

PART 3

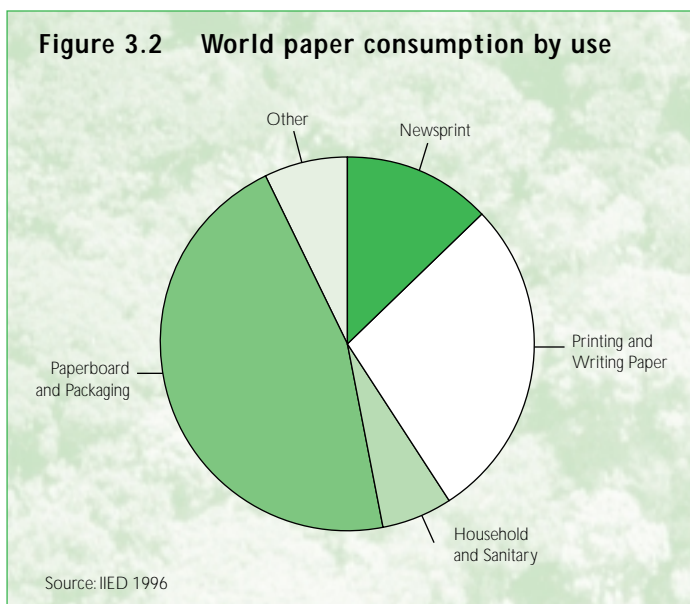
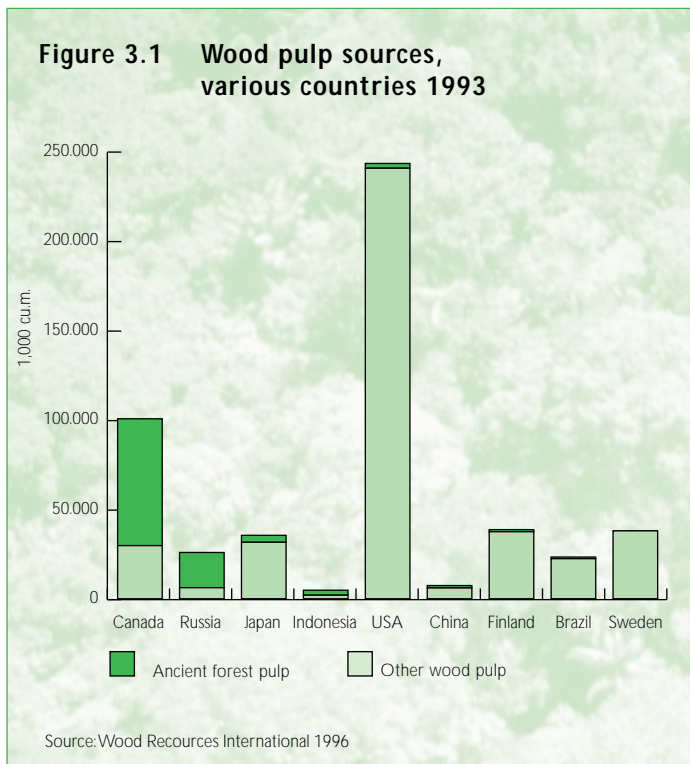
paper

3.1 ANCIENT FOREST PULP AND PAPER CONSUMPTION

The bulk of ancient forest pulp and paper in the world is produced in Canada. Wood Resources International estimated that in 1993, at least 70% of the raw material processed by the Canadian paper industry came from ancient forests⁷³. Much of this ends up as graphic paper and newsprint, consumed in the United States. Canada's pulp, paper and newsprint exports to the USA added up to well over US\$ 10 billion in 1997⁷⁴. Russian paper plants rely on ancient forests for 76% of their pulp (Figure 3.1). Most of the wood pulp processed by Japanese paper factories is imported from ancient forests in Chile, Canada and Australia.

Considering total and per capita paper consumption for the world's major paper markets, paper from ancient forest pulp is probably largely consumed in the USA (Table 3.1). The paper consumed in Europe and Japan has a lower overall 'ancient forest content'. Nevertheless, some papers are largely made from virgin fibre, notably printing and writing paper. The fibre required comes from second growth forests and plantations, but also ancient forests in Canada, Russia and the Far East.

By volume, most paper in the world is used for paperboard and packaging (see Figure 3.2), which generally has a high recycled content. Most relevant to ancient forests are printing and writing paper (including office paper) and newsprint, which have much higher virgin fibre contents, although regional differences do exist (see section 3.4).



73 Wood Resources International 1996.

74 This value also represents a percentage of recycled paper product exports. Industry Canada, based on data from Statistics Canada <<http://www.strategis.ic.gc.ca>> viewed October 25 1997.

75 IIED 1996.

Table 3.1 Main paper consuming markets, 1997 (million metric tonnes)

Markets	Paper and Paperboard consumption	Share of world consumption	Per capita consumption (kg/p.p.p.y)
USA	97	33%	323
Europe	69	23%	184
Japan	31	10%	249
Other	100	34%	20
World	297	100%	51

Source: Pulp and Paper International, Annual Review 1997

3.2 PULP AND CARBON EMISSIONS

The pulp and paper industry is a significant emitter of greenhouse gases. According to the International Institute for Environment and Development's report *Towards A Sustainable Paper Cycle*, produced for World Business for Sustainable Development⁷⁵, for the industry to become a net zero emitter, it would need to pursue changes at all levels of the paper cycle:

- Curtailment of timber extraction from ancient forests in Russia, North America and some developing regions. Around 17% of all wood pulp production is derived from ancient forests, which are a globally significant reservoir of carbon.
- Efficiency improvements in manufacturing, such as reducing the use of fossil fuels.
- Alternative disposal routes to landfilling, such as recycling and resource reduction.

3.3 OFFICE PAPERS

Reduction of office paper use

Office papers include letterhead paper, copy paper, paper in printers, envelopes, forms, etc. A4-size paper is the most used office paper, accounting for approximately 10% of global paper use. In Western Europe, there are currently around 20 million offices using 75-85kg per year of office paper per employee⁷⁶.

Paper use reduction programs reduce pressure on ancient forests and landfill sites, and reduce the costs for paper purchases, copying and printing, postage and waste disposal. Many government and corporate offices have adopted policies to reduce office paper use and, in many instances, substantial cuts in paper consumption have already been achieved. Effective paper reduction programmes usually involve:

- Introduce double-sided copying and printing
- Using lighter-weight papers, smaller margins and efficient letter types
- Using copiers and printers which can handle recycled paper properly and that support double-sided imaging
- Reducing unnecessary paper information
- Cleaning-up address files (saves greatly on postage)
- Reducing accessibility to copiers and printers
- Shifting towards electronic media communication and archiving

According to the International Institute for Environment and Development (IIED), most offices can achieve a 20% cut in consumption of paper through good housekeeping, while the greatest cut - up to 50% - requires a change in systems, such as computer-based communications and information management⁷⁷.

⁷⁵ IIED 1996.

⁷⁶ Paper Europe (1999).

⁷⁷ Robins and Roberts 1996.

Today, 90% of the information used at the average office desk is on hardcopy paper. Methods of sending, receiving, and storing information without paper (e-mail, Intranets, Internet, CD-Roms, electronic ordering and paying, etc.) are already being adopted on a wide scale in the USA, Europe and Japan. It is expected that by the year 2004, as much as 70% of the information used at the office desk will be electronic⁸⁰.

This development will be driven largely by the direct benefits of electronic media. They include increased productivity, space savings and reduction of storage costs. A Compact Disk, for example, can store as much information as half a tonne of printer paper⁸¹.

Introducing recycled office paper

The introduction of recycled paper in the workplace has in the past been hampered by technical complications, poor quality, high prices and limited availability. In recent years, many of these problems have been overcome. Copiers and printers can be adjusted to handle recycled paper properly, different brands of recycled paper compete in

Box 3.2 Osaka Gas: Successful paper consumption reduction in Japan

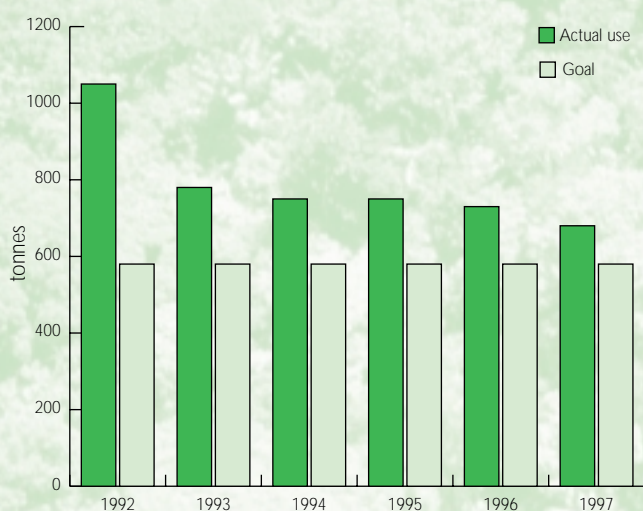
In June 1995, the Government of Japan launched the "Action Plan on Greening Government Operations", with a target to stabilise paper use in the year 2000⁷⁸. While this plan is apparently being implemented with little force, the Japanese company Osaka Gas, one of the biggest gas utility companies in the world, started a successful paper reduction programme in 1993 (see Figure 3.3). In 1996, total paper use by weight, including copy paper, printing paper, name cards and stationery, was reduced by 35.3% compared to 1992. Since July of 1996, Osaka Gas has made a complete switch to recycled paper for copier use (80% recycled content) and, as a result, the proportion of recycled paper used for copying increased to 98%. Overall combined use of recycled paper for copying, computer output paper, name cards and stationery has reached 82%. The reduction in paper consumption, recycling of waste paper and use of recycled paper is equivalent to about 32,000 tonnes of pulpwood⁷⁹.

Box 3.3 Less paper through the Internet: AT&T's electronic bills

US communications giant AT&T is working to move customers to electronic phone and internet bills and threshold billing. This shift reduces paper use and at the same time provides consumers with up-to-date account information. AT&T estimates that some 21 million sheets of paper are saved each year through the following measures⁸²

- Offering consumers a totally paperless billing process. This electronic billing has saved about 600,000 sheets of paper a year.
- Combining long distance phone bills with internet bills in a totally web-based process. This saves approximately 200,000 sheets a month.
- Implementing "threshold billing", where consumers are not sent a bill unless their monthly total exceeds a certain amount. Consumers who are billed directly by AT&T (as opposed to through their local provider) do not receive a bill until the billing total reaches the threshold amount, or every three months, whichever limit is reached first. This saves the sending of about 1.5 million bills each month.

Figure 3.3 Osaka Gas - Amount of paper used, by weight (tonnes)



Source: Osaka Gas

78 The State government has no policy yet to use post-consumer recycled paper, though some departments might use this paper. Pers. comm. Yoichi Kuroda, JATAN 23 October 1998.

79 Data derived from: <<http://www.osakagas.co.jp>> viewed on 4 November 1998.

80 Xplor 1998.

81 Neogi 1998.

82 Pers. comm. B. Allenby, Vice President Environment, Health & Safety, AT&T, received 11 November 1998.

Table 3.2 Recovered recycled paper utilisation rates

(recovered paper as % of total paper production). Main paper markets, 1993 and 1997⁸³

Main paper market	recovered paper utilisation rate		
	1993	1997	Increase '93 - '97
United States	32.3	37.6	16%
European Union	39.6	43.1	9%
Japan	51.3	53.2	4%

whiteness with bleached virgin papers and many wholesale dealers offer a range of recycled paper, allowing a consistent corporate image. Greater availability and competition between suppliers has dampened prices. As a result of government regulations aiming to reduce landfill and to increase the availability of post-consumer paper waste, the utilisation rate of recovered paper in overall paper production is rising (Table 3.2). Indeed, within the next ten years the world will already be manufacturing more paper from recovered fibres than from virgin fibres. Still, much higher recycling rates need to be achieved.

The need to introduce recycled paper is increasingly recognised by governments and the private sector. They have adopted policies to promote the use of paper with recycled content, not only to address their own paper use, but also to set an example to others. Recycling paper helps to close the loop, preventing waste going to landfill. Especially valuable elements of these policies are ambitious targets, continuous monitoring of progress and transparency.

As early as 1992, the German parliament insisted that at least 90% of paper use by government departments should be 100% post-consumer recycled and that progress should be regularly reported. This policy has been exceptionally successful. By the end of 1993 all by one department had complied with the 90% goal. Only the

Department of Traffic and Agriculture got stuck at 40%⁸⁴. Various sources confirm that in 1998 almost all the paper used by the German government was recycled paper. The German government has also promoted recycled paper use in the marketplace by issuing the ecolabel 'Blaue Engel' (Blue Angel) to paper with 100% post-consumer recycled content. Copiers are awarded the 'Blaue Engel' label if recycled paper runs well on them.

Box 3.4 US Federal government: building markets for recycled goods

As the nation's largest paper buyer, the US Government buys more than 2% of all printing and writing paper sold in the USA⁸⁵. In September 1998, President Bill Clinton signed an executive order (EO) requiring that federal government offices start using paper with recycled content. The target was that, from 31 December 1998, all federal agencies should purchase paper with at least 30% post-consumer recycled paper content. Purchases of paper with at least 20% post-consumer recycled content are obligatory⁸⁶. The EO applies to all office paper, notably copier paper, offset paper, writing papers and envelopes. President Bill Clinton clarified the wider goal of the executive order as follows:

'... the federal government has a special responsibility to lead the way in building markets for recycled goods. (...) We will harness our tremendous purchasing power to spur the growing market for recycled products'⁸⁷.

83 Recovery rates: CEPI Press release, 13 July 1998. Utilisation rates: Statistics American Forest & Paper Association, CEPI, Japanese Paper Recycling Promotion Centre.

84 Abfallwirtschaft 1993.

85 Culver in Soltani and Whitney 1995.

86 <<http://www.ofee.gov>> viewed 14 October 1998.

87 Statement by the President of the United States, Bill Clinton, at the signing of Executive Order 13101 "Greening the Government through Waste Prevention, Recycling, and Federal Acquisition", 14 September 1998. Viewed on <<http://www.ofee.gov>> on 14 October 1998.

In the USA and Japan private and public organisations have joined in recycled paper buyers' groups. These groups maximise efficient use of paper; they demand recycled post-consumer paper products, and initiate dialogue with the paper industry⁸⁸. In the United States, the following 100% post-consumer recycled office paper brands are now available, among others: Astrolite PC100 (supplied by Monadnock Paper), Eureka! 100 (Ft. James), Genesis (Fraser Paper), Options (Mohawk), Quest (Fox River) and Sandpiper

(Domtar)⁸⁹. The guide "10 Easy Ways to Buy Recycled: A Smart Shopper's Guide to Closing the Loop" provides practical advice to companies wishing to purchase recycled paper products in the USA⁹⁰. Box 3.5 describes one of Europe's most advanced office paper mills, UK Paper.

Box 3.5 Recycled office papers: UK Paper⁹¹

In 1997, UK Paper finished building a ReCycled Fibre (RCF) plant which produced true white recycled pulp from mixed post-consumer waste. The company invested £43 million (US\$ 66 million) in the plant, incorporating the best recycling technologies used by modern plants in the USA and Japan. No less than 99.5% of the inks from the recovered paper are removed, allowing UK Paper to produce high quality paper in terms of cleanliness and brightness. The recycled office papers the UK Paper company produces are virtually indistinguishable from virgin fibre papers. Judith Davis, Marketing Manager, of UK Paper says: *"the quality of our recycled pulp is superior and more competitive to anything processed and produced by anyone else in the world"*.

The RCF mill currently uses 180,000 tonnes of mixed post-consumer waste per annum to produce 120,000 tonnes of recycled fibre. Of the 60,000 remaining tonnes 55,000 tonnes is turned into agricultural fertiliser. This is mainly the clay and fillers in the collected paper, but also some small fibres. The RCF plant uses a totally chlorine-free bleaching process. A waste-water treatment plant and a combined heat and power plant increased investments to £100 million (US\$ 156 million).

The majority of the recycled pulp is used to produce a range of office papers. The brands Evolve Business and Evolve Office are both 100% recycled office papers, and acquired the Nordic Swan and the Blue Angel ecolabels. The coated grades of Evolve papers, Silk and Gloss, used primarily for reports, accounts and corporate literature, contain 75% recycled fibres.

The whole of the EVOLVE range (Business, Office, Gloss and Silk) have been assessed for the Archival Guarantee and have been awarded international standard ISO 9706: 1994 and DIN

6738 (requirements for paper performance). This standard guarantees that the paper will not deteriorate with age, unlike a number of other recycled office papers which may contain fibres that will turn yellow over a period of time. The Evolve papers are proving a popular choice with one central and some local government bodies, including the DETR (Department for the Environment, Transport and the Regions), Birmingham City Council and Coventry City Council. Other users include:

UK: North West Water, the Children's Society, DHL International (UK) Ltd., Cable & Wireless (UK) Ltd., Sainsbury's, Fiat, Glaxo Wellcome, Rio Tinto, British Nuclear Fuels Ltd. (BNFL) and Shell

Holland: NS Rail Infrabeheer (branch of the national railway), ABN-AMRO (this bank uses coated versions for its environmental report only)

Europe: Ericsson

The RCF plant is located on the edge of one of the world's largest waste paper "urban forests", London. Moreover, UK Paper's facilities are in the midst of one of the largest markets for graphic and business papers. Current estimates show that UK Paper is receiving only about 15 per cent of the paper recovered from London's offices. In order to access urban resources, the company has set up long term contracts with 25 waste paper suppliers throughout the UK, to guarantee continuity and quality of supply. This has also allowed recovered paper suppliers to develop their own waste collection operations as they have guaranteed business. To date, no other European paper manufacturer has employed the technology used by UK Paper. However, Judith Davis expects *"others will soon follow."*

88 See Recycled Paper Coalition, Annual reports 1996 and 1997.

89 Pers. comm. Meghan Clancy Hepburn. Resource Conservation Alliance, Washington.

90 See: Makower 1997.

91 Sources for UK Paper case: Paper Europe 1998a, b, c; Paper Focus 1996, 1998b; UK Paper 1997, 1998; Elder 1998.

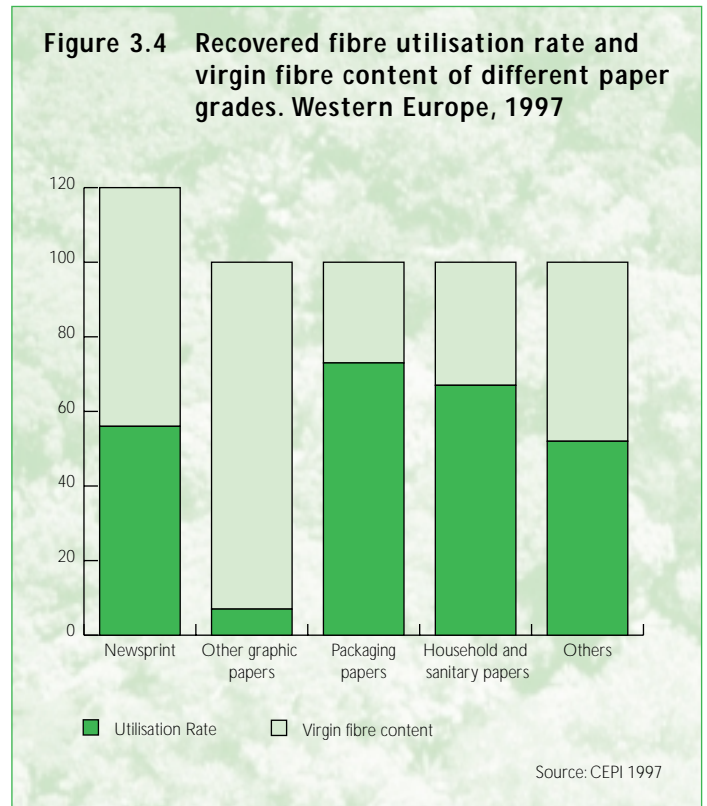
Re-usable paper

The Media Labs of the Massachusetts Institute of Technology (MIT) in Cambridge (USA) are developing a desktop printer and re-usable paper substrate capable of producing a high-quality, high-contrast image, which may subsequently be erased and rewritten multiple times without any expendable materials, such as toner or chemicals. The material, called electronic ink, may change its image reversibly many times by application of an electric field. Research leader Joseph M. Jacobsen believes that: *“Large offices will use reversible paper by 2010 if the price for such material can be made commensurate with today’s costs for normal paper and if the quality of the image is high.”*⁹²

Another project is being carried out by Toshiba Corporation of Japan, which has developed a prototype of ‘decolorable’ printing ink that could make recycling faster and cheaper and achieve higher yields than conventional processes. The ink, which can be made invisible by heat treatment or solvents, helps to overcome existing difficulties in removing ink on used paper⁹³.

3.4 PRINTING PAPERS

Printing papers other than office paper (magazines, direct mail catalogues, junk mail, inserts and large corporate mailings) account for approximately 11% of global paper use⁹⁴. Printing paper has a notoriously low recycled content. In Western Europe, only 6.6% of all printing paper other than newsprint contained recycled paper in 1997⁹⁵ (see Figure 3.4). The world average growth in per capita paper consumption between 1994 and 2010 is expected to be 2.8%, but high quality printing grades will have a much faster growth than that, rising to approximately 3.8 - 4.3% per year⁹⁶.



New technologies in paper manufacture offer opportunities to decrease the environmental impacts of paper by using lighter or cheaper grades of coated mechanical papers without sacrificing print quality.

Traditionally, coated mechanical papers are composed of one-third mechanical pulp and one-third chemical pulp, the remainder being fillers and clay coating. Cost reduction strategies adopted by a number of major magazine paper manufacturers enable them to use recycled or cheaper fibres at lower costs for products with the same printing properties⁹⁷(see Box 3.6).

92 Pers. comm. Joseph M. Jacobsen, 3 November 1998.

93 The main ingredient in traditional ink, carbon black, cannot be broken down or chemically decolored. Financial Times, 10 January 1998; Nature 1998.

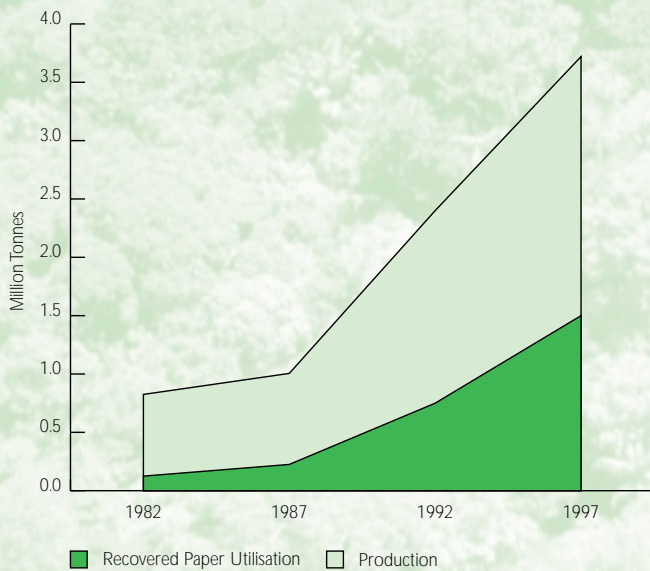
94 IIED 1996.

95 CEPI 1997.

96 Gundersby 1996.

97 Metsä-Serla 1996, Valmet 1998c.

Figure 3.5 Haindl Papier's Recovered Paper Utilisation vs. Production



Source: Haindl 1999

Box 3.6 Recycled printing paper: Haindl Papier⁹⁸

The German paper manufacturer Haindl Papier prides itself on being one of the paper industry's important pioneers. It started to recycle recovered paper back in 1962 and today consumes some 1.5 million tonnes of fibre every year, which accounts for around three-quarters of its paper production. The Haindl Group has the highest processing capacity for recovered paper of any printing paper producer in Europe, producing newsprint and magazine grade papers. (see Figure 3.5)

The main reason for the expansion of recovered paper processing was the introduction of a new grade of mechanical coated paper at Haindl's Augsburg mill. The A new 'film-coated' paper coating process, Film-Coated (FC), allows the use of up to 50% de-inked recycled pulp in the base paper, producing high quality magazine paper. Haindl's FC papers are marketed under the SCALA brand.

The FC process allows the simultaneous on-line film coating of the surface of the paper and can be applied to most types of paper machines. The result is that the papermaking machine can run at higher speeds, thus reducing costs. The process creates a bulky paper with good opacity that provides a better print yield and is lighter than traditional light-weight coated mechanical papers.

With the success of these new papers in the marketplace, Haindl has announced it is increasing its output of FC papers at its Augsburg mill. The investment of around US\$86 million will create the world's largest coated paper machine, with an annual output of approximately 400,000 tonnes. It is scheduled to start production in June 2000.

98 Sources: Otto 1998, Haindl 1995 & 1999, Valmet 1998b, Valmet 1998c, Metsä-Serla 1994.

3.5 NEWSPRINT

Recycled newsprint

Newsprint, the paper grade which newspaper is made of, accounts for approximately 13% of global paper use⁹⁹. About 54% of newsprint consumption in the USA is imported from Canada¹⁰⁰.

The introduction of innovative recycling technologies has enabled manufacturers to produce recycled newsprint (from old newspapers/magazines) that can match or surpass the performance of genuine primary fibre newsprint¹⁰¹. A recent study by the German Institut für Papierfabrikation

Box 3.7 Recycled content in newspapers in North America

By the year 2000, newspapers produced in New York State must contain at least 40% recycled content¹⁰⁷. Quebec mills are beginning to turn the tables by harvesting the heaps of used newspapers from New York. The Quebec newsprint mills are close enough to the urban forests of New York to make processing recycled paper an immediately viable proposition¹⁰⁸. In 1989, only one newsprint mill in Canada was capable of recycling. Today there are at least 23 with newsprint-recycling capacity and 62% of Canadian newsprint now contains some post-consumer fibre¹⁰⁹.

Krüger Paper Company, the fifth largest producer of newsprint in North America, based in Canada, has established a 220,000 tonnes per year facility in New York. The New York Post, which consumes about 80,000 tonnes per year, is now moving its printing installations to the Krüger plant¹¹⁰.

concluded that newsprint can be recycled and remanufactured into newsprint five times with no change in fibre quality¹⁰².

Swedish newsprint manufacturers are now importing recovered paper from Germany, Holland and the UK¹⁰³. In 1997, the average recycled content of newspapers in Western Europe was already 55.8%, climbing from 42.7% in 1993¹⁰⁴. In the USA, the recycled content of newspapers was 10% in 1989, climbing to 28% in 1997¹⁰⁵. In order to increase the consumption of recycled newsprint, 12 US states have mandated recycling requirements, and 14 have voluntary commitments. Many of these states have already achieved 30 to 50% recycled content of newsprint¹⁰⁶. In all major markets, individual frontrunner companies have already achieved much higher levels than the goals set by governments (see Box 3.6 and 3.7).

Switzerland's largest newspaper, Blick, contained 85% recycled content in 1997 compared to 50% in 1992¹¹¹. Hans Strickler, responsible for the environmental aspects of the Ringier Group in Switzerland, clarifies: *"One of the reasons for the fast development are the environmental targets of Ringier with a clear policy for these aspects. Other reasons are certainly the increasing capacity of the newsprint mill close to the printing plant as well as lower costs of recycled newsprint compared to newsprint from original fibres. And not to forget: the quality of recycled paper opens new marketing and product approaches for customers"*¹¹².

99 Pulp and Paper International 1997.

100 Source newsprint consumption: Pulp and paper International 1997 (consumption in 1996: 11,621 million metric tonnes). Imports from Canada: 6,232 million metric tonnes (source: United Nations 1997).

101 Frey 1991; Paper Focus 1995; Cooper 1996; Environment Agency 1997; CAG 1998.

102 IFP 1997.

103 Warmer 1997.

104 CEPI 1998 and pers. comm. Carlos Reinoso, Director Recycling CEPI.

105 Newspaper association of America (NAA) 1998.

106 American Forest & Paper Association and the Newspaper Association of America. State Newsprint Content Requirements and Agreements. 1 September 1997.

107 Op cit. In the US 12 States have mandated requirements regarding the consumption of recycled newsprint. 14 states have voluntary commitments. The target is usual 40 or 50% recycled content in 2000.

108 May 1998.

109 Recycling Council of Ontario 1989; CPPA 1997 &, 1998.

110 May 1998; Hershkowitz 1998.

111 Ringier 1997; May 1998.

112 Pers. comm. Hans J. Strickler, Managing Director for the printing activities of Swiss publisher Ringier and responsible for the environmental aspects of the Ringier Group, 4 November 1998.

Box 3.8 Recycled newsprint in the UK: Aylesford Newsprint

In the early 1980s, the UK newspaper publishers were importing as much as 90% of their newsprint from Canada and countries in Scandinavia. The UK is the second largest market for Canadian newsprint after the USA. In 1996, a quarter of all UK newsprint imports originated from Canadian manufacturers¹¹³.

The UK is unique among European countries in setting a voluntary target for the recycled content of newspapers, encouraged by the government¹¹⁴. In 1991, the newspaper publishers collectively agreed with government to increase the average recycled content in newsprint from 27% (1990) to at least 40% by the year 2000.

Reflecting this commitment, two companies, SCA (a forest products company based in Sweden) and Mondi Europe made the decision in 1993 to build a new £250 million (around US\$ 380 million) advanced paper recycling and manufacturing facility in the UK. An additional grant of around £20 million (around US\$ 30 million) from the UK government provided a substantial help. The new factory was opened in 1995, producing 370,000 tonnes a year of premium grade recycled newsprint, based entirely on recovered paper. The newspaper publishers were able to meet the government's target of 40% four years ahead of schedule.

Aylesford newsprint is Europe's largest producer of 100% recycled newsprint. According to SCA's President, Sverker Martin-Löf, Aylesford has "proven [itself] as a first class cost efficient

newsprint mill and it proves the point that newsprint needs to be produced locally to the market it operates."¹¹⁵

Despite the increase in recycling production capacity in the UK in recent years, every year around 1.4 million tonnes of used newspaper and around 450/500,000 tonnes of used magazines still end up in landfill. A study (commissioned by Friends of the Earth, Wastewatch, the Community Recycling Network and Avon Friends of the Earth) found that an average of 80% recycled content would not strain current technical limits, with improved technology increasing this a little further. The study recommends that the industry set a three-phase target, leading to 80% recycled content by 2010. This would allow the production and recovery businesses 12 years to respond. Since the voluntary target was met in 1995, the UK Government has been in discussions with the British newspaper industry and is "determined to see an increase in the amount of recycled newsprint used in newspapers" beyond the 40% target.

Ongoing investment in recovered paper use by the Shotton newsprint mill (owned by the Finnish company UPM-Kymmene) will bring the recycled content up to roughly 50%. Aylesford Newsprint is considering further expansion in production, by around 650,000 tonnes, in the next few years, bringing total consumption up to around 800,000 tonnes annually¹¹⁶, which could potentially bring the recycled content closer to the 80% goal.

3.6 TREE-FREE PAPERS

There are at least 300 paper mills worldwide which use tree-free fibres, mainly from agri-residues, for paper production¹¹⁷. They account for some 7% of all fibres used for paper making worldwide. Production is based primarily on straw (46%), sugar cane waste ('bagasse', 14%) and bamboo (6%). The remainder consists of kenaf, hemp, flax, cloth and jute. Over three-quarters the tree-free paper in the world is made in China¹¹⁸. Hemp and hemp/straw paper is already produced and marketed in Germany, Spain, France, the UK, the USA and Canada. Most mills are small and ser-

vice regional markets. A globally significant mill is owned by Saica in Zaragosa, Spain, which produces testliner and fluting, with an annual straw capacity of 120,000 tonnes¹¹⁹. In Germany hemp farming is now allowed and production is expanding. In the USA, the company Crane Co. has been printing on cotton rag pulp paper for 100 years. They have recently started up their Continuum line, which contains hemp and kenaf fibres. Crane Co. also has a line called Denim Blues, paper which is made from old blue jeans and recycled US currency! Like recycled paper, many of the

113 United Nations 1997.

114 CAG 1998.

115 Martin-Löf S. (1998). Letter to Greenpeace UK from the President and Chief Executive Officer of SCA. 17 September 1998.

116 ENDS 1994; IIED 1998; CAG 1998; Meacher 1998.

117 Soltani & Whitney 1995; PPI 1998.

118 Paavilainen 1998.

119 Op cit.

hemp and straw-based paper producers have overcome initial problems with supply and quality. Non-wood pulps can replace wood pulp in almost all paper and board grades¹²⁰. However, as wood pulp has for many years been the dominating paper-making fibre, research and development has focused on improving wood pulp technology to increase price/quality and environmental standards. This has left the potential of tree-free fibre resources for paper production severely undervalued. There are, however, important benefits to tree-free paper production:

- Paper recycling has its limits: paper fibres break and become shorter when recycled. A closed recycling system is therefore not possible: new fibres are always needed. Tree-free fibres can be used for applications where the use of recycled paper has technical limitations, like the high print quality requirements of wood-containing paper for magazines¹²¹.
- Kenaf and hemp are notable for their natural whiteness; they can be readily bleached without chlorine¹²². They are grown quickly without - or with very limited use of - pesticides, fungicides or other chemicals. Moreover they can be integrated into a farmer's existing crop rotation, preserving and revitalising the soil when planted in alternate growing seasons¹²³. Hemp and kenaf yields per hectare are approximately two to four times higher than pulp wood yields in natural forest.
- Using wheat and rice straws as a significant fibre source for paper (and board). Large areas of straw are currently burnt, creating pollution problems. Using this straw for paper and board production generates additional employment and income in rural areas.

Box 3.9 More demand for hemp pulp needed: Danforth

Danforth, based in the USA, is the world's largest producer and supplier of non-wood fibre and pulp, and the world's only supplier of hemp pulp outside of China. Frank Riccio, president of Danforth International, believes there is a lack of market demand. Despite being the world's largest hemp pulp producer, Danforth is selling less than 1,000 tonnes a year and the company's sales have not increased in 10 years¹²⁶.

- While some agri-fibres (hemp and kenaf) are more expensive than wood, some are substantially cheaper. Straw is three times cheaper than sawmill chips¹²⁴. However, as substantial investments are still required to develop tree-free paper industries, retail prices are often still high.
- Straw, bagasse, bamboo and reeds produce pulp with good printing properties and adequate strength. These pulps provide realistic alternatives to hardwood pulps in wood-free printing/writing papers, cartonboard and, in some cases, in tissue and newsprint¹²⁵.

120 Paavilainen 1998.

121 Göttsching L., Prof. Dr. Ing. Dr. h.c., Institut für Papierfabrikation (IFP), letter 27 October 1998: "With (uncoated and coated wood-containing) magazine papers the content of recycled fibres cannot exceed approximately 25% because of printability requirements."

122 Ayres 1993.

123 Tolliver 1996.

124 US\$ 35 versus \$100 per tonne in the USA, 1996. Source: Arbokem 1996.

125 Paavilainen 1998

126 Tolliver 1996.

Paper from straw fibres

Straw pulp is an excellent alternative to tree-based pulp for newsprint, printing and writing papers, corrugated medium paper and liner board from ancient forest pulp. It is already being used for paper production in Canada, Spain, Italy, India and China. Straw-based board and paper production has had a poor reputation because of its polluting industries in the past, but several companies have succeeded in making straw-based processing industries environmentally friendly, while creating jobs and income in rural areas in the United States.

There is a great potential for expanding agri-pulp paper production. According to the Montana Straw to Paper Working Group, 2.5 billion tonnes of agricultural wastes are available around the world, often at costs well below those of wood. Generally, less than half of this fibre is needed to improve the quality of the soil. The remaining half could be converted to 500 million tonnes of pulp - 1.5 times the world's current paper consumption¹²⁸.

In terms of practical opportunities, the Native Forest Network have estimated that paper production from excess straw from Montana's agricultural sector could generate jobs and incomes for some 50 small paper mills. Each mill would require an investment of up to US\$ 30 million. Despite their consolidated investments in huge tree-based pulp and paper mills, large forestry-based paper industries are increasingly looking at the development potentials of alternative sources of pulp. Stone Container has agreed with a coalition of Montana environmental organisations that the company will study the economic and technical feasibility of using alternative fibres for its paper production. Weyerhaeuser Paper Company has completed a successful pilot project at its linerboard mill, using seed grass straw in corrugating packaging in Springfield, Oregon¹²⁹.

Large forestry-based paper industries are increasingly looking at the development potentials of alternative sources of pulp

Box 3.10 Straw-based paper: Arbokem

The paper company Arbokem has been a pioneer in straw-based pulp/paper since 1983 and has established a paper mill in Alberta, Canada. Its papers are composed of straw (45%), post-consumer waste paper (43%) and filler (12%), produced in a totally chlorine-free and effluent-free manufacturing process.

Arbokem's paper series is being marketed as Downtown Paper. Al Wong, founder and co-owner of Arbokem says:

*"We're essentially reinforcing the three R's. We're **reducing** the amount of trees that would be clearcut as well as the transportation needed to haul materials. We're **re-using** waste paper and crop residues. And we're **recycling**, because our dissolved straw and spent processing chemicals can return to the fields as fertiliser."*¹²⁷

127 Arbokem 1996.

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Further reading

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Towards a sustainable paper cycle: An independent study on the sustainability of the pulp and paper industry. IIED, London, UK. 1996.

Building the future: A guide to building without PVC. Greenpeace UK, London. 1996.

Efficient Wood Use in Residential Construction. NRDC website:
www.nrdc.org/nrdcpro/fpprog.html

Useful website addresses

APA, Engineered Wood Assn.

www.apawood.org/index.html

CanFibre Group

www.canfibre.com

FSC International

www.fscoax.org

FSC UK

www.fsc-uk.demon.co.uk

Greenpeace Forest Campaign

www.greenpeace.org/~forests

Haindl Papier

www.haindl.de/englisch/e-index.html

Kafus Environmental Industries

www.kafus.com

NRDC (Efficient Wood Use in Residential Construction)

www.nrdc.org

Osaka Gas

www.osakagas.co.jp

ReThink Paper

www.earthisland.org/paper/rtphome.html

SCA

www.sca.se

UK Paper plc

www.ukpaper.co.uk

WWF Forest For Life

www.panda.org/forests4life/target2.htm

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