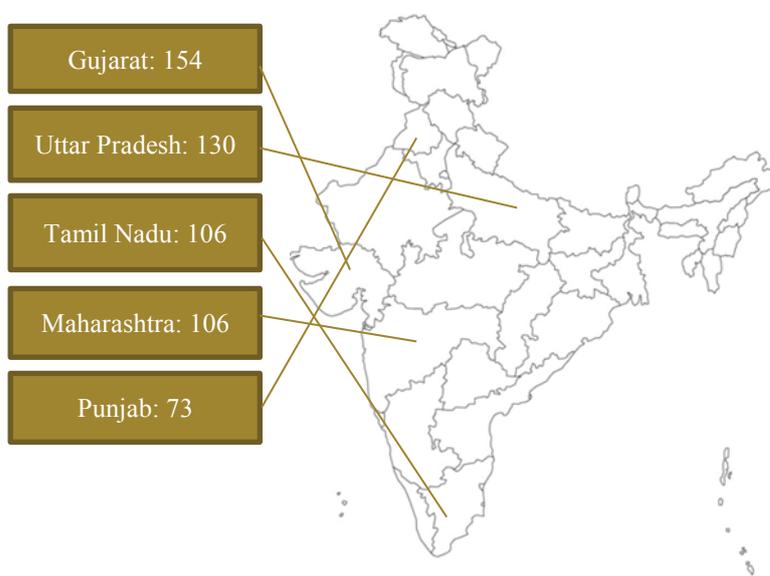


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India has a long established Pulp & Paper sector, with its first commercial mill starting operations in the late 1800s. Production in 2015 was recorded at 14.9 Million Metric Tons (Mt) of finished product. India makes up approximately 3.7 percent of global production and is considered an important part of the Indian economy.¹ Revenue is expected to reach USD 11.8 billion (SEK 101.7 billion).

Figure 1 Large coverage of mills across five states



The industry is broad and fragmented with the over 800 mills scattered across the country. India's mills are a mix of world class larger integrated mills, medium sized mills and smaller production units. Over half the country's mills are in the states of Maharashtra, Gujarat, Uttar Pradesh, and Tamil Nadu (figure 1). This is largely due to historical reasons of proximity to raw materials. However, India can be considered a challenging business environment and the attractiveness of certain states as being slightly easier to do business in will doubtless be factored in when making investment decisions.

Notwithstanding recent dips in growth, the Indian economy is vibrant with ongoing year on year GDP growth in the vicinity of 7 percent. Paper production growth generally tracks GDP growth, and India's paper and pulp market has been experiencing year on year growth between 7-8 percent for the past five years, and is expected to continue at a similar rate.

¹ Industry statistics through this briefing paper rely heavily on the Central Pulp & Paper Research Institute Census. There are areas where the CPPI and other publications have varying numbers, and should be used conservatively.

Some of the demand drivers identified for the sector include:

- Growth in the education sector: India has a young population entering all levels of education. For example, in 2010 the Government enacted the Right to Education, ensuring there would be moves to ensure access to education for all children aged 6-14.
- Increased corporate activity: India’s growth story is well known. Although there is increasing digitization of records, physical documentation demands are still high.
- Growth in press publications: India is the second largest market for press publications with a readership base of over 250 million.² This figure is expected to continue to grow.
- Growing affluence and changes in lifestyle: Changes in lifestyle as well as the emergence of activities such as of online shopping is helping drive up packaging requirements. Although more convenient, the trade-off for online shopping is increased packaging requirements to protect goods in transit.

1.1 Industry Snapshot

As with many industries in India, leading larger players are increasing investments in productivity and efficiency. This is in part due to a desire to increase competitiveness, as well as an increased regulatory burden being placed on the sector – particularly to increase energy efficiency and environmental performance (water usage and effluent management).

The Government of India (GoI) has continued to liberalise India’s economy since initial reforms started in 1991. Most recently India has been promoting a ‘Make in India’ campaign which seeks to stimulate domestic manufacturing. Although there is not a particular focus on Pulp & Paper as a sector in the policy, there is an overarching desire to see in-country manufacturing as part of any successful technology partnership.

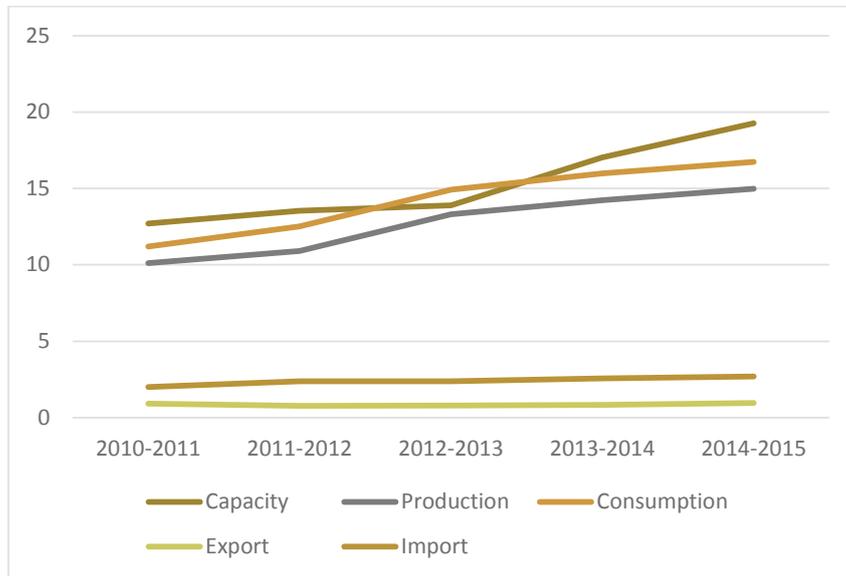
Table 1 Industry (2014-2015)

Number of Mills	813
Total Installed Capacity	22.15 Mt
Per Capita Consumption	13.2 kg
Direct Employment	500 000
Indirect Employment	1 500 000
India's Share of World Production	3.7 percent

Source: Central Pulp and Paper Research Institute (CPPI), Census Compendium 2015

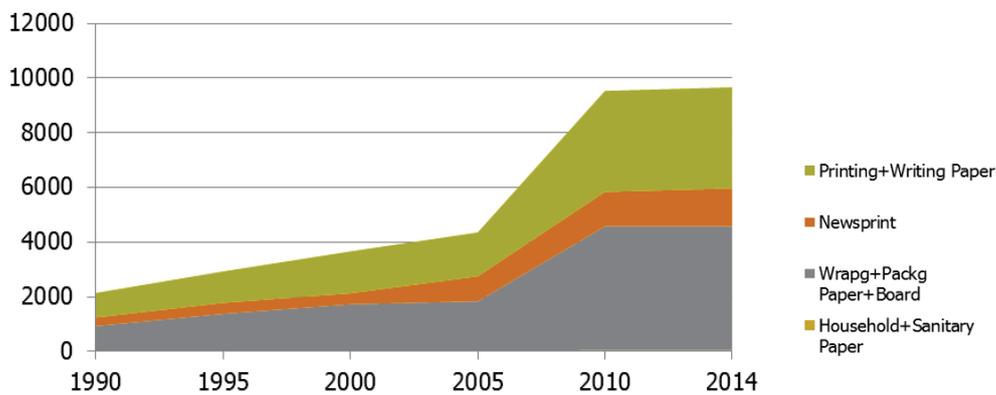
² Turning the page on India’s paper industry. A new chapter in investment potential and growth, April 2012, Deloitte

Figure 2 Industry growth (Mt)



Source: CPPI Census compendium 2015

Figure 3 Production trends



In recent years GoI has also eased routes for Foreign Direct Investment (FDI) across a number of sectors. 100 percent FDI has been allowed in the Pulp & Paper sector since 2011, though this is yet to translate to a large influx of capital. But one often cited example of international interest in India's market for Paper is the 2011 purchase of a 75 percent stake by International Paper in the South India based Andhra Paper Mills, for USD 388 Million (3.325 billion SEK). One other recent announcement notes Vital Paper Products, a part of Singapore based Vital Solutions, is setting set up a packaging product unit in the special economic zone (SEZ) of Sri City, Andhra Pradesh. The USD 8.95 million (76.7 Million SEK) investment that will be operational from April 2017.

1.2 Shaping the industry: sector stakeholders

Given the size of the industry, there are multiple stakeholders representing the sector (table 2). Pulp & Paper as a matter sits with the Department of Industrial Policy and Promotion, which in turn is a part of the Ministry of Commerce and Industry.

Table 2 Key organisations

Organisation	Role
Department of Industrial Policy & Promotion	The Department in charge of policy making for the sector. Sits under the Ministry for Commerce and Industry.
Central Pollution and Control Board	The Governing body for pollution control. Has been active in driving improvements in effluent treatment and water discharge.
Bureau of Energy Efficiency	A body under the Ministry of Power. It is responsible for administration of the Perform, Achieve, Trade scheme to enhance energy efficiency for larger industrial entities.
Central Pulp and Paper Research Institute	A Government funded research institute. Has led efforts to create a census of Pulp & Paper companies and also to provide a comprehensive detailing of technical processes among India's mills.
Industry Associations: Indian Paper Manufacturers Association; Indian Agro & Recycled Paper Mills Association; Indian Pulp & Paper Technical Association	Companies within the sector are supported by Industry Associations. Larger players are a part of the Indian Paper Manufacturers Association. The Indian Pulp & Paper Technical Association has broader membership base and provides technical training base for the sector.

1.3 Value Chain

The Paper industry in India employs the same general steps as other entities worldwide:

- Raw Material Preparation
- Pulping, Washing of Pulp and Chemical Recovery Operations
- Bleaching of Pulp
- Stock Preparation and Paper Making
- Finishing

Since the 1970s when wood based raw material made up over 75 percent of raw material used for paper production, the sector has moved towards the use of agro residue products and waste paper as raw material and wood now makes up only 26 percent of raw materials used (table 3). Although there is ongoing growth in demand for finished paper products it is noted that there are substantial challenges ensuring adequate supply of raw materials (which plays a part in capacity utilization running at around 80 percent). Wood is primarily used for the production of writing grade paper, whereas agro based residue and waste paper is more often used in the production of packaging grade paper (table 4).

1.3.1 Raw Materials Challenges

Wood: Use of wood as a raw material has fallen considerable in the past 20-30 years. In India this in part has been due to reduced access to pulpable wood supplies, especially from state owned forests and further constraints due to national forestry management policy (in particular the National Forest Policy Act). The sector has struggled with land use reform and the inability to develop plantation forests for the purposes of paper production. There is over 28 million Hectares (ha) degraded forest land in the country – though there is difficulty in developing this as current policy precludes industry from directly leasing this for plantation forestry purposes. Industry associations continue to engage with government on this matter.³ The Central Pulp & Paper Institute estimates that even taking into account growth of other raw materials, there is a need to plan for production of 21.1 million tons of pulp wood to meet industry demand in 2025 – up from the current 8.7 million. Current suggested solutions include policy reform to allow more flexible land use, and collaboration on more effective wood species for pulping. For example, in 2015 a delegation from India visited Sweden to learn about paper technologies in use, including quick maturity wood species for pulping purposes.

Agro Residue: India has a large sugar cane production base, with about 45 percent of crops being sent to sugar mills. The residue from this process is known as bagasse. Around 80 percent of bagasse generated is used as fuel with the sugar mills themselves. In addition, India is also one of the world's largest wheat producers, meaning that there is also a related amount of wheat straw produced.

Bagasse and wheat straw are the main agro residue raw materials used for the production of paper but there is also use of rice straw and Jute/Kenaf. In recent years there has been a shift from agro residue to recycled fibres due to increased pressure on the supply chain. Nonetheless it is estimated that nearly 2.4 million tons of paper will be produced from agro residue by 2025. To do this the agro residue based mills will need to overcome challenges that include: increased co-gen plants diverting agro residue (bagasse) for energy use, and low efficiency boilers in sugar mills meaning more raw material is used to generate electricity than would be required under more efficient settings. There is a similar situation with wheat straw where inefficient mechanical harvesting methods mean that up to 25 percent of the straw usable for pulping is left in the ground and often burnt to clear way for new crops. Manual harvesting is far more efficient.

³ GoI has announced the Compensatory Afforestation Fund Bill, 2015 which aims to increase forest cover from a current 21.34 percent to 33 percent and also help achieve its Nationally Determined Contribution. Currently there is not any guidance on whether this will enable enhanced use of plantation forestry for paper purposes.

Waste paper: The largest source of raw material, waste paper is sourced domestically as well as, to a large extent, imported. The use of waste paper is process heavy due to a number of cleaning stages involved and a number of smaller mills lack appropriate technology to deal with issues with poor quality waste paper to efficiently create clean stock.

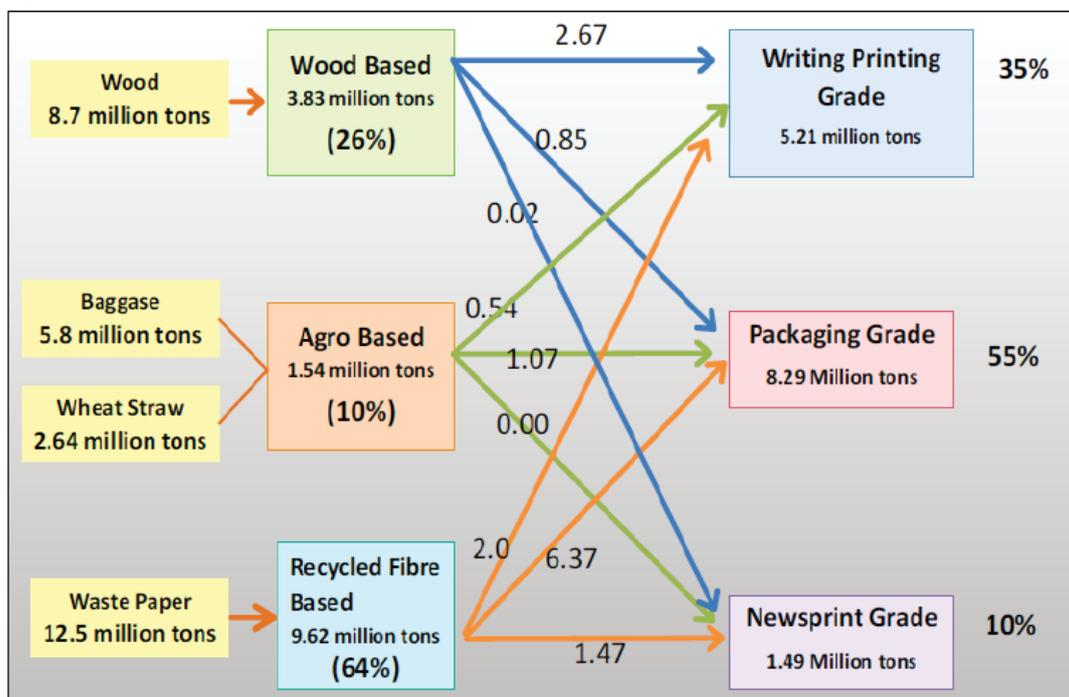
Waste paper is used primarily for the production of newsprint, duplex board, and kraft paper. Currently the supply of domestic wastepaper is limited due to ineffective collection methods, lack of an organised secondary market and multiple uses for waster paper (eg. Packaging).

Table 3 Structure of paper industry 2015

Material & Scale	# of Mills	Production Mt	Share
Wood Based (Large Integrated, 100 – 800 tons per day)	31	3.83	26
Agro Based (Medium Scale, 50 – 100 tons per day)	135	1.54	10
Recycled Fibre Based (Medium & Small Scale, 5 – 50 tons per day)	647	9.62	64
Total	813	14.99	100

Source: CPPI Census Compendium 2015.

Figure 4 Product flows



Source: CPPI Census Compendium, 2015.

1.3.2 Technology, Energy Intensity/Consumption

Pulp & Paper ranks sixth among energy intensive sectors in the country. The energy and environmentally intensive nature of the industry is well understood and being actively addressed by policy makers and businesses. The following table and discussion looks at the energy usage across the different types of manufacturing processes and discusses what is being done to enhance efficiency. Raw Material scarcity and competitiveness are driving efficiency gains, which opens up opportunities for process and business model innovation. But at the time being the real focus is on, where possible, bringing an industry that has historically suffered from inefficiency across the manufacturing process up to speed. Currently on average the energy consumption of the domestic industry is 20-30 percent higher than average global consumption levels (table 4).

Larger integrated wood mills are higher on technological efficiency (as are larger Agro residue based mills). Many of these larger mills have the resources to implement world class technologies and practices.

The Perform, Achieve, Trade Scheme acts as a driver for efficiency improvements among larger designated consumers. The scheme is a market based regulatory mechanism intended to encourage efficiency improvements in large industrial entities. It identifies 'Designated Consumers' amongst these industries. Within the Pulp & Paper sector there are 31 such designated consumers. Established in 2010, the PAT is now entering its 3rd cycle of activity. The scheme provides an incentive to larger players to make investments in efficiency improvements, who can trade excess energy efficiency certificates. This is particularly useful in the Pulp & Paper where there is substantive low hanging fruit. For smaller entities it's still a challenge to finance improvements.

Table 4 Consumption benchmarks

Type of Mill and Input Particulars		Consumption Level		
Industry Segment/Type of Mill	Particulars of Inputs	Global	Indian	Industry Benchmark
Wood Based Mill	Raw Material, t paper	1.8-2.0	2.0-2.1	Upto 2.0
	Power, kWh/t paper	1000-1200	1225-1500	1200
	Steam, t/t paper	7-12	12.5-16.5	9
	Water M ³ /t paper	below 50	Up to 100	75
Agro Based Mills	Raw Material, t paper	NA	2.6 - 2.8	2.3
	Power, kWh/t paper	NA	1200 - 1400	1100
	Steam, t/t paper	NA	12 -14 (CR) 8-10 (NCR)	10 (CR) 7 (NCR)
	Water M ³ /t paper	NA	Up to 120	Upto 100
RCF based mills (unbleached grades)	Raw Material, t paper	1.1	1.1 - 1.2	Upto 1.1
	Power, kWh/t paper	500	450 – 550	400
	Steam, t/t paper	2.5	4-5	3.5
	Water M ³ /t paper	5.0 - 7.5	Upto 30	Upto 20
RCF based mills (bleached)	Raw Material, t paper	1.2 -1.25	1.2 - 1.4	Upto 1.3

grades				
	Power, kWh/t paper	600 - 650	680 - 800	570 - 700
	Steam, t/t paper	4.0 - 4.5	6.0 - 7.0	5.0 - 6.0
	Water M ³ /t paper	10 - 15	Upto 50	Upto 35

Source: CPPI Census Compendium, 2015

Note 1: Industry benchmarks are sourced from CPPI publication

Note 2: CR: Chemical Recovery; NCR: Non-Chemical Recovery

1.4 Challenges for the industry

Cost of business: In addition to the raw material challenges noted in the previous section, raw materials costs are also considered high in comparison to overseas mills. For example, a mill producing Writing Paper can expect raw materials to comprise about 57 percent of the cost of manufacturing, whereas for a European mill it is around 40 percent (figure 5).⁴

Figure 5 Comparative cost breakdowns



Source CPPI

Low Utilisation and Obsolete Technology: small mills are currently finding it difficult to deal with high costs of inputs and complexity associated with scaling operations. These small mills struggle to mobilise funds to improve technology. This becomes a self-fulfilling cycle in an environment where there is increasing regulatory burden being placed on companies to ensure that they are playing a role in ensuring effective effluent treatment and water usage. Although the intention of the regulations is to ensure that the burden placed is commensurate with the size of operations the ability of the smaller mills to take a proactive role is limited. In the case of large mills there is a greater financial base and staff resources to call upon, and realistically there are opportunities to make greater efficiency gains and recoup costs.

Although not endemic to Pulp & Paper, the cost of capital in India is high, making investments expensive. However, this does relate to India’s Pulp & Paper sector being able to be internationally competitive by making ongoing investments in technology.

⁴ There are limitations to looking at the cost breakdown in this manner, and the chart is only intended for illustrative purposes. A comprehensive dollar-to-dollar comparison may be better.

Environmental Concerns

Environmental concerns loom large over the sector. Some specific issues identified by the CPPI include:⁵

- High Effluent and Colour loads
- Environmental management in small mills, especially black liquor management (especially in agro based mills)
- Solid Waste Management

Key metrics show that the India Pulp & Paper sector does lag in several areas related to environment. In particular there are challenges associated with the effluent management from the mills, energy usage, and water usage.

Lack of Skilled Manpower It has been noted that the Indian Pulp & Paper industry suffers a shortage of skilled individuals to take up key positions. There are a number of initiatives being undertaken to increase the number of youth in vocational and technical training programs. CPPI will play a part in developing training programs for the sector, which will be bolstered by inputs from associations and their stakeholders.

2 Building for the future

2.1 Policies for promotion

India has a complex Customs and Excise structure, which is further complicated by additional taxes at State level. There have been some efforts recently to reduce the customs duties associated with the import of certain inputs. In the most recent Union Budget (2016 – 17) there was:

- Basic Customs duty on wood in chips or particles for manufacture of paper, paperboard and news print is being reduced from 5 percent to Nil
- Basic Customs duty on Pulp of wood [4701-4706] for manufacture of goods falling under heading 9619 (sanitary products) is being reduced from 5 to 2.5 percent

As noted, raw material scarcity is a barrier to growth of the industry. The high-cost of raw materials has been recognised a challenge and Associations such as the Indian Paper Manufacturers Association (IPMA) continue to advocate for the reduction of Duties against some key raw materials – particularly wood where shortages in India have been driving up prices.

The industry, as noted by IPMA, has also come under pressure from imports from large producing nations such as Vietnam and Indonesia, who are able to easily access the Indian market to sell excess inventory due to an existing ASEAN-India FTA. Again, the IPMA and other industry bodies have advocated that there be a

⁵ Jain, RK et al, 2015, Central Pulp & Paper Research Institute, Census Survey of Indian Paper Industry

level playing field for players with retention of Basic Customs Duties. India is also on the cusp of major tax reform with the proposed implementation of a Goods and Services Tax (GST) having passed through the upper house of parliament.⁶ Final decisions on the GST levels and exact flow through are yet to be determined, but stakeholders appear cautiously optimistic that the move is positive for the sector.⁷

2.1.1 Energy & Environment

India has increasingly focused on the potential environmental impacts of its growth, and in particular it has sought to understand ways in which the energy impact of its industries can be reduced and increasingly it is looking to protect and manage its water resources. A number of these activities are guided by the Government's flagship Climate Change effort – The National Action Plan on Climate Change (NAPCC). The NAPCC was initiated in 2008 with eight 'Missions' covering areas such as Solar Energy, Water, and the Himalayan Ecosystem. The NAPCC has since been extended to include four more Missions which covers Wind Energy, Human Health, Coastal Resources and Waste to Energy.

Specifically, for the Pulp & Paper, the desire to protect and clean up the areas surrounding the Ganga River, known as the Ganga Basin, has a practical impact on operations. This has resulted in strict control measures being implemented for industries around the Ganga Basin.⁸ This has included several Pulp & Paper Mills. Industry Associations have been working with the Central Pollution Control Board to support technology upgrades to better manage wastewater discharge. This activity is a part of the CPCB's 'Charter for Water Recycling and Pollution Prevention in Pulp & Paper Industries'.

2.2 Technology, research and collaboration

As noted in prior sections, there is significant scope for technology and process efficiency gains within the sector with a focus on technology and process efficiency. The desire for change is being driven by a mix of competitive and regulatory pressures.

Focus areas for modernization within the sector include:

- Acquisition of proven technologies (domestic and foreign)
- Acquisition/license of patent rights
- Contractual R&D activities

Sector associations such as the IPMA and other broader industry associations such as the Confederation of Indian Industries (CII) act as facilitators for enhanced knowledge within the sector. The IPMA has worked to facilitate knowledge sharing trips, including to Sweden. As noted in an article reporting on the trip state that there are potential avenues

⁶ "Indiens största ekonomiska reform sedan 1991 – GST antaget av parlamentet", Growth Analysis 2016, Available at: <http://www.tillvaxtanalys.se/aktuellt/global-utblick/global-utblick/2016-09-26-indiens-storsta-ekonomiska-reform-sedan-1991--gst-antaget-av-parlamentet.html>

⁷ Indian Pulp and Paper industry delegation visits Sweden, 20 October 2015, <http://www.printweek.in/news/indian-pulp-paper-industry-delegation-visits-sweden-11693>

⁸ Previous governments have attempted to achieve better management of the Ganga River, including the launch of the Ganga River Action Plan in 1986. Efforts to protect the Ganga River Basin have gained fresh focus under the current government.

for collaboration in development of new plant; rebuilding (refurbishing) paper machines; energy efficiency; collaborative R&D; plantation of short maturity pulpable wood; and improved recovery, sorting and use of waste paper.⁹

As routes for Foreign Direct Investment open up and GoI continues its efforts to increase the ‘ease of doing business’ there are opportunities for international companies to position themselves for growth within the Indian market. It is important to note that these efforts to increase ease of doing business are also in parallel with a greater focus on increasing opportunities to ‘Make in India’ as part its National Manufacturing Policy.

The National Manufacturing Policy (NMP) has an aim to push manufacturing’s contribution to GDP from the present 16 percent to 25 percent by 2022. In doing so, the policy intends to create an additional 100 million jobs and support required skills development programmes. Other key objectives of the policy include:¹⁰

- Creation of National Investment and Manufacturing Zones (NIMZs)
- Development of Small and Medium Enterprises (SMEs)
- Implementation of industrial training and other skill upgradation measures
- Promotion of Green Manufacturing
- Rationalisation and simplification of business regulations

In addition to commercial partnerships, there are opportunities to leverage institutions in India that focus on Pulp & Paper research. Two institutes stand out as having potential opportunities for collaboration:

- Central Pulp & Paper Research Institute: Located in Saharanpur in the North Indian State of Uttar Pradesh, CPPI has been in operation since 1980. The institute focuses on technology research & development, and also looks to research other sector needs including Human Resource and Skills requirements.
- Indian Institute of Technology (IIT) – Roorkee: Also based in North India, IIT – Roorkee is a premier tertiary institution. The institute has a Department of Pulp and Paper and undertakes research in area such as: Chemical Recovery; Environmental Engineering; Modeling of Process Systems; Non-wood Fiber Pulping; and Pulp Processing. 11

There are ample avenues for R&D collaboration, though in practice it takes a focused research plan coupled with an adequate funding sources to bring research partnerships to fruition.

⁹ <http://www.printweek.in/news/indian-pulp-paper-industry-delegation-visits-sweden-11693>

¹⁰ Source: www.pwc.in

¹¹ <http://www.iitr.ac.in/departments/DPT/pages/Research+Project.html>

Central planning view on what the industry needs
<p>Key Recommendations of the Working Group on Pulp & Paper Industry (The Planning Commission was replaced by NITI Aayog under the Modi administration)</p> <p>Ensuring availability of basic raw material and power –</p> <p>Wood: Large scale promotion of agro based plantation and substantial improvement in productivity of agro based plantation activity; Restoration of degraded forest land</p> <p>Bagasse: Review of incentives policy for use of bagasse in sugar mills</p> <p>Identification and promotion of alternate lingo-cellulosic raw materials</p> <p>Setting up waste paper collection centres and creation of awareness</p> <p>Modernising entire Recycled Fibre/ Waste paper based industry to adopt state of the art technology</p> <p>Technology Improvements for better energy efficiency and reduced environmental impact - Improving energy efficiency of existing and designing of incentives for technology upgradation for paper industry - Development of indigenous technologies to make agro based industries competitive and environmentally sustainable - Development of energy efficient technologies - R&D institutes like Central Pulp and Paper Research Institute to be strengthened with appropriate funding support</p> <p>Rationalisation of duty structure to address inefficiencies</p>
<p><i>Source: 12th Plan Working Group Paper</i></p>

3 Charting a way forward

India is often quoted as reaping a ‘demographic dividend’ due to its large and young population. Though that dividend may not pay out across all sectors, pulp & paper is definitely one area that may benefit – particularly as the Government seeks to ensure its youngest citizens are part of formal education and that overall literacy rates increase.

As demand is projected to continue to grow at between 7-8 percent per year there are systemic challenges that will need to be addressed: need for ongoing efficiency improvements; better technologies to cater to prevalent raw materials; and cohesive efforts to manage the environmental impacts from industry production.

Given Sweden’s own technological turn around in the pulp & paper industry in the 1980s there are several strong potential areas for collaboration:

- Energy Efficiency Improvements: knowledge sharing around energy enhancements to not only meet compliance requirements, but helping promote the business case to move to efficient technologies across different mills sizes.
- Water Management: India has very high water usage as compared to other countries. There is significant scope to work with mills to enhance manufacturing processes to improve water usage, which also fits well with broader water conservation initiatives.
- Effluent Management: As policy makers seek to clean up India’s largest rivers and catchment areas, there is potential for Sweden to again share its accumulated knowledge on effluent treatment.
- Rational forestry management: engage Sweden’s forestry experts to help transfer knowledge around managed forestry best practice so as to enable India to better leverage its ambitions for greater forest cover.

To do this will require ongoing engagement and appropriate leverage of various governmental and private sector platforms.