



EIB SECTOR PAPERS

FINANCING THE EUROPEAN PULP, PAPER AND BOARD INDUSTRY

This is an abridged version of an internal report

**O. Haltia
Ph. Guinet**

**A. Fürstenberg
E. Bömcke**

J.J. Mertens

J. Holloway

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DEFINITIONS

For different paper grades, see **Appendix 1: PAPER GLOSSARY**

Grammage: a measure of weight of paper (g/m²)
Rotonews: newsprint grade fulfilling requirements of (rotogravure) high-quality colour printing

Operating Margin: Sales - Cost of Goods Sold - Selling, General and Administrative Expenses divided by Sales times 100

RoCE: EBIT/Average Capital Employed times 100

RoE: Net Income/Average Shareholders' Funds times 100

ABBREVIATIONS

BHKP bleached hardwood kraft pulp
BSKP bleached softwood kraft pulp
NBSK northern bleached softwood kraft
BEKP bleached eucalyptus kraft pulp
HWC heavy weight coated paper
LWC light weight coated paper
MFC machine finished coated (lightly coated mechanical paper)
MWC medium weight coated paper
SC supercalendered magazine paper (uncoated mechanical paper)
MC mechanical coated (comprises LWC, MWC, HWC and MFC)
sob solid over bark
MF machine finished
TMP thermomechanical pulp
CTMP chemithermomechanical pulp

UNITS

m³/ha/y yield
m/min machine speed (metres per minute)
g/m² grammage (grammes per square metre)
Mt million tons
kt 1000 tons

Main Sources:

EIB Data Banks
FAO
IIED
INDUFOR
Jaakko Pöyry
Wood Resources International Inc.
PPI
CEPI

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EXECUTIVE SUMMARY

The Sector:¹

- **Paper Consumption - Volume Growing Strongly.** The world paper market has grown from 43 Mt/a in 1950 to the current level of 268 Mt/a at an average rate of 4.3%/a or 5.1 Mt/a. While its present relative growth is actually slowing down (2.9 %/a), its annual volume growth is still increasing (+7.1 Mt/a in 1995). With maturing of the industry during the next two decades, it is likely that the volume growth will also start to decrease.
- **Large Industry World-Wide and in the EU.** The world-wide turnover of the pulp, paper and board industry is in the region of ECU 200 bn per annum, of which the European industry accounts for 26% (ECU 52 bn). The industry generates some 2.5% of the world's industrial production. The relative importance of the industry varies between regions, but the sector is responsible for 1.9-3.3 % of manufacturing employment in such countries as the USA, Japan and Germany, while a major employment contribution with 7-9% share of manufacturing employment is generated by the industry in Scandinavia and Canada.
- **Mill Size is Growing.** The annual investments of the European pulp, paper and board industry amount to some ECU 7 bn. The industry is very capital intensive and a typical investment cost for a paper mill is about ECU 500 million and for a modern pulp mill ECU 800 million. Due to technological development and economies of scale, the average size of new mills is still growing by some 3-5%/a. Whether smaller size mills (mini-mills) would become more adapted to the market in the future, remains to be studied.
- **Cyclicity - Fluctuating Annual Result.** Mainly due to price volatility of pulp and paper products, considerable variations in sales are typical for the industry. The industry frequently scores excellent results at cyclical peaks, being perhaps a moderate performer in average terms over cycles.

Market:

- **EU(15) - a Significant Paper Exporter.** The paper production capacity in the EU(15) is some 50% larger than the capacity of EU(12). While EU(12) produced only about 76% of its paper consumption, EU(15) is virtually self-sufficient and a net exporter for some 8% (5.5 Mt/a) of its total production (70 Mt/a). Only North America (USA and Canada) is a bigger net exporter with a

¹This report has been written on the basis of the industry structure and data prevailing in 1995.

volume of some 8 Mt/a, while for example Asia (including China and Japan) is a net importer of 9 Mt/a.

- **Tough Competition.** Due to increasing competition in woodfree printing and writing papers from Asian and South American producers, the competitive advantage for most European producers is increasingly in mechanical printing and writing papers as well as in recycled fibre-based grades, including corrugated packaging materials, cartonboard and newsprint, which should be growing at 2-3%/a. Furthermore, the competitive position of Europe is strong in high quality woodfree papers.
- **New Business Opportunities and Substitution.** New office technology will affect the required paper quality and, in consequence, totally new (woodfree) paper qualities are being developed e.g. for colour copying, colour laser, ink-jet and colour facsimile. Electronic media development will limit the growth of newsprint consumption. Paper-based packaging will compete against plastics, but recycling is tending to improve the competitiveness of paper in packaging (despite improving recyclability, or "returnability", of plastics) .
- **Vertical Integration.** In many cases, integration of a pulp mill and paper mill may generate a decisive competitive advantage due to decreased exposure to pulp price fluctuations. There is a high degree of vertical integration in the industry and only around 10-20% of the total pulp output is sold on the open market.

Investment Trends:

- **World-wide Trend: Shift towards New Fibre Baskets.** An increasing number of greenfield pulp mill investments rely on fast-growing plantations only, especially in Asia and South America. The prevailing environmental trend is tending to increase the (opportunity) costs of industrial forest utilisation in high-income countries and decrease the attractiveness of traditional virgin fibre sources. An increase in paper consumption in densely populated areas is likely to justify new investments based on recycled fibre while virgin fibre input will continue to be needed due to fibre degradation in recycling.
- **Technological Development.** Development of technology and products will continue at a steady pace. Especially, energy efficiency in processing (drying) will be improved. With the future introduction of a closed-cycle process, chlorine will eventually come to be used again for bleaching, under strict environmental control. The implementation of alcohol pulping, a revolutionary technology allowing a smaller mill size, has been delayed due to doubts about its economic viability.

- **European Producers.** In the EU countries, investment opportunities are now in the recycled fibre-based paper and board market. Mergers and acquisitions and an upgrading of existing plants are likely to be more common than new greenfield investment. As locations for such greenfield investments to take place, the EU industry is looking to the fast-growing plantation countries. Although technological advance has solved most problems related to environmental performance of mills, environmental upgrading will continue towards closed-cycle solutions. In Eastern Europe, Poland, the Czech Republic and also the Baltic countries can offer a good raw material base for new capacity.

Project appraisal issues

Following issues have special importance in the case of investment appraisal in the paper industry:

- **Corporate strategy.** Although this is a sector in which short term fluctuations play a prominent role (see next point), corporate strategy requires a long term view of the potential of a company and its positioning within the industry. Such issues as degree of diversification, downward integration, marketing conception have an impact on its staying power.
- **Resilience to downturns.** The price volatility and capital intensiveness which characterize this industry necessitate a particularly thorough examination of possible price scenarios and of net cash flow. There may well be some years when selffinancing is not forthcoming or where negative cash flows are to be financed.
- **Cost-competitiveness** is an important element of staying power. It has to be assessed in relation to specific markets and the degree to which the product is more commodity or more specialty oriented.

1 INTRODUCTION

This study was written to provide the Bank with an in-house analysis of this particularly cyclical sector.

The objectives of this study were to give:

- an overview of the sector's present situation;
- an analysis of the Bank's portfolio;
- indications of areas where the Bank's activity would be interesting and useful;
- indications on how the Bank should look at companies and projects of which financing is considered.

This abridged version concentrates on:

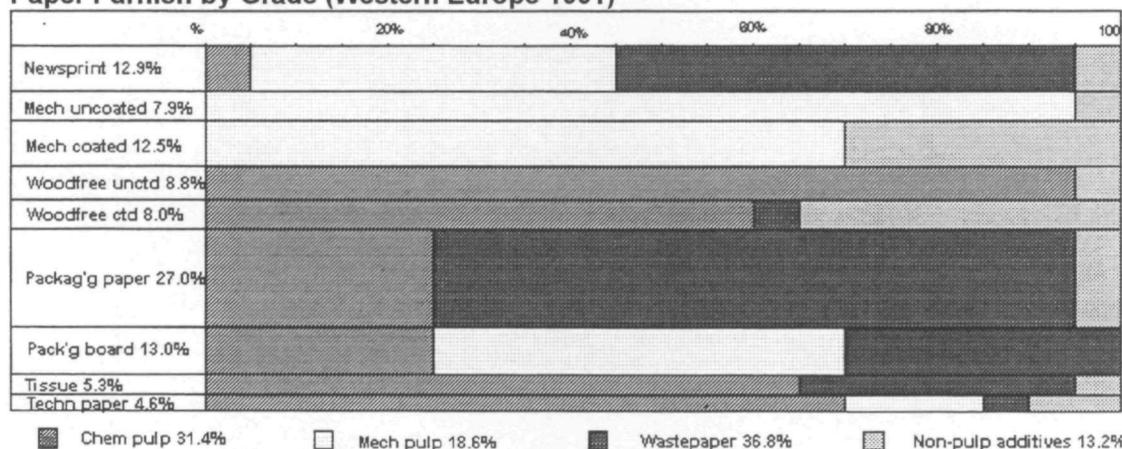
- the overview of the sector, and relevant issues;
- project analysis in the sector.

2 THE SECTOR

2.1. What is paper

Paper is a material made of vegetal fibre (essentially cellulose) mainly extracted from wood (woodpulp) or plants and then recombined either pure, with other fibre, with mineral fillers or with other additives. Paper is used as a printing or writing support, as a packaging material (wrapping or board boxes), as a household help (hygiene, kitchen) or as a technical material (adhesive labels, masking papers in painting, filters, etc...). Yearly per capita consumption generally range from about 20kg (Turkey) to 350kg (USA). In comparison, only steel and cement are more used by weight.

Figure 2.1
Paper Furnish by Grade (Western Europe 1991)



Source: EIB/PJ

Woodpulp is obtained from wood by chemical cooking or mechanical grinding (with or without addition of heat and chemicals). Paper is made by diluting the pulp in water (between 60 to 120 times its weight) and feeding it to a continuous screen (or "wire") where the paper is formed and

water is withdrawn, first mechanically and then by heat. Various fillers and additives can be added, either at the pulping stage or during the process. Paper can also be coated with mineral products, and a particular finish can be obtained by thermal and mechanical means.

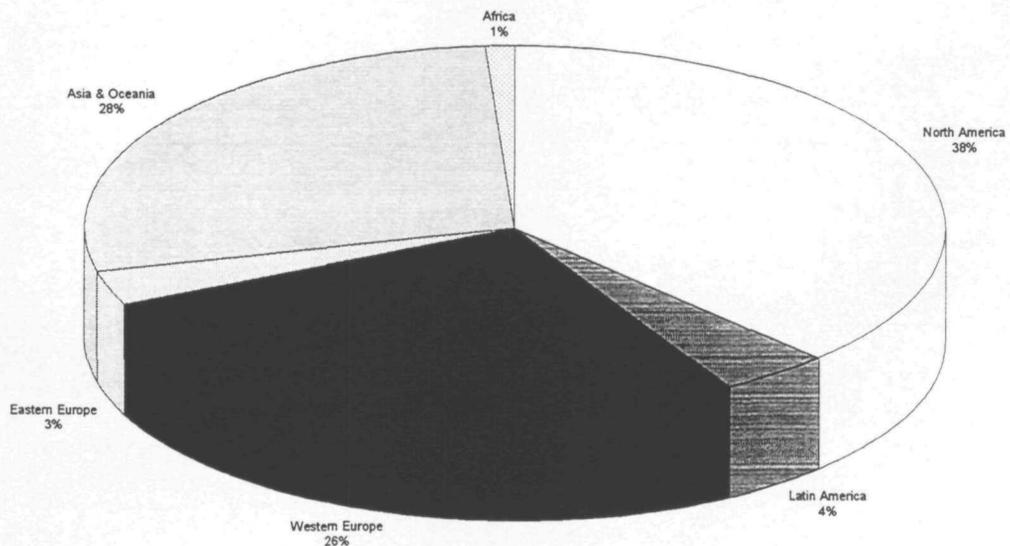
De-inked pulp is obtained by treating and cleaning wastepaper and is then used as a component of paper and board.

2.2 The Pulp, Paper & Board Industry

The world paper and board industry currently produces some 254 Mt/a, with a turnover of about ECU 200 bn. The industry is very capital intensive and a typical investment cost for a modern paper mill (450 kt/a) is about ECU 500 million (ECU 1100/t) and for a modern pulp mill (600 kt/a) about ECU 800 million (ECU 1300/t).²

As a result of many factors to be discussed below, considerable volatility in sales is typical for the industry. In Fortune Magazine's recent review (August 5, 1996) of the world's 500 largest corporations, the forest and paper products increased revenues from 1994 to 1995 by 13.4% and the industry ranked No 8 among all 30 industries looked at. The profits increased by 223% and the industry was ranked No 1 in this respect. With a return on assets of 4.8%, the industry was ranked No 5 whereas the median return for the 500 corporations was 1.7%. While it has to be acknowledged that the industry's performance in any similar comparison would be likely to be less impressive during other years (and worse than a performance of a "median industry"), one has to appreciate that the industry is frequently able to score excellent results during high cycles, being perhaps a moderate performer in average terms over cycles.

Figure 2.2
Geographical Distribution of the World Paper and Board Production (total 254 Mt/a).



Source: FAO

²The investment cost by job is about 1.0 to 1.5 MECU per job.

Western Europe currently accounts for 26% (67 Mt/a, ECU 52 bn) of the world production (Figure 2.2). The annual replacement investments (including environmental improvements) in Europe are estimated at in the region of ECU 7-8 bn.

The traditional production centres, Western Europe, North America and Japan, are responsible for about 74% of the world production. Japan currently produces some 40% of the total Asian production (64 Mt), but especially the roles of China (currently 19 Mt), India (2.6 Mt) and Indonesia (2.6 Mt) are growing rapidly.

With Austria, Finland and Sweden joining the EU in 1995, the EU trade balance of paper products was drastically changed. While EU (12) only produced approximately 76% of its paper production (the balance being supplied by imports), the Community's paper production was increased by the new countries by some 50%, and consequently EU(15) became a net exporter of paper products. On average, the net exports account for about 7-8% (5.5 Mt/a) of the current EU production, but for some printing and writing paper grades export has exceeded 15%, while virtually a 100% self-sufficiency is reached in all main paper grades. However, as will be pointed out in section 3, EU needs to import some corrugating packaging materials and the region remains a significant importer of wood pulp. Globally, EU(15) is a major paper producer with a world-wide market share of about 25-27%. Moreover, only North America (USA and Canada) is a bigger net exporter with a volume of some 8 Mt/a while e.g. Asia (including China and Japan) is still a net importer of 9 Mt/a.

In the EU (15), the paper and board production is fairly concentrated, with 5 countries (Germany, Finland, Sweden, France and Italy) producing about 72% of the total production in the region (Table 2.1).

While the production in Eastern Europe (Hungary, Czech, Slovakia and Poland) amounted to nearly 6 Mt/a in the mid-1980s, the region currently produces less than 4 Mt/a.

Table 2.1
Production of Paper and Board in the EU (15) in 1995

	- Mt -	- % of Total EU (15) -	- % of World Prod. -
Germany	14.8	21	5
Finland	10.8	16	4
Sweden	9.2	13	3
France	8.6	12	3
Italy	6.8	10	2
United Kingdom	6.1	9	2
Spain	3.7	5	1
Austria	3.6	5	1
Netherlands	3.0	4	1
Belgium	1.3	2	0
Portugal	1.0	1	0
Greece	0.3	0	0
Denmark	0.3	0	0
Ireland	0.0	0	0
Luxembourg	0	0	0
EU (15) Total *	69.5	100	25
World Total	279		

* Western Europe in Figure 2.2 is equal to EU (15) plus Norway (2.2 Mt) plus Switzerland (1.4 Mt).

Source: PPI

The paper industry has a significant impact on EU transportation and energy consumption. A rough estimate for the EU paper industry energy consumption, based on US figures would be about 12% of manufacturing consumption and 2 to 3% of the total economy. This figure rises

substantially in Scandinavia where it can roughly be estimated at 50-60% of industrial consumption and about 25-30% of total consumption.

The gravity point of a forestry operation is usually remote from consumption centres. Because of this the paper industry can be considered relatively transport-intensive, and indeed, link-ups of the paper industry with ship and road transport services have happened frequently. In Finland, for instance, the forestry industry is the biggest transportation user.

As an other implication of the location economics, the industry has been a substantial provider of jobs and economic wealth in rural areas where forestry operations are located.

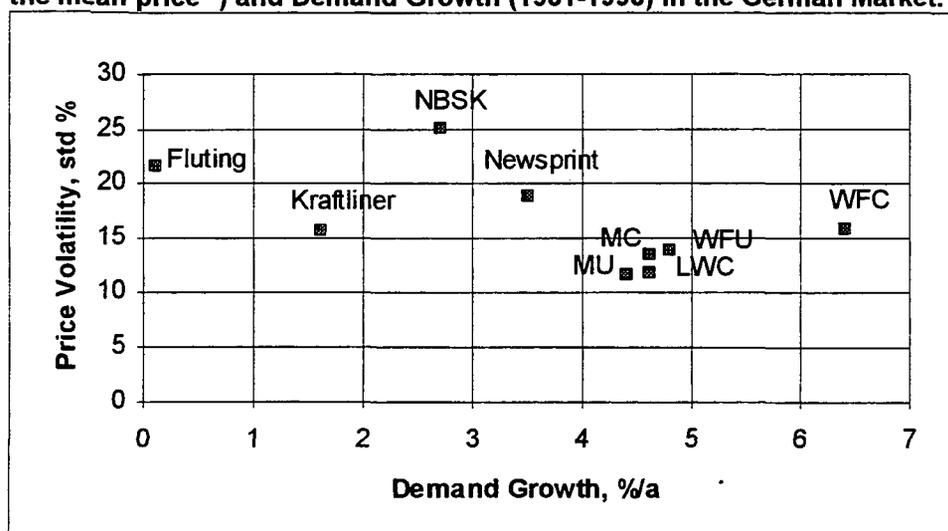
2.3 Basic Sector characteristics: Cycles, Price Volatility and Capital Intensity

The pulp and paper industry is characterised by two interlinked key features: capital intensity and price volatility. Volatility is a result of many factors influencing the industry.

Firstly, economic agents form (partly speculative) **expectations** over the production chain from forest to paper consumer that tend to accentuate normal economic business cycles. At the start of a new cycle, customers and merchants increase pulp and paper inventories partly to offset price rises (customers) or to take speculative advantage of price rises to come (merchants). Thus increasing volumes of pulp and paper are purchased with rising prices (resulting in a positive demand price elasticity). For forest owners, the rising pulp prices signal the possibility to increase wood prices. In consequence, wood sales are reduced in hope to sell later with higher price (resulting in a negative wood supply price elasticity). When the price rise slows down, the positive expectations collapse for prices of wood, pulp and paper. The emphasis moves to reducing stocks and purchases from the pulp and paper mills, accelerating price falls for the products. Expectations change towards lower prices, keeping the price elasticity of demand for pulp and paper positive as well as the price elasticity of wood supply negative.

Figure 2.3

Paper and Board Price Volatility (1986II-1996I; measured as standard deviation per cent of the mean price *) and Demand Growth (1981-1993) in the German Market.



Details:

Newsprint 45-g

Uncoated woodcontaining SC reel 60-g (MU)

LWC offset 57-g (LWC)

Uncoated woodfree A4 (WFU)

Kraftliner 150-g

Fluting

Coated woodfree sheet 90-g (WFC)

Northern bleached softwood kraft (NBSK)

Coated woodcontaining offset 80-g (MC)

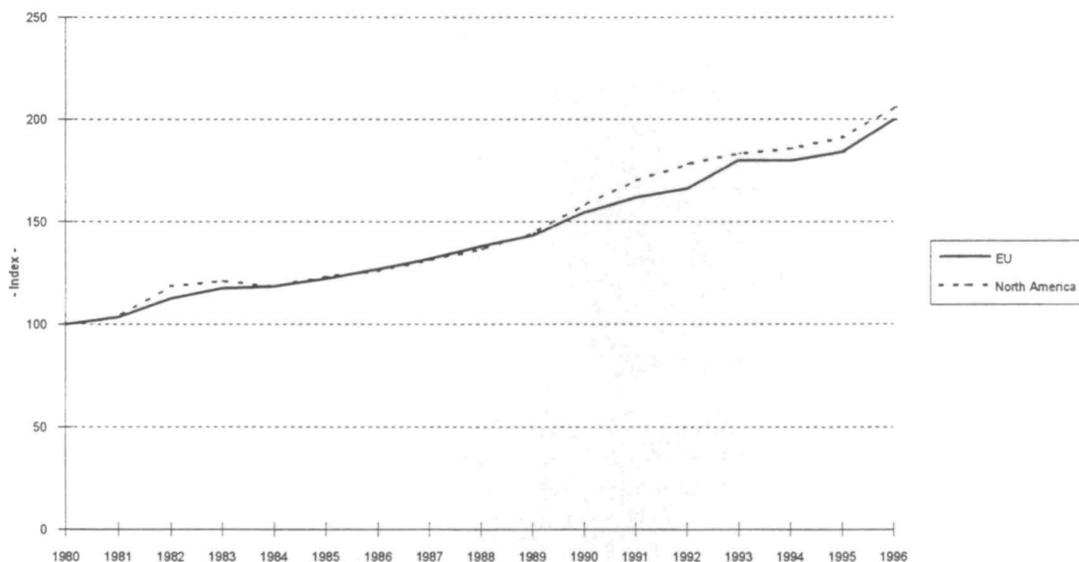
Sources: PPI, EIB/PJ Data Bank

* The vertical axis in the figure could also be taken as indicating the level of a price risk.

Secondly, while there is no incentive for companies to reduce production during the high cycle, operating rates have tended to be kept as high as possible during declining prices because **capital intensity** (see Figure 2.3.1) leads companies to operate at the highest possible rate to reduce fixed unit costs. Therefore, supply adjustments have tended to occur slowly, which further accelerates price falls when there are negative price expectations on the demand-side.

As indicated by Figure 2.3.1, capital intensity in the paper industry has increased substantially over time and this trend is expected to continue.

Figure 2.3.1
Capital/Labour Input Ratio in the Paper Industry



Source: INDUFOR

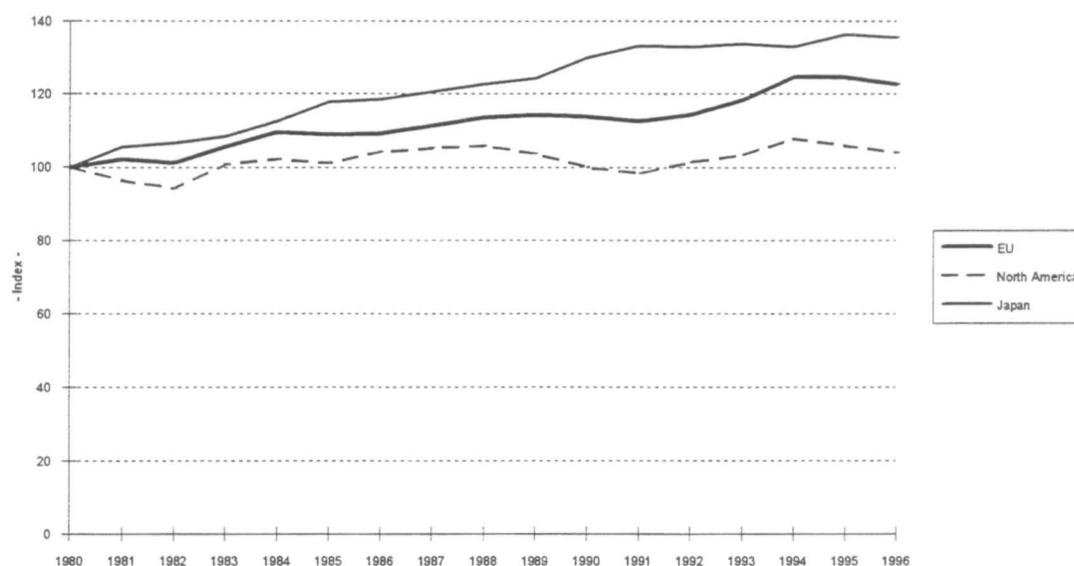
In spite of similar technological change in terms of capital/labour ratio, there is interestingly a considerable difference in total factor productivity development in the EU and North America (Figure 2.3.2).

The EU has clearly been more successful in translating technological change revealed in Figure 2.3.1 into improvement in productivity (output/input). The EU is however outperformed by Japan.

Thirdly, scale economies have caused the average new paper machine size to increase by some 3-5%/a while paper consumption is growing in many cases only 2-3%/a. The growth of the paper market is shared between an ever smaller number of paper machines. In consequence, attempts to achieve optimal scale economies and market shares induce **investment waves** which result in excess supply and the need to re-balance supply and demand at a lower price level.

Fourthly, competing producers are not keen to let a competitor take a larger position in the market where they believe they could take it, which partly explains the simultaneity of investments in a given grade, accentuating the wave effect.

Figure 2.3.2
Total Factor Productivity in the Paper Industry



Source: INDUFOR

2.4 Financial Behaviour of Companies over Business Cycles.

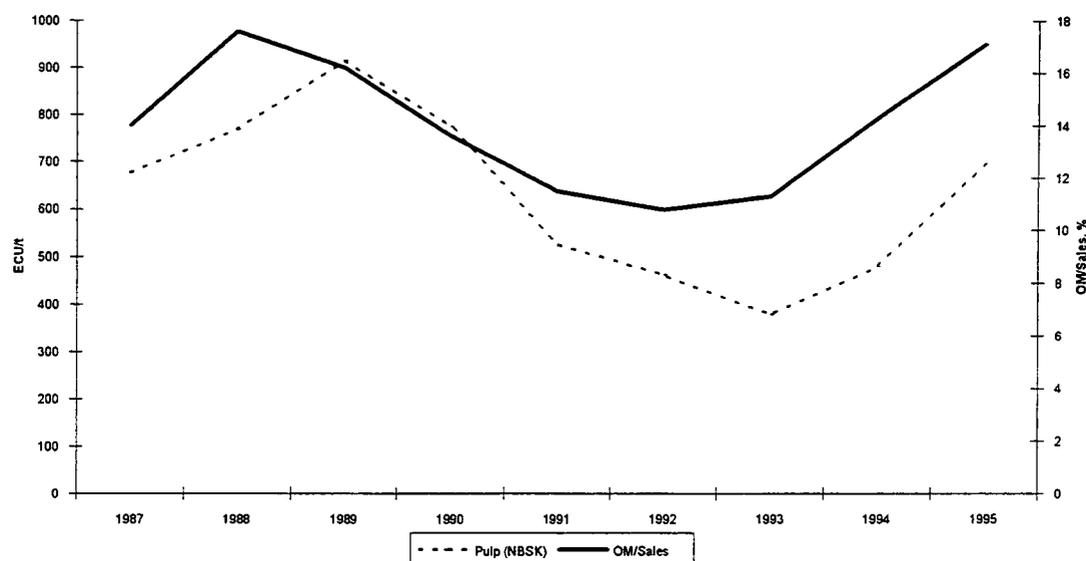
Price volatility results in considerable variations in the industry margins. Figure 2.4 indicates that there exists a close correlation between the wood pulp price and the industry results, calculated based on the Operating Margin of a representative sample of some 29 European paper and board companies (the lag between OM/Sales and pulp price might be explained by the fact that pulp prices tend to follow changes in paper prices with lag of about 6 months to a year; see also Figure 3.9).³ The average Operating Margin, has fluctuated between 10.8 % and 17.6 %, with the average at 14%.

This technical ability of companies to generate cash flows has translated into financial performance for shareholders; the average Return on Equity of the sample over the period 90-95 is 5.1%. It has been negative during low cycle (-2.6% in 1991 and -4% in 1992) but has jumped to 19% in 1995. It is noteworthy that those financial results are not significantly different from the ones of the large US paper sector.

Another important feature of the financial structure of those companies, which appears from the analysis of the last five years cycle, has been the reduction of the ratio of Debt to Equity, which has been reduced from 2.5 in 1990 to 1.5 in 1995. This trend of reduction of debt with respect to equity is especially pronounced among some Nordic producers.

³In addition to pulp and paper prices, the industry's result is largely dependent on exchange rates. In Finland and Sweden, there has been a tradition to use devaluation in order to improve the competitiveness of the pulp and paper industry during a low price cycle on the export market (e.g. FIM has been devalued in 1957, 1967, 1977-78, 1982, 1991 and 1992). With EMU, it is possible that interest towards new risk management instruments will arise, including derivatives discussed in 3.2.1.

Figure 2.4
Operating Margin per Sales (%) in the European Paper and Board Industry and Real Pulp Price (ECU/t, in 1996 terms) *



Source: PPI, PJ Data Bank

* Operating Margin = Sales minus Operating Expenses (excluding Depreciation).

3 PULP, PAPER AND BOARD MARKET DEVELOPMENTS⁴

3.1 Demand Overview

The world paper market has grown from 42.6 Mt/a in 1950 to reach the current level of 268 Mt/a (about ECU 200 bn) at an average rate of 4.3%/a or 5.1 Mt/a (Table 3.1). The growth is currently slowing to some 2.9%/a but in volume terms the present growth rate of 7.1 Mt/a is still larger than ever before. With maturing of the industry, it is likely that the volume growth will start to decrease during the next two decades.

Table 3.1
Growth of World Paper and Board Markets 1950-1994

Year	World Consumption - million t/a -	Annual increase during period	
		Volume Growth - million t/a -	Relative Growth - %/a -
1950	42.6	3.1	5.6
1960	73.2	5.2	5.5
1970	125.4	4.3	3.0
1980	168.8	7.1	3.6
1990	239.5	7.1	2.9
1994	268.0		
Average Growth 1950-1994:		5.1	4.3

Source: FAO

⁴See **Appendix 1: PAPER GLOSSARY** for explanations and definitions of different pulp and paper grades to be reviewed in this section.

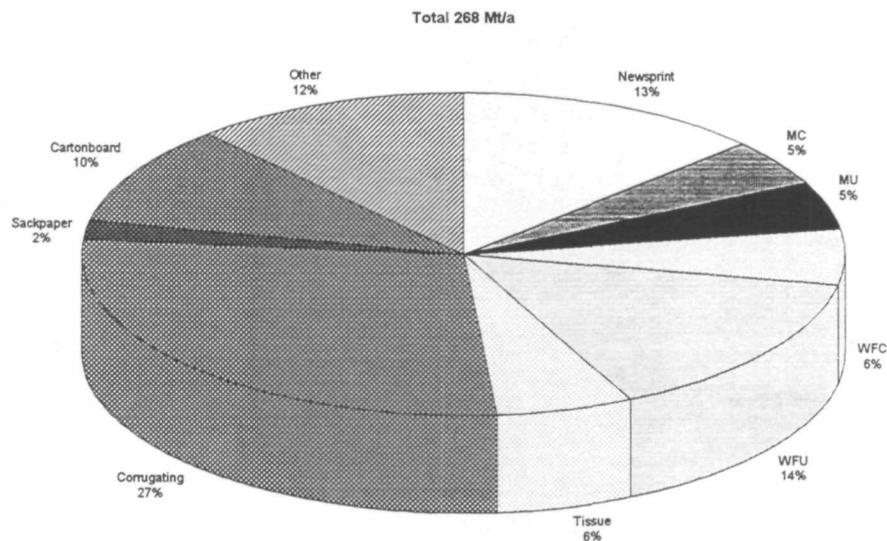
Consumption of paper and board in Western Europe amounts to about 61 Mt/a (23% of the world demand).

As shown by Figures 2.1 and 3.1, the most significant paper markets in terms of consumption tonnage are (in a descending order): **corrugating materials** (packaging: 72 Mt/a or 27% of world markets), **uncoated woodfree paper** (printing & writing: 38 Mt/a), **newsprint** (33 Mt/a), **cartonboard** (packaging), **tissue**, **coated woodfree paper** (printing & writing) and **mechanical papers** (printing & writing).

Different paper grades have different end-uses, prices and demand patterns. On the producer side, there is tendency to focus on few specific paper markets while simultaneously increasing the company size through acquisitions. A considerable evolution of the industry concentration ratio is currently taking place and the supply structure is developing with different speeds on different paper markets.

The following sections will, firstly, present key characteristics of fibre markets, including wood pulp, recycled fibre and non-wood fibre. The focus will be on reviewing different fibre materials as paper raw material. Secondly, the paper and board market will be reviewed. The presentation will divide the market into three main categories: **(1) the graphic paper market** (newsprint and printing & writing); **(2) packaging** (corrugating materials and cartonboard) and **(3) other papers** (tissue and technical). The review will analyse demand trends, prices and end-uses by paper grade, paying also attention to supply structure and concentration among the producers.

Figure 3.1
World Paper and Board Market in 1994



Source: FAO

3.2 Fibre Markets

The following presents a brief review of fibre sources for paper and board manufacturing. The sources fall in three categories: (1) wood fibre, (2) recycled fibre and (3) non-wood fibre.

Although fibre is strategically the most important raw material of paper, it should be noted that in most advanced printing and writing papers nonfibrous raw materials can account for some 50% of all materials by weight contained in paper. Because only a limited range of paper properties can be achieved in paper manufactured from wood fibres alone, the papermaker combines wood fibres with a wide array of chemical additives when preparing the furnish for a particular grade of paper. These additives are classified as follows: (i) functional additives are chemical additives that either enhance an existing property or impart a new property to paper (e.g. sizing agents, dry-strength agents, wet strength resins, colouring and tinting agents, fillers); (ii) chemical processing aids either promote the performance of a functional additive or assist the papermaker in maintaining the cleanliness and runnability of a paper machine system (e.g. retention aids, microbiological control agents, pitch control agents, drainage aids, formation aids). In some cases, there is a pronounced trend to substitute functional additives for fibre for two main reasons: (a) functional additives are often less expensive than fibre and (b) the market tends to pay a premium for qualities achieved by the substitution. A significant R&D investment may be required for a successful operation of functional additives.

3.2.1 Wood Pulp

About 200-250 million tons of pulp (including mechanical pulps) are produced annually world-wide mainly to be used as a raw material for paper and board products. There is a high degree of vertical integration in the pulp industry and only around 10-20% (20-40 Mt) of the total output is sold on the open market. Table 3.2 shows that some 9 Mt of market pulp is produced in the EU, mostly bleached sulphate pulp. **The EU appears to be a pulp importer of some 5-6 Mt in net terms.**

Table 3.2
Production of Woodpulp in the EU in 1995, 1000 t

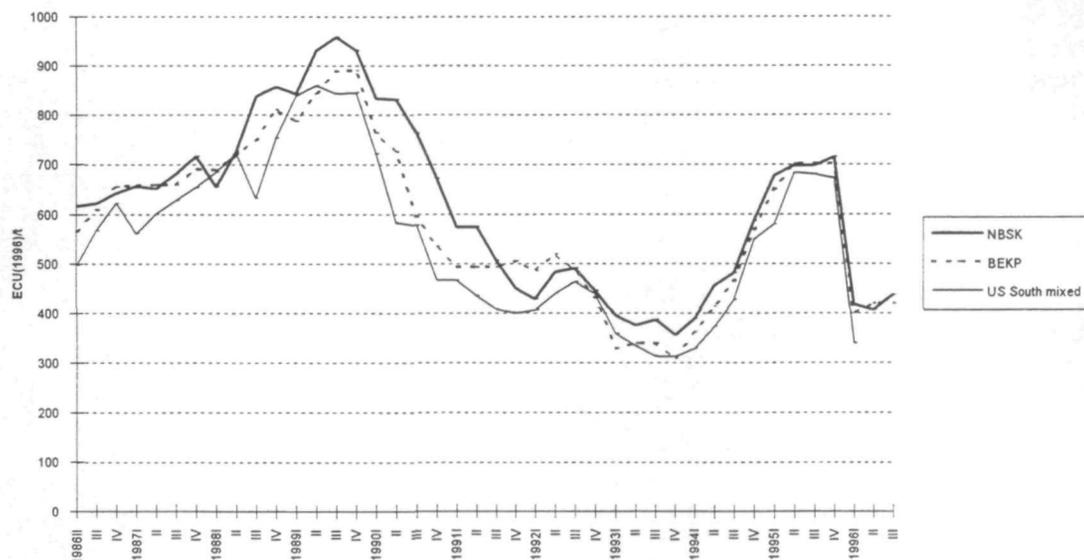
Pulp	Production - total	of which Prod. - open market	Consumption - total
Mechanical	9992	268	10250
Semi Chemical	1558	262	1693
Sulphite	2177	966	2358
Unbleached Sulphate	4251	265	4234
Bleached Sulphate			
- hardwood	6435	3654	8180
- softwood	6587	3379	9761
- Total	13022	7033	17680
Chemical - Total	19450	8264	24272
For Paper - Total	31000	8794	36215
Dissolving	188	42	562
Woodpulp - Total	31188	8836	36777

Source: CEPI

The production of wood pulp is increasingly based on fast-growing plantations which are able to provide a low-cost wood resource base for pulping operations (see section 4.1). Although Canada will remain as a major pulp supplier to the US paper industry, the relative importance of Asian and South American producers is growing and it is likely that increasing amounts of plantation-based pulp will be imported to Europe. This import potential also shows that there is some space for price-competitive pulp production in Europe.

As indicated by Figures 2.3 and 3.2.1, the pulp market is very volatile, with standard deviations for different pulp grades exceeding 25%. Compared to other commodity markets such as copper, soybeans, corn etc., the pulp market appears the most volatile after crude oil (standard deviation 37%).

Figure 3.2.1
Real Price of Pulp (in 1996 terms)



Source: PPI

Pulp Futures as an Instrument for Risk Management ?

The establishment of derivative markets that would enable producers and buyers to hedge future pulp commitments is currently being considered by several companies in Europe and North America. The Finnish Options Exchange has recently launched an international options and futures market for NBSK pulp in Helsinki. The Swedish OM Group AB has set up a wood pulp derivative market in London in May 1997. In the UK, McKenna & Co, a law firm, is leading an initiative to set up an electronic derivatives market for pulp and paper contracts. The American Forest and Paper Association, based in Washington DC, is also engaged in a preliminary review for a possibility of futures market.

The idea of applying futures for risk management is new for the pulp and paper industry. After an introductory period, futures market is expected to gain wider acceptance within the industry and establish itself among the management instruments applied. Were a full-scale pulp and paper derivative market to be realised, it could potentially change the price patterns of the industry's products reviewed in this report above as well as provide a possible instrument for reducing risk in project financing. However some speculative aspects are still subject of a wide debate.

3.2.2 Recycled Fibre

The total waste paper consumption in the EU countries was 29.5 Mt in 1995. The consumption is expected to grow to some 40 Mt by 2005. In relative terms, this implies an increase in the total waste paper utilisation rate of about 42% to some 47% (waste paper utilisation rate is a ratio where the consumption of waste paper is divided by the production of paper and paperboard; the rate shows roughly the share of waste paper in the end product).

Wastepaper recovery was 29 Mt in 1995, or 46% of EU paper consumption. Recovery rates vary widely by country: they reach 65-67% in Germany, Netherlands and Austria, 53-58% in Sweden and Finland but less than 20% in Ireland and Greece.

Liner and fluting manufacturing is by far the most important single consumer of waste paper in the EU, accounting for about 45% (11 Mt) of the total waste paper consumption. The paper industry (newsprint, printing and writing, tissue) accounted for some 25% (6.1 Mt) of the total consumption. The remaining 30% of the waste paper was mainly consumed by the cartonboard industry.

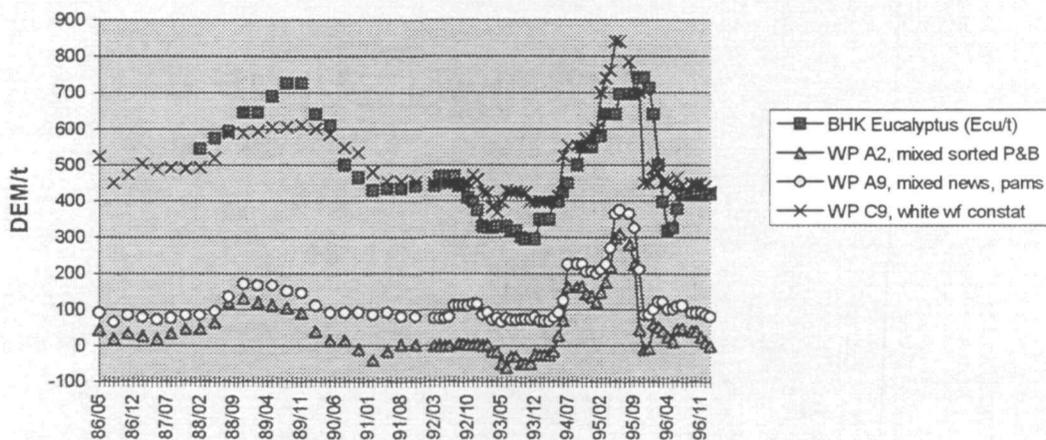
As shown in Figure 2.1, the waste paper share varies greatly in the fibre furnish by paper grade. It is forecast that waste paper use will still grow rapidly especially in the newsprint industry, increasing the share of waste paper in the fibre furnish close to 60%. Also the printing and writing and the tissue paper industry are expected to increase use of waste paper. The paper industry as a whole is expected to increase its share of the total waste paper use from the current 25% to some 35% by 2005 as opposed to a rather static waste paper use in the production of packaging grades where the waste paper utilisation is already high.

As shown by Figure 3.2.2, there is a close correlation between waste paper prices and wood pulp prices. Although there is no clear lag structure, waste paper prices may sometimes provide an early indication for the turn of the pulp price cycle.

Full recovery of waste paper is probably practically difficult and environmentally counterproductive as some tentative life cycle analyses seem to show. Some incineration of part of the waste paper might therefore be considered justified.

The waste paper market has to be differentiated by quality and grade, some of which are less available and more desirable than others for given applications. The treatment can also be different. The origin of waste paper consumed is about 40% of old corrugated and the same of old newsprint and woodfrees.

Figure 3.2.2
Prices of Waste Paper and Eucalyptus Pulp in the German Market.



Source: PPI

3.2.3 Non-Wood Fibres

Non-wood fibre represents less than 5 % of total fibre supply. However, non-wood fibres may be of a significant importance in some regions, mostly located in developing countries where they may account for up to half of the pulp used (e.g. in China, non-wood fibres are an

important raw material). Three categories of non-wood fibre can be separated by source: (1) agricultural residues such as bagasse, rice straw and cereal; (2) purpose-grown crops including kenaf, hemp, jute; and (3) natural uncultivated crops such as bamboo, sisal and wild grasses. The most common non-wood fibres globally is straw (45 % of total non-fibre use), followed by bagasse (12 %) and bamboo (6 %).

From the processing point of view, the main advantage of non-wood fibres is that most of them contain more silica and less lignin than wood. The lower lignin levels means that less energy is required to pulp the fibres, reducing the cost especially in the energy intensive mechanical pulping processes. On the other hand, the higher proportion of silica makes traditional chemical recovery processes ineffective, resulting in a highly polluting effluent. On balance, there is no environmental benefit from non-wood fibres.

In certain projects located in developing countries, non-wood fibre-based mills may be a source of economic benefits. The most appropriate size for non-wood mills is usually smaller than for wood-based mills and subsequently the investment cost is smaller, which is an advantage especially when there are capital market imperfections. Secondly, non-wood fibre cultivation can be practised on soils which have few alternative uses, and where the opportunity cost tends to be low. However, the necessity of crop rotation can be a limitation. In conclusion, non-wood fibres are a complement source of fibre rather than an alternative, but are an interesting niche for some of our projects.

3.3 Graphic Paper Markets

3.3.1 Newsprint

Demand

In 1993, world newsprint consumption amounted to 32.6 million tons (i.e. 13% of the total paper and board consumption), of which North America (12.5 Mt), Western Europe (8.2 Mt) and Japan (3.4 Mt) accounted for 74 %. World consumption is expected to grow by about 0.9 Mt per annum (2-3%/a). Most of the growth is likely to take place in the current main consumption regions.

Newsprint consumption is driven by advertising (North America and Western Europe) and increased pagination as well as establishment of new newspapers (China and Asia). The development of electronic media (electronic superhighway) is expected to have a negative effect on newsprint consumption, limiting the world-wide growth of demand to some 2-3%/a. The per capita consumption of newsprint is clearly highest in North America (40-45 kg/c) and the Nordic countries (35-50 kg/c). There are big differences in the per capita consumption of newsprint in Western Europe. France (12.9 kg/c), Italy (9.2 kg/c), Spain (11.0 kg/c) and other South European countries consume much less newsprint than the United Kingdom (33.5 kg/c) or the Netherlands (32.1 kg/c): reading habits are different. Newsprint consumption in the CIS and Eastern Europe is limited by the lack of local supply, but is in due course is likely to converge at least to South European levels.

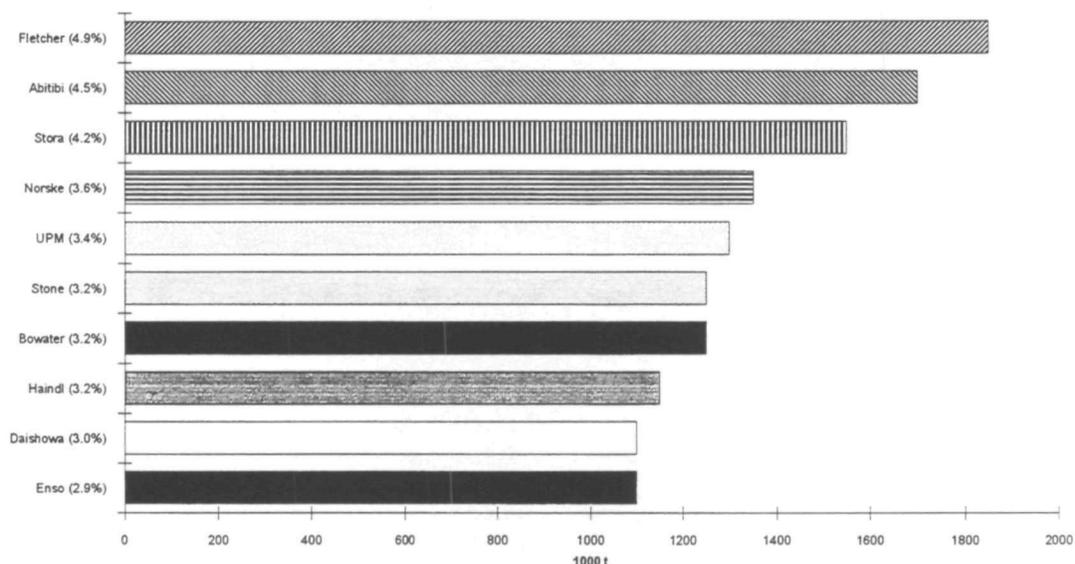
Newsprint sales are based on annual contracts and there are fewer buyers than e.g. in woodfree grades, which tends to reduce the volatility of the newsprint price. During the 1980s, the price of newsprint was stable (not volatile) with a trend of slightly declining real price (Figure 3.4, p). During 1992-94, prices were severely depressed by the recession and low advertising rates.

Producers

The biggest European producers are Stora (third worldwide producer), Norske (fourth) and UPM-Kymmene (fifth). The importance of recycling is still growing and new investments are likely to

take place close to sources of waste paper. The ten largest producers account for less than 40% of world-wide capacity.

Figure 3.3
Main Newsprint Producers in 1995 (world market shares in brackets).



Source: Annual Reports, EIB/PJ Data Bank

3.3.2 Uncoated Mechanical Paper

Demand

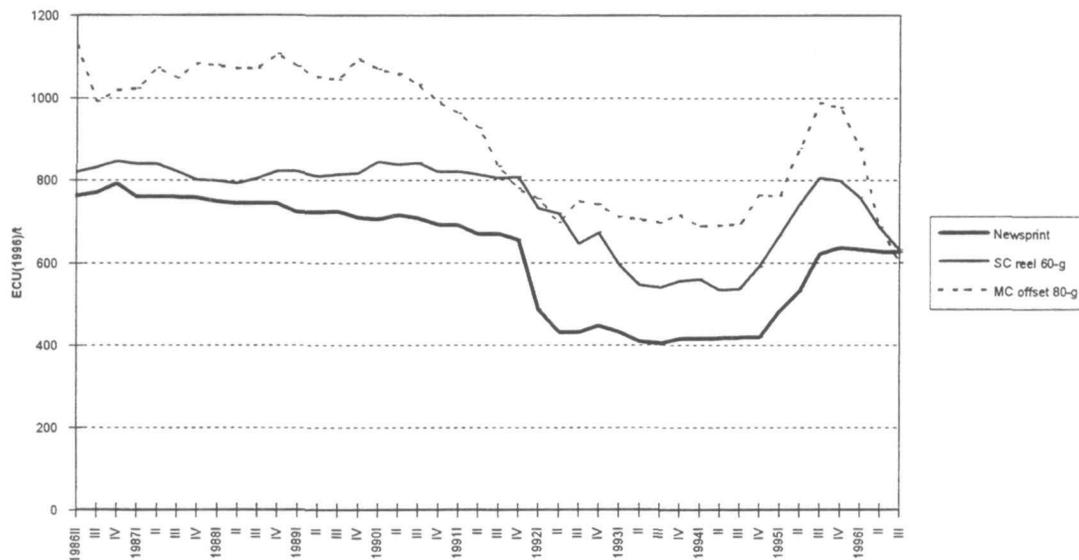
The world consumption of uncoated mechanical printing and writing paper was 12.3 million tonnes in 1993, clearly dominated by Western Europe (4.1 Mt) and North America (4.2 Mt). In volume terms, only a small world-wide growth of 0.25 Mt/a (2-3%/a) is expected. More than 70% of the current SC paper consumption in Western Europe is accounted by the magazine sector. In North America, only 15% of the demand comes from magazines, the main uses being inserts, commercial printing in general and mail order catalogues. In advertising and Sunday magazine supplements, competition between SC paper and coated mechanical grades (see 3.3.3) is tough.

The price of SC paper has been stable during the 1980s, but the price fell by some 30% during 1992-94. Recent price developments suggest increased volatility (Figure 3.4).

Producers

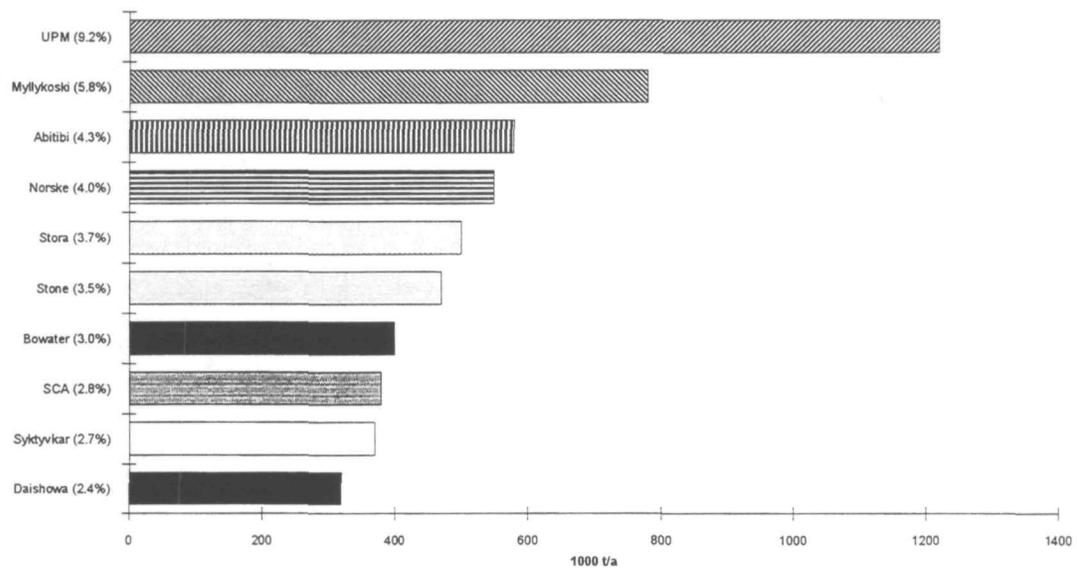
The world leading producers of uncoated mechanical paper are shown in Figure 3.5 (the capacities include both SC and MF paper). The leading world-wide producer is UPM-Kymmene, followed by Myllykoski (Metsä-Serla), Abitibi (Canadian producer), Norske and Stora. The ten biggest companies account for more than 40% of world capacity.

Figure 3.4
Real Prices of Newsprint, SC Paper (uncoated mechanical) and Mechanical Coated Paper (MC) in the German Market, 1986II-1996III.



Source: PPI

Figure 3.5
Uncoated Mechanical Paper - Main Producers in 1995 (world market shares in brackets)



Source: Annual Reports, EIB/PJ Data Bank

3.3.3 Coated Mechanical Paper

Demand

The world consumption of coated mechanical grades (LWC, MWC, HWC, MFC) was 11.9 Mt in 1993. About 83% of the world total was consumed in North America (4.8 Mt) and Western Europe (5.0 Mt). All world markets have grown rapidly (5-6%/a) mainly due to advertising growth, though the volume growth has been quite limited in the developing countries due to different growth patterns, lack of web-fed printing presses etc. Japan has become an interesting market for coated mechanical grades. Traditionally, woodfree grades have been used in Japan in the same applications as in Europe and the USA (magazines, catalogues, inserts) but currently mechanical grades are competing successfully against woodfree grades (see section 3.3.5). Future growth of the market is likely to be slowed by the increasing competition from the woodfree sector (where excess supply is likely; see 3.3.5) and SC papers. Coated mechanical grades are used especially in publication markets, in the magazine and Sunday supplement market. Printing technology developments (web-offset etc.) represent a major driving force of the demand for the grade.

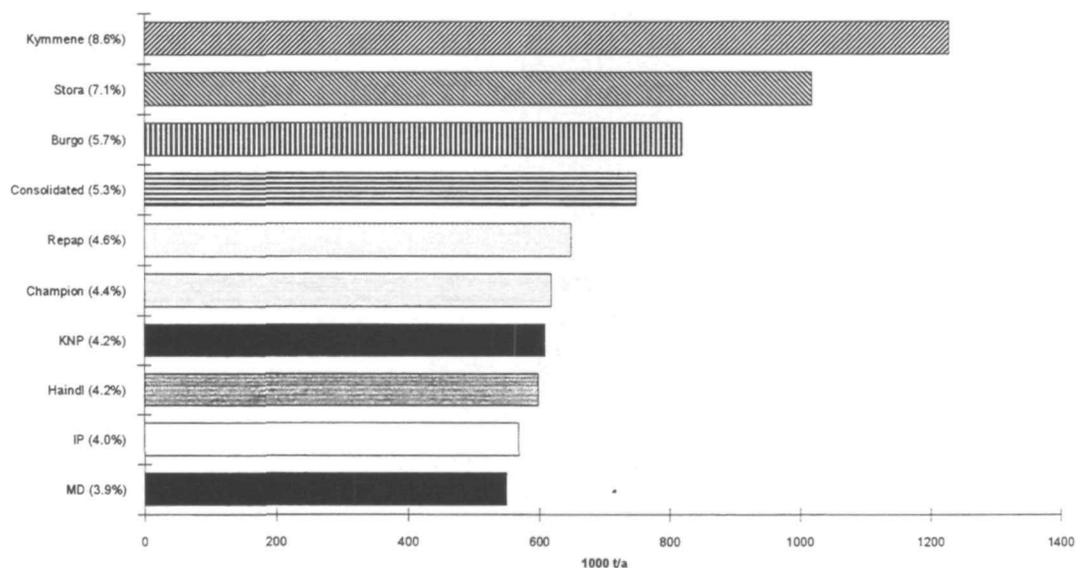
As in the case of uncoated mechanical grades, the stable development of coated price was interrupted by the recession of 1992-94, after which the price has been rather volatile (Figure 3.4).

Producers

European producers Kymmene (UPM-Kymmene), Stora and Burgo are the leading producers, followed by North American Consolidated and Repap (Figure 3.6). The coated mechanical paper industry is rather concentrated: the ten biggest producers control over 50 % of the total world capacity.

Figure 3.6

Coated Mechanical Paper - Main Producers in 1995 (world market shares in brackets)



Source: Annual Reports, EIB/PJ Data Bank

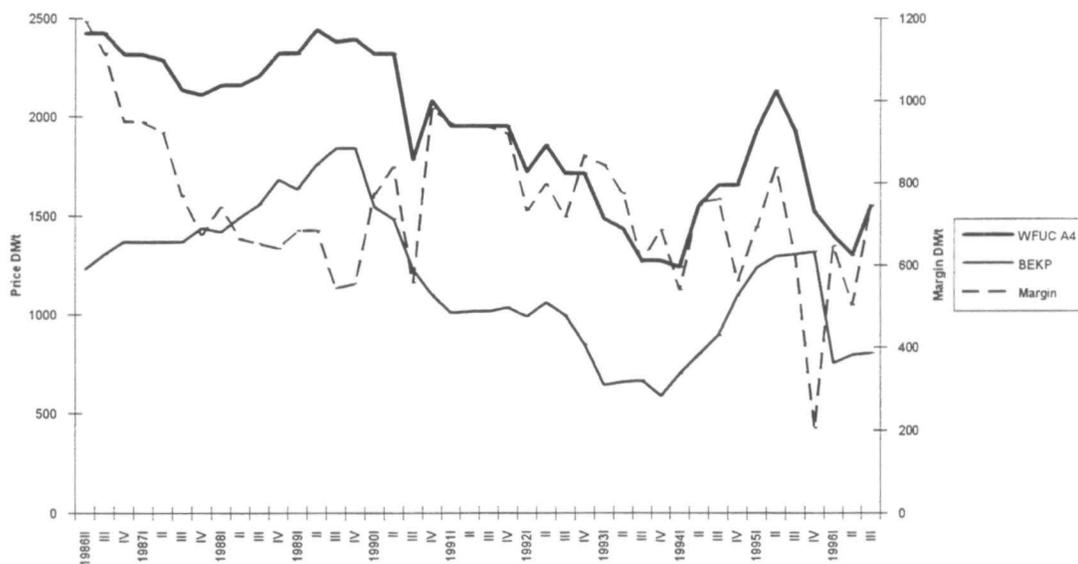
3.3.4 Uncoated Woodfree Paper

Demand

The total world market for uncoated woodfree printing and writing papers (WFU) is currently about 39 Mt per annum (about 15% of total paper & board production), of which the Western European market accounts for about 21% (8.2 Mt). About 35% of the WFU demand comes from the cut size segment (for desk-top-publishing, page printers, copiers), 22% is used as folio sheets (magazines and books), 12 % is for continuous stationery and the remaining 31% is for such purposes as educational material and envelopes. During 1980-95, the cut size segment grew about 10.4%/a while the total WFU market growth amounted to 4.5%/a.

Figure 3.7

Real Prices of Uncoated Woodfree (WFUC A4) and Eucalyptus Pulp (BEKP) and the Real Processing Margin (Margin) in Germany (*) (in 1996 terms).



Source: PPI

(*) real margin = real woodfree uncoated price minus real eucalyptus pulp price.

The Electronic Data Interchange and the Electronic Superhighway will affect the market several ways. First, office technology developments will increase demand for cut size paper. Second, the new electronic media is affecting the required paper quality and in consequence, totally new paper qualities are being developed e.g. for colour copying, colour laser, ink-jet and colour facsimile (cut size segment). Third, increasing electronic document handling and storage of data will be a factor limiting the demand growth of the office papers. Thus, the overall growth of the uncoated woodfree market is slowing down to 2.5-3%/a (about 1 Mt/a), but significantly faster growth (around 5%/a i.e. 0.7 Mt/a) is expected in the cut size business paper segment (due to mentioned office technology developments).

The real price of WFU has been declining by about 3%/a over the last ten years (the trend since 1989 is unclear however; Figure 3.7). Viewed over a longer term, say 20 years, the decline amounts to around 1.5%/a. The pulp (BEKP) price has declined by some 1%/a over a long term. Due to such developments, there is a trend of a squeeze in the WFU margin (WFU A4 price minus BEKP price) by about 2%/a (Figure 3.7). As indicated by Figure 3.7, during the last ten years the real margin has varied mainly between 500 DEM/t (265 ECU/t) and 800 DEM/t (425

ECU/t). As is typical for woodfree papers, the margin tends to decrease during high cycles due to differences in the standard deviations of paper and pulp prices (c.f. Figure 2.2 above).

Producers

Future supply of WFU in Europe will have four main sources: (1) existing capacity, (2) new investments, (3) imports and (4) swing capacity between paper types. Production of WFU paper in Western Europe amounted to 8.6 Mt in 1994, while the operating rate was almost 95% (total capacity is 9.1 Mt). Exports have traditionally amounted to more than 400 kt per year (Middle East, Asia, USA; Figure 3.8). New committed and planned investments in Western Europe will expand WFU capacity by about 570 kt by 2000. In addition, there are plans for further possible capacity expansions around 2000. Imports to Western Europe have been around 150 kt a year, mainly from Brazil, for which the USA is the main export target (the USA imports some 1 Mt WFU per annum). The decided and announced investments in Asia/Pacific amount to about 3.5 Mt by 2000. It is expected that the increased production will mainly be consumed in the local market which is growing by nearly 1Mt per year, but there is a possibility that part of the production will come to the European market, at least initially.

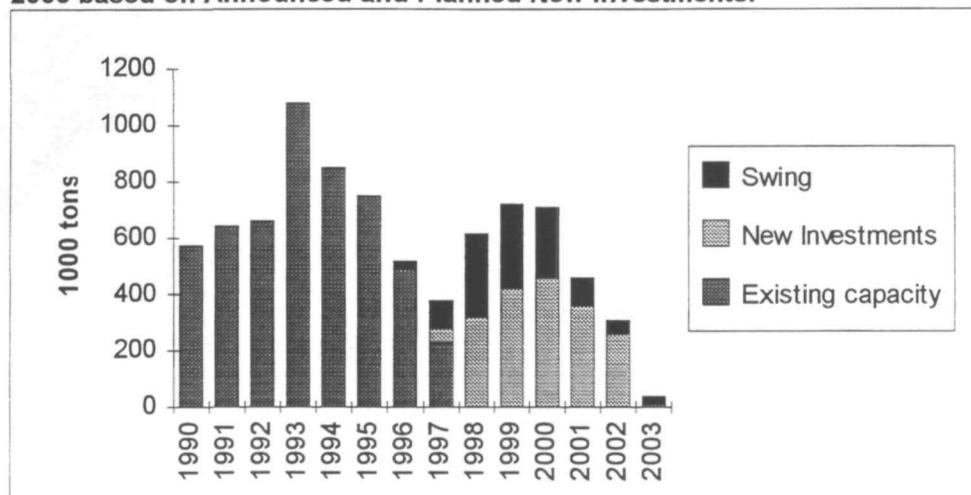
- **swing capacity:** The likelihood of swing capacity from the coated to uncoated woodfree market will be determined by the operating rates of coated vs. uncoated woodfree producers. Based on committed investments, the production capacity of WFC will expand by some 25-30% by 2000 compared to the current operating capacity. This is likely to bring operating rates down to 85-90% during 1998-2001 (see 3.3.5). Based on the forecast demand and announced new WFU investments, an operating rate of more than 90% would be possible for uncoated woodfree production. However, the difference in WFC and WFU operating rates is likely to induce a narrowing of the coating premium (difference between WFC and WFU prices). The narrowed premium would provide an incentive to swing capacity from the coated to the uncoated market thus decreasing the WFU price, increasing the WFC price and therefore the premium. The equilibrium swing would be reached approximately at the level of the initial premium (assumed to represent a sufficient margin for coating to become more profitable). In practice, swing is constrained by the fact that only a limited number of coated producers accommodate cut size lines and have the right access to the business paper sector. These producers include groups such as UPM-Kymmene and Enso which operate in the coated as well as in the uncoated business. The maximum amount of swing capacity is estimated at 200-300 kt per annum. This line of argument would suggest that the WFC/WFU premium will reduce a little over time - from, say, the current DEM 150/ton to around DEM 100/ton.

In summary, the production based on the existing WFU capacity in Western Europe could be absorbed by the local market by 1998 (Figure 3.8). The production based on new investments in Western Europe could be absorbed by 2003. Exports of around 400-600 kt per annum would be required to reach an operating rate of 95%. The contribution of swing capacity to WFU supply may be significant during 1998-2000 (swing in Figure 3.8 represents the effect of the swing rather than that the swing itself would need to be exported). Although exports from Western Europe would not necessarily exceed the exports of the early 1990s, the export market is likely to become more competitive due to increasing production in Asia/Pacific and Latin America.

The world-wide WFU industry is heavily influenced by the North American companies: International Paper (IP), Georgia Pacific (GP) and Champion are responsible for about 16% of the world production of WFU paper. The top ten companies control about 31% of world capacity. The concentration ratio is thus clearly smaller than for most printing and writing papers (around 40%), making the WFU segment a likely target for future merger and acquisition developments.

Figure 3.8

Exports of WFU from Western Europe in 1990-1995 and the Projected Exports in 1996-2003 based on Announced and Planned New Investments.



Source: PJ based on PPI and Jaakko Pöyry.

Remark: Swing has been estimated based on announced and planned WFC investments (see 3.3.5). For projections, operation rate of 95% has been assumed for WFU. Projected exports = projected production minus forecast demand (growth of 2.5-3%/a).

Currently only UPM-Kymmene (2.8% of the world-wide production, i.e. 1.2 Mt/a) of the West European companies belongs to the list of the top ten producers of WFU. The largest world-wide producer IP is currently the fourth largest WFU producer also in Europe, after UPM-Kymmene (Finland), Enso (Finland), and MoDo (Sweden). Its PM2 investment in Figueira da Foz will raise Soporcel (Portugal) from the current seventh position to become the third largest producer in Europe. Figueira da Foz will become the largest WFU mill site in Europe with cost competitive paper machines, enjoying considerable scale advantages (Table 3.4).

Table 3.4

Selected Producers in Western Europe Classified based on Average Capacity of Paper Machine on a Site and the Total Site Capacity in 2000.

Average Capacity of Paper Machine:

Site Capacity	<100 kt PAPER MACHINE	100kt-200 kt PAPER MACHINE	200 kt < PAPER MACHINE
500< kt		UPM-Kym., Nordland	Soporcel, Figueira da F.
200-500 kt	Inapa, Setúbal Federal Tait, Inverurie	Neusiedler, Theres. Enso, Kemi SCA/PWA, Stockstadt MoDo, Alipap MoDo, Husum Stora, Nymölla	UPM-Kym., Kuusankoski Enso, Varkaus
<200 kt	Neusiedler, Kematen IP, Kwidzyn IP, Iridium Stora, Dalum SCA/PWA, Hallein MoDo, St. Maxence UPM-Kym., Docelles	Metsä-Serla, Kangas UK Paper, New Thames IP, Aussest Rey SCA/PWA, Wifsta Enso, Kaukopää, Enso, Berghuizer	

Source: EIB/PJ Data Bank

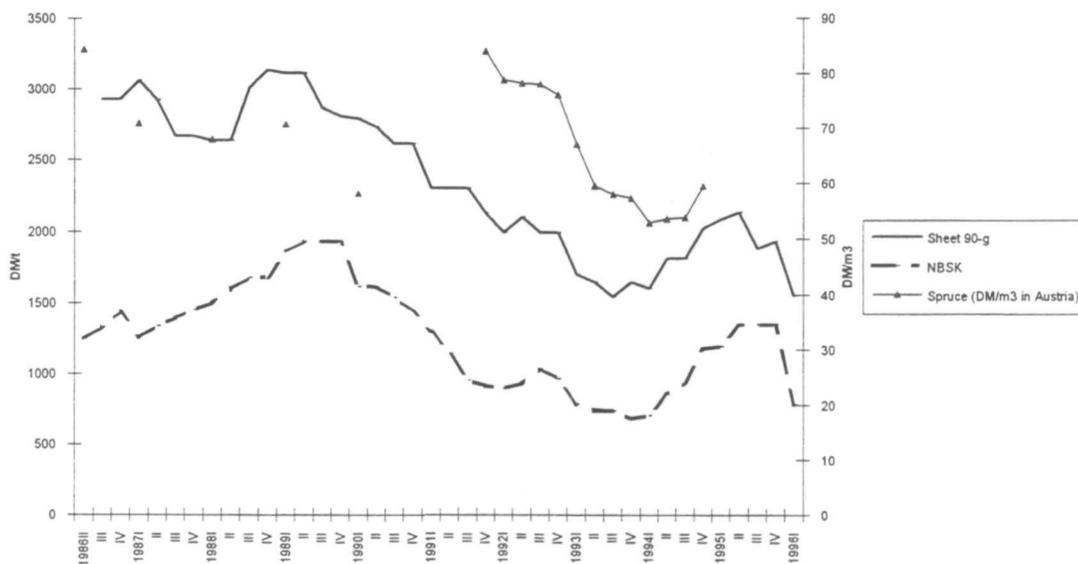
3.3.5 Coated Woodfree Paper

Demand and Price

The total world market for coated woodfree printing and writing papers (WFC) is currently about 14.4 million tons per annum (about 5% of total paper & board production), of which the Western European market accounts for about 31% (4.7 million tons). Compared to most paper markets, the coated woodfree business has been characterised by high demand growth and modest price volatility. The consumption of WFC is expected to continue growing although the growth will be slower (4-5 %/a i.e. 0.6 Mt/a) than before. In Western Europe, the demand for WFC papers mainly comes from such sectors as commercial printing (55% of the end use), magazines (20%) and books (10%). In the USA, commercial printing accounts for about 35% of the end use, catalogues for 20% and magazines for 15% (about 30% of world-wide WFC paper production is consumed in the USA). The rapid growth of coated woodfree consumption has been mainly due to developments in direct mail and especially due to increasing targeting in advertising. Increasing availability of good-quality standard WFC papers and development of matt, semimatt and gloss surfaces have also improved the prospects of these grades. In future, advertising will be the main driving force for WFC paper. The trend to upgrade the print quality of advertising materials will continue to favour the use of coated woodfree. On the other hand, although paper-based media are expected to continue growing, an increasing percentage of the advertising expenditure will be allocated to electronic media, especially television.

Figure 3.9

Real Prices of Coated Woodfree (Sheet-90-g) and Pulp (NBSK) in Germany and Spruce (at roadside in Austria in DM/m³ solid over bark).



Source: PPI, ECE

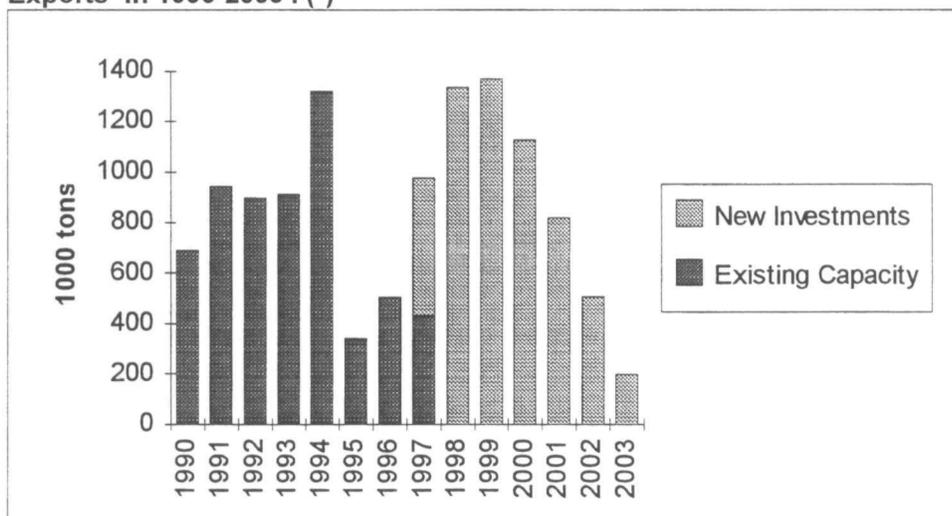
As indicated by Figure 3.9, the real price has decreased fairly rapidly during the last ten years (close to 4%/a); however, it should be noted that the mid-1980s was a high cycle period with historically high prices. The long term trend (20 years) for the real price of woodfree coated paper has been slightly decreasing by about 0.3% per year in real terms.

With respect to the declining development of real price of coated woodfree paper, the position of the WFC business is enhanced due to the following factors. Firstly, the price of wood in Europe has been elastic with respect to the price of WFC paper (see Figure 3.9 for Austria). Secondly, many European producers are at least partly integrated (e.g. KNP-Leykam), with most of the pulp requirement being produced at the paper mill site. The price of coated woodfree paper tends to fluctuate in the same cycles as market pulp prices, while there is no difference in real price trends of these products (Figure 3.9). Due to the greater standard deviation for the price of market pulp, integrated producers usually gain a clear advantage over non-integrated producers during the high cycles when the pulp price tends to rise faster than the WFC paper price, subsequently squeezing the margins of non-integrated producers. On average, the WFC price has been around 70-80% higher than market pulp price (NBSK), with the margin varying between 140% (low cycles) and 40% (high cycles).

Producers

The recession in Western Europe at the beginning of 1990s resulted in slow growth of WFC demand, while the total production capacity for WFC increased during 1990-1993 by about 0.9 Mt. The subsequent over-supply was adjusted in two ways. Firstly, the operating rate of the WFC business fell from 92% in 1990 to 86% in 1992. Secondly, exports from Western Europe increased from about 0.7 Mt in 1990 to about 1.3 Mt tons in 1994 (resulting in price falls; see Figure 3.9).

Figure 3.10
Exports of Coated Woodfree Papers from Western Europe in 1990-1995 and Projected Exports in 1996-2003 . (*)



Source: EIB/PJ based on CEPI, and Jaakko Pöyry

(*) Projected exports = existing capacity and announced investments in Western Europe adjusted by the assumed operating rate (90%) - forecast consumption in Western Europe (growth of ca 4-5%/a). The period of 1996-2003 has been estimated based on forecast consumption of WFC in Western Europe and announced investments 1996-2000; for 1996-2003, operation rate of 90% is assumed.

The market is currently growing rapidly in Western Europe and it is estimated that by 1998 the local market could absorb totally the production of the existing capacity (assuming 90% operating rate; Figure 3.10). However, the announced and on-going investments will increase the capacity in Western Europe by about 1.9 Mt by 2000. In view of the expected consumption growth (see above and Figure 3.10), this implies that a significant level of WFC exports (around 1 Mt per annum) will be required during the next five years to achieve 90% operating rates (Figure 3.10). Based on the forecast consumption of WFC papers in Western Europe, the local

market could absorb the announced capacity increases by 2004 (Figure 3.10). North America is an important export target market for European coated woodfree producers; e.g. in 1993 the USA imported around 0.3 million tons of CWF. The Asia-Pacific region is largely supplied by Japanese producers.

The world-wide leading producers of WFC are Sappi (South Africa), New Oji (Japan) and KNP Leykam. The market has been characterised by acquisitions (which have also significantly contributed to the current leading position of Sappi). The ten biggest producers currently control 42% of the world capacity while the corresponding figure in 1991 was 38%. As a result of the PM11 investment in Gratkorn by KNP-Leykam, KNP will become the second biggest world-wide producer of WFC paper after Sappi. The mill site of KNP-Leykam in Gratkorn will be in 2000 the largest European production unit which associates the benefits of integration with utilisation of cost competitive modern paper machines (Table 3.5).

Table 3.5
Selected Producers in Western Europe Classified based on Integration and Age of Paper Machine in 2000

Age of Paper Machine(s):	Market Pulp	Captive Pulp Supply	Integrated
0-10 years	UK Paper, Sittingsb.	Metsä-Serla, Kirkn. Kymmene, Nordland	KNP, Gratkorn Enso, Oulu Burgo, Ardennes
11-20 years	Zanders, B. Gladb. Smurfit Condat Arjo Wiggins, L'Aa Arjo Wiggins, B-s-B,		Stora, Nymölla PWA, Hallein PWA, Stockstadt Sappi, Schwäbische
20+ years	Scheufelen, Lenning.	Stora, Grycksbo	Sappi, Hannov. Kymmene, Kuusank.

Source: EIB/PJ Data Bank

Traditionally, major coated woodfree producers have participated in a captive merchant network to gain control over the end use market. Furthermore, acquisitions of merchants has been used as means to secure their position by new entrants. In contrast, medium sized producers have adopted a mixed strategy of direct deliveries from mills to local markets and distribution through other (not self-controlled) merchants (Table 3.6).

Table 3.6
Branding Alternatives and Distribution Channels for Selected Producers in the EU

	Not Own Merchants	Own Regional Merchants + Others	Own Network of Merchants + Others
Merchant Brands	Hannoversche (Sappi)		PWA
Mill/Merchant Brands	Smurfit Condat Scheufelen	Kymmene Enso Group Burgo	Arjo Wiggins KNP Leykam Stora (Feldmühle)
Mill Brands		Zanders (IP)	Stora (Sweden)

Source: EIB/PJ Data Bank

3.4 Packaging

3.4.1 Corrugated Board Raw Materials (linerboard and fluting)

Demand

Corrugated board is a conventional product which has established a wide consumption base world-wide. The world consumption of linerboard and fluting increased from 44 million tons in 1981 to 70 million tons in 1993, which corresponds to 4.0 %/a average growth. The growth rates of corrugated board consumption have been fastest in Asia (excl. Japan). These countries will continue to have the highest relative growth rates, about 4.7 %/a during the next 15 years. The overall growth rate of demand in Western Europe is currently decreasing to about 2%/a (from 3%/a experienced during recent years), but there are still some rapidly growing end uses including

- (1) packaging of branded food products, fruit and vegetables, soft drinks and juices,
- (2) packaging of paper products/office papers, chemicals, pharmaceuticals and cosmetics.

In per capita terms, the USA consumes more linerboard and fluting than any other country in the world. The leading per capita consumers in 1993 were:

-	USA	90 kg/capita
-	Taiwan	85 kg/capita
-	Japan	68 kg/capita.

The Western European average was 38 kg in 1993.

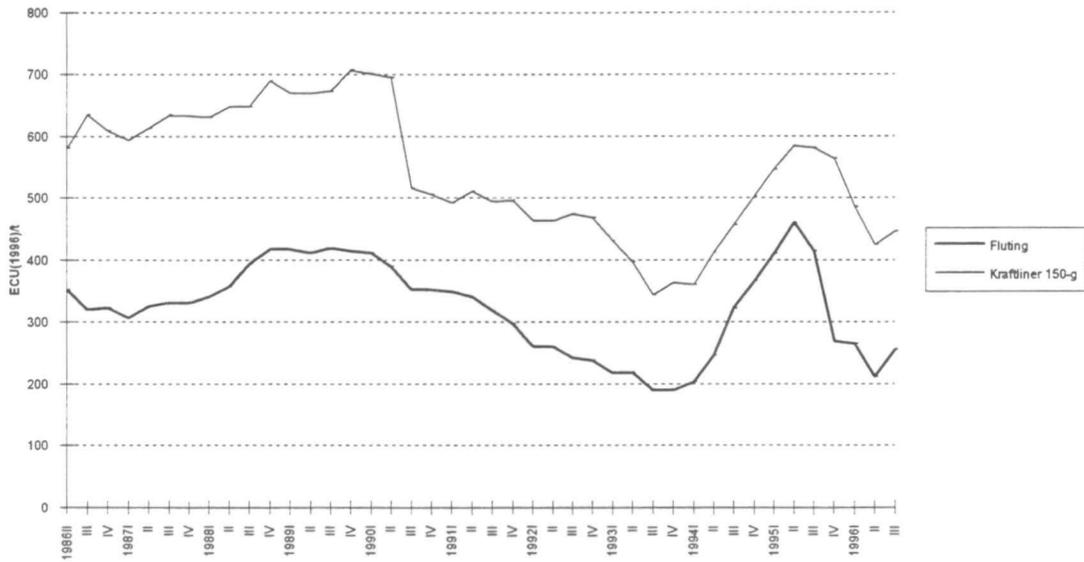
Kraftliner accounted for 42% of the world consumption of corrugated board materials in 1993. World-wide, kraftliner has lost some market share to testliner and other recycled fibre-based materials, and this trend is expected to continue due to increasing availability of recycled grades. The share of kraftliner will continue to be clearly highest in North America and lowest in Asia. The volume growth will be biggest in North America, followed by Asia. White surface linerboards are expected to have above average growth in all main markets since the display and advertising function of corrugated packagings have become more important.

In the USA, corrugating medium prices closely follow kraftliner prices, whereas in Europe fluting prices have developed more independently. Being a major exporter of kraftliner, North America has a strong influence on international prices (in addition, kraftliner prices are normally quoted in US dollars, so US dollar exchange rates have a strong influence on international pricing). For recycled fibre-based grades in Europe, rising waste paper prices have sometimes created pressure to increase the prices of recycled fibre-based liners (testliner) and fluting (wellenstoff). As recycled liner and fluting in Germany are quoted in local currencies, there is less buoyancy than in virgin fibre kraftliner prices (kraftliner is mainly imported and quoted in US dollars). The trend prices of corrugated board raw materials have recently been fairly stable in real terms. Over a long period, about 20 years or so, a slightly declining real price trend can be observed with a negative rate of around -0.2 %/a.

Producers

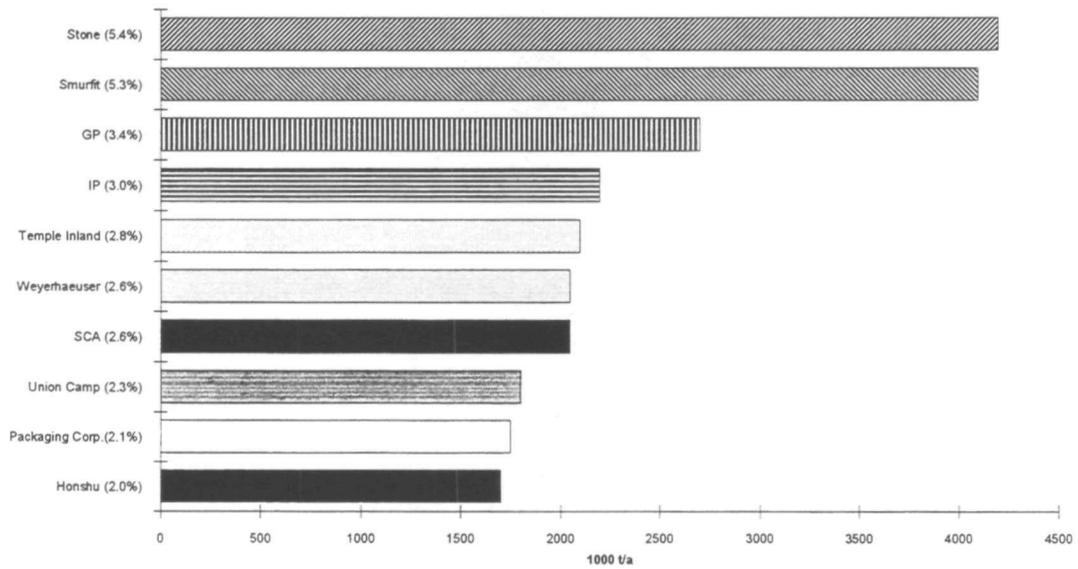
The leading producers are typically North American companies mainly using virgin fibre. SCA is the only purely European producer on the list. Altogether the ten biggest companies control about 35% of the world linerboard capacity.

Figure 3.13
Real Prices of Fluting and Kraftliner (in 1996 terms).



Source: PPI

Figure 3.12
Corrugated Board Raw Materials - 10 Main Producers in 1995 World-wide (world market shares in brackets).



Source: Annual Reports, EIB/PJ Data Bank

3.4.2 Cartonboards

Demand

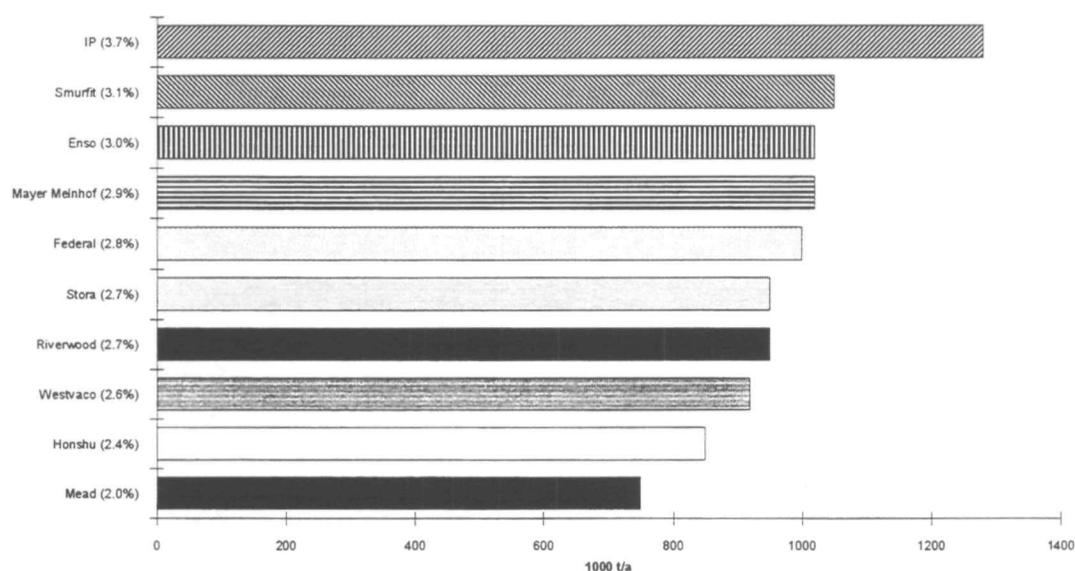
Cartonboards can be defined to include folding boxboard, solid bleached board, solid unbleached board, white-lined chipboard, liquid packaging board and other board used for producing boxes (different definitions exist). The world consumption of cartonboards was 25.4 Mt in 1993, of which North America and Western Europe accounted for 31% (8.0 Mt) and 28% (7.1 Mt), respectively. The past growth rates have been rather low in the industrialised countries (2-3%/a). Environmental issues have recently limited the growth especially in some European countries (lightweighting, elimination of cartonboard packages etc.). On the other hand, China and some Asian countries have experienced rapid growth in packaging applications for cartonboards (growth rates 9-14%/a).

Demand for cartonboards is rather sensitive to the growth of GDP and industrial production in the industrialised countries. The growth in these grades originates mostly from food products, cosmetics, pharmaceuticals and dried, frozen and convenience foods and beverages as well as luxury goods, which are easily affected by changes in purchasing power. Different cartonboard grades show different growth prospects. Liquid packaging board, solid unbleached board and coated recycled boxboards will have the highest growth rate (around 4%/a), driven by Asian demand. Non-lined recycled boards are expected to have the slowest growth (about 1.5%/a).

Producers

International Paper, Smurfit, Enso, and Mayer Melnhof are the leading producers of cartonboards including whitelined chipboard (WLC), recycled boxboard, folding boxboard (FBB), solid bleached board (SBS), solid unbleached board (SUS) and liquid packaging board (LPB). The ten biggest suppliers account for slightly less than 30 % of the world total cartonboard capacity and compared to other paper and board grade markets, the cartonboards industry is fairly fragmented.

Figure 3.14
Cartonboard - Main Producers in 1995 (world market shares in brackets)



Source: Annual Reports, EIB/PJ Data Bank

3.5 Tissue and Technical Papers

3.5.1 Tissue Papers

Demand

World consumption of tissue papers (household and sanitary papers) was 9.5 Mt in 1981 and it grew to 15.1 Mt by 1993 (3.9%/a). North America accounted for 38% (5.8 Mt) and Western Europe for 26% (3.9Mt) of world consumption. Tissue consumption has grown by some 2-3%/a in North America whereas in Western Europe and Japan the growth has been some 3-4%/a. Starting from low consumption levels, the Asian market is growing rapidly (7-11%/a). The market (household and all sanitary papers) in Western Europe and North America is expected to continue growing by some 120 kt/a while the growth is accelerating in Asia to about 80 kt/a. There are wide differences even in Western Europe in per capita levels of tissue paper consumption. These differences depend partly on the GDP per capita level, partly on different habits and partly on demographic factors such as the age structure of the population. Habits cause differences especially in other end-use segments than toilet tissue; there are countries where e.g. kitchen rolls and towels are not yet commonly used.

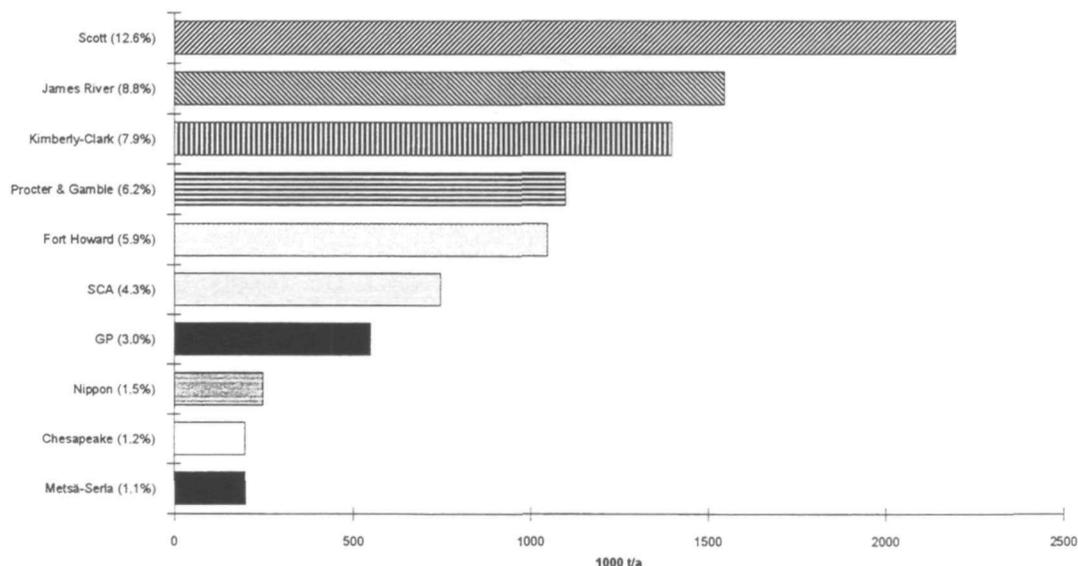
Producers

Scott Paper, now absorbed by KC, was in 1995 by far the biggest tissue producer world-wide, accounting for over 12% of the world capacity. James River, Kimberly-Clark and Procter & Gamble were the next biggest suppliers. All these companies have extensive foreign operations. The Western European tissue companies are internationally relatively small in comparison with the US giants operating world-wide, SCA and Metsä-Serla belonging however to the world top ten producers.

The tissue paper industry is very concentrated; the ten biggest suppliers account for 52% of the world capacity. However, further concentration development is likely.

Figure 3.15

Tissue Paper - Main Producers in 1995 (world market share in brackets)



Source: Annual Reports, EIB/PJ Data Bank

3.5.2 Technical Papers

Technical papers comprise a wide range of speciality papers designed for specific industrial, medical, artistic, banknote and other commercial applications, many involving advanced technology and a high level of expertise. The market sizes for such niche products are usually relatively small, amounting globally perhaps to a few hundred thousand tons and typically these markets are supplied by small paper machines with a capacity of 100 kt/a or less. A considerable premium is often available for niche products, resulting in attractive profitability. Due to the small market size, a situation of excess supply may develop rapidly. The life-time of special papers tend to be rather short and continuous product development is necessary.

For example, decorative laminating papers are supplied for the furniture manufacturing industry. Release paper is produced for self-adhesives, envelope paper and other similar specialities. Some technical papers have household or tissue paper characteristics and separation of the markets is not always clear. For example, strong, absorbent and non-linting airlaid paper has been developed for hygiene products, but is normally included in the category of special papers. Airlaid-paper can also be used to make table settings and industrial wipes. Also, filter paper is a special product for engines, coffee machines etc.

Most of the largest paper manufacturers operate on a particular speciality market as a key player. This is usually a niche business accounting for, say, less than 5% of the company turnover. More specialised technical paper producers include Ahlström (including Sibille-Dalle) and Gascogne.

4. TRENDS AND ISSUES

4.1 Shift towards New Fibre Baskets

4.1.1 Wood Availability

The paper and board industry tends to locate close to fibre sources due to reasons related to transport economics. Since in wood pulping some four tons of wood are transformed into one ton of pulp, the minimisation of the transport costs requires that pulping takes place as close to a forest as possible. Wood fibre is currently the most important input to paper. In 1994, the global output of 268 million tonnes of paper and board was produced from approximately 160 Mt of wood pulp, 12 Mt of non-wood pulp and 107 Mt of waste paper. However, wood fibre for paper represents only 14% of total forest harvesting, and paper manufacturing represents only one third of all industrial uses of wood (more than 55% of roundwood removals are still for fuelwood uses, taking place mainly in developing regions of Africa, Asia and Latin America; other industrial use include e.g. the sawmill industries, often small-scale operations). Also, only 63% of wood consumption in the paper industry is in roundwood form, the remaining being residues and chips (mainly good quality waste wood from the sawmill industry).

As shown in Table 4.1 below, the most important source of wood is currently the natural production forests, located mainly in Scandinavia, Western Europe and North America.

Table 4.1
Sources of Wood Fibre

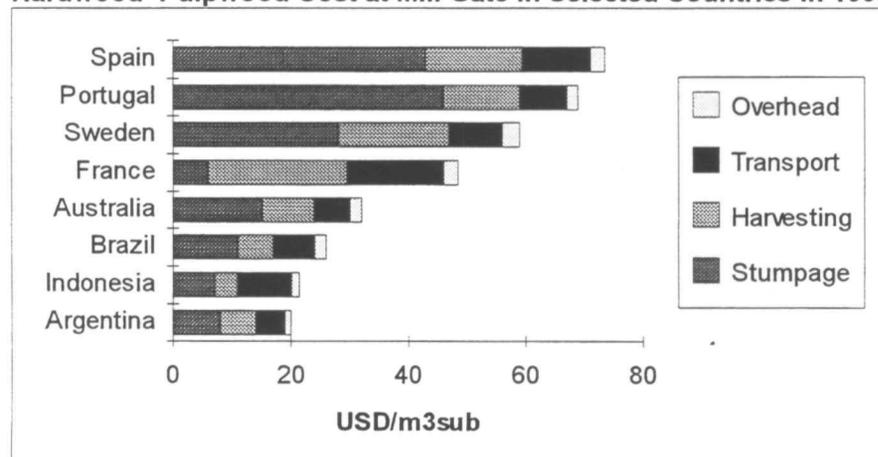
Forest Type	- % of Total Wood Fibre -
Natural production forests ⁵	69%
Plantations, indigenous	18%
Plantations, exotic	11%
Tropical rain forests	1%
Temperate hardwood forests	1%
Total	100%

Source: Wood Resources International Ltd.

Plantations

As indicated by Table 4.1, plantations currently provide 29% of wood fibre used in the paper and board industry. The importance of plantations is growing as there are strong incentives towards more reliance on intensively-managed forests, designed in order to meet pulp fibre needs. The competitive advantage of plantations is related to such features as the fact that the location of a plantation can be selected to be optimal for a pulp mill, the species can be selected, improved genetic material can be employed and that plantations can be designed large enough to meet the economies of scale requirements of modern pulp mills. In theory, the world's current total demand for wood fibre for pulp could be supplied from a high-yielding (10-40 m³/ha/a) industrial plantation area of about 40 million ha - only 1.5% of the world's closed forest area and less than four times the current area of all high-yielding plantations (for comparison, the total plantation area for industrial use in Brazil is currently some 4.5 M ha). Of a total forest cover of 3440 million ha, there are only some 100-135 million ha of plantations. Forty million of these are industrial plantations, of which 10-14 million are high-yielding. In some regions, plantation wood provides already almost all wood for pulp, notably South America (e.g. Argentina, Brazil, Chile, Uruguay), Asia/Oceania (Indonesia) and Africa. Although Spain and Portugal will supply increasing amounts of plantation wood (Eucalyptus), European wood will remain high cost due high land prices. The cost-competitiveness of non-European plantation fibre is shown in Figure 4.1.

Figure 4.1
Hardwood Pulpwood Cost at Mill Gate in Selected Countries in 1995.



Source: EIB/PJ Data Bank

⁵Regeneration of these forests takes place through natural processes, seeding or planting. Importantly, even if planting is applied (mainly to speed up the regeneration and to shorten the rotation), a large percentage of trees is normally seeded naturally from surrounding forests, which distinguishes the natural forests from indigenous plantations.

***Observation 1:** An increasing number of greenfield pulp mill investments rely on plantations only, especially in Asia and South America.*

Natural Production Forests and Environment

The growth of the European forests clearly exceeds fellings and thus the utilisation rate of potential fellings is only some 80%. In theory, it would be possible to increase fellings considerably without sacrificing sustainability. However, the prevailing environmental trend is currently limiting industrial forest uses and leading to emergence of alternative environmental utilisation of forests (recreation, amenity, option etc.) which is effectively resulting in increased opportunity cost of industrial wood production.

Among other things, environmental concerns have materialised in such concept as **timber certification** which requires **sustainable forest management**, ensuring "long-term forest health and productivity while providing continued social and economic benefits". As timber certification is related to many unmeasurable issues, general rules for it have not yet been established although there are several remarkable initiatives e.g. by the Forest Stewardship Council, ISO and others. However, these initiatives are not mutually consistent in all respects. The current issues for timber certification include the following:

- **Limited availability of certified timber** - The current potential supply of certified timber of 3.5 M m³/a is considered infinitesimal compared to the annual world output of industrial wood of 1700 M m³/a. Even with an optimistic scenario, only 15% of traded wood products could be influenced by certification by the year 1999.
- **Not clear support in the market as yet** - There may be pent-up demand for certified timber but there is little to indicate that the market is fully ready to support it today. There is no convincing evidence of the acceptance of a price premium for certified timber, although a recent finding in Germany indicates that consumers will not squabble over a 5% premium for certified timber. It is further reported that, in the Netherlands, consumers will probably accept ca 6-10% premium. However, it has also controversially been expressed that most buyers would not be prepared to pay a premium for certified wood and paper products.
- **Unbalanced benefits possible for forest owners** (in economic terms, certification is not necessarily efficient) - Large private and government-owned forests could benefit from a possible premium but at the expense of small-scale forest owners (especially in Europe), as the latter will face the disadvantages of: (i) higher unit cost impacts due to economies of scale both in forest management and certification itself, and (ii) less possibilities of benefiting due to weaker links with the market.
- **Increase in the forestry sector costs** - The direct costs of forest management certification are not insignificant, perhaps up to USD 1.50/m³ depending on the size of certification unit and local conditions. In addition, there might be a cost of some USD 1.20/m³ for certification of origin of wood. If tracking of individual logs is applied throughout the chain-of-custody (e.g. forest-pulp mill-paper mill etc.), indirect costs can become important without any environmental or other benefit.
- **Growing political importance** - In spite of apparent problems in executing certification schemes, it is likely to stay on the agenda and play an increasing role, especially in temperate and boreal forests. Certification is becoming an environmental liability and a way to reduce environmental risk. It is therefore likely to find its way into checklists of the forest sector (pulp & paper, wood industry, forestry) investment appraisals.

***Observation 2:** The prevailing environmental trend is tending to increase (opportunity) costs of industrial forest utilisation in high income countries and decrease the attractiveness of traditional fibre sources.*

4.1.2 Location of Recycling

The centre of gravity of recycling is determined by the fact that the production of paper and board in Scandinavia is five times higher than consumption while in the rest of the western European region consumption exceeds production. Hence, in spite of a high waste paper recovery of 43% (the ratio between recycled paper and consumed paper) in Scandinavia as compared to recovery rate of about 40% in other western Europe, the Nordic countries can only cover a small part of the total fibre need with domestic waste paper. Recycled fibre currently accounts for 10% of the total fibre use in Nordic countries while in other western Europe the corresponding figure is around 53%. In other words, consumption of paper simultaneously creates fibre assets in central western Europe, where initial virgin fibre sources are scarce compared to consumption in the region.

Due to technological development (deinking etc.), utilisation of recycled fibre is bound to grow. According to some estimates, paper volumes to be recycled during the next decade could be about 80% larger than the current volumes due to increasing recovery and increasing consumption. Regions which increase consumption of paper will also create increased potential for paper manufacturing. This is likely to result in a shift of the gravity point of paper production in future.

It should be noted that recycling is not a closed loop system as fibre can only be recycled up to 4-5 times and there is a considerable fibre loss (about 15-20% of fibre is lost in deinking) on every round. Therefore the system has to be continuously fed with virgin fibre. In addition, recycling is only profitable in densely populated areas where the recovery cost per waste paper unit is low. Within technological constraints, there will be a competitive balance between the use of recycled fibre and virgin fibre.

***Observation 3:** Increase in paper consumption in densely populated areas is likely to absorb new investments based on recycled fibre.*

4.2 Technology

Manufacturing of Pulp

Modified kraft cooking techniques have developed in the 80's with the aim of better delignification, better resistance, less water consumption and more whiteness of the pulp. Most important examples are: Superbatch cooking, Oxygen, Ozone, Enzyme treatment to improve delignification and reduce peroxide consumption.

In mechanical pulping, pressure groundwood and TMP are supplanting conventional groundwood. Mechanical pulping refiners have increased size (from 1.5 MW to 20 MW in 25 years). The operating flexibility which is lost at the benefit of capital savings is partly recuperated with the new two stage process. A lot of effort has also been placed in reduction of electricity consumption, without compromising on yields for fibres. In wood handling sections, there is development of automatic stations for control of chips' quality. Non sulphur (for instance soda) based pulp production techniques are still under development: according to the industry, industrial applications are still 10 years ahead.

Paper Machine Capacity

The dominant trend is the rising of paper machine output through increases in speed, which are mainly led by tissue (from 1000 to 2100 m/min) and newsprint paper machine (from 800 to 1500m/min). Higher speed imposes better dewatering efficiency and better forming to maintain the quality of paper.

- There is a tendency to specialise machines in more narrow product areas with a consequence of better adaptation to clients needs but loss of flexibility to other users.
- Large production equipment certainly makes sense for commodity type products like newsprint or tissue. The same logic cannot be applied directly to smaller market segments.

4.3 Environment

Land intensiveness and closeness to nature have contributed to put the forestry industry in the limelight of the environmental battles of the 80's. This, and some highly visible or smelly aspects of its activity have given it the image of a highly polluting industry and have led to public concern. New Government regulations, pressure of consumer markets and more responsiveness and transparency from the industry are now changing that image. The environmental dimension is now more integrated in the decision process of the industry, but is also used as a marketing tool and as an important element of its communication policy: for example, the successful eco-marketing of chlorine-free pulp, and environmental reports which are commonly a part of the annual financial report.

Former concerns about subjects such as dioxin emissions and contents in paper products tend to wane as the public is better informed and the industry more respondent. Effluents and fumes are now much cleaner than they were 20 years ago. Concerns about forest exploitation have moved from opposition to the concept to criticism of the method. The message that the pulp and paper industry is a clean industry indeed is now gaining acceptance in the public.

A number of environmental issues are however still of concern to producers, consumers and authorities in the EU. Amongst those prevailing most we find:

- Forest certification (see 4.1.1)
- Eco-labeling
- Eco-taxes and CO2 taxes
- Packaging directives

The last three of these have their origin in the people's concern that the environment will not be able to cope with the absorption of discharged waste solids and gases with damageable consequences for mankind. Some countries initially more concerned than others have been pressing legislation which can differ widely from one country to another.

The industry concern's has been to keep demands at a reasonable level, to not distort competition between competing materials and to avoid trade distortions, supported in this by trade authorities. Negotiations are very difficult given the sensitivity and complexity of the subject, and the high number of parties concerned.

4.4 Substitution of Paper and Board.

Substitution trends have already been discussed in section 3 above by paper grade. The aim of the following is to summarise briefly the discussion over relevant paper grades. There are three different frontiers on which paper and board are facing increasing competition: (i) media, (ii) office technology and (iii) packaging:

- **Media** - Firstly, development of electronic media is expected to slow down the demand for **newsprint**. Electronic media will help give consumers better access to global information and the electronic media reader will be a more active participant in exploring information, rather than being just a passive consumer. Secondly, although world advertising expenditure is expected to continue growing faster than GDP on the average, an increasing percentage of advertising expenditure will be allocated to electronic media (especially television), reducing demand for **coated woodfree and mechanical papers** (magazines) and also newsprint. Traditional paper-based media will not disappear, but their development will slow down and new media markets will develop.
- **Office technology** - Increasing electronic document handling and storage of data will be a factor limiting the growth of the office papers based on **uncoated woodfree paper**. On the other hand, multiplication of printers, copiers and faxes is a factor increasing the uses. The new technology will affect the required paper quality and in consequence, totally new paper qualities need to be developed, e.g. for colour copying, colour laser, ink-jet and colour facsimile.
- **Plastics in Packaging** - Packaging can be analysed in two segments according to the functions it provides: a) consumption: protection of the product and its display to the consumer; b) transportation: grouping for manipulation and transport. In each segment, paper competes with different materials e.g. glass, plastics, aluminium, etc. Paper represents one third of the value and weight of all packaging materials. Paper-based packaging is divided in three categories: **1) corrugated containers, 2) folding box boards, and 3) paper sacks**. Plastic packaging (30% of all plastic uses) is the main competitor (basically polyethylene and polypropylene) for corrugated containers. Because the price of plastics has halved over the last 25 years, plastics consumption has grown over 7 % per annum compared to a growth rate of about 4 %/a for paper. In general, recycling improves the competitiveness of corrugated board as a packaging material over plastics.

4.5 Cost structure

With new modern technology involved, paper machines look the same for investments anywhere in the world. But paper is not only produced on modern machines and the cost structure of paper making can differ significantly for geographical and quality reasons. We give hereafter some indications of the typical for some qualities of paper.

The most important cost elements are exemplified in the following table with the breakdown for producing some typical papers on hypothetical paper machines in the EU, which roughly summarises in one third for raw materials, one third for Manufacturing and Distribution and one third for value added.

	NP	LWC	WFC
Wood	-	6 %	-
Chemical Pulp	-	14 %	40-50%
Deinked pulp	40-60%		-
Chemicals & fillers	8-10%	19 %	25-30%
Energy	10-15%	5-10 %	6-10%
Personnel	10-15%	5 %	15-20%
Other Manufacturing	12-15%	7 %	6-8%
Operating cost (ECU/t)	280-350	450-500	520-580

The most price sensitive factors are: fibre costs (wether virgin or recycled), which depend on the cycle and on the level of integration of the operation, energy costs, which reflect local conditions

and possible preferential rates for heavy industry, and cost of logistics, which reflect distance to raw material sources and consumption centers and transportation conditions.

It has to be stated that, although technological and productivity improvements tends to flatten industry costs curves, a factor from 1 to 2 can still be applied between the most efficient, modern and best located machine and the worst one.

4.6 Investment Trends

4.6.1 The EU industry

The developments regarding fibre materials, nonfibrous materials, technology, competition, environmental concerns and location of fibre baskets, discussed in the section above, are resulting in an investment behaviour with the following characteristics:

Investment Strategies:

- The European paper and board companies have either relied on large scale utilisation of fibre resources (fibre intensity high; especially in cases of large forest properties in company ownership) or substituted wood by less expensive filling materials (in cases of limited forest ownership) and specialised in more energy intensive paper grades. These investment strategies have further resulted in different product profiles across the industry and a balanced utilisation of market opportunities (Table 4.2).

Table 4.2
Paper Grades and Competition in Fibre and Energy Space

		Energy Intensity:	
		<i>low</i>	<i>high</i>
Virgin Fibre Intensity:	<i>high</i>	woodfree printing & writing papers; corrugated materials (packaging) Chemical Pulp competition:+++	
	<i>low</i>	(partly) <u>recycled</u> fibre- based: - newsprint - corrugating - cartonboard (- printing & writing) competition: +	mechanical printing & writing papers; newsprint competition: ++ (mainly newsprint)

- +++ very competitive, excess supply
 ++ competitive (possibly emerging excess supply)
 + balanced market, demand growing

Source: EIB/PJ

- The balance in the paper production game is currently changing due to increasing competition from the fast-growing plantation countries, notably in Asia (Indonesia) and South America (Argentina, Brazil, Chile). These countries are in a position to establish low cost virgin fibre intensive operations, the effect of which will be felt especially in the pulp and woodfree paper markets. From the viewpoint of competition, the best opportunity for the European producers is in the recycled fibre-based paper and board market, i.e. in the lower left quadrant in Table 4.2.
- Due to scarcity of resources (fibre) needed for capacity expansions, the dominating investment strategy is likely to be based on mergers and acquisitions, although scale economies will continue to be the main reason for process improvements in Europe.

Modernisation Investments for Higher Added Value:

- There is likely to be a continuous shift towards higher added value products. Cost increases especially due to environmental regulation will be eliminated by substituting wood and energy. Substitution requires greater use of filling materials. The industry has to move rapidly in search for high added value products and the need for modernisation investments will increase. Production will be based on the principle of *minimised processing* and the emphasis will be in coated paper grades. The need for R&D will increase.
- During the last decade, the Swedish companies expanded in Europe mainly based on acquisitions, whereas the Finnish companies relied upon greenfield investments as a main strategy outside Scandinavia. After major mergers within the domestic Finnish industry, it is possible that also the Finnish companies will place greater emphasis on acquisitions in attempts to gain larger market shares in Europe. Acquisitions often result in subsequent modernisation investments.
- Environmental upgrading of mills will continue in Europe (and the opportunity for environmental investments in Eastern Europe is significant).

Location:

- The focus of the investments will be on the current key market areas, i.e. the UK, Germany and France. Investment possibilities will be increasingly looked at in Russia and Asia; however, the expansion of European companies to the east will progress slowly because of risks related to political and environmental factors. Upgrading investments will take place in Scandinavia.
- Restructurings will be likely in south Europe, especially Italy, where the average mill size is small. Increasing efficiency will mainly require mergers, but could result also in some greenfield investments.
- European companies are showing increasing interest in plantation-based greenfield investments especially in Asia - where demand for paper is expanding - but also in South America.

Fibre Base:

- The European paper and board industry will consider capacity expansions in Europe based on three types of technologies:

- (i) *Use of virgin fibre only.* For the time being, scope for such investments exists in Scandinavia and, to some extent, in Scotland. In Scandinavia these investments are likely to replace existing capacity or increase added value, whereas some scope for real expansion exists in Scotland. By the year 2010, considerable capacity expansion possibilities exist in Ireland and the UK;
 - (ii) *Mixed use of recycled fibre and virgin fibre.* Scope for these investments exists in England and Germany;
 - (iii) *Use of recycled fibre only.* Scope for these investments exists in Dublin area, England (London area) and some areas in Germany and France.
- As argued above (investment strategies), a combination of alternatives (ii) and (iii) seems the best opportunity from the viewpoint of competition. This suggests that new European greenfield investments will locate mainly outside Scandinavia.

4.6.2 Eastern Europe and the Baltic Countries

This section aims at characterising the main features of the paper and board industry in Central Eastern Europe (Poland, Czech Republic, Hungary and Slovakia) and the Baltic countries with regard to investment possibilities in the sector.

Consumption and Production

Since the early 1990s, there has been a substantial increase in consumption of paper in the region, with annual increase rates exceeding in many cases 10%. However, paper and board consumption per capita in Eastern Europe and Baltic Countries still amounts only at most 30% (35-65 kg/c) of the level of consumption in Western Europe (around 200 kg/c), and paper consumption can be expected to continue growing considerably.

There are several rather modern pulp mills in the region, mostly integrated with paper manufacturing facilities. The pulp and paper mills with a potentially positive future outlook are located in Poland, Czech Republic, Slovakia, while the situation of the current capacity in Hungary and the Baltic states is more difficult. Significant capacity upgrading is required even for the most modern installations in Eastern Europe.

Poland is the most important market in the region, where important investments have already carried out. For example, Table 4.5.2 shows the recent major investments in the Polish paper industry. Due to necessary modernisation, the investments can be taken as indicating future key players in the Polish market and opportunities for further viable investments.

Fibre Resources

Poland

Poland has the largest forest resources in the region, about 8.7 million ha. The forest resources are sufficient to support considerable capacity expansions. However, the most notable investment opportunities in the near future may be in recycled fibre-based paper manufacturing, as recycling of used newsprint and other paper products is expected to increase.

Czech Republic

Forest resources are under-utilised and there is clearly potential to increase paper production. Paper consumption per capita (67.1 kg/c) is one of the highest in the region. Important producers include JIP and Sepap.

Table 4.3
Recent Major Investments in the Polish Pulp and Paper Industry

<u>Company</u>	<u>Investment</u>	<u>USD million</u>
International Paper - Kwidzyn S.A.	Alkaline process for two machines to improve paper quality, resistance to ageing, printability and other quality properties.	200 (estimated minimum)
Celuloza S.A.	Pulp and paper mill modernisation.	116
Intercell S.A.	Paper machine and converting lines modernisation.	75
Kostrzyn Paper Mill S.A.	Paper machine modernisation and construction of converting lines.	50
Silesianpap S.A.	Waste water treatment.	2
Warsaw Paper Mill S.A.	Stock preparation department modernisation, paper machine computerisation, steam boiler modernisation.	1.5
Krapkowice Paper Mill S.A.	Modernisation of cogeneration and waste water treatment.	0.5

Hungary

Hungary has small forest resources and therefore capacity expansions do not seem feasible, although paper consumption per capita is high. As in other countries in central eastern Europe, a sufficient base for recycled fibre-based production is developing along with increasing consumption.

Slovakia

The country's forest resources are not fully utilised and new investments could be feasible. There are a few significant producers in the country which export more than 50% of their production.

The Baltic Countries

The countries have abundant forest resources, but the paper industry is in financial difficulties. The forest resources could support greenfield projects of a considerable size.

5. APPRAISAL ISSUES

When analysing European paper projects, apart from the standard project or credit issues, the following issues need to be addressed in the assessment of the company/project.

5.1 Operations

Price Volatility:

Economic and financial viability of a project, and a company, is frequently tested during cycle downturns. The price volatility is often associated with variations in production volumes, with a high positive correlation between price and volume. Timing of the cycle can critically affect the debt repayment capability (of the project and/or company). Different cyclic price and volume scenarios should be incorporated in the profitability analysis, taking account that capacity

utilisation may change over a cycle. The analysis should pay regard to net cash flow (before depreciation but after tax, interest and change in debt). Maximum cumulated negative cash flows at start up should help define financing needs. If a derivative market for pulp and paper products develops, hedging possibilities should be reviewed.

Fibre Supply:

Commonly only a fraction of the wood required can be obtained from the forests owned by the promoter. Forest management and logging are increasingly environmental issues. Recycling is increasing and is often critically affected by fiscal policy measures. Change in a policy regime can therefore modify the economics of recycling. Moreover, the wood procurement, availability and cost of wood are long-term issues and considerable changes may occur over time. Source of fibre and applied silvicultural practices, including possible certification of timber, are issues to be reviewed in view of developing environmental requirements.

Availability of the required waste paper grades and feasibility of supply/collection also have to be checked carefully.

Competition:

Markets of several paper grades in Europe are characterised by recurrent situations of temporary excess supply. Some export markets outside Europe are becoming increasingly difficult to access due to expanding production in fast-growing plantation countries.

The European paper producers face competition from both the big American paper producers and low cost producers from the Eastern European countries. Possible mismatches between production and consumption growth in South East Asian markets might further contribute to the destabilisation of paper markets already subject to cyclicity.

Development of competition may require that the price trends and price levels be adjusted dynamically over the life-span of the project when evaluating profitability of a project or/and company.

Competitiveness

The long-term viability of a project is influenced by the dynamically-changing competitive situation of the European industry resulting from growing production outside Europe. Size, the distribution network and the cost structure of the company are crucial to be successful in the long term. Due to economies of scale, attention have to paid on that the output of a single new paper machine may represent a significant percentage of the market. In particular, the optimal size of a new paper machine already exceeds an annual volume growth of market for some paper grades.

Cost-competitiveness and the prospects of further cost reductions is one of the measures of the survival potential of a company, as are market prospects. These are therefore essential aspects of the Bank's appraisal. However the emphasis on cost-competitiveness will vary with the degree of commodity/specialty content of the product, a true commodity being more sensitive to the cost aspect while a specialty would be more sensitive to substitution by another material.

Also, cost-competitiveness can not be dissociated of the availability and prices of raw materials. Therefore our analysis generally are based on likely evolutions of price differentials between product and raw material, which we believe have lower variances than the prices themselves.

5.2 Company Analysis

Corporate Strategy:

The basis of assessing a project as well as the future credit quality is understanding the company's long-term objectives and the ways it intends to take to get there.

There is no absolute recipe for success: analysis of type of ownership, type of management, balance sheet structure, product mix, level of integration upstream and downstream is not conclusive. It rather appears that success is generated by a mixture of deep knowledge of customer needs and market behaviour, of management foresight, aptitude and continuity and of manpower skills, as well as an adequate regulatory environment. Some specific strategic features of companies of the sector are however striking:

A common feature to the sector is the process of **concentration**, which leads to mergers and acquisitions. Especially the mid-tier players are facing the realistic chance of being taken over, and credit documentation needs to provide for this event. On the other hand, after the acquisition a re-focus to the core competencies of the group takes place, leading to divestiture and sell off of non-compatible areas.

The trend is clearly to more concentration still. Industry experts anticipate that in the medium term, through mergers and acquisitions the number of global, leading players in the world paper industry will be limited to the 5 -10 biggest companies in each market. Small companies will continue to compete in specialised markets, whereas medium-sized players could be competitive players on national markets. Regard should be paid on the potential for strategic mergers, which would further enhance existing technical or commercial co-operation.

Furthermore, in many cases, **integration** of a pulp mill and a paper mill is pursued and may generate a decisive advantage, but not always.

Most companies find themselves at some time faced with the dilemma of either **diversification** or more concentration on core businesses. The assessment of the company's strategy will consider whether the actual strategy makes sense in terms of product development potential, managerial skill availability, stretching of communications and common business attitudes.

As there is a general tendency in the paper industry when it develops to get closer to the customer instead of selling only to merchant intermediaries, companies are looking closely to their **marketing** alternatives. For marketing assessment, appraisal needs to assess at least branding strategy and distribution.

Financial Aspects:

Due to the exceptional combination of price volatility and capital intensity, specific measures have to be applied. Attention has to be paid on acquisitions and divestments as a common trend within the industry. As laid out in section 3, due to its cyclical nature an assessment of the financial strength of a paper company has to focus on the capability of the company to successfully cope with a cycle downturn. A strong equity base, prudent dividend policy, adequate capital expenditure program that leaves enough room to cope with downwards variations in the cash flow and in some cases full integration (to be less dependent on variations in the pulp and paper prices) are some indicators that support the robustness of a project in the paper industry.

Investment Programs:

The paper industry is a typical industry where economies of scale have mattered, at least up to now. Big paper machines (with production capacities up to 500 000 tpa paper production) are a heavy capital investment, amortised over periods up to 15 years.

It is crucial to the success of a paper company to phase the capital expenditure program in order not to burden the company too much in the downturn cycle and to be able to be ready for production in the upward cycle.

Appendix : PAPER GLOSSARY

1. COMPOSITION

1.1. Paper is essentially made out of fibre, with some additives ,fillers etc...

1.2 Fibre (63 Mt in 1993 in EU+EFTA) is basically cellulose of vegetal origin under the form of either

virgin fibre (fibre vierge) (50% of total raw materials in 1993), as:

- Chemical pulp (Pâte chimique)(37%),obtained by chemical extraction of cellulose from wood or other vegetal stuff, now almost exclusively by the Kraft Sulfate process, but in the past also by the Sulfite process.
- mechanical pulp (Pâte mécanique)(17%), or groundwood and its variations:
- thermomechanical pulp (TMP) and
- chimicothermomechanical pulp (CTMP).

recycled fibre (fibre recyclée) (42% of total raw materials) or waste paper.

Virgin fibre is further classified in:

- hardwood (feuillus) or short fibre or leaf wood (beach, birch, poplar, eucalyptus, etc...)
- softwood (résineux) or long fibre or needle wood (pine, spruce, fir, etc...);
- non-wood (5 %) or annual crops like bagasse (2.5 mt/yr), straw pulp (8.8 Mt/yr) or kenaf etc...

These fibres can be bleached (blanchiment, blanchies) or unbleached, bleaching meaning a treatment removing residual lignin and other elements from pulp for colour or other qualities purposes.

1.3 Additions (14 % of raw materials) are mainly

- mineral fillers, usually up to 20%,
- coating materials, (kaolins, carbonates,...),
- glueing agents, retention agents, starches, pigments.

Paper can be coated (couchage, couché), which means that it can be covered by one, two or more layers of additives to give specific surface characteristics for good printing or writing or for some other kind of specific technical use.

In uncoated papers additions could reach up to 20% of total feed, and in coated papers fibre in some cases more than 50% of total feed.

1.4 According to paper composition of these various elements the following paper categories can be distinguished:

- Woodfree paper (papier sans bois): made of bleached chemical pulp essentially
- Woodcontaining paper (papier avec bois): where mechanical pulp (or its variations) is an important part of the mix, with some chemical pulp.
- Recycled paper where old deinked waste paper makes most of the fibre furnish has increasingly its own place in this classification.

These types of paper are coated or uncoated.

2. CLASSIFICATION ACCORDING TO END USES

According to end uses papers can be classified in the following main categories (figures refer to share of EU+EFTA paper production (P) in 1993, which was 66.4 Mt and apparent consumption (C), which was 61.5 Mt):

GRAPHIC PAPERS (P=51%; C=49%)

- . Newsprint (P=C=13%): mechanical pulp and recovered paper;
- . Magazine and catalogues: woodcontaining grades, with or without coating (P=17%;C=15%)
- . Business papers: uncoated woodfree grades (P=12%; C=13%) with some recycled fibre;
- . Company reports, luxe reviews and catalogues: coated woodfree (P=C=8%).

PACKAGING PAPERS (P=38%; C=39%)

Wrapping papers: (P=C=5%): big and small paper bags: unbleached (Kraft) or bleached woodfree;

Case materials: (P=22%; C=24%) paper for corrugated board: Kraftliner, testliners (recycled paper)

Folding Boxboard: (P=9%; C=7%): made out of several layers of different kinds of paper with a total unit weight of over 224 g/m². 50% of board is coated.

Other: (P=C=3%)

TECHNICAL PAPERS

Speciality and technical papers : (P=C=6%)

- . all kinds, coated and uncoated.
- . typical applications are:
 - reprography: autocopying and thermal papers (about 85%)
 - filter and solvent barrier papers (13%)
 - electrical (condensator, dielectric) and electronic paper
 - security paper

HOUSEHOLD PAPERS (P=5%; C=6%)

Tissue paper: for household and sanitary uses