of RCF is required per day. In kraft paper manufacturing, up to 95 per cent of the requirement is met through recycled corrugated boxes and the rest through other kinds of wastepaper. There is no specific requirement for virgin paper in kraft paper manufacturing, but its usage varies from 1–5 per cent depending on the industry.

The cost of RCF for the mills is in the range of Rs 18,000–20,000 per tonne and strictly depends upon the quality received. There is no set ratio maintained at the mills between domestic and imported raw material. The quality of raw material available domestically is good enough for the mills. The ratio of domestic to imported RCF used varies only according to availability and price. Some mills use 95–100 per cent domestic RCF while some import up to 60–70 per cent of their raw material. Some mills also tie up with FMCG companies to directly procure their packaging waste (pre-consumer wastepaper).

The price of the final product depends upon quality and market conditions. It can range anywhere between Rs 28,500 to 32,000 per tonne.

Each mill is associated with about 8–10 suppliers for sourcing of raw material and as many dealers for selling its product. The supply chain mechanism includes rag pickers, kabadiwallahs and wholesalers.

The mills were hesitant about sharing information of their raw material suppliers. This may be due to the fact that raw material suppliers are part of a large supply chain which is majorly informal in nature and is an important resource to the industry. These suppliers don't disclose their profit margins as we observed during our surveys. This may be the reason the industries also want to cover up these agencies as they are important to their business continuity.

Observation: The raw material recovery from the local market is good for kraft paper industries as they need corrugated boxes as raw material and don't require virgin paper. The industries have a relatively closed supply chain. The raw material sourcing of the industry is based on availability and pricing of domestic and imported RCF.

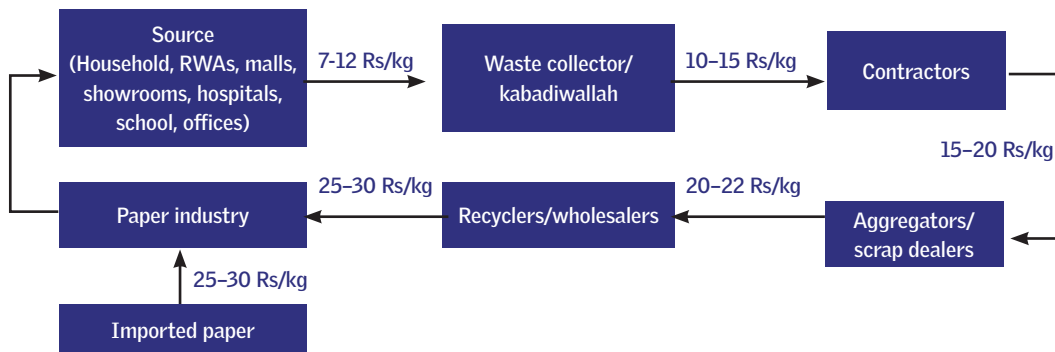
boxes (kraft) for RCF-based industries. The cost of raw material for kraft paper industries is Rs 17–20 per kg. For kraft paper, bust factor (BF) defines the strength of the paper, and the cost of the product increases as the bust factor increases.

Similarly, for manufacturing duplex boards or writing & printing paper, the major raw material is recycled as well as virgin wastepaper. The units manufacturing writing & printing paper use different blends of imported and domestic RCF. The requirement of imported paper is driven by the insufficient availability of domestic RCF, frequently fluctuating cost of domestic RCF, specific requirement of fibre strength, etc. CSE’s team visited industries which use 100 per cent domestic raw material as well as those which import as much as 70 per cent of their raw material. The raw material usage in the industry and the reason for import differs on case-to-case basis. During the survey and interaction with different industries, it was understood that only writing & printing paper/paperboard and kraft grade paper is imported in the country.

The cost of both domestic and imported RCF for industries is in the range of Rs 25–30 per kg. This cost may go as high as Rs 35–40 per kg based on market conditions. The cost of the raw material also varies from industry to industry depending upon the quality of raw material required.

The numbers mentioned in Figure 2 are indicative and vary as per demand and supply, quality of the wastepaper, and according to region as well. The cost of the finished product from industries also varies depending upon the proportions of

Figure 2: Costing of wastepaper in the supply chain



Product cost

1. Duplex board: 35–60 Rs/kg
2. Kraft paper: 25–50 Rs/kg
3. Writing/printing paper: 65–75 Rs/kg (80+ brightness), 50–60 Rs/kg (65 brightness)

Source: CSE

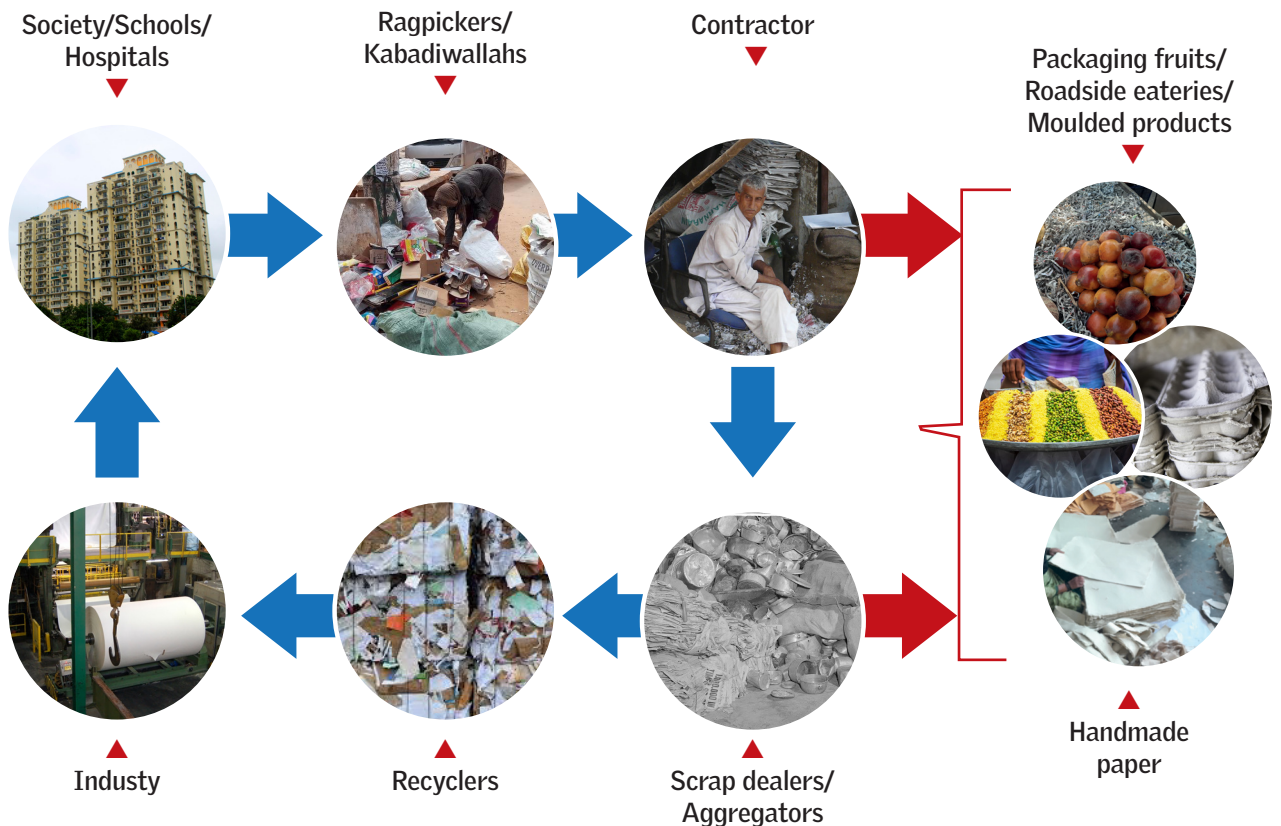
imported and domestic raw material used. The percentage share of imported and domestic wastepaper decides the strength and quality of fibres.

3.5 Applications of wastepaper

It is up for discussion what applications recycled paper is used for other than as a raw material in pulp and paper industries.

During CSE’s interactions with various stakeholders, various secondary applications of wastepaper were observed. CSE enumerated these secondary applications with inputs from experts, on-ground surveys and discussions with sector representatives. Significant wastepaper is used by hawkers, by roadside eateries, in packaging of fruits, as egg/apple trays and in similar moulded items. Other applications include handmade paper units, record keeping, envelope making, as filling in leather bags, etc.

Figure 3: Secondary applications of wastepaper



A significant percentage of paper also ends up as mixed waste, which is ultimately disposed of in dumpsites. There are no documented figures regarding secondary applications of wastepaper or amount of paper going to dumpsites. However, CSE has done an estimation to understand the quantum of wastepaper recycled into different applications.

For use in above-mentioned secondary applications, wastepaper is diverted from within the existing supply chain. Most of this diversion takes place at the initial stages of the collection system i.e., from the contractors itself, as the cost of procurement is low at this level. Diversion of wastepaper for secondary applications does not take place at the recycler/wholesaler level (supplier to mills) as the cost by this level is significantly higher—Rs 20–30/kg or more—which is not economical for the user in the secondary chain.

Some of the major secondary applications have been discussed below:

3.5.1 Wastepaper as packaging material

During the survey, CSE's team found that significant quantity of wastepaper (mostly newspaper) goes into packaging of fruits and vegetables. Newspaper is procured by agencies dealing in the supply of fruits and vegetables since it is economical, costing anywhere between Rs 10–12 per kg or less. Unsold copies of newspapers left with retailers are used for packaging since they have more moisture retaining capacity for soft fruits such as oranges, grapes, mangoes, etc. Newspaper waste is also sourced directly from printing agencies through a tendering process.

Newspaper is used either as a whole or in shredded form. Shredded paper used in packaging can't be used as raw material for industries as the paper is mostly contaminated with dust or soiled. Even if some portion of this is used by the industries, it will not add to the quality of the fibres in the product. Shredded newspaper is taken by industries for a minimal cost of Rs 1–3/kg or even free of cost because it has no fibre content. It is for this reason that the shredded paper used in packaging doesn't help to increase the recovery rate of wastepaper. Similarly, envelopes made using newspapers and magazines don't get recycled and end up in dumpsites.

Okhla Subzi Mandi: Fruit packaging

To understand the quantity of wastepaper used in packaging and waste generated from packaging of fruits and vegetables, the CSE team visited Okhla Subzi mandi. On interacting with fruit vendors and sweepers, it was understood that fruit packaging was earlier done using agricultural waste but with time the packaging

Photographs 1–3: Different packaging material used for fruits



Agricultural waste



Shredded newspaper



CREDIT: CSE SURVEY

EPE foam sheet

QUANTITY OF PAPER USED AS PACKAGING MATERIAL IN OKHLA SUBZI MANDI

Incoming crates of 10 kg = 5,000–10,000 per day

Wastepaper used for packaging per crate = 250–300 gram

Total packaging waste generated = 1.25–3 tonnes per day

Waste generations per month = 37–90 tonnes/month

material has changed to shredded newspaper/paper or Expanded Polyethylene (EPE) foam sheets. EPE sheets are costlier than newspapers.

As per the Agriculture Produce Marketing Committee (APMC) there are about 6,900 wholesale mandis, including grains, vegetables and fruits, across the country.¹² Out of which there are about 2,500–3,000 fruit markets. Considering average paper waste generation per month as 65 tonnes from one market, the total waste generation from fruit and vegetable markets is estimated to be about 2 million tonnes per year which is about 9.5 per cent of the total domestic paper consumption.

3.5.2 Use of paper by roadside eateries/hawkers/pharmacies/general stores

There has been no census of street food vendors in the country. The Ministry of Urban Poverty Alleviation, Government of India, has estimated that there are about 10 million street vendors in the country. About 20 per cent of them, i.e., 2 million are expected to be street food vendors.¹³ These vendors use newspapers, books and magazines to serve food to customers. Additionally, as per 2021 data, there are about 12.8 million traditional grocery retailers (kirana stores and corner shops).¹⁴ As per Pharmacy Council of India (PCI), till April 2022, a total of 1.69 million pharmacists had been registered.¹⁵ The kirana stores and pharmacy shops often provide their articles in paper envelopes.

Through a basic survey, CSE found out that each vendor in the above categories uses about 80-120 kg of wastepaper per year on average, which is about 1.4-1.8 million tonnes of wastepaper per annum in total. That is about 7.5 per cent of the total paper consumption in India.

3.5.3 Handmade paper manufacturing

Handmade paper is made using a mould, which is a frame covered with a flat, rigid or flexible screen. The mould is covered by a flat frame which stores the run off from wet pulp. The wet mat of fibres remaining on the sheet is then sun dried or dried against the blanket and may be hot or cold pressed.

The Indian handmade paper industry comes under the Khadi and Village Industries Commission (KVIC), Ministry of MSME, Government of India. Handmade paper is manufactured using different raw materials including wastepaper, cotton, jute, banana leaf and coconut. As per estimates, there are more than 600 handmade paper units scattered all over India.

As per CSE's discussions with the National Handmade Paper Institute, small handmade units (installed capacity of 100–500 kg/day) produce 300 kg/day on average. In addition to smaller units, there are about 10 large units across India, producing about 20–30 tonnes of paper per month. Based on these estimates, the following calculation has been carried out:

Annual production from 1 small unit = 99 tonnes (300 kg X 330 day per year)

Annual production from 600 units = 594,00 tonnes

Annual production from 1 large unit = 300 tonnes (25 tonnes per month X 12 months)

Annual production from 10 units = 3,000 tonnes

Approximate total annual production from handmade paper units in India = 62,400 tonnes

Considering about 80 per cent conversion rate, about 0.062 million tonnes of RCF is used in handmade paper manufacturing annually, which is around 0.3 per cent of the total annual domestic consumption of paper in the country. Raw materials are blended to meet the product requirement, based upon their availability. In general, around 15-20 kg of cotton rags are used in 100 kg of paper manufacturing

3.5.4 Paper landfilled as mixed waste

As per Central Public Health and Environmental Engineering Organisation (CPHEEO), the composition of municipal solid waste (MSW) varies with the economic status of countries. In low-income countries, paper constitutes about 1–10 per cent of the total MSW generated (by weight), whereas in middle- and high-income countries the share of paper in MSW is anywhere between 15–40 per cent.¹⁶

India is currently what the World Bank describes as a lower middle-income country. The total quantity of solid waste generated in the country in 2020–21 was 160,039 TPD, i.e., about 60 million tonnes per year. As per CPCB, total waste landfilled in India is about 18–19 per cent.¹⁷ Therefore the total waste landfilled per year is about 11 million tonnes, out of which about 1.65-2.2 million tonnes is estimated to be paper and related products (considering about 15-20 per cent of the waste landfilled is paper, as India is a lower middle-income country.¹⁸). That is about 10.4 per cent of the total domestic consumption in the country.

MANUFACTURING PROCESS OF HANDMADE PAPER

CSE visited several handmade paper manufacturing units—with production ranging from 30 tonnes to 250 tonnes per annum—in Delhi and Jaipur.

The raw material (RCF, cotton, jute, etc.) is mixed in a beater machine and allowed to rest for two to three hours, resulting in the formation of pulp. This pulp is stored in a mixing tank in the pulping section. In a small unit, about 10 kilolitres of pulp can be stored per day. The pulp is then transferred to the agitator machine. The consistency of the pulp is maintained and it is forwarded to the head box from where it is layered onto woollen fabric or rolled according to the thickness of the paper required either manually or using mechanical sieves.

Handmade paper units can manufacture paper of more than 100 gram/sqm. The rolled pulp in the form of sheets is sun dried and air dried and then taken to the calendaring section where the paper is pressed and polished. After finishing, the product is cut and trimmed in required sizes.



Beater machine



Pulp storage tank



Manual transfer of pulp to sheet making section



Sheet preparation on sieve



Pressing for dewatering



Air drying



SOURCE: CSE SURVEY

Cutting and trimming

Finished product

Table 3: Estimated wastepaper consumption in secondary applications

Details	Consumption %	Consumption (million tonnes)
Total domestic consumption of paper (Average 2018–22)		21.13
Packaging of fruits and vegetables	9.5%	2.0
Roadside eateries/hawkers/pharmacy/general stores	7.6%	1.6
Moulded products (egg trays, apple trays)	9%	1.9
Mixed waste	10.4%	2.2
Handmade paper units	0.3%	0.062
Record keeping	6.2%	1.3

Source: CSE analysis

CSE identified various secondary applications of wastepaper wherein it is diverted from within the supply chain (see *Table 3: Estimated wastepaper consumption in secondary applications*).

As per the table above, about 9 million tonnes of wastepaper is used in secondary applications. That is about 43 per cent of the total domestic consumption of paper. Most of the share of this diverted quantity doesn't come back into the supply chain and finally ends up at the dumpsite.

4. Current status of wastepaper circularity in India

- **The availability of wastepaper in the country is not sufficient due to the low recovery rate of wastepaper, diversions within the supply chain and specific requirements of fibre strength.**
- **As per CSE estimates, the present recovery of wastepaper in India is about 12 million tonnes per annum, which translates to a recovery rate of 57 per cent.**
- **About 3.67 million tonnes of wastepaper is estimated to be collected and recycled to the paper industries in Delhi through the existing supply chain.**

Wastepaper-based industries rely on the supply chain of wastepaper for fulfilling their requirement of raw material. However, the overall availability of wastepaper in the country is not sufficient to attend to the demand of the industries. This is due to the low recovery rate of wastepaper from different sources, diversions within the supply chain and specific requirements of fibre strength to produce certain qualities of paper.

Based on historical data and theoretical estimations done previously by agencies like GIZ, DIPP, etc., the recovery rate of wastepaper is given as 40–45 per cent or less.^{19,20} CSE also tried to estimate the recovery rate using the figures of production of paper in India, import and export of finished paper, wastepaper imports, etc. Data for last four years has been considered for this purpose. As per CSE's survey, the conversion rate of wastepaper in paper industries is in the range of 75–85 per cent. For the purposes of calculation, the conversion rate has been taken as 80 per cent.

As per CSE estimates, the present recovery of wastepaper in India is about 12 million tonnes per annum, which translates to a recovery rate of 57 per cent. This brings India close to many developed countries. However, there is still ample scope to improve upon the recovery rate, as Europe at present recovers about 70 per cent of its wastepaper. Japan has the highest recovery rate at about 80 per cent.²¹ Due to insufficient availability of wastepaper, Indian paper industries rely on imported paper to meet their raw material demand.

Table 4: Recovery rate of wastepaper in India (in million tonnes)

	2018-19	2019-20	2020-21	2021-22	Average
Total production	19.36	20.11	21.68	22.43	20.90
Wastepaper-based production	13.72	13.5	16.29	15.70*	14.80
Export of finished paper	1.91	2.097	2.585	3.53	2.53
Import of finished paper	3.25	3.54	2.10	2.18	2.77
Import of wastepaper	6.38	6.83	6.33	6.54	6.52
Domestic consumption	20.70	21.56	21.19	21.08	21.13
Total wastepaper used (based on 80% yield)	17.2	16.9	20.4	19.6	18.50
Recovery of wastepaper	10.77	10.05	14.03	13.09	11.98
Recovery rate	52%	47%	66%	62%	57%

* Estimated value

Source: CPPRI, DGCIS, CSE analysis

Table 5: Quantity of wastepaper utilized in different applications (Based on average data for 2018-2022)

Details	% of total domestic consumption	Quantity (million tonnes)
Total production		20.90
Total domestic consumption		21.13
Packaging of fruits and vegetables	10	2.0
Road side eateries/hawkers/pharmacy/general stores	8	1.6
Moulded products (egg trays, apple trays)	9	1.9
Mixed waste	11	2.2
Handmade paper units	0.3	0.062
Record keeping	6	1.3
Imported RCF (2018-22)		6.5
Total wastepaper as raw material		18.5
Recovery of wastepaper to industries	57	18.5 - 6.5 = 12.0

Source: CSE analysis

The major concerns related to the recovery of wastepaper in India are:

1. Majority of the country does not practice source segregation.
2. Lack of intensive collection mechanism for virgin paper and packaging paper from households and offices.
3. Paper is contaminated as it ends up in mixed waste and eventually disposed of in dumpsites.
4. Paper consumed in record keeping in offices, schools, hospitals and other commercial sectors doesn't immediately become available for recycling.
5. Lack of awareness among the societies and help in effective collection of paper from different sources.

Table 6: Estimation of wastepaper recycled in Delhi

Supply chain level	No. of person or units involved	Grade of paper	Collection of paper per day by 1 collector (kg)	Total collection of paper per day (kg)	Total wastepaper collection per year (million tonnes)	Diversion to secondary applications (million tonnes)
Waste collectors or kabadiwallahs	100,000	Paper (40%)	150	6,000,000	4.5	
		Cardboard (60%)		9,000,000		
Ragpickers	500,000	Paper (20%)	4	400,000	0.6	
		Cardboard (80%)		1,600,000		
Contractors	10,000	Paper	640	6,400,000	5.1	Packaging of fruits and vegetables: 0.48
		Cardboard	1,060	10,600,000		Roadside eateries/hawkers/pharmacies/general stores: 0.38
Scrap dealers	2,000					Moulded products and handmade paper units: 0.47
Aggregators	1,000					
Wholesaler	50	Paper			3.88	

6. Municipalities can be more vigilant in performing their responsibilities in the present waste management network.
7. Other than the recycling of wastepaper in industries, there are secondary applications where paper is consumed.

CSE has tried to estimate the quantity of wastepaper recovered in Delhi at various levels of the supply chain.

As mentioned in table 6, about 3.67 million tonnes of wastepaper is estimated to be collected and recycled to the paper industries in Delhi through the existing supply chain. This quantity provides an idea of the quantity of wastepaper getting recovered from any metropolitan city. Recovery of wastepaper in tier 2 and 3 cities is expected to be lesser.

We have also considered the diversion quantities to various applications based on the percentages worked out by CSE for each application. Accordingly, the wastepaper getting diverted for packaging of fruits and vegetables, road side eateries/hawkers, moulded products or handmade paper manufacturing is estimated at about 0.48, 0.38 and 0.47 million tonnes per year respectively.

5. Case studies on circularity of wastepaper

- **Wellbeing out of waste (WoW) programme is a CSR initiative to sensitize the common masses towards the recycling of paper and to bring wastepaper back into the system.**
- **There are many formal agencies working on the recycling of wastepaper. Greenobin, one such agency, recovers 500 tonnes of wastepaper per month to industries through different models.**

To understand the scenario of wastepaper circularity and supply chain of raw material, CSE's team visited some pulp and paper industries and wastepaper collection facilities. Some good practices are being highlighted here as there is a need to replicate such models in India. This will also help in increasing circularity of wastepaper within the country.

Case study 1: Wellbeing out of waste (WoW) programme of ITC—an example of Public Private Partnership (PPP)

ITC started its wastepaper collection scheme under the WoW programme. WoW is a CSR initiative to sensitize the common masses towards the recycling of paper and to bring wastepaper back into the system. The objective of the drive is that paper should go for recycling rather than to dumpsites. The programme is currently operative in Chennai, Hyderabad, Bengaluru, Coimbatore and Delhi. According to the WoW coordinator, the average monthly collection of wastepaper is 1,000 tonnes from all the cities.

Under this sensitization drive, some quantity of collected wastepaper is used for consumption within the industries. The surplus paper is sold to outside suppliers for further recycling to industries.

Table 7 : Details of the WoW initiative and quantity collected per year

City	No. of collection facilities	Quantity of wastepaper (RCF) collected per year
Delhi	Collection from 300+ wards across the 5 cities	10–12,000 tonnes
Bengaluru		
Hyderabad		
Coimbatore		
Chennai		

The model of the programme is such that private sector is extensively involved in providing services, while the municipal authority is acting more as a service facilitator rather than the regulator.

CSE's team visited a collection hub of South Delhi Municipal Corporation at Raghubeer Nagar, West Delhi. The collection hub has been operational since February 2021. It has an agreement with about 25 resident welfare associations, hotels and hospitals in and around West Delhi. Waste collectors or kabadiwallahs collect waste from different sources. The collected waste includes paper as well as other materials like plastic, glass, etc. The material received at the collection hub is sorted and bailed. The average collection of paper is about 13–14 tonnes per week. The major incoming grade of paper is newsprint and virgin paper. About 85 per cent of the wastepaper, including newspapers and virgin paper, is sent directly to Khatema Fibres in Uttarakhand.

Mixed paper waste and kraft paper, along with other types of paper, are collected in small quantities and sent to local wholesale agencies. About 8–10 small local wholesalers are attached with the collection hub for taking small quantities of waste (up to 500 kg per week).

The cost of purchase of books and newspapers for the hub is in the range of Rs 15–16/kg. The hub sells it to industries for Rs 20–25/kg, which includes the cost of transportation, rejects, etc. The cost for industries changes as per the demand and supply scenario in the market. It is understood that the hub comes under the wholesaler category as it acts as a source of wastepaper for the industry.

The collection, sorting and transportation mechanism of the hub can be replicated in other cities and regions also. The quantity collected is low due to the zonal boundary limits and can be increased by including a larger area under the scope of the collection hub.

Figure 4: Supply chain



SOURCE: CSE SURVEY



Photograph 4: Collection hub



Photograph 5: Waste collected at hub before sorting

Case study 2: Recovery of paper to industries by Greenobin

There are many formal agencies working on the recycling of wastepaper. Greenobin is one such agency located in Gurugram. Set up in 2010, it supplies wastepaper to industries and helps reduce the volume of wastepaper going to landfill. It is working on two models—retail and bulk.

The retail model involves minimum collection quantity of 500 kg. Recycling bins are placed at the client’s place—corporate offices, hospitals, etc. The wastepaper collected from recycling bins is brought to the warehouse where it is sorted and stored separately for supplying to industries. Confidential papers are shredded as per the requirement of the client.

The bulk model includes clients with minimum waste generation of 5–10 tonnes and mainly includes printing presses, publication houses, etc. The wastepaper



Photograph 6: Collected waste



Photograph 7: Sorted waste

collected from such clients is directly transported to paper mills for recycling. On an average, Greenobin recovers 500 tonnes of wastepaper per month to industries from retail and bulk recycling. The collected wastepaper is sent to paper mills located in Punjab and Uttar Pradesh.

In the supply chain, Greenobin sometimes acts as an aggregator and at times as the recovery agent, based on the channelization of wastepaper. More formal agencies should replicate this model to increase recovery to the industries with less diversions of wastepaper. The primary source of revenue for Greenobin is the sale and purchase of wastepaper collected. As per the requirement of clients, either it supplies free of cost recycled paper products or pays money in lieu of wastepaper collected. The cost of wastepaper collected varies anywhere between Rs 2–20/kg and it is sold to industries at the rate of Rs 5–30/kg. It is worth mentioning here that these prices are totally market driven and keep fluctuating. Mentioned values are average figures only.



Photograph 8: Trimmed wastepaper



Photograph 9: Loading for supply to industry



SOURCE: CSE SURVEY

Photograph 10: Waste collection bin installed at an office

6. Conclusion and recommendations

- **CSE proposes an integrated system for wastepaper recycling including both the formal and informal sectors, as this will help in developing the data pertaining to quantum of paper moving in the supply chain.**
- **Extended Producer Responsibility (EPR) guidelines should be developed for wastepaper management and exemption in GST rates should be provided for industries meeting the EPR obligations for wastepaper recovery.**
- **Quality standards should be introduced for the raw material to optimize percentage of virgin paper used with recycled paper to get a particular quality of paper.**

In India, the circularity of wastepaper mainly depends upon its collection, which is majorly in the hands of the informal sector, i.e., rag pickers and door-to-door collectors/vendors. The collection of wastepaper at present is at par with world's average figure of 58 per cent. Though the estimated recovery rate for industries has reached up to 57 per cent (*see Chapter 4*), there is still a lot of scope for improving the collection of wastepaper and its circularity to industries. Access to and sourcing of raw materials, including the collection and sorting of wastepaper, needs improvement.

Waste collectors and recyclers are all part of the supply chain. However, since there is no formally developed system to channelize the waste collected, it is getting lost to the informal sector at various levels of the supply chain. In this regard, we need a well-designed and aggressive system for collection, sorting, grading and utilization of recyclable wastepaper. This is the only way to contain imports and cut the increasing cost of raw materials for the industries. A sustainable model must be developed so that most of the collected paper can be channelized to the paper industry.

Also, there is no data available on the consumption of wastepaper in secondary applications. CSE, through its recommendations, also intends to initiate the documentation and recording of wastepaper movement in the supply chain.

6.1 Recommendations

Development of Extended Producer Responsibility (EPR) guidelines for wastepaper management

Currently, the EPR framework is limited to only plastic and electronic waste and yet to be fully effective. Lack of EPR framework for other dry waste streams such as paper, textile, tyres/rubber, metal and glass, etc. leads to unscientific disposal of these waste streams while also losing valuable resources. Without EPR no circularity can be obtained.²²

The Government of India may formulate the regulations on EPR for paper waste. These rules should include guidelines for manufacturers, consumers, CPCB/PCCs/SPCBs and recyclers, with clear distribution of responsibilities for all stakeholders.

Different grades of paper which need to be covered should be categorized as: Writing and printing (wastepaper-based); kraft and duplex board (packaging paper); and newsprint (newspapers, books, magazines, etc.).

The following stakeholders should be covered under EPR obligations:

1. Producers or manufacturers of paper products including kraft paper, duplex board and other wastepaper-based products;
2. E-commerce brands (Amazon, Flipkart, Blinkit, etc.) and other brand owners using any grade of paper in bulk.

The above-mentioned stakeholders should be registered through a system similar to the one created by CPCB under EPR notifications for plastic waste or e-waste. All business dealings should be undertaken among the registered stakeholders only.

Clear targets should be defined for each stakeholder. Based on the current scenario, CSE has prepared a proposal for what the target for paper industries should look like.

As per CSE's industrial surveys and estimation of recovery rate (57 per cent), it is understood that on an average 60 per cent of the raw material used by industries is from domestic sources while 40 per cent is imported. Some of the industries have been able to manufacture even with 100 per cent of the recycled paper (domestic) as they are procuring the raw material which includes at least 5-10 percent of off cuttings of imported paper available domestically. However, such units are limited. CSE recommends that wastepaper recovery rate for industries should be increased

Table 8: Proposed recovery target for RCF-based paper manufacturers under EPR

Year	Recovery target
2025–26	70%
2026–27	85%
2027–28 onwards	95%

to 95 per cent by 2028, i.e., the industries should be able to meet their raw material demand at least up to 95 per cent through recycling of wastepaper by domestic sources. The remaining 5 per cent of the raw material can be procured through international markets, if required. Only recycled wastepaper (RCF) or virgin wastepaper sourced from domestic markets will be considered under the EPR target.

Other stakeholders can be identified by the government to be included in the EPR regime to compliment the target given to the industries.

Exemption in GST rates for industries meeting the targets for wastepaper recovery

The GST rates applicable on paper, paperboard and articles of paper or paper pulp fall under five categories—0, 5, 12, 18 and 28 per cent.²³

Table 9: GST rates applicable on different paper grades and articles of paper

Sr. no.	Product	GST rate
1	<ul style="list-style-type: none"> Judicial and non-judicial stamp papers, and court fee stamps sold by government treasuries Postal items, like envelopes, post-cards, etc. sold by the government Rupee notes when sold to the Reserve Bank of India, and cheques, loose or in book form 	NIL
2	Newsprint, in rolls or sheets	5%
3	<ul style="list-style-type: none"> Uncoated paper and paperboard Aseptic packaging paper Cartons, boxes and cases of corrugated paper or paper board Exercise book, graph book and laboratory notebook Kites Paper pulp moulded trays Braille paper Paper splints for matches 	12%
4	<ul style="list-style-type: none"> Toilet or facial tissue stock, towel or napkin stock Vegetable parchment, tracing papers Carbon paper, self-copy paper and other copying or transfer papers Cigarette paper, whether or not cut to size or in the form of booklets or tubes Envelopes, letter cards, plain postcards and correspondence cards, of paper or paperboard Registers, account books, notebooks, order books, receipt books, letter pads Paper or paperboard labels of all kinds. 	18%
5	Wallpaper and similar wall coverings	28%

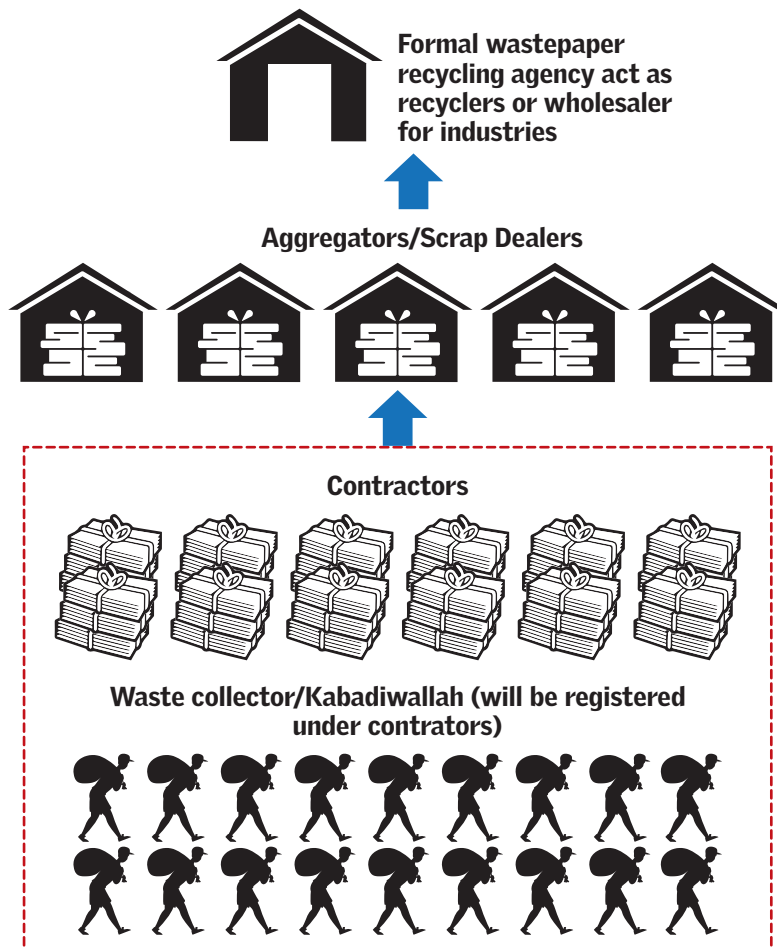
It is recommended for the government to introduce provision of GST exemption of 50 per cent to the industries which are able to meet the EPR targets provided to them. This will provide a push to the industries to ensure that they recover maximum potential raw material domestically.

Integrated system for wastepaper recycling including formal and informal sector

It is understood that the existing mechanism is weak and leads to considerable leakages. There is a need to integrate the informal sector with the mechanism of segregation, collection and recycling to improve the circularity of wastepaper.

The inclusion of formal agencies should be made mandatory in wastepaper management. In CSE's experience, the PPP model is a good initiative, provided that the financial model of the engagement is implemented properly.

Figure 5: CSE's proposed integrated system of wastepaper supply chain



There are formal agencies working towards collecting, sorting and recovering wastepaper to industries. Though the number of such agencies needs to be increased, the model of working will be integrated as the individuals or agencies working at different levels in the supply chain of wastepaper need to be clustered as suppliers to one or more formal agencies based on the quantum of wastepaper collected by them. To ensure that only legitimate agencies register as formal recyclers, the minimum criteria of wastepaper collection per month should be 1,000 tonnes for the agency. It is important to reiterate that all these entities or agencies need to be registered under proposed EPR as well. That will be the eligibility criteria for involvement in the wastepaper recycling system.

Formal wastepaper recycling agency: It should be registered with CPCB as a recycler under the proposed EPR scheme for wastepaper. Annual returns of wastepaper recycled need to be submitted to the CPCB every financial year.

Contractors, scrap dealers, aggregators and recyclers: They should register themselves in the wastepaper recycler category under EPR scheme with the associated kabadiwallahs and individual rag pickers.

The objective behind this integration is to start the accounting of the consumption of wastepaper in different applications and to be able to see the overall scenario of wastepaper collection in the country.

Introduction of quality standards for the raw material

At present, raw material is just judged by physical appearance during procurement. There is no actual analysis of the raw material regarding characteristics like tensile strength, fibre quality and other parameters which are important for the industry and play a significant role in raw material to product conversion. There is also no guideline on the optimum percentage of virgin paper which should be used with recycled paper to get a particular quality of paper (fibre strength). It is understood that at least 20-25 per cent virgin fibres are required in manufacturing of paper, but no specifications have been given for different grades of paper manufacturing.

It is recommended that a competent research organization like Central Pulp and Paper Research Institute should undertake R&D on how to do a quality check of the raw material, which will give an understanding as to how much conversion rate (raw material to product percentage) can be expected out of the processed raw materials. Also, it will help in optimal use of virgin and recycled wastepaper to obtain a certain quality of paper.

For instance, the industry at present may be using 100 tonnes of wastepaper (30 tonnes of virgin wastepaper and 70 tonnes recycled) to produce 80 tonnes of finished product of certain quality. If there are standards on the raw materials, the raw material blend can be optimized to achieve same quality of finished product with 80 tonnes recycled wastepaper and 20 tonnes virgin.

Restriction on usage of imported finished paper

It has been noted that about 13 per cent of the finished paper consumed domestically is imported from outside the country. This factor is also responsible for the low recovery of wastepaper from the consumer or waste generator. As the demand gets met by the imported finished paper, thus the requirement of domestic raw material is not felt and thus the recovery rate cannot be increased to its highest potential.

In order to increase the recovery rate of wastepaper in the country, it is recommended for the government to restrict the usage of imported finished paper by increasing the customs duty from the current rate of 10 per cent to 30 per cent.

Alternatives for secondary applications

As mentioned in Section 3.4, there are various secondary application of wastepaper other than its requirement as raw material in the paper industry. It is recommended to use alternate materials for such applications.

- **Agro straw for packaging of fruits:** At present newspaper is majorly used in the packaging of fruits. It is recommended to utilize either agro straw or Expanded Polyethylene (EPE) Foam Sheets, which is currently in use by the fruit merchants, but to a lesser extent as compared to wastepaper.

Use of agro straw in fruit packaging will prevent it from getting burnt in the open and polluting the ambient air. Agro straw packaging is a very good replacement for newspapers. It even prevents the adverse health effects of using newspaper as food packaging material.

- **Use of steel utensils and pattals for roadside eateries:** Instead of using newspapers, magazines or books for serving food, eateries can switch to using the pattal (broad leaved plant-based products) or steel utensils as used earlier. The shift from paper-based products will lead to more availability of wastepaper in the market and thus increased recovery rate.

- **Bamboo-based utensils:** Bamboo-based utensils are 100 per cent natural and non-toxic in nature. They can be reused and are biodegradable in nature. The shift can be a bit expensive but it totally sustainable and environment-friendly in the long-run.

Consideration of pulp and paper sector under the green credit programme

Recently, the Central Government notified the 'Green Credit Rules 2023'. Waste management based green credit has also been identified as one of the implementation mechanisms of the Green Credit Programme.

The pulp and paper industry should be included under this programme to promote sustainable and improved practices, specifically for wastepaper management, including collection, segregation and recycling to improve circularity of wastepaper. Indian Council for Forestry Research (ICFRE) is the administrator of the programme.

The utilization of post-consumer wastepaper as a raw material by the sector is itself an example of circularity. There should be a provision of green credits by the industries based on the quantity of wastepaper utilized within the manufacturing process and its scale of operation. The sector should prepare a proposal in consultation with CPPRI to be submitted to ICFRE.

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