# J. W. GOTTSTEIN MEMORIAL TRUST FUND

The National Educational Trust of the Australian Forest Products Industries


# HARDWOOD FIBRE REQUIREMENTS OF THE INDIAN PULP AND PAPER INDUSTRY

**STEPHEN WALKER**

2006 GOTTSTEIN FELLOWSHIP REPORT

The information contained in this report is published for the general information of industry. Although all reasonable endeavour has been made to verify the accuracy of the material, no liability is accepted by the Author for any inaccuracy therein, nor by the Trustees of the Gottstein Memorial Trust Fund. The opinions expressed are those of the author and do not necessarily represent the opinions of the Trustees.

# Joseph William Gottstein Memorial Trust Fund

The Joseph William Gottstein Memorial Trust Fund was established in 1971 as a national educational Trust for the benefit of Australia's forest products industries. The purpose of the fund is *"to create opportunities for selected persons to acquire knowledge which will promote the interests of Australian industries which use forest products for the production of sawn timber, plywood, composite wood, pulp and paper and similar derived products."*

Bill Gottstein was an outstanding forest products research scientist working with the Division of Forest Products of the Commonwealth Scientific Industrial Research Organization (CSIRO) when tragically he was killed in 1971 photographing a tree-felling operation in New Guinea. He was held in such high esteem by the industry that he had assisted for many years that substantial financial support to establish an Educational Trust Fund to perpetuate his name was promptly forthcoming.

The Trust's major forms of activity are:

1. Fellowships and Awards - each year applications are invited from eligible candidates to submit a study programme in an area considered of benefit to the Australian forestry and forest industries. Study tours undertaken by Fellows have usually been to overseas countries but several have been within Australia. Fellows are obliged to submit reports on completion of their programme. These are then distributed to industry if appropriate. Skill Advancement Awards recognise the potential of persons working in the industry to improve their work skills and so advance their career prospects. It takes the form of a monetary grant.

2. Seminars - the information gained by Fellows is often best disseminated by seminars as well as through the written reports.

3. Wood Science Courses - at approximately two yearly intervals the Trust organises a week-long intensive course in wood science for executives and consultants in the Australian forest industries.

Further information may be obtained by writing to:
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Mr Stephen Walker, Afforestation Manager for Midway Plantations Pty Ltd in Victoria, holds a Bachelor of Forest Science degree from The University of Melbourne. In 2005 he received a Masters of Business Administration through Deakin University and the Australian National Business School. Specialisation of the MBA emphasised trade between Asia and Australia including residential units at the INTI International College in Penang, Malaysia as part of AISAM 2004.

Stephen has been employed by several companies in eastern Australia, holding positions including Area Forester with Boral Timber Tasmania Ltd, Senior Forester for Forest Enterprises Australia Ltd and Forest Plantations Manager for the GRO Group in South-East Queensland. His current role involves responsibility for establishment and management of eucalypt plantations for Midway Pty Ltd and clients such as Macquarie Bank, Nippon Paper and Mitsui in South-East and Central Victoria.

On his Fellowship, Steve visited a number of companies and stakeholders involved in India's wood based pulp and paper industry. It is anticipated that the information presented in this Gottstein report will make an important contribution to the state of knowledge in Australia regarding India as a market destination. This information is likely to be of particular interest to hardwood plantation managers and traders throughout Australia.

**Acknowledgements**

This report was prepared using information collected during a market research trip to India in February and March 2006. I wish to thank the J.W. Gottstein Memorial Trust for providing funding for this project. Thanks are also due to Midway Pty Ltd for the time, facilities and support they have made available.

Particular thanks to Mr Piare Lal and Mr Balmukund Saroa for their most generous hospitality during my visit to their clonal forestry business in Jalandhar City.

I also wish to profusely thank Dr H.D.Kulkarni, Dy General Manager (Plantations) of ITC Limited Paperboards and Specialty Papers Division, and his team of forestry staff, for their patience, humour and time during my visit to their Bhadrachalam facility in Andhra Pradesh.

Special mention to Mr. Sanjay Mehra, General Manager of Universal Paper Export Company in New Delhi for his invaluable guidance.

There are a long list of others whose contributions from both Australia and India have assisted in facilitating both my visit and report. Thanks to:

- Mr R.Hariharan, Dr Suchita Bhandari and Mr O.P.Shukla - Ballarpur Industries Limited, Pulp Division;
- Mr Shashi Kanth Jain - Indian Agro and Recycled Papers Mills Association;
- Ms Sabina Jain and Mr Gittesh Aggarwal – Australian Trade Commission, India;
- Mr P.B.Naidu and Mr J.K.Jain – The Andhra Pradesh Paper Mills Ltd;
- Mr Rajesh Kedia – SLK Trade Linc;
- Mr Malcolm McComb – Pentarch Forest Products;
- Mr Rajesh Sundrani – SBS Paper Recycling Pvt Ltd;
- Mr Ashok Thakkar - Viking Shipping (Chennai) Pvt Ltd;
- Mr Stephen Midgley – Salwood Pty Ltd;
- Mr Chris Harwood – ENSIS;
- Dr U.N.Bhati – Australian National University.
- Mr Braden Jenkin – Sylva Systems Ltd;

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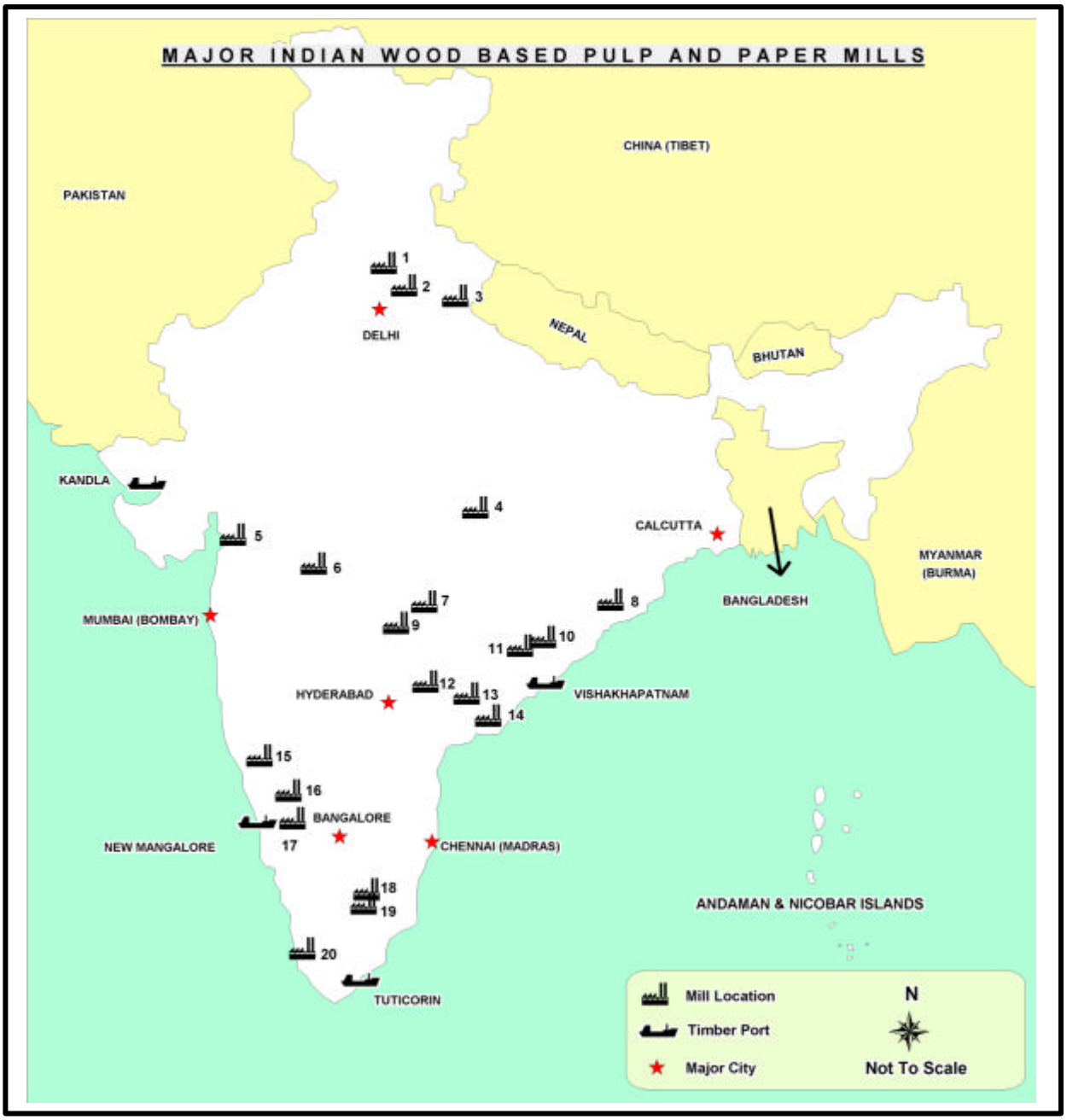



| No. | Mill Name | No. | Mill Name |
|---|---|---|---|
| 1 | BILT – Unit Shree Gopal | 11 | BILT – Unit Sewa |
| 2 | Star Paper Mills Ltd | 12 | BILT - AP Rayons |
| 3 | Century Pulp and Paper | 13 | ITC Ltd - Bhadrachalam |
| 4 | Orient Paper Mills | 14 | The Andhra Pradesh Paper Mills Ltd |
| 5 | Central Pulp Mills (JK Ltd) | 15 | The West Coast Paper Mills Ltd |
| 6 | Shree Vindya Paper Mills Ltd | 16 | The Mysore Paper Mills Ltd |
| 7 | BILT – Unit Ballarpur | 17 | Grasim Industries - Harihar Polyfibres |
| 8 | BILT – Unit Choudwar | 18 | Seshasayee Paper and Boards Ltd |
| 9 | The Sirpur Paper Mills Ltd | 19 | Tamil Nadu Newsprint and Papers Ltd |
| 10 | JK Paper Ltd | 20 | Hindustan Newsprint Mills |

## EXECUTIVE SUMMARY

- In 2006, the Gottstein Trustees commissioned a market review to investigate the Indian wood based pulp and paper industry. The field component of this visit encompassed a review of mills, infrastructure and potential resource supply opportunities for Australian growers and exporters. This report summarises the findings of this Fellowship including current market conditions regarding supply and consumption of hardwood fibre for pulp and paper manufacturing. The types of opportunities available from Australia are considered in reference to current and projected available supply and demand scenarios.

- There are 22 Indian pulp and paper mills which utilise hardwood (excluding bamboo) as one of their primary raw materials. Production from these mills represents approximately 38% of Indian supply. Products manufactured in order of significance include printing and writing paper (59.6%), paperboard (19.2%), rayon (13.3%), newsprint (6.6%) and tissue paper (1.6%).
- Hardwood log consumption in Indian pulp and paper manufacturing is at least 3.7 million green metric tonnes (GMT). Required intake is forecast to grow to between 6 and 10 million GMT by 2012.
- Wood for pulp and paper manufacturing is drawn mostly from plantations, with declining native forest availability. No supply from imported hardwood chips is known. Despite massive increases in imported industrial round wood, only minor amounts are used for pulping – though some softwood pulp logs are imported through New Mangalore. Pulp and paper manufacturing accounts for less than 2% of total harvest from Indian forests (including plantations).
- The main plantation species used for pulping include *Eucalyptus spp* (in particular *E.tereticornis*), *Acacia spp*, *Casuarina spp* and *Leucaena spp*. Estimates of plantation area are notoriously unreliable, however an annual maximum 'sustainable' yield for these species of 6.2 million GMT is calculated. Actual annual harvest probably does not reflect this figure in any way due to errors in estate modelling, over cutting, use of resource in alternative products and variable stand productivity.
- Due to land ownership restrictions, pulp and paper companies are not able to own freehold plantation estates and must rely on farm forestry extension and State government investment to ensure future wood availability. Some companies are promoting clonal forestry programs for farmers.
- The current Indian mill gate log price for plantation material is around $AUD 64 per GMT. This compares with a CIF price into Japan of around $AUD 105 per GMT. The true

difference may be less pronounced once recoverable fibre from common Australian species compared with Indian species is taken into account.

- There are 12 major Indian ports – and four have potential for any future trade in wood fibre. These include Vishakhapatnam (Central East Coast), Tuticorin (South East Coast), New Mangalore (Central West Coast) and Kandla (North West Coast). Kandla is already an important timber port – the destination of over half India's industrial round wood imports.
- Shipping times are similar to those from Australia to Japan. The sailing time to India from Australia is significantly less than from Chile, but significantly longer than that from South Africa.
- Inland transport distances from ports are considerable. Most mills are at least 200km to 500km inland. Poor quality roads and transport infrastructure compound this issue further. Trucks are generally small (i.e. less than 24 tonne), and roads are often congested – particularly in population centres.
- A number of companies are investing in plantations and pulp mills offshore (including Malaysia, Laos, Canada etc) to help overcome problems in raw material supply. An index of Indian pulp mills is included to provide status of current mills and their expansion strategies and plans.

- In conclusion:
  - Whilst Indian demand growth for pulp and paper products is increasing dramatically, a significant and growing deficit in related raw materials has emerged. New Indian hardwood plantings will only service part of this shortage – the balance will need to be sourced offshore as either logs, pulp or woodchips.
  - Australia is well positioned in terms of resource quality, geographic proximity and exporting experience to service this emerging hardwood fibre market.
  - Logistical solutions and strong relationship building will be required for Australian exporters to make these emerging opportunities a reality.

## INTRODUCTION

Australia's trade in export hardwood fibre is dominated by sales of residual native forest material into Japan. Expanding hardwood plantation resource and continuing access to native forest material have created an environment of increased overall supply. Australian exporters have begun exploring opportunities to develop new international markets.

Although India is Australia's 12th largest trading partner and 6th largest export destination (over AU$5 billion) – with major export products including bulk commodities such as coal, and high value minerals, gold and copper (Austrade 2006) - to date forest product sales have largely failed to materialise. Limited infrastructure, small inaccessible mills and poor wood prices are often cited as the reason. Regardless, India's population and economy continue to grow - and accordingly shortages in available wood and wood products make this country an increasingly attractive destination for Australian wood fibre.

The Gottstein Trust recognises the potential importance of India as a trading partner in forest products. In 2006, the Gottstein Trustees commissioned a fact finding trip to India to study mills, infrastructure and potential resource supply opportunities for Australian growers and exporters. This report provides a summary of the findings of this fellowship and including an overview of the state of the Indian wood based pulp and paper industry and current market conditions regarding supply and consumption of hardwood fibre for pulp and paper manufacturing. The types of opportunities available from Australia are considered in reference to current and projected available supply and demand scenarios.

### *INDIA*

India is a huge and diverse country with booming population growth. It is the world's second most populous nation behind China. By July 2006, the total national population is estimated to reach nearly 1.1 billion – growing at around 1.4% per annum (~ 15 million/au) (CIA 2006).

Education levels and literacy skills are high and many Indian people are multilingual. India holds the largest English speaking population of any country. India is a democracy - political, legal and banking systems are based on the same principals as Australia - inherited from shared English heritage.

India's economy is booming. GDP growth was 7.6% in 2005 and has grown by more than 7% annually since 1994. On a purchasing power parity (PPP) basis, India had a GDP per capita equivalent to US$3,400 in 2005 – making it the fifth largest economy in the world in that year. It is projected to emerge as the second largest economy behind China by 2050 (Hawkeworth 2006). Despite remarkable economic performance, inflation has generally remained stable at around 4% since 1999 (DFAT 2006).

## SECTION 1: INDIAN PULP AND PAPER INDUSTRY

### Overview

FAOSTAT (2006) records show total Indian paper consumption at over 4.8 million tonnes. Despite average annual consumption growth 1.5% per year since 2000, per capita consumption is still less than 10% of neighbouring China.

**Table 1: Total & Per Capita Paper Consumption for India, China & Australia 2004**

| | India | China | Australia |
|---|---|---|---|
| Total Annual Paper Consumption ('000 metric tonne) | 4,850 | 63,730 | 4,130 |
| Per Capita Annual Paper Consumption (kg) | 4.5 | 48.8 | 208.8 |

Source: FAOSTAT 2006

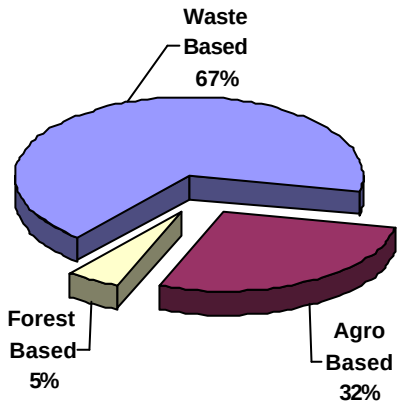
Whilst projections vary between agencies, estimates generally predict consumption growth to reach 8 to 10 million tonnes by 2010 (Kasiviswanathan 2005; Neilson and Flynn 2006; Ganapathy 1997).

There is also a move to higher quality paper products. Drivers include increased office automation, high-speed offset printing and substitution of traditional packing materials.

There are just fewer than 500 registered paper mills in India, with total installed capacity of approximately 8 million tonnes per annum. Indian paper manufacturers produce cellulose from wood, waste paper, bamboo and agricultural residues (IARPMA 2005). Only 22 mills - 5% of installed capacity - utilise forest products including bamboo as a component of their raw material supply (Chart 1).

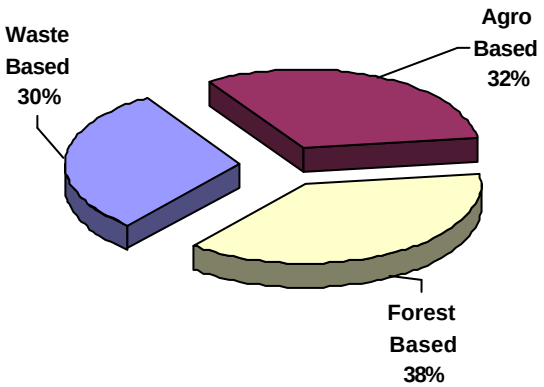
Wood pulp is utilised in manufacturing papers, board and rayon – with writing papers the highest share of production.

**Chart 1: Proportion of Mills by Raw Material**




*(IARPMA 2005)*

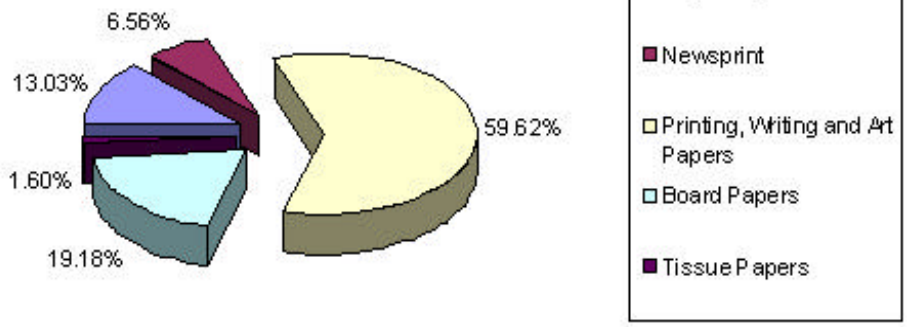
**Chart 2: Proportion of Production by Raw Material**




*(IARPMA 2005)*

Despite their relatively low share of the number of production facilities, these mills are still responsible for about a third of total production (Chart 2).

**Chart 3: Output of Wood Based Mills**




*(IARPMA 2005)*

Whilst there are a large numbers of small mills based on agricultural residues, these facilities face a number of challenges. Mill size is not sufficient to achieve economies of scale needed to ensure competitiveness with larger, wood based factories. The raw materials required are only produced seasonally and there is increasingly competitive demand for these same materials for other end uses such as electricity generation. Further, pulp produced from agricultural residues requires a significant amount of chemical consumption in the bleaching and processing process, often creating major effluent pollution problems. IARPMA (2005) consider expansion in processing capacity by residue based mills unlikely.

Waste based mills using recycled paper from both domestic and imported paper are also an important component of the Indian manufacturing base. Domestic paper recycling is a fascinating case study in itself, providing employment for a huge number of people involved in paper collection, transport and segregation. Domestic recycling is already at its limit of efficiency and India is importing large volumes of recycled paper products (FAOSTAT 2006).

**Plate 1: Paper Buyer, Hyderabad**

The raw materials supply issue is an extremely serious issue for Indian manufacturers. Mr K.S. Kaskviswanathan, Director (Operations) of Seshasyee Paper and Boards Ltd, stated in 2005 that the greatest challenge facing the Indian pulp and paper industry is decreasing available supply of raw materials. He believes that forest plantation raw material supplies are the only option for future large paper mills.

The status and opportunities for Indian wood based pulp and paper manufacturing are explored in the following sections.

**Plate 2: BILT *E.tereticornis* clones, Andhra Pradesh State.**

**Wood Requirements in Indian Pulp and Paper Mills**

A list of the companies using wood as part of their raw material intake is provided in Table 2. Further details regarding these facilities may be found in Appendix A. Estimates regarding raw material requirements have been sourced from IARPMA (2005), individual company websites and through discussions with mill resource managers, suppliers and agents in India.

Actual 'demand' for wood is probably much higher. Competition for resource is enormous. In many cases, further wood volumes are just not available.

Note: A green log to pulp ratio of 4:1 has been assumed. Ganapathy (1997) suggests that in India the ratio may actually be higher – his report suggests as much as 6:1.

**Table 2: Current Indian Hardwood Pulp Log Consumption (ex Bamboo)**

| Company | Ownership Type | Controlling Entity | Hardwood Intake (' 000 GMT) |
|---|---|---|---|
| | | | |
| APPM Rajahmundry | Public Listed | | 235 |
| Ballarpur Industries Ltd | Public Listed | Thapar Group | 660 |
| 1. Grasim Industries;<br>2. Century Pulp and Paper | Public Listed | Aditya Birla Group | 570 |
| Hindustan Newsprint | Central Government | Govt of India | 160 |
| ITC Bhadrachalam | Public Listed | Indian Tobacco Company | 300 |
| 1. Central Pulp Mills;<br>2. JK Raygada | Public Listed | JK Group | 250 |
| Mysore Paper Mills | State Government | Government of Karnataka | 200 |
| Orient Paper Mills | Public Listed | GP / CK Birla Group | 120 |
| Seshasayee Paper & Boards | Public Listed | ESVIN Group | 140 |
| Shree Vindhya Paper Mills Ltd | Public Listed | | 50 |
| Sirpur Paper Mills | Public Listed | | 220 |
| Star Paper Mills | Private Company | Duncan Goenka Group | 65 |
| Tamil Nadu Newsprint Mills | State Government | Government of Tamil Nadu | 320 |
| West Coast Paper Mills | Public Listed | | 380 |
| | | | |
| **Total Hardwood:** | | | **3,670** |

**Announced Capacity Expansions**

A number of existing manufacturers are proposing capacity expansion at Indian mills. Table 3 outlines announced capacity upgrades as at early 2006…

**Table 3: Currently Proposed Hardwood Pulp Expansions**

| Company | Year of Upgrade | New Capacity ('000 tonnes) | Hardwood Requirement ('000 GMT/AU) |
|---|---|---|---|
| | | | |
| Andhra Pradesh Paper Mills | 2006 - 2007 | 40 | 160 |
| BILT | 2007 - 2010 | 300 | 100 |
| The Bengal Paper Mill Company | 2009 | 60 | 120 |
| ITC | 2006 - 2010 | 300 | 1,200 |
| JK Paper Ltd | 2008 | 50 | 40 |
| Orient Paper Mills | 2007 | 30 | 120 |
| Sirpur Paper Mills | 2008 | 50 | 200 |
| TNPL | 2006 - 2007 | 100 | 400 |
| West Coast Paper Mills | 2006 - 2009 | 150 | 600 |
| | | | |
| **Estimated Annual Hardwood Consumption:** | | **1,080** | **2,940** |

(Source: Company Websites– see Appendix A)

If all the upgrades above are commissioned according to plan, between 2007 and 2012 total wood consumption by Indian pulp and paper mills will grow to at least 6.6 million tonnes per annum – although unsatisfied demand may be far higher.

If wood to pulp ratios are actually closer to those suggested by Ganapathy (1997), the real requirement may be over 10 million tonnes.

Plate 3: ITC Pulp and Specialty Papers Division Paper Mill, Bhadrachalam

Plate 4: Pulp Log Yard, ITC Paper Mill, Bhadrachalam

## SECTION 2: INDIAN PULPWOOD RESOURCE SUPPLY AND DEMAND SITUATION

### Indian Timber Consumption

Wood is used for many purposes in India and competition for wood and timber resources is considerable. Timber volumes are from three sources –

1) Legislated 'sustainable' harvest of timber from Government controlled natural forests and plantations;
2) Harvesting on farm forestry and other private plantations outside the control of Government; and
3) Illegal collection of wood, timber and branches from both Government and non Government lands.

The allowable cut ("sustainable yield") of timber from Indian forests (includes plantations) is about 106 million $m^3$ per annum. Fuel wood is allocated around 75% of the allowable cut – with industrial wood for sawn timber, plywood, pulping etc allocated a total of approximately 27 million $m^3$ (Saigal 2003).

Saigal (2003) believes that the actual annual harvest is over 250 million $m^3$. Collection of fuel wood accounts for around 80% of this figure. Production of pulp logs in India is less than 2% of harvest from all sources.

It is common to see villagers cutting and collecting small saplings and branches in forests for use in cooking and heating. These small trees are not remotely close to their optimal harvest age. The opportunity cost of this 'juvenile' cutting is both loss of future yield (cutting too early on the CAI/MAI curve) plus lost opportunity for growing other products

Two strategies to combat the gap between demand and available supply are being implemented in India:

1) Increasing imports of industrial round wood;
2) Increasing plantation estates

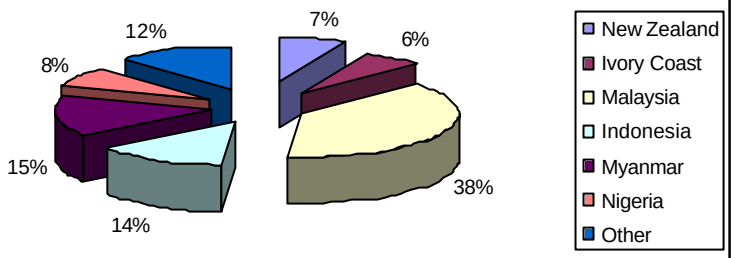
The status of these strategies is considered in the next two sections.

**Industrial Round Log Imports**

In 1996, the Government of India permitted wood import by classifying wood under Open General Licence to ease the wood shortage and reduce pressure on natural forests. The tariff structure implemented favours logs over processed and semi-processed timber. As such, industrial round wood imports represent over 93% of timber imports by volume (Muthoo 2004).

Although logs are imported from around 100 countries, six countries account for the bulk of imports. In order these countries include Malaysia, Myanmar, Indonesia, Nigeria, New Zealand and Ivory Coast (see Chart 4)

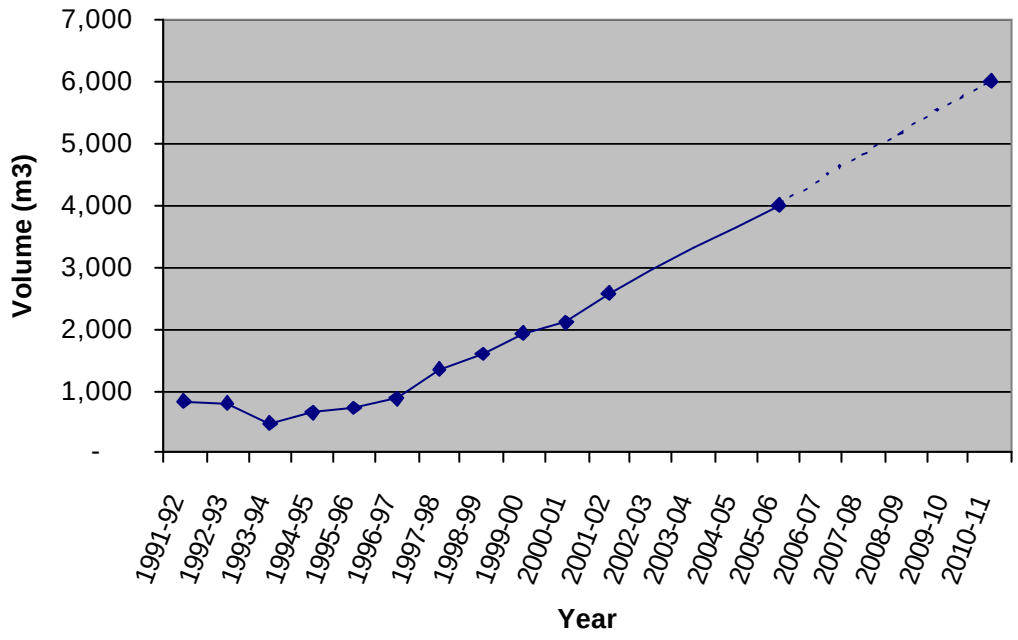
**Chart 4: Imported Roundwood Suppliers**




*(Muthoo 2004)*

Imports have grown from less than 1 million $m^3$ in 1997 to over 4 million $m^3$ by 2006. The International Tropical Timber Organisation forecast that by 2010, India will be importing over 6 million $m^3$ of whole logs per annum (Chart 5).

**Chart 5: Industrial Roundwood Imports ('000 m3)**




*(Muthoo 2004)*

Major end uses for industrial round wood include sawn wood, plywood, veneer, particle board, MDF and builders joinery. Only relatively small amounts are currently consumed in pulp and paper manufacturing – although some imports of softwood logs are consumed in manufacturing of newsprint.

**Plate 5: Malaysian Logs, Kandla**

**Plate 6: Plywood Veneer, Kandla**

## Plantation Resources

### *Plantations in India*

Extensive governmental and private plantation projects have been implemented throughout India, particularly over the last 30 years. FAO estimate the total area of planted forest at over 30 million hectares. Around 30% of this resource has been established for use as industrial round wood. The balance includes planting for fuel wood and a large land restoration planting program.

**Table 4 - Area of Plantation in India till 1997**

| **Purpose of Plantation** | **Area of Plantation till 1997 in 000 ha** | | |
|---|---|---|---|
| | Public | Private | Total |
| Industrial Round wood | 4460 | 5000 | 9460 |
| Rubber/Coconut/Oil Palm | 12 | 2337 | 2349 |
| Fuel Wood | 1266 | 4546 | 5812 |
| Other Purpose | 12185 | 0 | 12185 |
| Other Plantation | 167 | 405 | 572 |
| Total Area Plantation | 18090 | 12288 | 30378 |

*(FAO 2005)*

Accuracy of these figures is questionable. For example, the proportion of failed plantation included in the area figures is unknown – and failed plantations may be double counted if replanted. Second rotation crops may be counted twice (or more). Farmers plantations established independently of government programs are not included. Linear plantings in fields may be counted as fully stocked hectares.

Alternative figures presented by Saigal (2003) suggest that the total could be as low as 19.5 million hectares – with between 6 and 8 million hectares outside state forest lands.

Aerial and satellite mapping followed by 'ground-truth' surveys are becoming more prevalent in Indian plantation inventory programs (Kilkarni pers. comm., 2006). Future estimates should more truly reflect the state of development. This is particularly important for industrial processors who are reliant on accurate information to make informed decisions with regards to future capital investments.

***Plantations for Pulp Production***

The predominant market for Indian industrial plantations is the sawn timber and veneer/plywood industries. Nevertheless, most wood based pulp and paper manufacturers have also moved a significant proportion of their intake to plantations of fast grown, introduced species.

Plantation species commonly utilised in pulp and paper mills (excluding bamboo), include *Eucalyptus* and *Acacia spp*, *Casuarina equisetifolia*, and *Leucaena leucophloa* (Subabul). Availability and relative intake of each timber is a function of opportunity and geography. Mills own very little plantation estate in their own right. The timber species mix available from domestic suppliers is determined to a large extent by planting decisions by private and governmental growers.

*Eucalyptus tereticornis* is by far the most widely planted individual introduced tree species right across India. Other common eucalypt species include *E.camaldulensis, E.grandis, E.globulus* and *E.urophylla*. It was estimated by Mr Piare Lal (Lal pers.comm.2006) that relative share of *Eucalyptus spp* could be approximated as …

- *Eucalyptus tereticornis* 90%;
- *Eucalyptus camadulensis* 5%;
- Others 5%

High productivity clones and hybrids have become extremely popular in states where short rotation pulp-wood is a major market. Clones including *E.tereticornis* x *E.urophylla* (tere-phylla), *E.tereticornis x E.grandis* (tere-grandis) and more recently, experimental *E.tereticornis x E.globulus* have served to increase growth rates, improve form and streamline variability compared with traditional seed grown plantations.

Virtually all clonal and improved seedlings are produced by pulp and paper companies themselves. These trees are generally sold to farmers and limited control over ultimate use is available. Nevertheless, short rotation length requirements for pulpwood and proximity of clonal plantations to pulpwood markets means almost all clonal eucalyptus is made available to the pulp and paper industry.

*Acacia spp* including *A.mangium* and *A.nilotica* are common in the tropical south west of the country. Acacia species are heavily promoted for pulp and fuel wood – although environmental and land protection plantings are also a dominant purpose for acacia throughout the country (Lal pers.comm. 2006).

Poplar is common on irrigated land in a band through the north of the country. Whilst some poplar is used in pulp production, its plywood value is far higher and only core material is available for pulping.

The Forest Survey of India (1999) found that as a proportion of all species established by government Forest Departments up to 1997, areas of common timber production species were as follows …

**Table 5: Common timber species share of Gov't industrial round wood plantations**

| Species | Area in '000 hectares | Percentage |
|---|---|---|
| *Eucalyptus spp* | 1,361 | 8.87 % |
| *Tectona grandis* | 1,331 | 8.67 % |
| *Acacia spp* (inc non-production) | 1,663 | 10.84 % |
| *Casuarina equisetifolia* | 133 | 0.87 % |
| *Populus spp* | 47 | 0.31 % |

*FSI (1999)*

FSI (1999) do not provide a similar estimate for private plantations – however, given the importance of each of these species in Indian timber markets, their relative share on private property is likely to be far higher assuming that most farmers are growing trees for commercial rather than conservation related purposes.

In a review of potential for forests in carbon mitigation, Siyag (2001) also provides area estimates for three of the common industrial pulpwood species in both private and industrial estates…

**Table 6 – Area estimates from Sivag (2001)**

| Species Group | Total Area (ha) | % Industrial | Industrial Area (ha) |
|---|---|---|---|
| *Eucalyptus* | 8,004,500 | 30% | 2,401,350 |
| *Acacia* | 6,403,600 | 15% | 960,540 |
| *Casuarina* | 1,600,900 | 0% | 0 |

***Plantation Wood Quality***

The species promoted for farm forestry plantations in India are selected for growth and form. To date, pulp yield and wood quality have been a secondary consideration to achieving growth (i.e. poor quality wood is better than no wood at all!). Quality is however, becoming more important as the processing cost benefits associated with high yielding species such as *E.globulus*, *E.grandis* and *E.nitens* are more widely recognised.

*E.tereticornis* has a pulp yield of less than 47% - and importantly yield is also highly variable and can range from 42% to around 50% depending on provenance and age (Kilkarni 2006).

Tropical Acacia plantations may produce pulp yields of around 48% to 50%. Yields for *Casuarina* and *Leucaena spp* are unknown.

Clonal hybrids of *E.tereticornis* and *E.grandis* have been developed to try and address this issue – and *E.globulus* experimentation is underway. ITC Bhadrachalam hopes to have a high pulp yield clone within 2 years available for distribution.

Analysis of the cost difference in processing *E.globulus* versus *E.tereticornis* is beyond the scope of this report – however suffice to say that any marketing strategy promoting Australian exports should consider this issue in any price comparison.


**Plate 7: ITC *E.urophylla* x *E.tereticornis* hybrid, Bhadrachalam.**

***Plantation Productivity***

There is a wide discrepancy in claimed productivity between growers. The Forest Survey of India (1999) estimated average growth rates for selected plantation species as follows…

**Table 7 – Productivity estimates for 6 key Indian plantation species groups…**

| Species | Rotation (years) | MAI (m3/ha/yr) |
|---|---|---|
| Teak | 58 | 0.6 to 7 |
| *Dalbergia sissoo* | 30 to 40 | 4 to 6 |
| *Eucalyptus spp.* | 10 to 20 | 8 to 12 |
| *Gmelina arborea* | 30 to 40 | 10 to 15 |
| *Acacia nilotica* | 20 to 25 | 3 to 4 |
| *Populus spp.* | 8 to 10 | 20 to 25 |

*(FSI 1999)*

Certainly, a variety of silviculture and nursery practices have been implemented to produce faster growth and shorter rotations. It is extremely difficult to assess how representative various practices are in the context of whole estate management – or indeed across a variety of states and project boundaries.

Of the plantations visited during 2006, clonal *Eucalyptus* and *Leucaena* plantations were achieving considerably faster growth than seedlings crops. Several irrigated clonal *E.tereticornis* plantations sites in western India were measured achieving 50 MAI in four years (200 tonne per hectare). Further, on farm forestry and tribal sites, landowners were not growing their estate to anything like a 10 year rotation length. Many private growers appeared to be harvesting their plantations at 4 years or younger. One site visited was being harvested at age 2.5 years. The volume per hectare achieved was likely to be nearly 50 tonnes per hectare (20 MAI).

Growth rates observed in *Acacia* and clonal *Leucaena* plantations appeared similar to *Eucalyptus*.

Given the site types selected for Casuarina spp – typically coastal sands and lower rainfall – it would not be unreasonable to assume lower productivity. *Casuarina equisetifolia* is one of the major species promoted by Andhra Pradesh Paper Mills Ltd. They were claiming 75 – 100 tonnes per hectare growth rates on 8 year rotations (8 – 12 MAI).

A realistic average estate MAI for private industrial farm forests in India is probably around 75 – 100 tonnes per hectare in 4.5 years (16 – 22 MAI). Average productivity in Government plantations, managed for a greater range of products and values, is generally lower.

***Future Plantation Expansion***

Given that domestic raw material supply is already a limiting factor in Indian pulp and paper manufacturing, it must be assumed that any upgrade in capacity must be backed by investment in new raw material supplies.

According to the FAO (2005), India has proposed to bring 33% more area under forest cover in the next 20 years by planting 22 million hectares of non-forest land. Despite best endeavours, pressure for fuel wood may reduce the effectiveness of these plantings in many cases. A continual stream of trailers laden with small timber and branches seemed to follow many of my trips into or out of government land – whilst illegal grazing of goats and cattle is still commonplace in many of these young government plantation areas.

Industrial freehold programs in India are all but impossible to implement. Government controlled land expansion is off limits to private industry under the Forest (Conservation) Act 1988. This legislation firstly prohibits corporate afforestation expansion on any forest land without Central Government approval – and secondly prohibits clearing of naturally grown trees in forest land for the purposes of reforestation.

According to Saigal (2002), pulp and paper companies have been lobbying to get about two million hectares of degraded forest lands under lease to establish plantations – but this has been strongly opposed by NGO's and environment groups who believe it would disadvantage local communities and tribals who rely on these lands for fuelwood and grazing. They also believe that it would be against the interests of farmers who wish to supply wood to industry from farm forestry programs. A 1998 working group under The Planning Commission of India agreed, and although commercial plantations continue to be expanded by the State and Central governments for industrial wood, industry specific plantations remain out of bounds.

On private land, industrial plantations are similarly restricted by Central Government land ownership ceilings. These land ownership limitations were set in place in 1972 to ensure agricultural land remains in the hands of rural farmers and to ensure even distribution of agricultural income. In Andhra Pradesh, an individual cannot exceed 4.05 hectares of irrigated land or a maximum 21.85 hectares of poor quality un-irrigated land (Saigal 2002).

For this reason, most companies own only small areas of plantation – and often these are utilised for nurseries, research or promotional purposes.

To counter restrictions on available land, companies such as ITC, BILT and APPM have implemented aggressive marketing and extension strategies to ensure expansion of the farm forestry plantation base in their catchments. These companies own seedling nurseries and

promote incentive schemes for farmers to plant commercial pulpwood crops. The demand for forestry crops by farmers appears reasonable – and given current mill door wood prices available from Indian processors, and decreasing rotation lengths through clonal forestry, the strategy has been largely successful.

But not all mills have farm forestry programs – and there is no certainty that all farm forestry program wood will make it to the pulp mills which facilitated these developments. Demand from the plywood industry alone could easily compete for all or any of this resource – given potential returns from plywood, the growing estates in traditional pulpwood catchments must also be attractive raw material catchments for plywood mills.

Ultimately, competition by alternative land uses is likely to become a bigger issue. As the Indian population grows, demand for staple crops and food could well reverse attractiveness of farm plantations to farmers. Although many farmers grow inter-row crops of wheat, chilli or other food crops between trees now, future mechanisation of agriculture may make this type of forestry far more difficult.

**Plate 8: 3 Year Old *E.tereticornis* clones with Inter-row wheat crop, Punjab State**

***Some "Back of Envelope" Sustainable Yield Estimates…***

An overview of information pertaining to pulpwood-suitable plantations in India is presented in Table 8. Assumptions made are as follow:

1. Relevant plantation species limited to *Eucalyptus, Acacia, Leucaena and Casuarina spp*;
2. Plantation estate area adjusted to include estimated private industrial plantation area;
3. Growth rates as per FSI (1999) and observations from 2006 field trip (measured GMT);
4. Nominal rotation length applied as per FSI (1999) and information observed during my 2006 field visit.

**Table 8: Pulpwood Plantation Species - Area, MAI and Rotation Length Range**

| | Estate Area (ha) | | Average Growth Rate (MAI = GMT/HA/AU) | | Nominal Rotation Length (Years) | |
|---|---|---|---|---|---|---|
| | **High End** | **Low End** | **High End** | **Low End** | **High End** | **Low End** |
| *Eucalyptus* (seedling) | 3,000,000 | 2,000,000 | 12 | 8 | 20 | 10 |
| E*ucalyptus* (clonal) | 150,000 | 75,000 | 25 | 15 | 8 | 4 |
| *Acacia* | 1,600,000 | 960,000 | 5 | 3 | 25 | 15 |
| *Casuarina* | 250,000 | 130,000 | 13 | 4 | 20 | 8 |
| *Leucaena* | 250,000 | 130,000 | 15 | 4 | 12 | 5 |

Assuming fast growing plantations are cut on shortest possible rotation (ie high end MAI x low end rotation length) and vice versa – a crude calculation of annual 'sustainable' harvest volumes is possible for each species as per Table 9:

Table 9: Annual 'Sustainable' Harvest of 4 Common Pulpwood Species ('000 GMT)

| | High End Estate Area | | Low End Estate Area | |
|---|---|---|---|---|
| | **High End MAI.** | **Low End MAI.** | **High End MAI.** | **Low End MAI.** |
| *Eucalyptus* (seedling) | 3,600 | 1,200 | 2,400 | 800 |
| E*ucalyptus* (clonal) | 940 | 280 | 470 | 140 |
| *Acacia* | 530 | 190 | 320 | 115 |
| *Casuarina* | 400 | 50 | 210 | 25 |
| *Leucaena* | 750 | 85 | 390 | 45 |

Therefore the annual sustainable harvest of hardwood plantation species used for pulpwood production is at most 6.2 million tonnes (Table 10).

**Table 10: Annual Sustainable Harvest of 4 Common Pulpwood Species ('000 GMT)**

| | High End | Mid Point | Low End |
|---|---|---|---|
| **Total** | **6,220** | **3,670** | **1,125** |

The relevance and applicability of this 'sustainable' yield figure is affected by a number of factors:

- Annual harvest is not governed by any regulation of sustainable yield – particularly when wood flows are from private plantations. Farmers determine when they are ready to cut their trees themselves, and this may be as young as age 2.5 years.

- The figures regarding plantation area include plantations in states far from any pulpwood market, where the dominant use may be fuel wood or other.

- Clonal and other fast grown farm forestry estates are expanding rapidly (i.e. at least 20,000 hectares per annum) in many states that support pulp mills. Volumes from these plantations will add considerably to available harvests to 2012.

Regardless, even assuming that all of the sustainable supply were made available to pulpwood markets, this analysis highlights a gap in available supply up to 4 million GMT against projected demand to 2012. In order to fill this gap in the immediate term, at least another 250,000 hectares of farm forestry plantations for pulpwood would be required over the next 5 years. Given that average farm size is generally less than 5 hectares – this would involve around 50,000 farmers planting trees in addition to the current estates.

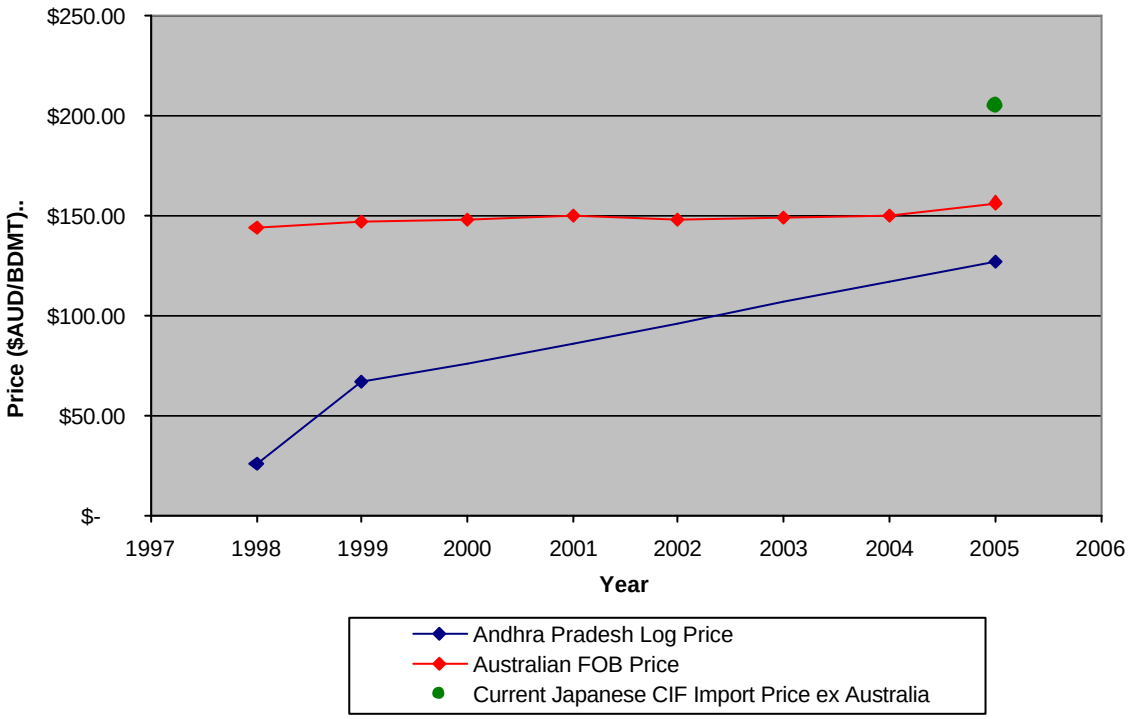
Whilst uptake of farm forestry schemes has been popular to date, incremental additions to farm forestry programs may become more difficult for several reasons:

1) Farmers willing to incorporate forest crops took up plantations early, whilst farms not yet converted may be owned by those farmers more resistant to forest crops;
2) As plantation establishment areas increase, the value of the remaining land for alternative agricultural uses may increase in response;
3) Silviculture is the role of the farmer, with assistance from paper company silvicultural officers. The ability for paper company staff to assist in ensuring high quality silviculture may become more challenging as a function of scale as estates increase;
4) A number of areas are reliant on irrigation from groundwater bores. This irrigation is largely unregulated and extension staff believe that this may not continue to be the case in future years as available supply decreases – further areas of salinity were observed in Andhra Pradesh, believed to be the result of irrigation with groundwater. This may become a bigger issue as bore irrigation becomes more widespread.

**Price Analysis**

Whilst Australian FOB pricing has remained static, the Indian log price reached a turning point in 1999. Before this time, farm growers were unrepresented during contractual negotiations between third party harvesting suppliers and mills. Successful contract suppliers would agree a price with mills and then were free to negotiate independently with farmers for 'appropriate' stumpages. In 1999, Agricultural Market Committees were introduced at the behest of the Central Government to provide representation to farmers in the negotiating process. These Committees set a minimum floor price for farm forestry stumpages and successfully arranged removal of income taxation from farmer royalties. The effect on stumpage is illustrated in Chart 6.

**Chart 6: Australian FOB Chip Price v Andhra Pradesh Pulp Log Price**




By 2005, the Indian pulpwood price was well above the floor value. There has also been steady upward movement due to increasing competition for scant resources. Although current pricing is still below Australian FOB - and the Japanese CIF landed price, the upward trend is clear and the gap is closing.

Note, 50% moisture content has been assumed. Potential differences in pulp yield values are ignored. Conversion to useable wood fibre may reduce this gap significantly when compared with *E.globulus*.

**Summary of Findings**

In summary, current domestic pulpwood demand in India is at least 3.7 million tonnes (excluding bamboo). The majority of this demand is met currently from plantation grown material on both government and private plantation estates. Pulpwood companies own virtually no plantation in their own right.

Demand for hardwood pulpwood is projected to grow to between 7 and 10 million tonnes over the next five years due to increased capacity installation in existing mills. No new processing facilities are expected to be constructed.

A crude analysis of existing plantations suggests maximum sustainable supply from suitable pulpwood species may be 6.2 million tonnes in total. Evidence suggests that this resource is already being cut at higher than its sustainable rate – and not all of this wood is being made available to pulp and paper companies.

Native forest supplies and bamboo are already producing at their maximum capacity, and neither estate is being expanded – in fact a decline in supply from both these sources is also probable.

Farm forestry is being facilitated by some pulp and paper producers in order to overcome this gap. Although pulp and paper companies grow the seedlings and produce clones, there is no tenure over the farm forestry plantation resource and companies must bid for the final wood produced against other paper companies, and alternative wood users such as fuel wood, plywood etc.

Import of timber in the form of logs or chips is the only other option. The price paid for wood by pulp and paper companies has been increasing rapidly to compete with alternative products and to make plantation development by farmers more attractive. This price is still less than the Australian FOB price for chips, but if fibre yield and pulp production costs were accounted for in a whole 'chain of custody' analysis, the picture may look somewhat different.

## SECTION 3: THE AUSTRALIAN SITUATION

In order to review opportunities for Australian exporters – it is first necessary to review what resource may be available.

### *Australian Market Supply Scenario*

*Plantations*

Australia's total hardwood plantation estate area grew to over 700,000 hectares by 2005. Hardwood plantations are concentrated in Western Australia (36%), Victoria (24%) and in Tasmania (21%) (National Forest Inventory 2005). Major species include *Eucalyptus globulus* and *Eucalyptus nitens*.

In 2006, the four biggest growers account for over half of all hardwood plantings. These companies include:

**Table 11: Major Australian Hardwood Plantation Managers**

| Company | Plantation Area (ha) | Location of Operations |
|---|---|---|
| Integrated Tree Cropping | 140,000 | WA/GT/QLD |
| Great Southern Plantations | 115,000 | WA/GT/Vic/Tas/QLD/NSW/NT |
| Gunns | 110,000 | TAS |
| Timbercorp | 80,000 | WA/GT |
| | | |
| TOTAL | 445,000 | |

The balance of hardwood estates are owned by a range of managers including processors, smaller managed investment schemes, State Governments and overseas investment companies.

Almost all of the existing hardwood plantation estates are on first rotation sites, are less than 10 years old (National Forest Inventory 2005), whilst being managed on 10-15 year pulpwood only rotations.

Available plantation hardwood pulpwood will increase from around 1.5 million GMT in 2005 to over 8.5 million GMT by 2012 (Neilson and Flynn 2006).

*Native Forests*

Pulp grade native forest logs are predominantly from high pulp yield species including: *Eucalyptus regnans, E.delegatensis*, *E.obliqua*, *E.diversicolor*, *E.pilularis* and *E.grandis.* However, lower yield eucalypts and some acacia are also used in smaller amounts.

Production of wood chip material from native forest residues continues in three mainland states (Victoria, Western Australia and New South Wales) and in Tasmania. Tasmania accounts for around half of Australia's total export volume, and unlike the mainland exporters, a significant proportion of this volume is from privately owned native farm forests.

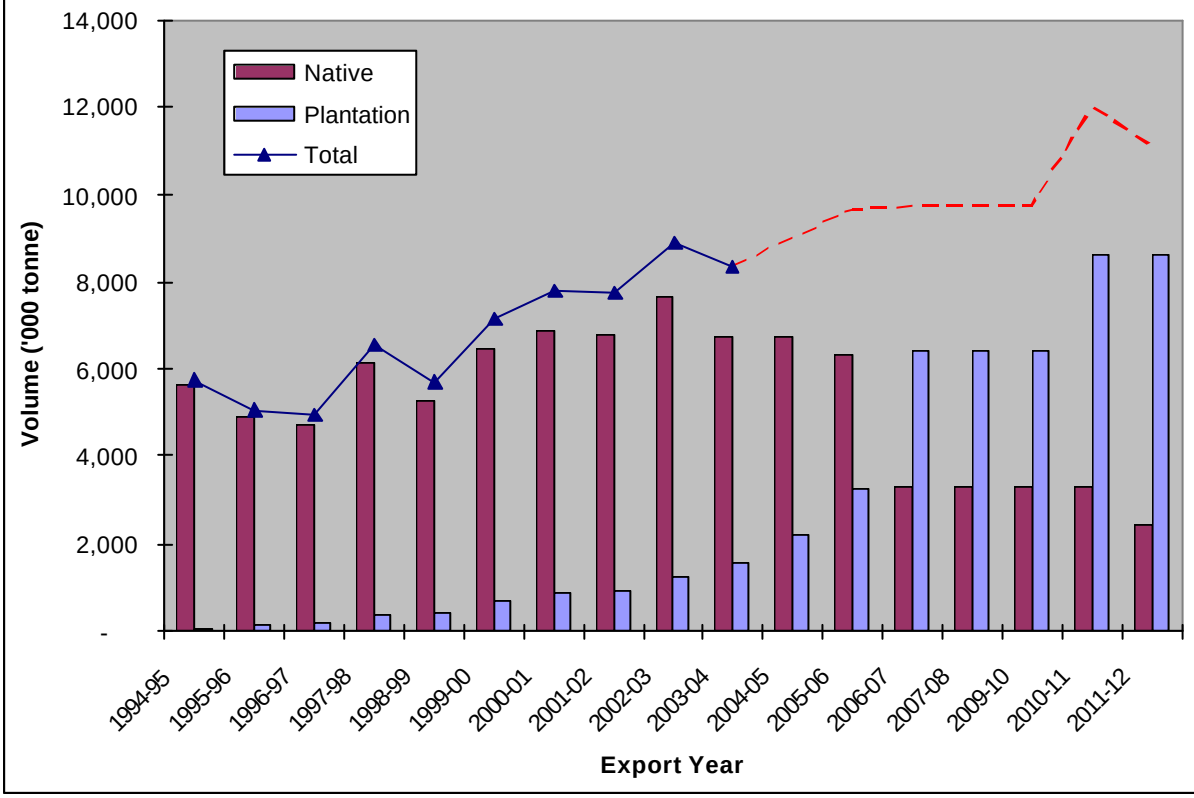
Whilst the total area available for native forest harvesting in Australia may have declined, total sales of native hardwood chip material have increased approximately 30% since 1995. This increase has largely been a function of improved utilisation standards through introduction of new systems, harvesting technology and equipment.

Neilson and Flynn (2005) estimate that by 2010 production of pulpwood from native forests will have more than halved from current levels to less than 3 million tonnes.

*Summary of Australian Supply Scenario*

Chart 7 provides an overview of Australia's trade in hardwood wood fibre since 1994. Forecasts to 2010 are modelled using yield and wood flow estimates from Neilson and Flynn (2006).

**Chart 7: Volume of Australian Hardwood Woodchip Trade 1994 - 2012**




*ABARE (2005) & Neilson and Flynn (2006)*

Pulpwood availability estimates by Neilson and Flynn (2006) appear to be at the lower end of national yield models. Other estimates to 2012 include

- URS (2002) - 10.2 million GMT;
- Ferguson et al (2002) - > 14 million GM;

Actual pulpwood sales by 2012 will be influenced by many factors far beyond the scope of this report. The true figure will be a reflection of:

- Actual achieved plantation productivity;
- Availability of native forest volumes from state forests/private land;
- Market preference for plantation versus native pulpwood;
- Competition from overseas suppliers.
- Logistical and infrastructure requirements in new plantation areas.

Nevertheless, it is clear that:

1) Plantation pulpwood availability from 2007 will at least offset any possible decline in native pulpwood supply – and should in fact add significant extra volume;

2) Domestic and international markets for increased Australian hardwood pulp volumes will need to be found to ensure opportunities for growers are optimised.

***Australian Market Demand Scenario***

Available supply must be offset against existing and future demand from domestic and international markets. Although domestic requirements are currently relatively low, several pulp mill developments in Australia have the potential to change market conditions considerably if they proceed as planned.

*Domestic Demand*

Hardwood pulp and paper manufacturing in Australia is extremely limited. Three existing mills operate in southern Australia as shown in Table 12:

**Table 12: Domestic Processing in Australia 2006**

| Mill | Location | Estimated Hardwood Intake (tonne/au) |
|---|---|---|
| PaperlinX – Australian Paper | Maryvale, Victoria | 750,000 |
| PaperlinX – Australian Paper | Wesley Vale, Tasmania | <30,000 |
| Norske Skog – Boyer | New Norfolk, Tasmania | <250,000 |
| | | |
| Total Demand (approx.) | | 1,000,000 |

Although no domestic hardwood pulping capacity has been constructed for many years, several recently proposed developments have potential to increase domestic consumption considerably:

**Table 13: Proposed Domestic Pulp Manufacturing Facilities 2006 - 2012**

| Project | Location | Proposed Start Up | Estimated Hardwood Intake (tonne/au) |
|---|---|---|---|
| Gunns Ltd | Bell Bay, Tasmania | 2008 | 3,000,000 |
| Heywood Pulp Mill | Heywood, Victoria | 2008 | 750,000 |
| Penola Pulp Mill | Penola, South Australia | 2009 | 750,000 |
| PaperlinX Maryvale Upgrade | Maryvale, Victoria | 2008 | 200,000 |
| | | | |
| Total Demand | | | 4,700,000 |

Most of these developments are moving into advanced planning stages. If all mills are commissioned by 2009 as planned, combined consumption would act to offset much of the extra projected available wood flow to 2012.

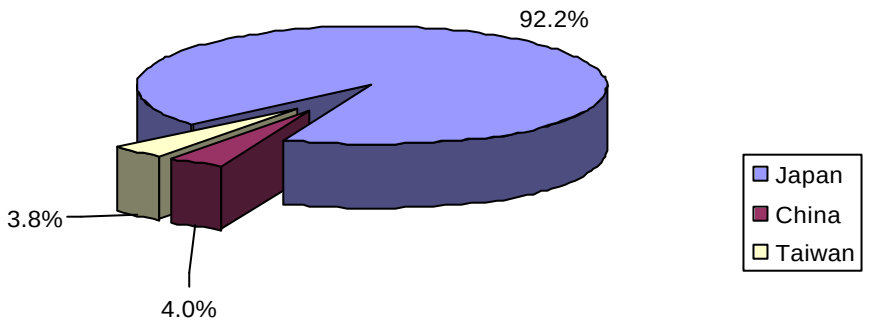
The Gunns and PaperlinX proposals are located in areas of significant integrated native forest management. Given the regional economic importance of these facilities, they may well provide political impetus to ensure ongoing medium term access to native residual wood.

*International Demand*

Australia has a long history with Japanese trading houses and paper manufacturers for supply of hardwood fibre. Japanese custom accounts for over 90% of Australian export volumes (Chart 8). Conversely, there are three countries which combined supply nearly 75% of Japan's resource requirement including Australia (32%), South Africa (28%) and Chile (14%). The balance is imported from Asia and South America (Chart 9). This trend has been steady for some time (Chart 10).

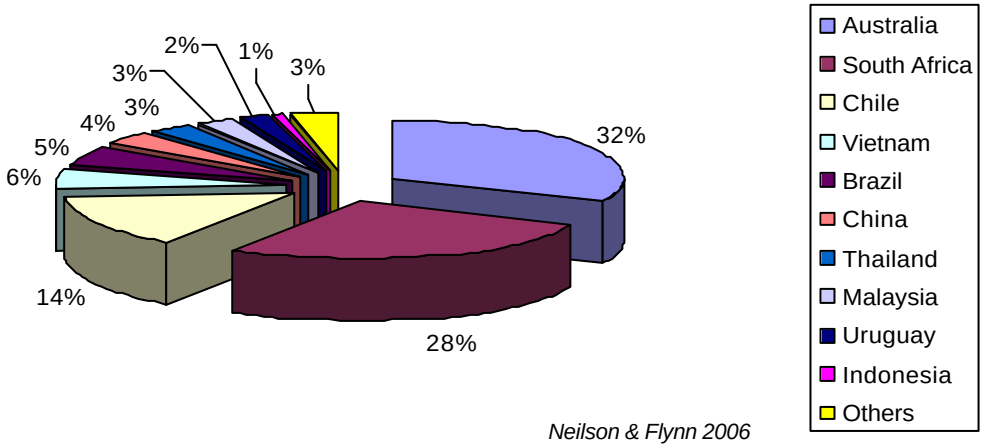
Taiwan and China are smaller market destinations as a proportion of overall sales, although they are emerging as major customers for several Australian exporters. Occasional sales into other south-east Asian destinations have been negotiated, but the strengthening Australian dollar and cheap resource from Indonesia and Malaysia have made Australian supplies less competitive.

**Chart 8: Australian Hardwood Chip Export Desinations (2005)**

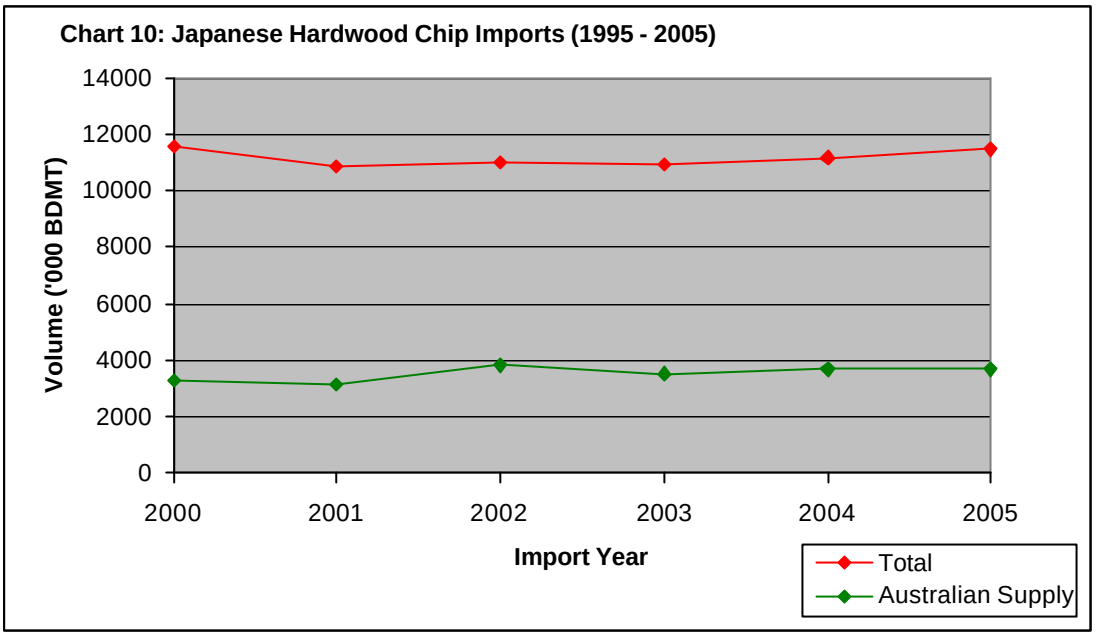



*Neilson & Flynn 2006*

**Chart 9: Japanese Hardwood Chip Imports (2005)**




*Neilson & Flynn 2006*




*Neilson & Flynn 2006*

Neilson and Flynn (2006) discuss the emerging trend of 3 segregated wood fibre quality grades, including:

1) *E.globulus* plantation chip: fibre yield > 54%;
2) *E.nitens* and ash native forest species: fibre yield 50% - 54%;
3) Other native forest and lower pulp yield plantation mix: fibre yield < 50%.

The fibre yield of pulp wood species relates to the amount of 'useable' cellulose for pulp manufacturing per tonne of wood. Yield is not the only important characteristic – wood density, moisture content and a number of other variables are also important. These factors taken together have important impacts on wood processing and transport costs.

Given the available benefits in pulp and paper manufacturing, it is reasonable to foresee that the Japenese market will pay a premium price to ensure they have priority access to Australia's *E.globulus* resource. Japanese customers are already expressing increasing preference for high pulp yield plantation material.

This segregated approach may result in surplus volume of lower grade (and cheaper?) wood fibre. This non 'premium-grade material is still possibly of higher quality than much of the red gum plantation resource developed in India and may be attractive as a secondary export product.

## SECTION 4: INFRASTRUCTURE ISSUES

### *Ports*

The Indian coastline is around 6,000 km long and has 12 major ports which handle about 90 % of all trade. The ports are managed by the Central Governments' Port Trust of India and include:

Table 14: Major Indian Ports

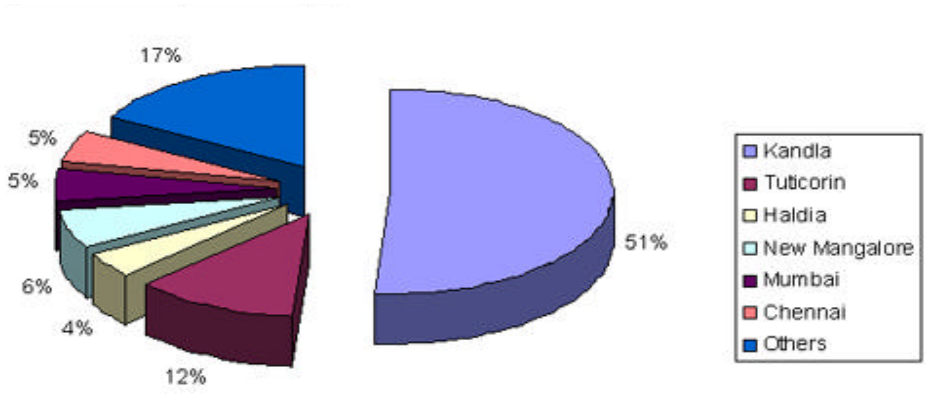
| | |
|---|---|
| 1. Calcutta/Haldia | 7. Chennai (Madras) |
| 2. Cochin | 8. Ennore |
| 3. Jawaharlal Nehru | 9. Kandla |
| 4. Mormugao | 10. Mumbai (Bombay) |
| 5. New Mangalore | 11. Paradip |
| 6. Tuticorin | 12. Vishakhapatnam (Visag) |

India's other 139 minor and intermediate ports are the responsibility of respective State Governments. A number of these facilities (e.g. Kakinada) are expanding to capture business from the major ports.

Although Indian ports are infamously congested and bureaucratically managed, Average Ship Turnaround (ASTA) and Average Ship Berth Output (ASBO) have been improving with infrastructural investment by the Central Government and Port Authorities (Austrade 2006). Most major ports report performance statistics improvements in their company performance charts – available on their websites (http://www.indiandata.com/ports_in_india.html).

Kandla is the most significant timber port for log imports. It was estimated by the Kandla Ports Trust during 2006 that they were now handling up to 2.5 million $m^3$ alone. A summary of the relative importance of individual ports used for whole log imports is presented as follows:

**Chart 11: Import of Logs by Port**




*Muthoo 2004*

***Suitable Future Chip Import Ports***

Whilst no Indian woodchip imports are known, several major ports do have clear potential for any future trade in wood fibre. These include:

**Table 15: Potential Woodchip Entry Ports**

| Port Name | Location | Relevant Mills |
|---|---|---|
| Tuticorin | SE India | 1. Hindustan Newsprint;<br>2. Seshasayee;<br>3. Tamil Nadu Paper; |
| Vishakhapatnam (Visag) | Central SE India | 1. APPM;<br>2. BILT (AP Rayons);<br>3. BILT (Ballarpur);<br>4. BILT (Choudwar);<br>5. BILT (Sewa);<br>6. ITC;<br>7. JK Paper;<br>8. Orient Paper;<br>9. Sirpur; |
| New Mangalore | Central SW India | 1. Harihar Polyfibres;<br>2. Mysore Paper;<br>3. West Coast Paper; |
| Kandla | NW India | 1. Century;<br>2. BILT (Shree Gopal)<br>3. Star Paper<br>4. Central Pulp Mill (JK) |

These ports have the capacity to handle break bulk vessels common in wood chip transport and have deep water channels and berths (> 11m draft). They are also relatively free of congestion (by Indian standards) and may have potential areas for storage of bulk cargos. Though Chennai and Mumbai are larger and more modern ports, they are extremely busy and have virtually no capacity to store bulk goods.

Sailing times from various Australian export locations are given in Table 16. Generally the shipping distance and times are likely to be relatively similar to those from Australia to Japan. Western Australian ports have at least a one day sailing advantage over eastern Australian ports.

Similar information is provided for key ports in competing supplier bases Chile and South Africa. Whilst Australia's existing transport advantage over South America to Japan accentuated to India, South Africa has a major time saving advantage – particularly Kandla and New Mangalore.

**Table 16: Sailing Times (days) from Selected Ports** (*www.distances.com*)

| | Indian Port | | | | Japan |
|---|---|---|---|---|---|
| | Vizag | Tuticorin | Kandla | Mangalore | Iwakuni |
| Victoria/Tasmania | 15-16 | 14-16 | 17-19 | 15-16 | 14-15 |
| SE Queensland | 16-17 | 16-17 | 19-20 | 17-18 | 12-13 |
| SW Western Australia | 11-12 | 10-11 | 13-14 | 11-12 | 13-14 |
| Richards Bay (S Africa) | 12-13 | 12-13 | 11-12 | 11-12 | 21-22 |
| San Antonio (Chile) | 31-32 | 31-32 | 32-33 | 32-33 | 28-29 |

(Note: Times in Days – vessel speed assumed constant 14kt)

Woodchip unloading and storage facilities are currently not available – and in discussion with marketing agents in Chennai and Delhi, lack of these facilities is currently considered a major impediment to import of chips. However, this issue is secondary to inland freight limitations - the technology required is relatively low-tech and given the skilled manufacturing base in India should be easily resolved if required.


**Plate 9: Entrance to Kandla Port, Gujarat State**

***Inland Freight***

Poor road infrastructure and unreliable rail freight make transport of high volume-low value products such as wood fibre very inefficient. Distances from nominated ports to each of the major mills are listed in Table 17.

**Table 17: Approximate Road Distance (km) from Mills to Nearest Port**

| | Nearest Suitable Port | | | |
|---|---|---|---|---|
| | **Vishakhapatnam** | **Kandla** | **New Mangalore** | **Tuticorin** |
| APPM | 200 | | | |
| BILT - AP Rayons | 640 | | | |
| BILT - Ballarpur | 760 | | | |
| BILT - Choudwar | 430 | | | |
| BILT - Sewa | 220 | | | |
| BILT - Shree Gopal | | 1330 | | |
| Century | | 1390 | | |
| Grasim Industries | | | 200 | |
| Hindustan Newsprint | | | | 400 |
| ITC Bhadrachalam | 490 | | | |
| JK Raygada | 190 | | | |
| Mysore | | | 180 | |
| Orient | 920 | | | |
| Seshasayee | | | | 430 |
| Shree Vinhya | | 890 | | |
| Sirpur | 820 | | | |
| Star | | 1330 | | |
| TNPL | | | | 430 |
| West Coast | | | 390 | |

Whilst possibly less costly than road transport, there appears to be some reluctance by pulp mills to utilise rail services for transport of raw materials. Dealings with Government controlled rail freight operators are viewed by suppliers as bureaucratic and complicated.

India has an extensive road network. The Central Government maintain a dual carriageway national highway network linking east and west coast and north to south. Various state governments manage highways and main roads. Local government and village councils are responsible for administering minor and village roads.

Freight is generally limited to small 24 tonne capacity trucks. These are widely utilised throughout India for anything other than short haul distances close to ports. Larger loads (30 tonnes plus) were viewed on 'conventional' type log trucks from Kandla Port to local mills, but taking these vehicles further inland may be complicated by traffic congestion in villages and capacity of road design.


Plate 10: 30 tonne truck, Kandla Port, Gujarat State.


Plate 11: 24 tonne truck, Back Road, Andhra Pradesh State.

No trucks fitted specifically to carry wood chip material currently exist in India for transport from port to mills. As per port infrastructure limitations, this is viewed as a major limiting factor by import marketing agents. Given the volume of grain and other agricultural produce transported to ports in 24 tonne 'bin' type trucks, only relatively minor modifications should be required by transport contractors to adapt to chip material if an opportunity to sell this type of material arises.

Given the size of trucks available, discussion regarding current likely transport cost seemed to indicate that Indian road freight rates are generally lower than Australia, however no specific information regarding this was gathered – and it would be reasonable to work with Australian road transport costs in the absence of better information. This said, there was a clear price saving expressed for using dual purpose trucks capable of back-carting other materials to the port rather than returning empty over long distances.

## SECTION 5: OTHER PRODUCTS

There is considerable market demand for other related forest products which may be produced from *Eucalyptus* plantation wood. These include pulp and paper related products and non-related wood products.

*Paper Related Products*

Products related to paper manufacturing include logs and market pulp. Market pulp is far easier to transport than wood chips. Many mills already import pulp as a percentage of their intake as outlined in Appendix A. Comment by ITC Pulp and Specialty Papers Division is that the cost of imported pulp is significantly higher than the price they are able to manufacture in-house. Given the limitation on raw materials for in-house manufacturing, the relative cost may be irrelevant to some extent.

To help counter the high cost of third party supplied pulp, Indian paper companies themselves have started to move their raw material investments offshore. BILT have begun a massive planting program in Malaysia, Aditya Birla own both plantations and pulping facilities in Thailand, Laos and Canada and other companies are also eying potential investments in Indonesia, Myanmar and other Asian countries where land for plantations is more readily available.

Opportunities may exist to attract foreign direct investment both in plantation development and downstream processing by Indian companies. Discussions during my field visit reflected considerable interest in exploring the price of land, potential obstacles to investment and areas which may be suitable for plantation growth.

As described earlier in this paper, whole log imports are already an important source of raw materials for many industries in India – though paper manufacturers are still only a minor contributor to this. Whilst most supplies are of tropical hardwoods and pine, there was considerable interest from agents, mills and suppliers regarding potential eucalyptus log supply. Although this is not the preferred option for most Australian companies, in the short term it may be an immediate way to access the Indian market and provide an avenue for building relationships for future chip supply arrangements.

*Non Paper Related - Plywood*

Both eucalypt and poplar are used extensively in the Indian plywood industry. Generally these species are utilised in core material, with facing sheets of tropical species such as teak, sal and meranti glued on outer layers. Domestic prices available for both logs and plywood sheets are considerably higher than those for pulp logs, with over $100 US for eucalyptus logs being a commonly quoted benchmark.

Unlike the pulp and paper industry, many plywood mills are already located near existing ports. AMUL Plywood's facilities were visited whilst in Kandla. This company has been located specifically to take advantage of imported timber including pine and tropical hardwood.

Almost every agent visited wanted information on material which might be available from Australia to service the plywood industry – and similarly to whole log pulp log imports, this may serve as a way for Australian companies to develop a trading relationship with India.

*Non Paper Related – Other*

Although clonal forestry plantations are extremely successful in many parts of India, seedling based plantations still form by far the majority of plantations by area. A major limitation in seedling plantation expansion has been availability of good quality seed orchard *E.tereticornis* seed. As a result, collection from unknown provenances is common and the resultant quality of plantations is variable. There is real interest by a number of growers in exploring potential genetics of Australian forest supplies and in purchasing any good quality seed which may be available. Price was not discussed.

Another important silvicultural issue was weed control – at this point, virtually no chemical weed control is used in Indian plantations. There did not appear to be a great deal of knowledge regarding post plant chemical weed control options as commonly used in Australian plantations. As a result almost all post planting weed control is carried out manually. There would be scope for Australian chemical suppliers to work with bigger companies to develop prescriptions suitable for Indian conditions.

*Clonal and Farm Forestry Research & Development*

India is not a country often cited for its advances in clonal forestry; however the results companies such as ITC in Bhadrachalam have achieved with eucalypts for pulp production are considerable. By improving growth rates, they have successfully reduced the rotation length from clonal sites to less than five years – as opposed to the seven to twelve year

rotations from seedlings. This has greatly broadened the appeal of forestry crops to farmers, making the return on investment considerably more attractive in terms of both NPV and payback period.

By employing silviculture extension officers, companies have been able to train local farmers regarding commercial tree crops, meaning that these farmers will now actively grow trees alongside other crops of maize, chilli, wheat or tobacco. Paper companies have facilitated a loan scheme to assist farmer finance and mills guarantee off take at the end of the rotation.

As a result farmers now pay full cost for all seedlings and clones grown by companies and establish plantations themselves to feed into local mills.

This is a very different approach to private forestry than that commonly employed in Australia. It is possibly more reflective of Scandinavian forestry systems which revolve far more heavily around community owned forest estates. However the reason it has been possible is that Indian companies have produced a short rotation product at a reasonable price – and that they have put in place adequate staff and nursery infrastructural resources to ensure maximum uptake. There are probably areas of Australia which would be well suited to the type of forestry system in place in India and exchange of knowledge regarding this approach could be valuable.

**Plate 12: ITC *E.tereticornis* Clonal Plantation: Age 3 years, Andhra Pradesh State.**

## CONCLUSIONS

Available supply of hardwood chip from Australia is expected to increase by at least 50% to 2012. Although increasing domestic and Japanese demand may ensure a large part of available resource is utilised, there is likely to be surplus supply capacity – particularly from lower grade native forest material and non *E.globulus* plantations.

India is an attractive export destination given its geographic proximity, economic growth, lack of language barriers and familiarity with eucalypt species. India's population is forecast to surpass China's within the next decade and India's economic growth shows no sign of abating. Whilst population growth alone will lead to substantial total consumption increases, per capita consumption is starting from such a low base, that even a small change spread over such a huge number of people must result in a dramatic impact on total volumes required. Growing demand pressure for wood products and wood fibre in India between 2007 and 2012 is likely to reflect just the start of a long term and significant trend.

There is no question that the Indian market will be increasingly unable to meet a significant part of its raw material requirement from domestic resources. As Indian native forest, bamboo and agricultural residues reach their limits of available supply, Indian pulp and paper manufacturers appear to increasingly need access to new plantation timber.

Import of woodchips by Indian companies has not occurred to date, but the only real obstacle to future trade is price. There are Indian mills, ports, traders, roads and freight options available – but Australian chip supply is perceived as expensive relative to Indian logs. The inland transport distance from available ports is a major contributor to mill gate pricing.

A number of Indian companies are expanding their pulping infrastructure both in India and offshore. Australian companies must exploit all and any opportunity to build relationships with these businesses in order that future investment decisions are made in the context of available supply from Australia.

In summary, Indian companies need wood and have limited capacity to resolve this situation from domestic supply. Australian growers may have surplus capacity of required resource. Logistical solutions need to be found to resolve what on the surface appears to be a relatively straightforward scenario!

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## APPENDIX A: INDEX OF INDIAN WOOD BASED PULP & PAPER MILLS

| | |
|---|---|
| **MILL** | **The Andhra Pradesh Paper Mills Ltd** |
| | |
| **LOCATION** | Rajahmundry, Andhra Pradesh |
| **OWNERSHIP** | Public Listed Company |
| **CAPACITY** | 98,500 TPA |
| | |
| **MILL ADDRESS** | Unit 1 : APPM – Rajahmundry, Andhra Pradesh 533 105 |
| | |
| **DIVISIONAL HQ** | 501 – 509, Swapnalok Complex, 5th Floor, 92/93, Sarojini Devi Road, Secunderabad Andhra Pradesh 500 003 |
| **PHONE** | 040-278 13715 |
| **FAX** | 040-278 13717 |
| **WEBSITE** | www.andhrapaper.com |
| | |
| **PULPING PROCESS** | Kraft |
| **RAW MATERIALS** | Mixed hardwoods & bamboo |
| | |
| **PRODUCTS** | Kraft Paper, Copy Paper, Cream Wove, Poster Paper, Offset Printing Paper, Azure Laid Paper |
| | |
| **NEAREST MAJOR PORTS:** | Kakinada, Visag and Chennai |

**COMMENTS:**

- A major expansion of the APPM pulp mill facilities is underway at present which will upgrade the entire facility to Elemental Chlorine Free grade & boost pulp manufacturing capacity to around 200,000 tonnes per annum.

- APPM are moving from native forest timber and bamboo to raw materials from their 'Social Forestry' program;

- Their focus is largely on *Casuarina* and *Leucaena* species, though *Eucalyptus* hybrid (*E.camaldulensis x E.tereticornis*) also makes up approximately 15% of the planting program;

- In total, APPM estimate the planted estate around their mill at 48,000 hectares with a yield average of 75 tonnes per hectare at harvest (nominally 5 years);

- Current mill door pricing is approximately A$60/GMT for logs;

| | |
|---|---|
| **MILL** | **The Bengal Paper Mill (1989) Co Limited** |
| | |
| **LOCATION** | Dist.Burdwan, West Bengal |
| **OWNERSHIP** | The EMTA Group – Kolkata |
| **CAPACITY** | N/A |
| | |
| **MILL ADDRESS** | P.O.Ballavpur (Ranigani)<br>Dist.Burdwam<br>West Bengal |
| | |
| **DIVISIONAL HQ** | EMTA Group – Kolkata |
| **PHONE** | |
| **FAX** | |
| **WEBSITE** | http://emtagran.com |
| | |
| **PULPING PROCESS** | Kraft |
| **RAW MATERIALS** | N/A |
| | |
| **PRODUCTS** | N/A |
| | |
| **NEAREST MAJOR PORTS:** | Calcutta |

**COMMENTS:**

- The Bengal Paper Mill has been closed since 1999, and was purchased in 2005 by the EMTA group who plan to reopen the pulp and paper facilities in 2009;

- It is unknown what capacity is planned for this mill on reopening, or which raw material supply is likely to be utilized.

| | |
|---|---|
| **MILL** | **Ballarpur Industries – AP Rayons** |
| | |
| **LOCATION** | Kamalapuram, Dist. Warrangal, Andhra Pradesh |
| **OWNERSHIP** | Thapar Group |
| **CAPACITY** | 100,000 TPA |
| | |
| **MILL ADDRESS** | BILT – AP Rayons Ltd<br>Kamalapuram, Dist Warangal<br>Andhra Pradesh 506 172 |
| | |
| **DIVISIONAL HQ** | Ballarpur Industries Limited<br>First India Place, Tower C, Block A,<br>Mehrauli Gurgaon Road, Gurgaon<br>Haryana 122 002 |
| **PHONE** | 0124-280 4242 |
| **FAX** | 0124-238 9495 |
| **WEBSITE** | www.bilt.com |
| | |
| **PULPING PROCESS** | Prehydrolysis – kraft |
| **RAW MATERIALS** | Bamboo & mixed softwood/hardwood. |
| | |
| **PRODUCTS** | Rayon-grade pulp |
| | |
| **NEAREST MAJOR PORTS:** | Kakinada, Chennai |

**COMMENTS:**

- BILT are the largest manufacturer of pulp and paper products in India;
- The Andhra Pradesh mills utilize combinations of farm forestry plantation grown *Eucalyptus, Leucaena* and *Casuarina spp* plus bamboo sourced from private property;
- BILT facilitate a moderate size farm forestry plantation program using mostly seedling stock. Clonal trials are currently underway with the aim of improving site productivity across their estate.
- Total plantation developments to date– approximately 16,000 hectares total. BILT's long term plan is to facilitate an annual short rotation program of approximately 20,000 hectares/annum.
- Current mill door log pricing is approximately AU$65/GMT for plantation logs in Andhra Pradesh.
- It is understood that BILT are also investing in pulpwood plantations in Malaysia commencing in 2007. Ultimately BILT would hope to manufacture pulp in that country and supplement Indian mills with imported resource.

| | |
|---|---|
| **MILL** | **Ballarpur Industries – Unit Ballarpur** |
| | |
| **LOCATION** | Dist. Chandrapur, Maharashtra |
| **OWNERSHIP** | Thapar Group |
| **CAPACITY** | 134 500 TPA |
| | |
| **MILL ADDRESS** | BILT – Ballarpur Ltd<br>PO Ballarpur Paper Mills<br>Dist. Chandrapur<br>Maharashtra 442 901 |
| | |
| **DIVISIONAL HQ** | Ballarpur Industries Limited<br>First India Place, Tower C, Block A,<br>Mehrauli Gurgaon Road, Gurgaon<br>Haryana 122 002 |
| **PHONE** | 0124-280 4242 |
| **FAX** | 0124-238 9495 |
| **WEBSITE** | www.bilt.com |
| | |
| **PULPING PROCESS** | Kraft |
| **RAW MATERIALS** | Bamboo & mixed hardwood. |
| | |
| **PRODUCTS** | Copy Paper, Ledger Paper, Azure Laid Paper, MICR Paper, Poster Paper |
| | |
| **NEAREST MAJOR PORTS:** | Vishakhapatnam (Visag), Kakinada |

**COMMENTS:**

- BILT are the largest manufacturer of pulp and paper products in India;

- The Andhra Pradesh mills utilize combinations of farm forestry plantation grown *Eucalyptus, Leucaena* and *Casuarina spp* plus bamboo sourced from private property;

- BILT facilitate a moderate size farm forestry plantation program using mostly seedling stock. Clonal trials are currently underway with the aim of improving site productivity across their estate.

- Total plantation developments to date– approximately 16,000 hectares total. BILT's long term plan is to facilitate an annual short rotation program of approximately 20,000 hectares/annum.

- It is understood that BILT are also investing in pulpwood plantations in Malaysia commencing in 2007. Ultimately BILT would hope to manufacture pulp in that country and supplement Indian mills with imported resource.

| | |
|---|---|
| **MILL** | **Ballarpur Industries – Unit Choudwar** |
| | |
| **LOCATION** | Dist. Cuttack, Orissa |
| **OWNERSHIP** | Thapar Group |
| **CAPACITY** | 22 000 TPA |
| | |
| **MILL ADDRESS** | BILT – Ballarpur Ltd<br>PO Daultabad,<br>Dist Cuttack<br>Orissa 754 026 |
| | |
| **DIVISIONAL HQ** | Ballarpur Industries Limited<br>First India Place, Tower C, Block A,<br>Mehrauli Gurgaon Road, Gurgaon<br>Haryana 122 002 |
| **PHONE** | 0124-280 4242 |
| **FAX** | 0124-238 9495 |
| **WEBSITE** | www.bilt.com |
| | |
| **PULPING PROCESS** | Kraft and soda |
| **RAW MATERIALS** | Bamboo & mixed hardwood. |
| | |
| **PRODUCTS** | Kraft Paper, Cream Wove, Duplicating Paper, Other Board |
| | |
| **NEAREST MAJOR PORTS:** | Calcutta, Vishakhapatnam (Visag) |

**COMMENTS:**

- BILT are the largest manufacturer of pulp and paper products in India;
- The Andhra Pradesh mills utilize combinations of farm forestry plantation grown Eucalyptus, Leucaena and Casuarinas plus bamboo sourced from private property;
- BILT facilitate a moderate size farm forestry plantation program using mostly seedling stock. Clonal trials are currently underway with the aim of improving site productivity across their estate.
- Total plantation developments to date– approximately 16,000 hectares total. BILT's long term plan is to facilitate an annual short rotation program of approximately 20,000 hectares/annum.
- It is understood that BILT are also investing in pulpwood plantations in Malaysia commencing in 2007. Ultimately BILT would hope to manufacture pulp in that country and supplement Indian mills with imported resource.

| | |
|---|---|
| **MILL** | **Ballarpur Industries – Unit Sewa** |
| | |
| **LOCATION** | Dist. Koratpur, Orissa |
| **OWNERSHIP** | Thapar Group |
| **CAPACITY** | 72,000 TPA |
| | |
| **MILL ADDRESS** | BILT – Ballarpur Ltd<br>Unit Sewa,<br>Gagnapur<br>PO Jeypore<br>Dist.Koratpur,<br>Orissa 746 002 |
| | |
| **DIVISIONAL HQ** | Ballarpur Industries Limited<br>First India Place, Tower C, Block A,<br>Mehrauli Gurgaon Road, Gurgaon<br>Haryana 122 002 |
| **PHONE** | 0124-280 4242 |
| **FAX** | 0124-238 9495 |
| **WEBSITE** | www.bilt.com |
| | |
| **PULPING PROCESS** | Kraft |
| **RAW MATERIALS** | Bamboo, mixed hardwood, softwood & rice straw |
| | |
| **PRODUCTS** | Copy Paper, Cream Wove, Maplitho |
| | |
| **NEAREST MAJOR PORTS:** | Calcutta, Vishakhapatnam (Visag) |

**COMMENTS:**

- BILT are the largest manufacturer of pulp and paper products in India;

- The Andhra Pradesh mills utilize combinations of farm forestry plantation-grown *Eucalyptus, Leucaena* and *Casuarina spp* plus bamboo sourced from private property;

- BILT facilitate a moderate size farm forestry plantation program using mostly seedling stock. Clonal trials are currently underway with the aim of improving site productivity across their estate.

- Total plantation developments to date– approximately 16,000 hectares total. BILT's long term plan is to facilitate an annual short rotation program of approximately 20,000 hectares/annum.

- It is understood that BILT are also investing in pulpwood plantations in Malaysia commencing in 2007. Ultimately BILT would hope to manufacture pulp in that country and supplement Indian mills with imported resource.

| | |
|---|---|
| **MILL** | **Ballarpur Industries – Unit Shree Gopal** |
| | |
| **LOCATION** | Dist. Yamunanagar, Haryana |
| **OWNERSHIP** | Thapar Group |
| **CAPACITY** | 53 868 TPA |
| | |
| **MILL ADDRESS** | BILT – Ballarpur Ltd<br>Unit Shree Gopal,<br>PO Yamunanagar,<br>Dist.Yamunanagar<br>Haryana 135 01 |
| | |
| **DIVISIONAL HQ** | Ballarpur Industries Limited<br>First India Place, Tower C, Block A,<br>Mehrauli Gurgaon Road, Gurgaon<br>Haryana 122 002 |
| **PHONE** | 0124-280 4242 |
| **FAX** | 0124-238 9495 |
| **WEBSITE** | www.bilt.com |
| | |
| **PULPING PROCESS** | Kraft |
| **RAW MATERIALS** | Bamboo & mixed hardwood. |
| | |
| **PRODUCTS** | Bond Paper, Cream Wove, Laminating Paper, Tissue Paper |
| | |
| **NEAREST MAJOR PORTS:** | Kandla |

**COMMENTS:**

- BILT are the largest manufacturer of pulp and paper products in India;

- The Andhra Pradesh mills utilize combinations of farm forestry plantation grown *Eucalyptus, Leucaena* and *Casuarina spp* plus bamboo sourced from private property;

- BILT facilitate a moderate size farm forestry plantation program using mostly seedling stock. Clonal trials are currently underway with the aim of improving site productivity across their estate.

- Total plantation developments to date– approximately 16,000 hectares total. BILT's long term plan is to facilitate an annual short rotation program of approximately 20,000 hectares/annum.

- It is understood that BILT are also investing in pulpwood plantations in Malaysia commencing in 2007. Ultimately BILT would hope to manufacture pulp in that country and supplement Indian mills with imported resource.

| | |
|---|---|
| **MILL** | **Century Pulp and Paper** |
| | |
| **LOCATION** | Nainital, Uttaranchal |
| **OWNERSHIP** | Century Textile and Industries Ltd (Public Limited Company) |
| **CAPACITY** | 153 170 TPA |
| | |
| **MILL ADDRESS** | Ghanshyamdham Lalkua,<br>Dist.Naintal<br>Uttaranchal 262 402 |
| | |
| **DIVISIONAL HQ** | 11th Floor Industry House,<br>10 Camac Street<br>Kolkata 700 017 |
| **PHONE** | 033-228 24721 |
| **FAX** | 033-228 21069 |
| **WEBSITE** | www.centurypaperindia.com |
| | |
| **PULPING PROCESS** | Kraft |
| **RAW MATERIALS** | Softwood, hardwood, bamboo, bagasse, & imported pulp |
| | |
| **PRODUCTS** | Writing and Printing Paper, Rayon Grade Paper & Rayon Pulp |
| | |
| **NEAREST MAJOR PORTS:** | Kandla |

**COMMENTS:**

- Century Pulp and Paper manufacture approximately 31,000 tonnes of Rayon grade pulp for textile manufacture and 37,000 tonnes of writing and printing paper from wood based pulp manufactured in the Uttaranchal mill;

- Century Textile and Industries Ltd is owned by the Aditya Birla Group whom also own Grasim Industries – Harihar Polyfibres. Relationships between the various Birla family companies are complex;

- Rayon Grade pulp production is consumed in Grasim Industries' Viscose Staple Fibre plant.

- Plans for mill upgrades are unknown;

- The scale of captive farm forestry facilitated by Century is unknown;

| | |
|---|---|
| **MILL** | **Grasim Industries – Harihar Polyfibres** |
| | |
| **LOCATION** | Kumarpatnum, Dist.Haveri, Karnataka |
| **OWNERSHIP** | Grasim Industries Ltd (Aditya Birla Group) |
| **CAPACITY** | 81 600 TPA |
| | |
| **MILL ADDRESS** | Unknown |
| | |
| **DIVISIONAL HQ** | Grasim Industries Limited<br>Grasilene Division and Harihar Polyfibres<br>Harihar, Dist Haveri<br>Karnataka 581 123 |
| **PHONE** | 08 36 842637 |
| **FAX** | 08 36 842465 |
| **WEBSITE** | www.birlaviscose.com |
| | |
| **PULPING PROCESS** | Pre-hydrolysis kraft |
| **RAW MATERIALS** | *Eucalyptus* and bamboo |
| | |
| **PRODUCTS** | Rayon Grade Pulp |
| | |
| **NEAREST MAJOR PORTS:** | Mangalore, Cochin |

**COMMENTS:**

- This facility is largely dependent on farm forestry eucalypt plantation operations for resource supply.

- Harihar Polyfibres and Grasim Industries are owned by the giant Indian multinational company – Aditya Birla Group. Aditya Birla is the world's largest producer of viscose staple fibre. The company is also an international market leader in production of palm oil, aluminum, copper, insulators, black carbon, cement and insurance.

- Aditya Birla also control two pulp mills in Canada – AV Cell Incorporated and AV Nackawic Incorporated;

- Grasim Industries recently announced plans to construct another Rayon grade pulp facility in Laos along with a 50,000 hectare eucalyptus plantation estate on land leased from the Government of Laos.

- Expansion plans in India are unknown.

| | |
|---|---|
| **MILL** | **Hindustan Newsprint Mills** |
| | |
| **LOCATION** | Kottayam, Kerala |
| **OWNERSHIP** | Hindustan Paper Corporation Ltd, Govt of India |
| **CAPACITY** | 112 200 TPA |
| | |
| **MILL ADDRESS** | PO Newsprint Nagar,<br>Mavellor<br>Dist.Kottayam<br>Kerala 686 616 |
| | |
| **DIVISIONAL HQ** | 4th Floor, South Tower,<br>Scope Minar,<br>Laxmi Nagar District Centre<br>New Delhi 110 092 |
| **PHONE** | 011-220 46250 |
| **FAX** | 001-224 64547 |
| **WEBSITE** | www.hindpaper.com |
| | |
| **PULPING PROCESS** | 80% Chemi-mechanical – 20% chemical |
| **RAW MATERIALS** | Reeds, bamboo, *Eucalyptus, Acacia spp* |
| | |
| **PRODUCTS** | Newsprint, Duplicating Paper, Offset Printing Paper |
| | |
| **NEAREST MAJOR PORTS:** | Tuticorin, Mangalore, Cochin |

**COMMENTS:**

- Hindustan Newsprint Mills (HNL) are owned by the Central Government of India along with 3 other mills in Assam and Nagaland.

- Total capacity of the four mills combined is nearly 350,000 tonnes per annum, making it one of the biggest paper manufacturers in India.

- HNL have priority access to government bamboo and hardwood resources – in addition to farm forestry and community initiatives, 5600 ha of captive plantation estate is also under management – land area which would not be available to private growers.

- The Hindustan Paper Corporation is currently reviewing options to upgrade capacity at Hindustan Newsprint Mills.

| | |
|---|---|
| **MILL** | **ITC Limited – Paperboards & Specialty Papers Division** |
| | |
| **LOCATION** | Bhadrachalam, Andhra Pradesh |
| **OWNERSHIP** | Public Listed Company |
| **CAPACITY** | 300,000 TPA |
| | |
| **MILL ADDRESS** | P.B. No 4, Sarapaka Village,<br>Bhadrachalam, Andhra Pradesh 507 128 |
| | |
| **DIVISIONAL HQ** | 106, Sardar Patel Road, Secunderabad, Andhra Pradesh 500 003 |
| **PHONE** | 040-278 46566 |
| **FAX** | 040-278 49509 |
| **WEBSITE** | www.itcpspd.com |
| | |
| **PULPING PROCESS** | Chemical with elemental chlorine free bleaching |
| **RAW MATERIALS** | Mixed hardwood, bamboo, pulp & waste paper. |
| | |
| **PRODUCTS** | Laminated Board, Laminating Paper, Cigarette Paper. |
| | |
| **NEAREST MAJOR PORTS:** | Kakinada, Vishakhapatnam (Visag), Chennai |

**COMMENTS:**

- ITC also own 3 much smaller pulp and paper manufacturing facilities in Andhra Pradesh, West Bengal and Tamil Nadu states;
- The Bhadrachalam facility currently produces 100,000 tonnes of ECF pulp which will increase to 200,000 tonnes in 2007 and 400,000 tonnes by 2010.
- ITC are a national leader in development of clonal *Eucalyptus, Casuarina* and *Leucaena* plantations.
- Indications were received that ITC were considering moving away from bamboo and concentration on subabul and eucalypts.
- The company have overseen development of more than 40,000 ha of farm forestry plantations since 1992;
- Aim to promote an annual planting regime of approximately 9,000 hectares per annum by 2007 on 45,000 hectares of land with a nominal 4 year rotation length.

| | |
|---|---|
| **MILL** | **JK Paper Ltd** |
| | |
| **LOCATION** | Dist.Raygada, Orissa |
| **OWNERSHIP** | Public Limited Company |
| **CAPACITY** | 103 000 TPA |
| | |
| **MILL ADDRESS** | J.K.Paper Mills,<br>Jaykaypur<br>Dist.Raygada,<br>Orissa 765 017 |
| | |
| **DIVISIONAL HQ** | PO Central Pulp Mills,<br>Fort Songadh,<br>Dist Surat<br>Gujarat 394 660 |
| **PHONE** | 02 624 221228 |
| **FAX** | 02 624 221138 |
| **WEBSITE** | www.jkpaper.com |
| | |
| **PULPING PROCESS** | kraft |
| **RAW MATERIALS** | Mixed hardwood & bamboo |
| | |
| **PRODUCTS** | Bond Paper, Copy Paper, Ledger Paper, Maplitho, Poster Paper, MICR Paper |
| | |
| **NEAREST MAJOR PORTS:** | Calcutta, Vishakhapatnam (Visag) |

**COMMENTS:**

- JK Paper is part of the diversified Indian JK Group which also includes investments in tyres, cement, fenner, sugar and seeds.

- JK also own a smaller integrated pulp and paper mill in Gujarat – Central Pulp Mills (~ 50,000 tpa).

- The company has announced a capacity expansion across its two mills of 50,000 tonnes per annum which will take paper production to 200,000 tonnes per year. It is unknown whether this is based on internally manufactured or purchased pulp.

- JK run social and farm forestry plantation programs in Orissa and Andhra Pradesh covering a total area of around 27,000 hectares;

- Planting stock is a mix of seedling and clonal trees – with claimed average growth of 60 tonne/ha vs 150 tonne/ha respectively on 7 year rotations.

| | |
|---|---|
| **MILL** | **The Mysore Paper Mills Ltd** |
| | |
| **LOCATION** | Bhadravathi, Karnataka |
| **OWNERSHIP** | Government of Karnataka |
| **CAPACITY** | 105, 000 TPA |
| | |
| **MILL ADDRESS** | The Mysore Paper Mills Ltd,<br>Paper Town Post,<br>Bhadravathi,<br>Karnataka 577 302 |
| | |
| **DIVISIONAL HQ** | 16/4, Ali Asker Road,<br>PB No 112,<br>Bangalore<br>Karnataka 560 052 |
| **PHONE** | 91-080-226 2334 |
| **FAX** | 91-080-225 3478 |
| **WEBSITE** | www.mysorepaper.com |
| | |
| **PULPING PROCESS** | Kraft and cold soda refiner mechanical |
| **RAW MATERIALS** | Pulp, bamboo, bagasse, mixed hardwood and softwood |
| | |
| **PRODUCTS** | Kraft Paper, Writing & Printing Paper, Newsprint |
| | |
| **NEAREST MAJOR PORTS:** | Mangalore |

**COMMENTS:**

- Mysore Paper traditionally utilizes bagasse sourced from sugar mills, but also has an afforestation program on approximately 30,000 hectares of leased land in Karnataka;

- The Government of Karnataka is understood to be reviewing options for privatising the company.

| | |
|---|---|
| **MILL** | **Orient Paper Mills** |
| | |
| **LOCATION** | Dist Shahdol, Orissa |
| **OWNERSHIP** | GP / CK Birla Group Company |
| **CAPACITY** | 85 000 TPA |
| | |
| **MILL ADDRESS** | PO Amlai Paper Mills,<br>Dist.Shahdol<br>Madhya Pradesh 484 117 |
| | |
| **DIVISIONAL HQ** | Bhoinagar,<br>Bhubaneshwar<br>Orissa 751 012 |
| **PHONE** | 0674-240 6930 |
| **FAX** | 0674-241 9664 |
| **WEBSITE** | www.orientpaperindia.com |
| | |
| **PULPING PROCESS** | Kraft |
| **RAW MATERIALS** | Imported pulp, bamboo, mixed softwood & hardwood |
| | |
| **PRODUCTS** | Maplitho, Writing & Printing Paper, Absorbent Paper, Tissue Paper, Azure Laid Paper, Poster Paper |
| | |
| **NEAREST MAJOR PORTS:** | Mumbai, Kandla, Vishakhapatnam (Visag) |

**COMMENTS:**

- Orient Paper Mills are believed to be planning a capacity upgrade of 30,000 tonnes per annum.
- Orient do not current manage an afforestation program & purchase all timber from 3rd parties.
- Orient Paper Mills are controlled by GP & CK Birla Group. Relationships between the various Birla family companies are complex, however this mill is understood to operate independently of the Aditya Birla.

| | |
|---|---|
| **MILL** | **Seshasayee Paper & Boards Limited** |
| | |
| **LOCATION** | Erode, Namakkal Dist, Tamil Nadu |
| **OWNERSHIP** | Public Limited Company |
| **CAPACITY** | 122 000 TPA |
| | |
| **MILL ADDRESS** | Pallipalayam,<br>Cauvery, RSPO.,<br>Erode, Dist.Namakkal<br>Tamil Nadu 638 007 |
| | |
| **DIVISIONAL HQ** | Pallipalayam,<br>Cauvery, RSPO.,<br>Erode, Dist.Namakkal<br>Tamil Nadu 638 007 |
| **PHONE** | 04288-240 221 |
| **FAX** | 04288-240 229 |
| **WEBSITE** | www.spbltd.com |
| | |
| **PULPING PROCESS** | Kraft |
| **RAW MATERIALS** | Mixed hardwood, bagasse, waste paper, imported pulp |
| | |
| **PRODUCTS** | Kraft Paper, Artpaper, Copier Paper, Cream Wove, Ledger Paper, Maplitho, Absorbant Paper, Azure Laid Paper, Duplicating Paper, Offset Printing Paper, Poster Paper |
| | |
| **NEAREST MAJOR PORTS:** | Chennai, Tuticorin |

**COMMENTS:**

- Seshasayee Paper (SPB) is part of the ESVIN Group, headquartered in Chennai. The group has also invested in sugar, high energy batteries, biotech research and engineering project consulting.

- It is unknown whether SPB manage their own plantation program, however they do secure pulpwood from TAFCORN – Tamil Nadu Forest Plantation Corporation Ltd – who manage a 45,000 hectare estate of *Eucalyptus tereticornis* and *Eucalyptus camadulensis*.

- TAFCORN supply both SPB and Tamil Nadu Newsprint Mills as their two primary customers with approximately 100,000 tonnes per annum;

- The TAFCORN estate is managed on a seven year rotation – producing on average 140 tonnes per hectare.

| | |
|---|---|
| **MILL** | **Shree Vindhya Paper Mills Ltd** |
| | |
| **LOCATION** | Dist Jalgoan, Maharashtra |
| **OWNERSHIP** | Public Limited Company |
| **CAPACITY** | 33 000 TPA |
| | |
| **MILL ADDRESS** | Somani Nagar,<br>Duskheda,<br>Via-Bhusawal<br>Dist Jalgoan,<br>Maharashtra 425 203 |
| | |
| **DIVISIONAL HQ** | Indian Mercantile Chambers,<br>3rd Floor, 14 R Kamani Marg.,<br>Ballard Estate, Mumbai<br>Maharashtra 400 001 |
| **PHONE** | 022-226 12557 |
| **FAX** | 022-563 14186 |
| **WEBSITE** | |
| | |
| **PULPING PROCESS** | Kraft |
| **RAW MATERIALS** | Mixed hardwood, waste paper, imported pPulp |
| | |
| **PRODUCTS** | Bond Paper, Carbon Paper, Cream Wove, Ledger Paper, Tissue Paper |
| | |
| **NEAREST MAJOR PORTS:** | Mumbai |

**COMMENTS:**

| | |
|---|---|
| **MILL** | **The Sirpur Paper Mills Ltd** |
| | |
| **LOCATION** | Dist.Adilabad, Andhra Pradesh |
| **OWNERSHIP** | Public Limited Company |
| **CAPACITY** | 83 550 TPA |
| | |
| **MILL ADDRESS** | PO Sirpur,<br>Kaghaznagar,<br>Dist Adilabad,<br>Andhra Pradesh 504 296 |
| | |
| **DIVISIONAL HQ** | UCO Bank Building,<br>3rd Floor, Parliament Street,<br>New Delhi, 110 001 |
| **PHONE** | 011-237 22200 |
| **FAX** | 001-237 18447 |
| **WEBSITE** | www.sirpurpaper.com |
| | |
| **PULPING PROCESS** | Kraft |
| **RAW MATERIALS** | Bamboo, mixed hardwood and softwood, cotton linters, imported pulp, imported waste paper |
| | |
| **PRODUCTS** | Kraft Paper, Artpaper, Absorbent Paper, Poster Paper, Azure Laid Paper, Offset Printing Paper |
| | |
| **NEAREST MAJOR PORTS:** | Vishakhapatnum (Visag), Kakinada, Chennai |

**COMMENTS:**

Sirpur Paper Mills has embarked on a program to increase capacity by 51,000 tonnes per annum.

| | |
|---|---|
| **MILL** | **Star Paper Mills Ltd** |
| | |
| **LOCATION** | Saharanpur, Uttar Pradesh |
| **OWNERSHIP** | Duncan Goenka Group |
| **CAPACITY** | 64 250 TPA |
| | |
| **MILL ADDRESS** | Star Paper Mills Ltd,<br>Set B.D.,<br>Bajoria Marg<br>Saharanpur,<br>Uttar Pradesh 247 001 |
| | |
| **DIVISIONAL HQ** | 27 Biplabi Trailokya,<br>Maharaj Sarani,<br>Kolkata<br>West Bengal 700 001 |
| **PHONE** | 033-224 27380 |
| **FAX** | 033-224 27383 |
| **WEBSITE** | |
| | |
| **PULPING PROCESS** | Kraft |
| **RAW MATERIALS** | Bamboo, softwood, hardwood, waste paper, imported pulp |
| | |
| **PRODUCTS** | Kraft Paper, Copy Paper, Ledger Paper, Poster Paper, Azure Laid Paper, Offset Printing Paper. |
| | |
| **NEAREST MAJOR PORTS:** | Kandla, Vishakhapatnam (Visag) |

**COMMENTS:**

| | |
|---|---|
| **MILL** | **Tamil Nadu Newsprint and Papers Ltd** |
| | |
| **LOCATION** | Karur Dist.,Tamil Nadu |
| **OWNERSHIP** | Govt of Tamil Nadu Enterprise |
| **CAPACITY** | 230 000 TPA |
| | |
| **MILL ADDRESS** | Kagithapuram,<br>Karur Dist.,<br>Tamil Nadu 639 136 |
| | |
| **DIVISIONAL HQ** | 67 Mount Road,<br>Guindy, Chennai<br>Tamil Nadu, 600 032 |
| **PHONE** | 044-233 01094 |
| **FAX** | 044-223 50834 |
| **WEBSITE** | www.tnpl.co.in |
| | |
| **PULPING PROCESS** | Kraft and Mechanical |
| **RAW MATERIALS** | Bagasse, mixed hardwood, imported pulp, imported logs, |
| | |
| **PRODUCTS** | Copy Paper, Maplitho, Writing Paper, Newsprint, Lottery Paper, Offset Printing Paper |
| | |
| **NEAREST MAJOR PORTS:** | Chennai, Tuticoran |

**COMMENTS:**

- Expansion plans includes a new ECF hardwood pulp mill of approximately 100,000 TPA. The mill upgrade – including the new hardwood pulp facility, will be completed by September 2006;

- TNPL have during early 2006 released a tender for supply of 30,000 tonnes of imported eucalyptus woodchip material. This is believed to be the first tender of its kind in India;

- As TNPL has been historically driven by supply of bagasse, it is not believed that they manage their own hardwood plantation program.

- TNPL are a major customer of TAFCORN – Tamil Nadu Forest Plantation Corporation Ltd – who manage a 45,000 hectare estate of *Eucalyptus tereticornis* and *Eucalyptus camadulensis*.

- TAFCORN supply both Seshasayee Paper & Boards Limited and Tamil Nadu Newsprint Mills as their two primary customers with approximately 100,000 tonnes per annum;

- The TAFCORN estate is managed on a seven year rotation – producing on average 140 tonnes per hectare.

| | |
|---|---|
| **MILL** | **Titagarh Paper Mills** |
| | **(2 Mills)** |
| **LOCATION** | Kakinara, West Bengal |
| **OWNERSHIP** | Public Limited Company |
| **CAPACITY** | 60 000 TPA (no 1 & no 2 mills combined) |
| | |
| **MILL ADDRESS** | Kakinara,<br>West Bengal |
| | |
| **DIVISIONAL HQ** | 113 Park Street,<br>Kolkata<br>West Bengal, 700 016 |
| **PHONE** | 033-222 95542 |
| **FAX** | 033-222 60437 |
| **WEBSITE** | www.titagarhindustries.com/paper_mills.htm |
| | |
| **PULPING PROCESS** | Kraft |
| **RAW MATERIALS** | Waste paper, hardwood, bamboo |
| | |
| **PRODUCTS** | Duplex Board, Triplex Board, Maplitho, Colour Printing Paper, Cartridge Paper, Project Poster Paper, Kraft Paper, Stamp Base Paper |
| | |
| **NEAREST MAJOR PORTS:** | Calcutta |

**COMMENTS:**

- Titagarh Industries is a diversified industrial group with interests in paper, steel, valves and rubber;

- Information available from the company website suggests Titagarh intend to upgrade the number 1 mill and relocate the number 2 mill to Myanmar. Total Indian production would increase to 100,000 TPA. Raw material for the new line is likely to be recycled paper;

- Information received independently during April 2006 indicates that both facilities may have actually been sold to BILT in late 2005.

| | |
|---|---|
| **MILL** | **The West Coast Paper Mills Ltd** |
| | |
| **LOCATION** | Dandeli, Karnataka |
| **OWNERSHIP** | Public Limited Company |
| **CAPACITY** | 157 750 TPA |
| | |
| **MILL ADDRESS** | Bangur Nagar,<br>Dandeli<br>Karnataka 581 325 |
| | |
| **DIVISIONAL HQ** | Bangur Nagar,<br>Dandeli<br>Karnataka 581 325 |
| **PHONE** | 08 284 2331391 |
| **FAX** | 08 284 2331225 |
| **WEBSITE** | www.westcoastpaper.com |
| | |
| **PULPING PROCESS** | Kraft |
| **RAW MATERIALS** | Softwood, hardwood, waste paper & imported pulp |
| | |
| **PRODUCTS** | Duplex Board/Paper, Kraft Paper, Copy Paper, Cream Wove, Ledger Paper, Maplitho, Writing and Printing Paper, Security Paper, LWC. |
| | |
| **NEAREST MAJOR PORTS:** | Mangalore |

**COMMENTS:**

- West Coast Paper Mills are currently upgrading their pulp and paper lines to increase output whilst improving environmental and economic performance. Production capacity will nearly double to 300,000 tonnes per annum upon completion of these works.

- The main source of raw materials for WCPM is mixed hardwood secured from private growers. Plantation hardwood procurement includes *Eucalyptus, Leucaena* and *Casuarina* species.

- Small amounts of softwood pulp are imported for specialty paper requirements.

## APPENDIX B: ORGANISATIONS VISITED

| Organisation | City | State |
|---|---|---|
| Amul Boards Pvt Ltd | Gandhidham | Gujarat |
| Australian Trade Commission | New Delhi | |
| Australian Trade Commission | Chennai | Tami Nadu |
| Ballarpur Industries, Pulp Division | Hyderabad | Andhra Pradesh |
| Chennai Port Trust | Chennai | Tami Nadu |
| Indian Agro and Recycled Paper Mills Association | New Delhi | |
| ITC Limited, Paperboards & Specialty Papers Division | Bhadrachalam | Andhra Pradesh |
| Kandla Port Trust | Kandla | Gujarat |
| Landmark Veneers Pvt Ltd | Gandhidham | Gujarat |
| Pragati Biotechnologies Clonal Research & Production Centre | Jalandhar | Punjab |
| SBS Paper Recycling Pvt Ltd. | Chennai | Tami Nadu |
| SLK Trade Linc - Timber Imports & Order Suppliers | Gandhidham | Gujarat |
| Sri Murali Krishna & Co, Timber, Plywood & MDF Importers | Chennai | Tami Nadu |
| The Andhra Pradesh Paper Mills Limited | Secunderabad | Andhra Pradesh |
| Universal Paper Export Co, Ltd | New Delhi | |
| Viking Shipping (Chennai) Pvt Ltd | Chennai | Tami Nadu |