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Indian **Pulp** & **Paper** Sector

An insight for an energy efficient tomorrow



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EXECUTIVE SUMMARY

The present study reports the status of the Indian Paper Sector with specific reference to the ToR given by GIZ. The study can be divided in to two segments. The first deals with the status of the Indian paper sector comprising largely of segment specific statistical data, its analysis and future projection of identified parameters. The second segment gives out the segmental energy utilization and efficiency scenario of the pulp and paper sector.

Thus, the study places on record the total number of pulp and paper plants in India, with total installed capacity and production. The data is then discussed based on categorization of the raw material used, products made and size of the unit (large, medium, small and micro enterprises). The contribution of the sector to India's GDP has been numerated in the present and projections have been made till 2030.

Based on the available data the study reports the total energy consumption in the sector reporting its break up based on the unit size (large, medium, small and micro enterprises). The fuel consumption in these segments has been worked out and projected till 2030. The total CO₂ emission has also been estimated using similar methodology. Besides highlighting the challenges faced by the sector, the report identifies clusters with lowest SEC. To this end the report also lists the latest technologies/ practices being used in India and abroad (with OEM name and locations of installations). At the end, the report carries details about state level agencies which are responsible for promoting energy efficiency.

A brief precis of the report is placed hereunder for executive review: -

There are 526 operating units of pulp and paper with operating capacity of 23.64 million tons, having yearly output of 20.61 million tons. This sector contributes about Rs. 8000 crores to the National exchequer with a turnover of above Rs. 70000 crores (top 50 companies reported 46394.44 crore turnover in 2018-19). The sector provides direct employment to more than 0.33 million people in the country's rural areas. Further, nearly 2 million people find indirect employment with the sector. Paper Industry based on the raw material utilization is categorized into three categories i.e., Wood Based Mills (Integrated mills), Agro Residues Based Mills (Integrated Mills) and Waste Paper Based Mills (Non-integrated mills). Earlier paper industry was known for dominance of wood-based paper industry but over the time due to dynamic nature of the industry and also because of various environmental compliances the dominance shifted from Wood based mills to Recycled fibre-based (RCF) mills. As on date, more than 70% (13.50 million tons) paper production is being contributed by the RCF based mills, nearly 18% (4.20 million tons) is being contributed by the wood-based industry and remaining (1.66 million tons)

share by the agro based industry. The wood-based sector produces writing / printing (copier paper, maplitho, cream wove paper etc.,) paper. The total production of this segment is 6.78 million tons. The packaging sector accounts for about 55% of the total production (10.65 million tons)

Apart from the writing printing segment, packaging paper is also holding powerful market dominance and therefore, contributing 55% (10.65 million tons) in the Indian paper industry. The products include Kraft paper, Duplex board and paper, Test liner, Paper board and other brown grade papers. Further, small segment of the paper industry is covered by newsprint and speciality paper manufactures which contributed nearly 1.5 million tons of newsprint and speciality paper like tissue, cheque paper, etc.

Indian paper industry is highly fragmented in terms of per day ton paper manufacturing capacity and it starts from 5 TPD up to 1650 TPD. And therefore, mills can be categorized into four segments viz. large, medium, small and micro enterprise. Size wise break up can be seen in the main report.

The affairs of the Indian Paper Sector are steered by four major pan-India associations, namely, Indian Paper Manufacturers Association (IPMA), New Delhi, Indian Agro & Recycled Paper Manufacturers Association (IARPMA), Head office New Delhi, Indian Recycled Paper Manufacturers Association (IRPMA), New Delhi and Indian Newsprint Manufacturers Association (INMA), New Delhi. Moreover, many local associations are also active, especially in the manufacturing hubs, like Gujarat Paper Association, Muzaffarnagar paper mill association, Kashipur local unit association, NCR Recycled Fibre Association etc. These associations, from time to time, represent their local concerns before the authority and therefore, their existence is particularly important for the industry.

As per estimates, in 2029-30 paper industry contribution in the GDP will touch 1.32 lakh crores.

The energy consumption data of 526 operational Pulp and Paper industries having energy requirement of about 9,37,26,147 Mkal per annum or about 3,37,75,188 Tons of coal equivalent was evaluated. In terms of equivalent coal consumption, the waste paper segment uses the least energy followed by the agro based and the wood-based segments. Further, as expected the energy uses increases with the increasing size of the paper units, though the figures are comparable for small and medium scale sector. The report also gives out the cluster wise energy consumption. The wood based sector emits the maximum carbon dioxide followed by the waste paper (packaging) sector.

The report also compiles the latest technologies that are being followed in Indian Paper Sector and compares the same with international status.

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LIST OF ABBREVIATIONS

AOX	Adsorbable Organic Halides.
ASEAN	Association of South East Asian Nations
BCD	Basic Customs Duty
BOD	Biochemical Oxygen Demand
CAGR	Compound Annual Growth rate
CD	Cross Direction
CFBC	Circulation Fluidised Bed Combustion
COD	Chemical Oxygen Demand
CPPRI	Central Pulp & Paper Research Institute
CR	Chemical Recovery
DCE	Direct Contact Evaporator
DCS	Distributed Control Systems
DGFT	Directorate General of Foreign Trade
DGTR	Directorate General of Trade Regulation
ECF	Elemental Chlorine Free
ERIC	Effective Residual Ink Concentration
ESP	Electrostatic Precipitator
ETP	Effluent Treatment Plant
FBC	Fluidised Bed Combustion
FF	Falling Film
FFE	Falling Film Evaporator
F/Y or FY	Financial Year
GCV	Gross Calorific Value
GDP	Gross Domestic Product

GSM	Grams/square meter
HSN	Harmonized System of Nomenclature
IMPEX	Import- Export
ITC	India Tobacco Company Limited
JK	JK Papers Ltd
kg	Kilogram
LED	Light Emitting Diode
LTV	Long Tube Vertical
MkCal	Million kilo Calorie
MOSPI	Ministry of Statistics and Program Implementation
NCG	Non-Condensable Gas
NCR	Non-Conventional Recovery
NPE	Non-Process Element
ODL	Oxygen Delignification
QCS	Quality Control System
RCF	Recycled Fibre
SDA	State Designated Agency
SEC	Specific Energy Consumption
SME	Small and Medium Enterprises
TCF	Total Chlorine Free
TPD	Tons per day
VFD	Variable Frequency Drive
YoY	Year on Year
w/p	Writing and Printing
WTO	World Trade Organization

BACKGROUND OF THE PROJECT

The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is Germany's leading provider of international cooperation services.

As a service provider in the field of international cooperation for sustainable development and international education work, we are dedicated to shaping a future worth living around the world. We have over 50 years of experience in a wide variety of areas, including economic development and employment promotion, energy and the environment, and peace and security.

We work with our partners to generate ideas for political, social and economic change, to develop these into concrete plans and to implement them. Together with our partners in national governments worldwide and cooperation partners from the worlds of business, research and civil society, we work flexibly to deliver effective solutions that offer people better prospects and sustainably improve their living conditions.

German and European values are central to our work. GIZ supports people, communities, businesses and countries in acquiring specialist knowledge, skills and management expertise that set the world more firmly on to paths of

sustainable development. Of course, we advise governments on how to achieve objectives and implement nationwide change processes by incorporating them into legislation and strategies. Without this, changes remain superficial and have no real impact in the medium term.

The Federal Republic of Germany and the Government of the Republic of India have, under the Indo-German Technical Cooperation, agreed to jointly promote the "Indo- German Energy Programme" (IGEN) with the aim to promote energy efficiency/conservation, renewable energy, access to energy, etc. and in turn improve the

environment/climate protection. The Energy Efficiency component of the IGEN (IGEN-EE) works in collaboration with the Bureau of Energy Efficiency, Ministry of Power for the implementation of the Energy Conservation Act (EC Act, 2001), focusing on energy efficiency and conservation.

A new project "Energy Efficiency in Industry and Data" is being commissioned by BMZ Germany. The broad objective of the new programme is, "Non-PAT industries in the secondary steel and pulp & paper sector in India are capacitated to implement EE measures". In view of this, there is a need to understand the diversified pulp and paper sector in India.

Therefore, GIZ approached Central Pulp & Paper Research Institute and signed a MoU for specific (time bound) study related to pulp and paper industry of India. The report, inter se, covers the Indian Paper Sector in its totality. The various key statistical parameters such as installed capacities, production, raw materials used, import/export etc of Indian mills are covered in details. The classification of the paper mills have been done based on their size as well as raw materials used. The overall position of the sector in the Indian market has been discussed based on contribution to the GDP of the country, with a projection of the same till 2030.

The report then covers the sectoral energy consumption scenario, with emphasis on fuel consumption in the various size groups of the mills. This is used to estimate the CO₂ emissions and its projection till 2030. The Specific Energy Consumptions have also been reported.

As with all the sectors, the paper industry also faces challenges and problems with respect to technology and its upgradation. A write up on the same is covered in the report, underscoring the present technologies being followed, the BAT and its availability/sourcing options.

1 | AN INTRODUCTORY PICTURE OF INDIAN PAPER INDUSTRY

The Indian paper industry is the fifth largest producer in the world at the present production volume of 20.61 million tons (2019-20¹). Paper is considered as an important contributor in national manufacturing sector and therefore, 7% of weightage has been given to it while calculating the National Manufacturing Growth. The Sector comprises of 861 paper mills spread across the country with an operating capacity of 23.64 million tons per annum. The sector continues to perform amidst large number of challenges posed by various factors such as acute shortage of raw materials, environmental issues, increasing cost of inputs, aggressive overseas trade practices followed by paper importing entities, zero to zero imports under various FTA's etc. Even with all its challenges, the sector has exhibited a CAGR of 5.83% over the last five years.

The negative effect of the present pandemic can clearly be seen on the Indian Paper Sector, and from April 2020 to date, (August 2020) it is estimated that only about 30% of the mills have achieved 70% capacity utilization. Many units are running only intermittently. The drop in demand is on expected lines since schools /colleges remain closed, and emphasis is being given to e-learning/ e-classes. The growth in the packaging sector, which saw an initial uptrend during lockdown, has exhibited a dip as trans-border movements of goods were affected due to state level decisions.

None the less, industry sources are of the view that pre-COVID demand levels will be reached by Q3 2021-22. We expect growth rate in double digits over the foreseeable future, wherein the consumption and hence the production of paper is projected to double by the year 2030.

Most of the paper units in India are in the rural hinterland close to either energy (coal) or raw material sources. The sector provides direct employment to more than 0.33 million people in the country's rural areas. Further, nearly 2 million people find indirect employment with the sector.

At the national level, this sector contributes about Rs. 8000 crores to the National exchequer with a turnover of above

70000 crores (top 50 companies reported 46394.44 crore turnover in 2018-19). The progress of the paper industry is inextricably linked to National Priority of a knowledge-based economy. The sector is likely to contribute significantly to the Government's target of achieving an overall growth of 8% in manufacturing in the times to come.

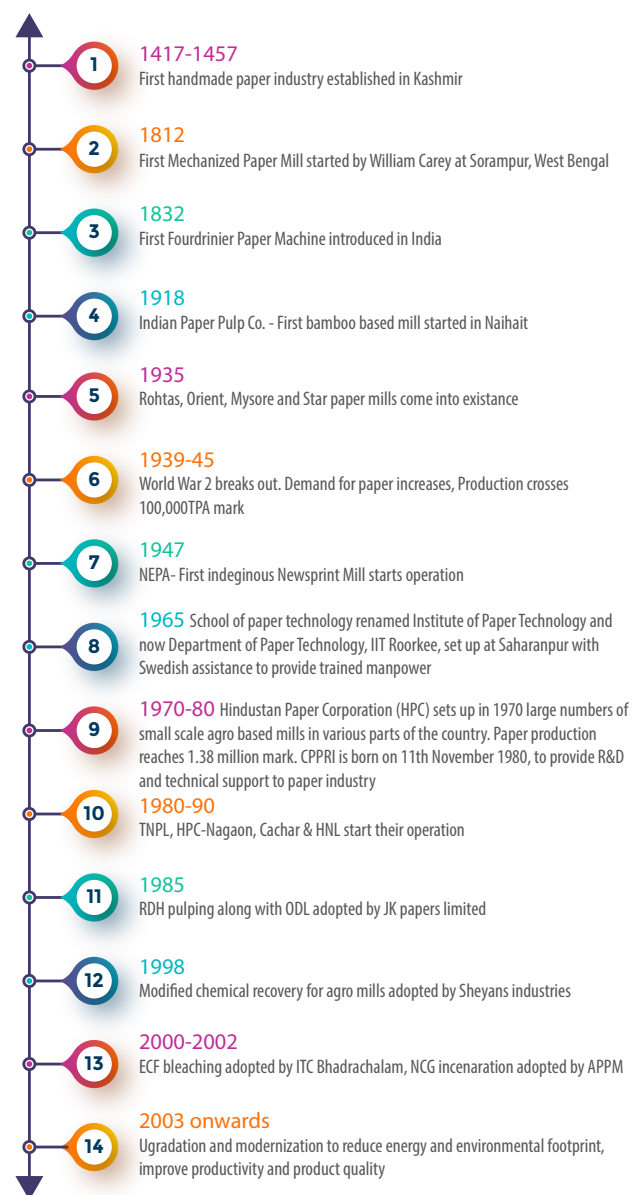


Figure 1: Milestones of Indian Paper Industry

1 Provisional Figures

Table 1: Indian Paper Industry -Key Statistics (2019-20)

No. of Mills	861
Total Installed Capacity, million tons	27.15
Operating Installed Capacity, million tons	23.64
Production of Paper, Paperboard, and Newsprint, million tons	20.61
Capacity Utilization, %	~87
No. of Running units	526
No. of Mills Closed	369
Idle installed capacity, million tons	3.51
Import (in Million tons)	3.54
Export (in million tons)	2.07
Consumption (in million tons)	22.055
Per capita Consumption (kgs)	~16
Global Share	4.72%

Contribution from Different Segments (million tons)

Segment wise Production	Wood-Based	Agro-Based	RCF Mills		
Production in Million tons	4.20	1.66	14.75		
	Large Mills		Medium Mills	Small Mills	Micro Mills
	Integrated		Non-Integrated		
Size Distribution (Operational Mills) total 526	17	29	96	233	151

(Source: Statistical Cell, CPPRI. IMPEX data taken from DGFT data base)

The above table places on record the key statistics of the Indian Paper Sector “at-a-glance”.

1.1 SEGMENTAL REVIEW:

Broadly, the Indian paper industry consists of four basic segments of product category viz. Writing & Printing, Packaging Paper & Board, Newsprint and Specialty papers.

As on date Packaging Papers & Boards have a share of around 55% in the total production. Their demand is fueled by folding & corrugated boxes as they are required by the manufacturing and goods marketing sector. This segment is growing mainly because of development of

the country’s logistics sector, increasing urbanization, increasing penetration of organized online retail leading to higher growth in FMCG, pharmaceutical and processed food industries. In the period of shut down there was a surge in demand of packaging segment during the period of lockdown 1 and 2. However, there were issues related to the upstream and downstream supply chains which had a negative effect on the segment. With the opening up of the economy, we expect the downturn to be arrested by Q4 2020-21.



Figure 2: Raw material utilization trend

The Printing & Writing (P&W) paper segment forms around 35% of the market. The consumption of Printing & Writing (P&W) segment is propelled by rising literacy rate (74.4%), universalization of education and synergistic contributions from flagship schemes of the government. (Pradhan Mantri Kaushal Vikas Yojana (PMKVY), Mahila Samakhya Programme, Sarva Shiksha Abhiyan (SSA), Beti Bachao Beti Padhao, strengthening for providing quality Education in Madrassas (SPQEM), Rashtriya Madhyamik Shiksha Abhiyan (RMSA), Saakshar Bharat (Adult Education) and Central & State Government Scholarship & Education Loan Scheme etc. to name a few). The sector has also benefitted from implementation of Goods & Service Tax (GST), the launch of E-way bill, improved procedures for Ease of Doing Business and the Make in India program.

In the COVID period, this segment has taken the biggest hit, as educational institutes (especially schools) remain closed. With e-classes and e-homework gaining ground, the demand for writing and printing segment has nosedived. Industry representatives have expressed their concerns at various platforms.

Traditionally, however, the domestic production of the above said varieties has been sufficient to meet the domestic demand. However, some amount of Writing & Printing paper is being imported in the specialty segment (cheque paper, security paper etc.).

Lately, however, serious concerns have been raised by the Industry due to rapid increase in imports of copier and coated paper. Some attribute this to Free Trade Agreements (typically ASEAN and Korea) while others see predatory marketing strategies of overseas players.

STRUCTURE OF INDIAN PAPER SECTOR

The Indian paper industry has a highly fragmented structure consisting of small, medium, and large-scale paper mills having capacities ranging from 5 to 1650 ton per day employing wood, agro-residues and recycled fiber (RCF) as major raw materials. At present 73% (14.75 million tons of the production) is coming from the RCF sector. In the face of pollution problems, many small/medium agro-based mills which could not afford chemical recovery switched to using RCF for paper making. Consequently, RCF based production has increased at the expense of agro based segment. On the other hand, the Wood segment is consistently giving its expected output supported by aggressive farm /social forestry programs. At present, 4.20 million tons of paper demand is met out from the wood segment. The third category is agro-based and 9% to 10 % of the demand is fulfilled by the agro-based paper. The distribution of figures is depicted in figure 3.

1.2 THE GROWTH OF INDIAN PAPER INDUSTRY

Out of 410 million tons of paper consumed globally, India consumes 22.05 million tons of paper and paper board

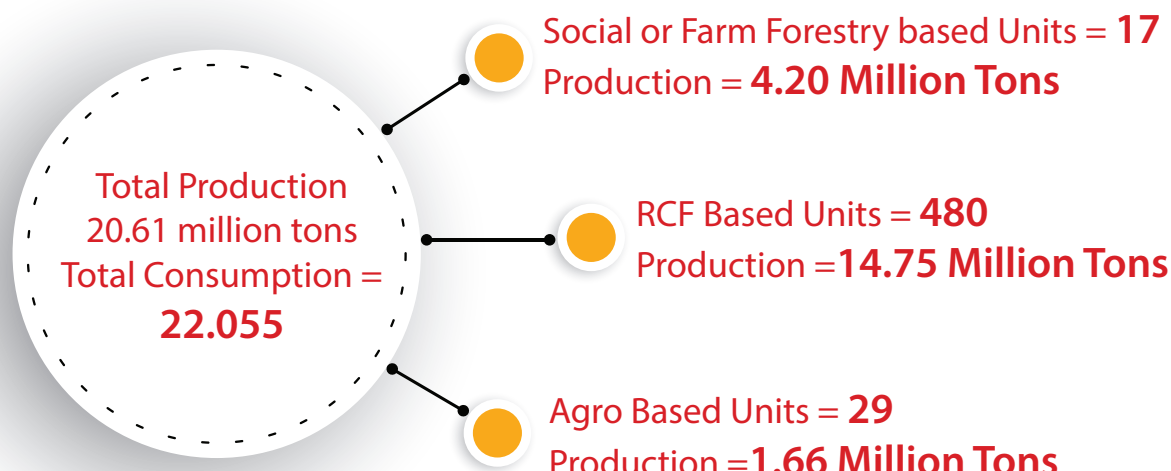


Figure 3: Sectoral Contribution in the Total Production of Paper, Paperboard and Newsprint

annually, putting the national paper demand at 4.72% of the global demand (2019-20 figures). With steady growth in the country's economy since the early 1990s, India has witnessed a steady rise in the consumption of paper. The consumption of paper in India increased from 13.96 million

Tons in 2010-11 to 22.05 million tons in 2019-20. During this period India's paper consumption registered CAGR of 6% compared to the global growth of 3% making India one of the largest growing paper markets in the world. Relevant figures are placed in the table below.

Table 2: Indian Paper Industry-Market

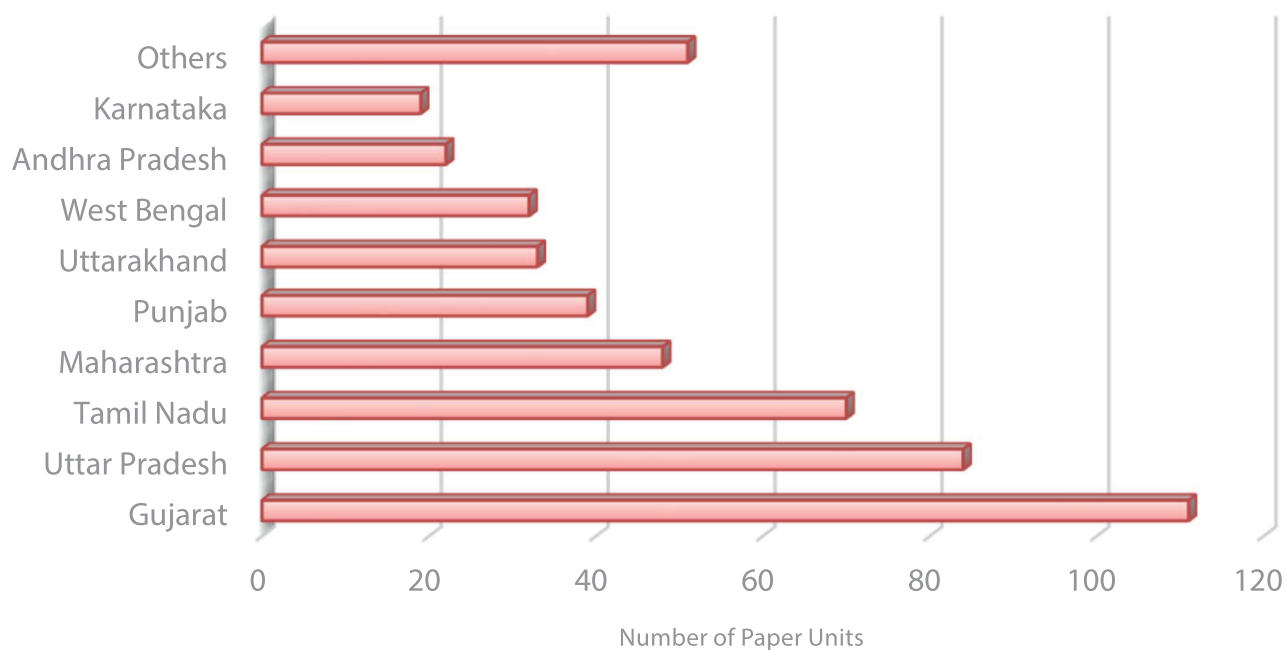
Year	Production Capacity	Production	Import	Export	Consumption
2010-11	14.71	12.95	2.010	0.921	13.960
2011-12	15.59	13.89	2.392	0.770	15.282
2012-13	17.17	15.21	2.391	0.799	16.601
2013-14	18.17	16.41	2.569	0.834	17.979
2014-15	19.72	16.59	2.694	0.956	18.284
2015-16	20.41	17.60	2.983	0.973	19.583
2016-17	20.65	16.91	4.310	1.040	20.220
2017-18	22.11	18.91	3.579	1.323	21.166
2018-19	21.90	19.36	3.250	1.910	20.700
2019-20	23.64	20.61	3.542	2.097	22.055

(Source: CPPRI & Import Export Data Bank, MoC, GoI)

If the numbers alone are considered, then Gujarat has the maximum paper making units. However, most of these units are recycled fibre based. The state of UP has the second largest number of paper mills. These include one or two large mills but most of these are located in the

Muzaffar Nagar and Meerut areas. Most of the large mills are located in Tamilnadu, Andhra Pradesh and Maharashtra. The major pulp and paper mills clusters are located in and around Vapi, Muzaffarnagar, Kashipur, Coimbatore, and Ahmedabad.

1.3 REGIONAL DISTRIBUTION OF INDIAN PAPER INDUSTRY



(Source: CPPRI Statistical Cell)

Figure 4: Geographical Spread of Indian Paper Industry

1.4 : RAW MATERIAL SUPPLY STUDY

One of the important questions that need to be addressed is the raw material requirement for production of paper in the country. As of now, this figure can at best be estimated based on the present sector production levels. The

table below gives one such calculation for raw material requirement in the country. This is a detailed table that gives out the distribution of variety wise production coming from various raw materials. Thus, it can be seen that all newsprint is being produced by recycled fiber only.

Table 3: Raw Material Contribution Study

Variety	Production Million tons (2019-20)	Raw Material	Production Distribution, Million tons (2019-20)	Share %
Writing Printing Grade	7.215	Wood Based	2.78	35%
		Agro Based	0.61	
		Recycled Fibre Based	3.83	
Packaging Grade	11.33	Wood Based	0.85	55%
		Agro Based	1.28	
		Recycled Fibre Based	9.2	
Newsprint	1.03	Wood Based	Nil	5%
		Agro Based	Nil	
		Recycled Fibre Based	1.03	
Others	1.03		1.03	5%
TOTAL	20.61		20.61	

(Source: CPPRI Census Survey of Indian Paper Industry)

In terms of production, the largest contribution is made by the Recycled Fibre Based Mills, which contribute over 70% of the paper being made in the country. In terms of volume, the highest contribution to the domestic paper production comes from the packaging sector followed by writing and printing paper and Newsprint sectors. Out of the total production of 20.61 million tons of paper, paper board and newsprint, writing & printing paper constitutes 35 %, packaging paper 55% and newsprint around 5%. Other varieties of paper account for 5% of production.

The writing and printing grade of paper comprises mainly of uncoated varieties viz. cream wove, maplitho; copier/cut size paper and is mainly produced from wood-based raw materials with a little share from Agro and Recycled fiber, whereas the industrial paper, classified into Kraft paper, whiteboard, Machine glazed (MG) poster, duplex board, and greyboard, is mainly produced by the recycled fiber and agro based mills. However, some varieties such as Flexible Box Board (FBB) is made by large players such as ITC & JK.

The total requirement of raw material for various segments is as below: -

Table 4: The Total Requirement of Raw Material for Various Segments of Paper

Raw Material Type	Raw Material Required at Mill Gate (Oven Dried) (In Million Tons/years)
Wood Based	7.73
Agricultural Residue Based	4.47
RCF Based	14.43
Other (Mixed Raw Material)	2.06
Total Raw Material Requirement	28.68

Thus, about 29 million tons of raw material is required to produce 20.61 million tons of paper. It may be pointed out that this figure is the requirement at the mill gate (free of moisture). If the moisture and losses during raw material harvesting is taken in to account and calculated at the natural moisture present in the substrate, this figure will be about 2.5 times of the table value as an approximation.

1.5 : TOTAL SUPPLY POSITIONS

The figures for the total supply of different varieties of paper are given in the table below. As can be seen, most of the supply is met from domestic production, with the sole exception of newsprint. It is expected that with the recent withdrawal of Actual User Condition and imposition of a

basic customs duty (BCD) of 5% will result in appropriate level playing field to domestic newsprint sector, thereby decreasing import dependence.

Unfortunately, the rising cost of raw material and its sustained availability is a big challenge facing the industry. However, the sales and production ratio have improved in the recent past in some cases. Yet, productivity issues remain within small/medium units, that needs to be addressed.

1.6 : EXPOSURE TO OVERSEAS TRADE

Table below presents the Import and Export of various grades of paper, paperboard and Newsprint from 2010-11 to 2019-20.

Table 5: Indian Paper Industry Exposure to Overseas Trade

Year	Export Market (Million tons)			Import Market (Million tons)		
	Newsprint	Paper & Paperboard	Total	Newsprint	Paper & Paperboard	Total
2010-11	0.011	0.910	0.921	1.25	0.760	2.010
2011-12	0.010	0.760	0.770	1.43	0.960	2.390
2012-13	0.009	0.790	0.799	1.24	1.150	2.390
2013-14	0.004	0.830	0.834	1.38	1.190	2.570

Year	Export Market (Million tons)			Import Market (Million tons)		
	Newsprint	Paper & Paperboard	Total	Newsprint	Paper & Paperboard	Total
2014-15	0.010	0.946	0.956	1.34	1.358	2.698
2015-16	0.005	0.968	0.973	1.50	1.486	2.986
2016-17	0.00042	1.040	1.040	1.58	2.726	4.306
2017-18	0.0068	1.329	1.336	1.44	2.131	3.571
2018-19	0.0127	1.898	1.910	1.37	1.889	3.255
2019-20	0.0160	2.081	2.097	1.35	2.192	3.542

(Source: Import Export Data Bank of Govt. of India)

As can be observed, the trend of import of paper, paperboard and newsprint is continuously increasing. Almost 21% growth can be seen in the year 2016-17. However, last two consequent years (2017-18 & 2018-19) have depicted a decreasing trend in the import of paper, paperboard and newsprint and one factor contributing to this drop seems to be the removal of actual user condition and the consequent imposition of basic custom duty of 5% on newsprint (but in 2019-20 again, import of paper and paperboard has shown so re-route and increased. This may be because of COVID-19 impact in the last quarter of 2019-20). This is important because newsprint import has a major impact on the balance of trade. Traditionally the sector was known for its balance of trade, excluding newsprint. However, this began to change from 2012-13, when import of paper started increasing and export started to lag behind. The situation has improved in last

2 years, when exports have exhibited an upward trend. As regards exports, the volumes are lower than that of imports. However, there has been an increase in Y-O-Y export growth. This is a positive step for the paper sector. CPPRI studies have found a link between ban on import of wastepaper by China and increase in our exports. It seems that China resorted to importing paper from India to balance its supply chain which was affected by the ban. While this may be good news for trade, it has ecological ramifications. China banned imports of waste paper to deal with garbage/contraries which ended up in dumps. In case India follows suit, we envisage operational problems for the RCF based mills in the near future. Further the export consignments of some mills that were shipped to China were returned due to quality rejections. Therefore, it is expected that the windfall of exports of paper to China may not last long and export figures may exhibit a drop.

2 | NEWSPRINT INDUSTRY

In any treatise of the Indian Paper Sector, the newsprint segment is discussed separately due to its unique application and design as a cheap, one time use product with low shelf life. This is radically different from all other varieties of paper which are intrinsically designed for a longer life and use. Also, the issues of this segment are different than that of paper and paper board industry. The Newsprint segment comprises only 6% of the total demand and in the last decade this segment has registered a negative CAGR growth of production (-0.12%). A little more than half of the domestic demand of the newsprint is being met by the imports. Newsprint could be imported duty free subject to actual user condition. The same has been removed in the budget 2019-20 and now the Newsprint attracts a basic duty of 5%. It was expected that this move will provide a somewhat level playing field to indigenous newsprint manufacturers. However, the sector suffered a body-blow due to predatory trade practices of overseas trade of Newsprint into India. Indian Newsprint Manufacturers Association (INMA) reports that Newsprint is being dumped at a price of US\$ 390-400/ton by Spain, Russia, Canada, EU, Singapore, Australia. The selling price in the host country has been reported to be US\$ 650/ton. The same newsprint was trading at USD 800/ton in Q4 2018-19 in the overseas market. As a result, the indigenous sale of Newsprint has plummeted from Rs 5000 crore/Year to nearly zero in Q1 2020-21. As early as Q4 2018-19, the imported as well as domestic production was almost equal (296 and 242, thousand tons, respectively). However, in Q1 20-21 the corresponding figures were 303 and 45 thousand tons. Thus, the domestic production fell by a factor of 5 in a period of just 6 quarters.

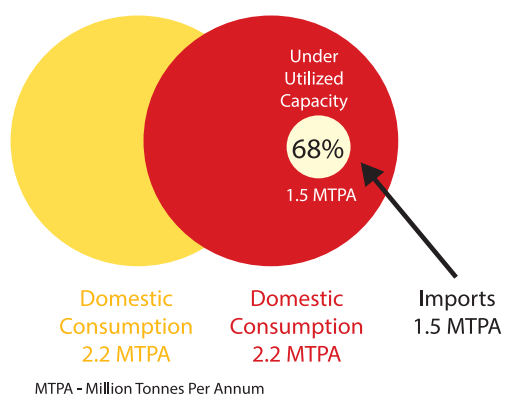


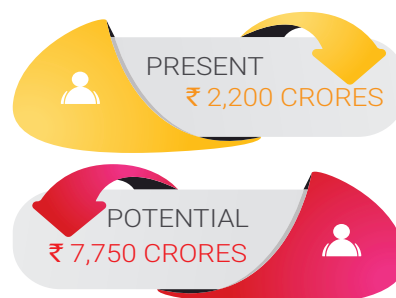
Figure 5: Capacity Utilization of Newsprint Sector

Since Jan 2020, the DGTR has initiated an investigation on dumping of Newsprint in India.

The specialty papers & others constitute the smallest segment, accounting for less than 4% of the market. Such papers are mostly used for packaging gift items, grocery bags and hygiene purpose etc. Within this segment, tissue paper/tissue products have registered impressive growth rate even though the volume in total are low, 35-40%. Out of this some portion does not reach the paper mills for recycling as it is either lost to competing uses (wrapping and packaging) or is degraded in the collection process itself. Consequently, only about 25-30% of post-consumer wastepaper reaches back to the paper sector for recycling. The shortfall in the waste paper supply is met from imports (6.3 million tons in 2019-20). Needless to say, the import of waste paper has been increasing significantly on the YoY basis.

If in case the domestic wood-based segment is provided adequate and assured raw material supply, it will operate at an increased capacity utilization. This in turn will increase the availability of quality waste paper in the market. Present value is about 80%. This will also help the sector plan for future brown and green field expansions.

Also, due to various internal and external factors, at present about 74% of the sector has switched to using wastepaper as the input substrate for paper making. Unfortunately, we do not have an organized system of collection of post-consumers waste paper. Therefore, recovery rate of waste paper in India is only of the order of 30-35% at best.



Generating 1.0 million direct and indirect employment opportunity in rural and urban area

Figure 6: Potential of Newsprint Sector (Source INMA)

3 | RECYCLED FIBER (RCF) BASED SEGMENT

With the progressing years, the scenario of raw material availability became more acute for the Indian Paper Sector. There was a time (in 1970's) when wood was available from natural resources for paper production. At that time, the RCF segment accounted for only 7% of the total paper production in India. In the time period between 1970 to 2000 the regulation for wood harvesting from natural resources were increasingly made stringent, whereby its availability for paper making decreased. Therefore, by 2000, more mills started using RCF as their raw material, accounting for about 30% of the total production of paper in India. In the next twenty years, two things happened that led to the shifting of raw material base to predominant use of RCF for paper making. The wood supply from forest sources completely dried up. Only those mills, who had taken corrective measures for going in for farm /social forestry could manage with the supplies of pulp wood. The other mills had the option of using either RCF or agricultural residues for paper making. Parallel to this, the two decades from 2000 saw increasingly stricter emission norms being promulgated for the pulp and paper sector. The meeting of these norms required the mills to compulsorily go in for chemical recovery systems

which were bundled with the installation of a lime kiln for lime mud reburning for the recovery of lime. Such control systems were unviable for small units. Thus, those units who had planned in advance for brown field capacity expansions using captive plantations could go in for the above said control systems. Other units, particularly the small agro based units, who could not afford chemical recovery operations had no alternative but to shift to using RCF as infeed stock for paper making. The use of RCF had two distinct advantages – it has a very small ecological foot print and required a fraction of the energy required to make paper in an integrated unit. As a combination of all these factors, today more than 70% of the total production comes from the waste paper segment. The sourcing of RCF is done through domestic collection of pre- and post-consumer waste paper and imports.

3.1 WASTE PAPER COLLECTION MECHANISM IN INDIA.

The table hereunder summarizes the generation and collection of main varieties of paper estimated for the year 2018-19.

Table 6: Generation and collection of main varieties of paper

Paper Grade	Source of generation	Type of waste	End User	Quantity Consumed (Million tons/ annum)	Quantity collected (Million tons/ annum) Estimated
Writing/ Printing	Printing Presses and Note Book Manufacturing Units	Press Cutting, Copy Cuttings, Trimings	Paper Mills	~7.18	2.87
	Households, Schools, Universities, Offices etc.	Old Books, Copies, Examination Sheets, Office Records etc.			
Packaging Grade	Printing Presses, Mono carton Makers, Corrugated Box Makers, House Holds, Departmental Stores, Food Seller and Various Shops and Market Establishments	Duplex Board Cutting, Corrugated Box Cutting, Old Boxes, Available Out of Various Packing of House Hold and Electronic Items, Packing of Food and Other Consumer Durables	Paper Mills	10.31	6.18

Paper Grade	Source of generation	Type of waste	End User	Quantity Consumed (Million tons/ annum)	Quantity collected (Million tons/ annum) Estimated
Newsprint	Over Issue, News Papers, Houses, Offices, Market and Various Readers- across the country	Over Issue, Newspapers, New Paper from Houses, Offices and News Paper Reader	Paper Mills, Packing of Fruits, Furniture's, Grocery Items, Packing of Hardware, roadside food vendors etc.	2.628	1.84
Speciality	Various manufacturing Units, Textile, Polymer Convertors and Various Industry	Paper Sheets and Rolls	Paper Mills, Packing of Consumer Durables, Glass Ware Crockery Items, roadside food vendors etc.	>1%	Data not available

3.2 SOURCES OF COLLECTION

The paper is collected mainly from two sources

- Direct source of collection is from household, office premises, schools, religious bodies, hospitals, shops, paper vendors (distributors), printing press, publishing house.
- Indirect source of collection is rag pickers, scrap dealers, (locally called as kabadiwalas or pheriwalas.)

3.3 PRESENT MECHANISM OF COLLECTION

- Paper discarded by consumers in street sweep is cherry picked by rag pickers. They collect as much of dry paper as they can segregate from the total waste, along with plastics, metals, cans, glass etc.
- The dry waste paper from households is picked up by a local vendor on cash sale basis. These persons, referred to as kabriwalas (waste collators) go around in colonies asking people to sell their paper waste (in fact any waste) for a sum based on weight basis with rates varying with quality. In most cases, these vendors are controlled by a stage –II vendor, who is located within a close vicinity, and having sufficient storage space for 4-8 days. Most of these stage –II vendors carry our rudimentary separation of paper waste in to newspapers, board, magazine and packaging. Now, these stage –II collectors are in contact with still larger collectors (the Stage –III collectors), who have got their own/hired small trucks. As and when a sizeable collection is available with the stage –II vendors, it is collected by the stage –III vendors. In most cases, these stage-III vendors are financially sound parties,

with large storage space mostly in the outskirts of Delhi or in the immediate neighbouring state of Haryana and Uttar Pradesh. These stage –III vendors collect sufficient waste that can then be purchased by a paper mill. These vendors employ persons who sift the papers in to further varieties such as white paper, white cuttings, brown paper, packaging (board and cartons), newspapers etc. Most of the pre consumer paper, particularly the press trimmings are purchased directly by stage – III vendors.

- Nowadays, due to increased awareness for green and clean environment, many entrepreneurs like Green-o-tech, Pom Pom, Green-o-bin, Pastiwala, Jagruti etc have started supply chain units in the NCR area and through their own network they are collecting waste paper. These organizations have their own ware house as well as converting facilities. Some of them are providing copies and other useful items to the seller and some are providing direct monitoring benefits.
- In India, an Act gives out the legal provisions on a subject. This is promulgated first, followed by the relevant set of Rules, which lay down the implementation of the provisions of the Act. Initially the Municipal Solid Wastes (Management and Handling) Rules, 2000 were put in place after a writ petition, Almira Patel v. Union of India was filed before the Hon'ble Supreme Court. These Rules were promulgated under Section 5 of Environment Protection Act, 1986.
- The above said rules of 2000 were replaced by the Solid Waste Management Rules 2016. At present, this

is the legal tool to tackle the issues related to waste collection and disposal. However, the provisions of the rules involve action on the part of multiple bodies and stake holders in the center / state level. In one of its provisions, it has been stipulated that

Integration of Waste pickers/ Rag pickers and waste dealers/ KabadiWalas in the formal system should be done by State Governments, and Self Help Group or any other Group to be formed.

Whereas the provisions are very topical and need of the hour, it is felt that the full application of the same is likely to take some time, perhaps spanning years.

- Local municipalities are collecting and dumping the waste in “Dhalav Ghar” without any segregation. At Dhalav Ghar local & marginal workers are performing segregation work. They are giving more focus on plastic waste rather than paper.
- At present 80% of waste collection system is in the hand of unorganized sector. These agencies are known as kabadiwalas or waste paper dealers. In some cases, it is voluntarily donated to NGO’s.
- The household waste is sold to local vendors
- The waste paper from schools and other places is sold through auction/ kabadiwalas/NGO’s/online vendor
 - o The waste paper from private offices/ banks are taken care of by peons who sell it to kabadiwalas/ local big trader
 - o Writing and printing paper which is being used for printing books and making of note books, trimmings & cutting during finishing of the same is being collected by the waste paper collectors and after sorting it is being supplied to the paper mills. Over issue of books/magazines are also collected in a similar manner. Such paper is classified as pre-consumer waste paper.
 - o The used writing /printing papers in the form of old books/ copies/ exam answer sheets/ used office stationery etc. are collected directly from source Similarly, newspapers and children books collected from the residential houses are being recycled in the paper mill. A competing use of the product is found in wrapping and packing of various items sold by ferrywala, chatwala, envelope making etc.
 - o The post-consumer collection of packaging paper and paper board, including corrugated paper is also done with some degree of efficiency as it

generates a premium to the seller in the trade. The drawback is that not all of the packaging material can be used directly for paper making. Stick tapes, staples, gums and glues used in the packaging process affect the quality of the paper board and limit its direct use in a paper mill.

- o Present systems of collection of waste paper from the printing presses, exercise book manufactures, household and government offices is quiet efficient. The only anomaly is that the waste paper collected is not going for recycling to the paper mills. It is also used for other end uses.
- o The waste paper diverted to secondary uses is not easily available for recycling as such waste paper becomes degraded and unusable for recycling by the paper mills.

3.4 IMPORT OF WASTE PAPER

Even with the above mechanisms in place, there are issues with availability of indigenously collected waste paper. Even with the best efforts, the industry claims that about 25-35% of the paper made in the country is recycled back for paper making. Even our theoretical calculations indicate that with the best-case scenario, we are able to claim only about 40-45% collection of paper made in the country. Out of this, about 20-25% definitely goes to competing uses, whereby after being used the quality deteriorates, and the fiber can then only be dumped in the land fill.

In the above background, the waste paper-based segment has no option but to manage the supply shortage by import of waste paper. The trend for import of waste paper is placed in the following graph

It can be seen that with the passing years, the import of waste paper is rising steadily. This reflects the fact that most of the capacity expansions have come in the waste paper-based segments.

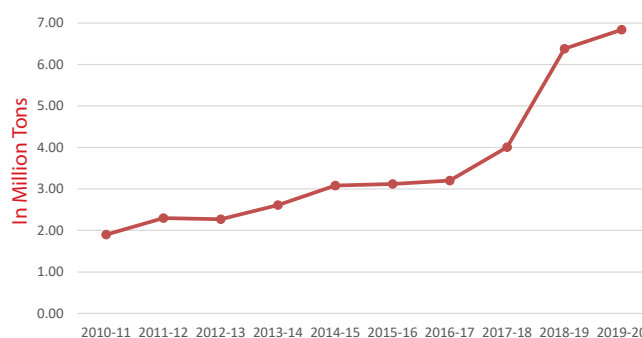


Figure 7: Import of Waste Paper Under HSN Code 4707

4 | DETAILED STUDY OF THE INDIAN PAPER SECTOR

4.1 Indian Demographics

As per data available with Statistical Data collection Cell of Central Pulp and Paper Research Institute, at present total operating plants in India are 526. These plants have a total installed capacity of about 23.64 million tons. However, capacity utilization due to various reasons is lower at nearly 20.61 million tons. 369 closed mills have a locked-up capacity of nearly 4 million tons.

If we consider the contribution of the paper industry in the nation building, then this sector contributes about Rs. 8000 crores to the National exchequer with a turnover of

above 70000 to 80000 crores (top 50 companies reported 46394.44 crore turnover in 2018-19). The sector provides direct employment to more than 0.33 million people in the country's rural areas. Further, nearly 2 million persons find indirect employment with the sector.

4.2 Plant Size Distribution

Indian paper industry is highly fragmented in terms of manufacturing capacity which ranges from 5 TPD to 1650 TPD. In this scenario, the Indian paper mills can be classified based on their size into four segments like, large, medium, small and micro units as shown in the table hereunder

Table 7: Scale wise operation of Indian Paper Units)

Scale Name	Scale of Operation In TPD	Integrated	Non-Integrated	Contribution from Integrated Mills (in Million Tons)	Contribution from Non-integrated (in Million Tons)
Large Mills	Above 300	17	29	4.20	4.54
Medium Scale Units	150 to 300	0	96	0	7.33
Small Scale Units	50 to 150	0	233	0	7.63
Micro Scale Units	Below 50	0	151	0	1.12

Large segment (operating above 300 TPD) can be subdivided into two categories - integrated and non-integrated units. Integrated units have 17 large units and in 2018-19 contributed above 4.20 million tons to production. Whereas, as per data available, 29 non-integrated mills contributed 4.54 million tons of different varieties of paper. (2018-19)

Medium segment of paper (mills operating between 150 to 300 TPD) consists of 96 units which contributed 7.33 million tons in the same FY. Out of these, 6 units manufacture Writing & Printing paper (nearly 0.40 million tons) and remaining contribute in the packaging sector (around 6.93 million tons).

Small segment mills (having capacity between 50 to 150 TPD) are 233 in number accounting for 7.63 million tons of production. Most of these units produced packaging grade paper.

Last segment is referred to as micro units (capacity below 50 Ton per day). 151 units fall in this category. Total contribution from this segment is nearly 1.12 million tons.

4.3 Locations of Paper Units

Further, if we look at geographical appearance, then Gujarat, Maharashtra, Andhra Pradesh, Tamilnadu, Uttar Pradesh etc, are major states of paper manufacturers.

² Census Data-CPRI & Discussion paper on Waste paper collection

**Table 8: Location of Large Paper Units
(Integrated & Non-Integrated)**

Name of State	No of Units
Andhra Pradesh	4
Gujarat	10
Himachal Pradesh	1
Karnataka	1
Maharashtra	3
Odisha	2
Punjab	4
Tamil Nadu	7
Telangana	1
Uttar Pradesh	9
Uttarakhand	2
West Bengal	2

**Table 9: Location of Medium-Scale Paper Units
(Non-Integrated)**

State	No. of Units
Andhra Pradesh	7
Assam	2
Gujarat	16
Haryana	2
Himachal	1
Karnataka	5
Kerala	1
MP	1
Maharashtra	7
Punjab	4
Tamilnadu	9
Telangana	1
Uttar Pradesh	23
Uttarakhand	14
West Bengal	3

**Table 10: Location of Small-Scale Paper Units
(Non-Integrated)**

State	No. of Units
Andhra Pradesh	11
Assam	2
Chhattisgarh	1
Gujarat	62
Haryana	2
Jammu & Kashmir	1
Karnataka	8
Kerala	3
MP	1
Maharashtra	17
Odisha	1
Punjab	19
Rajasthan	4
Tamilnadu	32
Uttar Pradesh	40
Uttarakhand	14
West Bengal	15

Table 11: Micro Scale paper Units (Non-Integrated)

State	No. of Units
Andhra Pradesh	
Assam	2
Bihar	1
Chhattisgarh	5
Gujarat	23
Haryana	2
Himachal Pradesh	1
Jammu & Kashmir	1
Karnataka	5
Kerala	5
MP	2
Maharashtra	21
Odisha	2
Punjab	12
Rajasthan	1
Tamilnadu	22
Telangana	2
Uttar Pradesh	12
Uttarakhand	3
West Bengal	12

5 | INDUSTRY ASSOCIATIONS- NATIONAL AND REGIONAL

As mentioned, the Indian paper industry can be classified on the basis of raw material being used for manufacture of the product. The Indian paper Associations are also formed on the same lines. Thus, we have the following five major associations in Indian Paper Industry:

- Indian Paper Manufacturers Association (IPMA), New Delhi
- Indian Agro & Recycled Paper Manufacturers Association (IARPMA), Head office New Delhi.
- Indian Recycled Paper Manufacturers Association (IRPMA), New Delhi
- Indian Newsprint Manufacturers Association (INMA), New Delhi
- South Kraft Paper Mills Association (Sukraft).

Moreover, there are many local associations active specially in the manufacturing hubs like Gujarat Paper Association, Muzaffarnagar paper mill association, Kashipur local unit association, NCR Recycled Fibre Association etc. These associations from time to time, represent their local concerns before the authority and therefore, their existence is particularly important for the industry. The addresses and contact persons list is placed hereunder.

(Details of All Association working for the Growth of Indian Paper Industry is given in Annexure I)

6 | CONTRIBUTION OF THE INDIAN PAPER SECTOR TO THE NATIONAL GDP- A STUDY

At present in the total GDP, Indian paper industry yearly contribution is ~ 80000 crores. And as per available sources entire manufacturing sector contributes averagely 15 % in the nation GDP. Further, as per Niti Aayog, in GDP 8 core sector viz. Coal, Crude oil, Natural Gas, Refinery Products, Fertilizers, Steel, Cement, Electricity have the largest share. Apart of these sectors, as per MoSPI following sectors falls under manufacturing sector category these are:

Table 12: Contribution of Different Manufacturing Sector (Excluding Mining in the Nation GDP)

Manufacturing Sectors (Excluding Mining)	Eleventh Plan - Contribution to Manufacturing GDP (in percent)
Food products and beverages	8.70
Tobacco products	1.70
Textiles	9.20
Wearing apparel	3.90
Leather products and others	1.30
Wood and others	2.20
Paper, publishing and others	2.70
Coke, petroleum products, and nuclear fuel, rubber and plastics	10.60
Chemicals and chemical products	12.20
Other non-metallic mineral products	6.80
Basic metals	9.70
Machinery and equipment and others	11.10
Electrical machinery and apparatus, telecom and others	6.00
Motor vehicles and other transport equipment	7.70
Furniture and other manufacturing	6.30

Source: MOSPI

Table 13: Contribution of Indian Paper Industry in the Gross Domestic Production (GDP)

Year	India's GDP (In crore)	Share of Manufacturing sector in %	Share of Manufacturing sector (in Crores)	Share of Pulp & Paper Industry in the Manufacturing GDP (in Crore)	Percentage of Pulp & Paper Share in Manufacturing Sector	Growth of Pulp & Paper Share in Mft GDP
2011-12	8736039	15.817	1381779.289	34544.48222	2.5	-
2012-13	9946636	15.253	1517160.389	37929.00973	2.5	9.797592
2013-14	11236635	15.066	1692911.429	42322.78573	2.5	11.58421
2014-15	12433749	15.584	1937675.444	48441.8861	2.5	14.45817
2015-16	13675331	15.162	2073453.686	55983.24953	2.7	15.56786
2016-17	15251028	14.894	2271488.11	61330.17898	2.7	9.550945

Year	India's GDP (In crore)	Share of Manufacturing sector in %	Share of Manufacturing sector (in Crores)	Share of Pulp & Paper Industry in the Manufacturing GDP (in Crore)	Percentage of Pulp & Paper Share in Manufacturing Sector	Growth of Pulp & Paper Share in Mft GDP
2017-18	17095005	14.584	2493135.529	67314.65929	2.7	9.757807
2018-19	19010164	13.755	2614848.058	70600.89757	2.7	4.881906
2019-20	20339859	14.030	2853702.558	77049.96905	2.7	9.134546

Source: Statistical Data Collection Cell-CPPRI & MoSPI

A contribution picture has been given in the above table where paper industry has a continuous contribution of about 2.7 % in the manufacturing sector excluding contribution from core sectors. The time series data available for the last 9 years has been used to extrapolate the future values using a liner model.

Table 14: Forecast of Paper Industry Contribution in the Nation Buidling (GDP Contribution)

Year	Forecast Value	Upper Limit	Lower Limit
2020-21	82491.43	84708.54	80274.33
2021-22	88004.73	90989.02	85020.44
2022-23	93518.03	97110.43	89925.64
2023-24	99031.33	103143.94	94918.73
2024-25	104544.63	109119.63	99969.64
2025-26	110057.93	115053.59	105062.28
2026-27	115571.23	120955.60	110186.87
2027-28	121084.54	126832.16	115336.91
2028-29	126597.84	132687.82	120507.86
2029-30	132111.14	138525.92	125696.35

(Source: Statistical Data Collection Cell-CPPRI)

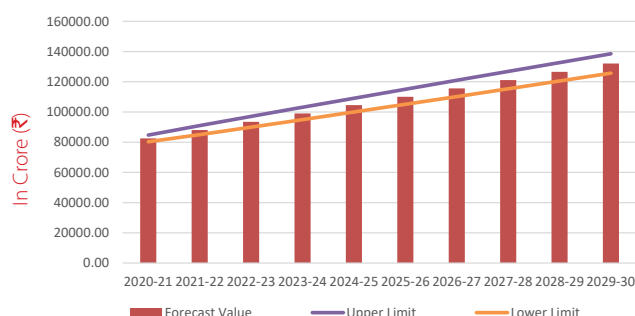


Figure 8: Forecasting Values of Indian Paper Industry Contribution in the Nation GDP

Therefore, contribution from the paper sector in the manufacturing sector is 2.7% which calculated comes to Rs. 80000 crores. In 2019-20 contribution from manufacturing sector stood at Rs. 2853702 crores. As per estimates, in 2029-30 paper industry contribution in the GDP will touch 1.32 lacs crores.

As regards assumptions, we have considered 90% confidence level for projecting the forecast figures of paper sector contribution in the total GDP. In the given graphs above simple linear method has been adopted to project the GDP figures.

6.1 RELATION BETWEEN GDP AND PAPER CONSUMPTION

The figure below plots GDP VS Per capita consumption figures for paper in India for the period 2011-12 to 2019-20. Normally, it is believed that consumption of paper has a direct link to the GDP and that it rises linearly with the GDP. The data goes to show that there are yearly variations but the overall increase is in a linear fashion.

(Source CPPRI Statistical Cell for per capital consumption of paper and Govt. Data for GDP)

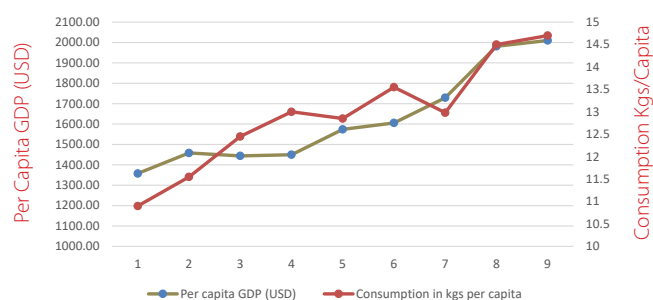


Figure 9: Relationship Between GDP & Paper Consumption

7 | ENERGY PERFORMANCE OF THE INDIAN PAPER INDUSTRY

The energy consumption data of 526 operational Pulp and Paper industries having energy requirement of about 93,726,147 Mkal per annum or about 33,775,188 Tons of coal equivalent was evaluated. Depending on the raw material and process, on an average, production of one ton of virgin paper requires 1-4 tons of coal. The basis of calculation is given in Annexure-2.

For understanding the energy consumption pattern in this highly fragmented industry we have segregated these 526 industries into three main categories.

1. Raw material wise
2. Scale wise
3. Cluster wise

7.1 Effect of Raw Material on Energy Consumption

The Indian paper industry uses diverse raw materials consisting of woods like Eucalyptus, Subabul, Casurina, Bamboo; agro residues like Bagasse, Wheat straw, Rice straw & and waste paper. Depending upon the raw material used by the paper mills, raw material preparation and pulping process may vary while the paper making processes remains almost similar for all mills.

On the basis of raw material used, paper industry in India can be categorized into four segments for the production of paper:

- Wood based mills
- Agro based mills
- Waste paper based mills (producing writing/printing grade paper) and
- Waste paper based mills (producing packaging grade paper and paperboard)

7.2 Wood based mills

Wood based mills are those which use wood like Eucalyptus, Subabul, Casurina, Bamboo etc as raw material for the production of paper. The major unit operations involved in wood-based mills are wood handling & chipping, pulping, washing, screening & centric leaning, bleaching, chemical recovery, stock preparation and paper making. There are 17 wood based operational mills in India having total production capacity of 3,385,147 Ton/year. The total energy consumption details of 17 wood-based mills are given below in table:

Table 15: Energy Consumption data of Wood-based Mills (2018-19)

Type of raw material	No of mills	Total Production in ton/year	Average Mkal/ton of paper	Total Energy consumption in Mkal	Equivalent Coal consumption in tons	Average equivalent coal consumption per ton of paper
Wood based	17	3385147	10.77	36458033	13138030	3.88

7.3 Agro based mills

Although wood is the most widely used raw material for paper industry producing virgin pulp, its availability is limited. With the shortage of forest based raw materials and to preserve the forest, the paper industry in India is

forced to use the agro residue fibres like Bagasse, Wheat straw, Rice straw etc and the mills using agro residues are termed as Agro based mills. There are 29 agro based operational mills in India having total production capacity of 1,630,020 Tons/year. The energy consumption details of these 29 agro based mills are given below in table:

Table 16: Energy Consumption data of Agro based Mills (2018-19)

Type of raw material	No of mills	Total Production in ton/year	Average Mkal/ton of paper	Total Energy consumption in Mkal	Coal Equivalent consumption in tons	Average equivalent coal consumption per ton of paper
Agro based	29	1630020	9.698	15807939	5696555	3.49

The energy consumption is shown in terms of coal equivalent in this case however these mills also use biomass, based on region wise availability and the technology used in the boilers. On an average about 30% -40% energy requirement is met from biomass, rest is met with Coal.

7.4 Recycled Fiber (RCF) based mills

Waste paper is one of the promising raw material for production of all varieties of paper and paperboards. Few mills are totally based on market pulp where paper is manufactured from the virgin pulp purchased from suppliers.

The waste paper based mills can be grouped into following categories:

- Mills producing white varieties using deinking and bleaching systems and
- Mills without deinking systems producing unbleached varieties.

There are total 480 RCF based operational mills in India having total production capacity of 16,458,149 Tons/year. The total energy consumption details of these 480 RCF based mills are given below in table:

Table 17: Energy Consumption Data of Recycled Fiber Based Mills (2018-19)

Type of raw material	No of mills	Total Production in ton/year	Average Mkal/ton of paper	Total Energy consumption in Mkal	Equivalent Coal consumption in tons	Average equivalent coal consumption per ton of paper
Waste paper based (W/P)	57	2230362	4.153	9262693	3337908	1.50
Waste paper based (Packaging)	423	14227787	2.263	32197482	11602696	0.82
Total	480	16,458,149	-	41,460,175	14,940,604	-

The energy consumption is shown in terms of coal equivalent in this case, however these mills use biomass, based on region wise availability and the technology used in the boilers. On an average about 60% -70% energy requirement is met from biomass rest 30%-40% is met with Coal.

7.5 Projection of energy consumption in Indian paper sector

The per capita consumption of paper in India has increased steadily over the past several years indicating steady growth in the demand of paper in the country. Despite the rising trend, India's per capita paper consumption at 15 Kg

continues to be far below the world average of 57 Kg. The low consumption figures are attributed to the low share of manufacturing sector in the Indian economy. The low per capita consumption is however indicative of an enormous potential for growth in paper demand in medium to long term in India.

Growth in demand is likely to continue in the future as the main drivers of demand like growth in literacy, print media, and government initiatives in the education sector etc. will continue to operate in medium to long term. The main driver in growth of paper industry has been the positive growth in domestic paper demand.

Seeing the trend of paper production and consumption it's estimated that the yearly percentage growth of wood, agro, RCF (w/p) and RCF (kraft) based mill will be 2%, 1%, 3 % and 4% respectively and therefore the production capacity of pulp and paper industry will touch 30 million tons per annum of production by the year 2029-30. To

meet this production capacity paper industry will require 122,012,362 Mkal of energy or 43,968,419 tons of coal equivalent.

Future projection of production and energy consumption during the year 2029-30 is tabulated below:

Table 18: Raw Material-Wise Operational Energy Consumption Data of Indian Paper Industry (2018-19)

S. No.	Type of raw material	No of mills	Total Production in ton/year (2018-19)	Total Production in ton/year (year 2029-30)	Average Mkal/ ton of paper	Total Energy consumption in Mkal (2029-30)	Equivalent Coal consumption in ton (year 2029-30)	Average equivalent coal consumption per ton of paper (year 2029-30)
1	Wood based	17	3385147	4126475	10.77	44442139	16015185	4.73
2	Agro based	29	1630020	1800557	9.698	17461799	6292540	3.86
3	Waste paper based (W/P)	57	2230362	2997420	4.153	12448285	4485869	2.01
4	Waste paper based (Packaging)	423	14227787	21060600	2.263	47660139	17174825	1.21
	Total	526	21473316	29985052	-	122012362	43968419	-

Average growth rates for estimation of future production data.

- Wood based mills – 2% CAGR
- Agro based mills – 1% CAGR
- RCF based mills producing writing/printing paper – 3% CAGR
- RCF based mills producing packaging grade paper – 4% CAGR

7.6 Scale wise energy consumption analysis

Paper industry can also be segregated on the basis of scale of paper production. The mills having production capacity of more than 300 ton per day (tpd) are termed as Large scale plant, 150-300 tpd capacity plants are termed as Medium scale plant, 50-150 tpd capacity plants are termed as small scale plant and all those plant having production capacity less than 50 tpd are termed as micro scale plant.

Further these plants are bifurcated into integrated and non-integrated paper mills. All of the wood and agro

based mills in India are integrated mills as they produce pulp in their captive pulp mills for paper-making from lignocelluloses raw materials. The agro based mills in India use conventional chemical recovery (CR) and non-conventional chemical recovery (NCR) systems to process the agro based black liquor.

Unit operations in integrated wood and agro based mills are generally similar, but technological status of agro based integrated mills differ based on the size of the mill. In many large agro based mills the processes used are based on state-of-art technologies, however, in some agro based mills, technological level is relatively obsolete.

The waste paper based mills are termed as non-integrated mills as they convert the waste paper into paper. They can be sub categorized depending on the manufacturing process and the final product. These are

- Mills with deinking and bleaching systems (Writing/ Printing) and
- Mills without deinking systems (Packaging).

The energy input for production of paper by the integrated, non-integrated, packaging mills is different. Details of the

energy consumption in large, medium, small and micro scale plants are presented in table.

Table 19: Cluster wise Details of Indian Paper Industry

S. No.	Type of mills	Sub category	No of mills	Total Production in ton/year	Average Mkal/ton of paper	Total Energy consumption in Mkal	Equivalent Coal consumption in ton	Average equivalent coal consumption per ton of paper
1	Large scale plant (Above 300 tpd)	Integrated (Wood/ Agro)	45	5015167	10.36	51947100	18719676	3.73
		Non integrated (W/P)	51	3820700	6.71	25652180	9244029	2.42
2	Medium scale plants (between 150 to 300 tpd)	Waste paper (W/P)	6	401611	6.71	2696416	971682	2.42
		Waste paper (packaging)	22	1126440	2.71	3052540	1100014	0.98
3	Small scale plant (between 50 to 150 tpd)	Waste paper (packaging)	161	4652560	2.71	12607972	4543413	0.98
4	Micro scale plant (less than 50 tpd)	Waste paper (packaging)	241	6231085	1.99	12424783	4477399	0.72
Grand total			526	21247563		108380991	39056213	

As can be seen, the micro scale plants exhibit lower energy consumption than small and medium scale plants. This is due to the small size of the plants in the micro scale as also due to the fact that lower quality products are generally made in these units.

7.7 Cluster of SME with lowest and highest average SEC

Paper industry in India is driven by water and raw material availability and therefore many micro and small-scale industries are found in clusters. Approximately 72% of the total installed capacity in India is concentrated in Andhra Pradesh, Gujarat, Odisha, Karnataka, Maharashtra and West Bengal” – JKPL [Annual Report FY18]. There are 21 clusters in India which are as following:

S. No.	Name of the cluster	No of mills in clusters	Types of mills in cluster
1	Bangalore	4	4 waste paper-based mills
2	Chennai	5	5 waste paper-based mills
3	Coimbatore	4	4 waste paper-based mills
4	Erode	6	6 waste paper-based mills
5	Godavari	17	17 waste paper-based mills
6	Mysore	5	5 waste paper-based mills

S. No.	Name of the cluster	No of mills in clusters	Types of mills in cluster
7	Pondhicherry	3	3 waste paper-based mills
8	Rajamundry	4	4 waste paper-based mills
9	Shiva Kashi	4	4 waste paper-based mills
10	Tirunelveli	5	5 waste paper-based mills
11	Mehsana	6	6 waste paper-based mills
12	Morbi	20	20 waste paper-based mills
13	Valsad	4	4 waste paper-based mills
14	Vapi	34	4 waste paper-based mills producing writing/printing paper and 46 waste paper-based mills producing packaging paper
15	Amritsar	5	4 waste paper-based mills, 1 Agro based mill
16	Ludhiana	11	10 waste paper-based mills, 1 Agro based mill

S. No.	Name of the cluster	No of mills in clusters	Types of mills in cluster
17	Patiala	7	7 waste paper-based mills
18	Meerut	13	13 waste paper-based mills
19	Moradabad	2	2 waste paper-based mills
20	Muzaffarnagar	30	2 Agro based mills and 28 waste paper-based mills
21	Kashipur	27	2 Agro based mills and 25 waste paper-based mills

Energy Consumption details of each cluster is given in Annexure -3

The Lowest and highest SEC in the cluster is given below in table:

S. No.	Name of the cluster		Production ton/annum	SEC MkCal/ton of paper
1	Bangalore	Highest SEC	42900	2.70
		Lowest SEC	13582	2.10
2	Chennai	Highest SEC	35230	2.71
		Lowest SEC	2848	1.99
3	Coimbatore	Highest SEC	109000	2.71
		Lowest SEC	9689	1.99
4	Erode	Highest SEC	121594	2.71
		Lowest SEC	7519	1.99
5	Andhra Pradesh	Highest SEC	161900	6.71
		Lowest SEC	3240	1.99
6	Mysore	Highest SEC	62500	2.50
		Lowest SEC	4800	1.99
7	Pondhicherry	Highest SEC	30362	2.50
		Lowest SEC	2500	1.99
8	Rajamundry	Highest SEC	45000	2.70
		Lowest SEC	5000	1.99

S. No.	Name of the cluster		Production ton/annum	SEC MkCal/ton of paper
9	Shiva Kashi	Highest SEC	69300	2.71
		Lowest SEC	13200	2.10
10	Tirunelveli	Highest SEC	84480	2.71
		Lowest SEC	31680	2.50
11	Mehsana	Highest SEC	21600	2.30
		Lowest SEC	3000	1.99
12	Morbi	Highest SEC	132000	2.71
		Lowest SEC	16500	2.10
13	Valsad	Highest SEC	68400	2.71
		Lowest SEC	15200	2.10
14	Vapi	Highest SEC	91800	2.71
		Lowest SEC	1104	1.99
15	Amritsar	Highest SEC	355700	10.36
		Lowest SEC	1600	1.99
16	Ludhiana	Highest SEC	49169	10.36
		Lowest SEC	5280	1.99
17	Patiala	Highest SEC	60000	2.71
		Lowest SEC	2640	1.99
18	Meerut	Highest SEC	165000	2.71
		Lowest SEC	15840	2.10
19	Moradabad	Highest SEC	62700	2.71
		Lowest SEC	13200	2.10
20	Muzaffarnagar	Highest SEC	172000	10.36
		Lowest SEC	3960	1.99
21	Kashipur	Highest SEC	99244	2.71
		Lowest SEC	5280	1.99

7.8 Carbon dioxide (CO₂) emission in the sector

Anthropogenic emissions of carbon dioxide (CO₂) weighted by global warming potentials, constitute by far, the largest part of the emissions of greenhouse gases. The pulp and paper industry is a highly energy intensive sector, and carbon emissions emitted from this sector are worthy of attention. Of these carbon dioxide (CO₂) emissions, those that are produced from fuel combustion, mainly coal, make up the great majority.

Large wood and agro based mills are major consumers of coal for generation of steam and power, apart from that, they also recover black liquor from the effluent, generated in the process, to use it as a fuel in recovery boiler for generation of steam.

Medium scale Agro based mills and all the RCF based industries depend on the Biomass fuel readily available locally like Bagasse, Firewood chips, wood dust, husk etc for generation of steam. The estimated total CO₂ emission by the paper industry sector for the year 2018-19 is 48753686 Tons.

Table 20: Carbon Dioxide Emission of Indian Paper Industry (Raw Material Wise) 2018-19

S. No.	Type of raw material	No of mills	Total Production in ton/year	Average Mkal/ton of paper	Total Energy consumption in Mkal	Equivalent Coal consumption in ton	Total CO ₂ emission by the sector
1	Wood based	17	3385147	10.77	36458033	13138030	18787383
2	Agro based	29	1630020	9.698	15807939	5696555	8146073
3	Waste paper based (W/P)	58	2230362	4.153	9262693	3337908	4773208
4	Waste paper based (Packaging)	422	14227787	2.263	32197482	11602696	16591856
	Total	526	21473316				48298519

In year 2029-30 the production capacity of Indian pulp and paper sector will be 30 million tons per annum and will require 44.26 million tons of equivalent coal. In 2029-30 the CO₂ emission by the pulp and paper sector will be 63.29 million tons, which is 29.82% more in comparison to the 2018-19 value.

Table 21: Future Projection of CO₂ Emission Upto 2029-30)

S. No.	Type of raw material	Total Production in ton/year (2018-19)	Total Production in ton/year (2029-30)	Average Mkal/ton of paper	Total Energy consumption in Mkal (year 2029-30)	Equivalent Coal consumption in ton (year 2029-30)	Total CO ₂ emission by the sector in year 2029-30
1	Wood based	3385147	4126475	10.77	44442139	16015185	22901715
2	Agro based	1630020	1800557	9.698	17461799	6292540	8998332
3	Waste paper based (W/P)	2230362	2997420	4.153	12448285	4485869	6414792
4	Waste paper based (Packaging)	14227787	21060600	2.263	47660139	17174825	24559999
	Total	21473316	29985052		122012362	43968419	62874839

8 | TECHNOLOGIES AND RELATED ISSUES

Large number of industries has been facing issues due to obsolescence of technology used by them for paper making operations. The major problem in upgradation and modernization is due to the high capital requirement for up gradation and scale of operation at which no standard state of the art equipment and machinery are available. The large number of small and micro level units operating in India face problems in technology up gradation, as most of them are based on decade's old machinery.

Three segments of industry namely-wood, agro and recycled fibre based have different technological levels. Many of the agro and recycled paper mills still use conventional process technology which is otherwise obsolete by international standards. Some of the wood-based mills and few agro / recycled mills have upgraded the technology from time to time for improvement in the quality of paper, energy efficiency and reduction in the pollution load.

There have been remarkable developments in technology in global paper industry particularly in US and Europe which have resulted in optimal use of inputs, resulting in cost effective production along with reduced environmental loads. Even neighboring countries like China, Malaysia, Indonesia and Thailand have kept pace with the technological advancement and paper industry in these countries have achieved the benefits of advanced technology.

The foremost difference between the Indian paper industry and global leaders lies in the economies of scale. As compared to international capacities, we lag far behind. Scandinavian countries, USA, the Russian Federation, China, Indonesia and Japan are the major players in the field of pulp and paper. These countries have some of the best available raw materials for paper production, cutting edge technologies and control the global trade. However, only a few mills in India employ the state-of-art technologies.

One of the serious implications of technological obsolescence is the environmental impact which can be overcome only through appropriate technology upgradation and modernization. Further, obsolescence has

been responsible for low performance of the industry leading to higher consumption of basic inputs.

To address the various issues, the need for technology upgradation and modernization in Indian paper industry is strongly emphasized as level of technology in Indian paper industry is lagging behind as compared to that in developed countries.

The technological interventions required to fulfil the technology gaps may be taken up through a dedicated technology modernization programme in the wood and agro based & recycled fibre based paper mills.

Technology modernisation should basically aim to improve the competitiveness of industry through acquisition of state-of-art technologies. This can be achieved through:

- Acquisition of proven technology of foreign or indigenous origin/design and drawing.
- Acquisition / license of patent rights.
- Acquisition of capital goods for transfer of process technology.
- Contractual R&D activities leading to technology upgradation of the units.

The technology modernisation & upgradation should lead to emergence of core competencies in critical areas including quantifiable increase in productivity, quality improvement with reduced cost, improvement in energy efficiency norms and better compliance with environmental protection legislations, safeguards for eco-sustainability of products as well as also compliance with legislation relating to patent as per the WTO regime.

Broad areas to be addressed are:

- 8.1 Raw material upgradation.
- 8.2 Resource conservation.
- 8.3 Product quality.
- 8.4 Process improvement.
- 8.5 Energy conservation.
- 8.6 Environmental compliance.
- 8.7 Research & Development.

Major problems faced by the paper plants in technology up gradation are due to use of obsolete technologies in unit operations. These unit operations are required to be upgraded/modernized by installation of energy efficient systems available for the scale of operation. In case it is not possible to achieve the required efficiency level due to non-matching equipment/machines, the whole fiber line needs to be upgraded.

This requires high investment and many times not available or not possible due to high investment required for modernization of the complete fiber lines. However, apart from the above these are same areas where attention is required for modernization.

The most significant benefit of technology up-gradation and modernization would be reduced environmental impact by adoption of environment friendly cleaner technologies (e.g. low Kappa pulping, ECF fiber line including efficient washers, ODL & screening, modern evaporators & recovery boilers, recausticizing system, lime kiln, water treatment & recycling system and modern ETP system etc.).

The problematic areas where technology up gradation is required are given below for small and micro units.

8.1 Raw material upgradation.

Investment is required in following areas for raw material availability and efficient operations of the equipment.

- Prorogate clonal sapling like - Mixed chambers, Hardening chambers.
- Screening and cleaning of waste paper for yield improvement.
- Baling of agro material for optimum storage.
- Efficient depithing of bagasse and cutters for straws.

8.2 Resource Conservation

Equipment related for reducing water consumption like save all, disc filters, recycling of paper machine water.

Fibre recovery system like multistage screening.

- Slotted screens, disc filters to obviate use of centricleaners in unbleached pulp screening.
- Boiler conversion to FBC/CFBC from traveling grate stoker fired.

8.3 Product Quality

- Improvement in optical properties and consistency of product.

- Reduction in dirt count.
- Improvement in bulk and stiffness.
- Surface properties improvement.
- Adoption of blade/roll technology in coating.

8.4 Process Improvement

- Equipment for deinking technology.
- Raw material washing system.
- System for conversion from acid to alkaline sizing.
- System for improving filler and fines retention.
- QCS/DCS system installation.
- High speed winders.
- Continuous stock proportioning system.
- Equipment for fibre fractionation

8.5 Energy Conservation

- Replacement of inefficient pumps and vacuum pumps.
- Installation of VFD.
- Insulation of plant and machinery.
- Installation of efficient steam condensate system.
- Investment in Evaporator plants leading to steam economy greater than 5.
- High efficiency hood and ventilation system.
- Sensors and software for energy measurements.
- Replacement of conical refiners with better refiners.
- Changing line shaft to sectional drives.
- Improvement in blow heat recovery system.
- Change in direct heating to indirect heating in digester.

8.6 Environmental Compliance

- Installation of appropriate chemical recovery system with minimum recovery efficiency of 80%
- Reduction in AOX generation, through chlorine substitution, ODL system, extended delignification system.
- Improved pulp washing system to reduce chemical carry over.
- NCG burning system.
- Lime sludge reburning system.
- Installation of ESP's for reduction in suspended particulates.
- Anaerobic/ Aerobic waste water treatment plants.
- Installation of systems qualifying carbon crediting.

9 | RESEARCH & DEVELOPMENT

A Quality measurement devices.

As pointed out above, the small and micro scale industry needs technical investment and are facing various challenges to adopt the latest state of art technologies. The main bottleneck is the availability of adequate solutions due to their scale of operations and their inability to enhance capacities to the level at which the technical solutions are available for modernization.

The other issues which affect the technological up gradation are

B Financial issues

Non availability of priority lending by banks and financial institutions to the medium, small and micro scale paper industries.

C Raw material issues

Waste Paper based mills: Major part of production

comes from the waste paper-based mills and the demand for waste paper is increasing day by day. Since the recovery rate of waste paper is only 35% therefore the supply depends on impact of waste paper. Therefore, due to unavailability of the waste paper for enhancement of the production capacities, most of the waste paper-based mills are not able to modernize their plants. Interventions at Government level are required to address this issue.

D Lack of indigenous manufacturing capabilities for plant and machinery.

Nearly all state-of-the-art unit operations and equipment are imported in to India. The indigenous production is concentrated mostly in the ancillary equipment. There are certain manufacturers who make small size paper machines which are very basic in nature without much computerized controls. The Pulping and Recovery streets are mostly supplied / erected by the Indian agents of the overseas suppliers.

10 | LATEST TECHNOLOGIES AND PRACTICES IN INDIAN PAPER SECTOR

10.1 Status of Technology in India

The foremost difference between the Indian paper industry and global leaders lies in the economies of scale. As compared to international capacities, we lag far behind. Scandinavian countries, USA, the Russian Federation, China, Indonesia and Japan are the major players in the field of pulp and paper. These countries have some of the best available raw materials for paper production, cutting edge technologies and control the global trade. However, only a few mills in India employ the state-of-art technologies. Table below shows variety wise production of paper by different categories of mills in India, the status of technologies employed by these mills and their comparison with the major global paper producing countries.

Table 22: Latest & Old Technological Practices Adopted in Indian Paper Industry

Variety of paper	World		India	
	World's leading manufacturers	Cutting edge technologies used	No. of Mills using advanced technology	Status of technology in Indian mills
Printing + Writing / Coated / uncoated Wood free paper	USA Germany Brazil Indonesia Turkey China Italy Japan Finland	<ul style="list-style-type: none"> • Proficient debarking & chipping systems • Low Kappa pulping, Efficient washing screening & centri-cleaning • ECF & TCF Bleaching Efficient chemical recovery • Modern high speed paper machines 	5 wood based mills and 3 agro based mills	<ul style="list-style-type: none"> • Low Kappa pulping, ECF bleaching, Efficient washing, screening, cleaning & chemical recovery systems in 5 wood based mills • Drum pulpers and efficient deinking systems in RCF based mills. • Only 3 mills have paper machines above 1000 m/min speed
Packaging /Wrapping other paper	USA Turkey China Germany Italy Australia Sweden Finland	<ul style="list-style-type: none"> • Low Kappa Pulping • Efficient washing & chemical recovery • Modern high speed paper machines 	3 wood based mills, 6 RCF based mills	<ul style="list-style-type: none"> • Low Kappa pulping, Efficient washing, screening, cleaning & chemical recovery systems in 3 wood based mills. • Drum pulpers & pulp screening and cleaning systems in 6 RCF based mills

Variety of paper	World		India	
	World's leading manufacturers	Cutting edge technologies used	No. of Mills using advanced technology	Status of technology in Indian mills
Newsprint	Canada China Japan USA Germany	<ul style="list-style-type: none"> High yield pulping Efficient washing Modern high speed paper machines with super-calenders 	1 wood based mills, 10 RCF based mills	<ul style="list-style-type: none"> CTMP pulping in 1 wood based mill. Hi consistency pulpers and deinking systems in 6 RCF based mills. 4 high speed machines with calenders.
Household & Sanitary Paper	USA China Japan Italy Turkey	<ul style="list-style-type: none"> Low Kappa pulping Efficient washing, screening & cleaning Modern stock preparation and additives systems. Modern tissue paper machines 	2 wood-based mills	<ul style="list-style-type: none"> 2 modern paper machines in wood based mills

Latest technologies and innovations bring a progressive development within a field for competitive advantage. An emerging technology, as distinguished from a conventional technology, introduce new operational benchmarks in some significant way, with new developments. Three segments of industry namely-wood, agro and recycled fiber based have different technological levels. Many of the agro and recycled paper mills still use a conventional process technology which is otherwise obsolete by international standards. Some of the wood-based mills and few agro / recycled mills have upgraded the technology from time to time for improvement in the quality of paper, energy efficiency and reduction in the pollution load.

Old practices used in India`	Modern technological practices	Technology Adopted in India	Status of Technology (Commercial /Pilot/Under Development Early Trails)
Raw Material Preparation			
<ul style="list-style-type: none"> Use of Disc / drum chippers Cutting of agro residues- Straw cutters Conventional depithing of bagasse 	<ul style="list-style-type: none"> De-barking of raw material is practised. Mechanized harvesting and bailing Efficient depithing of bagasse 	<ul style="list-style-type: none"> Partially in some mills Whereas mechanized harvesting is gaining ground, the bailing operations are only very basic in nature . Most mills use the conventional depithing process 	<ul style="list-style-type: none"> Modern Debarkers are available in the market, however, the mills don't tend to use them Modern harvesters and bailer are available indigenously Technology at a pilot scale with CPPRI

Old practices used in India`	Modern technological practices	Technology Adopted in India	Status of Technology (Commercial /Pilot/Under Development Early Trails)
Pulping			
<ul style="list-style-type: none"> • Agro residues - Rotary Digesters & Continuous Pandia Digesters • Wood & bamboo - Stationary Batch Digesters are used. • Higher kappa number 	<ul style="list-style-type: none"> • Mostly Continuous Digesters • Energy efficient Super batch process • RDH pulping using sulphate process & sulphite process • Efficient blow heat recovery • Oxygen De-lignification 	<ul style="list-style-type: none"> • Only a few large mills have continuous digesters. • Most large wood based paper mills use this technology • Mills prefer Super Batch Process over RDH • This is now practiced in many units in one form or the other. • This is also practiced in many large units. 	<ul style="list-style-type: none"> • Modern continuous cooking digesters are available readily in the market. (Andritz is the leading supplier) • The technology /process is well established and available commercially • The technology /process is well established and available commercially • Blow heat recovery systems are mostly home grown solutions. New / retrofitting of pulp streets now carry blow heat recovery as an essential part. • The technology /process is well established and available commercially
Brown Stock Washing			
<ul style="list-style-type: none"> • Poacher washers - in agricultural residues and waste paper. • Counter current washing using rotary drum washer. • Chemi washers. 	<ul style="list-style-type: none"> • Ultra filters like double wire belt washer, twin roll washers and diffuser washers are being used. 	<ul style="list-style-type: none"> • Many large mills now use modern washers in place of the conventional washers. Most are diffuser washers 	<ul style="list-style-type: none"> • The state of the art washing streets are readily available in the market. Valmet and Andritz are the leading suppliers
Bleaching			
<ul style="list-style-type: none"> • Hypochlorite bleaching is done in small mills • Bleaching in medium & large mills is conventional - CEH, CEHH, CEoHH (CChlorine, E-Extraction, H-Hypochlorite, Eo-Oxidative Extraction). • Ozone bleaching is being practiced only in one mill 	<ul style="list-style-type: none"> • This is not about technology as it of the process and the chemical used therein. • Internationally, modern bleach sequence involves sequences that do not use chlorine in any form. 	<ul style="list-style-type: none"> • Many players have shifted to using Elemental Chlorine free bleaching sequences. • Internationally, ECF is executed in combination of Enzymatic bleaching • The state of the art however, is the Total Chlorine Free Bleaching incorporating bleach enzymes. • Elemental Chlorine Free (ECF) process incorporating enzymes 	<ul style="list-style-type: none"> • Internationally TCF is the norm. The process equipment needed for the said bleaching is readily available.

Old practices used in India`	Modern technological practices	Technology Adopted in India	Status of Technology (Commercial /Pilot/Under Development Early Trails)
Chemical recovery			
<ul style="list-style-type: none"> • In Evaporation Street most of the large mills have Long Tube Vertical (LTV) type of evaporators which are environmentally incompatible as well as it is difficult to achieve high solids concentration with DCE's. • Some of the mills have incorporated Falling Film (FF) type finisher effects and few have gone for complete FF street. • In the area of Recovery boiler, the mills are equipped with Tomlinson boilers with double drum technology. The problem of silica in black liquor is one of the major problems in the area of chemical recovery. • Use of Furnace Oil in the lime kiln • Few mills have installed NCG burning. 	<p>In the area of chemical recovery the state-of-the art technology used includes :</p> <ul style="list-style-type: none"> • Inclusion of 7 effect plate type falling film evaporators and Vapour Compression Evaporation for higher steam economy. • Inclusion of Thermal treatment in the evaporator street to achieve higher solids concentration. • Adoption of large capacity single drum boiler with continuous blow down. • Rotary lime kilns with pre coat filter for mud filtration. • Incorporation of NPE removal system • Use of Producer gas & bio-gas from waste biomass in the Lime Kiln • Incineration of NCG's in the Lime Kiln for reduced emission of sulfur compounds 	<ul style="list-style-type: none"> • In India, mills usually have a 5 effect evaporator. Off late, some mills have gone in for 7 effect evaporator (FFE) • New rebuilds are incorporating liquor heat treatment systems. Generally old systems do not use it. • Recovery boilers in Indian Paper Industry are usually old and small. Large capacity single drum boilers are with one or two units only • All large mills use lime kiln for lime bud reburning. The pre-coat filter for lime mud filtration is also used in many cases. • These systems are not used in Indian mills • This is a common use in Lime kilns • This is a common use in lime kilns (Secondary Air) 	<ul style="list-style-type: none"> • The evaporation technology is well developed. Multi effect evaporators are sold commercially by Andritz, a leading equipment supplier in the area of pulp and paper. • Andritz provides a liquor heat treatment process. • Large capcaites recovery boilers are available commercially (Mitsubishi Power, Andritz Group, Babcox and Wilcox are some of the suppliers. • Chloride and Potassium removal systems are supplied by Andtiz and Valmet • Multi fuel compatible lime kilns are available commercially
Stock Preparation			
<ul style="list-style-type: none"> • Poor Fibre Recovery • White Water recycling • No/ little automatic control in stock preparation section. 		<ul style="list-style-type: none"> • Efficient fibre recovery through sedimentation and floatation technology • Fully closed loop with minimum fresh water use • Improved automation 	

Old practices used in India`	Modern technological practices	Technology Adopted in India	Status of Technology (Commercial /Pilot/Under Development Early Trails)
Paper machine			
<ul style="list-style-type: none"> • Slow speed machines with smaller deckle hence low production rate. • Open head box without CD profile control system. • Fourdrinier wire section with low retention resulting in poor paper formation. • Single nip presses • Open hoods without heat recovery system. • More steam consumption and low condensate recovery from dryers. • Hardnip calendars 	<ul style="list-style-type: none"> • High speed (avg. speed of the best paper machine in world is double in comparison to best paper, machine in India). • Wider paper machine Deckle • Eco-friendly biocides • Efficient Filler & Fibre recovery • Efficient condensate recovery • Modification of Head Boxes, Modification of Forming section & introduction of high speed print formers, • Improved press configuration using nip presses & closed draw system 	<ul style="list-style-type: none"> • Out of all the operations, paper machine in India is by far the oldest equipment in a paper mill. The state of the art machines are available only with the top 3-4 mills of India. All the rest use rebuilds to modernize rather than go for new machines. • One reason for this is the low production capacities and shortage of raw material. This negates the necessity of machine with large deckles (the width of the machine). However, during re-builds many units have gone for better head boxes 	<ul style="list-style-type: none"> • Modern, computer controlled machines are readily available from many suppliers from Scandinavia, Europe and China.
Recycled Fibre – Deinking			
<ul style="list-style-type: none"> • High deinking & Bleach chemicals • Low Toner Ink Removal & Drainage rate • Low Brightness • High Stickies • High Dirt Count • High ERIC values • High BOD & COD 	<p>Use of enzymatic deinking resulting in :</p> <ul style="list-style-type: none"> • Savings in deinking & bleach chemicals • Improved drainage rate thereby productivity • Improved product quality through • Gain in Brightness • Reduction in Stickies • Reduction in Dirt Count • Low ERIC values • Reduced pollution load due to Low BOD & COD value 	<ul style="list-style-type: none"> • In India, most of the recovered paper based mills do not make high end paper and do not have deinking systems. Those that have such a syste have a single pass system. Only one or two mills have the dual flotation cell systems. 	<ul style="list-style-type: none"> • Many international as well as national suppliers provide deinking systems for paper pulp.

Old practices used in India`	Modern technological practices	Technology Adopted in India	Status of Technology (Commercial /Pilot/Under Development Early Trails)
Refining of Pulp			
<ul style="list-style-type: none"> • High Refining Energy • Poor Drainability 	Use of advance refining technology leads to : <ul style="list-style-type: none"> • Reduction in refining energy • Improved drainability 	<ul style="list-style-type: none"> • The production of mechanical pulp from refining is note done any longer as it is easier to use waste paper instead. • In the wet end of the paper machine, most of the mills use conventional systems to refine pulp so as to make paper of desired properties. These systems are upgraded with machine rebuilds. 	<ul style="list-style-type: none"> • Modern paper machine come with a dedicate wet end operation equipment, which uses lower energy with higher specific edge load to impart maximum action to the substrate fibers.
Utility			
<ul style="list-style-type: none"> • Use of old non efficient motors and pumps • Use of high power consuming conventional lights • old in efficient vacuum system 	<ul style="list-style-type: none"> • Use of energy efficient motors with VFD's. • LED lights and solar lights being used • Energy efficient vacuum system. 	<ul style="list-style-type: none"> • VFD's are now becoming a common site in Indian paper industry. Mills have also started to use LED lights wherever possible and even solar lights are being used 	<ul style="list-style-type: none"> • These utilities are readily available in the market under multiple brand names

10.2 State Affairs

In exercise of the powers conferred by section 15(d) of the Energy Conservation (EC) Act 2001, all the State Governments / UT Administrations have designated an agency as State Designated Agency (SDA) to coordinate, regulate and enforce the provisions of this Act within the State. One of the major role of SDA is to promote energy conservation awareness programmes and activities in industrial sector. As per industry inputs, some of the SDA's are actively involved in paper sector the other states are executing rudimentary functionality.

There are total 36 SDA working in the field of promotion of energy conservation and following main activities are carried out under SDA promotional awareness programme in pulp and paper industry sector:

- Replacement of old non efficient motors with energy efficient motors.
- Replacement of conventional light with Solar and LED lights.
- Replacement of old vacuum system with new and energy efficient vacuum system.
- Educational seminars on utility system, steam and boiler etc

Table 23: Contact Details of Different SDA

S. No.	State	Address of SDA
1	Andaman & Nicobar Islands	Shri Ajit Barnard Superintending Engineer Andaman & Nicobar SDA Office of Executive Engineer, NRSE Division (Behind Ganesh Temple) Electricity Department Pratrapur, Port Blair - 744105.
2	Andhra Pradesh	Shri A.Chandra Sekhara Reddy Chief Executive Officer State Energy Conservation Mission (SECM) 2nd Floor, 33/11 kV Indoor Substation, Museum Road, Governerpet, Vijayawada – 520 002, Andhra Pradesh.
3	Arunachal Pradesh	Shri Marki Loya Director Arunachal Pradesh Renewable Energy Development Agency Urja Bhawan, Post Box-124 Tadar Tang Marg, VIP Road, Niti Vihar, Itanagar - 791 111
4	Assam	Shri Akhil Chandra Khataniar Chief Electrical Inspector –cum- Adviser Government of Assam 1st floor, West End Block, Housefed Complex, Basistha Road, Dispur, Guwahati – 781 003, Assam.
5	Bihar	Shri Alok Kumar, IES Director Bihar Renewable Energy Development Agency (BREDA), 2nd Floor, Vidhyut Bhawan-II, Bailey Road, Patna – 800001
6	Chandigarh	Shri Ranjeet Singh SE (Electrical) Electrical Circle, Room No. 523, 5th Floor, Deluxe Building, U.T Sectt. Sector 9-D, Chandigarh – 160 009.
7	Chhattisgarh	Shri Alok Katiyar, IFS Chief Executive Officer Chhattisgarh State Renewable Energy Development Agency (CREDA) VIP Road (Airport Road), Near Energy Education Park, Raipur – 492 015, Chhattisgarh.
8	Dadra & Nagar Haveli	Shri R.B. Chaubal, Assistant Engineer (Commercial), Dadra Nagar Haveli Power Distribution Corporation Limited, Vidyut Bhavan, Near Secretariat, 66KV Road, Aml, Silvassa - 396230.

S. No.	State	Address of SDA
9	Daman & Diu	Shri M.R. Ingle Chief Executive Officer Electricity Department, 4th Floor, Vidyut Bhavan, Near 66/11 KV Kachigam Sub-Station, Somnath - Kachigam Road, Kachigam – 396 210, Daman.
10	Delhi	Shri Pradeep Gupta Executive Officer Energy Efficiency and Renewable Energy Management Centre 2nd Floor, E-Block, Vikas Bhawan - II, Near GPO Building, Civil Lines, New Delhi – 110 055.
11	Goa	Shri Raghuvir Keni Chief Electrical Engineer Electricity Department, Government of Goa 2nd floor, Vidyut Bhawan, Panaji – 403001, Goa.
12	Gujarat	Smt. S. Chhakchhuak, I.A.S. Director Gujarat Energy Development Agency (GEDA) 4th floor, Block No. 11 & 12, Udyog Bhavan, Sector-11, Gandhinagar – 382017, Gujarat.
13	Haryana	Dr. Hanif Qureshi, IPS Director General Renewable Energy Department, Haryana & HAREDA, Akshay Urja Bhawan, Institutional Plot No.1, Sector 17, Panchkula – 134109, Haryana.
14	Himachal Pradesh	Smt. Manasi Sahay Thakur , IAS Director Directorate of Energy (GoHP), Phase-III, Sector-VI, New Shimla, Himachal Pradesh – 171009.
15	Jammu & Kashmir	Chief Engineer, Commercial and Survey Power Development Department Complex Bemina, Srinagar – 190 008, Jammu & Kashmir.
16	Jharkhand	Shri Ashok Kumar, IFS Director Jharkhand Renewable Energy Development Agency (JREDA) 3rd Floor, SLDC Building, Kusai Colony, Doranda, Ranchi – 834 002, Jharkhand.

The complete list of all 36 SDA's along with address is given in table below:

S. No.	State	Address of SDA
17	Karnataka	Dr. H.B. Budeppa, KAS. Managing Director Karnataka Renewable Energy Development Limited (KREDL) 39, Shanthi Gruha, Bharath Scouts & Guides Building, Palace Road, Bengaluru – 560 001, Karnataka.
18	Kerala	Shri K.M. Dhasesan Unnithan Director Energy Management Centre (EMC) - Kerala, Sreekrishna Nagar, Sreekaryam, Thiruvananthapuram – 695 017, Kerala.
19	Lakshadweep	Shri C. N. Shajahan Director Electricity Division Office Lakshadweep Electricity Department Kavaratti Island, UT of Lakshadweep – 682 555.
20	Madhya Pradesh	Shri Manu Srivastava, I.A.S Managing Director M.P. Urja Vikas Nigam Limited Urja Bhawan, Link Road No. 2, Shivaji Nagar, Bhopal – 462 016, Madhya Pradesh.
21	Maharashtra	Shri Subhash S Dumbare, IAS Director General Maharashtra Energy Development Agency (MEDA) MHADA Commercial Complex, 2nd Floor, Opp. Tridal Nagar, Yerwada, Pune – 411 006, Maharashtra.
22	Manipur	Shri L. Priyokumar Singh Managing Director Manipur State Power Distribution Company Limited (MSPDCL), 3rd Floor, New Directorate Building (Near 2nd M.R. Gate) Imphal-Dimapur Road, Imphal – 795 001, Manipur.
23	Meghalaya	Shri C S Thangkhiew Senior Electrical Inspector Inspectorate of Electricity, Government of Meghalaya, Horse Shoe Building, Lower Lachumiere, Shillong – 793 001, Meghalaya.
24	Mizoram	Er. H. Zonunsanga Chief Electrical Inspector Power & Electricity Department, Electrical Inspectorate Government of Mizoram, Zuangtui, Aizawl – 796 017, Mizoram.

S. No.	State	Address of SDA
25	Nagaland	Shri T.K. Halder Electrical Inspector Old Assembly Secretariat Near Old Assembly Hostel, Kohima – 797 001, Nagaland.
26	Odisha	Shri Santosh Das Engineer- In-Chief (Electricity) – cum – Principal Chief Electrical Inspector State Designated Agency Odisha, Department of Energy Government of Odisha, Power House Square, Bidyut Marg, Bhubaneswar – 751 001, Odisha.
27	Puducherry	Thiru A.S.P.S Ravi Prakash Managing Director, Renewable Energy Agency Puducherry(REAP) Bungalow No.2, AFT Premises, Cuddalore Main Road, Mudaliarpet, Puducherry-605004.
28	Punjab	Shri Navjot Pal Singh Randhawa, IAS Chief Executive Punjab Energy Development Agency (PEDA) Solar Passive Complex, Plot No. 1-2, Sector 33-D, Chandigarh (U.T.) – 160 034.
29	Rajasthan	Shri. Anil Gupta, IAS Managing Director Rajasthan Renewable Energy Corporation Ltd (RRECL) E-166, Yudhishtir Marg,C-Scheme, Jaipur – 302 005, Rajasthan.
30	Sikkim	Shri Dilip Kumar Sharma Additional Chief Engineer (IPP) cum Nodal Officer Sikkim SDA Energy & Power Department, Government of Sikkim Power Secretariat, Kazi Road, Gangtok – 737 101, Sikkim.
31	Tamil Nadu	Shri Er. S. Stephen Arokiyaraj Chief Engineer Demand side Management. Tamil Nadu Generation & Distribution Corporation Limited 5th Floor, Eastern Wing, 144, Anna Salai, Chennai- 600002
32	Telangana	Shri N Janaiah Vice Chairman & Managing Director Telangana State Renewable Energy Development Corporation (TSREDCO) Ltd. D.No. 6-2-910, Visvesvaraya Bhavan, The Institution of Engineers Building, Khairatabad, Hyderabad – 500 001, Telangana.

S. No.	State	Address of SDA
33	Tripura	Dr. M.S. Kele Chairman-cum-Managing Director Tripura State Electricity Corporation Limited Bidyut Bhawan, North Banamalipur, Agartala, Tripura (West)-799001
34	Uttar Pradesh	Shri Bhawani Singh Khangarot, IAS Director Uttar Pradesh New and Renewable Energy Development Agency (UPNEDA) Vibhuti Khand, Gomti Nagar, Lucknow – 226010, Uttar Pradesh.
35	Uttarakhand	Capt. Alok Shekhar Tiwari, IAS Director & Additional Secretary (Energy), GoUK Uttarakhand Renewable Energy Development Agency (UREDA) Urja Park Campus, Industrial Area, Patel Nagar, Dehradun – 248 001, Uttarakhand.
36	West Bengal	Shri Amitava Sen Chief Engineer, Planning, Investigation & Design Department & Nodal Officer of WBSDA. Vidyut Bhavan, 5th Floor, B-Black, Bidhannagar, Block - DJ, Sector - II, Kolkata - 700091

ANNEXURE -1

1. Indian Paper Manufacturer Association**About IPMA**

As a national industry body, Indian Paper Manufacturers Association (IPMA) represents the resurgent and organized face of paper industry in India.

Large integrated paper mills from private and public sector with a product mix of all varieties of paper (writing, printing, packaging, speciality, paperboards and newsprint) located in all regions and using conventional fibre such as wood and bamboo and also unconventional raw materials like recyclable waste paper, agro-residues, viz. bagasse and wheat straw comprise the membership of IPMA in a broad spectrum.

Contact Details**Mr. Rohit Pandit (Secretary General)****Indian Paper Manufacturers Association (IPMA)**

3rd Floor, PHD House, 4/2 Siri Institutional Area
(Opposite Asian Games Village)
New Delhi – 110 016 (India)

Phone: +91-11-26518379, 41617188

Fax: +91-11-26518379

Email: sg@ipma.co.in , secretariat@ipma.co.in

Website: www.ipma.co.in

2. Indian Agro & Recycled Paper Manufacturers Association (IARPMA), Head office New Delhi.

Indian Agro & Recycled Paper Mills Association (IARPMA) is the apex body represents the vibrant non-wood paper segment in India.

The member mills of the Association (IARPMA) help the country to meet the major requirements of paper from waste materials. Thus help in conversion of waste into wealth.

IARPMA is registered body registered with the Registrar of Societies, Government of NCT of Delhi and function as a catalytic agent for the promotion

and development of Indian Paper Industry.

Since its inception in 1987, IARPMA is function as a catalytic agent for the promotion and development of Indian Paper Industry.

IARPMA Secretariat

Head Office

Contact Person: Mr. P.G. Mukundan (Secretary General)

Address: 404, Vikrant Tower, 4 Rajendra Place
New Delhi – 110008, INDIA

Tel: 91-11-25862301

Fax: 91-11-25768639

E-mail: iarpma@inpaper.com ,

Website: www.iarpma.org,
www.inpaper.com, www.paperex-india.com,

3. Iarpma Gujrat State Chapter

802, Avdhesh, House, OPP. Gurudwara,
Gobindham Nr. Taltej Cross Road,
Ghandhinagar-Sarkhej High Way,
Ahmedabad-380 054
iarpma@inpaper.com

4. Iarpma Uttar Pradesh State Chapter

c/o. Bindlas Duplex Ltd, 67, Banjaran,
Muzaffarnagar, U.P.-251001
iarpma@inpaper.com

Affiliated Association to IARPMA

- 1) South Indian Kraft Paper Mills Association 130, Bells Road, Triplicane, Chennai 600005
- 2) Industrial Board Manufacturers Association Erode, Tamil Nadu
- 3) South Indian White Paper Mills Association
- 4) South Indian Duplex Board Manufacturers Association
- 5) **Indian Recycled Paper Manufacturers Association (IRPMA), New Delhi**

Contact Person:

Mr. R.C.Rastogi (MD – Khatema Fibres Ltd)

404 - 405, Vikas Deep Building
Distric Centre Laxmi Nagar,
Delhi - 110 092
INDIA
Phone No. 011-47699999
www.khatemafibres.com
info@khatemafibres.com

**6. Indian Newsprint Manufacturers Association (INMA),
New Delhi**

Indian Newsprint Manufacturers Association, (INMA) the only apex body of Indian Newsprint industry, a non -profit organisation, Registered society under society act XXI of 1860 bearing registration number 40300/2001

OFFICE ADDRESS:

Mr. Vijay Kumar (Secretary General)
57, Panchkuian Road
(Opp.. Metro Pillar No. 6),
New Delhi – 110001 (INDIA)
+91-98102 91310
info@inma.org.in, sg@inma.org.in

**7. South Kraft Paper Mills Association (Sukraft).
Kraft Paper Manufacturers of South India consists
of 55 members.**

Contact Person

Mr. K. Swaminathan (Secretary)

Kraft Paper Manufacturers of South India
Old #130, Bells Road
Triplicane
Chennai - 600 005
cell: 98400-57208
Email id. ks@southkraft.com

Local Chapters

Gujarat Paper Mills Association	Mr. Bharat Bhai 138,Varun Complex, Opp.Rliance Super, G.I.D.C.Vapi. Ph.No.0260-2427153 email ID : gpma4u_vapi@yahoo.co.in
MuzaffarNagar Paper Association	Mr. Pankaj Aggarwal (MD) Bindlas Paper Mill Pvt Ltd 8 Km Bapa Road, Muzaffar Nagar
Kasipur Paper Mill Association	Mr. Pawan Aggarwal (MD) Naini Paper Ltd Kashipur Road Uttrakhand
NCR Recycled Fibre Association	Delhi Meerut Road President – Shri Arvind Agarwal, Chairman of Paswara Group Paswara Papers Limited, Paswara Border, NH-58, Mohiuddinpur, Delhi Road, Meerut – 250205, (U.P.) INDIA E mail - query@paswara.com

ANNEXURE -2

Basis for evaluation of Energy Consumption data

- 1) Average GCV of Coal – 2775 kCal/kg
- 2) Average SEC for mills based on raw material
 - a) Average SEC for wood-based mills – 10.77 MkCal/ton of paper
 - b) Average SEC for agro based mills – 9.69 MkCal/ton of paper
 - c) Average SEC for waste paper-based mills producing Writing/printing paper – 4.15 MkCal/ton of paper
 - d) Average SEC for waste paper-based mills – 2.26 MkCal/ton of paper
- 3) Average SEC for mills based on scale of operations.
 - a) Average SEC for Large scale Integrated plant – 10.36 MkCal/ton of paper
 - b) Average SEC for Large scale Non Integrated plant – 6.71 MkCal/ton of paper
 - c) Average SEC for Medium scale waste paper plant producing Writing/printing paper – 6.71 MkCal/ton of paper
 - d) Average SEC for Medium scale waste paper plant producing packaging paper – 2.71 MkCal/ton of paper
 - e) Average SEC for small scale waste paper plant producing Writing/printing paper – 2.71 MkCal/ton of paper
 - f) Average SEC for small scale waste paper plant producing packaging paper – 1.99 MkCal/ton of paper
- 4) CO₂ emission calculations
1 ton coal is equivalent to 1.43 ton of CO₂ emission.
- 5) Average growth rates for estimation of future production data.
 - a) Wood based mills – 2% CAGR
 - b) Agro based mills – 1% CAGR
 - c) RCF based mills producing writing/printing paper – 3% CAGR
 - d) RCF based mills producing packaging grade paper – 4% CAGR

Data mentioned in the table is for the Financial Year 2018-19.

S. No.	Name Of The Mill	Cluster/ District	State	Installed Capacity (T/Year)	Production (T/Year)	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Dev Kiran Paper Mills P Ltd	Bangalore	Karnataka	25000	42900	2.7	115830	41741	0.97
2	Ans Paper Mills P Ltd	Bangalore	Karnataka	68400	26646	2.3	61286	22085	0.83
3	Jodhani Paper Mills P Ltd	Bangalore	Karnataka	25200	18023	2.1	37848	13639	0.76
4	Eco Papers P Ltd	Bangalore	Karnataka	18000	13582	2.1	28522	10278	0.76
	Total				101151		243486	87743	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Vamshadhara Paper Mills (Formerly Sennar Paper (Sennar Group) Unit li	Chennai	Tamil Nadu	37000	35230	2.71	95473	34405	0.98
2	Dharmapuri Papers Mills Private Limited	Chennai	Tamil Nadu	6000	5400	1.99	10746	3872	0.72
3	Sri Venkatachalapathi Paper Mills Pvt Ltd	Chennai	Tamil Nadu	3000	2848	1.99	5668	2043	0.72
4	Vishnupria Paper Mills P Ltd (Formerly Vishnupriya Paper Mills Pvt Ltd)	Chennai	Tamil Nadu	43200	28080	2.3	64583	23273	0.83
5	Suryaans Paper (Group Company Of Sukraft)	Chennai	Tamil Nadu	36400	26493	2.3	60934	21958	0.83
	Total				98051		237405	85551	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Aditya Aswin Paper Mills Pvt Ltd.	Coimbatore	Tamil Nadu	19800	19800	2.1	41580	14984	0.76
2	Shree Karthik Papers Ltd	Coimbatore	Tamil Nadu	13350	9689	1.99	19281	6948	0.72
3	Bilt Industrial Packaging Co.ltd	Coimbatore	Tamil Nadu	65000	52000	2.71	140920	50782	0.98
4	Itc (Unit Kovai)	Coimbatore	Tamil Nadu	109000	109000	2.71	295390	106447	0.98
Total					190489		497171	179161	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Seshasayee Paper & Boards Ltd	Erode	Tamil Nadu	175000	121594	2.71	329520	118746	0.98
2	Sri Andal Paper Mills P Ltd. Unit li & lii	Erode	Tamil Nadu	66000	40670	2.7	109809	39571	0.97
3	Sri Andal Paper Mills P Ltd. Unit I	Erode	Tamil Nadu	13200	11330	2.1	23793	8574	0.76
4	Senthil Paper & Paper Board Pvt Ltd (Formerly Saradha Paeprs & Boards P Ltd)	Erode	Tamil Nadu	99000	99000	2.71	268290	96681	0.98
5	Sri Pariyur Amman Paper Boards P Ltd	Erode	Tamil Nadu	21600	7519	1.99	14963	5392	0.72
6	Vedagiri Paper Mills (India) Pvt.ltd Unit li	Erode	Tamil Nadu	9900	7920	1.99	15761	5680	0.72
Total					288033		762135	274643	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	International Paper (The Andhra Pradesh Paper Mills Ltd)	Godavari	Andhra Pradesh	174000	161900	6.71	1086349	391477	2.42
2	Shree Papers Ltd	Godavari	Andhra Pradesh	32850	32850	2.5	82125	29595	0.90
3	Pulavarthy Paper & Boards (P) Ltd	Godavari	Andhra Pradesh	3600	3240	1.99	6448	2323	0.72
4	Coastal Agro Industries Ltd	Goldavare	Andhra Pradesh	44000	44000	2.7	118800	42811	0.97
5	Vijay Anand Kraft Papers P Ltd	Hyderabad	Andhra Pradesh	66000	72600	2.71	196746	70899	0.98
6	Meenakshi Paper Mills P Ltd	Hyderabad	Andhra Pradesh	14500	12000	2.1	25200	9081	0.76
7	Sharma Papers P Ltd	Hyderabad	Andhra Pradesh	3600	3475	1.99	6915	2492	0.72
8	Parimala Paper Mills P Ltd	Hyderabad	Andhra Pradesh	7200	6000	1.99	11940	4303	0.72
9	Maruthi Paper Udyog	Hyderabad	Andhra Pradesh	10000	9000	1.99	17910	6454	0.72
10	Sai Tirumala Papers P Ltd	Hyderabad	Andhra Pradesh	18000	14500	2.1	30450	10973	0.76
11	Sree Raja Rajeshwari Paper Mills P Ltd	Hyderabad	Andhra Pradesh	6600	4500	1.99	8955	3227	0.72
12	Decor Papers P Ltd	Hyderabad	Andhra Pradesh	60000	35000	2.5	87500	31532	0.90
13	Seshadri Paper Boards Pvt Limited	Hyderabad	Andhra Pradesh	13000	10400	2.1	21840	7870	0.76
	Total				409465		1701178	613037	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	The South India Paper Mills Ltd	Mysore	Karnataka	62500	32687	2.5	81718	29448	0.90
2	Raman Boards Ltd	Mysore	Karnataka	6000	4800	1.99	9552	3442	0.72
3	Jay Js Paper Recycling P Ltd	Mysore	Karnataka	18000	15500	2.1	32550	11730	0.76

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
4	Rajshil Papers P Ltd.	Mysore	Karnataka	18000	19000	2.1	39900	14378	0.76
5	Varkood Paper & Boards P Ltd	Mysore	Karnataka	12000	11864	2.1	24914	8978	0.76
	Total				83851		188634	67976	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Nithya Pkg P Ltd	Pondicherry	Tamil Nadu	43200	30362	2.5	75905	27353	0.90
2	Vsb Paper Products	Pondicherry	Tamil Nadu	18000	7922	1.99	15765	5681	0.72
3	Entees Paper & Boards P Ltd	Pondicherry	Tamil Nadu	3600	2500	1.99	4975	1793	0.72
	Total				40784		96645	34827	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Sri Ramdas Paper & Boards P Ltd	Rajamundry	Andhra Pradesh	45000	45000	2.7	121500	43784	0.97
2	Shiv Shankar Papers P Ltd	Rajamundry	Andhra Pradesh	9900	5000	1.99	9950	3586	0.72
3	Sbs Boards P Ltd	Rajamundry	Andhra Pradesh	10000	8863	1.99	17637	6356	0.72
4	Rajamundry Paper Mills P Ltd	Rajamundry	Andhra Pradesh	10800	9000	1.99	17910	6454	0.72
	Total				67863		166997	60179	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Sripathi Paper Mills P Ltd (Duplex Paper Unit I & li)	Sivakasi	Tamil Nadu	82500	69300	2.71	187803	67677	0.98
2	Sripathi Paper & Boards P Ltd. (Kraft Unit)	Sivakasi	Tamil Nadu	33000	33000	2.5	82500	29730	0.90
3	Sri Hari Venkateswara Paper Mills	Sivakasi	Tamil Nadu	36000	24093	2.3	55414	19969	0.83
4	Sripathi Paper Mills P Ltd (Newsprint Unit)	Sivakasi	Tamil Nadu	13200	13200	2.1	27720	9989	0.76
	Total				139593		353437	127365	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Seshasayee Paper & Boards Ltd Unit li	Tirunelveli	Tamil Nadu	60000	66609	2.71	180510	65049	0.98
2	Bluemont Paper & Boards P Ltd (Sister Concern Of Aditiya Ashwin Paper Mill)	Tirunelveli	Tamil Nadu	39600	39600	2.5	99000	35676	0.90
3	Sun Paper Mill Ltd	Tirunelveli	Tamil Nadu	39600	31680	2.5	79200	28541	0.90
4	Subham Papers P Ltd	Tirunelveli	Tamil Nadu	108900	81000	2.71	219510	79103	0.98
5	Subburaj Paper Division	Tirunelveli	Tamil Nadu	105600	84480	2.71	228941	82501	0.98
	Total				303369		807161	290869	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Balaram Paper Pvt Ltd (Sister Concern Of Astron Paper Mill Ltd)	Mehsana	Gujarat	21600	21600	2.3	49680	17903	0.83
2	Palak Shree Foresights Ltd. (Paper Division) (Formerly Git-Vijay Paper Mills (P) Ltd.)	Mehsana	Gujarat	7200	4307	1.99	8571	3089	0.72
3	Shelavi Pulp & Paper Mills (P) Ltd	Mehsana	Gujarat	6600	3000	1.99	5970	2151	0.72
4	Sabarmati Papers Ltd	Mehsana	Gujarat						
5	Majitha Paper Mills (Formerly Tejpal Paper Mills (P) Ltd)	Mehsana	Gujarat	5000	5000	1.99	9950	3586	0.72
6	Tec Papers Mills (Formerly Parth Harsh Mills (P) Ltd)	Mehsana	Gujarat	6600	6600	1.99	13134	4733	0.72
	Total				40507		87305	31461	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Camerich Papwers	Morbi	Gujarat	132000	132000	2.71	357720	128908	0.98
2	Parth Papers Ltd	Morbi	Gujarat	48000	42000	2.7	113400	40865	0.97
3	Magnum Paper Mill Pvt. Ltd.	Morbi	Gujarat	16500	16500	2.1	34650	12486	0.76
4	Sofine Paper Mill Pvt Ltd	Morbi	Gujarat	16500	16500	2.1	34650	12486	0.76
5	Dhanlaxmi Paper Mill Pvt. Ltd.	Morbi	Gujarat	18000	24000	2.3	55200	19892	0.83
6	Anand Paper & Board Mill	Morbi	Gujarat	19800	18810	2.1	39501	14235	0.76
7	Sardar Paper Mills Private Limited	Morbi	Gujarat	19800	19800	2.1	41580	14984	0.76
8	Wilson Paper Mill Private Ltd	Morbi	Gujarat	19800	19800	2.1	41580	14984	0.76

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
9	Rajveer Paper Mill Pvt Ltd	Morbi	Gujarat	21000	17850	2.1	37485	13508	0.76
10	Adhyashakti Paper Private Limited	Morbi	Gujarat	23100	20790	2.3	47817	17231	0.83
11	Fact Paper Mills Pvt Ltd	Morbi	Gujarat	23100	21945	2.3	50474	18189	0.83
12	Panama Paper Mill Pvt. Ltd.	Morbi	Gujarat	26400	25080	2.3	57684	20787	0.83
13	Devkinandan Paper Mill	Morbi	Gujarat	33000	29700	2.3	68310	24616	0.83
14	Radheshyam Paper Mill Pvt. Ltd.	Morbi	Gujarat	34000	34000	2.5	85000	30631	0.90
15	Dhruv Craft Mill Private Limited	Morbi	Gujarat	42900	42900	2.7	115830	41741	0.97
16	Fortune Paper Mill	Morbi	Gujarat	49500	49500	2.7	133650	48162	0.97
17	Soham Papers Pvt Ltd	Morbi	Gujarat	60000	60000	2.71	162600	58595	0.98
18	Millenium Papers Pvt. Ltd (Koradiya Group Of Companies)	Morbi	Gujarat	72000	68400	2.71	185364	66798	0.98
19	Milano Papers Pvt. Ltd	Morbi	Gujarat	72600	72600	2.71	196746	70899	0.98
20	Tirthak Paper Mill Pvt. Ltd. (Tdp)	Morbi	Gujarat	108000	108000	2.71	292680	105470	0.98
	Total				840175		2151921	775467	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Shree Ajit Pulp And Paper Ltd (Formerly Ajit Paper Mills Limited)	Valsad	Gujarat	90000	68400	2.71	185364	66798	0.98
2	Kherani Paper Mills Ltd	Valsad	Gujarat	27600	24156	2.3	55559	20021	0.83

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
3	Nr Agarwal Industries (Unit Duplex Board) (Formerly Suman Paper & Board Limited)	Valsad	Gujarat	18000	16200	2.1	34020	12259	0.76
4	Vapi Paper Mills Ltd	Valsad	Gujarat	19000	15200	2.1	31920	11503	0.76
Total					123956		306863	110581	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Maheshwari Logistics Pvt Ltd (Daman Ganga Recycled Resources Ltd)	Vapi	Gujarat	72000	49938	2.7	134833	48588	0.97
2	Supreme Coated Board Mills Private Ltd	Vapi	Gujarat	49500	39600	2.5	99000	35676	0.90
3	Rvn Paper & Boards Pvt Ltd	Vapi	Gujarat	35000	25000	2.3	57500	20721	0.83
4	Best Quest Industries	Vapi	Gujarat	19800	19800	2.1	41580	14984	0.76
5	K. K. Kadri (Formerly Prince Paper Mill (P) Ltd)	Vapi	Gujarat	18000	1284	1.99	2555	921	0.72
6	Rama Pulp & Papers Ltd.	Vapi	Gujarat	15600	15144	2.1	31802	11460	0.76
7	Revival Papers Mills Pvt Ltd (Remco Group)	Vapi	Gujarat	15600	13440	2.1	28224	10171	0.76
8	Ramji Board & Paper Mill (P) Ltd	Vapi	Gujarat	16500	5736	1.99	11415	4113	0.72
9	Kwality Pulp & Paper Mills	Vapi	Gujarat	18000	15264	2.1	32054	11551	0.76
10	Remco Paper & Board Industries Ltd.	Vapi	Gujarat	18000	1104	1.99	2197	792	0.72

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
11	Daman Ganga Board Mills (P) Ltd. (Daman Ganga Group)	Vapi	Gujarat	19800	18828	2.1	39539	14248	0.76
12	Supreme Kraft Pvt Ltd	Vapi	Gujarat	20400	16776	2.1	35230	12695	0.76
13	Craft Corner Paper Mills Ltd	Vapi	Gujarat	21600	17400	2.1	36540	13168	0.76
14	Vaibhav Paper Boards (P) Ltd	Vapi	Gujarat	22000	19944	2.1	41882	15093	0.76
15	Super Deluxe Paper Mills (P) Ltd	Vapi	Gujarat	26400	23700	2.3	54510	19643	0.83
16	N.r.agarwal Industries Ltd (Unit li Writing & Printing)	Vapi	Gujarat	36000	32760	2.5	81900	29514	0.90
17	N.r.agarwal Industries Ltd (Unit lii Duplex Board)	Vapi	Gujarat	36000	34920	2.5	87300	31459	0.90
18	N.r.agarwal Industries Ltd (Unit Iv Duplex Board)	Vapi	Gujarat	36000	34920	2.5	87300	31459	0.90
19	Saiyed Paper Mills Ltd	Vapi	Gujarat	36000	16968	2.1	35633	12841	0.76
20	Shree Gajanan Paper & Boards (P) Ltd	Vapi	Gujarat	36000	30324	2.5	75810	27319	0.90
21	R A Shaikh Paper Mills Pvt. Ltd.	Vapi	Gujarat	42000	24996	2.3	57491	20717	0.83
22	Devang Paper Mills Pvt Ltd	Vapi	Gujarat	43200	34524	2.5	86310	31103	0.90
23	Shah Paper Mills Ltd (Unit lii)	Vapi	Gujarat	45000	37548	2.5	93870	33827	0.90
24	Aryan Paper Mills Ltd	Vapi	Gujarat	46200	42192	2.7	113918	41052	0.97
25	Dmb Paper Pvt Ltd (Formerly Delux Kraft Board (P) Ltd)	Vapi	Gujarat	54000	11160	2.1	23436	8445	0.76
26	Shah Pulp & Paper Mills Ltd	Vapi	Gujarat	56000	34668	2.5	86670	31232	0.90
27	Best Paper Mills (P) Ltd (Unit 1)	Vapi	Gujarat	60000	52536	2.71	142373	51305	0.98

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
28	N.r.agarwal Industries Ltd (Unit I Duplex Board)	Vapi	Gujarat	93600	90792	2.71	246046	88665	0.98
29	West Rock (Formerly Known As Mvv Limited Unit li- Aquired Ruby Macons Ltd December 2012))	Vapi	Gujarat	102000	91800	2.71	248778	89650	0.98
30	Best Paper Mills (P) Ltd (Unit- 2)	Vapi	Gujarat	108000	64896	2.71	175868	63376	0.98
31	Shah Paper Mills Ltd. (Unit 1 & li)	Vapi	Gujarat	117000	72288	2.71	195900	70595	0.98
32	Bhagwati Paper Mills	Vapi	Gujarat	5004	5004	1.99	9958	3588	0.72
33	Apna Paper Mills (P) Ltd	Vapi	Gujarat	4950	4197	1.99	8352	3010	0.72
34	Shri Gopal Krishna Paper Mill Pvt. Ltd.	Vapi	Gujarat	21600	20520	2.1	43092	15529	0.76
	Total				1019971		2548866	918510	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Jai Bharat Paper Board Mills	Amritsar	Punjab	1650	1600	1.99	3184	1147	0.72
2	Dhingra Papers Mills	Amritsar	Punjab	3960	3960	1.99	7880	2840	0.72
3	Khanna Paper Mills Ltd	Amritsar	Punjab	330000	355700	10.36	3685052	1327947	3.73
4	Kpm (Formerly R C Paper Mills Ltd)	Amritsar	Punjab	29700	23760	2.3	54648	19693	0.83
5	Shree Bhamha Paper Mills Pvt. Ltd.	Amritsar	Punjab	3300	2640	1.99	5254	1893	0.72
	Total				387660		3756018	1353520	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Shreyans Industries Ltd	Ludhiana	Punjab	67000	49169	10.36	509391	183564	3.73
2	S.n. Paper Mills (P) Ltd	Ludhiana	Punjab	33000	33000	2.5	82500	29730	0.90
3	Bharat Papers Ltd	Ludhiana	Punjab	72600	58080	2.71	157397	56720	0.98
4	Satkar Paper Mills (P) Ltd	Ludhiana	Punjab	24750	24750	2.3	56925	20514	0.83
5	Harisar Papers Ltd	Ludhiana	Punjab	6600	5280	1.99	10507	3786	0.72
6	Surindera Paper Mills Pvt. Ltd. (Formerly Zenith Duplex Board P Ltd)	Ludhiana	Punjab	16500	13200	2.1	27720	9989	0.76
7	Ast Paper Mills Ltd	Ludhiana	Punjab	16500	13200	2.1	27720	9989	0.76
8	Gm Paper Mill (P) Ltd	Ludhiana	Punjab	13200	10560	2.1	22176	7991	0.76
9	Hemkunt Paper Mills Ltd (Unit I & li)	Ludhiana	Punjab	13200	10560	2.1	22176	7991	0.76
10	Shree Ganesh Agroils (Paper Division)	Ludhiana	Punjab	9900	7920	1.99	15761	5680	0.72
11	Saber Group (Hambran) (Formerly Durga Paper Mills Ltd)	Ludiana	Punjab	32000	25600	2.3	58880	21218	0.83
Total					251319		991153	357172	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Pragati Paper Industries Ltd (Handesra Unit)	Patiala	Punjab	75000	60000	2.71	162600	58595	0.98
2	Vishal Coaters Ltd. (Vishal Industries Limited)	Patiala	Punjab	68000	54400	2.71	147424	53126	0.98
3	Nachiketa Papers Ltd	Patiala	Punjab	42900	42900	2.7	115830	41741	0.97
4	Dsg Paper Pvt Ltd	Patiala	Punjab	41250	24358	2.3	56024	20189	0.83
5	Sona Paper & Boards Ltd	Patiala	Punjab	4950	3960	1.99	7880	2840	0.72

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
6	Gurpreet Paper Mills Pvt. Ltd.	Patiala	Punjab	3300	2640	1.99	5254	1893	0.72
7	Ap Paper Mills Ltd	Patiala	Punjab	26400	21120	2.3	48576	17505	0.83
	Total				209378		543588	195888	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Paswara Papers Ltd (Unit I & II)	Meerut	Uttar Pradesh	165000	165000	2.71	447150	161135	0.98
2	Janki Newsprint Ltd (Formerly Sumit Agro Products Ltd)	Meerut	Uttar Pradesh	115500	72600	2.71	196746	70899	0.98
3	Star Kraft Papers Limited ((Formerly Dev Star Papers Pvt Ltd))	Meerut	Uttar Pradesh	19800	19800	2.1	41580	14984	0.76
4	Dev Priya Papers (P) Ltd-Mawana Road	Meerut	Uttar Pradesh	60000	49019	2.7	132351	47694	0.97
5	Dev Priya Industries Ltd. - Mawana Road	Meerut	Uttar Pradesh	200000	134904	2.71	365590	131744	0.98
6	Dev Priya Product Ltd	Meerut	Uttar Pradesh	150000	136775	2.71	370660	133571	0.98
7	Shree Venketesh Paper Mills Ltd (Anand Tissues Ltd)	Meerut	Uttar Pradesh	45000	36000	2.5	90000	32432	0.90
8	Anand Duplex Limited- Mawana Road Unit I & II	Meerut	Uttar Pradesh	99000	47850	2.7	129195	46557	0.97
9	Anand Triplex Board Limited- Mawana Road- Newsprint	Meerut	Uttar Pradesh	49500	39600	2.5	99000	35676	0.90
10	Dev Priya Fibres Ltd (P) Ltd- Bagpath Road	Meerut	Uttar Pradesh	39600	19800	2.1	41580	14984	0.76

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
11	Sangal Papers Ltd-Mawana Road	Meerut	Uttar Pradesh	36000	36000	2.5	90000	32432	0.90
12	New Bonanza India Ltd	Meerut	Uttar Pradesh	19800	15840	2.1	33264	11987	0.76
13	Modinagar Paper Mills Ltd	Modinagar	Uttar Pradesh	33000	26400	2.3	60720	21881	0.83
	Total				799588		2097836	755977	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Genus Paper Products Ltd (Formerly Kailash Paper Products)	Moradabad	Uttar Pradesh	66000	62700	2.71	169917	61231	0.98
2	Shri Ramchander Straw Products Ltd	Moradabad	Uttar Pradesh	16500	13200	2.1	27720	9989	0.76
	Total				75900		197637	71221	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Silverton Pulp & Papers Pvt Ltd	Muzaffar Nagar	Uttar Pradesh	182000	172000	10.36	1781920	642133	3.73
2	Bindals Papers Mills Limited	Muzaffar Nagar	Uttar Pradesh	109500	99000	10.36	1025640	369600	3.73
3	Maruti Paper Mills (P) Ltd	Muzaffar Nagar	Uttar Pradesh	100000	85000	2.71	230350	83009	0.98
4	N.s. Papers Ltd (Rana Papers Ltd) Unit li	Muzaffar Nagar	Uttar Pradesh	79250	66000	2.71	178860	64454	0.98
5	Tehri Pulp & Paper Ltd-Unit I	Muzaffar Nagar	Uttar Pradesh	75900	75900	2.71	205689	74122	0.98
6	Garg Duplex & Paper Mills (P) Ltd	Muzaffar Nagar	Uttar Pradesh	73000	66000	2.71	178860	64454	0.98

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
7	Siddheshwari Industries (P) Ltd (Sister Concern Of Sidharth Paper Kashipur)	Muzaffar Nagar	Uttar Pradesh	73000	52800	2.71	143088	51563	0.98
8	Silvertoan Papers Ltd. (Formerly Silverton Paper)	Muzaffar Nagar	Uttar Pradesh	66000	66000	2.71	178860	64454	0.98
9	Disha Paper Mills Ltd	Muzaffar Nagar	Uttar Pradesh	59400	59400	2.71	160974	58009	0.98
10	Shree Sidhali Papers Ltd (Formerly Adarsh Paper Fabric Ltd,)	Muzaffar Nagar	Uttar Pradesh	59400	59400	2.71	160974	58009	0.98
11	Tehri Pulp & Paper Ltd-Unit li	Muzaffar Nagar	Uttar Pradesh	59400	59400	2.71	160974	58009	0.98
12	Agarwal Duplex Board Mills Ltd	Muzaffar Nagar	Uttar Pradesh	52800	52800	2.71	143088	51563	0.98
13	Bindlas Duplex Ltd Unit I	Muzaffar Nagar	Uttar Pradesh	49500	49500	2.7	133650	48162	0.97
14	Suyash Kraft & Papers Ltd (Vehalana)	Muzaffar Nagar	Uttar Pradesh	42900	42900	2.7	115830	41741	0.97
15	Bindlas Duplex Ltd Unit li	Muzaffar Nagar	Uttar Pradesh	39600	39600	2.5	99000	35676	0.90
16	Mahalaxmi Crafts & Tissues (P) Ltd	Muzaffar Nagar	Uttar Pradesh	36500	33000	2.5	82500	29730	0.90
17	Parijat Paper Mills Ltd	Muzaffar Nagar	Uttar Pradesh	36300	36300	2.5	90750	32703	0.90
18	Bhageshwari Papers (P) Ltd-Unit li	Muzaffar Nagar	Uttar Pradesh	33000	33000	2.5	82500	29730	0.90
19	Meenu Paper Mills (P) Ltd	Muzaffar Nagar	Uttar Pradesh	33000	33000	2.5	82500	29730	0.90
20	N.s. Papers Ltd (Rana Papers Ltd) Unit I	Muzaffar Nagar	Uttar Pradesh	26400	26400	2.3	60720	21881	0.83
21	Shakti Krafts & Tissues (Formerly Kirti Paper Pvt Ltd)	Muzaffar Nagar	Uttar Pradesh	26400	26400	2.3	60720	21881	0.83
22	Dls Paper Ltd	Muzaffar Nagar	Uttar Pradesh	26400	26400	2.3	60720	21881	0.83

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
23	Shakumbhri Pulp And Paper Mills Ltd,	Muzaffar Nagar	Uttar Pradesh	23100	23100	2.3	53130	19146	0.83
24	Aristo Crafts & Papers Pvt. Ltd	Muzaffar Nagar	Uttar Pradesh	23100	23100	2.3	53130	19146	0.83
25	K.k. Duplex (P) Ltd	Muzaffar Nagar	Uttar Pradesh	19800	15840	2.1	33264	11987	0.76
26	Bhageshwari Papers (P) Ltd Unit I	Muzaffar Nagar	Uttar Pradesh	16500	16500	2.1	34650	12486	0.76
27	Tirupati Balaji Fibres Ltd (Formerly Balaji Cellulose Products Ltd)	Muzaffar Nagar	Uttar Pradesh	16500	16500	2.1	34650	12486	0.76
28	N.s. Papers Ltd (Rana Papers Ltd) Unit Iii	Muzaffar Nagar	Uttar Pradesh	14850	14850	2.1	31185	11238	0.76
29	Galaxy Papers Pvt Ltd	Muzaffar Nagar	Uttar Pradesh	9900	6000	1.99	11940	4303	0.72
30	Orient Board & Paper Mills Pvt Ltd	Muzaffar Nagar	Uttar Pradesh	4950	3960	1.99	7880	2840	0.72
	Total				1380050		5677996	2046125	

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
1	Sidharth Papers Ltd (Unit Ii)	Kashipur	Uttrakhand	123750	99244	2.71	268952	96920	0.98
2	Katyayini Paper Mills (P) Limited	Kashipur	Uttrakhand	79800	52875	2.71	143291	51636	0.98
3	Sahota Papers Limited	Kashipur	Uttrakhand	74250	54272	2.71	147078	53001	0.98
4	Siddheshwari Papers Udyog Limited (Sister Concern Of Sidharth Paper)	Kashipur	Uttrakhand	66000	30711	2.5	76777	27667	0.90
5	Naini Tissues Ltd	Kashipur	Uttrakhand	56100	49521	2.7	133707	48183	0.97

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
6	Vishwanath Paper & Boards Limited	Kashipur	Uttrakhand	55000	39838	2.5	99594	35890	0.90
7	Naini Papers Ltd	Kashipur	Uttrakhand	52800	45400	2.5	113500	40901	0.90
8	Vishvakarma Paper & Boards Ltd	Kashipur	Uttrakhand	51150	13729	2.1	28831	10390	0.76
9	Fibremax Papers Limited	Kashipur	Uttrakhand	46200	38808	2.5	97020	34962	0.90
10	Prakash Straw Board Mills (P) Ltd (Psb)	Kashipur	Uttrakhand	39600	34497	2.5	86243	31078	0.90
11	Sidharth Papers Ltd Unit I	Kashipur	Uttrakhand	36300	34508	2.5	86271	31089	0.90
12	Prolific Paper (P) Limited	Kashipur	Uttrakhand	36300	45151	2.7	121907	43930	0.97
13	Goraya Straw Board Mills (P) Ltd	Kashipur	Uttrakhand	24750	18781	2.1	39440	14213	0.76
14	Banwari Paper Mills Ltd	Kashipur	Uttrakhand	19800	11540	2.1	24233	8733	0.76
15	Dev Rishi Papers Pvt Ltd	Kashipur	Uttrakhand	19525	19525	2.1	41003	14776	0.76
16	Rajlakshmi Paper & Board Limited	Kashipur	Uttrakhand	16500	16783	2.1	35243	12700	0.76
17	Bahl Paper Mills Limited	Kashipur	Uttrakhand	75000	70816	2.71	191910	69157	0.98
18	Shree Shyam Pulp & Board Mills Ltd (Unit I)	Kashipur	Uttrakhand	49500	44550	2.7	120285	43346	0.97
19	Cheema Papers Ltd	Kashipur	Uttrakhand	52700	46586	2.7	125783	45327	0.97
20	Shree Shyam Pulp & Board Mills Ltd (Unit II) Waste Paper	Kashipur	Uttrakhand	26400	21780	2.3	50094	18052	0.83
21	B.r. Papers Pvt Ltd	Kashipur	Uttrakhand	19800	19800	2.1	41580	14984	0.76
22	Multiwal Pulp & Board Mills (P) Ltd	Kashipur	Uttrakhand	66000	46200	2.7	124740	44951	0.97
23	Satnam Paper Mills (P) Ltd	Kashipur	Uttrakhand	6600	5280	1.99	10507	3786	0.72

S. No.	Name Of The Mill	District	State	Installed Capacity	Production	Average Mkal/ Ton Of Paper	Total Energy Consumption In Mkal	Coal Equivalent Consumption In Tons	Average Equivalent Coal Consumption Per Ton Of Paper
24	P.n. Papers (P) Ltd	Kashipur	Uttrakhand	9900	7920	1.99	15761	5680	0.72
25	Khatema Fibers Ltd	Kashipur	Uttrakhand	66000	30000	2.5	75000	27027	0.90
26	Multiwal Duplex Pvt Ltd	Kashipur	Uttrakhand	33000	9900	1.99	19701	7099	0.72
27	Uday Paper Mills	Kashipur	Uttrakhand	16500	14025	2.1	29453	10614	0.76
	Total				922039		2347904	846091	



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