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WASTEPAPER IN THE UNITED STATES: OUTLOOK FOR WASTEPAPER CONSUMPTION TO THE YEAR 2002

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May 1999

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EXECUTIVE SUMMARY

This paper provides a projection of wastepaper consumption for the year 2002. Such a projection is difficult because there is no existing database to characterize how wastepaper gets used in each end product yet we know from fragmentary sources that uses are changing. A procedure was developed to allocate collection to uses in several stages in order to balance collection with uses and to characterize how uses have been changing.

Estimation Of Paper Composition And Wastepaper Allocation

Historic data of virgin pulp consumption, paper production and wastepaper recovery[1] are the starting point of the first stage. A number of sources provide an initial estimation of paper composition[2] by each grade. Initial requests of virgin and secondary pulp to supply this composition are then developed in a spreadsheet. A linear relationship is assumed between paper production and pulp (virgin and secondary) consumption. These requests are then compared to reported virgin pulp consumption and a preliminary allocation of secondary pulp by paper grade[3]. Minor adjustments in both sets of coefficients (composition and allocation) are made based on a hierarchy of the best known paper composition estimates until a definitive balance is reached by the years 1980, 1985, 1990 and 1995. Paper composition and wastepaper allocation in 1995 are then used in the set of assumptions for the 2002 projection.

Paper Production Projection

Assumptions for demand and capacity are needed to calculate wastepaper consumption in 2002. Capacity projections are derived from available sources[4]. Production is derived from projected capacity by using a range of operating rates. The range of operating rates corresponds to three scenarios of high, average and low activity in the industry based on an economic analysis of historic performance of paper grades[5].

Wastepaper Consumption Projection

The wastepaper consumption projection is derived from projected production, again assuming a linear relationship between projected paper production and pulp consumption as well as between secondary pulp consumption and wastepaper consumption (by grade). The assumed share of secondary pulp in each paper grade is multiplied by its projected production to project secondary pulp requirements in 2002. Pulp requirements are then translated into wastepaper consumption. Wastepaper recovery is also obtained from projected production. First, apparent consumption is estimated and then recovery is obtained from apparent consumption by using a range of recovery rates.

Results

The results of the projection show a significant increase in wastepaper consumption from 1995 to 2002 albeit not as high as it was from 1985 to 1990 and from 1990 to 1995. Since most of new production is projected to come from recycled and unbleached kraft paperboard, the two major wastepaper consumers in the industry, the projected growth rate of wastepaper consumption is almost twice the growth rate in paper production, increasing utilization rates in the industry by more than three percentage points (34.45 in 1995, 37.4% in 2002). Growth rates depend on the demand scenario. Available economic forecasts show a slowdown in the economy in 2000 and 2001[6], which make the low demand scenario the most likely. Paper and paperboard production are projected to grow 10.3% (1.4%

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1 API, 1980-1992, AF&PA, 1993-1996.

2 Mills Survey, 1980-1995; Biermann, 1996; Paper Task Force Report, 1995.

3 AF&PA 1996; Miller Freeman's The News in ONP, 1994; Franklin, 1990, 1982; Mills Survey, 1980-1995; Jaakko Poyry Oy, 1996.

4 API, 1980-1992; AF&PA, 1993-1996; Pulp and Paper North American Fact Book, 1998; FAO, 1998; Lockwood Post's Directory of Pulp, Paper and Allied Trades.

5 API, 1980-1992; AF&PA, 1993-1996; Pulp and Paper North American Fact Book, 1998; U. S. Bureau of Labor Statistics, 1998; Economic Report of the President, 1996; Congressional Budget Office, 1999

6 Congressional Budget Office. Real GDP Growth. 2000, 1.9%; 2001, 1.8%.

per year) in relation to 1995, a rate significantly lower than the historic production growth rate from 1990 to 1995 (13.6%, or 2.6% per year) and from 1985 to 1990 (17.1% or 3.2% per year). Production growth from 1980 to 1985 (in the midst of an economic recession) was just 7.8% (1.5% per year)[7].

Wastepaper consumption growth is mostly linked to production growth rather than to an increase in wastepaper utilization, since assumed composition has not been significantly modified from 1995 estimations. Estimated 1995 wastepaper allocation was assumed unchanged, so allocation patterns in 2002 are basically those of 1995. Projected wastepaper consumption growth will be 20.1% (2.65% per year) in the low scenario in relation to 1995. Even though this figure is far from historic consumption growth from 1990 to 1995 (44.4% or 7.6% per year) and from 1985 to 1990 (32.8% or 5.8% per year), it still is a significant increase[8]. Economic conditions from 1985 to 1995 were mostly favorable to the industry and to wastepaper in particular, except for the early 90s.

By paper grade, recycled paperboard keeps its position as the main consumer of wastepaper in the industry. Projected wastepaper consumption from this grade might increase up to 4,700,000 (31.9% or 4.0% per year) to 5,500,000 tons (37.7% or 4.7% per year). Among wastepaper sources, OCC is the most important (65% of wastepaper consumed). Unbleached kraft paper and paperboard mills are the second major consumers of wastepaper in the paper industry. Since projected production growth is low, at least in relative terms (4.3 to 6.2% depending on scenario, or 0.6 to 0.9% per year), wastepaper consumption is expected to be in the range of 5,200,000 to 5,300,000 tons compared to 5,000,000 tons in 1995, a 4.2-5.8% increase (0.6-0.8% per year), most of it coming from OCC (73%).

For the other grades, estimated consumption of wastepaper in 1995 in tissue mills almost reached 4,000,000 tons. Tissue production is projected to grow within the range of 10.7 to 12% from 1995 to 2002 (or 1.5-1.6% per year). Therefore, projected wastepaper consumption growth is estimated to be around 11.2 to 12.5% (1.5 to 1.7% per year), or 4,300,000 to 4,400,000 tons, mostly coming from pulp substitutes and high grade deinking (a combined 41%). Newsprint mills consumed 3,000,000 tons of wastepaper in 1995 (estimated) and are projected to reach around 3,300,000 tons in 2002 (11.4-12.1% increase from 1995 to 2002 or 1.6% per year). This growth rate is lower than the estimated from 1985 to 1990 (44% or 7.5% per year) and from 1990 to 1995 (52.2% or 8.8% per year), when most newsprint producers shifted to recycled-content newsprint. Most of wastepaper consumed will come from ONP (75%). Printing and writing papers are projected to increase their wastepaper consumption by about 400,000 tons above 1995 levels, most of it from pulp substitutes and high grade deinking, (38 and 34% respectively). Estimated wastepaper consumption in semichemical corrugating medium was about 1,900,000 tons in 1995, and will likely reach 2,100,000 in 2002. Most of it will come from OCC (86%)

By wastepaper grade, most of new consumption will correspond to OCC (roughly 3,500,000 tons out of 6,400,000 tons in the low production scenario). In 2002 OCC will make up about 53% of all wastepaper consumed (compared to 46% of all wastepaper consumed in 1980, 48% in 1985, 49% in 1990 and 52% in 1995[9]). Projected OCC consumption will be in the range of 20,000,000 to 20,700,000 tons in 2002, a 21.4-25.3% increase (2.8-3.3% per year) in relation to 16,500,000 tons[10] consumed in 1995.

In 1995, almost 4,900,000 tons[11] of ONP were consumed by the industry. According to the simulation, in 2002 between 5,700,000 and 5,800,000 tons of ONP will be demanded by paper and paperboard producers. That means an estimated 17.4-19.9% growth from 1995 (2.3-2.6% per year).

Pulp substitutes and high grade deinking are mainly used in printing and writing grades, tissue and, in a lesser proportion, recycled paperboard. In 1995, roughly 2,400,000 tons[12] of pulp substitutes were used by the industry. Projected consumption reaches 2,800,000-2,900,000 tons in 2002 (15.4-18.5% growth or 2.1-2.5% per year). The

[7] Historic production data from API, 1980-1992; AF&PA 1993-1996.
[8] Historic wastepaper consumption data from API, 1980-1992; AF&PA 1993-1996.
[9] Historic wastepaper consumption data from API, 1980-1992; AF&PA 1993-1996.
[10] Historic wastepaper consumption data from API, 1980-1992; AF&PA 1993-1996.
[11] Historic wastepaper consumption data from API, 1980-1992; AF&PA 1993-1996.
[12] Historic wastepaper consumption data from API, 1980-1992; AF&PA 1993-1996.

industry demanded 3,000,000 tons of HGD[13] in 1995. In 2002, projected demand will reach 3,500,000 to 3,600,000 tons, resulting in an 17.6-20.7% increase (2.3-2.7% per year).

Finally, in 1995, 4,500,000 tons[14] of mixed wastepaper were consumed by paper and, especially, paperboard producers. Projected consumption in 2002 might be around 5,500,000 to 5,700,000 tons, a 23-27% growth (3 to 3.5% per year) due to the strong recycled paperboard growth. This growth might situate mixed wastepaper above ONP as the second most consumed wastepaper grade in the short term.

Supply and Demand Balance Projection

Projected apparent consumption of paper and paperboard in 2002 will range from 108,300,000 tons to 109,800,000 tons. Recovery of paper is derived from those levels depending on a range of recovery rates (45 to 52%). Depending on the rate selected, the amount of wastepaper available for other uses (obtained by subtracting wastepaper consumed by the paper industry from wastepaper recovered) varies. In 1995, with a 44% recovery rate, 26.21% of wastepaper recovered was used for construction purposes, molded pulp or was allocated to export markets[15]. According to the 2002 simulation, if the recovery rate were 45%, only 21.3-22.4% of wastepaper recovered would be available for other uses. If the recovery rate were 48%, the percentage of wastepaper recovered allocated to other uses or to export would be similar to that in 1995 (26.3-27.3%). A 50% recovery rate would result in 29.2-30.2% of wastepaper recovered available for other uses, while a 52% rate, the highest considered, would result in 32.0-32.9%. Therefore, and according to the projections derived from the study, a recovery rate over 48% would likely increase the gap between recovery and demand signifying weaker secondary fiber pricing.

[13] Historic wastepaper consumption data from API, 1980-1992; AF&PA 1993-1996.
[14] Historic wastepaper consumption data from API, 1980-1992; AF&PA 1993-1996.
[15] Historic wastepaper consumption data from AF&PA, 1996.

1. INTRODUCTION

The original idea of this paper came from a study of wastepaper flow in Western Europe (Bystrom and Lonnstedt, 1995). They employed an input-output framework to model the pulp and paper market in Scandinavia and Western Europe in 1990 for several pulp and paper grades as well as raw materials and recycled fibers. Once the model was developed, assumptions about the projected demand for pulp and paper products were introduced, as well as national and regional recovery goals and technical assumptions about the most likely evolution of industry structures (both quantitative and qualitative) to the year 2000. Results showed an excess supply of waste paper that European industry was not ready to absorb, at least under current quality standards.

The purpose of this study is twofold. Wastepaper utilization and wastepaper allocation are estimated in five-year intervals from 1980 to 1995. This estimation is then used to project wastepaper consumption (demand), recovery and excess supply to 2002. Since available wastepaper utilization data are fragmentary and insufficient, especially for the 80s, estimations are intended to fill in information gaps and harmonize available sources. Therefore, figures obtained from these estimations are not presented as actual figures but approximations obtained under a number of assumptions that provide some historical prospective for the 2002 projections.

There are a number of variables that affect wastepaper demand[16]. Among them, production of end-use products, foreign trade, legislation and technology. In order to project wastepaper consumption, the number of variables is narrowed to production (which involves both capacity and operating rates) and technology, which involves yield, allocation and composition coefficients. The other two, legislation and foreign trade are considered when projecting supply of wastepaper, since they primarily influence the apparent consumption of paper and recovery rates. The production of end-use products, mainly paper and paperboard but also molded pulp products, insulation, construction materials *et cetera*, is also considered as a function of capacity and operating rates.

Capacity is equivalent to potential production and based on industry facilities like paper machines and pulping lines. Capacity is therefore strongly related to investment, but also to business cycles and expectations from firms. Capacity changes are slow, relatively small, and can be anticipated in the short term quite safely by adding projected investments to the existing capacity. Since most paper machines are designed to employ a certain grade of pulp or a defined pulp furnish, a virgin-stock paper machine can rarely be converted to recycled paper production. In most occasions, the old machine has to be replaced by a new one. Therefore, higher utilization of wastepaper in the industry is linked to new recycling capacity, not to changes in existing machinery, which makes it easier to track new trends in wastepaper utilization and to project recycled paper capacity based on capacity additions announced by firms.

Operating rates relate actual production to potential production for a given period. Strong demand and high annual operating rates result in high prices while weak markets and low operating rates force producers to reduce prices. Operating rates consistently increase during expansion periods and drop during recessions. Operating rates not only depend on economic conditions that impact demand, but are also dependent on the product considered. For instance, newsprint factories show annual operating rates that are usually over 95% and have a relatively small range of variation while free-sheet factories have annual operating rates consistently around 90% and show a higher range of variation.

Since recovery of wastepaper exceeds industry demand, excess wastepaper is traded in international markets. While US wastepaper imports are negligible, exports take almost 20% of wastepaper recovered every year in the US. The role of international consumers is significant since they do not just take whatever wastepaper is left but actively compete with domestic consumers for paper. International buyers have been blamed for raising domestic prices and reducing supply for domestic consumers in critical markets like New York and Los Angeles. The role of international markets may become even more significant as utilization rates tend to approach recovery rates and competition for wastepaper increases. The effect of increasing competition may result in reductions in US wastepaper exports and price increases in some wastepaper grades. 1996 and 1997 already reflect a reduction in wastepaper exports.

[16] Demand as a synonym of Apparent Consumption = Production (Recovery) + Imports – Exports.

Legislation indirectly affects wastepaper demand in two ways. Voluntary and mandatory legislation fosters recycling in order to reduce the stream of paper going into landfill. Therefore, legislators intend to limit the amount of paper disposed by setting recovery goals and promote the use of wastepaper recovered by demanding a given share of secondary fiber to be used in certain paper and paperboard grades. Good examples are procurement programs implemented in public offices and newsprint laws passed in the early 90s. Legal recovery levels determine the availability of wastepaper for both domestic consumption and international trade, and decisively affect the supply side of the market. Demand-oriented schemes, like those promoted by newsprint laws, influence certain markets forcing investment and industry renovation. Since the target of this legislation focuses on some key products, namely newsprint and packaging grades, and most of it is voluntary, the influence of legislation on the demand side of the market is far less marked than it is on the supply side.

Technology has an important influence in wastepaper demand. Technology determines what kind of wastepaper is used to furnish each paper grade, in what proportion wastepaper enters product composition and the yield of the pulping and de-inking processes needed to produce secondary fiber from wastepaper. New technologies allow the production of paper with a higher share of wastepaper, therefore increasing wastepaper demands, and allow the utilization of low quality wastepaper increasing the range of products demanded.

The combination of factors introduced by legislation, technology, industry structure and economics is crucial in order to understand and reproduce how wastepaper was allocated within the industry during the 80s and 90s and what are the most likely trends in wastepaper utilization and foreign trade in the short term. Projecting these changes ahead is the purpose of this paper.

Estimation Of Paper Composition And Wastepaper Allocation

A linear relationship between paper production and (virgin and secondary) pulp consumption is assumed. It is also assumed that a linear relationship exists between secondary pulp consumption and wastepaper consumption. Therefore, two sets of coefficients (pulp to paper ratio and composition) are needed to relate paper production (by grade) to pulp consumption (also by grade) and two additional sets of coefficients (wastepaper allocation and yield) are required to obtain wastepaper consumption (by grade) once secondary pulp requests (by end-use) are calculated.

Historic data of virgin pulp consumption, paper production and wastepaper recovery are the starting point of the first stage. A number of sources provide an initial estimation of paper composition by each grade. Initial requests of virgin and secondary pulp to supply this composition are then developed in a spreadsheet. These requests are then compared to reported virgin pulp consumption and a preliminary allocation of secondary pulp by paper grade. Minor adjustments in both sets of coefficients (composition and allocation) are made based on a hierarchy of the best known paper composition estimates until a definitive balance is reached by the years 1980, 1985, 1990 and 1995. Paper composition and wastepaper allocation in 1995 are then used in the set of assumptions for the 2002 projection. Additional assumptions are made about the yield of pulping and deinking processes, in the case of wastepaper, and for the ratio of pulp to paper, in the case of paper manufacture.

Paper Production Projection

Assumptions for demand and capacity are needed to calculate wastepaper consumption in 2002. Capacity projections are derived from available sources. Production is derived from projected capacity by using a range of operating rates. The range of operating rates corresponds to three scenarios of high, average and low activity in the industry based on an economic analysis of historic performance of paper grades.

Wastepaper Consumption Projection

The wastepaper consumption projection is derived from projected production, again assuming a linear relationship between projected paper production and pulp consumption as well as between secondary pulp consumption and wastepaper consumption (by grade). The assumed share of secondary pulp in each paper grade is multiplied by its projected production to project secondary pulp requests in 2002. Pulp requests are then translated into wastepaper consumption. Wastepaper recovery is also obtained from projected production. First, apparent consumption is estimated and then recovery is obtained from apparent consumption by using a range of recovery rates.

Contents

Chapter 2 provides all background data needed to estimate wastepaper utilization as well as those required to make the assumptions for the 2002 industry projection. It is divided into three sections.

Section 2.1 provides information about the products involved in the study as well as a number of statistics, which are used in the study. Every product group is identified and defined according to its composition and utilization. Products have been grouped into seven pulp grades, ten paper grades and five grades of wastepaper[17].

Production, capacity and foreign trade data come from API (1980-1992), AF&PA (1993-1996) statistics (several years) and FAO (1998) publications.

Composition of every paper grade is derived from several sources. Paper Science textbooks (Biermann, 1996), compositions and industry definitions provided by the Pulp and Paper North American Fact Book (several issues), assumptions made by the Paper Task Force (which comprises several US papermakers as well as high-volume consumers) in their Life Cycle Simulation, several journal articles and data obtained from the Paper Mill database.

The paper mill database was created using annual industry surveys as the main source (Lockwood and Post's Directory of Pulp, Paper and Allied Trades. 1981, 1986, 1991 and 1996). It includes all US-located pulp and paper mills producing more than 100 tpd (short tons per day) of one or more of the paper products considered and mills with wastepaper facilities processing over 25 tpd of wastepaper not included among the former. Mill data include: name of the firm, location, pulp and paper produced by the grade, market pulp production, wastepaper utilized (grade and quantity), de-inking facilities, end-use products and announced expansions and new machines for the period 1993-1999. Data appear in Annex 1.

Initial allocation of wastepaper is estimated according to several sources. The AF&PA recently published some utilization statistics for 1995 (by wastepaper grade and for several end-uses). Wastepaper utilization in 1980, 1985 and 1990 is initially derived from an article by Franklin and Associates, based on API data.

Yield coefficients in the re-pulping and deinking processes are initially derived from yield assumed in a wastepaper utilization projection made by Jaako Poyry Oy (1996).

The initial pulp to paper ratio is based on the assumptions made by the Paper Task Force in their Life Cycle Simulation.

Section 2.2 gives an economic framework to the paper market from 1980 to 1996 by paper grade. Paper production and operating rates are related to the general economic situation of the country as well as to foreign markets, capacity additions, inventories and prices. Information compiled in this section is used to project operating rates and capacity in the industry. Data for this section come from a variety of sources. Capacity and production data come from AF&PA statistics. List prices and inventory levels are obtained from the Pulp and Paper North American Fact Book. Producer Price Indexes are obtained from the U.S. Bureau of Labor Statistics. General economic data and GDP projections are obtained from the 1996 Economic Report of the President and the Congressional Budget Office. The end of section 2.2 includes several tables which summarize production, capacity, prices, inventories and operating rates from 1980 to 1996 by paper grade, as well as annual percentage changes of all these magnitudes.

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[17] **Pulp Grades**: Mechanical, Semichemical, Unbleached Sulfite, Bleached Sulfite, Unbleached Sulfate, Bleached Sulfate, and Other Pulps.
Paper Grades: Newsprint, Uncoated Groundwood, Coated Groundwood, Uncoated Free-sheet, Coated Free-sheet, Tissue, Semichemical Corrugating Medium, Unbleached Kraft, Recycled Paperboard, Other Paper and Paperboard.
Wastepaper Grades: Old Newspapers, Old Corrugated Containers, High Grade De-inking, Pulp Substitutes, Mixed.

Section 2.3 provides some general information about legislative initiatives focused on wastepaper utilization, both at the federal and state levels. The section is also dedicated to newsprint legislation, which is by far the most developed, and provides some data about paper procurement guidelines recommended by the EPA. Most information is based on articles from the Pulp and Paper North American Fact Book, legal texts (RCRA, EO 12.873) and the 1991 Cerma's Recycled Paper Handbook. The official AF&PA goal of 50% recovery is also addressed in the section. The range of projections in the simulation will include that goal as well as seven other alternative rates.

Chapter 3 describes how paper composition and wastepaper allocation is estimated and provides estimated historic composition coefficients and wastepaper allocation coefficients.

Section 3.1 gives an overview of the procedure used to estimate paper composition and wastepaper allocation. Initial composition and wastepaper allocation coefficients are provided and the adjustments made to initial coefficients and yields are explained in detail.

Section 3.2 shows partial results grouped by year. Tables show estimated composition by grade and year and estimated wastepaper allocation by grade and year.

Chapter 4 details the assumptions made when using the 1995 spreadsheet to simulate the 2002 industry.

Section 4.1 describes how paper capacity is projected from existing 1995 capacity. Projections made by two institutions, the AF&PA (1997 to 1999) and the FAO (1997 to 2002) are used in combination with new capacity expansions announced by the industry itself to project 2002 capacity.

Section 4.2 lists assumed operating rates. The study of paper, economics and business cycles developed in section 2.2 is used to identify operating rates and to relate them to prevalent economic conditions, resulting in a set of three figures, corresponding to low, average and high economic activity. Section 4.2 also provides projected production figures for every scenario and paper grade.

Section 4.3 lists composition coefficients for every paper grade assumed in the 2002 simulation. The only changes are in newsprint, which is assumed to increase its wastepaper share up to 40%, meeting legal targets, and some printing and writing grades. Paperboard grades other than recycled paperboard does not increase its share of secondary fiber since all new recycled capacity corresponds to 100% recycled linerboard, corrugating medium or boxboard, which statistically are considered recycled paperboard.

Section 4.4 projects apparent consumption of paper, that is, production plus imports minus exports. Since the overall figure was the only one needed, it was estimated from the entire paper production projected for 2002 by using a range of coefficients, which provided the ratio of apparent consumption to production according to historic data.

Section 4.5 lists the range of recovery rates used in the study. The official 2000 goal of 50% can be projected to 2002 to be close to 51%, while the 1997 recovery rate was 45.1%. A range of recovery rates from 45% to 52% were used to calculate the recovery of paper.

Chapter 5 describes the 2002 spreadsheet. Results from the simulation are also included.

Section 5.1 contains the description of the 2002 spreadsheet, and details how the projected production figures from every scenario are translated into pulp consumption through a linear relationship defined by the composition coefficients. Secondary pulp requirements are then converted into wastepaper consumption using a second set of coefficients (wastepaper allocation coefficients) and the yield coefficients.

Section 5.2 shows partial results of the five simulations. The historic evolution of wastepaper consumption from 1980 to 2002 is shown aggregated by wastepaper grade and by end-use.

Section 5.3 shows partial results of the five simulations. Wastepaper consumption is subtracted from projected recovery of wastepaper according to assumed apparent consumption of paper and a range of recovery rates.

Chapter 6 includes the discussion of the results presented in Sections 3.2, 5.2, and 5.3.

Chapter 7. Summary

Chapter 8. Bibliography.

2. BACKGROUND

Recycling policies commonly have a twofold approach. First of all, demand-oriented schemes target consumer's preferences and are designed to create a sensibility (i.e. market) for recycled products. Some campaigns include mandatory use of recycled paper within an official institution or prescribe a given share of recycled paper in certain furnishes. Second, recovery schemes (which I will call supply-oriented schemes) are intended to promote source sorting and recovery of paper, mainly from business and households.

Consumer preferences push industry to supply the recycled products demanded. Therefore, industry must adjust itself to meet new quantitative and qualitative requirements. Investment focuses on new technologies. Simultaneously, the industry sector, that constitutes the demand for wastepaper dealers, sets the amount (influencing the intensity of wastepaper recovery) and quality (defining more precise standards for wastepaper) of wastepaper needed. Throughout this process, recovery rates are set by the industry according to their own constraints (the utilization rate) and their final demand. Therefore, recovery rates are consistent with utilization rates, smoothing mismatches between demand and supply of wastepaper that are the main cause of traditional price oscillations in the sector.

The second approach emphasizes sorting and recovery. Supply of recycled fiber, strongly stimulated by governmental intervention, increases greatly and often surpasses industry demands, creating oversupply and causing prices to drop. The industry is caught between an excess supply of recycled fiber and a market that has a limited demand for recycled products.

Both approaches have been used to characterize waste disposal issues. The two approaches are, or should be, two sides of the same coin. Actually, it may appear that governmental institutions stress recovery (supply-oriented) schemes over demand-oriented strategies. The often observed mismatch between recovery rates and utilization rates and the subsequent oversupply of recycled paper in Western Europe and the USA may indicate a lack of equilibrium between both measures. Very often, recycling policies are adopted by corporations or public offices simply because it is a good thing without further questioning of the costs and benefits of the measure, forgetting that the utilization rate, as a measure of industry capacity, has a stronger influence on the recovery rate than the recovery rate has on the utilization rate.

Actually, the second scheme can impose a **market distortion** if utilization rates can not match recovery rates. A market distortion occurs because the opportunity costs of the recovered fiber is not the marginal recovery costs (since recovery is mandatory), but the marginal disposal costs (Lindall, 1995)[18]. This is not the only distortion that can be found in the market.

Recycled materials demand, supply and pricing mainly depends on export markets, virgin and recycled capacities, geography, transportation costs and end-product demand (Richard Keller[19] in Fickes, 1991). **Wastepaper demand and** therefore **prices** are volatile due to cyclical and almost endemic fluctuations on the demand for finished paper and paperboard products. The buyers, i.e. the paper industry, usually set prices. When demand for end-user products decays, prices of recycled inputs are therefore doubly affected, first due to the reduction of price

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[18] Lindall, Michael. Paper recycling in Denmark. Policy Issues and Impacts. In Life-Cycle Analysis-A Challenge for Forestry and Forest Industry. EFI Proceedings No. 8. 1995.

[19] Richard Keller, chief of recycling at Maryland Environmental Services, a state agency and non-profit corporation headquartered in Annapolis, Md.

in consumer products and secondarily due to industry policy intended to discourage further recovery. Changes in stocks and exports to fiber-scarce regions, like the Far East, the main world importer, Mexico or Canada, are commonly used in response to local price fluctuations (McKinney, 1995; and Garcia[20], 1991).

Environmental regulation and public policies added more instability to this framework during the late 80's and 90's. Regulation emphasized supply-oriented schemes over demand-oriented ones. Recovery goals, i.e. supply of recycled paper, were usually set up well above the demands of the industry for recycled fibers, characterized by the utilization rate, and strongly stimulated through regulatory tools that targeted households, wastepaper merchants and industry. The most common measures included source separation of wastepaper in households combined with recovery schemes, subsidies that stimulated private wastepaper dealers, legal requirements to use at least some portion of recycled fiber in certain paper and paperboard furnishes and public policies that favored the use of recycled materials. (Garcia, 1991)

Germany, a commonly cited example, set up recovery goals in 1985, with the implementation of the German Recycling Ordinance through the Green Dot Program, without further consideration about the final utilization of wastepaper recovered. In 1991 demand for waste paper in Germany fell as a consequence of reduced demand for end-user paper products. However, recovery of paper was not reduced, since it was subsidized. Therefore, German paper markets experienced an excess supply of wastepaper and recycled fiber that caused a sharp drop in prices and forced German producers to export excess wastepaper to other countries. In a chain-reaction-like situation, Denmark, France, Italy and Great Britain saw their markets flooded by German wastepaper, with a competitive advantage on prices. Eventually, their national recovery merchants were severely affected and were driven out of business (McKinney, 1995).

KEY WORDS DEFINITIONS. *The **recovery rate** is the relation between paper recovered and total apparent consumption of paper and paperboard. Regulation establishes recovery rates consistent with policy goals that ultimately mirror society preferences for environmentally friendly practices. The **utilization rate** is the ratio of wastepaper consumption to total paper and paperboard production. Recycling rates are mainly determined by the structure of the pulp and paper industry, that ultimately respond to technical requirements of consumers, like strength, weight, flexibility, opacity, color, and so on. Both rates may be expressed on a product or grade basis or as an overall number that comprises all grades. **Apparent consumption** is obtained adding production and imports minus exports for a given political or administrative unit.*

Demand/supply issues. It is important to keep in mind that demand for paper is actually increasing. Paper consumption is strongly related to income levels, population growth, technological development and literacy rates, and therefore a significant growth can be expected when these variables increase. Virgin fiber demand grew an annual average 2.5% worldwide for the 1970-1988 period, while recycled fiber demand reached 5% (Jaakko Poyry Oy, 1991). However, during the 80's and 90's, recovery rates were consistently higher than utilization rates almost universally, with the significant exception of the Far East. The main consequence of this situation was an oversupply of waste paper that had immediate effects on wastepaper prices.

A 1995 study by Bystrom and Lonnstedt employed an input-output framework to model the pulp and paper market flow in Scandinavia and Western Europe in 1990 for several pulp and paper grades as well as raw materials and recycled fibers. Once the model was developed, assumptions about projected demand for pulp and paper products were introduced, as well as national and regional recovery goals and technical assumptions about the most likely evolution of industry structures (both quantitative and qualitative) to the year 2000. Results again showed an excess supply of waste paper that European industry was not ready to absorb, at least under current quality standards.

Other studies (Uutela and Walker, 1997) point in the same direction: "It is clear that consumer demand for paper and (paper)board products, rather than the availability of waste paper, dictates how much recycling capacity can be built. But soon waste paper in Europe will be recovered because it is mandatory and not necessarily because it can be effectively recycled". Preservation of quality standards is also a critical issue: "The fate of the lower quality

[20] In Patrick, Ken L. 1991. Paper Recycling. Strategies, Economics and Technology. Miller Freeman, Inc.

waste emerging from increasing collection could become a problem and it is possible that incineration of the lowest quality fraction may be discussed," an alternative already suggested by several studies (Johnson, 1993; Virtanen and Nilson, 1993; BNMA, 1995; Bystrom and Lonnstedt, 1997). Actually, quality related concerns are already arising as it becomes evident than recovery rates for some paper grades are "close to the *optimum*" (Uutela and Walker, 1997).

Recycled fiber as fiber input. There is a technical basis to define an *optimum*. Paper "consists of a web of pulp fibers... held together by hydrogen bonding...that may also contain a variety of additives and fillers" (Biermann, 1996). To meet physical, chemical and visual requirements demanded by consumers, those fibers must possess certain key characteristics, like length and bonding capability, and a required texture, that is, the relative proportion of fines, long fibers and short fibers, which must meet industry standards as well. Recycled fibers have been refined at least twice, and it is not unusual that the same fiber be recycled five to eight times (Fjallstrom[21], 1991). Those fibers are shorter than virgin fibers and had lost most of their key properties. There are problems associated with low-strength, aging and yellowing of recycling grades and stickies (Jaakko Poyry Oy, 1991), that is, additives, minerals and chemicals (all of them non-fibrous materials) added to paper to improve its characteristics. Other substances, like food, ink, pigments, can also be found in post-consumer paper. The industry has developed some methods to partially restructure the fiber chemically or mechanically, but eventually there is a limit on the number of times it can be reused (Fjallstrom, 1991) and in the proportion of recycled fiber for any given furnish. Due to the above reasons, it has become usual to employ the average age of pulp, i.e., the number of cycles fiber has gone through, as a comprehensive fiber quality measure to summarize a number of physical and chemical properties.

The main consequence of the non-fibrous additives, however, is the loss associated with the recycling process. Losses are directly related to the average age of fiber, the heterogeneity of the mix of wastepaper and the relative content of additives. There is a huge range of variation depending on the grade produced, but this yield loss or "yield shrinkage" may amount around 20 to 30% (Fjallstrom, 1991). That means that from every 100 tons of recycled paper just 70 to 80 can be actually reused. The remaining must be eliminated through incineration or landfills. Technology changes can push the *optimum* beyond current limits and allow the production of furnishes with higher proportion of recycled fiber keeping quality standards, but renovation or installation of new recycling capability is expensive, specially in an industry as capital intensive as paper industry is.

KEY WORDS DEFINITIONS. ***Paper*** *is also defined as a "felted sheet of fibers formed on a fine screen from a water suspension...most paper products are also manufactured with non-fibrous additives" (Smook, 1982).* ***Recycled paper*** *is paper that is partially or fully made of recycled fiber.* ***Pulp*** *is the fibrous raw material for papermaking.* ***Virgin fiber*** *is obtained exclusively from wood.* ***Recycled fiber*** *is fiber whose source is paper or paperboard arising outside of the mill (Biermann, 1993). Throughout the present study,* ***virgin fiber*** *will be defined as the one that has not gone through the cycle, while* ***recycled fiber*** *is the one that has completed at least one full cycle, i.e. its age is at least two.* ***Fines*** *are small particles and short fibers that originate in the defibering process.* ***Deinking*** *is primarily a separation process intended to separate contaminants like ink from fiber by cleaning, washing and screening. The process also involves repulping and defibering (McBride[22], 1991).*

Costs. The issue has also fundamental economic implications. As utilization rates increase, so do marginal recycling costs. Actually, there is an economical optimum to deinking, and evidence shows that "there are already indications from deinking mills that recycling losses are increasing" (Uutela and Walker, 1997). Also, the high-brightness requirements in printing paper make bleaching costs for recycling paper cost-prohibitive (Jaakko Poyry Oy, 1991). Finally, there are high costs associated with pollution abatement at mills with recycling technology (Jaakko Poyry Oy, 1991).

No less important are the costs derived from the instability of wastepaper markets and associated to recovery, transportation and storage. In an initial stage, many municipalities which had implemented recovery schemes had to face huge costs due to excess recovery and low market prices for secondary fiber (Lindall, 1995)[23]. Regulations also

[21] In Patrick, Ken L. 1991. Paper Recycling. Strategies, Economics and Technology. Miller Freeman, Inc.
[22] In Patrick, Ken L. 1991. Paper Recycling. Strategies, Economics and Technology. Miller Freeman, Inc.
[23] Lindall, Michael. Paper recycling in Denmark. Policy Issues and Impacts. In Life-Cycle Analysis-A Challenge for Forestry and Forest Industry. EFI Proceedings No. 8. 1995.

affect private dealers' profits: "while packaging manufacturers are obligated to recover and recycle a percentage of the weight of packaging sent to customers, manufacturers had no rights over that packaging when it became waste … the holder of waste can auction packaging … which adds to manufacturers' costs" (Anonymous, 1997). This oncept of manufacturers' rights is termed *shared producer responsibility*. Also, the establishment of many recovery schemes within the same city or state frequently ends up increasing competition for recovered paper and increasing operation costs.

Furthermore, there are still many questions about the actual environmental benefits derived from recycling, especially in the case of paper:

> Wastepaper must be de-inked producing air and water pollution, and re-pulping uses energy which must usually come from fossil fuel sources. In contrast, virgin paper pulp is made from a renewable resource (trees), usually with renewable forms of energy (tree thinnings and offcuts). An alternative is to use wastepaper as a biofuel, burning it as an energy source in a modern incinerator. The carbon dioxide released will re-cycle to future generations of trees, and the electricity generated will displace use of fossil fuels. (Miller et al, 1985).

Actually, an increasing number of studies employ Life Cycle Analysis (LCA) to account for energy transfers and environmental impacts (usually carbon emissions and water usage) associated to each of the stages of the cycle (Johnson, 1993; Virtanen and Nilson, 1993; BNMA, 1995; Bystrom and Lonnstedt, 1997). All of them suggest that incineration may impose a lower net environmental cost than recycling. Virtanen and Nilson found that the demand for non-renewable energy would almost double if recycling rates were increased to a maximum, and recommended the use of newsprint as a biofuel.

The US began to implement its recovery policies during the late 80's and early 90's. By the year 1995 more than twenty states have passed legislation concerning recovery of paper, especially newsprint (old newspaper, i.e. ONP). US recovery rate was 44.3 % in 1995 and 44.8 % in 1996, showing a decreasing rate of growth in comparison to previous years, despite the growth in domestic consumption, due mainly to the reduction in exports. However, the American Forestry and Paper Association (AF and PA) hopes to reach its 50 % recovery goal by the year 2000. This goal is closely linked to the expansion of office paper recovery programs, new sources for old corrugated cardboard (OCC), and the expansion of exports of recycled paper. The exports market which comprises around 20% of all paper recovered in the US, is vital in national recovery schemes. Utilization rates in the US were 37.3 % during 1996 (Source: AF and PA, 1998).

2.1. Product Description. Composition. Historic 1980-1995 Data.

Pulp

Mechanical Pulp

Under this denomination, several different kinds of pulp are included. All these pulps (see Box 2.1.1 showing the most widely used) are produced using mechanical or chemi-mechanical means to separate the fiber. Mechanical pulping does not eliminate lignin, which results in weaker pulp that tends to darken over time. As a rule, these pulps have high opacity, stiffness, bulk, and softness, but low strength, albeit CTMP is relatively stronger. Yields are very high, with a range of 88-96% (Biermann, 1993, after Krahmer and VanVliet, 1983).

Paper furnished from mechanical pulp is specially suited for printing due to both opacity and softness. Therefore mechanical pulps are mainly used for making newsprint (according to the US Harmonized Tariff Schedule, at least 65% by weight must be mechanical pulp, although actual figures are often lower) and several printing and writing grades, grouped under the name of groundwood papers, in which mechanical pulp usually comprises about half of the pulp content, and no less than 10 % by definition. Other paper grades that use mechanical pulp are tissue, towel, and bleached board. Wastepaper obtained from books, telephone directories and old newspapers and magazines (ONP, OMZ) is therefore made mostly of mechanical pulp and in turn, secondary pulp from this origin (frequently deinked) substitutes mechanical pulp.

Box 2.1.1. ***Mechanical Pulping Processes***

Groundwood (GW). Pulp is produced from short logs (called bolts) pressed against a stone grinder. Also known as Stone Groundwood (SGW).
Pressurized Groundwood (PGW). Grinding is improved by pressurizing the grinder with steam.
Refiner Mechanical Pulp (RMP). Wood chips are disintegrated between revolving metal disks (refiner).
Thermomechanical Pulp (TMP). Wood chips are presteamed and refiners may be pressurized with steam to improve performance.
Chemi-Thermo Mechanical Pulp (CTMP, BCTMP if bleached). Chips are pretreated with chemicals (sodium sulfite or sodium hydroxide) prior to steaming and then refined in pressurized refiner.

According to the 1996 Pulp and Paper North American Fact Book, there were 71 mills in the US producing some kind of mechanical pulp in 1995, with a combined capacity of 6,820,000 tons (AF&PA). Fiber scarcity and environmental concerns have fostered an increasing use of mechanical pulp to the expenses of chemical pulping, since pulpwood required to produce a ton of pulp by mechanical means is about half of that needed to produce a ton of chemical pulp.

Capacity, production, imports, exports and apparent consumption of mechanical pulp in the US in 1980, 1985, 1990 and 1995 are shown in Table 2.1.1. Capacity and production data include all grades in Box 2.1.1. Figures are expressed as air-dry short tons (10% moisture by weight, 1 Metric Ton = 1.1 Short Tons).

Table 2.1.1. *Mechanical Pulp. Production and Trade Data (Short Tons). 1980, 1985, 1990, 1995.*

Year	Capacity	Production	Imports	Exports	App. Cons.
1995	6,820,000	6,167,000	185,198	146,300[1]	6,205,898
1990	6,957,000	6,345,000	155,629	32,000[1]	6,468,629
1985	5,964,000	5,251,000	111,501	2,100[1]	5,360,401
1980	7,069,000	4,766,000	148,499	13,640[1]	4,900,859

[1] FAOSTAT. Converted into short tons (1 MT=1.1 Short Tons). (Apparent Consumption = Production plus Imports minus Exports).
Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.

Semichemical Pulp

Semichemical pulping (also named high yield chemical pulping) uses mild chemical treatment followed by mechanical refining. Throughout this process there is a partial removal of both lignin and hemicellulose. The most common of semichemical pulping processes is the **Neutral Sulfite Semi-Chemical** or NSSC. In this process, chips are cooked in a mixture of Na_2SO_3 and Na_2CO_3. Residual lignin makes paper from this pulp very stiff, as it is required when producing corrugating medium, by far the most important end-use of this pulp. Strength is medium to medium low. Yields for the NSSC process range from 75 to 85% and the yield for semichemical pulping, as a rule, ranges from 60 to 80% (Biermann, 1993, after Krahmer and VanVliet, 1983).

Apart from corrugating medium, other end-uses are food boards, glassine, magazine, newsprint, and insulating and sheathing board (1996 Pulp and Paper North American Fact Book). According to the same source, in 1995 there were 29 mills in the US producing semichemical pulp, with a combined capacity of 4,269,000 tons (AF&PA).

Capacity, production, imports, exports and apparent consumption of semichemical pulp in the US in 1980, 1985, 1990 and 1995 are shown in Table 2.1.2. Capacity and production data include bleached and unbleached semichemical pulp. Figures are expressed as air-dry short tons (10% moisture by weight, 1 Metric Ton = 1.1 Short Tons).

Table 2.1.2. ***Semichemical Pulp. Production and Trade Data (Short Tons). 1980, 1985, 1990, 1995.***

Year	Capacity	Production	Imports	Exports	App. Cons.
1995	4,269,000	3,978,000	220,000[1]	59,400[1]	4,138,600
1990	4,669,000	4,219,000	189,420[1]	14,740[1]	4,393,680
1985	4,650,000	4,026,000	NA[2]	NA[2]	4,026,000
1980	4,601,000	4,027,100[1]	NA[2]	NA[2]	4,027,100

[1] FAOSTAT. Converted into short tons (1 MT=1.1 Short Tons).

[2] Not Available.

(Apparent Consumption = Production plus Imports minus Exports).

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.

Kraft Pulp

In the kraft pulping process, chips are separated using sodium hydroxide and sodium sulfide. This process removes most of the lignin, and assures the production of high strength pulp. This pulp, originally brown, can then be bleached with chlorine or oxygen to increase brightness. Average yield is around 47-50% for non-bleached pulp and 43-45% for bleached kraft pulp (Biermann, 1993, after Krahmer and VanVliet, 1983).

Unbleached kraft pulps are used to produce paper that requires strength, like linerboard, sack grades, and wrapping papers. Bleached kraft, due to its strength and brightness, is used to produce printing and writing grades, under the denomination of free-sheet or wood-free papers, and also added to newsprint and groundwood grades to improve strength. Linerboard is used, together with corrugating medium, to build containers and packages. These containers are eventually recovered as Old Corrugated Containers (OCC), which alone make half of paper and paperboard recovered in the US. The composition of OCC therefore consists of semichemical and unbleached kraft pulp.

According to the 1996 Pulp and Paper North American Fact Book, there were 123 mills in the US producing kraft pulp in 1995, with a combined capacity of 54,945,000 tons (unbleached, 22,898,000 tons) (AF&PA).

Table 2.1.3. ***Unbleached Kraft Pulp. Production and Trade Data (Short Tons). 1980, 1985, 1990, 1995.***

Year	Capacity	Production	Imports	Exports	App. Cons.
1995	22,898,000	22,163,000	139,791	357,509	21,945,282
1990	22,742,000	22,072,000	94,318	186,542	21,979,776
1985	21,182,000	19,510,000	125,408	95,207	19,540,201
1980	20,288,000	19,591,000	143,545	112,996	19,621,549

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.

(Apparent Consumption = Production plus Imports minus Exports).

Capacity, production, imports, exports and apparent consumption of kraft pulp in the US in 1980, 1985, 1990 and 1995 are shown in Tables 2.1.3 and 2.1.4. Capacity and production data show bleached and unbleached kraft pulp separately. Figures are expressed as air-dry short tons (10% moisture by weight, 1 Metric Ton = 1.1 Short Tons).

Table 2.1.4. ***Bleached Kraft Pulp[1]. Production and Trade Data (Short Tons) 1980, 1985, 1990, 1995.***

Year	Capacity	Production	Imports	Exports	App. Cons.
1995	32,047,000	32,138,000	5,059,308	6,183,289	31,014,019
1990	27,819,000	27,559,000	3,911,767	4,486,335	26,984,432
1985	23,624,000	22,626,000	3,553,592	2,767,726	23,411,866
1980	19,695,000	19,000,000	3,044,547	2,494,740	19,549,807

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
[1] Includes Semibleached Kraft Pulp.
(Apparent Consumption = Production plus Imports minus Exports).

Sulfite Pulp

Sulfite pulping, which also includes bisulfite pulping, is carried out under acidic conditions in a solution of sulfur dioxide in water at high temperature and pressure. The lignin and sulfur combine to produce acids that can be removed by adding a base. Chemicals used are H_2SO_3 and HSO_3^-, with Ca^{2+}, Mg^{2+}, Na^+ or NH_4^+ as bases. The pulp is light brown colored, and can then be bleached. Paper produced from this pulp is weaker than the one obtained from kraft pulping. Average yield is higher than in the kraft pulping method, around 48-51% for non bleached pulp and 46-48% for bleached sulfite pulp (Biermann, 1993, after Krahmer and VanVliet, 1983).

Paper produced from sulfite pulps provides good sheet formation, softness, bulk and absorbency, which make them suitable for tissue and sanitary papers. Also, when bleached, brightness is higher than in bleached kraft papers, so bleached sulfite pulp is also used in certain printing and writing paper grades, such as bond and reproduction. It used to be employed to produce newsprint, but the trend is to be substituted by kraft pulps.

The 1996 Pulp and Paper North American Fact Book lists 15 mills in the US producing sulfite pulp in 1995, with a combined capacity of 1,330,000 tons (AF&PA). Environmental issues have affected sulfite production since as early as the 1930's, and its importance in terms of share of the pulp market, already small, keeps diminishing.

Capacity, production, imports, exports and apparent consumption of sulfite pulp in the US in 1980, 1985, 1990 and 1995 are shown in Tables 2.1.5 and 2.1.6. Capacity and production data show bleached and unbleached sulfite pulp separately. Figures are expressed as air-dry short tons (10% moisture by weight, 1 Metric Ton = 1.1 Short Tons).

Table 2.1.5. ***Unbleached Sulfite Pulp. Production and Trade Data (Short Tons). 1980, 1985, 1990, 1995.***

Year	Capacity	Production	Imports	Exports	App. Cons.
1995	-[1]	158,400[3]	13,756	57,416	114,740
1990	-[1]	167,000[3]	29,465	18,629	177,836
1985	256,000	317,900[3]	110,918	22,241	406,577
1980	NA[2]	383,900[3]	109,277	25,885	467,292

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
[1] Combined with Bleached Sulfite Pulp Capacity.
[2] Not Available.
[3] FAOSTAT. Converted into short tons (1 MT=1.1 Short Tons).
(Apparent Consumption = Production plus Imports minus Exports).

Table 2.1.6. ***Bleached Sulfite Pulp. Production and Trade Data (Short Tons). 1980, 1985, 1990, 1995.***

Year	Capacity	Production	Imports	Exports	App. Cons.
1995	1,330,000[1]	1,346,400[2]	242,395	646,518	942,277
1990	1,689,000[1]	1,390,400[2]	290,368	388,633	1,292,135
1985	1,482,000	1,342,000[2]	313,592	250,047	1,405,545
1980	1,512,000	1,455,300[2]	317,468	322,212	1,450,556

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
[1] Bleached and Unbleached Sulfite Pulp Capacity.
[2] FAOSTAT. Converted into short tons (1 MT=1.1 Short Tons).
(Apparent Consumption = Production plus Imports minus Exports).

Other Pulp

FAO statistics include several grades of pulp whose origin is non-wood fiber. The most extended raw inputs are cotton, straw, canes, grasses and hemp. In the US, wood has almost completely replaced other fiber sources. Corrugating medium used to be made of straw prior to the 1930's (Biermann, 1993). Now almost all corrugated medium comes from wood fiber. Some high-quality printing and writing papers use cotton fiber. Pulping methods depend on the kind of fiber used. Most of them use either the soda or the kraft processes.

Table 2.1.7. ***Other Pulps. Production and Trade Data (Short Tons). 1980, 1985, 1990, 1995.***

Year	Capacity	Production	Imports	Exports	App. Cons.
1995	NA[1]	264,000[2]	22,000[2]	123,200[2]	162,800
1990	NA[1]	388,300[2]	13,970[2]	146,740[2]	255,530
1985	NA[1]	333,300[2]	75,570[2]	107,030[2]	301,840
1980	NA[1]	825,000[2]	24,750[2]	148,170[2]	701,580

Source: Unless otherwise specified, all figures from FAO.
[1] Not Available.
[1] FAOSTAT. Converted into short tons (1 MT=1.1 Short Tons).
(Apparent Consumption = Production plus Imports minus Exports).

Capacity, production, imports, exports and apparent consumption of non-wood pulps in the US in 1980, 1985, 1990 and 1995 are shown in Table 2.1.7.. Figures are expressed as air-dry short tons (10% moisture by weight, 1 Metric Ton = 1.1 Short Tons).

Paper and Paperboard Grades

Newsprint

Newsprint is a special kind of uncoated groundwood paper, but because of its importance and the volume of trade involved, it is usually considered as a group in itself. It is used to print newspaper and other low-cost, short-lived publications.

It contains a high percentage of mechanical pulp and a small share of chemical pulp to increase strength and improve runnability on paper machines. There is no universal recipe to make newsprint. Every paper mill has its own one. Newsprint has no coating or fillers. In relation to the fiber content, the US Harmonized Tariff Schedule (from 1996 Pulp and Paper North American Fact Book) determines that newsprint is uncoated paper with no less than 65% by weight of the total fiber content obtained from mechanical pulps. The actual share of mechanical pulp is lower, since statistics include recycled newsprint, which is often furnished from 100% wastepaper. The composition (as a percentage of all fiber content) estimated from the 1995 simulation, which will be used in the 2002 simulation, is as follows: 44% mechanical pulp, 20% bleached kraft pulp and 36% secondary fiber.

Recycled fiber began to be used to produce newsprint in the 1950's and now it makes about 38.1% of the fiber input in recycled-content newsprint (1995, The News in ONP). Recycling content in newsprint has a wide range of variation. Actually, there is newsprint with no secondary fiber content at all and others with 100%-recycled fiber. ONP is the traditional secondary fiber source for newsprint, but OMG, OTD, OCC and pulp substitutes are used as well. EPA recommendations point out to a 40% content (by weight) of recycled fiber in newsprint, but in fact very few states stick to this recommendation. State mandatory recycling programs have been established in 13 states to date, and their recommendations range from 45% content of recycled fiber (Florida provision for 1994), 40% (Maryland, 1994: Wisconsin, 1998) to 10/12% (Texas, Arizona, California, Rhode Island). Those states that do not have mandatory newsprint recycling programs usually have voluntary schemes, which recommend fiber contents from 10 to 30% (of total fiber content). Table 2.1.8 is adapted from "The News in ONP" and shows the share of recycled fiber in recycled newsprint manufacturing.

Table 2.1.8. *Average secondary fiber content in US recycled newsprint*

Year	ONP/OMG	Pulp Substitutes	Total
1995	38.1	-	38.1
1990	25.2	-	25.2
1985	20.5	-	20.5
1980	13.6	0.7	14.3

Capacity, production, imports, exports and apparent consumption of newsprint in the US in 1980, 1985, 1990 and 1995 are shown in Table 2.1.9. Capacity and production data include 100%-recycled newsprint. Figures are expressed as air-dry short tons (1 Metric Ton = 1.1 Short Tons).

Table 2.1.9. *Newsprint. Production and Trade Data (Short Tons). 1980, 1985, 1990, 1995.*

Year	Capacity	Production	Imports	Exports	App. Cons.
1995	7,253,000	7,001,800	7,807,471	828,774	13,980,497
1990	6,792,000	6,610,500	8,299,557	535,993	14,374,064
1985	5,788,000	5,427,700	8,496,568	314,385	13,609,883
1980	4,836,000	4,672,300	7,279,349	174,869	11,776,780

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
(Apparent Consumption = Production plus Imports minus Exports).

Uncoated Groundwood

Uncoated groundwood papers make a small share of the printing and writing papers. They are quite similar to newsprint, with higher brightness and a smoother surface. Actually, the same machines that make newsprint can be used to make some uncoated groundwood grades with slight modifications. The main end-uses include newspaper inserts, direct mail flyers, catalogs, low-cost business forms, paperback books and telephone directories. This is a growing segment of the market which competes with coated groundwood and uncoated free-sheet. Among the grades included in this category are directory paper, supercalender papers (SC), machine-finished offset (MF), computer, rotogravure and similar grades.

Uncoated groundwood papers contain at least 10% mechanical pulp by definition, and usually chemical pulp is added to the mixture to improve brightness and physical strength. It also may contain fillers. The Paper Task Force assumes the following composition for uncoated groundwood in their life-cycle study: 94 % Mechanical Pulp and 6% Moisture (1995). Actually, uncoated groundwood usually contains a small amount of chemical pulp. In relation to recycled content, most of recycled fiber utilized to make groundwood papers go to telephone directories. The Yellow Pages Publisher Association (YPPA) adopted a schedule of 10% recycled content in 1993, 25% by 1995 and 40% by 1998 (AF&PA). In other grades, as much as 40% post-consumer paper is added, but the average is quite lower. The composition (as a percentage of all fiber content) estimated from the 1995 simulation, which will be used in the 2002 simulation, is as follows: 57% mechanical pulp, 34% bleached kraft pulp and 9% secondary fiber.

Capacity, production, imports, exports and apparent consumption of uncoated groundwood paper in the US in 1980, 1985, 1990 and 1995 are shown in Table 2.1.10. Capacity and production data include publishing and printing grades as well as converting grades under the uncoated groundwood denomination. It is important to notice that groundwood production is understated by official statistics since some newsprint grades should rather be considered uncoated groundwood (AF&PA, 1996). The same can be said for capacity, since some newsprint equipment may be used to produce uncoated groundwood when markets are favorable. I will follow official statistics. Figures are expressed as air-dry short tons (1 Metric Ton = 1.1 Short Tons).

Table 2.1.10. ***Uncoated Groundwood Paper. Production and Trade Data (Short Tons). 1980, 1985, 1990, 1995.***

Year	Capacity	Production	Imports	Exports	App. Cons.
1995	2,198,000	2,129,600	2,221,271	203,252	4,147,619
1990	1,946,000	1,805,800	1,337,581	75,299	3,068,082
1985	1,710,000	1,520,900	1;027,211	36,779	2,511,332
1980	1,624,000	1,498,800	487,973	100,951	1,885,822

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
(Apparent Consumption = Production plus Imports minus Exports).

Coated Groundwood

Coated groundwood papers are used in magazines, directories, catalogs, brochures, and direct mailing. Among the grades included in this category are lightweight coated (LWC), by far the most important one in terms of market size, machine-finished coated, coated supercalender and film-coated offset. Coated papers are grouped into five categories, named 1 to 5. Coated free-sheet specialties (grades 1, 2, 3) are more expensive and brighter than coated groundwood ones (4, 5).

Table 2.1.11. ***Coated Groundwood Paper. Production and Trade Data (Short Tons). 1980, 1985, 1990, 1995.***

Year	Capacity	Production	Imports	Exports	App. Cons.
1995	4,493,000	4,424,000	932,398[1]	200,865	5,155,533
1990	4,414,000	4,233,200	-[2]	136,957	
1985	3,820,000	3,393,400	-[2]	36,444	
1980	2,762,000	2,664,700	-[2]	44,503	

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
[1] U.S. Department of Commerce.
[2] Combined with Coated Free-sheet.
(Apparent Consumption = Production plus Imports minus Exports).

Coated groundwood papers contain at least 10% mechanical pulp (TMP and CTMP are generally used) by definition, but it is more usual a 50% content of mechanical fiber (in relation to total fiber content) being the rest chemical (bleached kraft as a norm) pulp. It also contains coatings and fillers. LWC coating makes about 30% by weight (AF&PA). The Paper Task Force assumes the following composition for coated groundwood papers: 32% Mechanical pulp, 32% Bleached Kraft Pulp, 30% Fillers and Coatings and 6% Moisture (1995). Use of recycling fiber is growing in importance, but it is still small. The price and availability of high-quality recycled fiber seriously affects the utilization of wastepaper. All recycled fiber used for these grades is deinked. Some mills have a deinking facility while others rely on deinked market pulps. The composition (as a percentage of all fiber content) estimated from the 1995 simulation, which will be used in the 2002 simulation, is as follows: 46% mechanical pulp, 51% bleached kraft pulp and 3% secondary fiber.

Capacity, production, imports, exports and apparent consumption of coated groundwood paper in the US in 1980, 1985, 1990 and 1995 are shown in Table 2.1.11. Figures are expressed as air-dry short tons (1 Metric Ton = 1.1 Short Tons).

Uncoated Free-sheet

Uncoated free-sheet papers are the most important category within printing and writing papers. This category includes most of office papers, offset paper for commercial printing, business forms converters and envelope converters, text papers, carbonless paper, thin paper and similar papers. Cotton papers and bristols will be also included in this class.

Uncoated free-sheet papers contain less than 10% mechanical pulp. Bleached kraft is the chemical pulp most commonly used, but also bleached sulfite, soda and cotton pulps are employed. It contains coatings and fillers. The Paper Task Force assumes the following composition for coated groundwood papers: 78% Bleached Kraft Pulp, 16% Fillers and Coatings and 6% Moisture (1995). In relation to recycled content, its share is being increased as deinking capacities are expanded. The composition (as a percentage of all fiber content) estimated from the 1995 simulation, which will be used in the 2002 simulation, is as follows: 85.8% bleached kraft pulp, 2% bleached sulfite pulp, 2% unbleached kraft pulp, 1.2% other pulp and 9% secondary fiber.

Capacity, production, imports, exports and apparent consumption of uncoated free-sheet paper in the US in 1980, 1985, 1990 and 1995 are shown in Table 2.1.12. Capacity and production data include bond and writing, form bond, ledger, duplicating, papeterie and wedding, carbonless, cover and text papers, MF/EF/Supercalenders, offset, white wove envelope, tablet, kraft envelope papers, thin papers, cotton fiber papers and bleached bristols. Figures are expressed as air-dry short tons (1 Metric Ton = 1.1 Short Tons).

Table 13. ***Uncoated Free-Sheet Paper. Production and Trade Data (Short Tons) 1980, 1985, 1990, 1995.***

Year	Capacity	Production	Imports	Exports	App. Cons.
1995	15,928,000	14,480,200	1,233,609	854,569	14,859,240
1990	14,113,000	13,028,700	831,236	371,285	13,488,651
1985	12,087,000	11,067,000	389,584	83,586	11,372,998
1980	10,190,000	9,330,500	136,778	147,557	9,319,721

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
(Apparent Consumption = Production plus Imports minus Exports).

Coated Free-sheet

Coated free-sheet papers are used in annual reports, expensive advertising, magazines and other end-uses where high brightness is required. Coated free-sheet typically constitutes coated publication grades 1, 2 and 3.

Coated free-sheet papers contain less than 10% mechanical pulp. Bleached kraft is the most commonly used pulp, although bleached sulfite and mechanical pulps are used as well in smaller percentages. It also contains coatings and fillers, which make around 30% of weight. The Paper Task Force assumes the following composition for coated groundwood papers: 64% Bleached Kraft Pulp, 30% Fillers and Coatings and 6% Moisture (1995). In relation to recycled content, the situation is quite similar to that described in the coated groundwood section. The price and availability of high-quality recycled fiber affect the utilization of wastepaper. Utilization rates are low albeit higher than in groundwood grades, due to the higher availability of post-consumer paper. All recycled fiber used for these grades is deinked. The composition (as a percentage of all fiber content) estimated from the 1995 simulation, which will be used in the 2002 simulation, is as follows: 96% bleached kraft pulp and 4% secondary fiber.

Capacity, production, imports, exports and apparent consumption of coated free-sheet paper in the US in 1980, 1985, 1990 and 1995 are shown in Table 2.1.13. Capacity and production data include only those papers under the coated free-sheet denomination. Figures are expressed as air-dry short tons (1 Metric Ton = 1.1 Short Tons).

Table 2.1.13. ***Coated Free-Sheet Paper. Production and Trade Data (Short Tons) 1980, 1985, 1990, 1995.***

Year	Capacity	Production	Imports	Exports	App. Cons.
1995	4,876,000	4,371,400	465,537[1]	254,800	4,582,137
1990	3,676,000	3,302,700	936,046[2]	81,727	
1985	2,845,000	2,481,700	496,072[2]	46,017	
1980	2,222,000	2,113,900	114,927[2]	47,848	

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
[1] U.S. Department of Commerce.
[2] Includes Coated Groundwood.
(Apparent Consumption = Production plus Imports minus Exports).

Tissue

Tissue papers are mainly characterized by their absorbency, softness and medium strength. Among the most important grades included in this category are bath tissue, paper towels, facial tissue and napkins.

The main virgin pulp used to furnish these papers is either bleached kraft or bleached sulfite. Some mechanical pulp may be used as well. According to the 1996 Pulp and Paper North American Fact Book, about 42% of U.S. tissue is made exclusively from purchased waste fiber, 21% from purchased virgin fiber and the rest is produced in integrated pulp and paper mills with different combinations of both (1995). The composition (as a percentage of all fiber content) estimated from the 1995 simulation, which will be used in the 2002 simulation, is as follows: 40% bleached kraft pulp, 9% bleached sulfite and 51% secondary fiber.

Capacity, production, imports, exports and apparent consumption of tissue and sanitary papers in the US in 1980, 1985, 1990 and 1995 are shown in Table 2.1.14. Capacity and production data include bathroom tissue, facial tissue, napkin, towel and wiper stock. Figures are expressed as air-dry short tons (1 Metric Ton = 1.1 Short Tons).

Table 2.1.14. ***Tissue. Production and Trade Data (Short Tons). 1980, 1985, 1990, 1995.***

Year	Capacity	Production	Imports	Exports	App. Cons.
1995	6,552,000	6,210,300	110,265	105,088	6,215,477
1990	6,005,000	5,802,400	131,189	34,651	5,898,938
1985	5,345,000	4,940,500	55,990	18,118	4,978,372
1980	4,954,000	4,438,500	4,116	60,939	4,381,677

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
(Apparent Consumption = Production plus Imports minus Exports).

Unbleached Kraft Paper

Under this denomination are included all paper and paperboard grades whose composition consists mainly of unbleached kraft pulp and recycled fiber. The traditional end use of these papers is wrapping and packaging. The most important single grade is unbleached kraft linerboard, which is used as the inner and outer facing in containerboard in combination with corrugating medium. Linerboard provides the strength to the board, while corrugating provides the stiffness. That is the reason why almost only kraft pulp is used (among the virgin pulps). About 7% of linerboard produced in the US is made from other pulps than unbleached kraft, and they will be included in the 'Other paper and paperboard' section.

Industry definitions determine linerboard must contain at least 80% (unbleached) kraft pulp, being the remaining recycled pulp, usually obtained from OCC and ONP or more recently new double-lined kraft cuttings (NDLK). However, many mills are producing linerboard with a recycling content over 20%. According to the 1996 Pulp and Paper North American Fact Book, 22% of fiber content in linerboard was recycled pulp in 1995. An increasing number of mills are producing 100% recycled linerboard. 100%-recycled linerboard will be included among recycled paperboards, which are all made from 100% recycled pulp. The composition (as a percentage of all fiber content) estimated from the 1995 simulation, which will be used in the 2002 simulation, is as follows: 81.8% unbleached kraft pulp, 0.4% unbleached sulfite pulp and 17.8% secondary fiber.

Capacity, production, imports, exports and apparent consumption of unbleached kraft paper in the US in 1980, 1985, 1990 and 1995 are shown in Table 2.1.15. Capacity and production data include unbleached kraft paperboard (most of it linerboard), and unbleached kraft papers like wrapping, bag, sack, shipping sack and other converting grades. Figures are expressed as air-dry short tons (1 Metric Ton = 1.1 Short Tons).

Table 2.1.15. ***Unbleached Kraft Paper. Production and Trade Data (Short Tons). 1980, 1985, 1990, 1995.***

Year	Capacity	Production	Imports	Exports	App. Cons.
1995	26,252,000	24,717,100	573,785[1]	4,333,104	20,957,781
1990	24,148,000	22,734,300	348,981[1]	3,290,913[3]	19,792,368
1985	21,952,000	19,614,100	114,579[2]	1,975,497[3]	17,753,182
1980	20,077,000	19,110,800	77,361[2]	2,833,895[3]	16,354,266

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
[1] Includes Includes Unbleached Kraft Paper plus Kraft Linerboard.
[2] Includes Unbleached Kraft Paper plus Test or Containerboard Paperboard.
[3] Includes Includes Unbleached Kraft Pkg and Ind. Conv. Plus Kraft Linerboard plus other Unbl.
(Apparent Consumption = Production plus Imports minus Exports).

Semichemical Corrugating Medium

Semichemical corrugating medium is used to form the middle fluting material in corrugated board. Its main end-use is as the middle layer in containerboard between one or two layers of linerboard. This paper must be stiff and inexpensive.

Semichemical corrugating medium is made from unbleached, semichemical pulp (especially NSSC) and recycled fiber (OCC and NDLK being the main source). According to AF&PA, no more than 25% content may come from recycled fiber, but actual figures are around 37% recycled content (1996 Pulp and Paper North American Fact Book). About 64% (1995) of corrugating medium is produced from semichemical pulp and recycled pulp and the remaining comes from 100% recycled pulp (1996 Pulp and Paper North American Fact Book). The last one will be considered as recycled board and not included in this grade. The composition (as a percentage of all fiber content) estimated from the 1995 simulation, which will be used in the 2002 simulation, is as follows: 70% semichemical pulp, 30% secondary fiber.

Table 2.1.16. ***Semichemical Corrugating Medium. Production and Trade Data (Short Tons). 1980, 1985, 1990, 1995.***

Year	Capacity	Production	Imports	Exports	App. Cons.
1995	5,994,000	5,662,000	305,455	137,383	5,830,072
1990	5,894,000	5,640,000	111,935	50,466	5,701,469
1985	5,411,000	5,088,000	65,203	61,853	5,091,350
1980	4,946,000	4,724,000	31,349	62,884	4,692,465

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
(Apparent Consumption = Production plus Imports minus Exports).

Capacity, production, imports, exports and apparent consumption of semichemical corrugating medium in the US in 1980, 1985, 1990 and 1995 are shown in Table 2.1.16. Capacity and production data include only semichemical paperboard. Figures are expressed as air-dry short tons (1 Metric Ton = 1.1 Short Tons).

Recycled Paperboard

The denomination "recycled paperboard" comprises a number of paperboard grades whose composition is 100% recycled fiber. That includes recycled linerboard, recycled corrugating medium and many other grades mainly used in containers, folding and set-up boxes. The 1996 Pulp and Paper North American Fact Book lists 38 recycled paperboard grades.

This grade represents the largest market for wastepaper in the USA. Folding and set-up boxboard (25% of recycled paperboard produced) is manufactured as a multi-ply material. The top layer may be made from deinked pulp or high quality wastepaper, like pulp substitutes, while the inner layers use mainly ONP (80%) and OCC (20%) as wastepaper sources. Some of the grades are coated (up to 6% of the weight is the coating). Recycled linerboard and corrugating medium, which made 42 % of recycled paperboard in 1995 are almost exclusively made of OCC (1996 Pulp and Paper North American Fact Book). The assumed composition will be 100% secondary fiber.

Capacity, production, imports, exports and apparent consumption of recycled paperboard in the US in 1980, 1985, 1990 and 1995 are shown in Table 2.1.17. Capacity and production data include recycled linerboard, corrugating medium, container chip and filler, folding and set-up boxboard and gypsum grades. Figures are expressed as air-dry short tons (1 Metric Ton = 1.1 Short Tons).

Table 2.1.17. ***Recycled Paperboard. Production and Trade Data (Short Tons). 1980, 1985, 1990, 1995.***

Year	Capacity	Production	Imports	Exports	App. Cons.
1995	13,992,000	12,977,000	-[1]	322,949	12,654,051
1990	10,040,000	8,921,000	-	226,598	8,694,402
1985	8,795,000	7,555,000	-	245,564	7,309,436
1980	8,617,000	7,071,000	-	248,754	6,822,246

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
[1] Means 0.
(Apparent Consumption = Production plus Imports minus Exports).

Other Paper and Paperboard

Other paper and paperboard includes mainly those bleached kraft papers and paperboard grades not included elsewhere, whose main end-use is consumer and industrial packaging (food, liquid, folding, wrapping, bags, sacks, etc.).

Bleached kraft pulp is the main pulp source (according to industry definitions, at least 80% of fiber content, 1996 Pulp and Paper North American Fact Book) and there is also a small share of unbleached sulfite and recycled fiber and mechanical pulp (CTMP, TMP). Coating is also used. The composition (as a percentage of all fiber content) I estimated from the 1995 simulation, which will be used in the 2002 simulation, is as follows: 86.9% bleached kraft pulp, 5% unbleached kraft pulp, 0.1% unbleached sulfite and 3% secondary fiber.

Capacity, production, imports, exports and apparent consumption of other paper and paperboard in the US in 1980, 1985, 1990 and 1995 are shown in table 2.1.18. Capacity and production data include most other bleached kraft paper and paperboard, like wrapping, bag, sack, solid bleached board (SBS) and shipping together with special industrial and packaging papers, and wet machine board, building paper and insulating board. Figures are expressed as air-dry short tons (1 Metric Ton = 1.1 Short Tons).

Table 2.1.18. ***Other Paper and Paperboard. Production and Trade Data (Short Tons). 1980, 1985, 1990, 1995.***

Year	Capacity	Production	Imports	Exports	App. Cons.
1995	10,399,000	9,377,000	1,228,716	1,839,967	8,765,749
1990	9,486,000	8,364,300	732,236	945,176	8,151,360
1985	8,869,000	7,594,800	592,887	762,310	7,425,377
1980	10,488,000	8,061,700	554,562	859,678	7,756,584

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
(Apparent Consumption = Production plus Imports minus Exports).

Wastepaper or Recovered Paper Grades

Old Newspapers (ONP)

ONP includes newspapers collected from households, overissues collected at newstands, old magazines (OMG), groundwood paper trim, white blank news, groundwood computer printout (CPO), publication blanks, mixed groundwood and flyleaf shavings.

Its main end-use is in newsprint and recycled paperboard manufacture. According to "The News in ONP", in 1995, 46% of ONP consumed in the USA went to newsprint production, 31% to recycled paperboard, 9% to tissue, 4% to printing and writing grades and the remaining 10% to other uses like construction, semichemical corrugating medium, bleached and unbleached paper grades and other. In 1990, 38% went to newsprint, 32% to recycled paperboard, 12% to tissue, and the remaining 18% went to other uses. In 1984, 43% went to newsprint and 50% to different grades of paperboard (Source: Franklin, 1990, after American Paper Institute). In 1980, according to the same source, 33% went to newsprint and 48% to paperboard.

Recovery, imports, exports and apparent consumption of old newspapers in the US in 1980, 1985, 1990 and 1995 are shown in Table 2.1.19. Recovery data include old newspapers (ONP) and old magazines (OMG). Figures are expressed as air-dry short tons (10% moisture by weight, 1 Metric Ton = 1.1 Short Tons).

Table 2.1.19. ***Old Newspapers. Recovery and Trade Data (Short Tons). 1980, 1985, 1990, 1995.***

Year	Recovered	Imports	Exports	Consumption[1]	App. Cons.
1995	7,669,000	28,000	1,560,000	1,252,000	4,885,000
1990	5,787,000	17,000	1,016,000	977,000	3,812,000
1985	3,864,000	29,000	668,000	529,000	2,696,000
1980	3,279,000	10,000	425,000	473,000	2,391,000

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
[1] for Molded Pulp, Insulation and other uses.
(Apparent Consumption = Production plus Imports minus Exports).

Old Corrugated Containers (OCC)

The OCC category includes used corrugated containers as well as plant cuttings. Apart from recycled paperboard, the class is made of old semichemical corrugated medium and unbleached kraft linerboard that make most of containers used for consumer and industrial shipping. The main ingredient is therefore semichemical pulp and unbleached kraft pulp. This is the reason why this recovered paper grade is mostly destined to recycled paperboard grades, and specially to recycled corrugating medium/linerboard manufacture.

According to AF&PA figures, in 1995, 58% of OCC consumed in the US went to recycled paperboard furnish, 24% went to kraft paperboard mills and the remaining 22% to other uses. In 1990, 53% went to recycled paperboard, 24% to unbleached kraft paperboard, 16% to semichemical corrugating medium and the remaining 7% went to other uses (Source: Franklin, 1990, after American Paper Institute). According to the same source, in 1984, 57% went to recycled paperboard, 16% to unbleached kraft paperboard and 20% to semichemical corrugating medium. In 1980, 61% went to recycled paperboard, 12% to unbleached kraft paperboard and 16% to semichemical corrugating medium

Table 2.1.20. ***Old Corrugated Containers. Recovery and Trade Data (Short Tons). 1980, 1985, 1990, 1995.***

Year	Recovered	Imports	Exports	App. Cons.
1995	20,708,000	108,000	4,304,000	16,513,000
1990	13,407,000	11,000	2,731,000	10,688,000
1985	9,361,000	5,000	1,467,000	7,899,000
1980	8,062,000	13,000	1,209,000	6,866,000

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
(Apparent Consumption = Production plus Imports minus Exports).

Recovery, imports, exports and apparent consumption of old corrugated containers in the US in 1980, 1985, 1990 and 1995 are shown in table 2.1.20.. Figures are expressed as air-dry tons (10% moisture by weight, 1 Metric Ton = 1.1 Short Tons).

Pulp Substitutes

Pulp substitutes, according to the U.S. Department of Commerce classification, comprises unprinted grades of brown and colored kraft, white and semibleached sheets and cuttings, tabulating cards and shavings or trim of unprinted grades. Lately, print-free grades are usually referred to as pulp substitutes while printed grades, if deinked, are reported as high grade deinking.

The preferred end-use of this high-priced quality recovered paper is therefore printing and writing grades, followed by recycled paperboard and tissue. In 1995, according to the AF&PA, 30% of pulp substitutes consumed in the U.S. were used in printing and writing grades, 18% went to recycled paperboard manufacture and 13% to tissue. Figures for 1980, 1984 (1985 is not available) and 1990 are aggregated to those of high grade deinking, given the close relationship between these two grades (Source: Franklin, 1990, after the American Paper Institute). In 1990, 27% went to printing and writing grades, 42% went to tissue manufacture and 21% went to recycled paperboard. In 1984, 29% went to printing and writing grades, 38% went to tissue manufacture and 21% went to recycled paperboard. In 1980, 23% went to printing and writing grades, 39% went to tissue manufacture and 26% went to recycled paperboard.

Recovery, imports, exports and apparent consumption of pulp substitutes in the US in 1980, 1985, 1990 and 1995 are shown in table 2.1.21. Data include all categories cited above. Figures are expressed as air-dry short tons (10% moisture by weight, 1 Metric Ton = 1.1 Short Tons).

Table 2.1.21. ***Pulp substitutes. Recovery and Trade Data (Short Tons). 1980, 1985, 1990, 1995.***

Year	Recovered	Imports	Exports	App. Cons.
1995	3,388,000	67,000	996,000	2,459,000
1990	3,120,000	6,000	394,000	2,732,000
1985	2,715,000	3,000	224,000	2,494,000
1980	2,450,000	9,000	205,000	2,254,000

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
(Apparent Consumption = Production plus Imports minus Exports).

High Grade Deinking

High grade deinking includes deinking grades of white and colored ledger, computer printout (CPO), coated book and groundwood paper and bleached sulfate sheets and cuttings.

Since high grade deinking is closely related to pulp substitutes, all that was said for those can be said here again. End-uses are mainly printing and writing grades, tissue and recycled paperboard. In 1995, according to the AF&PA, 22% of high grade deinking consumed in the U.S. was used in printing and writing grades and 43% went to tissue. Figures for 1980, 1984 (1985 is not available) and 1990 are aggregated to those of pulp substitutes and can be found in the preceding section.

Recovery, imports, exports and apparent consumption of high grade deinking recovered paper in the US in 1980, 1985, 1990 and 1995 are shown in table 21.22. Data include all grades listed above. Figures are expressed as air-dry short tons (10% moisture by weight, 1 Metric Ton = 1.1 Short Tons).

Table 2.1.22. ***High Grade Deinking. Recovery and Trade Data (Short Tons). 1980, 1985, 1990, 1995.***

Year	Recovered	Imports	Exports	App. Cons.
1995	3,805,000	22,000	824,000	3,004,000
1990	2,955,000	22,000	977,000	2,000,000
1985	1,716,000	7,000	342,000	1,380,000
1980	1,318,000	-	176,000	1,142,000

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
(Apparent Consumption = Production plus Imports minus Exports).

Mixed Recovered Paper

This category includes paper of varied quality, often office waste (OWP) if not deinked or of suitable quality to be used as a pulp substitute, magazines and catalogs, telephone directories (OTD), recycled boxboard cuttings, tissue paper, converting scrap, mill wrappers, specialty grades and a variety of mixed and super mixed papers.

This is the cheapest of wastepaper grades and is used in many different processes as a minor input. As the less-priced wastepaper grade, when demand is poor and prices fall recovery ceases, and it is also the less documented grade. The amount allocated to every use will be calculated so mixed papers will make the remaining share once the share of the other four grades has been added for every process.

Table 2.1.23. ***Mixed Recovered Paper. Recovery and Trade Data (Short Tons). 1980, 1985, 1990, 1995.***

Year	Recovered	Imports	Exports	App. Cons.
1995	6,968,000	273,000	2,712,000	4,528,000
1990	3,826,000	66,000	1,387,000	2,505,000
1985	2,712,000	44,000	854,000	1,902,000
1980	2,862,000	55,000	649,000	2,268,000

Source: Unless otherwise specified, all figures from American Forest and Paper Association. Statistics. Various issues to 1997.
(Apparent Consumption = Production plus Imports minus Exports).

Recovery, imports, exports and apparent consumption of mixed recovered paper in the US in 1980, 1985, 1990 and 1995 are shown in table 2.1.23. Data include all grades listed above. Figures are expressed as air-dry short tons (10% moisture by weight, 1 Metric Ton = 1.1 Short Tons).

2.2 Economic Background

General economic situation from 1980 to 1995

Demand of paper and paperboard closely tracks the overall economic performance of a country. Research shows paper prices are cyclical and closely follow economic peaks and valleys, while wastepaper prices tend to lead cycles and woodpulp prices tend to lag them for as much as two years. Paper consumption is narrowly related to printing, advertising and the service sector, and paperboard demand is tied to industrial activity, since most paperboard products are used for packaging purposes. Therefore, it is important to consider how US economy behaved during the 80s and 90s to find a general pattern that most paper products will follow, at least to a certain extent, since other variables like new capacity, competition from other grades, inventory management, foreign trade and currency exchange also work to shape market cycles.

Real GDP is commonly used to summarize the economic activity of a country, since it includes all commodities and services produced within the country during a year. Real GDP and real GDP growth for the US during 1980-1994 are shown in Table 2.2.1. From 1979 to 1994, the economy consistently grew with just three years, 1980, 1982 and 1991, showing a negative growth rate, i.e. a recession. Not surprisingly, the beginning of the 80s and 90s were the most troublesome for the paper and paperboard industry as a whole, with operating rates and prices usually lower that those in expansion periods like the 1984-1989 period. One factor must be added, the currency exchange rate, which is fundamental for US foreign trade. The dollar was strong from 1980 to 1985, when it peaked, severely damaging US exports and causing a 1985 downturn not fully explained when looking to GDP statistics. From 1986 onward the dollar exchange rate weakened, favoring US trade, with some up-and-downs in the early 90s.

Recent projections, released by the Congressional Budget Office (CBO) (see table 2.2.2.), point out to a slow down in the economy from 1999 onward.

Table 2.2.1. ***US Real GDP and GDP growth. 1979-1994.***

Year	Real GDP (Billion chained 1992 $)	%Change
1980	4,612	-0.3
1981	4,725	2.5
1982	4,624	-2.1
1983	4,810	4
1984	5,138	6.8
1985	5,330	3.7
1986	5,490	3
1987	5,648	2.9
1988	5,863	3.8
1989	6,060	3.4
1990	6,139	1.3
1991	6,079	-1
1992	6,244	2.7
1993	6,386	2.3
1994	6,609	3.5
1995	6,743	2
1996		3.4
1996		3.9

Source: 1997 Economic Report of the President and CBO.

Table 2.2.2. ***Projected US Real GDP growth. 1998-2002.***

Year	%Change
1998	3.4
1999	2.2
2000	1.9
2001	1.8
2002	2.4

Source: Congressional Budget Office (CBO)

Newsprint

Newsprint capacity usually increases following tight markets, as were those in the late 70s. Therefore, in 1980, new newsprint capacity rose 15% and increased again in 1981 in about 12%, being matched by a similar production growth rate. However, by the end of 1981 the framework changed as the economy, which had just recovered from the 1980 recession, went again into depression. Consumer newsprint inventories (US publisher stocks), which had increased from 1979 to 1981, decreased in 1982 and 1983, reducing domestic demand. Furthermore, a strong dollar favored a significant increase on Canadian imports and reduced the competitiveness of US newsprint exports. As a consequence of these factors, new capacity additions plummeted in 1982 (just a 3.61% increase), production fell 3.75% and the high operating rates which have characterized newsprint factories from 1979 to 1981 rapidly fell to 89.2% in 1982, down from 96% in 1981. Finally, the combination of low demand and high supply forced producers to reduce list prices from $453/ton in 1981 down to $425/ton during the 4th quarter of 1982.

During the next four years, 1983 to 1986, the increase in new capacity was negligible (a new 225,000-tpy machine for Augusta Newsprint in 1983). The economy rebounded from 1983 to 1989, although a strong dollar moderated the effects of this growth. Consumer inventories significantly rose in 1984 and 1985. Following favorable conditions, prices recovered in 1983 up to $453/ton (1981 list prices) and kept the positive trend up to 1985 ($485/ton), although transaction prices were well below list prices. Production growth outpaced new capacity so operating rates actually went up from 89.2% in 1982 to 94.7% in 1984.

In 1985-1986 the economy slightly slowed down. The high dollar exchange rate damaged some economic sectors like paper industry. In 1985 newsprint production decreased by 2% as newsprint imports from Canada and Scandinavia flooded the market, already with an excess capacity and a not-so-strong demand. Correspondingly, capacity was reduced by 1%. Operating rates went down to 93.8%. The following year, consumer inventories went down worsening demand, and list prices felt to $454/ton.

In 1987, the economy strongly recovered and kept in good shape until 1988 (+3.8% GDP growth). Publisher's demand strongly grew, while a weaker dollar allowed newsprint exports to expand. As consumer inventories increased in 1987, markets tightened, and newsprint producers were able to force price raises. Newsprint estimated transaction prices were around $517/ton in 1987 and $544/ton in 1988. Although new capacity was added in 1987 (GLFP/Ponderay new 154,000-tpy mill in Usk, Wash.) and in 1988, production growth surpassed capacity growth rates, raising operating rates up to 97.8%, the highest since 1973.

From 1989 onwards, the economy cooled down until it entered a recession in 1991. However, following favorable perceptions in 1987 and 1988, new capacity came online from 1989 onwards. Furthermore, in 1989 Florida passed its law forcing publishers to increase the utilization of recycled newsprint. More than twenty states would follow them in less than four years, forcing newsprint industry to undertake a dramatic transition to recycling in a troubled economy. The combination of early favorable prospects and legislation translated into significant capacity increases. From 1989 to 1992 net added capacity grew 19.4%. Most of it came from new recycled newsprint mills/machines. For example, in 1989, a new mill was built in Grenada, Miss. (Newsprint South). In 1990, a new machine was added to the Southeast Paper mill in Dublin, Ga. In 1991, a new mill was built in Claiborne, Ala. and a new recycled newsprint machine was added to the mill in Longview, Wash.. Simultaneously, consumer inventories were reduced in 1988 and 1989 and demand weakened, even though export markets were still strong and imports weakened due to a low dollar. Therefore, list prices slightly dropped down to $535/ton and production growth, although positive, was lower than in 1987 and 1988. As a consequence of weak production and new capacity, operating rates felt in 1989 (96.7%).

In 1990, despite the weakness of the economy and the poor performance of other grades, consumer inventories increased, foreign markets kept strong (especially in Europe) and producers were successful in raising prices ($565/ton). Production significantly rose, in part due to new capacity, added the year before, going on-line, exceeding new capacity growth. Operation rates increased up to 97.3%.

In 1991, recession hit the bottom. Although consumer inventories increased, prices went down due to a weaker demand and a fierce price war between producers, pulling list prices down to $495/ton, falling 12.4%. Production increased, but less than half of what it did in 1990. Overcapacity worked to reduce operating rates down to 97%. In 1992 and 1993, consumer newsprint inventories grew but newsprint prices kept going down ($445/ton in 1993) as well as production did. In 1993, production growth was negative. Not surprisingly, operating rates kept falling until 1994 (96%), despite the fact that no new newsprint capacity was added after 1992.

From 1994 onward, the economy improved. Newsprint producers were able to raise prices ($510/ton in 1994), even though a price collusion investigation in 1995 stopped the trend. In 1995 the economy slowed down, and consumer inventories showed some reduction, indicating weaker demand. Production growth was almost flat from 1994 to 1996, even negative, although the reduction of existing capacity and the lack of new capacity allowed a small increase on operating rates (96.6% in 1996).

Table 2.2.3 summarizes newsprint inventories, producer price index, capacity, production, operating rates for the 1980-1996 period (see end of Section 2.2 for this table and others cited below).

Printing and Writing Papers

Uncoated Groundwood

The strong new capacity additions that marked the uncoated groundwood (UG) sector during the late 70s ended up in 1980 (a 5.39% increase). In 1981, no new capacity was added and capacity stabilized during the next five years (in 1987, capacity was at 1982 levels). Albeit list prices behaved well for some grades like directory paper, which consistently increased from $535/ton in 1980 to $720/ton in 1987, real price increases were modest for UG printing papers as a whole (see price index in Table 3.3), showing a significant decrease in 1983. The prevailing weak economic conditions in the early 80s pulled production down, which showed negative growth rates for three consecutive years (1980-1982). Therefore, industry operating rates decreased from 92.2% in 1980 to 88.8% in 1982.

After 1983, the economy expanded (+6.8% real GDP growth in 1984), and demand recovered. UG papers especially compete with coated grades (CG) and also with upgraded newsprint. Therefore, when coated groundwood (CG) markets are strong, there is less ground for UG growth. Correspondingly, when supply of CG is short, as high operating rates may indicate, UG demand increases. That was the situation in 1983 and 1984, with CG operating rates around 97%. UG production increased and operating rates rebounded up to 91.8% in 1984 and producers were able to increase prices. The trend was short-lived, since in 1985 economic growth slowed down, and the magazine market was weak. As a result, production decreased by almost 3 percentage points. Operating rates were down to 88.9% in 1985 and up again in 1986 (91.3%), while prices in real terms stabilized in 1985 and specially in 1986. In 1987, both capacity and production decreased, and operating rates went down to 90.6%, even though prices increased.

In 1988 the economy showed the second highest growth rate in the decade. Favorable economic expectations and short supply of CG fostered new capacity that came on-line from 1988 to 1990. A new Pentair mill in Duluth, Minn. added 235,000 tpy of SC capacity to the sector in 1988. High demand pulled by CG strong markets and some inventory build-up allowed production to increase for three consecutive years and operating rates move in the range of 93% for the 1988-1990 period, the highest since 1979. Price hikes were significant in certain grades like directory, which jumped from $720/ton in 1987 to $850/ton in 1988, increases also reflected in the overall price index before 1990.

The 1991 recession strongly hit the industry. Capacity additions slowed down in 1991, while from 1992 to 1993 capacity was actually reduced down to 1989 levels. Demand decreased and production fell in 1991 and 1992. Operating rates hit the bottom in 1993 with an 86.1%, the lowest since 1974. Directory prices decreased in 1989 and from 1991 to 1993, leaving list prices in the range of $710-740/ton in 1993. The price index also showed price reductions from 1990 to 1992. From 1994 onwards, the situation improved. The economy recovered, and demand for CG extraordinarily expanded, to the point that some newsprint production switched to CG after upgrading. Accordingly, both capacity and production grew, although prices did not completely returned to 1989 levels until 1995 (in real terms). As a consequence of the favorable environment, operating rates reached 96.9% in 1995.

Table 2.2.4 summarizes uncoated groundwood producer price index, capacity, production, and operating rates for the 1980-1996 period.

Uncoated Free-sheet

1980 operating rates in uncoated free-sheet (UF) factories were significantly lower than those of the late 70s. Good economic prospects during the second half of the 70s fostered investment in new capacity that came on-line in 1980. By then, the economy was in a downturn, demand weakened and exports decreased while imports surged because of a strong dollar. Production growth first stabilized and finally fell in 1982, the worst year of that recession. The overall effect of excess capacity and weak markets was a marked reduction in operating rates, that went from 91,6% in 1980 down to 85.7% in 1982. During that period, big discounts and over supply forced prices to drop in some cases (from $813/ton to $680/ton, in the case of No.3 offset paper) even though a number of grades like No.1 actually saw small price increases. The UF price index shows a reduction in 1983, albeit no previous-year data are available. The general index which includes all printing and writing grades shows a price increase from 1980 to 1982, but these data do not reflect the behavior of individual paper grades and understate the extent of reductions.

The recovery of the economy in 1983 was accompanied by new capacity additions (a 2.7% change in relation to 1982) which were sustained until 1989. The list of new machines and mills added from 1983 to 1989 includes nine new machines and a new mill with a net addition of more than 3.3 million tons. Strong demand pulled an 11% growth in production (1983). Price increased in most grades, reflected in a 6% increase in the 1984 price index. Although prices fell in 1985 and production expanded less than capacity in 1985, the favorable trend followed from 1986 to 1989. Operating rates went up to 92.6% in 1983, slightly decreased in 1984 and 1985 and then increased again reaching 95.3% in 1987 and 1988. The prices of individual grades like offset and No.1 generally increased from 1983 to 1988, with some up and downs.

In 1989, still-strong capacity expansions were not matched by production, which actually decreased in relation to the previous year. From 1990 to 1992 the overall recession did not affect capacity, which kept growing up to the 15 million ton level, 2.1 millions above 1989 levels. However, the combined effect of overcapacity and weak demand affected production and prices, which decreased from 1990 to 1992. Individual grade prices did not change for a three-year period or slightly decreased. Operating rates fell to 88.3% in 1991, the worst year of the recession.

The period 1993-1995 was characterized by a recovering economy. Capacity growth slowed down while production slowly increased, especially from 1992 to 1995. Prices went up and operating rates reached 95.7% in 1994, although in 1995 and 1996 utilization fell again despite the nearly lack of new capacity additions after 1995.

Table 2.2.5 summarizes uncoated free-sheet producer price index, capacity, production, and operating rates for the 1980-1996 period.

Coated Grades

Both coated grades, coated groundwood (CG) and coated free-sheet (CF), have experienced a strong expansion process which has almost doubled coated paper capacity from 1980 to 1996. The expansion has been so strong despite cyclical recessions that some authors have pointed out a change in consumers' preferences. During the early 80s, CG capacity grew significantly (10.3% in 1981, 8.6% in 1983), while CF capacity showed a more moderate growth. As in the case of UF and newsprint papers, strong capacity investments were made following favorable market perception back in the late 70s. From 1980 to 1983 three CG new machines and a CF new machine were added. When the country entered recession in 1980 and 1982, excess capacity forced producers to reduce utilization of existing capacity. However, producers were successful in raising prices, with certain grades experiencing sustained and significant increases (see Tables 3.5.1 and 3.5.2), especially when compared to other printing and writing papers. Price indexes show an upward trend for both No. 3 and No. 5 (the most important in terms of tonnage) that lasted up to 1983. Operating rates went down to 91% in the case of CG and to 89.7% for CF papers.

The economy rebounded in 1983, and demand for coated grades grew stronger. CG production grew 13% while CF production increased 16%. Even though new capacity was added, demand was so strong that absorbed new capacity in less time than expected. Operating rates reached 94.8% (CG) and 96% (CF) in 1983. In 1984 the trend sustained, although extra CF capacity caused operating rates to reduce despite the strong production growth for both grades. Prices followed the positive trend and increased in 1984 and 1985, after an uncertain behavior in 1983, although weaker conditions pushed them back in 1986. Focusing on key grades, No. 1 prices grew 7.1% in 1984 and No. 5 prices increased 13.8%. Both grades showed lesser but positive price increments in 1985.

Demand weakened in 1985, in part due to the strong position of the dollar and its effects on foreign trade. As a result, production decreased for both grades. Since capacity growth was positive, operating rates fell to 88.8% for CG and to 87.2% for CF, the lowest in more than a decade. Shortly after, in 1986, demand expanded and production strongly recovered, outpacing heavy capacity expansions (three new CG machines in 1986, two new CF machines in 1988 and a new CG machine in 1989). Operating rates were up to 96.7% (CG, 1988) and 94.4% (CF, 1987). No. 1 and No. 5 paper prices went down in 1986 and strongly recovered in 1987 and 1988. Both price indexes show significant increases in 1988 and 1989. As it happened to other grades, in 1989 excess capacity and weaker conditions forced production to decrease and pulled operating rates down to 93.5% (CG) and 90.1% (CF).

The early 90s were a period of deep recession. In 1990, demand from the advertisement market was low causing price discounts. In 1991 CG production actually decreased in relation to the year earlier, and traditionally stable CF production growth approximated to zero with periods of downtime in some factories. Since CG capacity stabilized and CF capacity actually kept growing at a strong rate, with three new CF machines added between 1990 and 1992, operating rates severely dropped down to 91.7% (CG, 1991) and 83.7% (CF, 1991). Prices went down for three consecutive years (1990-1992) as show price indexes and product list prices.

The period 1993-1996 was characterized by economic recovery. CG capacity stabilized, with just one new machine added, while CF capacity kept growing solidly. Strong demand in 1994 and 1995 pushed production and raised operating rates, which surpassed 100% for CG in 1994, while CF operating rates reached 93.8% in 1994. Prices kept increasing from 1993 onwards, and were especially high in 1995. In 1996 inventory building by customers was eroding demand, which was expected to weaken.

Tables 2.2.6.1 and 2.2.6.2 summarize coated paper producer price indexes, capacity, production, and operating rates for the 1980-1996 period.

Tissue

Tissue behavior is more predictable and stable that that of the rest of paper products, since its consumption is linked to household economies. Therefore, a detailed year-by-year description is not considered necessary for the purpose of this paper.

A brief overview of historic data shows that capacity and production growth from 1980 to 1995 was sustained and quite uniform, with no great up-and-downs. None of the years capacity showed a negative growth, and the only three years where production actually decreased were those of recession, 1980, 1982 and 1989. Expansion periods, like the second half of the 80s or the 1993-1996 period showed production growth in the range of 2-4% while the beginning of the 80s and 90s, that correspond to economic crisis times, were usually below 3% and negative the three recession years. Operating rates under strong economic conditions were usually in the range of 92-96% while under difficult times the range was 88-91%.

Although available tissue price indexes just cover the 1984-1994 period, it seems that tissue price behavior is not very different from other papers' behavior. There were sustained and strong price increases from 1985 to 1989, and stabilization, even decreases of real prices from 1991 to 1994. List prices (BLS index) show price increases in 1981 and 1982, stabilization in 1983 and sustained increases up to 1990, with a low point in 1985. From 1990 to 1994, prices significantly decreased.

Table 2.2.7 summarizes tissue producer price index, capacity, production, and operating rates for the 1980-1996 period.

Semichemical Corrugating Medium

The period 1980-1982, characterized by a weak economy, severely affected corrugating medium, whose demand is closely related to industrial activity. Even though capacity growth was small, since most of the new capacity was focusing on recycled corrugating medium, inventories increased and low demand pushed production down, especially in 1982, when production decreased 7% in relation to the previous year. As a consequence, operating rates fell from 98% in 1979 down to 84.8% in 1982. Prices, which in 1981 had actually increased, fell 10.9% in 1982 (list price, Semichemical medium, 26 lb. East). Both semichemical corrugating medium and unbleached kraft linerboard are used to make paperboard containers. Therefore both products are highly integrated and show similar price trends, so what it is said for the one is in most cases fitted to the other.

The 1983 economic recovery positively affected corrugating medium. Capacity, which decreased in 1983, increased again in 1984 with the addition of a new 210,000-tpy machine to the MacMillan Bloedell mill in Pine Hill, Ala. Production went up by 7.8% in 1983 and by 9.3% in 1984, even though exports descended that year. Inventories significantly diminished, and prices increased during both years but especially in 1984. Operating rates raised up to 98.4% (1984).

1985 was a weak year, as it was for the rest of paper grades for the reason already mentioned. Capacity increased by 3% on the wake of the economic recovery but low demand pulled production down, with a 1.6% decrease. Semichemical corrugating followed the trend of linerboard prices, with a reduction of -22.6% of 1984 list price. Operating rates fell down to 94%.

The following four years, from 1986 to 1989, correspond to an expansion period. Capacity grew consistently from 1986 to 1988, and production growth surpassed new capacity additions all four years. Both list prices and price indexes show a significant price increase that lasted until 1989, with 1986 and 1987 as the most remarkable years. By 1989, prices went down due to a weaker demand and increasing competition from new recycled corrugating capacity and imports.

In 1990 the economy slowed down and finally entered into recession in 1991. The effect on corrugating medium producers was felt the year before, when production actually decreased as capacity did. In 1990 and 1991 capacity grew, but production kept decreasing since demand weakened and Canadian imports saw an easier penetration once NAFTA was approved. Inventories increased in 1990, 1991 and 1992. Prices followed a downward trend while operating rates dropped down to 93.9% in 1991.

In 1992 the situation improved since no new capacity was added. Box demand grew and supply tightened, pulling operating rates up to 99% and allowing price hikes. From 1993 onwards, the economic conditions improved and so did the situation of the sector. Capacity barely changed during the next four years, and it is uncertain it will, since most new corrugating machines employ wastepaper instead of semichemical pulp. Production expanded, inventories decreased, and operating rates reached again 99% in 1994. Following tight markets, prices increased during the period, albeit oscillations were common in 1993 and 1994. In 1995 and 1996, high inventories threatened to jeopardize the positive trend.

Table 2.2.8 summarizes corrugating medium producer price index, capacity, production, containerboard inventories and operating rates for the 1980-1998 period.

Unbleached Kraft Paper and Paperboard

Unbleached kraft paper and paperboard makes the biggest single category in the paper industry. It includes linerboard used for containers as well as shipping and wrapping papers. Its use is widespread across the industry, and is very narrowly tied to industrial activities and less susceptible to oscillation than other paper grades. Data show unbleached kraft grades followed a similar trend than the rest of paper grades, but with less marked up-and-downs.

The 1980-1982 period was characterized by an important increase of capacity and a strong recession in the national economy. In 1980, due to high export volume, markets were still strong, but as economy went into recession in 1981 and 1982 and the dollar exchange rate grew, damaging exports, markets weakened. Production was down in 1980 and 1982 and inventories heavily increased. As a consequence, operating rates fell from 95.2% in 1980 to 84.8% in 1982. Previous studies show that linerboard prices go up when operating rates are over 95% and inventories are under six weeks of demand, and are likely to go down when operating rates descend and inventories are high as it was the case. As a result, linerboard list prices dropped in 1982.

1983 saw an economic recovery that had a positive effect in production, which grew 9.4% and increased operating rates to 92.4%. In 1984 production growth kept the positive trend and operating rates increased up to 95.7%, allowing prices to grow. In 1985 the situation reversed, even though economic indicators were positive, as the dollar value peaked in relation to foreign currencies. Demand decreased, production went down, operating rates were reduced down to 89.3% and consequently prices fell.

During the 1986-1989 period, characterized by an expanding economy, capacity grew at a similar pace than production did. With a weaker dollar, exports grew, which resulted in a strong demand in 1986. In 1987, the combination of low inventories and high operating rates allowed producers to raise prices, especially in 1987 and 1988. Operating rates stayed in the range of 95-96%. Surprisingly, during the following years the trend continued, and production was able to keep growing until 1992, in the middle of the recession. However, and despite strong exports, the growth was smaller than in the late 80s due to higher than normal inventories and a weaker demand. Operating rates were reduced down to 93.5% in 1991. Prices resented the crisis and fell in 1990, 1991 and 1993.

From 1994 onwards, both production growth and new capacity additions were small, and inevitably operating rates fell after a recovery in 1994. 1995 operating rates were 94.2% down from the rates of the expansion period in the late 80s. Priced increased in 1994 and especially in 1995, to fall again in 1996, as competition intensified and inventories rapidly built-up.

Table 2.2.9 summarizes unbleached kraft producer price index, capacity, production, containerboard inventories and operating rates for the 1980-1995 period.

Recycled Paperboard

The development of recycled paper markets was slow during the first half of the 80s. Economic recession, capacity retirement or replacement and the lack of clear policies related to the use of recycled items actually caused recycled capacity to drop in 1980 and in 1982. Poor demand, volatile markets and high costs combined to result in negative production growth rates for three consecutive years. As a result, operating rates went down to 74.5% in 1982. The lack of prospective also resulted in no new capacity additions from 1982 to 1985. However, the 1983 economic recovery and the low 1982 wastepaper prices drove recycled paperboard demand up and increased production in more that 14% compared to previous year. Operating rates recovered up to 85.1%. The following year production growth slowed down but it was still positive and was accompanied by a price increase. Operating rates were up again, since no new capacity was added. Finally, in 1985, again the trend reversed. Competitiveness was seriously affected by high energy costs and volatile wastepaper prices and production decreased for the fourth time in six years.

The second half of the 80s was accompanied by an economic expansion, and had positive effects in the recycled sector. Capacity grew an average 2.8% between 1986 and 1988 whereas production strongly grew. Prices increased significantly in 1987 and 1988. Accordingly, operating rates reached 93.6% in 1988. In 1989 the economic environment cooled down. Even though prices kept going up for a while, no more capacity was added and production growth stopped. Operating rates descended down to 92%, as a prelude o the crisis to come.

The late 80s and early 90s were times of recession and frenetic legislative activity focused on recycling. Therefore, as it happened to the newsprint industry and the irruption of recycled newsprint, the main consequence of legislation and previous economic expectations originated in the late 80s was a massive addition of new capacity under weak market conditions that inevitably pushed production and operating rates down. Although prices were not as affected as it may seem, operating rates fell down to 88.9% in 1990 and 89.3% in 1992.

By 1983 both the economy and the recycled paperboard sector had recovered. Capacity kept growing even at a higher rate, as it is expected to do in the short term, but production almost kept pace, so operating rates saw some increase in 1993 (94.6%) and 1994 (96.3%), before excess capacity again pushed them down to 92.2% in 1996. Following this trend, prices increased in 1984 and 1985, and then fell down in 1996 and 1996.

Table 2.2.10 summarizes recycled paperboard producer price index, capacity, production, and operating rates for the 1980-1996 period.

Other Paper and Paperboard

Other paper and paperboard includes the rest of paper and paperboard grades not included elsewhere. Most of it is made of bleached kraft grades, like solid bleached board, and the price analysis therefore will focus on them, although capacity, production and operating rates include all grades identified in the product description for this particular category. Since this is a category formed by many different products and it basically includes what is left over after the main, most distinctive grades have been selected, its performance is tied to that of other grades. As unbleached kraft grades and recycled paperboard, for instance, consolidate their position in markets, and more products are furnished from these materials, other grades lost market share and therefore tend to weaken. All things considered, it is not surprising that new capacity, production growth and operating rates are lower for this grade than for the rest of paperboard categories, even though the category follows the same economic trends identified when analyzing the other ones and even though some individual grades within the category are doing well.

The 1980-1982 crisis hit hard on this paper category. Capacity and production decreased dramatically, and operating rates moved around 78%, the lowest of any paper grade. Solid bleached board prices managed to increase in 1981, but decreased in 1982, 1983, and remained flat in 1984. Situation improved in 1983. Capacity kept decreasing, but a stronger economy allowed some production growth, which drove operating rates to 90.3% in 1984. In 1985 again markets weakened and production dropped as well as prices.

The period 1986-1988 saw a significant expansion in both new capacity and production, which slowed down in 1989. Operating rates moved around 90% from 1987 to 1989 and prices consistently increased, especially in 1987-1988. In 1990, the economic downturn pushed production down and took operating rates down to 88.9%, also affecting prices downward, but from 1991 onwards, the sector showed a fairly regular behavior, with moderate but sustained annual increases in both capacity and production and operating rates stabilized around 89.3%. The evolution of prices during that period was fairly erratic, with frequent small up-and-downs.

Table 2.2.11 summarizes solid bleached producer price index, capacity, production, and operating rates for the 1980-1996 period.

Table 2.2.3. *Newsprint. Economic Facts. 1980-1996.*

Year	Producer Price Index	% Change	Capacity	% Change	Production	% Change	U.S. Consumer Newsprint Stocks	% Change	Operating Rates
1980	88.5		4,836,000	15.17	4,672,300	15.03	1,090		96.6
1981	97.5	10.17	5,457,000	12.84	5,238,600	12.12	1,477	35.50	96.0
1982	100.0	2.56	5,654,000	3.61	5,041,900	-3.75	1,258	-14.83	89.2
1983	95.9	-4.10	5,774,000	2.12	5,167,000	2.48	1,179	-6.28	89.5
1984	102.3	6.67	5,851,000	1.33	5,538,800	7.20	1,329	12.72	94.7
1985	105.3	2.93	5,788,000	-1.08	5,427,700	-2.01	1,394	4.89	93.8
1986	103.3	-1.90	5,804,000	0.28	5,630,000	3.73	1,268	-9.04	97.0
1987	112.3	8.71	6,006,000	3.48	5,842,000	3.77	1,411	11.28	97.3
1988	127.6	13.62	6,115,000	1.81	5,982,000	2.40	1,204	-14.67	97.8
1989	122.5	-4.00	6,296,000	2.96	6,088,000	1.77	1,204	0.00	96.7
1990	119.6	-2.37	6,792,000	7.88	6,610,100	8.58	1,226	1.83	97.3
1991	120.9	1.09	7,054,000	3.86	6,840,900	3.49	1,283	4.65	97.0
1992	109.8	-9.18	7,303,000	3.53	7,081,400	3.52	1,313	2.34	97.0
1993	112.1	2.09	7,294,000	-0.12	7,067,500	-0.20	1,344	2.36	96.9
1994	116.7	4.10	7,278,000	-0.22	6,983,600	-1.19	879	-34.60	96.0
1995	161.8	38.65	7,253,000	-0.34	7,001,800	0.26	1,008	14.68	96.5
1996	158.9	-1.79	*7,194,000*	-0.81	*6,948,900*	-0.76			*96.6*

Source: Pulp& Paper North American Fact Book (several items), Bureau of Labor Statistics, AF&PA Statistics

Italics: Preliminary data.

Table 2.2.4. *Uncoated Groundwood. Economic Facts. 1980-1996 .*

Year	Producer Price Index	% Change	Capacity	% Change	Production	% Change	Operating Rates
1980			1,624,000	5.39	1,498,000	-0.73	92.2
1981			1,625,000	0.06	1,471,000	-1.80	90.5
1982	100.0		1,655,000	1.85	1,470,000	-0.07	88.8
1983	96.2	-3.80	1,710,000	3.32	1,530,000	4.08	89.5
1984	101.4	5.41	1,704,000	-0.35	1,565,000	2.29	91.8
1985	103.0	1.58	1,710,000	0.35	1,520,000	-2.88	88.9
1986	103.3	0.29	1,685,000	-1.46	1,539,000	1.25	91.3
1987	107.7	4.26	1,653,000	-1.90	1,498,000	-2.66	90.6
1988	115.3	7.06	1,735,000	4.96	1,623,000	8.34	93.5
1989	118.7	2.95	1,874,000	8.01	1,742,000	7.33	93.0
1990	117.4	-1.10	1,946,000	3.84	1,805,000	3.62	92.8
1991	117.2	-0.17	1,968,000	1.13	1,716,000	-4.93	87.2
1992	110.8	-5.46	1,868,000	-5.08	1,608,000	-6.29	86.1
1993	111.1	0.27	1,877,000	0.48	1,798,000	11.82	95.8
1994	104.2	-6.21	2,036,000	8.47	1,914,000	6.45	94.0
1995	117.2	12.48	2,198,000	7.96	2,129,000	11.23	96.9
1996	97.4	-16.89	*2,334,000*	6.19	*2,028,000*	-4.74	*86.9*

Source: Pulp& Paper North American Fact Book (several items), Bureau of Labor Statistics, AF&PA Statistics
Italics: Preliminary data.

Table 2.2.5. *Uncoated Freesheet. Economic Facts. 1980-1996 .*

Year	Producer Price Index	% Change	Capacity	% Change	Production	% Change	Operating Rates
1980			10,190,000	5.11	9,330,000	-0.06	91.6
1981			10,384,000	1.90	9,329,000	-0.01	89.8
1982	100.0		10,638,000	2.45	9,112,000	-2.33	85.7
1983	97.4	-2.60	10,928,000	2.73	10,116,000	11.02	92.6
1984	103.2	5.95	11,628,000	6.41	10,605,000	4.83	91.2
1985	97.7	-5.33	12,087,000	3.95	11,067,000	4.36	91.6
1986	98.9	1.23	12,552,000	3.85	11,874,000	7.29	94.6
1987	103.9	5.06	13,060,000	4.05	12,440,000	4.77	95.3
1988	115.1	10.78	13,509,000	3.44	12,877,000	3.51	95.3
1989	123.2	7.04	13,920,000	3.04	12,665,000	-1.65	91.0
1990	123.2	0.00	14,113,000	1.39	13,028,000	2.87	92.3
1991	121.9	-1.06	14,712,000	4.24	12,987,000	-0.31	88.3
1992	121.3	-0.49	15,173,000	3.13	13,664,000	5.21	90.1
1993	120.9	-0.33	15,257,000	0.55	13,985,000	2.35	91.7
1994	124.4	2.89	15,665,000	2.67	14,994,000	7.21	95.7
1995	191.3	53.78	15,928,000	1.68	14,480,000	-3.43	90.9
1996	151.2	-20.96	*16,191,000*	1.65	*14,653,000*	1.19	*90.5*

Source: Pulp& Paper North American Fact Book (several items), Bureau of Labor Statistics, AF&PA Statistics
Italics: Preliminary data.

Table 2.2.6.1. *Coated Groundwood. Economic Facts. 1980-1996.*

Year	CG Producer Price Index	% Change	Capacity	% Change	Production	% Change	Operating Rates
1980	91.1		2,762,000		2,664,000		96.5
1981	98.5	8.12	3,047,000	10.32	2,778,000	4.28	91.2
1982	100.0	1.52	3,242,000	6.40	2,950,000	6.19	91.0
1983	96.7	-3.30	3,522,000	8.64	3,340,000	13.22	94.8
1984	112.1	15.93	3,766,000	6.93	3,650,000	9.28	96.9
1985	122.4	9.19	3,820,000	1.43	3,393,000	-7.04	88.8
1986	116.1	-5.15	3,799,000	-0.55	3,506,000	3.33	92.3
1987	108.3	-6.72	4,136,000	8.87	3,811,000	8.70	92.1
1988	125.6	15.97	4,347,000	5.10	4,204,000	10.31	96.7
1989	129.6	3.18	4,341,000	-0.14	4,058,000	-3.47	93.5
1990	127.0	-2.01	4,414,000	1.68	4,233,000	4.31	95.9
1991	121.8	-4.09	4,406,000	-0.18	4,039,000	-4.58	91.7
1992	118.5	-2.71	4,587,000	4.11	4,364,000	8.05	95.1
1993	123.3	4.05	4,587,000	0.00	4,339,000	-0.57	94.6
1994	124.5	0.97	4,433,000	-3.36	4,445,000	2.44	100.3
1995	152.0	22.09	4,493,000	1.35	4,424,000	-0.47	98.5
1996			*4,539,000*	1.02	*3,820,000*	-13.65	*84.2*

Source: Pulp& Paper North American Fact Book (several items), Bureau of Labor Statistics, AF&PA Statistics

Italics: Preliminary data.

CG PPI corresponds to No.5 CF PPI corresponds to No. 3

Table 2.2.6.2. *Coated Free-sheet. Economic Facts. 1980-1996 .*

Year	CF Producer Price Index	% Change	Capacity	% Change	Production	% Change	Operating Rates
1980	88.0		2,222,000	-53.92	1,956,000	-56.26	88.0
1981	95.2	8.18	2,245,000	1.04	2,113,000	8.03	94.1
1982	100.0	5.04	2,274,000	1.29	2,040,000	-3.45	89.7
1983	101.7	1.70	2,473,000	8.75	2,375,000	16.42	96.0
1984	110.6	8.75	2,791,000	12.86	2,598,000	9.39	93.1
1985	115.6	4.52	2,845,000	1.93	2,481,000	-4.50	87.2
1986	115.3	-0.26	2,944,000	3.48	2,756,000	11.08	93.6
1987	116.9	1.39	3,229,000	9.68	3,048,000	10.60	94.4
1988	124.2	6.24	3,436,000	6.41	3,154,000	3.48	91.8
1989	129.9	4.59	3,503,000	1.95	3,156,000	0.06	90.1
1990	130.2	0.23	3,676,000	4.94	3,302,000	4.63	89.8
1991	128.6	-1.23	3,966,000	7.89	3,318,000	0.48	83.7
1992	123.2	-4.20	4,218,000	6.35	3,754,000	13.14	89.0
1993	123.2	0.00	4,386,000	3.98	3,936,000	4.85	89.7
1994	125.8	2.11	4,647,000	5.95	4,358,000	10.72	93.8
1995	154.7	22.97	4,876,000	4.93	4,371,000	0.30	89.6
1996	155.2	0.32	*5,107,000*	4.74	*4,362,000*	-0.21	*85.4*

Source: Pulp& Paper North American Fact Book (several items), Bureau of Labor Statistics, AF&PA Statistics

Italics: Preliminary data.

CG PPI corresponds to No.5 CF PPI corresponds to No. 3

Table 2.2.7. *Tissue. Economic Facts. 1980-1996* .

Year	Producer Price Index	% Change	Capacity	% Change	Production	% Change	Operating Rates
1980			4,954,000	1.72	4,375,000	-3.22	88.3
1981			5,035,000	1.64	4,517,500	3.26	89.7
1982			5,125,000	1.79	4,437,600	-1.77	86.6
1983			5,190,000	1.27	4,788,600	7.91	92.3
1984	104.5		5,276,000	1.66	4,920,600	2.76	93.3
1985	109.9	5.17	5,345,000	1.31	4,940,500	0.40	92.4
1986	123.1	12.01	5,472,000	2.38	5,094,900	3.13	93.1
1987	134.5	9.26	5,505,000	0.60	5,300,700	4.04	96.3
1988	143	6.32	5,667,000	2.94	5,476,100	3.31	96.6
1989	152.2	6.43	5,798,000	2.31	5,636,400	2.93	97.2
1990	154.4	1.45	6,005,000	3.57	5,802,400	2.95	96.6
1991	153.5	-0.58	6,242,000	3.95	5,668,600	-2.31	90.8
1992	152.8	-0.46	6,413,000	2.74	5,784,200	2.04	90.2
1993	152.9	0.07	6,407,000	-0.09	6,007,800	3.87	93.8
1994			6,539,000	2.06	6,097,800	1.50	93.3
1995			6,552,000	0.20	6,210,300	1.84	94.8
1996			*6,647,000*	1.45	*6,263,600*	0.86	*94.2*

Source: Pulp& Paper North American Fact Book (several items), Bureau of Labor Statistics, AF&PA Statistics
Italics: Preliminary data.

Table 2.2.8. *Semichemical Corrugating Medium. Economic Facts. 1980-1996.*

Year	Producer Price Index	% Change	Capacity	% Change	Production	% Change	U.S. Containerboard Inventories (000 tons)	% Change	Operating Rates
1980			4,946,000	1.69	4,724,000	0.75	1,984		95.5
1981	100.1		4,988,000	0.85	4,719,000	-0.11	2,729	37.55	94.6
1982	100	-0.10	5,207,000	4.39	4,389,000	-6.99	2,524	-7.51	84.3
1983	97.2	-2.80	5,119,000	-1.69	4,730,000	7.77	2,415	-4.32	92.4
1984	107.7	10.80	5,252,000	2.60	5,169,000	9.28	2,442	1.12	98.4
1985	109.1	1.30	5,411,000	3.03	5,088,000	-1.57	2,469	1.11	94.0
1986	104.6	-4.12	5,557,000	2.70	5,376,000	5.66	2,134	-13.57	96.7
1987	117.9	12.72	5,682,000	2.25	5,536,000	2.98	2,369	11.01	97.4
1988	130.6	10.77	5,788,000	1.87	5,664,000	2.31	2,501	5.57	97.9
1989	134.3	2.83	5,781,000	-0.12	5,656,000	-0.14	2,501	0.00	97.8
1990	128.8	-4.10	5,894,000	1.95	5,640,000	-0.28	2,526	1.00	95.7
1991	123.8	-3.88	5,910,000	0.27	5,552,000	-1.56	2,665	5.50	93.9
1992	127.6	3.07	5,817,000	-1.57	5,762,000	3.78	2,918	9.49	99.1
1993	123.8	-2.98	5,869,000	0.89	5,672,000	-1.56	2,501	-14.29	96.6
1994	139.7	12.84	6,002,000	2.27	5,943,000	4.78	2,182	-12.75	99.0
1995	183	30.99	5,994,000	-0.13	5,662,000	-4.73	2,885	32.22	94.5
1996	151	-17.49	*6,003,000*	0.15	*5,619,000*	-0.76			*93.6*

Source: Pulp& Paper North American Fact Book (several items), Bureau of Labor Statistics, AF&PA Statistics

Italics: Preliminary data.

Table 2.2.9. *Unbleached Kraft. Economic Facts. 1980-1996* .

Year	Producer Price Index	% Change	Capacity	% Change	Production	% Change	U.S. Containerboard Inventories (000 tons)	% Change	Operating Rates
1980			20,077,000	2.20	19,110,800	-0.71	1,984		95.2
1981			20,699,000	3.10	19,482,000	1.94	2,729	37.55	94.1
1982			21,493,000	3.84	18,223,000	-6.46	2,524	-7.51	84.8
1983	105		21,576,000	0.39	19,928,000	9.36	2,415	-4.32	92.4
1984	122.4	16.57	21,806,000	1.07	20,869,000	4.72	2,442	1.12	95.7
1985	116.5	-4.82	21,952,000	0.67	19,614,100	-6.01	2,469	1.11	89.3
1986	116.3	-0.17	22,201,000	1.13	20,991,000	7.02	2,134	-13.57	94.5
1987	135.3	16.34	22,717,000	2.32	21,737,000	3.55	2,369	11.01	95.7
1988	161.3	19.22	23,177,000	2.02	21,941,000	0.94	2,501	5.57	94.7
1989	165.3	2.48	23,687,000	2.20	22,172,000	1.05	2,501	0.00	93.6
1990	155.2	-6.11	24,148,000	1.95	22,734,300	2.54	2,526	1.00	94.1
1991	143.6	-7.47	24,861,000	2.95	23,240,000	2.22	2,665	5.50	93.5
1992	149.4	4.04	25,287,000	1.71	24,037,000	3.43	2,918	9.49	95.1
1993	139.5	-6.63	25,190,000	-0.38	23,706,000	-1.38	2,501	-14.29	94.1
1994	153.1	9.75	25,902,000	2.83	24,776,000	4.51	2,182	-12.75	95.7
1995	205.5	34.23	26,252,000	1.35	24,717,100	-0.24	2,885	32.22	94.2
1996	158.7	-22.77	*26,443,000*	0.73	*24,129,000*	-2.38			*91.2*

Source: Pulp& Paper North American Fact Book (several items), Bureau of Labor Statistics, AF&PA Statistics

Italics: Preliminary data.

Table 2.2.10. *Recycled Paperboard. Economic Facts. 1980-1996* .

Year	Producer Price Index	% Change	Capacity	% Change	Production	% Change	Operating Rates
1980			8,617,000	-1.60	7,071,000	-6.85	82.1
1981			8,599,000	-0.21	7,001,000	-0.99	81.4
1982			8,690,000	1.06	6,476,000	-7.50	74.5
1983	101.7		8,692,000	0.02	7,398,000	14.24	85.1
1984	109.2	7.37	8,722,000	0.35	7,637,000	3.23	87.6
1985	108.5	-0.64	8,765,000	0.49	7,555,000	-1.07	86.2
1986	107.7	-0.74	9,008,000	2.77	8,092,000	7.11	89.8
1987	114.3	6.13	9,268,000	2.89	8,602,000	6.30	92.8
1988	124.1	8.57	9,532,000	2.85	8,919,000	3.69	93.6
1989	129.0	3.95	9,617,000	0.89	8,852,000	-0.75	92.0
1990	128.7	-0.23	10,040,000	4.40	8,921,000	0.78	88.9
1991	129.0	0.23	10,238,000	1.97	9,259,000	3.79	90.4
1992	131.9	2.25	11,168,000	9.08	9,973,000	7.71	89.3
1993	132.2	0.23	12,067,000	8.05	11,410,000	14.41	94.6
1994	143.9	8.85	12,759,000	5.73	12,283,000	7.65	96.3
1995	187.5	30.30	13,992,000	9.66	12,977,000	5.65	92.7
1996	171.6	-8.48	*16,124,000*	15.24	*14,868,000*	14.57	*92.2*

Source: Pulp& Paper North American Fact Book (several items), Bureau of Labor Statistics, AF&PA Statistics
Italics: Preliminary data.

Table 2.2.11. *Other Paper and Paperboard. Economic Facts. 1980-1996.*

Year	Producer Price Index	% Change	Capacity	% Change	Production	% Change	Operating Rates
1980			10,488,000	-1.45	8,061,000	-11.22	76.9
1981			10,177,000	-2.97	7,916,000	-1.80	77.8
1982			8,987,000	-11.69	7,083,000	-10.52	78.8
1983	100.8		8,991,000	0.04	7,672,000	8.32	85.3
1984	107.7	6.85	8,698,000	-3.26	7,858,000	2.42	90.3
1985	108.1	0.37	8,869,000	1.97	7,594,000	-3.36	85.6
1986	106.9	-1.11	8,898,000	0.33	7,838,000	3.21	88.1
1987	107.4	0.47	9,085,000	2.10	8,132,000	3.75	89.5
1988	113.3	5.49	9,356,000	2.98	8,456,000	3.98	90.4
1989	131.5	16.06	9,499,000	1.53	8,543,000	1.03	89.9
1990	135.5	3.04	9,486,000	-0.14	8,364,000	-2.10	88.2
1991	136.8	0.96	9,636,000	1.58	8,609,000	2.93	89.3
1992	138.0	0.88	9,793,000	1.63	8,668,000	0.69	88.5
1993	136.4	-1.16	9,812,000	0.19	8,766,000	1.13	89.3
1994	135.5	-0.66	10,208,000	4.04	9,098,000	3.79	89.1
1995	162.4	19.85	10,399,000	1.87	9,377,000	3.07	90.2
1996	160.0	-1.48	*10,660,000*	2.51	*9,484,000*	1.14	*89.0*

Source: Pulp& Paper North American Fact Book (several items), Bureau of Labor Statistics, AF&PA Statistics
Italics: Preliminary data.

2.3. Legislation

Origins

The first effort to legislate on wastepaper recovery and utilization lays in the 1970 Resource Recovery Act (P. L. 91-512), which was an amended version of the Solid Disposal Act of 1965. The Act provided funds for collection and recycling of materials and laid the "foundations for the current waste disposal industry"[24]. In 1976, Congress passed the Resource Conservation and Recovery Act (RCRA) (P. L. 94-580), which replaced the Resource Recovery Act. After being amended in 1978, the Act acquired its definitive formulation. Neither recovery nor utilization goals were proposed, though. Section 6002 of the Act required the federal government to buy recycled paper but no further attempt was made to set national targets. In 1991, a bill to reauthorize RCRA was introduced in Congress. The bill included minimum annual recovery rates for several grades that would have to be achieved by the end of 1995, like ONP (52%), OCC (66%), mixed paper (20%), high-grade deinking (50%) and pulp substitutes (100%). The overall target was 40%. However, Congress has not already addressed reauthorization of RCRA.

One of the reasons for the lack of federal legislation is that EPA has opposed congressional efforts to legislate at the federal level. Also, the "unfunded mandates" bill signed in 1995 requires Congress to fund federal requirements that cost states and municipalities more than $50 million each year, thus preventing the development of federal legislation on the issue. Since the initiative was left to states, many state Congresses developed their own legislation, which mainly emphasized the use of recovered paper in newsprint and the use of recycled paper for official use in state and local public offices. Several states also issued proposals dealing with packaging and container grades.

EPA's Recycled Paper Guideline

The Environmental Protection Agency's (EPA) procurement paper guideline implemented Section 6002 of the RCRA. Minimum content standards were defined for several grades. Since June 1989, the federal government was required to buy recycled paper according to those standards. Office papers were required to include at least 50% of recycled paper, even though the amount of post-consumer wastepaper content was not addressed. Newsprint was required to contain at least 40% post-consumer wastepaper. Toilet tissue was required to contain 20% post-consumer wastepaper with a number of tissue grades with recycled content ranging from 20 to 40%. Corrugated cartons should contain no less than 35% post-consumer wastepaper while recycled paperboard was required to contain 80% post-consumer wastepaper. Executive Order 12.873, issued in 1993, complemented the provisions contained in the guideline. EO. 12.873 required printing and writing papers consumed by the federal government to contain at least 50% recycled paper and also specified post-consumer content, which should make 20% by December, 31, 1994 and 30% by December, 31, 1998.

Newsprint

Legal schemes affecting recycled paper content in newsprint were initiated in the late 80s[25]. In 1988 Florida instituted a penalty scheme in which a 10c tax was imposed on state publishers for every ton of virgin newsprint used exceeding half of total consumption. By late 1989, Connecticut was the first state to set goals prescribing 11% of secondary fiber content by 1991 and 50% by 1995, albeit in 1995 the law was revised to set a 20% goal by 1994 and 45% by 1999. Also in 1989, California set its own goals, which required that recycled newsprint with 40% recycled content should make at least 25% of newsprint consumed by state publishers by 1991, and 50% (of newsprint bought) by 1999. The three programs were mandatory, as the ones being debated in Wisconsin, Arizona, Illinois, Maryland and Missouri, which were approved in 1990. Recycled newsprint purchase goals were on the range of 10-25% in the short term (1-3 years after the law was passed) and 40 to 50% by the year 2000.

In 1991, a second wave of legislation came forward, which focused on voluntary agreements between state officials and publishers. Iowa, Louisiana, Maine, Massachusetts, Michigan, New Hampshire, New York, Pennsylvania,

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[24] Pulp and Paper 1996 North American Fact Book.
[25] Several sources. Pulp and Paper North American Fact Book. 1989-1996. Cerma's Recycled Paper Handbook. First Edition. 1991. CERMA.

Vermont and Virginia passed their laws encouraging use of recycling newsprint and setting goals either on the percentage of recycled newsprint purchased in relation to total newsprint purchases or in the percentage of secondary fiber content, if not both. Most of them set a 10-12% goal of recycled newsprint purchased by the year 1991-1993 and a 40 to 50% to the year 2000. One way or the other, by 1995 26 states had passed recycled-newsprint related legislation, among them eight of the ten most populated states in the country, which were also the major consumers of newspapers and therefore newsprint. The effects on the newsprint industry were considerable. Albeit recycling issues have been on the stage for more than thirty years before 1988, it was surprising the short period of time in which most of legislation materialized and actually most of big newsprint-makers were forced to produce recycled newsprint in less than three years. The big producers, either in Canada or in the U. S. were forced to respond to the challenge by transforming part of their existing plants, by building new facilities, by purchasing some of the already existing facilities, as Jefferson Smurfit Corp. did in 1985 or by selling their newsprint divisions. By 1995 only two firms stayed in the market relying solely on virgin newsprint.

Apart from state legislation, in 1992 a bill was introduced in the U. S. Congress requiring newspapers with circulation over 200,000 to meet an annual recycled-content standard of 35% by 1995 and 50% by 2002, actually lowering most state targets, wherever legislation existed. The bill was rejected in 1992 and again in 1994 and no attempt has been made to date to set national targets on recycled newsprint consumption. Newsprint is a highly standardized product, whose composition and weight differs scarcely among national or world regions. It is extensively traded and consumed by environmentally conscious customers such as publishers, which often own the mills where newsprint is produced. The difficulties involved in developing federal legislation on newsprint are a sample of those derived when addressing federal legislation concerning the rest of grades, which usually have a lower profile among final consumers and a wider set of specifications, standards and end-uses. Therefore no federal legislation has been even proposed for the remaining paper grades.

Other paper grades

Currently about 40 states have some kind of legislation concerning office paper procurement and collection. Most of them require that part or all the paper consumed in public offices contain a certain percentage of recycled paper. A full list of states with office-paper procurement legislation and some details of the existing laws can be found in 1991 Cerma's Recycled Paper Handbook.

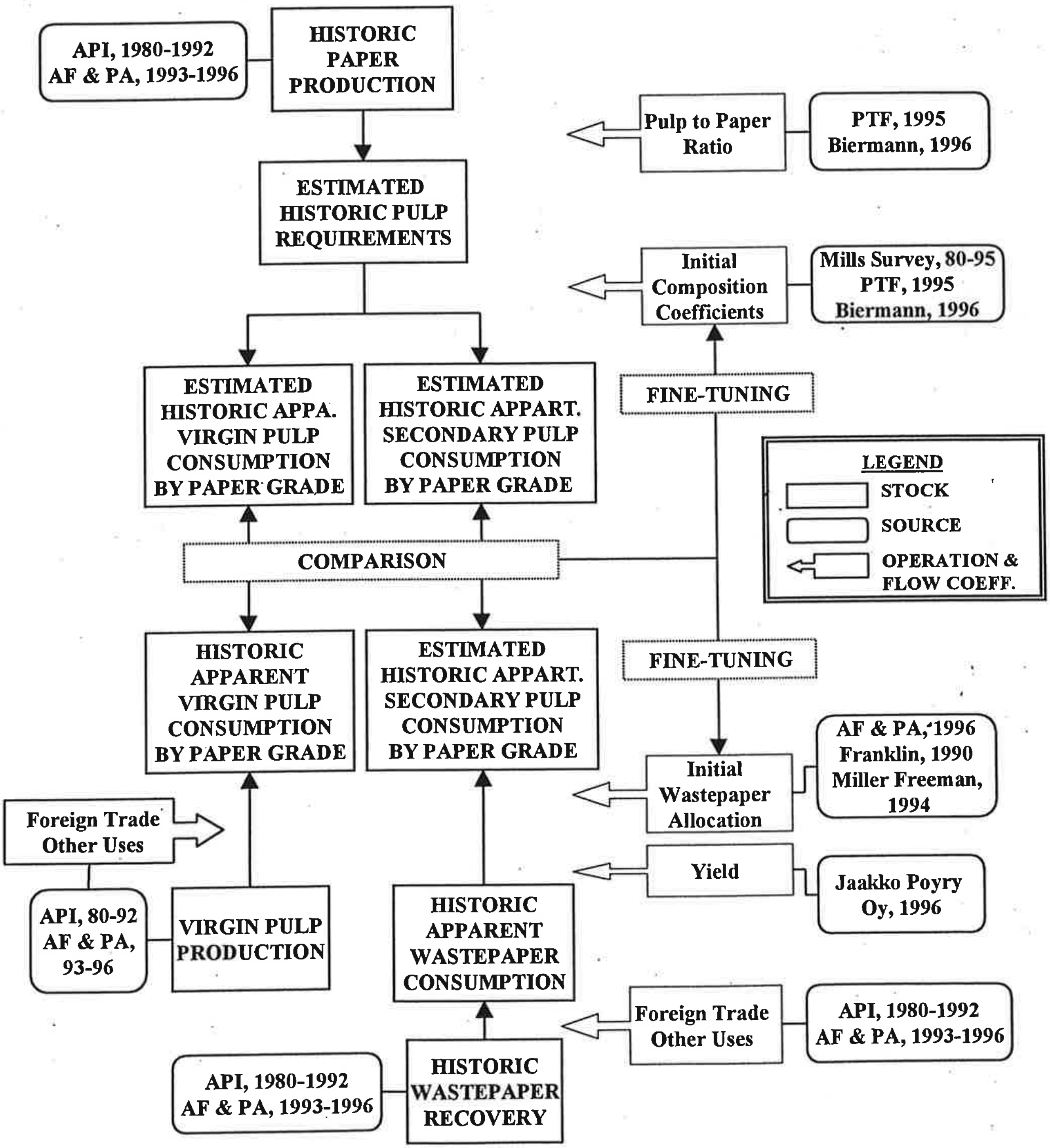
Several packaging initiatives have been introduced on a state level to both reduce the stream of packaging waste and increase the recycled content in packaging grades. The Massachusetts Interest Research Group (MassPIRG) developed the major model bill. This proposal, however defeated several times, has broken the path for packaging legislation introduced in New York, Connecticut, Minnesota, and Michigan. Hawaii, Colorado and New Jersey are already debating packaging legislation. Basically legislation focus on packaging-consumption reduction by a percentage that ranges from 15% to 35%, and a recycled content on packaging grades ranging from 25 to 50%, and also include provisions for collecting packaging material and requirements about the origin of recycled material, which are to be obtained mainly from statewide collection.

Recovery target

The AF&PA has a 50% recovery goal for the year 2000 which will be one of the recovery rates used for the 2002 simulation. A range of recover rates from 45 to 52 % will be

Chart 3.1.

ESTIMATION OF COMPOSITION AND WASTEPAPER ALLOCATION COEFFICIENTS. 1980-1995.



3. ESTIMATION OF COMPOSITION AND WASTEPAPER ALLOCATION COEFFICIENTS. 1980-1995.

3.1. Description of the process

Overview

In order to project wastepaper consumption to the year 2002, a number of assumptions are required in relation to the share of secondary pulp present in every paper grade and the allocation of wastepaper by end-use. These assumptions are based on estimations for the year 1995. Estimations for the years 1980, 1985 and 1990 are also developed so wastepaper consumption during those years can be segregated both by end-use and wastepaper grade. Historic wastepaper consumption figures obtained from these estimations provide a historic prospective of wastepaper utilization between 1980 and 2002.

The share of secondary pulp in every paper grade and the allocation of wastepaper by end-use are initially estimated by using a number of sources, whenever available. Since the information provided by these sources is neither complete nor exhaustive due to the fact that wastepaper utilization has not been documented except in very recent times, a definitive estimation is developed by combining all these sources and statistical data in a spreadsheet. The objective of this estimation is more to fill in information gaps than to modify actual data, which are maintained in most cases and slightly adjusted in the remaining. The spreadsheet is first adjusted in order to compare virgin pulp requirements calculated from initial composition coefficients to actual consumption of virgin pulp obtained from official statistics. In a second step, secondary pulp requirements are compared to secondary pulp consumption derived from historic wastepaper apparent consumption by using a set of yield and wastepaper allocation coefficients.

An outline of the adjustment process is shown in Chart 3.1. Production of paper and pulp and recovery of wastepaper are derived from statistics (API, 1980-1992; AF&PA 1993-1996). Those are the initial data plugged into the spreadsheet. Foreign trade data and the demand from other uses (API, 1980-1992; AF&PA 1993-1996) are subtracted to determine apparent consumption of both virgin pulp and wastepaper.

Paper production is then used to calculate the amount of pulp required (in this stage, virgin and secondary pulp are still aggregated). The relation between paper and pulp is given by a ratio. The ratio is defined by the amount of coating and fillers in a given paper grade, the moisture content of the paper and the average moisture content of the pulp (Sources: Paper Task Force, 1995; Biermann, 1996). The amount of pulp obtained is compared to apparent consumption of pulp (secondary and virgin) and the ratios are uniformly adjusted until calculated pulp requirements equal apparent consumption of pulp. This is done for each one of the years.

Once the amount of pulp is calculated, calculated pulp is split among virgin pulp grades and secondary pulp. The distribution is given by a set of composition coefficients. Initially these coefficients are based on a number of sources (Mill Survey, 1980-1995; Paper Task Force, 1995; Biermann, 1996). Virgin and secondary pulp requirements are initially segregated by paper grade and afterwards aggregated to compare them to apparent consumption of pulp. The adjustment of composition coefficients is done to each paper grade and detailed in the following sections.

As for wastepaper apparent consumption, an initial allocation is assumed based on several sources (AF&PA, 1996; Franklin, 1990; Miller Freeman, 1994). Each wastepaper grade is distributed among end-uses according to that allocation. Then, a yield coefficient (derived from Jaakko Poyry Oy, 1996) provides the amount of secondary pulp obtained from wastepaper. The calculations are done initially by wastepaper grade and end-use. In a second stage, secondary pulp is aggregated by end-use, so secondary pulp allocated to each end-use can be compared to secondary pulp requirements obtained from paper production.

The last stage of the process involves comparing virgin pulp requirements (by pulp grade) to virgin pulp consumption, adjusting initial composition coefficients until both sets of figures (closely) match. Simultaneously, secondary pulp requirements (by end-use) are compared to secondary pulp initially allocated to that use and allocation coefficients adjusted until a close match is reached[26].

As a rule, the adjustment process affected the percentage of wastepaper allocated to Other Uses in the available statistics. The rest of allocations were not changed in most cases. In the result section (3.2.), percentages based on actual sources are marked in Bold characters, while actual percentages that were slightly changed are highlighted in Italics (the initial value is provided throughout this chapter). Non highlighted characters are those derived from the estimation. Additional sources were used to clarify the allocation of wastepaper destined to Other Sources (Paper Mills Survey, 1980-1995; Franklin, 1982). Even though this allocation might be questionable, a tentative allocation was preferable to an imprecise Other Uses category.

Composition Coefficients

The estimation of composition coefficients was initially based on several sources (Mill Survey, 1980-1995; Paper Task Force, 1995; Biermann, 1996). Then, pulp requirements derived from calculations were compared to virgin pulp apparent consumption and secondary pulp consumption. Finally coefficients were adjusted until both sets of figures matched. Once composition was estimated for 1995, this estimation was used as an initial composition to estimate 1990 composition, and the 1990 composition was correspondingly used as a first estimate for 1985 and so on, so each set of composition coefficients was initially estimated from the one obtained five years after. This backward estimation made it possible to reproduce the gradual evolution of the industry and the penetration of secondary pulp as it was substituting for virgin pulp.

The general rule in this process was that no paper grade in a given year could have a bigger share of secondary pulp than it had five years after. The rule was also that the major virgin pulp component in each paper grade could not have a smaller share in a given year than it had five years after. It is important also to note that the main objective of the estimation was to obtain an accurate estimation of the secondary pulp share in each paper grade, while the distribution of virgin pulp was secondary to the study.

Recycled paperboard

For some grades the estimation was straightforward and no initial estimations were needed. Recycled paperboard was assumed to be composed of 100% recycled fiber, according to industry definitions. This composition remained unchanged throughout the study.

There are other paperboard grades whose composition could be easily estimated, since they meet two conditions: First, composition included just one (two) virgin pulp grade(s). Second, that paperboard grade is the only consumer of that (those) virgin pulp grade(s). That is the case of semichemical corrugating medium, and also of unbleached kraft paperboard, even though in this last case a small share of unbleached kraft pulp goes to other uses.

Semichemical Corrugating Medium

It is assumed that all semichemical pulp consumed goes to semichemical corrugating medium (which includes all kinds of semichemical paperboard). The remaining pulp comes from secondary sources. Therefore, in **1995** composition was estimated at 70% semichemical pulp and 30% secondary, mostly coming from OCC.

Industry definitions limit the share of recycled pulp in this grade up to 25%, but the actual figure is higher. The Pulp and Paper North American Fact Book shows recycled content at 37%, but this figure also includes 100%-recycled semichemical corrugating medium, which is accounted for in the recycled paper category, so the actual figure must be somewhere between 25 and 37%. The mill survey understates recycled pulp content, providing the following production for integrated semichemical corrugating medium mills in 1995: 85% semichemical pulp and 15% secondary. All things considered, the estimated 30% share of secondary pulp seems close to reality.

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[26] The adjustment process ceased once the difference between both figures was less than 10,000 tons.

Following a similar procedure, **1990** composition was estimated 74% semichemical pulp and 26% secondary pulp. Estimated **1985** composition was 75.5% semichemical pulp and 24.5% secondary pulp. Finally, **1980** composition was estimated at 77% semichemical pulp and 23% secondary pulp. In this case is especially clear how secondary pulp has been gradually substituting semichemical pulp, since no other virgin pulp grade enters the composition.

Unbleached Kraft Paper And Paperboard

Unbleached kraft paper and paperboard is mainly composed by unbleached kraft pulp and secondary pulp. Those grades made with a 100% recycled content are statistically included in the recycled paperboard section. The only significant fiber source is unbleached kraft, which according to industry definitions must account for at least 80%, being the remaining other pulps (unbleached sulfite) and secondary fiber. Figures calculated from data from the mill survey in 1995 show that pulp produced in integrated unbleached kraft paper mills is 84% unbleached pulp, 15% of secondary pulp and 1% of other kinds of virgin pulp. That was used as the initial composition.

After adjustments, the final **1995** composition was fixed at 81.8% unbleached kraft, 0.4% unbleached sulfite and 17.8% secondary pulp, mostly from OCC, ONP and pulp substitutes, which is consistent to industry definitions and the initial estimation derived from the survey. In the rest of estimations unbleached kraft pulp share was increased according to availability as well as the share of unbleached sulfite pulp, which is almost totally consumed by unbleached kraft factories. Correspondingly the share of secondary pulp consistently decreased.

Estimated **1990** composition was set at 86% unbleached kraft, 1% unbleached sulfite and 13% secondary pulp. Estimated **1985** composition was 88% unbleached kraft, 2% unbleached sulfite and 10% secondary pulp. Estimated **1980** composition was 89% unbleached kraft, 2% unbleached sulfite and 9% secondary pulp.

As for paper grades, newsprint, coated groundwood and uncoated groundwood are assumed to be the only consumers of mechanical pulp. It is also assumed that bleached kraft enters their composition and there is a variable share of secondary pulp. Since the three grades are strongly related, their adjustment was done simultaneously. Most of initial composition was derived from the 1995 mill survey. According to data from the survey, secondary pulp share in coated groundwood was around 4%, while secondary pulp share was around 10%. After adjustment both shares were fixed at, respectively, 3 and 9%. The share of secondary pulp in newsprint derived from the survey was 31%, which was smaller than the figure from other sources (38.1%, Miller's Freeman The news in ONP). The final percentage was set at 36%.

As for virgin pulp, coated groundwood has a standardized composition which is close to 50% mechanical, 50% bleached kraft. That composition was kept almost unchanged all years while the other two grades were allowed to change. The initial settings of newsprint and uncoated groundwood derived from the 1995 survey were respectively 48% and 61% of mechanical pulp. Since available mechanical pulp was not enough, both shares were reduced down to 44% and 57%, respectively. The rest was assumed to be bleached kraft pulp.

A similar procedure was used to estimate 1990, 1985 and 1980, having the composition of 1995 as the starting point. The adjustment is detailed by grade in the following paragraphs.

Newsprint

Newsprint is assumed to be composed of a majority of mechanical pulp, a lesser percentage of secondary pulp and the remaining coming from bleached kraft pulp. Although a 65% content of mechanic pulp fitted industry definitions, this percentage should be smaller to conform to the increasing share of 100%-recycled newsprint, not included in the recycled paperboard section. Data available pointed out a 38% secondary fiber content in recycled newsprint (Miller Freeman. The News in ONP. 1994), so the overall figure should be also smaller. Data obtained from the survey calculations show 48% mechanical and 31% secondary pulp. These figures come from integrated mills that produce uniquely newsprint and groundwood grades, and have two important shortcomings. First, these mills sell part of their production as market pulp, which can not be assumed to serve as input, or they buy part of the pulp they use in the market, and that pulp does not generally appear in the survey. That is especially true with bleached kraft pulp, since many integrated mills produce just mechanical and secondary pulp. The other flaw is that wastepaper quantitative information in the survey is weak and understates or ignores its utilization.

Estimated **1995** composition was about 44% mechanical, 36% secondary and 20% bleached kraft. The kraft percentage might be higher than the real one, but actually not enough mechanical pulp was available to supply newsprint without neglecting the other two groundwood grades. In 1990, data obtained from the survey calculations showed 59% mechanical, 10% bleached kraft, 27% secondary and a remaining 4% for the rest. In **1990**, after fine-tuning, estimated composition was assumed 50% mechanical, 13% bleached kraft, 10% unbleached kraft and 27% secondary pulp. Following a similar estimation procedure, estimated **1985** composition was 51% mechanical, 15% bleached kraft, 14% unbleached kraft and 20% secondary pulp. **1980** composition was estimated at 56% mechanical, 14% bleached kraft, 11% unbleached kraft and 19% secondary pulp.

Groundwood Grades

Uncoated groundwood is assumed to be composed almost exclusively by mechanical pulp and a very small percentage of secondary pulp while coated groundwood is assumed to contain mechanical and bleached kraft pulp in the same proportion and a small share of secondary pulp, like in the rest of printing and writing grades. It is assumed that the amount of secondary pulp in high-priced coated grades is smaller than in uncoated grades, and that distinction will remain for the rest of the study. The amount of mechanical pulp will be determined by the availability of it once the share allocated to coated groundwood has been discounted.

The compositions of both groundwood grades are consistent with the literature, with the assumptions of the Paper Task Force, and with the survey, which shows a nearly 100% of mechanical pulp content, albeit some chemical pulp is bought in the market and used in their furnish. Final composition will show a certain amount of chemical pulp to balance the lack of enough mechanical pulp. After adjusting, **1995** estimated composition for uncoated groundwood is 57% mechanical pulp, 34% bleached kraft and 9% of secondary fiber, mostly allocated to telephone directories stock, the major consumer of wastepaper within the grade. **1995** coated groundwood estimated composition is made of 46% mechanical, 51% bleached kraft and 3% of secondary pulp. Secondary pulp used for all four printing and writing grades came mostly from pulp substitutes, high grade deinking and mixed paper.

Following a similar procedure, the rest of compositions were estimated. After adjustments, **1990** uncoated groundwood estimated composition was 64% mechanical pulp, 29% bleached kraft and 7% secondary fiber. **1990** coated groundwood composition was estimated at 49% mechanical pulp, 50% bleached kraft and 1% secondary fiber.

1985 uncoated groundwood composition was estimated at 64% mechanical pulp, 30% bleached kraft and 6% secondary fiber. **1985** estimated coated groundwood composition remained 49% mechanical pulp, 50% bleached kraft and 1% secondary fiber.

1980 estimated uncoated groundwood composition was 66% mechanical pulp, 28% bleached kraft and 6% secondary fiber. **1980** estimated coated groundwood composition was 50% mechanical pulp, 49% bleached kraft and 1% secondary fiber.

Freesheet Grades

Both freesheet grades, coated and uncoated, are assumed to be furnished from chemical pulp, mainly bleached kraft with a small share of bleached sulfite, pulps from non-wood origin and some secondary pulp. This is consistent with the literature cited in the Paper Grade description section and with the assumptions of the Paper Task Force, albeit they assumed all chemical pulp to be bleached kraft. The mills survey shows that in 1995 integrated freesheet mills produced around 80% of bleached kraft pulp, 5% of bleached sulfite, 5% of deinking and a remaining constituted by other pulps, mechanical and semichemical pulp. To estimate the composition, the secondary pulp share was derived from the survey and the rest of pulp was assumed to come from bleached kraft and bleached sulfite. Considering only mills that produce uncoated freesheet, the share of secondary pulp was found close to 9%, which was the percentage finally adopted. In the case of coated grades, data were inconclusive, so I adopted the same share of secondary pulp as in coated groundwood (3%) as my initial estimation. The final share was 4%, and the rest assumed to come from bleached kraft.

A similar procedure was used to adjust the rest of years, assuming that the share of secondary pulp in the two coated grades was almost the same, as it was for the two uncoated grades. The amount of bleached sulfite was distributed among uncoated freesheet and tissue according to the distribution observed in the survey. The remaining came from bleached kraft.

The estimated composition of uncoated freesheet in **1995** was 85.8% of bleached kraft pulp, 2% bleached sulfite, 2% unbleached kraft, 1.2% of other pulps and 9% of secondary pulp. **1995** estimated coated freesheet composition was fixed at a 96% bleached kraft and 4% secondary pulp.

The 1990 survey showed a reduction in the amount of secondary pulp and an increase in the share of bleached sulfite. Also, data showed a slight increase in the amount of other pulps available that were allocated to this grade. Whenever possible, the share of bleached kraft was also increased. Estimated **1990** uncoated freesheet composition was 86% of bleached kraft pulp, 3% bleached sulfite, 2% unbleached kraft, 2% other pulps, 1% mechanical and 6% of secondary pulp while **1990** estimated coated freesheet composition was fixed at a 97% bleached kraft and 3% secondary pulp. In **1985**, both estimated compositions remained unchanged. **1980** estimated composition for uncoated freesheet was 83% of bleached kraft pulp, 3% bleached sulfite, 4% unbleached kraft, 3% other pulps, 1% mechanical and 6% secondary pulp while coated freesheet composition was not changed.

Tissue

Tissue was initially assumed to be composed by a majority of bleached chemical pulps with a significant proportion of secondary fiber. Bleached sulfite would enter the composition according to available supply (net apparent consumption) and the demand of competing uses like freesheet grades. Secondary pulp, which literature places over 45% (Pulp and Paper North American Fact Book), will also be subjected to supply constraints. Figures from the mill survey from integrated tissue mills in 1995 showed a share of 40% bleached kraft, 40% secondary and 20% bleached sulfite, but it was already said that the survey understates utilization of wastepaper. That was the initial composition used in 1995. After adjustments, estimated secondary pulp share in **1995** was increased up to 51%, with a 40% of bleached kraft and a 9% bleached sulfite share. The origin of secondary pulp was mainly from high deinking and mixed wastepaper, with some amount of pulp substitutes, ONP and OCC.

The 1990 mill survey shows an increase in the percentage of chemical pulps to the expenses of secondary pulp. **1990** estimated composition was 42% secondary pulp, 44% of bleached kraft and 14% bleached sulfite. The origin of secondary pulp was mainly from high grade deinking and pulp substitutes. **1985** estimated composition was 32% secondary pulp, 51% of bleached kraft and 17% bleached sulfite. **1980** estimated composition was 31% secondary pulp, 47% of bleached kraft, 20% bleached sulfite and 1% unbleached kraft.

Other paper and paperboard

Finally, the last category, other paper and paperboard was assumed to be composed by what was left over once the rest of grades, better defined, had been adjusted. It was also assumed that bleached kraft will make most of its composition, since the category is also defined as "other kraft papers". Therefore, the estimated **1995** composition showed 86.9% bleached kraft, 8% secondary pulp, 5% unbleached kraft and 0.1% unbleached sulfite. Following the same procedure (using the 1995 composition as the starting point and assigning to this category what pulp was remaining), **1990** estimated composition was 85% bleached kraft, 6% secondary pulp, 8% unbleached kraft and 1% semichemical. **1985** estimated composition was 86% bleached kraft, 2% secondary pulp, 9% unbleached kraft, 1% semichemical, 1% bleached sulfite and 1% other pulps. **1980** estimated composition was 73% bleached kraft, 3% secondary pulp, 14% unbleached kraft, 4% semichemical, 1% bleached sulfite and 5% other pulps.

Tables 3.2.1, 3.2.3, 3.2.5 and 3.2.7 summarize estimated compositions for all the grades included in the study (see end of Section 3.2 for these and other tables referenced below).

Wastepaper Allocation Coefficients

Wastepaper allocation was initially estimated from several sources (AF&PA, 1996; Franklin, 1990; Miller Freeman, 1994). These sources provide the allocation of every wastepaper grade except mixed wastepaper to the most important end-uses in terms of volume. In that initial allocation there is a percentage from 10 to 20% which statistics assign to Other Uses. Actual percentages have been kept constant (shown in bold characters), and in just a few of them the share has been slightly adjusted (shown in italics). The reason for that adjustment is the multiplicity of sources used. In several cases actual allocation percentages were not consistent with data from the survey, or two of the sources were contradictory. But in most of cases, historical share has been kept.

Therefore, the estimation has focused on the share allocated to Other Uses, trying to come up with an estimation consistent with the secondary pulp requirements obtained from the spreadsheet, with quality requirements and with data obtained from two additional sources (Paper Mills Survey, 1980-1995; Franklin, 1982). Again, the author considered that a tentative allocation would be preferable than no allocation at all. Those grades like ONP which are better documented offer more reliable estimations while other like Mixed Wastepaper basically offer no documentation

ONP

The initial allocation of ONP in **1995** assigned 46% of ONP consumed in the US to newsprint production, 31% to recycled paperboard, 9% to tissue, 4% to printing and writing (estimation from Miller Freeman, The News in ONP, 1994). None of those percentages was changed. The remaining percentage (10%) was mostly assigned to unbleached kraft paperboard (in 32 unbleached kraft mills ONP was identified as one of wastepaper sources. 1995 Mills Survey). Therefore, 8% of ONP was assigned to unbleached kraft while 1% was assigned to semichemical (identified in one of the mills as a wastepaper source).

The allocation of ONP followed a similar pattern the rest of years. Most of it was assigned to newsprint, recycled paperboard, tissue and unbleached kraft. First, allocation followed historic percentages. As for the remaining, it was mostly allocated to unbleached kraft and some to semichemical.

In **1990**, 38% of ONP consumed in the U.S.A. in 1990 went to newsprint production, 32% to recycled paperboard, and 12% to tissue (Miller Freeman, The News in ONP, 1994). None of those percentages was changed. The remaining of it was assigned to unbleached kraft (8% since ONP was identified as a wastepaper source in 18 unbleached kraft mills. 1990 Mills Survey) and other paper and paperboard (6% since ONP was identified as a wastepaper source in 9 mills. 1990 Mills Survey). Semichemical was assigned the remaining 2%.

In 1984, 43% of ONP consumed in the U.S.A. went to newsprint production, and 50% to paperboard grades (Franklin, 1990). This was the initial allocation of ONP assumed for **1985**. The first percentage was not changed, while the second was split among recycled paperboard (40%) and unbleached kraft (10%). Since the remaining was just 7%, the share allocated to tissue had to be reduced (4%) going the remaining to semichemical and other paper and paperboard.

In **1980**, 33% of ONP consumed in the U.S.A. in 1980 went to newsprint production, and 48% to recycled paperboard (Franklin, 1990). The first percentage was not changed while the second was adjusted to 47%. The remaining was mostly assigned to unbleached kraft (16%) while tissue share (3%) was similar to that in 1985 (4%). The allocation to other uses in 1985 and 1980 is more questionable, since data are scarce. Data from 1980 (Franklin, 1982) show tissue producers consumed 149,000 tons of ONP and semichemical mills consumed 12,000 tons.

OCC

In **1995**, 58% of OCC consumed went to recycled paperboard furnish, 24% went to unbleached kraft paperboard mills and the remaining 22% to other uses (AF&PA, 1996). The percentage allocated to recycled paperboard was not changed while the percentage allocated to unbleached kraft was adjusted to 24% to meet calculated secondary pulp requirements. In relation to the rest, most of it was assigned to semichemical mills. Historic figures from 1980, 1984 and 1990 showed that 14 to 17% of OCC consumed by the industry went to semichemical manufacture. Also, the 1995 Mills Survey showed 18 semichemical paper mills using OCC as a wastepaper source. Therefore, a 15% was initially assigned to this category and finally adjusted to 10%. Throughout the period considered, recycled board, semichemical and unbleached kraft paperboard made at least 90% of OCC demand and the share of every one of the three grades was very similar from year to year.

The remaining was mostly assigned to newsprint (3%) and tissue (5%), and none to printing and writing for quality considerations. The allocation is justified since OCC was identified as a wastepaper source in one newsprint mill and 6 tissue mills (1995 Mills Survey). The 1995 allocation of OCC was used as a starting point for the rest of the years.

In **1990**, 53% went to recycled paperboard furnish, 24% went to unbleached kraft paperboard mills, 16% to semichemical corrugating medium and the remaining 7% to other uses (Franklin, 1990). Those percentages were slightly adjusted to 55% recycled paperboard, 24% unbleached kraft paperboard mills and 16% to semichemical corrugating medium. The remaining was again assigned to newsprint (4%) and tissue (2%). That was the general pattern for 1985 and 1980 too.

In 1984, 57% of OCC consumed by the paper industry went to recycled paperboard furnish, 16% went to unbleached kraft paperboard mills, 20% to semichemical corrugating medium and the remaining 7% to other uses (Franklin, 1990). After slight adjustments, the **1985** estimated allocation was 61% to recycled paperboard furnish, 17% to unbleached kraft paperboard mills, and 17% to semichemical corrugating medium. The remaining was again assigned to newsprint (1%) and tissue (3%).

In **1980**, 61% of OCC consumed by the paper industry went to recycled paperboard furnish, 12% went to unbleached kraft paperboard mills, 16% to semichemical corrugating medium and the remaining 11% to other uses (Franklin, 1990). None of them was changed. The remaining was again assigned to newsprint (3%) and tissue (3%).

Pulp Substitutes

Pulp substitutes are mainly used in printing and writing grades, tissue and recycled paperboard, as shown by available statistics. In **1995**, 30% of pulp substitutes consumed in the U.S. were used in printing and writing grades, 18% went to recycled paperboard manufacture and 13% to tissue (AF&PA, 1996). That allocation was not changed. Estimations affected just the share (39%) allocated to other uses. Most of it went to unbleached kraft (20% since pulp substitutes was identified as a wastepaper source in 6 unbleached kraft mills), other paper and paperboard (10% and identified as a wastepaper source in 2 OPP mills), and newsprint (5% and identified in one newsprint mill as a wastepaper source) (Source: 1995 Mills Survey).

The allocation followed the same criterion the remaining years. Actually, the share allocated to other uses the rest of years was very small (around 10%), so most of it went to unbleached kraft. Data from 1980, 1984 and 1990 aggregate pulp substitutes and high grade deinking. Due to the lack of additional sources, I assume this allocation is valid for both of them. Accordingly, in **1990** 21% of pulp substitutes were used in printing and writing grades, 27% went to recycled paperboard manufacture and 42% to tissue (Franklin, 1990). Only the share allocated to P and W has been adjusted to 24%, remaining the rest unchanged.

In 1984, 29% of pulp substitutes were used in printing and writing grades, 21% went to recycled paperboard manufacture and 38% to tissue (Franklin, 1990).. Those percentages were adjusted to fit calculated pulp requirements. **1985** estimated allocation was 23% to printing and writing grades, 28% went to recycled paperboard manufacture and 37% to tissue. A 10% share was assigned to unbleached kraft grades going the rest to other paper and paperboard and newsprint.

In **1980**, 23% of pulp substitutes were used in printing and writing grades, 39% went to recycled paperboard manufacture and 26% to tissue (Franklin, 1990). Only the share of recycled paperboard was adjusted (25%) remaining the rest unchanged. The remaining went to unbleached kraft paperboard (11%), and newsprint.

High Grade Deinking

In **1995**, 22% of high grade deinking consumed in the U.S. was used in printing and writing grades and 43% went to tissue (AF&PA). That share was not changed. As for the remaining, figures from 1980, 1984 and 1990 show that about 25% of high grade deinking is used in recycled paperboard. After adjustments, it was estimated that 24% of high grade went to recycled paperboard. The rest was distributed mainly among unbleached kraft paperboard, which is a big consumer of all kinds of wastepaper, and newsprint, which also consumes deinking grades for quality considerations. Documentation about this grade was very poor so this allocation is thought the most likely. The criterion for the rest of years was to assign the Other Users share first to unbleached kraft and secondarily to newsprint.

Data from 1980, 1984 and 1990 aggregate pulp substitutes and high grade deinking. Due to the lack of additional sources, I assume this allocation is valid for both of them. Accordingly, in **1990** 21% of high grade deinking were used in printing and writing grades, 27% went to recycled paperboard manufacture and 42% to tissue (Franklin, 1990). The share allocated to printing and writing has been adjusted to 25%, while the share allocated to recycled was adjusted to 27 %

In 1984, 29% of high grade deinking were used in printing and writing grades, 21% went to recycled paperboard manufacture and 38% to tissue (Franklin, 1990). Those percentages were adjusted to fit calculated pulp requirements. **1985** estimated allocation was 24% to printing and writing grades, 226% went to recycled paperboard manufacture and 38% to tissue. 11% was assigned to unbleached kraft grades going the rest to newsprint.

In **1980**, 23% of high grade deinking was used in printing and writing grades, 39% went to recycled paperboard manufacture and 26% to tissue (Franklin, 1990). The estimated allocation was 22% to printing and writing grades, 39% went to recycled paperboard manufacture and 25% to tissue. The remaining went to unbleached kraft paperboard (10%), and newsprint.

Mixed Wastepaper

There is hardly any data about Mixed Wastepaper, since this category basically includes all kinds of wastepaper not included anywhere else. Therefore, the category was estimated once the rest of wastepaper allocations had been adjusted, assigning what was left over to this category. Therefore, allocation within this category is not as reliable as it is in the rest and must be taken carefully.

Estimated wastepaper allocation is summarized in tables 3.2.2, 3.2.4, 3.2.6 and 3.2.8.

Pulp to Paper Ratio

1995

Pulp is assumed to be expressed as air dry short tons, with a 10% moisture, or a 90% content of fiber (bone dry). Paper is assumed to include 6% moisture, consistent with the assumptions of the Paper Task Force (Paper Task Force, 1995), which used the same moisture content and slightly below the moisture contents published in Biermann that range from 7 to 10% (Biermann, 1996). Coating and fillers were assumed to make 8% of weight content for uncoated freesheet papers and 21% for coated printing and writing grades, down from the, respectively, 16 and 30% assumed in the Paper Task Force Report. The reason for this change was the deficit of calculated pulp consumed in relation to net apparent consumption of pulp when the last coefficients were used. These coefficients were slightly and uniformly changed when constructing the rest of spreadsheets to conform year consumption figures by modifying assumed moisture content and the changes were comparatively small.

Under these assumptions, 1 ton of newsprint, uncoated groundwood paper, tissue or paperboard was transformed into pulp by multiplying by 1.044. The coefficient for uncoated freesheet was .955 and for coated grades .810. The decreasing range of coefficients makes sense since an increase in the relative weight of coatings and fillers in a paper grade reduces the amount of fiber and therefore the amount of pulp needed to manufacture it. The coefficient over 1 makes sense as well since the moisture content of paper is smaller than that of pulp, and therefore more than one ton of pulp is needed to produce a single ton of paper.

1990

There was an excess of calculated pulp over the net apparent consumption that forced to modify the pulp to paper ratio by a small margin, assuming moisture for newsprint, tissue, uncoated groundwood, coated grades and paperboard to be 7%, up from the original 6% and leaving uncoated freesheet unchanged. That reduced pulp requirements to fit availability.

Under these assumptions, 1 ton of newsprint, uncoated groundwood paper, tissue or paperboard was now transformed into pulp by multiplying by 1.033. The coefficient for uncoated freesheet was again .955 while coated grades were now assigned .800

1985

An excess of calculated pulp over the net apparent consumption forced to modify the pulp to paper ratio, assuming uncoated freesheet moisture to be 7%, up from the original 6%, increasing moisture of unbleached kraft paper and semichemical corrugating medium up to 7.5 and leaving the rest of grades unchanged.

Under these assumptions, 1 ton of newsprint, uncoated groundwood paper, tissue, recycled paperboard and other paperboard was now transformed into pulp by multiplying by 1.033. The new coefficient for unbleached kraft paper and semichemical corrugating medium was now 1.027 while the new coefficient for uncoated freesheet was .944 and coated grades were now assigned .800.

1980

There was an excess of calculated pulp over the net apparent consumption that forced to modify the pulp to paper ratio, assuming moisture for uncoated groundwood and coated freesheet to be 7.5%, up from the original 6.5% and moisture for tissue, unbleached kraft, semichemical corrugating medium and recycled to be 8%, up from the original 6.5 and 7.5%.

Under these assumptions, 1 ton of uncoated groundwood paper was transformed into pulp by multiplying by 1.027. Tissue and paperboard coefficient was 1.022. The coefficient for uncoated freesheet was .944 again while coated free-sheet was now assigned .794, remaining the rest unchanged.

Yield Coefficients

Yield coefficients provide information about losses derived from the repulping and deinking processes when transforming wastepaper into secondary pulp. Yields are based on a wastepaper simulation developed by Jaakko Poyry Oy (published in Patrick, 1991). Initial yields are 86% for the production of newsprint, 82-86% for printing and writing grades, 80% for tissue manufacturing and 92% for the rest of grades (paperboard). These yields are initially used and then slightly increased to conform to the amount of secondary pulp required. Finally, assumed yields are 88% for the production of newsprint, 86% for printing and writing grades, 84% for tissue manufacturing and 92% for the rest.

Other Uses

Other uses refer both to wastepaper demand created by industries other than the paper industry and pulp demand from industries other than the paper industry. Wastepaper demanded from molded pulp and construction manufacturers is detailed in AF&PA statistics and can be subtracted from recovery statistics. In relation to pulp demand by other users, fluff pulps used as a filling for disposable diapers and adult incontinence products are subtracted from pulp consumption.

Table 3.2.1. Estimated Composition Coefficients. 1980 (% of all pulp needed).

	P/Pa Ratio	Mechanical	Semichemical	Unbld. Kraft	Bld. Kraft	Unbld. Sulfite	Bld. Sulfite	Other Pulps	Secondy.
Newsprint	1.033	56.0		11.0	14.0				19.0
Uncoated freesheet	0.944	1.0		4.0	82.8		3.4	3.1	5.7
Uncoated groundwood	1.027	66.0			27.6		0.4		6.0
Coated freesheet	0.794				97.0				3.0
Coated groundwood	0.800	50.0			49.0				1.0
Tissue	1.022			2.0	47.0		20.0		31.0
Unbleached Kraft	1.022			88.5		2.3			9.2
Semichem Corrugating M	1.022		77.2						22.8
Recycled	1.022								100.0
Oth. Paper & Paperboard	1.033		3.6	13.8	71.1	0.2	1.3	5.3	4.7

Table 3.2.2. Estimated Wastepaper Allocation by End-use (tons and %). 1980.

Wastepaper Grade	Total App. Consumption	End-use	%	App. Consumption	Assumed Yield	Sec. Pulp
ONP	2,391,000	Newsprint	33	789,030	0.88	694,346
		P&W	0	0	0.86	0
		Tissue	3	71,730	0.84	60,253
		Unbl. K	16	382,560	0.92	351,955
		S CM	1	23,910	0.92	21,997
		Recycled	47	1,123,770	0.92	1,033,868
		Other K	0	0	0.92	0
OCC	6,866,000	Newsprint	3	205,980	0.88	181,262
		P&W	0	0	0.86	0
		Tissue	3	205,980	0.84	173,023
		Unbl. K	12	823,920	0.92	758,006
		S CM	16	1,098,560	0.92	1,010,675
		Recycled	61	4,188,260	0.92	3,853,199
		Other K	5	343,300	0.92	315,836
Pulp Substitutes	2,254,000	Newsprint	1	22,540	0.88	19,835
		P&W	23	518,420	0.86	445,841
		Tissue	39	879,060	0.84	738,410
		Unbl. K	11	247,940	0.92	228,105
		S CM	1	22,540	0.92	20,737
		Recycled	25	563,500	0.92	518,420
		Other K	0	0	0.92	0
High Grade Deink	1,142,000	Newsprint	2	22,840	0.88	20,099
		P&W	22	251,240	0.86	216,066
		Tissue	39	445,380	0.84	374,119
		Unbl. K	10	114,200	0.92	105,064
		S CM	1	11,420	0.92	10,506
		Recycled	25	285,500	0.92	262,660
		Other K	1	11,420	0.92	10,506
Mixed	2,268,000	Newsprint	0	0	0.88	0
		P&W	0	0	0.86	0
		Tissue	3	68,040	0.84	57,154
		Unbl. K	17	385,560	0.92	354,715
		S CM	2	45,360	0.92	41,731
		Recycled	75	1,701,000	0.92	1,564,920
		Other K	3	68,040	0.92	62,597

Table 3.2.3. Estimated Composition Coefficients. 1985 (% of all pulp needed).

	P/Pa Ratio	Mechanical	Semichemical	Unbld. Kraft	Bld. Kraft	Unbld. Sulfite	Bld. Sulfite	Other Pulps	Secondy.
Newsprint	1.033	51.0		14.0	15.0				20.0
Uncoated freesheet	0.944	1.0		1.5	86.4		3.0	2.4	5.7
Uncoated groundwood	1.033	64.0			30.0				6.0
Coated freesheet	0.800				97.0				3.0
Coated groundwood	0.800	49.0			50.0				1.0
Tissue	1.033				51.0		17.0		32.0
Unbleached Kraft	1.027			88.0		1.9			10.1
Semichem Corrugating M	1.027		75.5						24.5
Recycled	1.033								100.0
Oth. Paper & Paperboard	1.033		1.0	9.0	85.9	0.2	1.3	0.6	2.0

Table 3.2.4. Estimated Wastepaper Allocation by End-use (tons and %). 1985.

Wastepaper Grade	Total App. Consumption	End-use	%	App. Consumption	Assumed Yield	Sec. Pulp
ONP	2,696,000	Newsprint	43	1,159,280	0.88	1,020,166
		P&W	0	0	0.86	0
		Tissue	4	107,840	0.84	90,586
		Unbl. K	10	269,600	0.92	248,032
		S CM	2	53,920	0.92	49,606
		Recycled	40	1,078,400	0.92	992,128
		Other K	1	26,960	0.92	24,803
OCC	7,899,000	Newsprint	1	78,990	0.88	69,511
		P&W	0	0	0.86	0
		Tissue	3	236,970	0.84	199,055
		Unbl. K	17	1,342,830	0.92	1,235,404
		S CM	17	1,342,830	0.92	1,235,404
		Recycled	61	4,818,390	0.92	4,432,919
		Other K	1	78,990	0.92	72,671
Pulp Substitutes	2,494,000	Newsprint	1	24,940	0.88	21,947
		P&W	23	573,620	0.86	493,313
		Tissue	37	922,780	0.84	775,135
		Unbl. K	10	249,400	0.92	229,448
		S CM	0	0	0.92	0
		Recycled	28	698,320	0.92	642,454
		Other K	1	24,940	0.92	22,945
High Grade Deink	1,381,000	Newsprint	1	13,810	0.88	12,153
		P&W	24	331,440	0.86	285,038
		Tissue	38	524,780	0.84	440,815
		Unbl. K	11	151,910	0.92	139,757
		S CM	0	0	0.92	0
		Recycled	26	359,060	0.92	330,335
		Other K	0	0	0.92	0
Mixed	1,902,000	Newsprint	0	0	0.88	0
		P&W	0	0	0.86	0
		Tissue	8	152,160	0.84	127,814
		Unbl. K	10	190,200	0.92	174,984
		S CM	0	0	0.92	0
		Recycled	80	1,521,600	0.92	1,399,872
		Other K	2	38,040	0.92	34,997

Table 3.2.5. Estimated Composition Coefficients. 1990 (% of all pulp needed).

	P/Pa Ratio	Mechanical	Semichemical	Unbld. Kraft	Bld. Kraft	Unbld. Sulfite	Bld. Sulfite	Other Pulps	Secondy.
Newsprint	1.033	50.0		10.0	13.0				27.0
Uncoated freesheet	0.955	1.0		1.5	86.4		3.0	2.1	6.0
Uncoated groundwood	1.033	64.0			29.0				7.0
Coated freesheet	0.800				97.0				3.0
Coated groundwood	0.800	49.0			50.0				1.0
Tissue	1.033				45.0		13.5		41.5
Unbleached Kraft	1.033			86.4		0.7			12.9
Semichem Corrugating M	1.033		74.0						26.0
Recycled	1.033								100.0
Oth. Paper & Paperboard	1.033		1.0	8.0	85.0	0.1			5.9

Table 3.2.6. Estimated Wastepaper Allocation by End-use (tons and %). 1990.

Wastepaper Grade	Total App. Consumption	End-use	%	App. Consumption	Assumed Yield	Sec. Pulp
ONP	3,811,000	Newsprint	**38**	1,448,180	0.88	1,274,398
		P&W	0	0	0.86	0
		Tissue	**12**	457,320	0.84	384,149
		Unbl. K	10	381,100	0.92	350,612
		S CM	2	76,220	0.92	70,122
		Recycled	**32**	1,219,520	0.92	1,121,958
		Other K	6	228,660	0.92	210,367
OCC	10,687,000	Newsprint	4	427,480	0.88	376,182
		P&W	0	0	0.86	0
		Tissue	2	213,740	0.84	179,542
		Unbl. K	***24***	2,564,880	0.92	2,359,690
		S CM	***14***	1,496,180	0.92	1,376,486
		Recycled	***55***	5,877,850	0.92	5,407,622
		Other K	1	106,870	0.92	98,320
Pulp Substitutes	2,732,000	Newsprint	3	81,960	0.88	72,125
		P&W	***24***	655,680	0.86	563,885
		Tissue	**42**	1,147,440	0.84	963,850
		Unbl. K	1	27,320	0.92	25,134
		S CM	1	27,320	0.92	25,134
		Recycled	**27**	737,640	0.92	678,629
		Other K	2	54,640	0.92	50,269
High Grade Deink	2,000,000	Newsprint	3	60,000	0.88	52,800
		P&W	***25***	500,000	0.86	430,000
		Tissue	**42**	840,000	0.84	705,600
		Unbl. K	3	60,000	0.92	55,200
		S CM	1	20,000	0.92	18,400
		Recycled	**24**	480,000	0.92	441,600
		Other K	2	40,000	0.92	36,800
Mixed	2,505,000	Newsprint	3	75,150	0.88	66,132
		P&W	0	0	0.86	0
		Tissue	12	300,600	0.84	252,504
		Unbl. K	10	250,500	0.92	230,460
		S CM	1	25,050	0.92	23,046
		Recycled	68	1,703,400	0.92	1,567,128
		Other K	6	150,300	0.92	138,276

Table 3.2.7. Estimated Composition Coefficients. 1995 (%of all pulp needed).

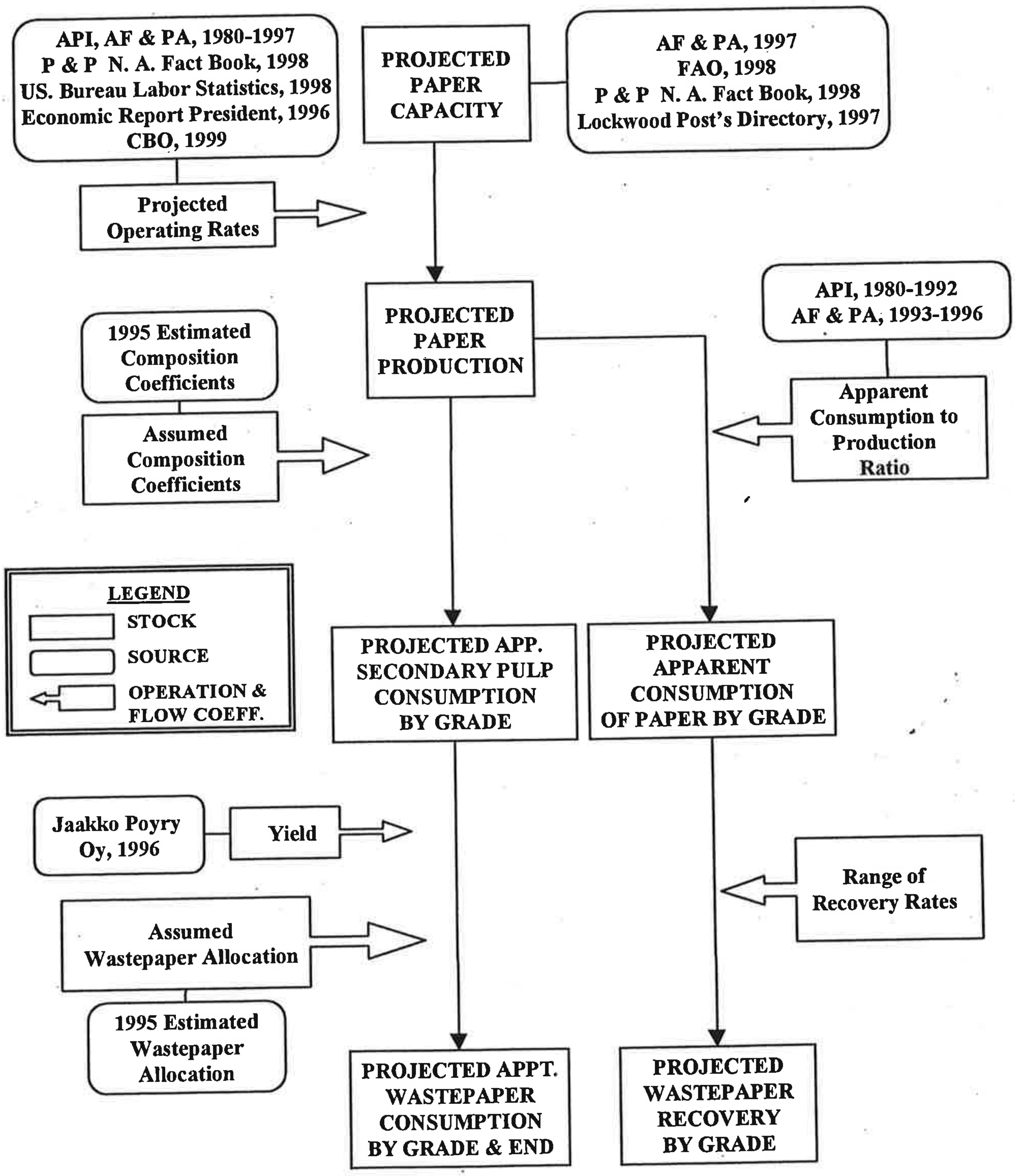
	P/Pa Ratio	Mechanical	Semichemical	Unbld. Kraft	Bld. Kraft	Unbld. Sulfite	Bld. Sulfite	Other Pulps	Secondy.
Newsprint	1.044	44.0			20.0				36.0
Uncoated freesheet	0.955			2.0	85.8		2.0	1.2	9.0
Uncoated groundwood	1.044	57.0			34.0				9.0
Coated freesheet	0.810				96.0				4.0
Coated groundwood	0.810	46.0			51.0				3.0
Tissue	1.044				40.0		9.0		51.0
Unbleached Kraft	1.044			81.8		0.4			17.8
Semichem Corrugating M	1.044		70.0						30.0
Recycled	1.044								100.0
Oth. Paper & Paperboard	1.044			5.0	86.9	0.1			8.0

Table 3.2.8. Estimated Wastepaper Allocation by End-use (tons and %). 1995.

Wastepaper Grade	Total App. Consumption	End-use	%	App. Consumption	Assumed Yield	Sec. Pulp
ONP	4,885,000	Newsprint	**46**	2,247,100	0.88	1,977,448
		P&W	**4**	195,400	0.86	168,044
		Tissue	**9**	439,650	0.84	369,306
		Unbl. K	8	390,800	0.92	359,536
		S CM	1	48,850	0.92	44,942
		Recycled	**31**	1,514,350	0.92	1,393,202
		Other K	1	48,850	0.92	44,942
OCC	16,512,000	Newsprint	3	495,360	0.88	435,917
		P&W	0	0	0.86	0
		Tissue	5	825,600	0.84	693,504
		Unbl. K	**22**	3,632,640	0.92	3,342,029
		S CM	10	1,651,200	0.92	1,519,104
		Recycled	**58**	9,576,960	0.92	8,810,803
		Other K	2	330,240	0.92	303,821
Pulp Substitutes	2,459,000	Newsprint	4	98,360	0.88	86,557
		P&W	**30**	737,700	0.86	634,422
		Tissue	**13**	319,670	0.84	268,523
		Unbl. K	20	491,800	0.92	452,456
		S CM	5	122,950	0.92	113,114
		Recycled	**18**	442,620	0.92	407,210
		Other K	10	245,900	0.92	226,228
High Grade Deink	3,003,000	Newsprint	2	60,060	0.88	52,853
		P&W	**22**	660,660	0.86	568,168
		Tissue	**43**	1,291,290	0.84	1,084,684
		Unbl. K	4	120,120	0.92	110,510
		S CM	2	60,060	0.92	55,255
		Recycled	24	720,720	0.92	663,062
		Other K	3	90,090	0.92	82,883
Mixed	4,529,000	Newsprint	2	90,580	0.88	79,710
		P&W	8	362,320	0.86	311,595
		Tissue	23	1,041,670	0.84	875,003
		Unbl. K	8	362,320	0.92	333,334
		S CM	1	45,290	0.92	41,667
		Recycled	55	2,490,950	0.92	2,291,674
		Other K	3	135,870	0.92	125,000

Chart 4.1.

PROJECTION OF WASTEPAPER CONSUMPTION AND RECOVERY TO THE YEAR 2002



In 1995, about 3 M metric tons (about 3.3 M short tons) were allocated to that end-use in the world (AF&PA, 1996). According to the same source, 25% of consumption corresponded to North America, 93% of that to the U. S. A.. It amounts up to 767,250 tons, of which roughly 80% came from bleached kraft, 10% from mechanic and 10% from bleached sulfite (AF&PA, 1996). Those quantities were subtracted from calculated apparent consumption to come up with net apparent consumption.

In 1990, as well as in 1985 and 1980, the author could not find data about the amount of pulp allocated to this end-use. Despite the fact that the amount is relatively small (less than 1% of all pulp consumed) and therefore has little influence on the rest of the results, it was considered in the calculations assuming that its relative share of pulp consumption has remained over the years of the study. Therefore, 1.9% of bleached kraft pulp, 1.2% of mechanic pulp and 8.1% of bleached kraft pulp consumed has been subtracted to come up with net apparent consumption. The rest of pulp grades have not been modified.

4. ASSUMPTIONS FOR THE 2002 SIMULATION

Wastepaper consumption in 2002 is projected using the spreadsheet framework developed to estimate wastepaper allocation and utilization in 1995. Production of paper in 2002 is projected in two steps. First, capacity is projected for the year 2002 and then a range of operating rates is used to simulate periods of low, average and high economic activity, providing three sets of production figures that constitute the three scenarios of the study. Then, pulp and paper requests are calculated according to assumed composition and wastepaper allocation coefficients. Finally, recovery of paper is estimated to allow comparisons between domestic wastepaper consumption and supply. Chart 4.1 characterizes the projection process.

The assumptions made to project wastepaper consumption for the year 2002 can therefore be grouped into five sets: capacity assumptions, operating rate assumptions, composition coefficient assumptions, foreign trade assumptions and recovery rate assumptions. The first three ones are used to project wastepaper demand by the industry, i.e. wastepaper apparent consumption. The last two ones provide the range of projected supply of wastepaper to be expected in 2002. Part of this supply is absorbed by the industry while the rest would be available to be used elsewhere or to be exported abroad.

Section 4.1 describes how paper capacity is projected from existing 1995 capacity. Projections made by two institutions, the A.F. and P.A. and the F.A.O. are used in combination with new capacity expansions announced by the industry itself. Since capacity additions are slow and usually announced well in advance, these projections should not be very far from reality.

Section 4.2 lists assumed operating rates. Operating rates relate production to capacity for any given paper grade studied. Production of paper is strongly cyclical depending on economic up and downturns. Therefore, operating rates tend to be in their lower level during recessions and peak on expansion years. The study of paper and economics developed in section 2.2 is used to identify operating rates and to relate them to prevalent economic conditions, resulting in a set of three figures, corresponding to low, average and high economic activity. Section 4.2 also provides projected production figures for every scenario and paper grade.

Section 4.3 lists composition coefficients for every paper grade to be used in the simulation. The only changes come from newsprint, which is assumed to increase its wastepaper share up to 40%, meeting legal targets, and some printing and writing grades. Paperboard grades other than recycled paperboard will not increase its share of secondary fiber since all new recycled capacity mostly corresponds to 100% recycled linerboard, corrugating medium or boxboard, which statistically are considered recycled paperboard.

Section 4.4 projects apparent consumption of paper, that is, production plus imports minus exports. Since the overall figure is the only one I need, it is estimated from the whole paper production projected for 2002 by using a range of coefficients which provide the ratio apparent consumption to production according to historic data.

Section 4.5 lists the range of recovery rates used in the study. The official 2000 goal of 50% can be projected to 2002 to be close to 51%, while the 1997 recovery rate was 45.1%. I use a full range of recovery rates from 45% to 52% to calculate recovery of paper.

4.1 Capacity Projection

Capacity is projected using the projections made by two organizations, the American Forest and Paper Association (AF&PA) and the Food and Agriculture Organization (FAO) of the UN. Both projections are obtained from industry surveys carried out on an annual basis. AF&PA projections were released in 1996 and project capacity up to 1999 by adding up new net capacity (expansions less replacements or idle machines) to existing capacity. FAO projections cover the 1997-2002 period. Years 1, 2 and 3 were projected by adding "committed plans" to existing capacity, while year 4 and year 5 projections include "expansions which are under active consideration or seem likely to come to stream". I contrast both projections. If there is no significant discrepancy between them I use the 2002 FAO capacity projections. If there is a significant gap, I use two additional sources of information to choose the one I think is more accurate. These two sources are the lists of expansions (committed or proposed) released by the US Pulp and Paper Mill Directory from 1994 to 1996 and by the Pulp and Paper 1996 North American Fact Book. I do not make my own projections except in some cases. If there is a significant discrepancy between the two projected figures and the list of new projects, I will remark it.

Newsprint

The historic trend for newsprint capacity shows a small decrease from 1992 (7,303,000 tons) to 1996 (7,194,000 tons). This decrease is coincident with a weak demand, a volatile price situation and an operating rate significantly lower than in the 1990-1992 period, which suggests an uncertain future for newsprint.

AF&PA projections basically suggest a stabilization of capacity (0.02% growth rate from 1996 to 1999), while FAO projections show a small capacity increase.

Although prospects are bad, the list of expansions suggests that capacity growth could be bigger than expected. According to the P and P Directory, two new newsprint projects and three new recycled newsprint projects were proposed or committed between 1997 and 1999, with a capacity of, respectively, 670,000 and 635,000 tpy. The North American Fact Book lists two newsprint projects and five new recycled newsprint projects with no start-up date, with a joint capacity of 1,183,000, close to the figure obtained by adding the two previous numbers. Even though much of this capacity, if finally built, will replace existing newsprint machines, as is the case of recycled capacity, it looks like the increase of capacity will be bigger than predicted and closer to FAO projections than to the conservative figures provided by AF&PA. The assumed capacity will be **7,289,000 tons**, which is about 16.14% of all projected paper capacity (less bleached and unbleached kraft papers included in, respectively, Other Paper and Paperboard and Unbleached Kraft), slightly under 1996 figures, which showed 17.12%, but consistent with the historic trend, down from 18.46% in 1992.

Table. 4.1.1. *Projected Newsprint Capacity. 1997-2002.*

Year	Capacity (000 tons)	Source
1996	7,194	*AF&PA*
Year	**Projected Capacity (000 tons)**	**Author**
1997	7,212	*AF&PA*
1998	7,184	AF&PA
1999	7,199	AF&PA
2000	7,289	FAO
2001	7,289	FAO
2002	7,289	FAO

Uncoated Groundwood

Capacity growth was strong from 1994 to 1996. After two years of healthy growth in production, economic conditions deteriorated and production fell in 1996. Operating rates went under 87% showing a situation of overcapacity that might threat short-term capacity additions.

AF&PA projections support a moderate capacity increase (1.3% capacity growth from 1996 to 1999), while FAO projections are very low, perhaps due to differences in classification criteria.

Table 4.1.2. ***Projected Uncoated Groundwood Capacity. 1997-2002.***

Year	Capacity (000 tons)	Source
1996	2,334	*AF&PA*
Year	**Projected Capacity (000 tons)**	**Author**
1997	2,359	*AF&PA*
1998	2,416	AF&PA
1999	2,427	AF&PA
2000	2,295	FAO
2001	2,295	FAO
2002	2,295	FAO

AF&PA projections seem to be consistent with announced projects. The P and P Directory does not list new projects. The North American Fact Book lists three proposed expansions with a total of 470,000 tons. Even though this capacity may or may not be built, it seems that AF&PA projections are more accurate than FAO's. Since AF&PA projections stop in 1999, I will project capacity assuming that the growth rate from 1996 to 1999 is the same than the growth rate from 1999 to 2002. The annual growth rate was 1.3%, so the assumed capacity will be **2,524,000 tons**, which is about 5.59% of all projected paper capacity, around 1996 figures (17.12%).

Uncoated Free-sheet

Markets for uncoated free-sheet weakened in 1995 and 1996, with operating rates close to 90%, the lowest rate since 1991, in the middle of a recession. Soft markets do not suggest strong capacity expansions.

AF&PA projections consider a slight capacity increase, with a 1.0% annual growth rate from 1996 to 1999. FAO projections are consistent with these figures, and actually projections for 1999 and 2000 are basically the same. Since FAO projections do not contemplate growth from 2000 onward, the 2002 number may be low, so I will get 2002 capacity using a 1% annual growth rate from 2000 to 2002.

Table 4.1.3. ***Projected Uncoated Free-sheet Capacity. 1997-2002.***

Year	Capacity (000 tons)	Source
1996	16,191	*AF&PA*
Year	**Projected Capacity (000 tons)**	**Author**
1997	16,196	*AF&PA*
1998	16,512	AF&PA
1999	16,688	AF&PA
2000	16,684	FAO
2001	16,684	FAO
2002	16,684	FAO

Both projections seem to be quite consistent with announced expansions. The P and P Directory mentions two new projects with a joint capacity of 655,000 tons. The North American Fact Book lists five expansions (although three of them are still under study) with a total capacity of 1,100,000 tons. The assumed capacity will be **17,200,000 tons**, which is about 38.10% of all projected paper capacity, down from 38.54% in 1996.

Coated Groundwood

The situation of CG seems to point out to a weak market. After a strong 1993, with operating rates around 100%, both capacity and production fell and operating rates went down to 84.2%. In this situation, strong capacity additions are not likely to be seen.

AF&PA projections foresee a moderate capacity increase (annual 1.2% growth from 1996 to 1999). FAO projections are very low, close to 1994 capacity figures. It may also be attributed to differences in classification criteria.

AF&PA projections seem again to be consistent with the expansion data. The P and P Directory lists just one new project (65,000 tpy). The North American Fact Book lists four proposed expansions with a total of 310,000 tpy, but three of them were yet under study and it is uncertain how many of them will be finally built and when. Since AF&PA projections stop in 1999, I will project capacity assuming that the growth rate from 1996 to 1999 is the same than the growth rate from 1999 to 2002. The annual growth rate was 1.2%, so the assumed capacity will be **4,863,000 tons.**, making 10.77% of total projected paper capacity, almost as in 1996 (10.80%)

Table 4.1.4. ***Projected Coated Groundwood Capacity. 1997-2002.***

Year	Capacity (000 tons)	Source
1996	4,539	*AF&PA*
Year	**Projected Capacity (000 tons)**	**Author**
1997	4,606	*AF&PA*
1998	4,635	AF&PA
1999	4,698	AF&PA
2000	4,474	FAO
2001	4,474	FAO
2002	4,474	FAO

Coated Free-sheet

The situation of CF was characterized by a strong capacity expansion for seven consecutive years (1990-1996) and a high production growth that lasted until 1994. In 1995 and 1996 production was outpaced by capacity growth and, therefore, operating rates went down to the 85% level.

Despite these indications of excess capacity, AF&PA projections anticipate a strong capacity increase (annual 3.7% growth from 1996 to 1999). FAO projections are lower, showing a more moderate increase.

Table 4.1.5. ***Projected Coated Free-sheet Capacity. 1997-2002.***

Year	Capacity (000 tons)	Source
1996	5,107	*AF&PA*
Year	**Projected Capacity (000 tons)**	**Author**
1997	5,488	*AF&PA*
1998	5,638	AF&PA
1999	5,688	AF&PA
2000	5,919	FAO
2001	5,919	FAO
2002	5,919	FAO

AF&PA projections seem to be high. The P and P Directory lists no new expansions in the sector. The North American Fact Book lists three proposed expansions with a total of 650,000 tpy, but two of them were actually under study. I will therefore take the FAO projections, which consider a lower growth rate (actually, if 5,688,000 were extrapolated to 2002 at an annual 3.6% growth rate, the figure would be 6,335,000). The assumed capacity will be **5,919,000 tons**, which will be 13.11% of total projected paper capacity, up from 12.87% in 1996 but again consistent with the historic upward trend (9.95% in 1990, 10.66% in 1992 and 11.45% in 1994).

Tissue

Tissue markets are traditionally stable, without big up-and-downs, since it is an inexpensive product whose consumption is linked to households and to population growth. Correspondingly, both capacity growth and production showed positive figures during most of the 90s and operating rates were stable and up in 1995.

AF&PA projections presume a significant capacity expansion (annual 2.0% growth from 1996 to 1999), bigger than it was from 1993 to 1995. FAO projections are consistent. Actually, when 1999 figures are projected to 2002 using a 2% increase rate, the result is 7,499,000, quite close to FAO's 7,353,000.

Table 4.1.6. ***Projected Tissue Capacity. 1997-2002.***

Year	Capacity (000 tons)	Source
1996	6,647	*AF&PA*
Year	**Projected Capacity (000 tons)**	**Author**
1997	6,783	*AF&PA*
1998	6,857	AF&PA
1999	7,060	AF&PA
2000	7,353	FAO
2001	7,353	FAO
2002	7,353	FAO

AF&PA projections seem to be a bit high. The P and P Directory lists two new expansions that will add 150,000 tpy. The North American Fact Book lists just one expansion project after 1996. I will take FAO projections, which are consistent with AF&PA figures. The assumed capacity will be **7,353,000 tons**, which will make 16.29% of all projected paper capacity, up from 15.82% in 1996.

Semichemical Corrugating Medium

Semichemical Corrugating capacity has remained almost unchanged for years, with 1996 capacity not far from that of 1990, while production was downhill for most of the 90s (1996 production was under 1988 levels). Even though capacity reductions allowed high operating rates, markets weakened again in 1995 and 1996, with the added threat of competition from recycled corrugating medium, which is included in the recycled paperboard category for statistical purposes.

Given these facts, is quite surprising that AF&PA projections anticipate a significant capacity expansion (annual 2.3% growth from 1996 to 1999). FAO projections are lower.

AF&PA projections are likely too high. The P and P Directory lists no new expansion projects, apart from those related to recycled corrugating medium (2) while the North American Fact Book lists just one expansion project (115,000 tpy) after 1996 and four more projects involving recycled corrugating medium. I will take the 1999 AF&PA projection as the 2002 figure, since the FAO figure may be excessively low. The assumed capacity will be **6,426,000 tons**, 9.90% of all projected paperboard capacity, down from 10.14% in 1996. Since the second half of the 80s, semichemical corrugating medium capacity share has decreased from 12.17 in 1986 to 11.89% in 1990, so 9.90% seems consistent with the historic trend.

Table 4.1.7. ***Projected Semichemical Corrugating Medium Capacity. 1997-2002.***

Year	Capacity (000 tons)	Source
1996	6,003	*AF&PA*
Year	**Projected Capacity (000 tons)**	**Author**
1997	6,235	*AF&PA*
1998	6,259	AF&PA
1999	6,426	AF&PA
2000	6,213	FAO
2001	6,213	FAO
2002	6,213	FAO

Unbleached Kraft

The situation of Unbleached Kraft is similar to the case of Semichemical Corrugating. Capacity slightly increased from 1992 to 1996 while production has actually decreased, pulling down operating rates which in 1996 where in the lowest point since 1982. Markets were weak, and the competition with recycled linerboard severely damaged the market position of the product.

According to these facts, AF&PA projections anticipate very modest capacity expansion (annual 0.8% growth from 1996 to 1999). FAO projections for year 2000 are consistent, but the figure for the year 2002 might be low.

Table 4.1.8. ***Projected Unbleached Kraft Capacity. 1997-2002.***

Year	Capacity (000 tons)	Source
1996	26,443	*AF&PA*
Year	**Projected Capacity (000 tons)**	**Author**
1997	26,604	*AF&PA*
1998	26,772	AF&PA
1999	27,060	AF&PA
2000	26,935	FAO
2001	26,935	FAO
2002	26,935	FAO

AF&PA low projections seem to be consistent with data. The P and P Directory lists no new expansion projects, except those related to recycled linerboard (5) while the North American Fact Book lists just two expansion projects (360,000 tpy) after 1996 and six more projects involving recycled linerboard. I will project capacity assuming that the growth rate from 1996 to 1999 is the same than the growth rate from 1999 to 2002. The annual growth rate was 0.8%, so the assumed capacity in 2002 will be **27,691,000 tons**. That means 42.68% of all projected paperboard capacity, down from 44.64% in 1996 and consistent with its historic trend (49.03% in 1984, 48.72% in 1990, 47.58% in 1993, and 46.35% in 1995).

Recycled Paperboard

Recycled paperboard experienced a strong growth since the beginning of the 90s, both in terms of capacity and production, albeit capacity usually has outpaced production growth driving operating rates down. In 1996, capacity increased more than 15% as a number of new recycled linerboard machines came on-line. Markets seem strong, although subjected to the chronic volatility of wastepaper prices.

According to the situation, AF&PA projections anticipate a strong capacity expansion (annual 2.9% growth from 1996 to 1999). FAO projections are not available, since its classification differs from the criteria used by the AF&PA and therefore both projections are not comparable, as it happens with the section dedicated to Other Paper and Paperboard.

Table 4.1.9. *Projected Recycled Paperboard Capacity. 1997-2002.*

Year	Capacity (000 tons)	Source
1996	16,124	*AF&PA*
Year	**Projected Capacity (000 tons)**	**Author**
1997	16,992	*AF&PA*
1998	17,390	AF&PA
1999	17,584	AF&PA
2000	n.a.	FAO
2001	n.a.	FAO
2002	n.a.	FAO

The strong expansion anticipated by AF&PA is corroborated by actual data. The P and P Directory lists five new projects after 1996 (when five new recycled linerboard machines were added), including recycled corrugating medium and containerboard, with a total capacity of 905,000 tpy. It is likely that the trend will sustain, at least for a few years, and therefore I will project capacity assuming that the growth rate from 1996 to 1999 is the same than the growth rate from 1999 to 2002. The annual growth rate was 0.8%, so the assumed capacity in 2002 will be **19,176,000 tons**, making about 29.56% of all projected paperboard capacity, up from 27.22% in 1996. This increase shows the positive historic trend of the category, up from 20.26% in 1990, 22.79% in 1993 and 24.70% in 1995.

Other Paper and Paperboard

During the 1991-1996 period, this category observed small but sustained capacity and production growth, and operating rates remained low but fairly stable in the vicinity 89%.

AF&PA projections also anticipate a moderate capacity expansion (annual 1.4% growth from 1996 to 1999). FAO projections are not available, since its classification differs from the criteria used by the AF&PA and therefore both projections are not comparable.

Table 4.1.10. *Projected Other Paper and Paperboard Capacity. 1997-2002.*

Year	Capacity (000 tons)	Source
1996	10,660	*AF&PA*
Year	**Projected Capacity (000 tons)**	**Author**
1997	10,817	*AF&PA*
1998	11,001	AF&PA
1999	11,115	AF&PA
2000	n.a.	FAO
2001	n.a.	FAO
2002	n.a.	FAO

The P and P Directory lists just a small expansion project after 1996. Since it is likely that the category would keep growing at a moderate rate, I will project capacity assuming that the growth rate from 1996 to 1999 is the same than the growth rate from 1999 to 2002. The annual growth rate was 1.4%, so the assumed capacity in 2002 will be **11,589,000 tons**, which makes 17.86% of all projected paperboard capacity, slightly down from 18.00% in 1996 and consistent with the negative historic trend (19.71% in 1985, 19.14% in 1990, 18.36% in 1995).

4.2 Operating Rates

The Operating Rate is given by the ratio production to capacity, and measures the degree of utilization of capacity. It is strongly related to the economic situation of the country. Tables 2.2.3 to 2.2.11 in the Economic Background section list complete historical operating rates for all grades analyzed. Rates peak on expansion periods and significantly decrease during recessions. I will use average values to estimate operating rates excluding the 1980-1984 period, whose low values pull down the average. Therefore, I will assume that operating rates under average

Announced New or Proposed Expansions. 1997-1999.

Company	Location	Grade	New capacity	Startup
Boise Cascade	Jackson, Ala.	UFS	330,000	1997
Willamette Industries	Hawesville, Ky.	UFS	325,000	1998
Kimberly-Clark	Owensboro, Ky.	Tissue	80,000	1999
Kimberly-Clark	Beech Island, SC.	Tissue	70,000	1999
Gulf States Paper Corp.	Demopolis, Ala.	SBS	30,000	1998
Evergreen Pulp & Paper Co.	Poughkeepsie, Ny.	Rec Newsprint	300,000	1998
NYC Paper Mills	Bronx, Ny.	Rec Newsprint	200,000	1998
Enviroprint LLC	lowell, Ma.	Rec Newsprint	135,000	1998
Cedar River Paper Co.	Cedar Rapids, Ia.	Rec Linerboard	320,000	1996
Georgia Pacific	Big Island, Va.	Rec Linerboard	215,000	1996
Corrugated Services	Forney, Tx.	Rec Linerboard	150,000	1996
MacMillan Bloedel Inc.	Henderson, Ky.	Rec Linerboard	140,000	1996
Georgia Pacific	Toledo, Or.	Rec Linerboard	110,000	1996
International Paper	Mansfield, La.	Rec Containerboard	429,000	1996
Pratt Industries	New York City, Ny.	Rec Containerboard	200,000	1997
Stone Container Corp.	Snowflake, Ariz.	Rec CM	280,000	1998
Mead Corp.	Stevenson, Ala.	Rec CM	225,000	1997
Boundary Paper Co.	Sumas, Wa.	Rec CM	200,000	1997
Southern Newsprint	Longview, Tx.	Newsprint	500,000	1998
Stone Container Corp.	Snowflake, Ariz.	Newsprint	170,000	1998
Consolidated Papers	Wi.	LWC	65,000	1996

Source: 1993-1996. Lockwood-Post's Directory of the Pulp, paper and Allied Trades
Replacements are not included if capacity does not increase
New mills that produce deinked pulp are not included

conditions will correspond to the average value of those of the 1985-1995 period. Low economic conditions are identified for the years 1985 and 1989-1992, and therefore the average operating rate during those years will provide the low estimate. The average operating rate for 1986-1988 and 1993-1995 will provide the high estimate. Results appear in Table 4.2.1. At the end of the section, table 4.2.2. provides production for every grade for each scenario. Since projections released by the Congressional Budget Office are pessimistic, the low and average scenarios seem more likely than the high one.

Table 4.2.1. ***Projected Operating Rates. 2002.***

Grade	Low	Average	High
Newsprint	96.3	96.7	*96.9*
Uncoated Groundwood	89.6	91.8	*93.7*
Uncoated Free-sheet	90.6	92.4	*93.9*
Coated Groundwood	93.0	94.5	*95.7*
Coated Free-sheet	88.0	90.3	*92.2*
Tissue	93.5	94.1	*94.6*
Semichemical Corrugating Medium	96.1	96.6	*97.0*
Unbleached Kraft	93.1	94.0	*94.8*
Recycled Paperboard	89.4	91.5	*93.3*
Other Paper and Paperboard	88.3	88.9	*89.4*

Table 4.2.2. ***Projected Paper and Paperboard Production. 2002.***

Grade	Low	Average	High
Newsprint	7,019,307	7,048,463	7,063,041
Uncoated Free-sheet	15,583,200	15,892,800	16,150,800
Uncoated Groundwood	2,261,504	2,317,032	2,364,988
Coated Free-sheet	5,208,720	5,344,857	5,457,318
Coated Groundwood	4,522,590	4,595,535	4,653,891
Tissue	6,875,055	6,919,173	6,955,938
Unbleached Kraft	25,780,321	26,029,540	26,251,068
Semichemical Corrugating Medium	6,175,386	6,207,516	6,233,220
Recycled Paperboard	17,143,344	17,546,040	17,891,208
Other Paper and Paperboard	10,233,087	10,302,621	10,360,566

4.3 Composition Coefficients

The composition assumed in 2002 is mostly similar to that of 1995. There are three changes. First of all, secondary fiber share in newsprint is raised up to 40%, since that is the ultimate goal of many legislative initiatives. I have also considered the strong addition of recycled newsprint capacity since 1996. Actually, if all new recycled capacity announced were built in substitution of already-existing woodpulp newsprint capacity, the share of recycled fiber in newsprint would be around 40%.

The second change affects uncoated printing grades, whose secondary fiber share has been increased up to 10% from 9% in both cases, to account for new addition of recycled capacity in both grades. Coated grades have not been changed, and it is not likely a significant increase of secondary fiber in them, due to quality concerns. Share of tissue was already high, and the share of secondary fiber in paperboard was not changed assumed that all new recycled capacity would add to the Recycled Paperboard category, instead of increasing the share of secondary fiber in the other three paperboard categories. Composition coefficients appear in Table 4.3.1.

The origin of the secondary fiber allocated to every paper grade is the same as in 1995 (see Table 4.3.2.). The ratio pulp to paper is also the same for every paper grade, as it is the yield of re-pulping and de-inking. Actually, if those processes were more efficient, i.e. those relations were higher, wastepaper needs would decrease.

Table 4.3.1. Assumed Composition Coefficients. 2002 (% of all pulp needed)

	Mechanical	Semichemical	Unbld. Kraft	Bld. Kraft	Unbld. Sulfite	Bld. Sulfite	Other Pulps	Secondy.
Newsprint	44.0			16.0				40.0
Uncoated freesheet			2.0	84.8		2.0	1.2	10.0
Uncoated groundwood	57.0			33.0				10.0
Coated freesheet				96.0				4.0
Coated groundwood	46.0			51.0				3.0
Tissue				40.0		9.0		51.0
Unbleached Kraft			81.8		0.4			17.8
Semichem Corrugating M		70.0						30.0
Recycled								100.0
Oth. Paper & Paperboard				86.9	0.1			8.0

Table 4.3.2. Assumed Origin of Secondary Fiber. (As a % of secondary fiber consumption)

	ONP	OCC	Pulp Substitutes	High Grade Deink	Mixed
Newsprint	75.0	16.5	3.2	2.0	3.3
P&W	9.9	0.0	37.7	33.7	18.7
Tissue	11.2	21.1	8.2	33.0	26.5
Unbleached Kraft	7.8	72.7	9.8	2.4	7.3
Semichem Corrugating M	2.5	85.6	6.3	3.1	2.5
Recycled	10.3	64.9	3.0	4.9	16.9
Oth. Paper & Paperboard	5.7	38.8	28.9	10.6	16.0

4.4 Apparent Consumption

An estimation of apparent consumption of paper and paperboard in 2002 is needed to project recovery, since the recovery rate is defined as the ratio between wastepaper recovered and apparent consumption of paper and paperboard. Table 4.4.1 shows the ratio apparent consumption to production of paper and paperboard for the US between 1980 and 1995. I will use the ratio, which relates the two overall figures, instead of making individual predictions about imports and exports of every grade which are more susceptible to variation and uncertainty.

Table 4.4.1. ***Apparent Consumption/Production Ratio of Paper and Paperboard. US. 1980-1995***

Year	Ratio
1980	1.061
1981	1.066
1982	1.064
1983	1.068
1984	1.096
1985	1.106
1986	1.098
1987	1.103
1988	1.103
1989	1.095
1990	1.084
1991	1.059
1992	1.058
1993	1.074
1994	1.072
1995	1.074

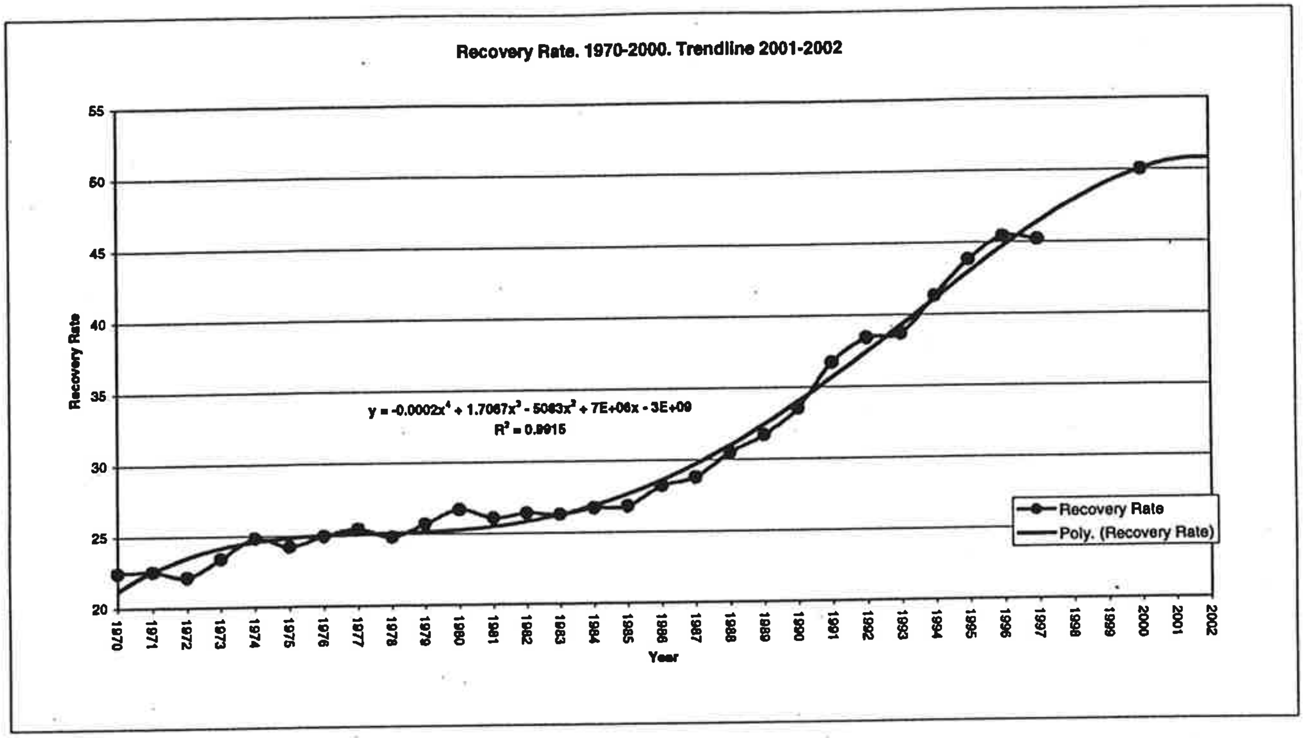
Apparent consumption is obtained by adding imports to production and subtracting exports, and it is sometimes referred as new supply. When imports grow in relation to exports, the ratio tends to increase, as it happened with a strong dollar in 1984-1985, while it goes down when imports decrease in relation to exports, as it happened in the early 90s. Since imports in the US tend to decrease in relative terms as domestic production increases its market share, the ratio has tended to diminish during the last years, moving around 1.06 to 1.075 in the 90s. Since I can not predict the extent of the variation, I will assume the two extremes. A low international trade scenario with a 1.060 ratio and a more significant foreign sector with a 1.075 value.

4.5. Recovery Rate

The A.F. and P.A. has the goal of recovering 50% of all paper and paperboard consumed in the US in year 2000. Projecting this figure to 2002, the recovery goal would be around 51%. However, to consider a wider range of possibilities, I will use a range of recovery goals from 45% (in 1997, the recovery rate was 45.1%) to 52%.

5. SIMULATION 2002

The 2002 spreadsheet is slightly different from the 1995 spreadsheet. There are no actual data to compare to. No attempt has been made to anticipate pulp apparent consumption since that would involve pulp capacity, operating rates and foreign trade projections that would only add additional uncertainty to the study. Instead, the composition of paper grades in 1995 and the allocation of wastepaper grades has been assumed unchanged (with several exceptions) while paper production has been increased to check the effect of new demands on 1995 industry structures. Thereafter, the spreadsheet calculates new pulp requests that could meet the projected 2002 demand according to the share of pulp input in 1995 (composition coefficients). From that calculation, secondary pulp requirements are derived, which are then split into five origins (ONP, OCC, pulp substitutes, high grade deinking, mixed wastepaper) according to the wastepaper allocation estimated in 1995. Finally, secondary pulp requirements by wastepaper grade are translated into wastepaper consumption by using 1995 yield coefficients. The figures



Recovery Rate. 1970-2000. Trendline 2001-2002
55
50
45
40
35
30
25
20
Recovery Rate
y = -0.0002x⁴ + 1.7067x³ - 5083x² + 7E+06x - 3E+09
R² = 0.9915
Recovery Rate
Poly. (Recovery Rate)
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
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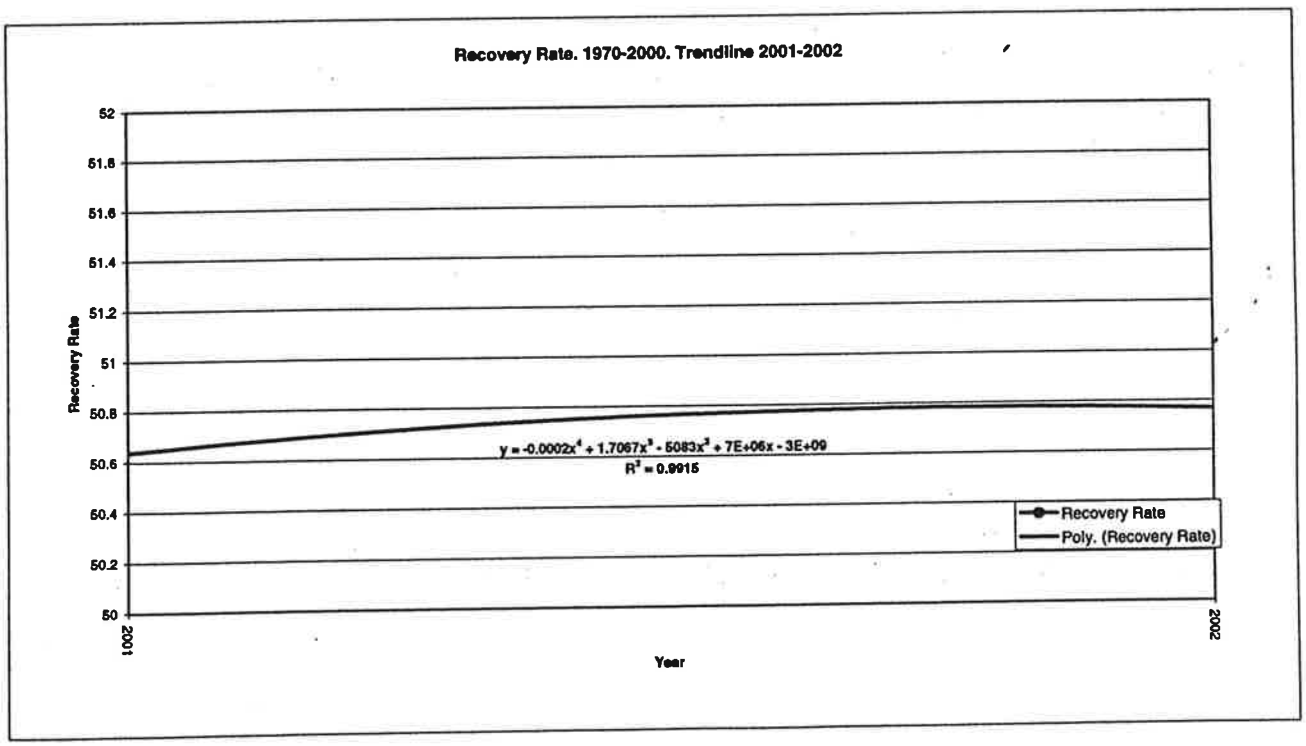
2000
2001
2002
Year



Recovery Rate. 1970-2000. Trendline 2001-2002
52
51.8
51.6
51.4
51.2
51
50.8
50.6
50.4
50.2
50
Recovery Rate
y = -0.0002x⁴ + 1.7067x³ - 5083x² + 7E+06x - 3E+09
R² = 0.9915
Recovery Rate
Poly. (Recovery Rate)
2001
2002
Year

obtained are then grouped both by wastepaper grade and by end-use and they constitute the first result of the spreadsheet. In a second stage, wastepaper consumption is compared to projected wastepaper recovery to assess the amount of wastepaper available for uses other than paper and paperboard production like molded products, construction or export markets.

The spreadsheet can be divided into two sections.

Wastepaper Consumption

Wastepaper consumption is calculated in two steps. First, projected values of production (for each one of the three scenarios) are multiplied by the 1995 pulp to paper ratio to calculate the pulp required to furnish them. Pulp requirements (by paper grade) are then multiplied by the assumed composition coefficients (See section 4.3) to calculate how much is derived from virgin pulp (by grade) and how much corresponds to secondary fiber.

Once the secondary fiber consumption is calculated, which is overall consumption, there is a second stage where this figure is multiplied by a set of five coefficients (derived from the 1995 estimated allocation), which results in five figures. Each of them corresponds to the amount of secondary fiber used in a certain paper grade coming from a certain wastepaper grade. This quantity is then multiplied by the inverse of the 1995 yield coefficient to calculate actual wastepaper consumption for every wastepaper grade and end-use. Results are presented by wastepaper grade and by end-use and compared to 1980, 1985, 1990 and 1995 figures in section 5.2.

Wastepaper Available for Other Uses

Wastepaper available for other uses is calculated by subtracting projected wastepaper consumption from projected recovery of wastepaper. Projected recovery is calculated in two steps. First of all, apparent consumption of paper is estimated by multiplying overall paper and paperboard production by a ratio (see section 4.4). Two apparent consumption figures are calculated to account for a high and low foreign market. Production and wastepaper apparent consumption will be taken from the Average Scenario, since the results are barely different when the other two are employed. Apparent consumption of paper and chosen recovery rates scenarios result in much more significant differences.

The second step involves multiplying apparent consumption of paper and paperboard by a recovery rate (I will test a range of them) to calculate wastepaper recovery. Recovery is split into five wastepaper grades according to the 1995 share. This share has been quite stable over the years and it should not experience significant changes in the short term. Finally, wastepaper consumed, by grade, is subtracted from wastepaper recovered, also by grade. Results appear in section 5.3.

6. DISCUSSION

6.1. Highlights

Results derived from projections can be summarized in several key points, before further discussion.

1. Wastepaper consumption will grow in the range of 20.1-23.8% from 1995 to 2002. By wastepaper grade, the highest growth will correspond to mixed papers (23-27%), followed by OCC (21.4-25.3%), while ONP, pulp substitutes and high grade deinking consumption growth slows down. By end-use, the highest demand increase will come from recycled paperboard (31.9-37.7%), followed by printing and writing grades (19.1-23.6%), newsprint, tissue, and the rest of paperboard grades.

2. Wastepaper consumption will not grow in the 1995-2002 period as fast as it did during the 1985-1990 period (32.8%) and especially from 1990 to 1995 (44.4%).

3. Projected paper and paperboard production growth from 1995 to 2002 will be in the range of 10.3-13.2%. The higher estimate is lower than production growth rates from 1985 to 1990 (17.1%) and comparable to those from

Table 5.2.1. ***Paper Production (tons). Historic 1980-1995. Projection 2002.***

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
Newsprint	4,672,300	5,427,700	6,610,500	7,001,800	7,019,307	7,048,463	7,063,041
Uncoated Free-sheet	9,330,500	11,067,000	13,028,700	14,480,200	15,583,200	15,892,800	16,150,800
Uncoated Groundwood	1,498,800	1,520,900	1,805,800	2,129,600	2,261,504	2,317,032	2,364,988
Coated Free-sheet	2,113,900	2,481,700	3,302,700	4,371,400	5,208,720	5,344,857	5,457,318
Coated Groundwood	2,664,700	3,393,400	4,233,200	4,424,000	4,522,590	4,595,535	4,653,891
Tissue	4,438,500	4,940,500	5,802,400	6,210,300	6,875,055	6,919,173	6,955,938
Unbleached Kraft	19,110,800	19,614,100	22,734,300	24,717,100	25,780,321	26,029,540	26,251,068
Semichemical Corrugating Medium	4,724,000	5,088,000	5,640,000	5,662,000	6,175,386	6,207,516	6,233,220
Recycled Paperboard	7,071,000	7,555,000	8,921,000	12,977,000	17,143,344	17,546,040	17,891,208
Other Paper and Paperboard	8,061,700	7,594,800	8,364,300	9,377,000	10,233,087	10,302,621	10,360,566
Total	63,686,200	68,683,100	80,442,900	91,350,400	100,802,514	102,203,577	103,382,038

Table 5.2.2. ***Paper Production (% change). Historic 1980-1995. Projection 2002.***

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
Newsprint		16.2	21.8	5.9	0.3	0.7	0.9
Uncoated Free-sheet		18.6	17.7	11.1	7.6	9.8	11.5
Uncoated Groundwood		1.5	18.7	17.9	6.2	8.8	11.1
Coated Free-sheet		17.4	33.1	32.4	19.2	22.3	24.8
Coated Groundwood		27.3	24.7	4.5	2.2	3.9	5.2
Tissue		11.3	17.4	7.0	10.7	11.4	12.0
Unbleached Kraft		2.6	15.9	8.7	4.3	5.3	6.2
Semichemical Corrugating Medium		7.7	10.8	0.4	9.1	9.6	10.1
Recycled Paperboard		6.8	18.1	45.5	32.1	35.2	37.9
Other Paper and Paperboard		-5.8	10.1	12.1	9.1	9.9	10.5
Total		**7.8**	**17.1**	**13.6**	**10.3**	**11.9**	**13.2**

Table 5.2.3. *Wastepaper Consumption by End-use (000 tons). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint	1,040	1,277	2,093	2,991	3,331	3,345	3,352
To P & W	770	905	1,156	1,956	2,329	2,377	2,418
To Tissue	1,670	1,944	2,959	3,918	4,358	4,386	4,409
To Unbleached Kraft	1,954	2,204	3,284	4,998	5,207	5,258	5,302
To Semichemical Corrugating M	1,202	1,397	1,645	1,928	2,102	2,113	2,122
To Recycled Paperboard	7,862	8,476	10,018	14,746	19,454	19,911	20,302
To Other Paper & Paperboard	423	169	580	851	929	935	940
Total	14,921	16,372	21,735	31,388	37,710	38,325	38,845

Table 5.2.4. *Wastepaper Consumption Growth (% change). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint		22.8	63.9	42.9	11.4	11.8	12.1
To P & W		17.5	27.7	69.2	19.1	21.5	23.6
To Tissue		16.4	52.2	32.4	11.2	11.9	12.5
To Unbleached Kraft		12.8	49.0	52.2	4.2	5.2	6.1
To Semichemical Corrugating M		16.2	17.8	17.2	9.0	9.6	10.1
To Recycled Paperboard		7.8	18.2	47.2	31.9	35.0	37.7
To Other Paper & Paperboard		-60.0	243.2	46.7	9.2	9.9	10.5
Total		9.7	32.8	44.4	20.1	22.1	23.8

Table 5.2.5. *Wastepaper Consumption Share by End-Use (%). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint	7.0	7.8	9.6	9.5	8.8	8.7	8.6
To P & W	5.2	5.5	5.3	6.2	6.2	6.2	6.2
To Tissue	11.2	11.9	13.6	12.5	11.6	11.4	11.4
To Unbleached Kraft	13.1	13.5	15.1	15.9	13.8	13.7	13.6
To Semichemical Corrugating M	8.1	8.5	7.6	6.1	5.6	5.5	5.5
To Recycled Paperboard	52.7	51.8	46.1	47.0	51.6	52.0	52.3
To Other Paper & Paperboard	2.8	1.0	2.7	2.7	2.5	2.4	2.4
Total	100	100	100	100	100	100	100

Table 5.2.6. ***Wastepaper Consumption by Wtp. Grade (000 tons). Estimation 1980-1995. Projection 2002.***

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP	2,391	2,696	3,811	4,885	5,732	5,802	5,858
OCC	6,866	7,899	10,687	16,512	20,041	20,394	20,696
Pulp Substitutes	2,254	2,494	2,732	2,459	2,837	2,879	2,914
High Grade Deinking	1,142	1,381	2,000	3,003	3,531	3,582	3,624
Mixed Paper	2,268	1,902	2,505	4,529	5,569	5,668	5,753
Total	14,921	16,372	21,735	31,388	37,710	38,325	38,845

Table 5.2.7. ***Wastepaper Consumption Growth by Grade (% change). Estimation 1980-1995. Projection 2002.***

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP		12.8	41.4	28.2	17.3	18.8	19.9
OCC		15.0	35.3	54.5	21.4	23.5	25.3
Pulp Substitutes		10.6	9.5	-10.0	15.4	17.1	18.5
High Grade Deinking		20.9	44.8	50.2	17.6	19.3	20.7
Mixed Paper		-16.1	31.7	80.8	23.0	25.1	27.0
Total		9.7	32.8	44.4	20.1	22.1	23.8

Table 5.2.8. ***Wastepaper Consumption Share by Wtp. Grade (%). Estimation 1980-1995. Projection 2002.***

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP	16.0	16.5	17.5	15.6	15.2	15.1	15.1
OCC	46.0	48.2	49.2	52.6	53.1	53.2	53.3
Pulp Substitutes	15.1	15.2	12.6	7.8	7.5	7.5	7.5
High Grade Deinking	7.7	8.4	9.2	9.6	9.4	9.3	9.3
Mixed Paper	15.2	11.6	11.5	14.4	14.8	14.8	14.8
Total	100	100	100	100	100	100	100

Table 5.2.9. *Newsprint. Wastepaper input by grade (000 tons). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP	789	1,159	1,448	2,247	2,498	2,509	2,514
OCC	206	79	427	495	550	552	553
Pulp Substitutes	23	25	82	98	107	107	107
High Grade Deinking	23	13	60	60	67	67	67
Mixed Paper	0	0	75	91	110	110	111
Total	1,041	1,276	2,092	2,991	3,332	3,345	3,352

Table 5.2.10. *Newsprint. Wtp input by grade (% of all wastep. used). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP	76	91	69	75	75	75	75
OCC	20	6	20	17	17	17	16
Pulp Substitutes	2	2	4	3	3	3	3
High Grade Deinking	2	1	3	2	2	2	2
Mixed Paper	0	0	4	3	3	3	3
Total	100	100	100	100	100	100	100

Table 5.2.11. *Newsprint. Wastepaper Utilization Growth (% change). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP		46.9	24.9	55.2	11.2	11.7	11.9
OCC		-61.7	440.5	15.9	11.1	11.5	11.7
Pulp Substitutes		8.7	228.0	19.5	9.2	9.2	9.2
High Grade Deinking		-43.5	361.5	0.0	11.7	11.7	11.7
Mixed Paper				21.3	20.9	20.9	22.0
Total		**22.6**	**63.9**	**43.0**	**11.4**	**11.8**	**12.1**

Table 5.1.12. ***P & W. Wastepaper input by grade (000 tons). Estimation 1980-1995. Projection 2002.***

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP	0	0	0	195	231	235	239
OCC	0	0	0	0	0	0	0
Pulp Substitutes	518	574	656	738	878	896	911
High Grade Deinking	251	331	500	661	785	801	815
Mixed Paper	0	0	0	362	436	445	452
Total	769	905	1,156	1,956	2,330	2,377	2,417

Table 5.2.13. ***P & W. Wastepaper input by grade (% of all wtp. used). Estimation 1980-1995. Projection 2002.***

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP	0	0	0	10	10	10	10
OCC	0	0	0	0	0	0	0
Pulp Substitutes	67	63	57	38	38	38	38
High Grade Deinking	33	37	43	34	34	34	34
Mixed Paper	0	0	0	19	19	19	19
Total	100	100	100	100	100	100	100

Table 5.2.14. ***P & W. Wastepaper Utilization Growth (% change). Estimation 1980-1995. Projection 2002.***

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP					18.5	20.5	22.6
OCC							
Pulp Substitutes		10.8	14.3	12.5	19.0	21.4	23.4
High Grade Deinking		31.9	51.1	32.2	18.8	21.2	23.3
Mixed Paper					20.4	22.9	24.9
Total		**17.7**	**27.7**	**69.2**	**19.1**	**21.5**	**23.6**

Table 5.2.15. ***Tissue. Wastepaper input by grade (000 tons). Estimation 1980-1995. Projection 2002.***

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP	72	108	457	440	488	491	494
OCC	206	237	214	826	919	925	930
Pulp Substitutes	879	923	1,147	320	357	360	362
High Grade Deinking	445	525	840	1,291	1,438	1,447	1,455
Mixed Paper	68	152	301	1,042	1,154	1,162	1,168
Total	1,670	1,945	2,959	3,919	4,356	4,385	4,409

Table 5.2.16. ***Tissue. Wtp. input by grade (% of all wastepaper used). Estimation 1980-1995. Projection 2002.***

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP	4	6	15	11	11	11	11
OCC	12	12	7	21	21	21	21
Pulp Substitutes	53	47	39	8	8	8	8
High Grade Deinking	27	27	28	33	33	33	33
Mixed Paper	4	8	10	27	26	26	26
Total	100	100	100	100	100	100	100

Table 5.2.17. ***Tissue. Wastepaper Utilization Growth (% change). Estimation 1980-1995. Projection 2002.***

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP		50.0	323.1	-3.7	10.9	11.6	12.3
OCC		15.0	-9.7	286.0	11.3	12.0	12.6
Pulp Substitutes		5.0	24.3	-72.1	11.6	12.5	13.1
High Grade Deinking		18.0	60.0	53.7	11.4	12.1	12.7
Mixed Paper		123.5	98.0	246.2	10.7	11.5	12.1
Total		**16.5**	**52.1**	**32.4**	**11.2**	**11.9**	**12.5**

Table 5.2.18. *Unbleached Kraft. Wastepaper input by grade (000 tons). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP	383	270	381	391	406	410	414
OCC	824	1,343	2,565	3,633	3,786	3,822	3,855
Pulp Substitutes	248	249	27	492	510	515	520
High Grade Deinking	114	152	60	120	125	126	127
Mixed Paper	386	190	250	362	380	383	387
Total	1,955	2,204	3,283	4,998	5,207	5,256	5,303

Table 5.2.19. *Unbleached Kraft. Wtp. input by grade (% of all wtp. used). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP	20	12	12	8	8	8	8
OCC	42	61	78	73	73	73	73
Pulp Substitutes	13	11	1	10	10	10	10
High Grade Deinking	6	7	2	2	2	2	2
Mixed Paper	20	9	8	7	7	7	7
Total	100	100	100	100	100	100	100

Table 5.2.20. *Unbleached Kraft. Wtp. Utilization Growth (% change). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP		-29.5	41.1	2.6	3.8	4.9	5.9
OCC		63.0	91.0	41.6	4.2	5.2	6.1
Pulp Substitutes		0.4	-89.2	1,722.2	3.7	4.7	5.7
High Grade Deinking		33.3	-60.5	100.0	4.2	5.0	5.8
Mixed Paper		-50.8	31.6	44.8	5.0	5.8	6.9
Total		**12.7**	**49.0**	**52.2**	**4.2**	**5.2**	**6.1**

Table 5.2.21. *Semichemical Corrugating Med. Wastepaper input by grade (000 tons). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP	24	54	76	49	53	53	53
OCC	1,099	1,343	1,496	1,651	1,780	1,809	1,816
Pulp Substitutes	23	0	27	123	132	133	134
High Grade Deinking	11	0	20	60	65	66	66
Mixed Paper	45	0	25	45	53	53	53
Total	1,202	1,397	1,644	1,928	2,083	2,114	2,122

Table 5.2.22. *Semichemical Corrugating Med. Wtp. input by grade (% of all wtp. used). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP	2	4	5	3	3	3	2
OCC	91	96	91	86	85	86	86
Pulp Substitutes	2	0	2	6	6	6	6
High Grade Deinking	1	0	1	3	3	3	3
Mixed Paper	4	0	2	2	3	3	2
Total	100	100	100	100	100	100	100

Table 5.2.23. *Semichemical Corrugating Med. Wtp. Utilization Growth (% change). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP		125.0	40.7	-35.5	8.2	8.2	8.2
OCC		22.2	11.4	10.4	7.8	9.6	10.0
Pulp Substitutes				355.6	7.3	8.1	8.9
High Grade Deinking				200.0	8.3	10.0	10.0
Mixed Paper				80.0	17.8	17.8	17.8
Total		**16.2**	**17.7**	**17.3**	**8.0**	**9.6**	**10.1**

Table 5.2.24. *Recycled Paperboard. Wastepaper input by grade (000 tons). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP	1,124	1,078	1,220	1,514	2,004	2,051	2,091
OCC	4,188	4,818	5,878	9,577	12,626	12,922	13,176
Pulp Substitutes	564	698	738	443	584	597	609
High Grade Deinking	286	359	480	721	953	976	995
Mixed Paper	1,701	1,522	1,703	2,491	3,288	3,365	3,431
Total	7,863	8,475	10,019	14,746	19,455	19,911	20,302

Table 5.2.25. *Rec. Paperboard. Wtp. input by grade (% of all wtp. used). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP	14	13	12	10	10	10	10
OCC	53	57	59	65	65	65	65
Pulp Substitutes	7	8	7	3	3	3	3
High Grade Deinking	4	4	5	5	5	5	5
Mixed Paper	22	18	17	17	17	17	17
Total	100	100	100	100	100	100	100

Table 5.2.26. *Recycled Paperboard. Wtp. Utilization Growth (% change). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP		-4.1	13.2	24.1	32.4	35.5	38.1
OCC		15.0	22.0	62.9	31.8	34.9	37.6
Pulp Substitutes		23.8	5.7	-40.0	31.8	34.8	37.5
High Grade Deinking		25.5	33.7	50.2	32.2	35.4	38.0
Mixed Paper		-10.5	11.9	46.3	32.0	35.1	37.7
Total		**7.8**	**18.2**	**47.2**	**31.9**	**35.0**	**37.7**

Table 5.2.27. ***Other Paper & Paperboard. Wastepaper input by grade (000 tons). Estimation 1980-1995. Projection 2002.***

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP	0	27	229	49	53	53	54
OCC	343	79	107	330	360	363	365
Pulp Substitutes	0	25	55	246	268	270	272
High Grade Deinking	11	0	40	90	98	99	100
Mixed Paper	68	38	150	136	149	150	150
Total	422	169	581	851	928	935	941

Table 5.2.28. ***Other Paper & Paperboard. Wtp. input by grade (% of all wtp. used). Estimation 1980-1995. Projection 2002.***

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP	0	16	39	6	6	6	6
OCC	81	47	18	39	39	39	39
Pulp Substitutes	0	15	9	29	29	29	29
High Grade Deinking	3	0	7	11	11	11	11
Mixed Paper	16	22	26	16	16	16	16
Total	100	100	100	100	100	100	100

Table 5.2.29. ***Other Paper & Paperboard. Wtp. Utilization Growth (% change). Estimation 1980-1995. Projection 2002.***

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
ONP			748.1	-78.6	8.2	8.2	10.2
OCC		-77.0	35.4	208.4	9.1	10.0	10.6
Pulp Substitutes			120.0	347.3	8.9	9.8	10.6
High Grade Deinking		-100.0		125.0	8.9	10.0	11.1
Mixed Paper		-44.1	294.7	-9.3	9.6	10.3	10.3
Total		**-60.0**	**243.8**	**46.5**	**9.0**	**9.9**	**10.6**

Table 5.2.30. *ONP Consumption by End-use (000 tons). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint	789	1,159	1,448	2,247	2,498	2,509	2,514
To P & W	0	0	0	195	231	235	239
To Tissue	72	108	457	440	488	491	494
To Unbleached Kraft	383	270	381	391	406	410	414
To Semichemical Corrugating M	24	54	76	49	53	53	53
To Recycled Paperboard	1,124	1,078	1,220	1,514	2,004	2,051	2,091
To Other Paper & Paperboard	0	27	229	49	53	53	54
Total	2,392	2,696	3,811	4,885	5,733	5,802	5,859

Table 5.2.31. *ONP Consumption by End-use (%). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint	33	43	38	46	44	43	43
To P & W	0	0	0	4	4	4	4
To Tissue	3	4	12	9	9	8	8
To Unbleached Kraft	16	10	10	8	7	7	7
To Semichemical Corrugating M	1	2	2	1	1	1	1
To Recycled Paperboard	47	40	32	31	35	35	36
To Other Paper & Paperboard	0	1	6	1	1	1	1
Total	100	100	100	100	100	100	100

Table 5.2.32. *ONP Cons. Growth by End-Use (% change). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint		46.9	24.9	55.2	11.2	11.7	11.9
To P & W					18.5	20.5	22.6
To Tissue		50.0	323.1	-3.7	10.9	11.6	12.3
To Unbleached Kraft		-29.5	41.1	2.6	3.8	4.9	5.9
To Semichemical Corrugating M		125.0	40.7	-35.5	8.2	8.2	8.2
To Recycled Paperboard		-4.1	13.2	24.1	32.4	35.5	38.1
To Other Paper & Paperboard			748.1	-78.6	8.2	8.2	10.2
Total		**12.7**	**41.4**	**28.2**	**17.4**	**18.8**	**19.9**

Table 5.2.33. *OCC. Consumption by End-use (000 tons). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint	206	79	427	495	550	552	553
To P & W	0	0	0	0	0	0	0
To Tissue	206	237	214	825	919	925	930
To Unbleached Kraft	824	1,343	2,565	3,633	3,786	3,822	3,855
To Semichemical Corrugating M	1,099	1,343	1,496	1,651	1,780	1,809	1,816
To Recycled Paperboard	4,188	4,818	5,878	9,577	12,626	12,922	13,176
To Other Paper & Paperboard	343	79	107	330	360	363	365
Total	6,866	7,899	10,687	16,511	20,021	20,393	20,695

Table 5.2.34. *OCC. Consumption by End-use (%). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint	3	1	4	3	3	3	3
To P & W	0	0	0	0	0	0	0
To Tissue	3	3	2	5	5	5	4
To Unbleached Kraft	12	17	24	22	19	19	19
To Semichemical Corrugating M	16	17	14	10	9	9	9
To Recycled Paperboard	61	61	55	58	63	63	64
To Other Paper & Paperboard	5	1	1	2	2	2	2
Total	100	100	100	100	100	100	100

Table 5.2.35. *OCC. Cons. Growth by End-Use (% change). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint		-61.7	440.5	15.9	11.1	11.5	11.7
To P & W							
To Tissue		15.0	-9.7	285.5	11.4	12.1	12.7
To Unbleached Kraft		63.0	91.0	41.6	4.2	5.2	6.1
To Semichemical Corrugating M		22.2	11.4	10.4	7.8	9.6	10.0
To Recycled Paperboard		15.0	22.0	62.9	31.8	34.9	37.6
To Other Paper & Paperboard		-77.0	35.4	208.4	9.1	10.0	10.6
Total		**15.0**	**35.3**	**54.5**	**21.3**	**23.5**	**25.3**

Table 5.2.36. *Pulp Subs. Consumption by End-use (000 tons). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint	23	25	82	98	107	107	107
To P & W	518	574	656	737	878	896	911
To Tissue	879	923	1,147	320	357	360	362
To Unbleached Kraft	248	249	27	492	510	515	520
To Semichemical Corrugating M	23	0	27	123	132	133	134
To Recycled Paperboard	564	698	738	443	584	597	609
To Other Paper & Paperboard	0	25	55	246	269	270	272
Total	2,255	2,494	2,732	2,459	2,837	2,878	2,915

Table 5.2.37. *Pulp Substitutes. Consumption by End-use (%). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint	1	1	3	4	4	4	4
To P & W	23	23	24	30	31	31	31
To Tissue	39	37	42	13	13	13	12
To Unbleached Kraft	11	10	1	20	18	18	18
To Semichemical Corrugating M	1	0	1	5	5	5	5
To Recycled Paperboard	25	28	27	18	21	21	21
To Other Paper & Paperboard	0	1	2	10	9	9	9
Total	100	100	100	100	100	100	100

Table 5.2.38. *Pulp Subs. Cons. Growth by End-Use (% change). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint		8.7	228.0	19.5	9.2	9.2	9.2
To P & W		10.8	14.3	12.3	19.1	21.6	23.6
To Tissue		5.0	24.3	-72.1	11.6	12.5	13.1
To Unbleached Kraft		0.4	-89.2	1,722.2	3.7	4.7	5.7
To Semichemical Corrugating M		-100.0		355.6	7.3	8.1	8.9
To Recycled Paperboard		23.8	5.7	-40.0	31.8	34.8	37.5
To Other Paper & Paperboard			120.0	347.3	9.3	9.8	10.6
Total		10.6	9.5	-10.0	15.4	17.0	18.5

Table 5.2.39. *High Grade Deinking. Cons. by End-use (000 tons). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint	23	14	60	60	67	67	67
To P & W	251	331	500	661	785	801	815
To Tissue	445	525	840	1,291	1,438	1,447	1,455
To Unbleached Kraft	114	152	60	120	125	126	127
To Semichemical Corrugating M	11	0	20	60	65	66	66
To Recycled Paperboard	286	360	480	721	953	976	995
To Other Paper & Paperboard	11	0	40	90	98	99	100
Total	1,141	1,382	2,000	3,003	3,531	3,582	3,625

Table 5.2.40. *High Grade Deinking. Consumption by End-use (%). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint	2	1	3	2	2	2	2
To P & W	22	24	25	22	22	22	22
To Tissue	39	38	42	43	41	40	40
To Unbleached Kraft	10	11	3	4	4	4	4
To Semichemical Corrugating M	1	0	1	2	2	2	2
To Recycled Paperboard	25	26	24	24	27	27	27
To Other Paper & Paperboard	1	0	2	3	3	3	3
Total	100	100	100	100	100	100	100

Table 5.2.41. *High Grade Deink. Cons. Growth by End-Use (% change). Estimation 1980-1995. Projection 2002.*

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint		-39.1	328.6	0.0	11.7	11.7	11.7
To P & W		31.9	51.1	32.2	18.8	21.2	23.3
To Tissue		18.0	60.0	53.7	11.4	12.1	12.7
To Unbleached Kraft		33.3	-60.5	100.0	4.2	5.0	5.8
To Semichemical Corrugating M				200.0	8.3	10.0	10.0
To Recycled Paperboard		25.9	33.3	50.2	32.2	35.4	38.0
To Other Paper & Paperboard				125.0	8.9	10.0	11.1
Total		**21.1**	**44.7**	**50.2**	**17.6**	**19.3**	**20.7**

Table 5.2.42. ***Mixed Paper. Cons. by End-use (000 tons). Estimation 1980-1995. Projection 2002.***

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint	0	0	75	91	110	110	111
To P & W	0	0	0	362	436	445	452
To Tissue	68	152	301	1,042	1,155	1,162	1,168
To Unbleached Kraft	386	190	251	362	380	384	387
To Semichemical Corrugating M	45	0	25	45	53	53	53
To Recycled Paperboard	1,701	1,522	1,703	2,491	3,288	3,365	3,431
To Other Paper & Paperboard	68	38	150	136	149	150	150
Total	2,268	1,902	2,505	4,529	5,571	5,669	5,752

Table 5.2.43. ***Mixed Paper. Consumption by End-use (%). Estimation 1980-1995. Projection 2002.***

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint	0	0	3	2	2	2	2
To P & W	0	0	0	8	8	8	8
To Tissue	3	8	12	23	21	20	20
To Unbleached Kraft	17	10	10	8	7	7	7
To Semichemical Corrugating M	2	0	1	1	1	1	1
To Recycled Paperboard	75	80	68	55	59	59	60
To Other Paper & Paperboard	3	2	6	3	3	3	3
Total	100	100	100	100	100	100	100

Table 5.2.44. ***Mixed Paper. Cons. Growth by End-Use (% change). Estimation 1980-1995. Projection 2002.***

	1980	1985	1990	1995	Low 2002	Average 2002	High 2002
To Newsprint				21.3	20.9	20.9	22.0
To P & W					20.4	22.9	24.9
To Tissue		123.5	98.0	246.2	10.8	11.5	12.1
To Unbleached Kraft		-50.8	32.1	44.2	5.0	6.1	6.9
To Semichemical Corrugating M		-100.0		80.0	17.8	17.8	17.8
To Recycled Paperboard		-10.5	11.9	46.3	32.0	35.1	37.7
To Other Paper & Paperboard		-44.1	294.7	-9.3	9.6	10.3	10.3
Total		**-16.1**	**31.7**	**80.8**	**23.0**	**25.2**	**27.0**

Table 5.3.1 Wastepaper Available for Other Uses. 2002.

ApCons/Prod Ratio	
1.060	
Apparent Consumption (tons)	
108,335,792	

Assumed Wastepaper Origin	
ONP	18%
OCC	49%
Pulp Substitutes	8%
High Grade Deink	9%
Mixed	16%

Wastepaper Grade	Wastepaper Apparent Consumption (tons)	Recovery (tons)				Wastepaper Available for Other Uses (tons)			
		Recovery Rate				Recovery Rate			
		45	46	47	48	45	46	47	48
All wastepaper	**38,325,150**	**48,751,106**	**49,834,464**	**50,917,822**	**52,001,180**	**10,425,956**	**11,509,314**	**12,592,672**	**13,676,030**
ONP	5,802,248	8,775,199	8,970,204	9,165,208	9,360,212	2,972,951	3,167,956	3,362,960	3,557,964
OCC	20,393,711	23,888,042	24,418,887	24,949,733	25,480,578	3,494,331	4,025,176	4,556,021	5,086,867
Pulp Substitutes	2,878,944	3,900,088	3,986,757	4,073,426	4,160,094	1,021,144	1,107,813	1,194,481	1,281,150
High Grade Deink	3,581,835	4,387,600	4,485,102	4,582,604	4,680,106	805,765	903,267	1,000,769	1,098,271
Mixed	5,668,412	7,800,177	7,973,514	8,146,852	8,320,189	2,131,765	2,305,103	2,478,440	2,651,777

Table 5.3.2 Wastepaper Available for Other Uses. 2002.

ApCons/Prod Ratio	
	1.060
Apparent Consumption (tons)	108,335,792

Assumed Wastepaper Origin	
ONP	18%
OCC	49%
Pulp Substitutes	8%
High Grade Deink	9%
Mixed	16%

Wastepaper Grade	Wastepaper Apparent Consumption (tons)	Recovery (tons)				Wastepaper Available for Other Uses (tons)			
		Recovery Rate				Recovery Rate			
		49	50	51	52	49	50	51	52
All wastepaper	38,325,150	**53,084,538**	**54,167,896**	**55,251,254**	**56,334,612**	**14,759,388**	**15,842,746**	**16,926,104**	**18,009,462**
ONP	5,802,248	9,555,217	9,750,221	9,945,226	10,140,230	3,752,969	3,947,973	4,142,978	4,337,982
OCC	20,393,711	26,011,424	26,542,269	27,073,114	27,603,960	5,617,712	6,148,557	6,679,403	7,210,248
Pulp Substitutes	2,878,944	4,246,763	4,333,432	4,420,100	4,506,769	1,367,819	1,454,487	1,541,156	1,627,825
High Grade Deink	3,581,835	4,777,608	4,875,111	4,972,613	5,070,115	1,195,774	1,293,276	1,390,778	1,488,280
Mixed	5,668,412	8,493,526	8,666,863	8,840,201	9,013,538	2,825,114	2,998,452	3,171,789	3,345,126

Table 5.3.3 Wastepaper Available for Other Uses. 2002.

ApCons/Prod Ratio	
	1.075
Apparent Consumption (tons)	
	109,868,845

Assumed Wastepaper Origin	
ONP	18%
OCC	49%
Pulp Substitutes	8%
High Grade Deink	9%
Mixed	16%

Wastepaper Grade	Wastepaper Apparent Consumption (tons)	Recovery (tons)				Wastepaper Available for Other Uses (tons)			
		Recovery Rate				Recovery Rate			
		45	46	47	48	45	46	47	48
All wastepaper	**38,325,150**	**49,440,980**	**50,539,669**	**51,638,357**	**52,737,046**	**11,115,830**	**12,214,519**	**13,313,207**	**14,411,896**
ONP	5,802,248	8,899,376	9,097,140	9,294,904	9,492,668	3,097,129	3,294,892	3,492,656	3,690,420
OCC	20,393,711	24,226,080	24,764,438	25,302,795	25,841,152	3,832,369	4,370,726	4,909,084	5,447,441
Pulp Substitutes	2,878,944	3,955,278	4,043,174	4,131,069	4,218,964	1,076,334	1,164,229	1,252,124	1,340,019
High Grade Deink	3,581,835	4,449,688	4,548,570	4,647,452	4,746,334	867,853	966,735	1,065,617	1,164,499
Mixed	5,668,412	7,910,557	8,086,347	8,262,137	8,437,927	2,242,145	2,417,935	2,593,726	2,769,516

Table 5.3.4. Wastepaper Available for Uses other than Paper and Paperboard. 2002.

ApCons/Prod Ratio
1.075
Apparent Consumption (tons)
109,868,845

Assumed Wastepaper Origin	
ONP	18%
OCC	49%
Pulp Substitutes	8%
High Grade Deink	9%
Mixed	16%

Wastepaper Grade	Wastepaper Apparent Consumption (tons)	Recovery (tons)				Wastepaper Available for Other Uses (tons)			
		Recovery Rate				Recovery Rate			
		49	50	51	52	49	50	51	52
All wastepaper	**38,325,150**	**53,835,734**	**54,934,423**	**56,033,111**	**57,131,800**	**15,510,584**	**16,609,273**	**17,707,961**	**18,806,649**
ONP	5,802,248	9,690,432	9,888,196	10,085,960	10,283,724	3,888,184	4,085,948	4,283,712	4,481,476
OCC	20,393,711	26,379,510	26,917,867	27,456,224	27,994,582	5,985,798	6,524,156	7,062,513	7,600,870
Pulp Substitutes	2,878,944	4,306,859	4,394,754	4,482,649	4,570,544	1,427,914	1,515,809	1,603,705	1,691,600
High Grade Deink	3,581,835	4,845,216	4,944,098	5,042,980	5,141,862	1,263,381	1,362,263	1,461,145	1,560,027
Mixed	5,668,412	8,613,717	8,789,508	8,965,298	9,141,088	2,945,306	3,121,096	3,296,886	3,472,676

4. 1990 to 1995 (13.6%), while the low-scenario figure is significantly lower. The 1980-1985 period remains as the lowest in terms of production growth (7.8%).

5. Wastepaper consumption growth will be higher than paper and paperboard consumption growth and therefore utilization rates and wastepaper as fiber input rates would increase from, respectively, 34.4% and 30.8% in 1995 to 37.4-37.6% and 33.5-33.7% in 2002.

6. Even though utilization rates increase by more than three percentage points, a 2002 recovery rate of 50% (up from 44% in 1995) will increase the amount of paper available for other uses, widening the gap between recovery and utilization. If the recovery rate in 2002 were the same as in 1995, wastepaper available for other uses would significantly decrease.

6.2. Wastepaper consumption

Traditional wastepaper consumers like tissue and especially unbleached kraft producers strongly increased their production from 1990 to 1995. Since the share of wastepaper in both grades significantly increased during that period, wastepaper needs experienced a dramatic increase, both in relative and absolute terms. Additionally, the substitution of virgin newsprint by recycled newsprint and the massive addition of recycled containerboard machines combined to increase wastepaper consumption in more than 44% from 1990 to 1995, with overall consumption reaching 31,300,000 tons.

It is not likely that wastepaper consumption will experience a similar growth in the 1995-2002. The big shift in wastepaper utilization trends has already taken place, especially for grades like newsprint, although some lesser consumers like printing and writing grades are expected to keep increasing their wastepaper input share. Since wastepaper share increases are limited by the assumptions made, most of new wastepaper consumption will come from production growth. However, the projected slowdowns in capacity growth for most grades greatly limit production growth and will likely decrease wastepaper consumption growth. The most notable exception comes from recycled paperboard. This grade, which alone consumes almost half of wastepaper used by the paper and paperboard industry, is expected to increase its production in the range of 32.1 to 37.9%. Since the composition of recycled paperboard is 100% recycled fiber, projected wastepaper consumption for this grade is expected to increase in the range of 31.9-37.7% from 1995 to 2002. All grades considered, total wastepaper consumption is projected to be around 37,700,000 to 38,800,000 tons in 2002, a 20.1-23.8% increase (See Tables 5.2.3 to 5.2.8).

As it has been said, production growth is not expected to be as strong as it was in the preceding periods, although under the high production scenario the overall growth rate will equal that of 1990-1995 (See Tables 5.2.1 to 5.2.2). This growth will be uneven, with some grades like recycled paperboard and some printing and writing well above the average, tissue close to the average (since its consumption is less affected by business cycles) and the rest of grades below projected average. Since wastepaper consumption growth will likely outpace paper production growth, the most visible result will be a significant increase on wastepaper utilization rates by the industry, reaching around 37.5% by 2002 compared to 34.4% in 1995. The effects of increased utilization of wastepaper could be negligible on wastepaper excess supply, however, if recovery rates keep growing at higher rates than utilization rates. That question will be addressed in the final section of this chapter.

By end-use

Recycled paperboard has traditionally been the main consumer of wastepaper in the industry. Throughout the study, it has been assumed a 100%-recycled fiber composition, so wastepaper consumption growth within the grade almost mirrors production growth rates. Although weak from 1980 to 1990, recycled paperboard production has outpaced overall paper and paperboard production growth rates from 1985 on. From 1990 to 1995, the category showed the highest production growth rate among those identified by the study (45.5%) which resulted in a 47.2% increase in wastepaper consumption.

Since its production is projected to grow significantly from 1995 to 2002, wastepaper allocated to this end-use will experience the most noteworthy growth among all end-uses, both in relative as well as in absolute terms.

Wastepaper consumption will increase in the range of 4,700,000 (31.9%) to 5,500,000 tons (37.7%) (See Tables 5.2.24 to 5.2.26). Among wastepaper sources, OCC is the most important one. Almost 65% percent of all wastepaper consumed in recycled paperboard mills, according to the assumptions derived from 1995 estimations, comes from old corrugated containers, up from an estimated 53-57% in the early 80s and 59% in 1990. Accordingly OCC consumption will significantly increase. OCC consumed by recycled paperboard factories would reach up to 12,600,000-13,100,000 tons (a 31.8-37.6% increase) in 2002, up from 9,500,000 tons in 1995.

Mixed wastepaper and ONP make most of the remaining wastepaper input to recycled paperboard. Accordingly, mixed wastepaper and ONP demanded by recycled paperboard mills will considerably increase as well. Actually, most of ONP consumption growth (about 500,000 tons out of 900,000 tons) will not come from newsprint demand but from recycled paperboard factories. However, the relative share of ONP allocated to recycled paperboard has diminished from an estimated 14% in 1980 to 12% in 1990 to the 10% estimated in 1995 and assumed for 2002 calculations.

In the case of mixed wastepaper, demand derived from recycled paperboard production accounts for a half of projected consumption growth (900,000 tons out of 2,000,000), placing this grade as the first one in relative terms of growth and the second in absolute terms. Mixed paper is assumed to be 17% of all wastepaper used by recycled paperboard producers in 2002. This estimated share is slightly lower than that of the late 80s and early 90s (around 18%).

The amount of pulp substitutes and high grade deinking employed by recycled paperboard producers is small (respectively, 3 and 5% of wastepaper input. 1995 estimation), so demand created by this industry will have a lesser affect on both grades.

Unbleached kraft paper and paperboard mills are the second major industry consumers of wastepaper. Even though the share of secondary fiber is lower than secondary fiber share in newsprint, tissue or semichemical corrugating medium, the high volume of production (24,717,000 tons in 1995) resulted in an estimated 5,000,000 tons of wastepaper consumed in 1995. Estimated share of secondary fiber was 17.8% in 1995, up from 10% in the early 80s and 13% in 1990. The share estimated for 1995 was assumed for 2002 without changing it, since most new containerboard capacity belongs to either to 100%-recycled linerboard or semichemical corrugating medium, which are considered recycled paperboard for classification purposes.

Projections of wastepaper consumption growth within this grade are low. Since the share of secondary fiber was not increased from that in 1995 and projected production growth is low, at least in relative terms (4.3 to 6.2% depending on scenario), wastepaper consumption is expected to be in the range of 5,200,000 to 5,300,000 tons compared to 5,000,000 tons in 1995, a 4.2-5.8% increase (See Tables 5.2.18 to 5.2.20).

Most of wastepaper used to furnish unbleached kraft papers comes from OCC, which makes sense since unbleached kraft pulp is one of the main components of OCC. Therefore, it was estimated that 73% of wastepaper input in 1995 came from OCC (this share was assumed in 2002 simulations). This percentage has changed throughout time, from 61% in 1985 to 78% in 1990, according to estimations, but OCC has always kept a predominant position as a wastepaper source for unbleached kraft papers. More than 3,700,000-3,800,000 tons of OCC are projected to be consumed by this industry in 2002, up from 3,600,000 in 1995, a 4.2-6.1% increase.

As for the rest of wastepaper sources, pulp substitutes, ONP and mixed wastepaper make, respectively, 10, 8 and 7% of wastepaper input. ONP and mixed paper shares have decreased from estimated shares in the 80s and early 90s, while pulp substitutes share has remained around 11%. Projected consumption growth from this sources will be similar to that of OCC.

The third most important end-use for wastepaper, in terms of volume, is tissue. Tissue papers composition includes bleached kraft pulp, bleached sulfite and a significant share of secondary fiber. The assumed share in 2002 was the estimated share in 1995 (51%). Estimated share in 1980 was 22.8%, 24.5% in 1985 and 41% in 1990. The high share of secondary fiber results in high consumption figures. Estimated consumption of wastepaper in 1995 in tissue mills almost reached 4,000,000 tons. Tissue production is expected to grow within the range of 10.7 to 12% from

1995 to 2002. Therefore, projected wastepaper consumption growth is estimated to be around 11.2 to 12.5%, or 4,300,000 to 4,400,000 tons (See Tables 5.2.15 to 5.2.17).

Most of wastepaper employed in tissue traditionally came from pulp substitutes. During the 80s, almost half of wastepaper used in tissue production came from pulp substitutes. This share decreased in the 1990 estimation (39%) and was significantly reduced in 1995 (8%). However, the main source used to estimate this figure (AF&PA) is not the same I used to derive the rest (Franklin). That may explain the difference, so actual figures may be significantly higher than my estimation. Both sources, however, are coincident in highlighting high grade deinking as the other predominant wastepaper source (estimated in 27% of wastepaper consumed in 1980 and 1985, 28% in 1990, 33% in 1995). Mixed papers and OCC make most of the remaining wastepaper used.

In 1995, almost 1,300,000 tons (estimated) of high grade deinking were used in tissue production. Projected figures situate high grade deinking consumption in 2002 around 1,400,000 tons, an 11.4-12.7% increase from 1995 to 2002. Figures for mixed paper are similar (1,100,000 tons and a 10.7-12.1% growth) while estimated OCC consumption is 900,000 tons in 2002 (a 11.3-12.6%).

Newsprint mills come next as the fourth wastepaper consumer in the country. Newsprint was assumed to be composed by mechanical pulp, bleached kraft pulp and an increasingly higher share of secondary fiber (estimated at 19% in 1980, 20% in 1985, 27% in 1990 and 36% in 1995). Secondary fiber share in 2002 was assumed to be 40% since that is the goal of many legislative initiatives concerning recycled newsprint. This assumption is consistent with capacity additions announced from 1996 on, which focus on recycled newsprint capacity rather than virgin-fiber newsprint.

Since newsprint capacity is hardly expected to grow, production growth will be almost negligible (0.3-0.9%) and projected wastepaper consumption growth will rather come from the increasing use of secondary fiber in newsprint (as recycled-newsprint machines replace old ones) than from production increases. Overall wastepaper consumption in newsprint mills almost reached 3,000,000 tons in 1995 (estimated) and is projected to reach around 3,300,000 tons in 2002 (11.4-12.1% increase from 1995 to 2002). This growth is lower than the estimated from 1985 to 1990 (44%) and from 1990 to 1995 (52.2%), when most newsprint producers shifted to recycled-content newsprint (See Tables 5.2.9 to 5.2.11).

Most of wastepaper used to manufacture newsprint comes from ONP. In 1995, an estimated 75% of wastepaper consumed by newsprint producers came from ONP. Even though this percentage has oscillated along the years, ONP has always made more than 65% of wastepaper input used in newsprint. The estimated amount of ONP used in newsprint production was 2,200,000 tons in 1995, and it is projected to reach 2,500,000 in 2002 (11.2 to 11.9% increase). OCC is the second wastepaper source, with estimates ranging from 17-20% of wastepaper used, depending on the year. In 1995, almost 500,000 tons of OCC were consumed, and it is projected to reach 550,000 tons in 2002 (11.1 to 11.7% increase). The rest of wastepaper grades together only comprise 8% of wastepaper input, and it is not likely that their utilization would increase.

Printing and writing papers include coated and uncoated free-sheet and groundwood paper. The four categories have been aggregated for wastepaper allocation purposes, since existing literature do not offer data about wastepaper allocation desegregated by grade. In general, wastepaper share is very small due to quality considerations. High-priced coated papers have a very small share of secondary fiber, if any, while uncoated grades have a relatively bigger one, albeit much lower than in the rest of paper or paperboard grades. Estimated secondary fiber share was in 1995 in the range of 9% for uncoated grades and 3-4% for coated grades. The share has been slightly increased for uncoated grades only, up to 10% for the 2002 simulations, and it is not likely it will be much higher, since there were no announced capacity additions (according to AF&PA estimations, wastepaper input could reach 14% in 2000).

Since the amount of wastepaper is relatively small, the relatively important wastepaper consumption growth projected for this grade (19.1-23-6% from 1995 to 2002) is first related to production growth and secondarily to higher utilization. In absolute figures, growth is quite modest (around 400,000 tons above 1995 estimated wastepaper consumption) (See Tables 5.2.12 to 5.2.14).

Wastepaper consumed by printing and writing paper mills comes mainly from the two high quality categories, pulp substitutes and high grade deinking, each one making about one third of wastepaper consumed (according to 1995 estimation, 38 and 34% respectively), and the rest coming mainly from mixed papers and ONP.

Semichemical corrugating medium is composed by semichemical pulp and a significant share of secondary fiber (100% semichemical corrugating medium is classified as recycled paperboard, though). Since this grade is the only consumer of semichemical pulp, and the production of paperboard is known, estimation of the share of recycled fiber used in its production is pretty straightforward. In 1995, estimated share of secondary fiber was 30%, 26% in 1990, 24.5% in 1985 and 22.8% in 1980. The trend shows an increasing utilization of recycled fiber. However, almost all new capacity focuses on 100%-recycled corrugating medium, while new semichemical capacity grows slowly, and production is projected to grow just 9 to 10.1% from 1995 to 2002.

According to this situation, wastepaper consumption in semichemical corrugating mills is not expected to grow significantly (8 to 10.1%). In absolute terms, estimated wastepaper consumption was about 1,900,000 tons in 1995, and will likely reach 2,100,000 in 2002. As it was the case with recycled paperboard and unbleached kraft paperboard, most of it will come from OCC (which is also composed of semichemical pulp). According to the wastepaper allocation estimated for 1995, OCC constitutes 86% of wastepaper input, slightly lower than the estimate for the other three years, which was over 90% (See Tables 5.2.21 to 5.2.23).

Composition, wastepaper allocation and projections affecting the **Other Paper and Paperboard** category were adjusted after the other categories, better documented, were adjusted themselves, and what was left over was assigned to this category. Correspondingly, some results may look inconsistent. Estimated composition shows a majority of bleached kraft with many other pulp ingredients and variable shares of secondary fiber. Also, wastepaper allocation estimations show a big disparity of results, although OCC seems to be the main wastepaper source. Therefore, I would not pay much attention to projections of wastepaper consumption for this category (See Tables 5.2.27 to 5.2.29).

By wastepaper grade

Since most of wastepaper consumption growth will come from recycled paperboard, which mainly uses old corrugated containers (OCC) as fiber input, OCC consumption growth will make more than half of total wastepaper consumption growth (roughly, 3,500,000 tons out of 6,400,000 in the low production scenario). Even though in relative terms mixed papers consumption exceeds OCC consumption growth, in absolute figures the privileged position of OCC consolidates.

In 1980, for instance, OCC consumption was just 46% of all wastepaper consumption, in 1985, 48%, 49% in 1990 and 52% in 1995. According to the projections for 2002, OCC will make about 53% of all wastepaper consumed. Mixed wastepaper will also increase its participation, but slightly, while the rest of wastepaper grades will likely see their share slightly reduced. That outcome is consistent with the trend observed in the five grades from 1980 to 1995 (See Table 5.2.8).

Actually, projected wastepaper share in 2002 is quite close to most recent data. A preliminary wastepaper consumption share released by AF&PA showed OCC consumed 53.9% of wastepaper demanded by the US paper industry in 1998 (compared to an estimated 53.2% in 2002). The same goes for other grades: ONP, 15.4% according to 1998 data, estimated 15.1% in 2002: Pulp substitutes, respectively, 7.2% and 7.5%: HGD, 8.9% and 9.3% and mixed wastepaper, 14.7% and 14.8%.

OCC is mainly used to produce different grades of containerboard and recycled paperboard. According to the estimated share in 1995, 58% of OCC consumed was used in recycled paperboard, 22% in unbleached kraft paper and paperboard and 10% in semichemical corrugating. Estimated share in 1980-1985 and 1995 is quite similar, with unbleached kraft and recycled paperboard tending to increase their participation and the combined demand of the three main grades close to 90% of OCC consumed.

Projected OCC consumption will be in the range of 20,000,000 to 20,700,000 tons in 2002, a 21.4-25.3% increase in relation to 16,500,000 tons consumed in 1995. Among all end-users, consumption from recycled paperboard manufacturers will experience the highest growth (31.8-37.6%) increasing its relative demand in relation to the rest (63% of OCC consumed in 2002). (See Tables 5.2.33 to 5.2.35)

Old newspapers (**ONP**) have traditionally been consumed by newsprint manufacturers and containerboard producers. In 1995, almost 4,900,000 tons of ONP was consumed by the industry. According to the estimation of this study, 46% of ONP consumed in 1995 went to newsprint mills, 31% to recycled paperboard mills and 8% to unbleached kraft paperboard. Estimations for 1980, 1985 and 1990 show a similar distribution, albeit newsprint seems to have increased its relative consumption of ONP to the expenses of recycled paperboard, which consumed about 40% of ONP consumed in the 80s. It is likely that the introduction of recycled newsprint in the industry from the late 80s on increased ONP demands from newsprint mills.

According to the projection, in 2002 between 5,700,000 and 5,800,000 tons of ONP will be demanded by paper and paperboard producers. That means an estimated 17.4-19.9% growth from 1995. However, the significant growth of recycled paper production relative to that of newsprint and unbleached kraft will introduce some changes in the allocation of ONP in the industry, which tends to resemble the situation in the 80s, when containerboard absorbed most of ONP consumed. According to the simulation, recycled paper and unbleached kraft paperboard will demand about 43% of ONP consumed in 2002, while newsprint will use around 43%, down for 46% in 1995 (See Tables 5.2.30 to 5.2.32).

In relation to other end-uses, ONP consumption is expected to grow among tissue producers in the range of 10.9 to 12.3%. A significant growth is expected for printing and writing grades in relative terms (18.5-22.6%), even though absolute figures are unimportant compared to other end-uses.

Pulp substitutes and high grade deinking are mainly used in printing and writing grades, tissue and, in a lesser proportion, recycled paperboard. **Pulp substitutes** are actually used by almost every papermaker which uses secondary fiber, and the allocation estimated in 1995 shows 30% of pulp substitutes consumed in printing and writing, 13% in tissue mills, 18% in recycled paperboard factories, 20% in unbleached kraft mills and the remaining distributed among the rest. Estimations made in 1980, 1985 and 1990 show a slightly different structure, with printing and writing and tissue consuming about 60-65% of pulp substitutes, and recycled paperboard using a quite stable 25-28% of pulp substitutes consumed.

Since tissue and printing and writing are not expected to grow as much as recycled paperboard, pulp substitutes consumption growth is not as significant as ONP or OCC is. In 1995, roughly 2,400,000 tons of pulp substitutes were used by the industry. Projected consumption reaches 2,800,000-2,900,000 tons in 2002. In percentages, 15.4-18.5%, more than six percentage points below expected OCC growth. The distribution of that consumption is quite similar to that of 1995, even though the share allocated to recycled paperboard increases, as it happens with all wastepaper grades (See Tables 5.2.36 to 5.2.38).

By end-use, the highest growth in consumption of pulp substitutes corresponds to recycled paperboard mills (31.8-37.5%), as one would expect. Printing and writing grades and tissue, the other traditional consumers, follow recycled paperboard, increasing their pulp substitutes consumption in, respectively, 19.1-23.6% and 11.6-13.1%. Consumption growth is less significant for the rest of end-users.

High grade deinking (HGD) is mostly used by tissue manufacturers, followed by printing and writing and recycled paperboard producers. In 1995, an estimated 43% of HGD was used to produce tissue, 24% in recycled paperboard production and 22% in printing and writing. Estimated percentages for the rest of years are quite similar, with tissue and printing and writing together using about 60 to 66% of HGD consumed and recycled paperboard around 25%.

In 1995, 3,000,000 tons of HGD were demanded by the industry. In 2002, according to the simulation, demand will reach 3,500,000 to 3,600,000 tons, resulting in an 17.6-20.7% increase. Apart from the expected increase in the relative amount of HGD consumed by recycled paperboard manufacturers, the distribution of HGD among end-users keeps its traditional structure (See Tables 5.2.39 to 5.2.41).

By end-use, the situation is quite similar to that described for pulp substitutes. The highest growth in consumption of HGD corresponds to recycled paperboard mills (32.2-38.0%). Tissue and printing and writing grades increase their HDG consumption in, respectively, 11.4-12.7% and 18.8-23.3%. Consumption growth is less significant for the rest of end-users.

Mixed wastepaper includes the rest of wastepaper not included in one of the above categories. Due to its heterogeneity, wastepaper grades included in this class are used almost everywhere, albeit recycled paperboard consumes most of it.

In 1995, 4,500,000 tons of these grades were consumed by paper and, especially, paperboard producers. Projected consumption in 2002 may be around 5,500,000 to 5,700,000 tons, a 23-27% growth due to the strong recycled paperboard growth. This growth may situate mixed wastepaper above ONP as the second most consumed wastepaper grade in the short term (See Tables 5.2.42 to 5.2.44).

6.3. Wastepaper available for other uses

According to the assumptions made, apparent consumption of paper and paperboard in 2002 will range from 108,300,000 tons to 109,800,000 tons, depending on the volume of foreign trade. This number was obtained by multiplying aggregated production of paper and paperboard from the average scenario times two extreme ratios derived from historic series of apparent consumption and production. The other two scenarios were not calculated since differences in wastepaper available were very small compared to that of the average scenario. Then apparent consumption was multiplied by a range of recovery rates to obtain a range of quantities of wastepaper recovered which would define supply of wastepaper (See Tables 5.3.1 to 5.3.4).

Perhaps the most striking consequence of the comparison between projected supply of wastepaper and wastepaper demanded by the industry is the increasing distance between both figures, if AF&PA goals are actually met. The comparison between recovery rates and the relative amount of wastepaper not consumed by the industry, that is, available for other uses, clarifies the question.

In 1995, with a 44% recovery rate, 26.21% of wastepaper recovered was used for construction purposes, molded pulp or was allocated to export markets. According to the 2002 simulation, if the recovery rate were 45%, only 21.3-22.4% of wastepaper recovered would be available for other uses. If the recovery rate was 48%, the percentage of wastepaper recovered allocated to other uses or to export would be similar to that in 1995 (26.3-27.3%). A 50% recovery rate would result in 29.2-30.2% of wastepaper recovered available for other uses, while a 52% rate, the highest considered, would result in 32.0-32.9%. Therefore, and according to the projections derived from the study, a recovery rate over 48% would likely increase the gap between recovery and demand.

Table 6.1. ***Wastepaper Available for Others Uses (As a % of all Wastepaper Recovered)***

Recovery Rate (%)	Wastepaper Available For Others Uses
44[1]	26.21
45	21.3-22.4
48	26.3-27.3
50	29.2-30.2
52	32.0-32.9

[1]1995 Historic Recovery Rate

6.4 Discussion

The 2002 projection has been designed on the assumptions that the composition of paper grades, wastepaper allocation and the efficiency (yield) of wastepaper processing would not change for a seven year period, with the exception of newsprint and printing and writing composition, which were allowed to increase their secondary pulp share. Ceteribus paribus, the only variable allowed to change significantly was production in the form of capacity growth and a selection of operating rates based on historic performance of the industry. The results reflect new secondary pulp requirements on 1995 industry structures when confronted to an increased paper demand. Under this assumptions it is not surprising than most new wastepaper demand is strongly related to paper production growth while traditional wastepaper demand growth was tied to both production growth and substitution (reflected as increases in the share of wastepaper).

However, by modifying some of the variables that remained unchanged throughout the study, it is possible to complement the results provided in the preceding sections and gain some understanding about the influence of the other variables in the final outcome of the model.

The yield of wastepaper processing (repulping and deinking processes) was assumed unchanged from 1980 to 2002. However, this is not the case. Actually, as technology enhances the efficiency of those processes, yield improves. That means less wastepaper is needed to produce the same amount of secondary pulp. The effect of an increased efficiency therefore results in reduction of wastepaper consumption.

The overall yield rate of wastepaper processing in the 2002 simulation was .9, or 90%. If this overall yield were increased up to 91% by uniformly increasing the yield of every single process, wastepaper consumption in 2002 would decrease by 300,000 tons in relation to the original projections (average scenario). A 92% yield will reduce projected wastepaper consumption up to 650,000 tons in relation to the 38,325,000 tons initially projected for 2002. Roughly, every percentage point increase in yield results in one percentage point reduction in the original wastepaper consumption projection.

The share of secondary pulp was also assumed unchanged. It is not likely though to expect a significant increase since that share is already high in most grades and new capacity usually comes from 100%-recycled grades. Only in printing and writing grades there is still room enough for secondary pulp utilization once the quality of secondary pulp reaches the standard demanded by printing and writing manufacturers.

Excluding recycled paperboard, which is composed by 100%-recycled pulp, the 2002 overall composition of paper and paperboard grades assumed a 19.27% share of secondary pulp (wastepaper as fiber input rate). When recycled paperboard is added, the share increases up to 30.8%. If the share of secondary pulp is increased by 5% (to 20.23%), wastepaper demand reaches 39,379,000 tons in the average scenario (assuming an overall 90% yield in processing). That is a 25.4% increase in relation to 1995 (compared to 22.1% in the original projection). A 10% increase in the overall share of secondary pulp (to 21.20%, again excluding recycled paperboard) drives wastepaper demand up to 40,291,000 tons in the average scenario (a 28.4% increase in relation to 1995 instead of 22.1%). A more significant increase (20%, or a 23.12% share) results in 42,096,000 tons of wastepaper consumed (a 34.11% increase). In short, the effect of an increase in secondary pulp share in grades other than recycled paperboard strongly reinforces wastepaper consumption.

As for wastepaper allocation, estimated 1995 wastepaper allocation was assumed unchanged, so allocation patterns in 2002 are basically those of 1995. Changes in the assumed allocation would not affect the overall amount of wastepaper consumed, only the relative consumption of every wastepaper grade.

7. SUMMARY

This paper provides a projection of wastepaper consumption for the year 2002. Such a projection is difficult because there is no existing database to characterize how wastepaper gets used in each end product yet we know from fragmentary sources that uses are changing. A procedure was developed to allocate collection to uses in several stages in order to balance collection with uses and to characterize how uses have been changing.

Estimation Of Paper Composition And Wastepaper Allocation

Historic data of virgin pulp consumption, paper production and wastepaper recovery (API, 1980-1992, AF&PA, 1993-1996) are the starting point of the first stage. A number of sources provide an initial estimation of paper composition (Mills Survey, 1980-1995; Biermann, 1996; Paper Task Force Report, 1995) by each grade. Initial requests of virgin and secondary pulp to supply this composition are then developed in a spreadsheet. A linear relationship is assumed between paper production and pulp (virgin and secondary) consumption. These requests are then compared to reported virgin pulp consumption and a preliminary allocation of secondary pulp by paper grade (AF&PA 1996; Miller Freeman's The News in ONP, 1994; Franklin, 1990, 1982; Mills Survey, 1980-1995; Jaakko Poyry Oy, 1996). Minor adjustments in both sets of coefficients (composition and allocation) are made based on a hierarchy of the best known paper composition estimates until a definitive balance is reached by the years 1980, 1985, 1990 and 1995. Paper composition and wastepaper allocation in 1995 are then used in the set of assumptions for the 2002 projection.

Paper Production Projection

Assumptions for demand and capacity are needed to calculate wastepaper consumption in 2002. Capacity projections are derived from available sources (API, 1980-1992; AF&PA, 1993-1996; Pulp and Paper North American Fact Book, 1998; FAO, 1998; Lockwood Post's Directory of Pulp, Paper and Allied Trades). Production is derived from projected capacity by using a range of operating rates. The range of operating rates corresponds to three scenarios of high, average and low activity in the industry based on an economic analysis of historic performance of paper grades (API, 1980-1992; AF&PA, 1993-1996; Pulp and Paper North American Fact Book, 1998; U. S. Bureau of Labor Statistics, 1998; Economic Report of the President, 1996; Congressional Budget Office, 1999).

Wastepaper Consumption Projection

The wastepaper consumption projection is derived from projected production, again assuming a linear relationship between projected paper production and pulp consumption as well as between secondary pulp consumption and wastepaper consumption (by grade). The assumed share of secondary pulp in each paper grade is multiplied by its projected production to project secondary pulp requirements in 2002. Pulp requirements are then translated into wastepaper consumption. Wastepaper recovery is also obtained from projected production. First, apparent consumption is estimated and then recovery is obtained from apparent consumption by using a range of recovery rates.

Results

The results of the projection show a significant increase in wastepaper consumption from 1995 to 2002 albeit not as high as it was from 1985 to 1990 and from 1990 to 1995. Since most of new production is projected to come from recycled and unbleached kraft paperboard, the two major wastepaper consumers in the industry, the projected growth rate of wastepaper consumption is almost twice the growth rate in paper production, increasing utilization rates in the industry by more than three percentage points (34.45 in 1995, 37.4% in 2002). Growth rates depend on the demand scenario. Available economic forecasts show a slowdown in the economy in 2000 and 2001[27], which make the low demand scenario the most likely. Paper and paperboard production are projected to grow 10.3% (1.4% per year) in relation to 1995, a rate significantly lower than the historic production growth rate from 1990 to 1995 (13.6%, or 2.6% per year) and from 1985 to 1990 (17.1% or 3.2% per year). Production growth from 1980 to 1985 (in the midst of an economic recession) was just 7.8% (1.5% per year)[28]. Most of new production will likely come from recycled paperboard (44% of projected production growth in the low scenario) and unbleached kraft paperboard (11%), the two major wastepaper consumers in the industry.

Wastepaper consumption growth is mostly linked to production growth rather than to an increase in wastepaper utilization, since assumed composition has not been significantly modified from 1995 estimations. Estimated 1995 wastepaper allocation was assumed unchanged, so allocation patterns in 2002 are basically those of 1995. Projected wastepaper consumption growth will be 20.1% (2.65% per year) in the low scenario in relation to 1995. Even though this figure is far from historic consumption growth from 1990 to 1995 (44.4% or 7.6% per year) and from 1985 to 1990 (32.8% or 5.8% per year), it still is a significant increase[29]. Economic conditions from 1985 to 1995

[27] Congressional Budget Office. Real GDP Growth. 2000, 1.9%; 2001, 1.8%.
[28] Historic production data from API, 1980-1992; AF&PA 1993-1996.
[29] Historic wastepaper consumption data from API, 1980-1992; AF&PA 1993-1996.

were mostly favorable to the industry and to wastepaper in particular, except for the early 90s, corresponding to a general upturn in the economy in the late 80s and mid 90s and to a favorable exchange rate that fostered American exports while damaging imports. It was also the time when the industry undertook a massive transition into recycled-content products. All things considered, a 20.1% growth in wastepaper consumption is a significant figure.

This growth is mostly linked to an important expansion in recycled paperboard production and secondarily to unbleached kraft manufacturing. It is also a growth rate mostly linked to production growth rather than to an increase in wastepaper utilization, since assumed composition has hardly been modified from 1995 estimations. Estimated 1995 wastepaper allocation was assumed unchanged, so allocation patterns in 2002 are basically those of 1995. Allocation does not affect the overall consumption of paper but it does affect consumption of individual grades.

By paper grade, recycled paperboard keeps its position as the main consumer of wastepaper in the industry. Since its production is projected to grow significantly (32.1% or 4.1% per year in the low scenario) from 1995 to 2002, wastepaper consumption will increase in the range of 4,700,000 (31.9% or 4.0 % per year) to 5,500,000 tons (37.7% or 4.7% per year). Among wastepaper sources, OCC is the most important one. Almost 65% percent of all wastepaper consumed in recycled paperboard mills, according to the assumptions derived from 1995 estimations, comes from old corrugated containers, up from an estimated 53-57% in the early 80s and 59% in 1990. OCC consumed by recycled paperboard factories might reach up to 12,600,000-13,100,000 tons (a 31.8-37.6% increase) in 2002, up from 9,500,000 tons in 1995.

Mixed wastepaper and ONP make most of the remaining wastepaper input to recycled paperboard. Accordingly, mixed wastepaper and ONP demanded by recycled paperboard mills will considerably increase as well. Actually, most of ONP consumption growth will not come from newsprint demand but from recycled paperboard factories. However, the relative share of ONP allocated to recycled paperboard has diminished from an estimated 14% in 1980 to 12% in 1990 to the 10% estimated in 1995.

In the case of mixed wastepaper, demand derived from recycled paperboard production accounts for a half of projected consumption growth, placing this grade as the first one in relative terms of growth and the second in absolute terms. Mixed paper is assumed to be 17% of all wastepaper used by recycled paperboard producers in 2002. This estimated share is slightly lower than that of the late 80s and early 90s (around 18%).

Unbleached kraft paper and paperboard mills are the second major industry consumers of wastepaper. Even though the estimated share of secondary pulp is just 17.8% (up from 10% in the early 80s and 13% in 1990), the high volume of production (24,717,000 tons in 1995) resulted in an estimated 5,000,000 tons of wastepaper consumed in 1995. Projections of wastepaper consumption growth within this grade are low. Since the share of secondary fiber was not increased from that in 1995 and projected production growth is low, at least in relative terms (4.3 to 6.2% depending on scenario or 0.6-0.9% per year), wastepaper consumption is expected to be in the range of 5,200,000 to 5,300,000 tons compared to 5,000,000 tons in 1995, a 4.2-5.8% increase (a 0.6-0.8% per year).

Most of wastepaper used to furnish unbleached kraft papers comes from OCC. It is estimated that 73% of wastepaper input in 1995 came from this source (this share was assumed in 2002 simulations). This percentage has changed throughout time, from 61% in 1985 to 78% in 1990, according to estimations, but OCC has always kept a predominant position as a wastepaper source for unbleached kraft papers. More than 3,700,000-3,800,000 tons of OCC are projected to be consumed by this industry in 2002, up from 3,600,000 in 1995, a 4.2-6.1% increase.

The third most important end-use for wastepaper, in terms of volume, is tissue. The assumed share of secondary pulp in 2002 was 51%, up from estimated 22.8% in 1980, 24.5% in 1985 and 41% in 1990. Estimated consumption of wastepaper in 1995 in tissue mills almost reached 4,000,000 tons. Tissue production is expected to grow within the range of 10.7 to 12% from 1995 to 2002 (or 1.5-1.6% per year). Therefore, projected wastepaper consumption growth is estimated to be around 11.2 to 12.5% (or 1.5 to 1.7% per year), or 4,300,000 to 4,400,000 tons.

During the 80s, almost half of wastepaper used in tissue production came from pulp substitutes. This share decreased in the 1990 estimation (39%) and was significantly reduced in 1995 (8%). However, the main source used to estimate this figure (AF&PA, 1996) is not the same I used to derive the rest (Franklin, 1990). That might explain the difference, so actual figures might be significantly higher than my estimation. Both sources, however, are coincident in highlighting high grade deinking as the other predominant wastepaper source (estimated in 27% of wastepaper consumed in 1980 and 1985, 28% in 1990, 33% in 1995). Mixed papers and OCC make most of the remaining wastepaper used.

In 1995, almost 1,300,000 tons (estimated) of high grade deinking were used in tissue production. Projected figures situate high grade deinking consumption in 2002 around 1,400,000 tons, an 11.4-12.7% increase from 1995 to 2002. Figures for mixed paper are similar (1,100,000 tons and a 10.7-12.1% growth) while estimated OCC consumption is 900,000 tons in 2002 (a 11.3-12.6% increase)

Newsprint mills are the fourth wastepaper consumers in the paper industry. Newsprint secondary pulp share is significant (estimated at 19% in 1980, 20% in 1985, 27% in 1990 and 36% in 1995). Secondary fiber share in 2002 was assumed to be 40% since that is the goal of many legislative initiatives concerning recycled newsprint. Since newsprint capacity and therefore production is hardly expected to grow, projected wastepaper consumption growth will rather come from the increasing use of secondary fiber in newsprint as recycled-newsprint machines replace old ones. Overall wastepaper consumption in newsprint mills almost reached 3,000,000 tons in 1995 (estimated) and is projected to reach around 3,300,000 tons in 2002 (11.4-12.1% increase from 1995 to 2002 or 1.6% per year). This growth is lower than the estimated from 1985 to 1990 (44% or 7.5% per year) and from 1990 to 1995 (52.2% or 8.8% per year), when most newsprint producers shifted to recycled-content newsprint.

Most of wastepaper used to manufacture newsprint comes from ONP. In 1995, an estimated 75% of wastepaper consumed by newsprint producers came from ONP. The estimated amount of ONP used in newsprint production was 2,200,000 tons in 1995, and it is projected to reach 2,500,000 in 2002 (11.2 to 11.9% increase). OCC is the second wastepaper source, with estimates ranging from 17-20% of wastepaper used, depending on the year. In 1995, almost 500,000 tons of OCC were consumed, and it is projected to reach 550,000 tons in 2002 (11.1 to 11.7% increase). The rest of wastepaper grades together only comprise 8% of wastepaper input.

Printing and writing papers include a very small share of secondary pulp. Estimated secondary fiber share was in 1995 in the range of 9% for uncoated grades and 3-4% for coated grades. The share has been slightly increased up to 10% in the case of uncoated grades for the 2002 simulation. Since the amount of wastepaper is relatively small, the relatively important wastepaper consumption growth projected for this grade (19.1-23.6% from 1995 to 2002 or 2.5-3.1% per year) is first related to production growth and secondarily to higher utilization. In absolute figures, growth is quite modest (around 400,000 tons above 1995 estimated wastepaper consumption). Most of this paper will come from the two high quality categories, pulp substitutes and high grade deinking, each one making about one third of wastepaper consumed (according to 1995 estimation, 38 and 34% respectively), and the rest coming mainly from mixed papers and ONP.

Semichemical corrugating medium has a considerable share of secondary pulp. In 1995, the estimated share of secondary fiber was 30%, 26% in 1990, 24.5% in 1985 and 22.8% in 1980. However, almost all new capacity focuses on 100%-recycled corrugating medium, while new semichemical capacity grows slowly, and production is projected to grow just 9 to 10.1% from 1995 to 2002 (or 1.2-1.4% per year). According to this situation, wastepaper consumption in semichemical corrugating mills will not significantly grow (8 to 10.1% or 1.1-1.4% per year). In absolute terms, estimated wastepaper consumption was about 1,900,000 tons in 1995, and will likely reach 2,100,000 in 2002. Most of it will come from OCC (which is also composed of semichemical pulp). According to the wastepaper allocation estimated for 1995, OCC constitutes 86% of wastepaper input, slightly lower than the estimate for the other three years, which was over 90%.

By wastepaper grade, most of new consumption will correspond to OCC. Since most of wastepaper consumption growth is projected to come from recycled paperboard, which mainly uses old corrugated containers (OCC) as fiber input, OCC consumption growth will make more than half of total wastepaper consumption growth (roughly, 3,500,000 tons out of 6,400,000 in the low production scenario). In 2002 OCC will make about 53% of all wastepaper consumed (compared to 46% of all wastepaper consumed in 1980, 48% in 1985, 49% in 1990 and 52%

in 1995[30]). Projected OCC consumption will be in the range of 20,000,000 to 20,700,000 tons in 2002, a 21.4-25.3% increase (2.8-3.3% per year) in relation to 16,500,000 tons[31] consumed in 1995. Among all end-users, consumption from recycled paperboard manufacturers will experience the highest growth (31.8-37.6%) increasing its relative demand in relation to the rest (63% of OCC consumed in 2002).

Newsprint manufacturers and containerboard producers have traditionally consumed old newspapers (ONP). In 1995, almost 4,900,000 tons[32] of ONP was consumed by the industry. According to the simulation, in 2002 between 5,700,000 and 5,800,000 tons of ONP will be demanded by paper and paperboard producers. That means an estimated 17.4-19.9% growth from 1995 (2.3-2.6% per year). However, the significant growth of recycled paper production relative to that of newsprint and unbleached kraft will introduce some changes in the allocation of ONP in the industry, which tends to resemble the situation in the 80s, when containerboard absorbed most of ONP consumed. According to the simulation, recycled paper and unbleached kraft paperboard will demand about 43% of ONP consumed in 2002, while newsprint will use around 43%, down for 46% in 1995.

Pulp substitutes and high grade deinking are mainly used in printing and writing grades, tissue and, in a lesser proportion, recycled paperboard. Since tissue and printing and writing are not expected to grow as much as recycled paperboard, pulp substitutes consumption growth is not as significant as ONP or OCC are. In 1995, roughly 2,400,000 tons[33] of pulp substitutes were used by the industry. Projected consumption reaches 2,800,000-2,900,000 tons in 2002 (15.4-18.5% or 2.1-2.5% per year), more than six percentage points below expected OCC growth. The distribution of that consumption is quite similar to that of 1995, even though the estimated share allocated to recycled paperboard increases, as it happens with all wastepaper grades. By end-use, the highest growth in consumption of pulp substitutes corresponds to recycled paperboard mills (31.8-37.5%). Printing and writing grades and tissue, the other traditional consumers, follow recycled paperboard, increasing their pulp substitutes consumption in, respectively, 19.1-23.6% and 11.6-13.1%.

High grade deinking (HGD) is mostly used by tissue manufacturers, followed by printing and writing and recycled paperboard producers. In 1995, 3,000,000 tons of HGD[34] were demanded by the industry. In 2002, projected demand will reach 3,500,000 to 3,600,000 tons, resulting in an 17.6-20.7% increase (2.3-2.7% per year). Apart from the expected increase in the relative amount of HGD consumed by recycled paperboard manufacturers, the distribution of HGD among end-users keeps its traditional structure. The highest growth in consumption of HGD corresponds to recycled paperboard mills (32.2-38.0%). Tissue and printing and writing grades increase their HDG consumption in, respectively, 11.4-12.7% and 18.8-23.3%.

Mixed wastepaper includes the rest of wastepaper not included in one of the above categories. In 1995, 4,500,000 tons[35] of these grades were consumed by paper and, especially, paperboard producers. Projected consumption in 2002 may be around 5,500,000 to 5,700,000 tons, a 23-27% growth (3 to 3.5% per year) due to the strong recycled paperboard growth. This growth might situate mixed wastepaper above ONP as the second most consumed wastepaper grade in the short term.

Supply and Demand Balance Projection

Projected apparent consumption of paper and paperboard in 2002 will range from 108,300,000 tons to 109,800,000 tons. Recovery of paper is derived from those levels depending on a range of recovery rates (45 to 52%). Depending on the rate selected, the amount of wastepaper available for other uses (obtained by subtracting wastepaper consumed by the paper industry from wastepaper recovered) varies. In 1995, with a 44% recovery rate, 26.21% of wastepaper recovered was used for construction purposes, molded pulp or was allocated to export markets[36].

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[30] Historic wastepaper consumption data from API, 1980-1992; AF&PA 1993-1996.
[31] Historic wastepaper consumption data from API, 1980-1992; AF&PA 1993-1996.
[32] Historic wastepaper consumption data from API, 1980-1992; AF&PA 1993-1996.
[33] Historic wastepaper consumption data from API, 1980-1992; AF&PA 1993-1996.
[34] Historic wastepaper consumption data from API, 1980-1992; AF&PA 1993-1996.
[35] Historic wastepaper consumption data from API, 1980-1992; AF&PA 1993-1996.
[36] Historic wastepaper consumption data from AF&PA, 1996.

According to the 2002 simulation, if the recovery rate were 45%, only 21.3-22.4% of wastepaper recovered would be available for other uses. If the recovery rate were 48%, the percentage of wastepaper recovered allocated to other uses or to export would be similar to that in 1995 (26.3-27.3%). A 50% recovery rate would result in 29.2-30.2% of wastepaper recovered available for other uses, while a 52% rate, the highest considered, would result in 32.0-32.9%. Therefore, and according to the projections derived from the study, a recovery rate over 48% would likely increase the gap between recovery and demand signifying weaker secondary fiber pricing.

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APPENDIX I

Chart 1. Paper Production (tons). Historic 1980-1995. Projection 2002.

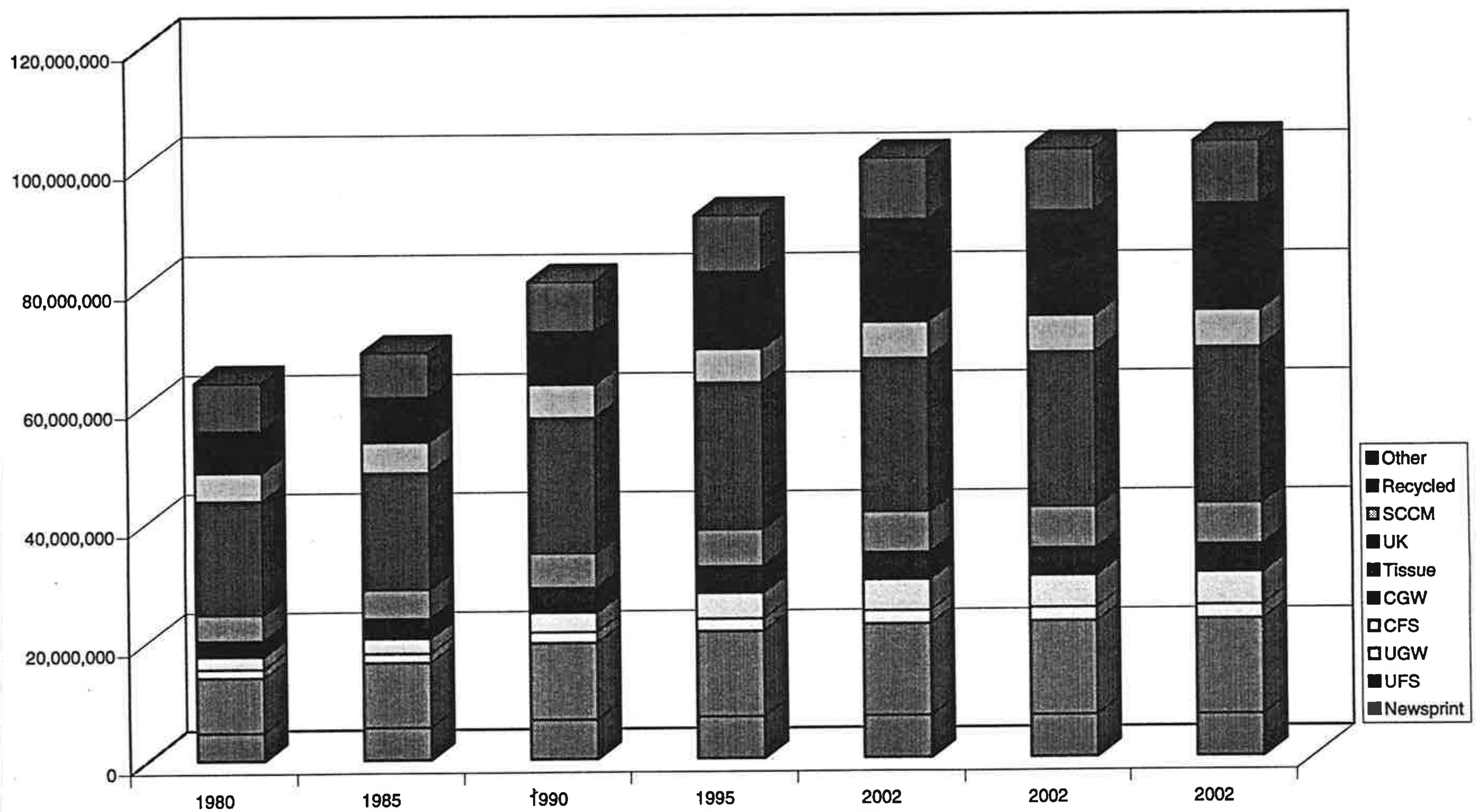


Chart 2. Wastepaper Consumption by End-Use (000 tons). Estimation 1980-1995. Projection 2002.

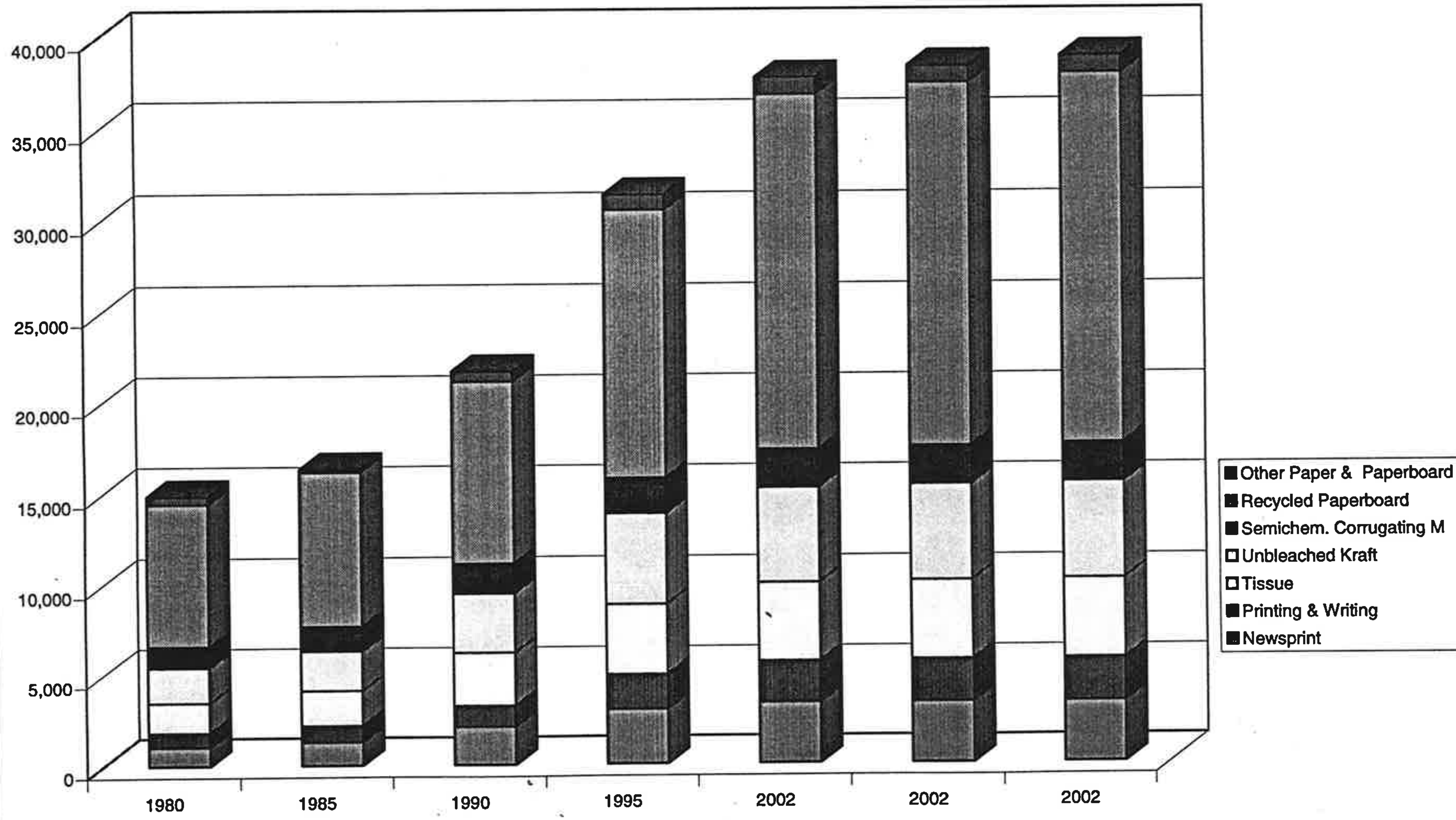


Chart 3. Wastepaper Apparent Consumption by Wastepaper Grade (000 tons). Estimation 1980-1995. Projection 2002..

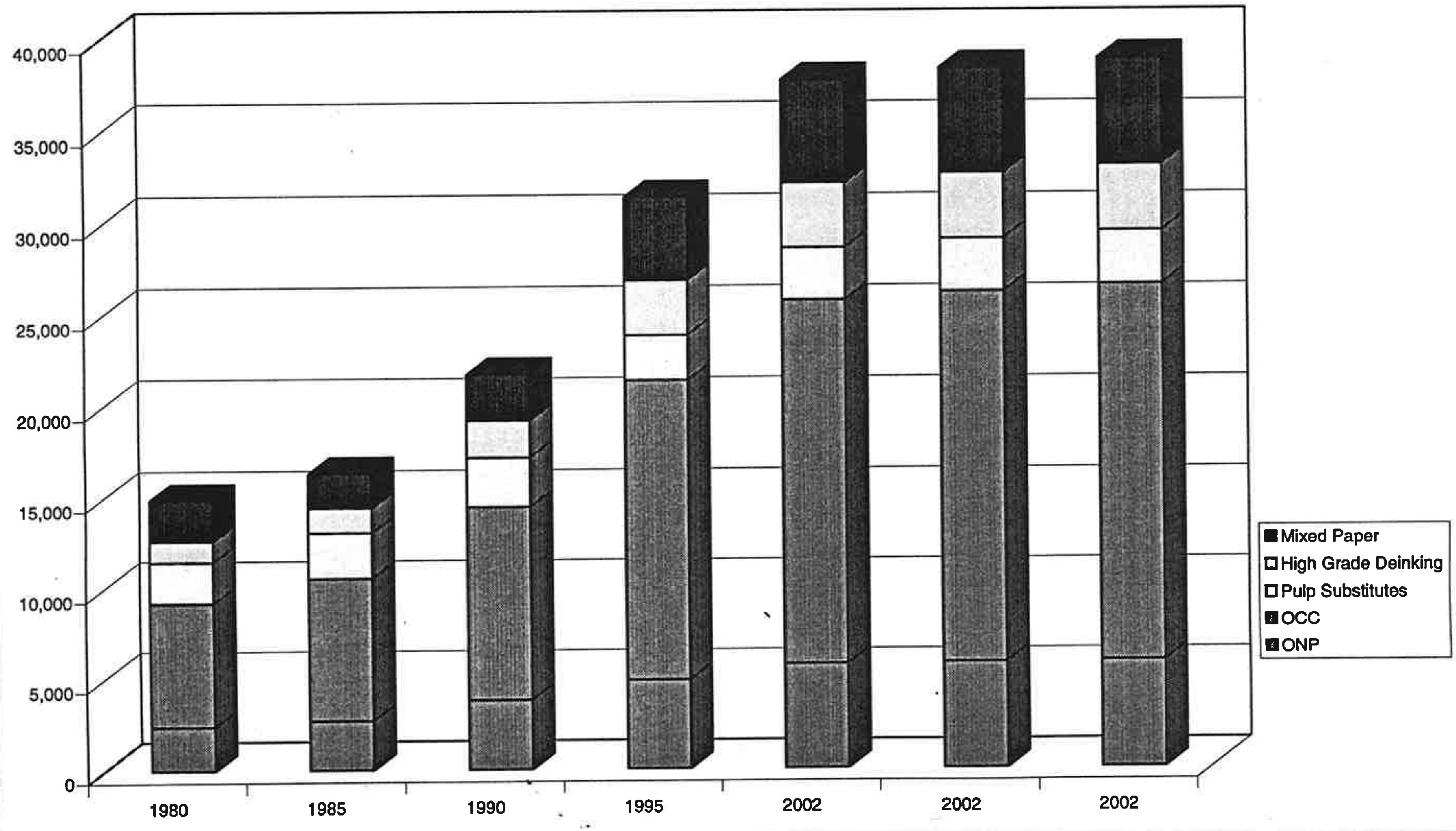


Chart 4. Newsprint. Wastepaper input by grade (000 tons). Estimation 1980-1995. Projection 2002.

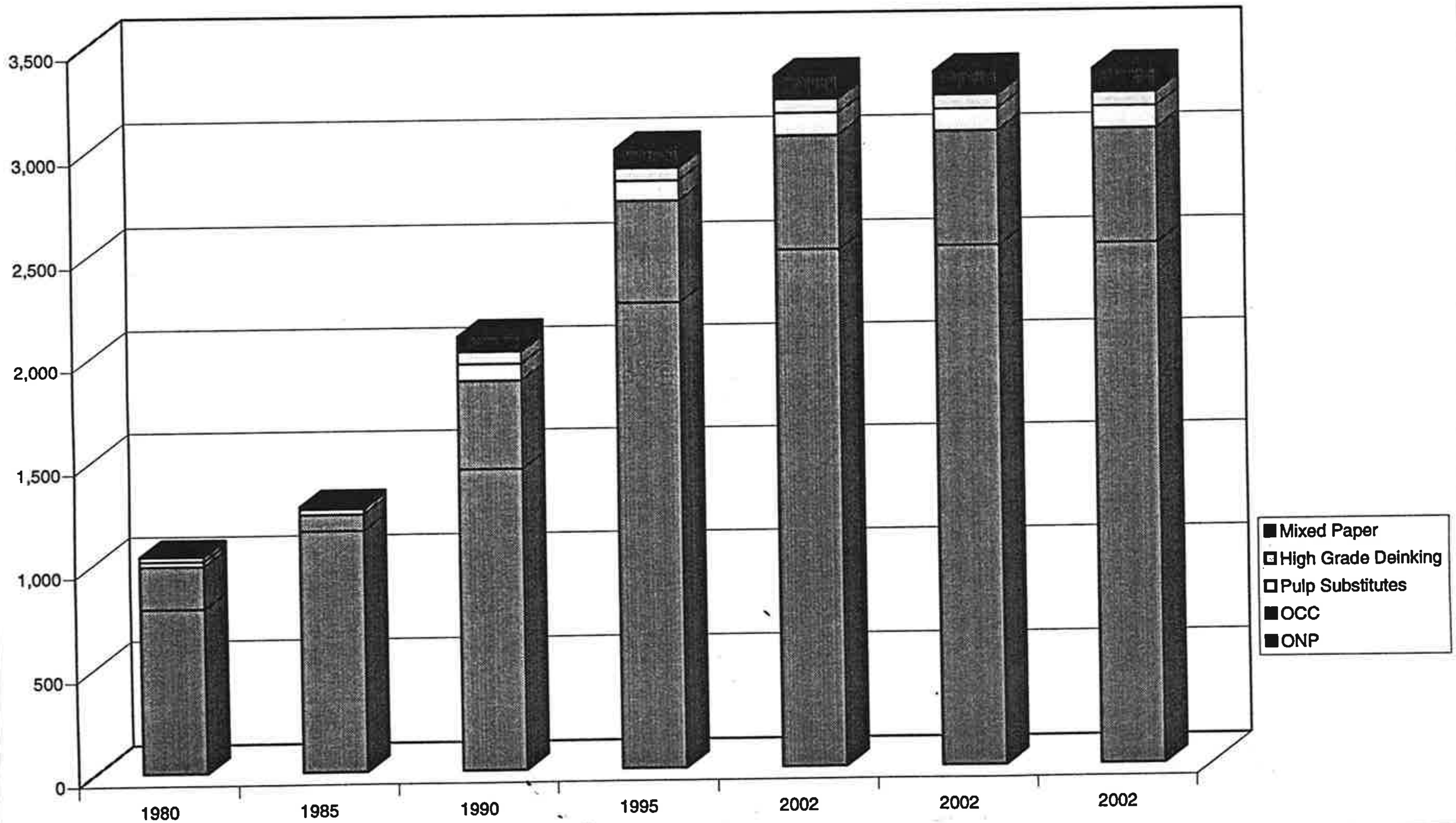


Chart 5. Printing & Writing. Wastepaper input by grade (000 tons). Estimation 1980-1995. Projection 2002.

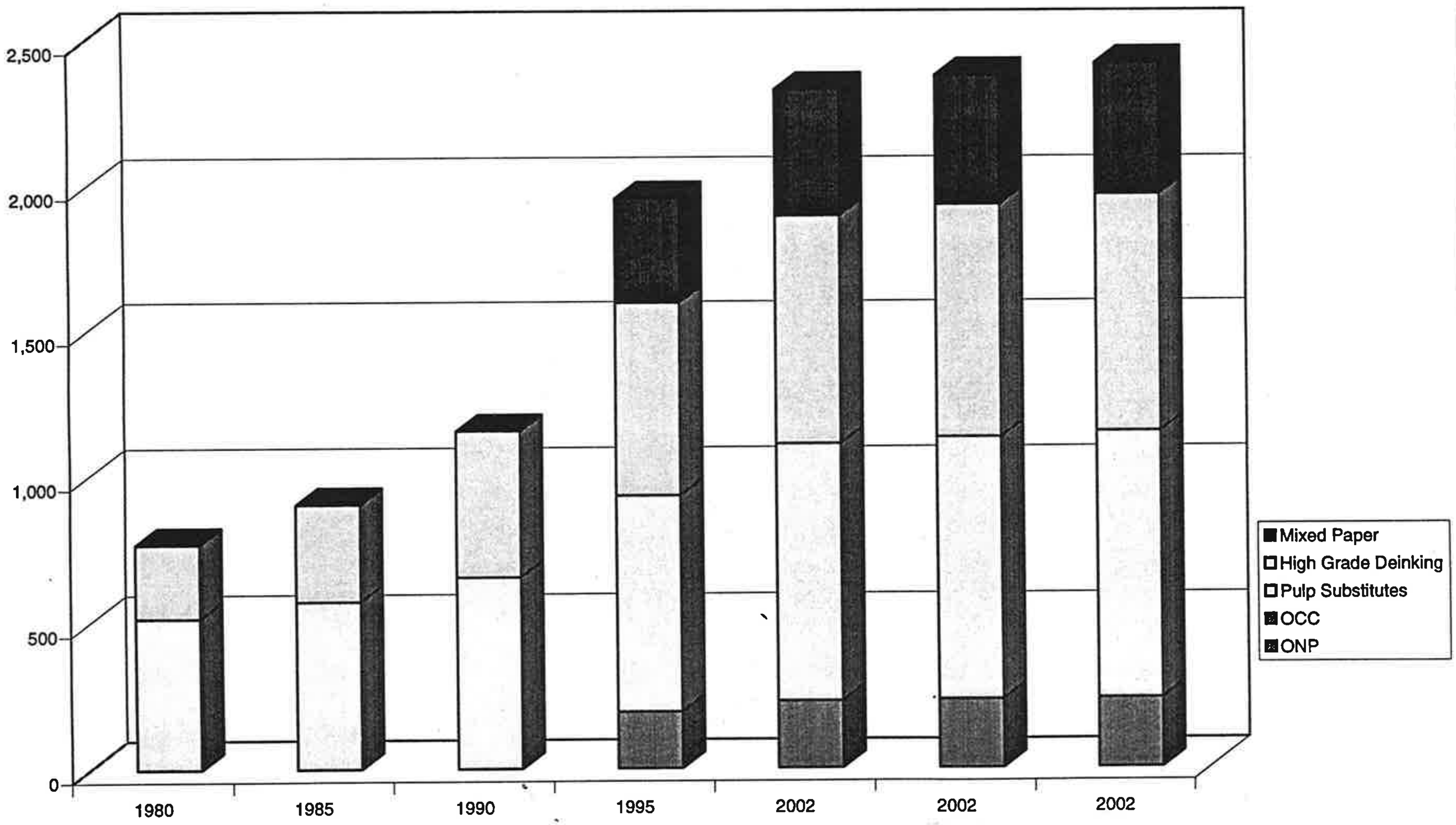


Chart 6. Tissue. Wastepaper input by grade (000 tons). Estimation 1980-1995. Projection 2002.

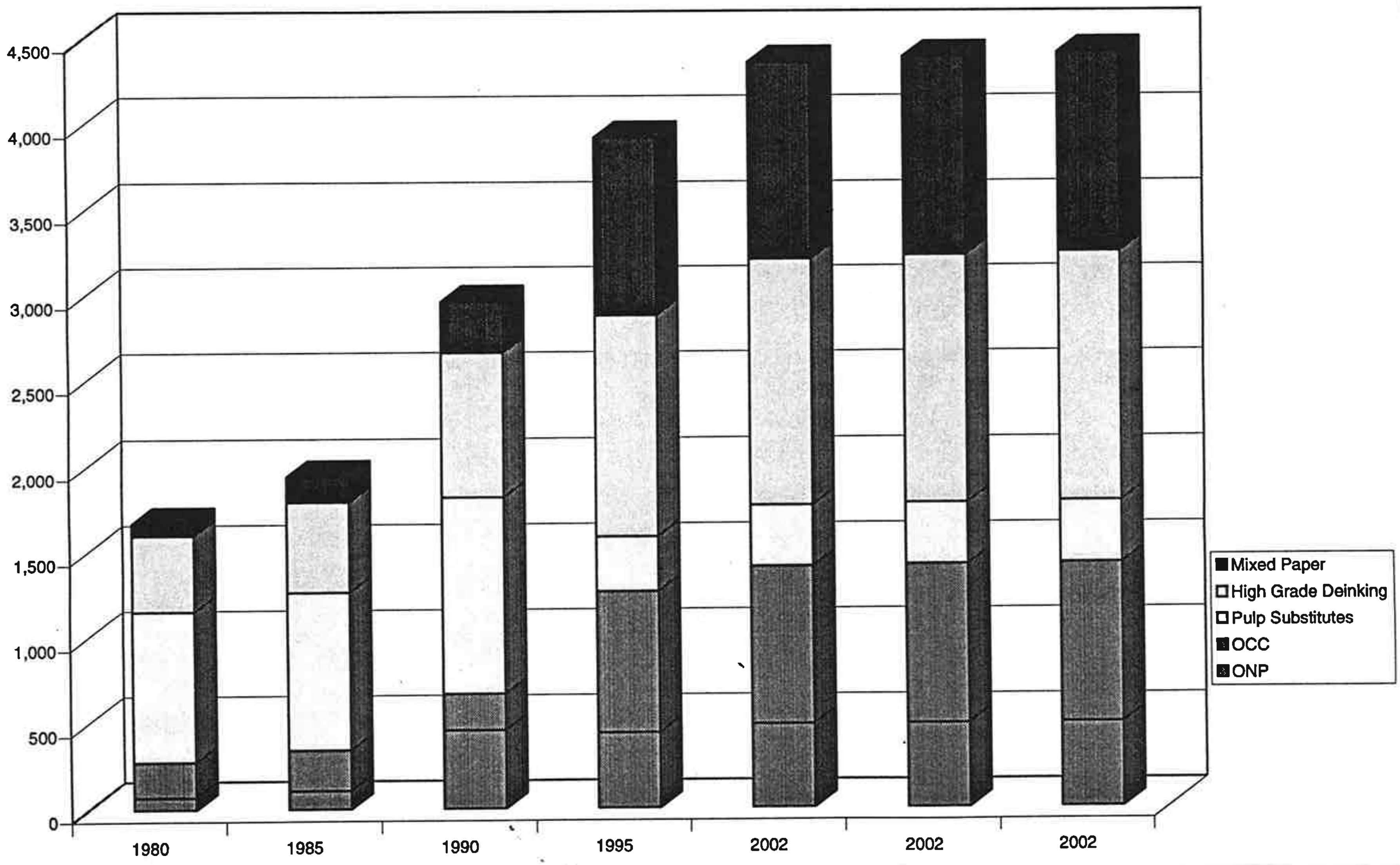


Chart 7. Unbleached Kraft. Wastepaper input by grade (000 tons). Estimation 1980-1995. Projection 2002.

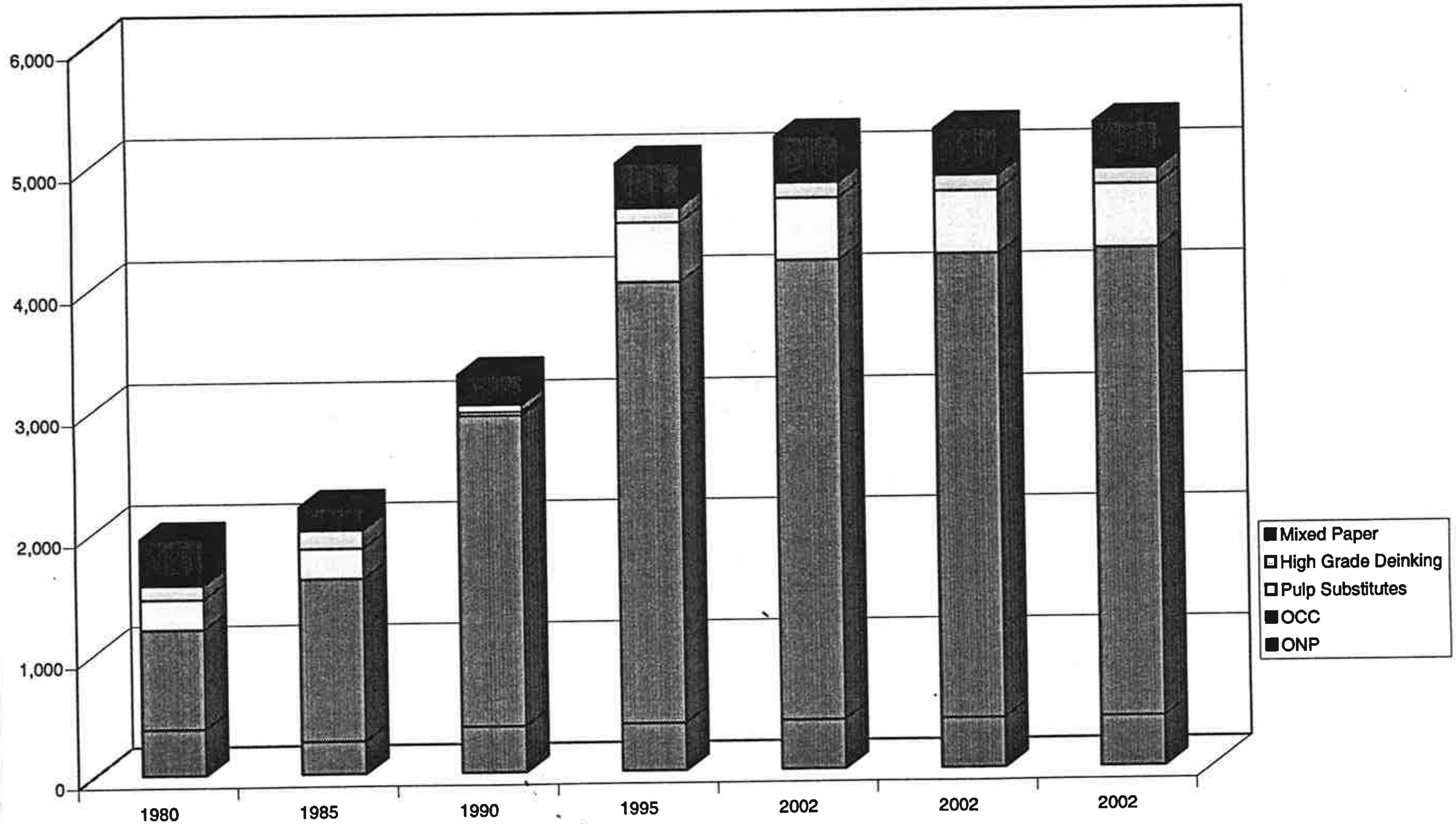


Chart 8. Semichemical Corrugating Medium. Wastepaper input by grade (000 tons). Estimation 1980-1995. Projection 2002.

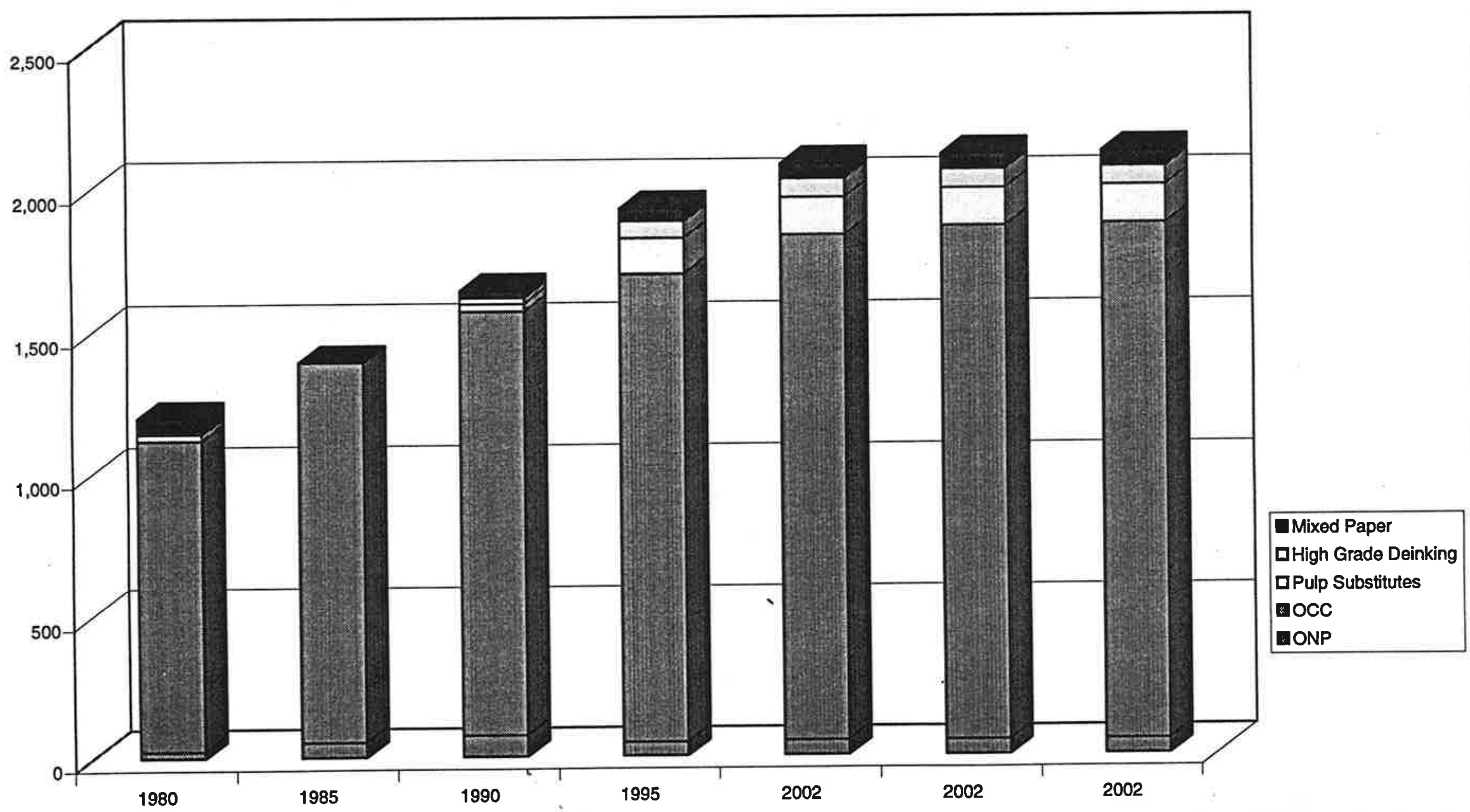


Chart 9. Recycled Paperboard. Wastepaper input by grade (000 tons). Estimation 1980-1995. Projection 2002.

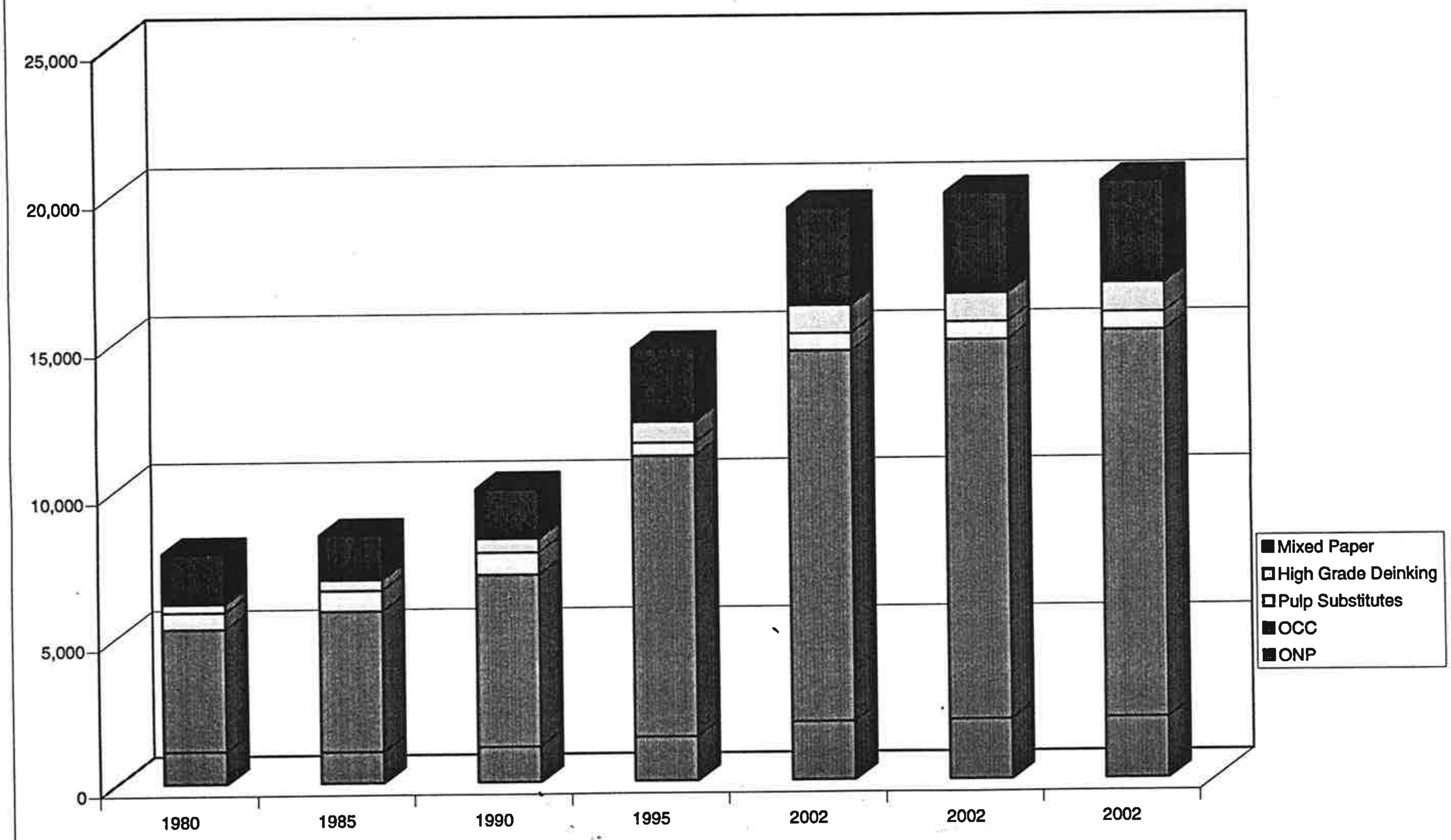


Chart 10. ONP Consumption by End-use (000 tons). Estimation 1980-1995. Projection 2002.

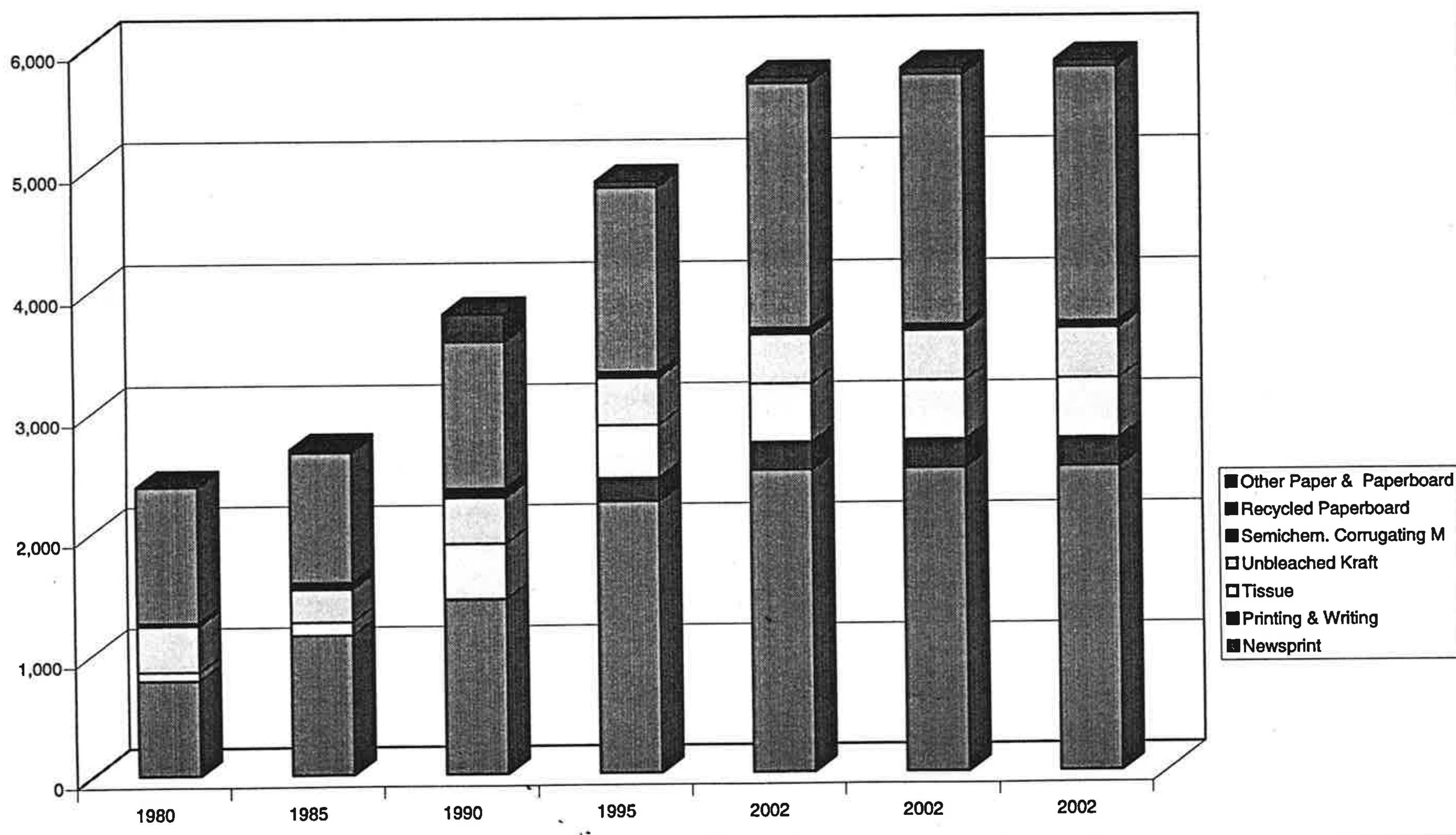


Chart 11. OCC Consumption by End-use (000 tons). Estimation 1980-1995. Projection 2002.

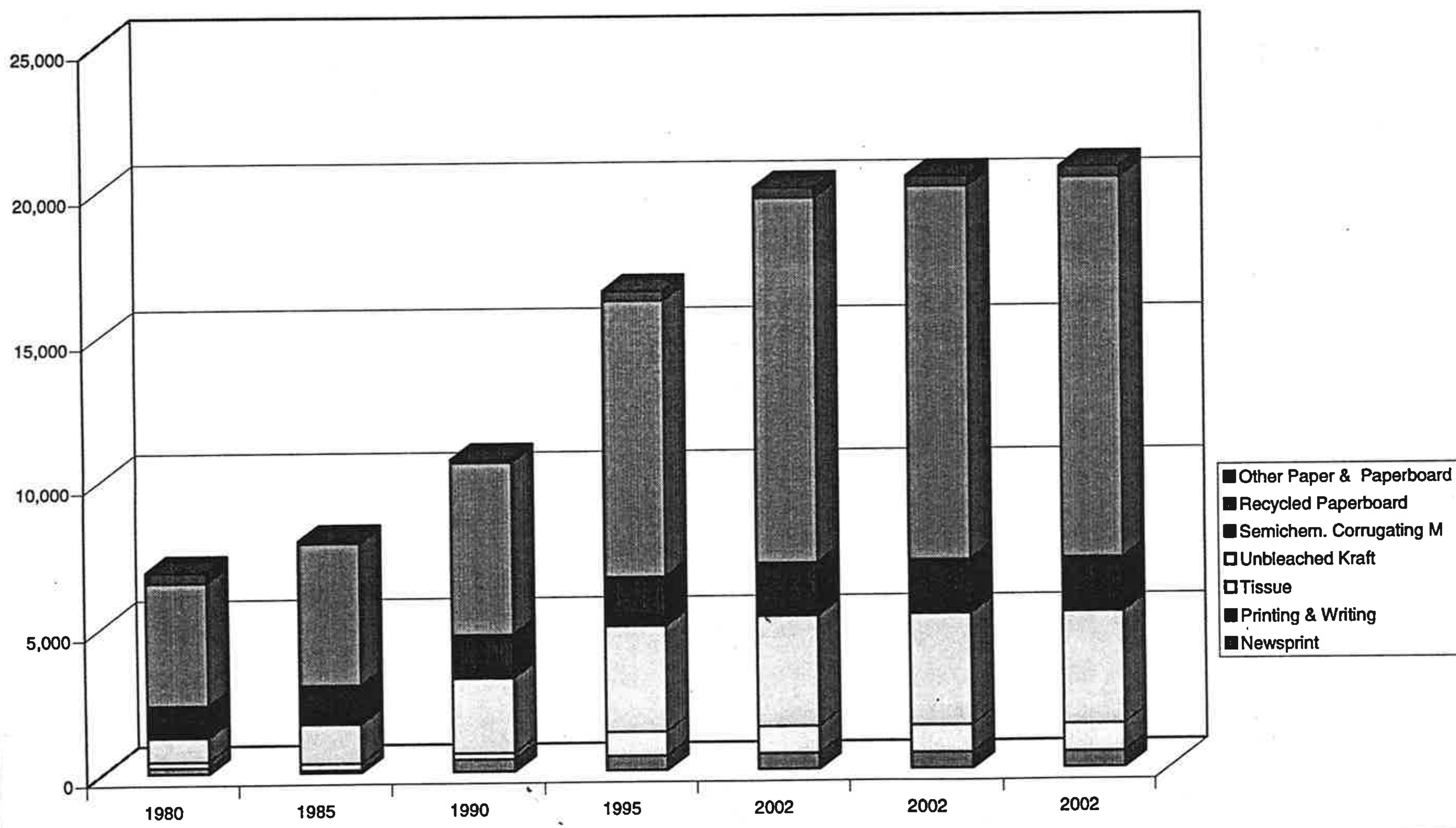


Chart 12. Pulp Substitutes. Consumption by End-use (000 tons). Estimation 1980-1995. Projection 2002.

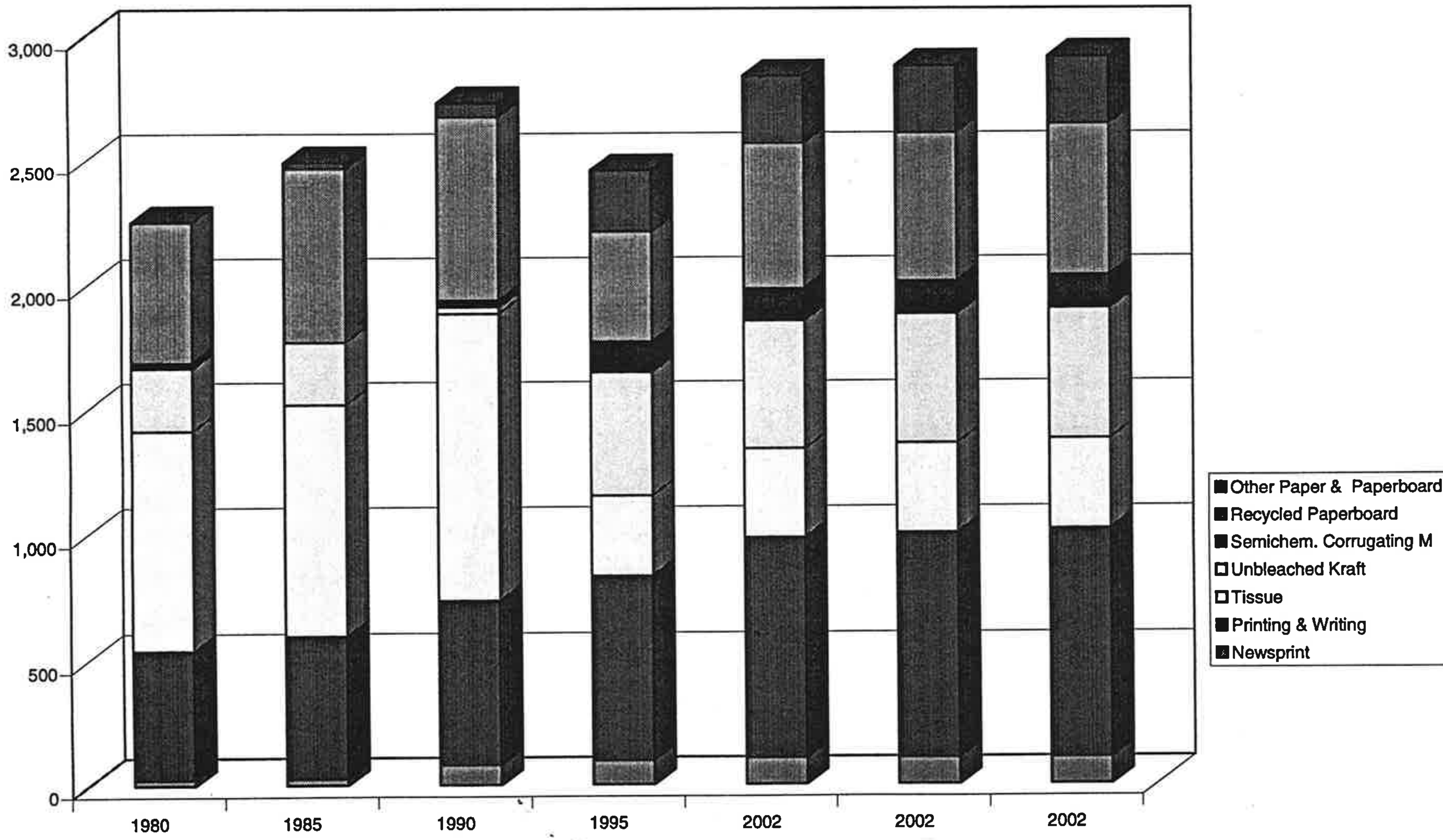


Chart 13. High Grade Deinking. Consumption by End-use (000 tons). Estimation 1980-1995. Projection 2002.

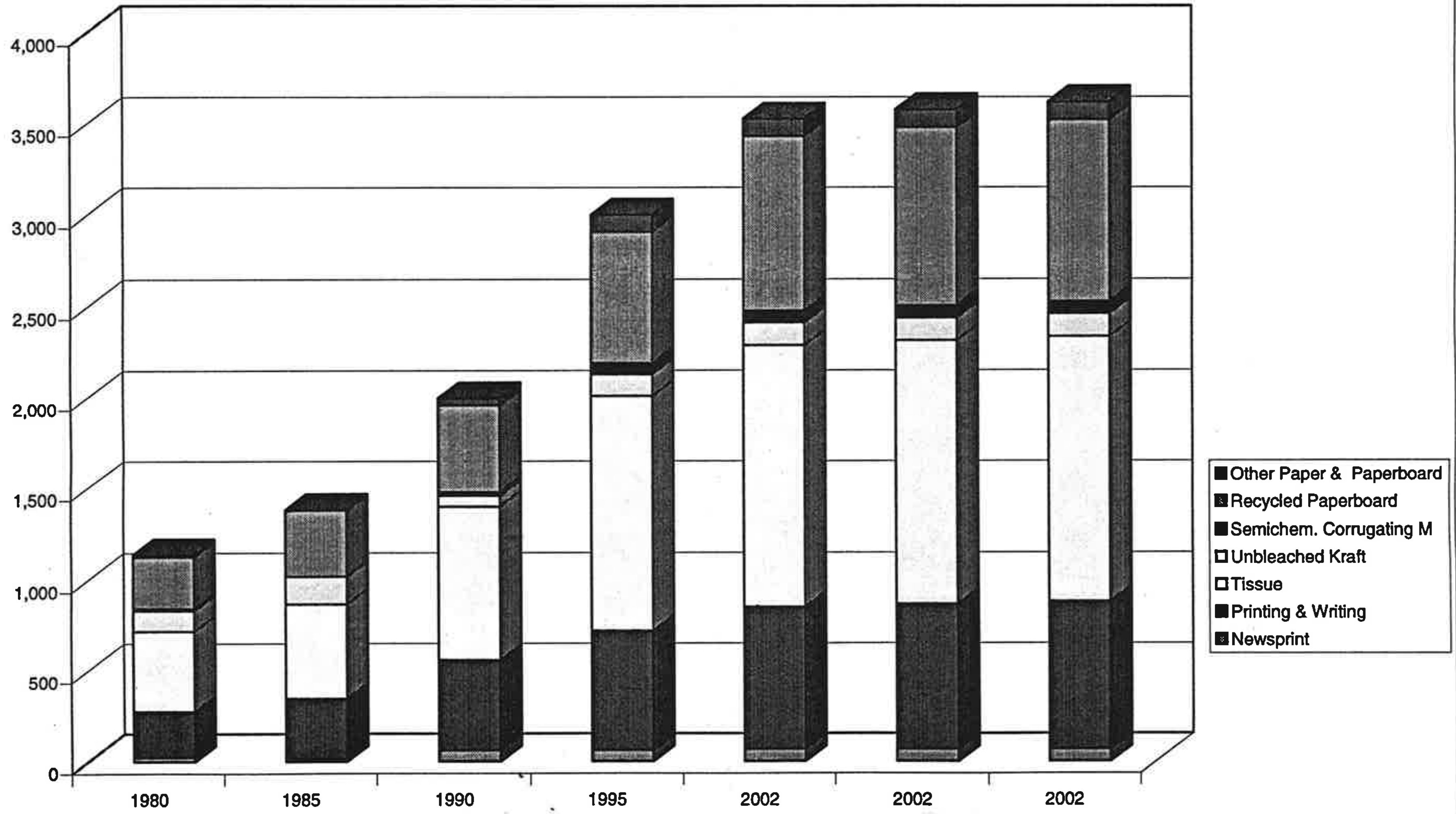
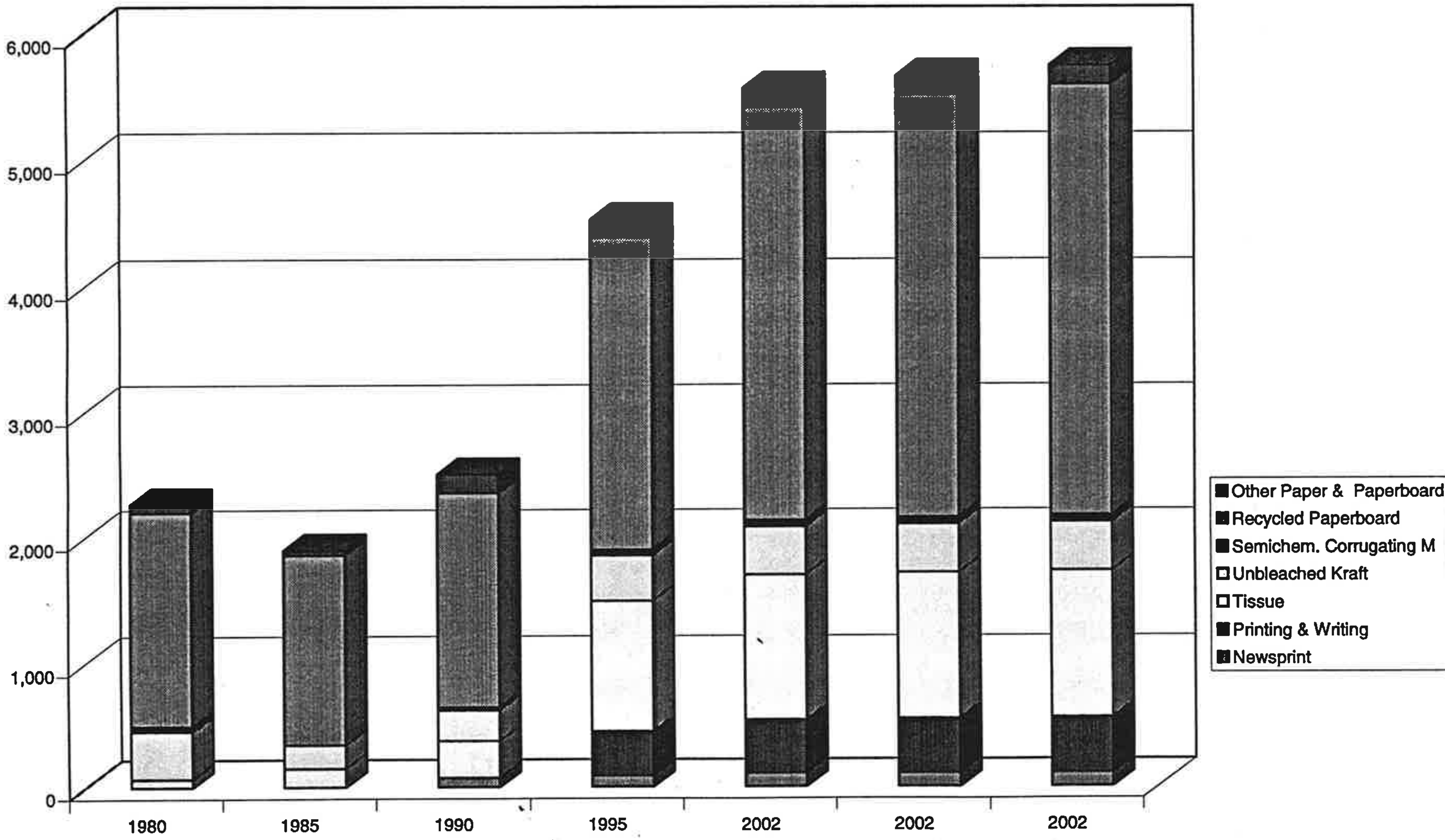


Chart 14. Mixed Wastepaper. Consumption by End-use (000 tons). Estimation 1980-1995. Projection 2002.



APPENDIX II

Table 1. *Newsprint Paper Mills. USA. 1980.*

St.	Location	Firm	SGW	RMP / TMP	Mech.	Bl. K.	Ubl. K.	K.	Ubl. Sulfite	Sulfite	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	Newsp. 100% R.	U. Gwd.	Gwd.	FS.	Tissue	Ubl. K. Paper
TN	Calhoun	Bowater Southern Papers	820	405	1225			1250						1850						
AL	Coosa Pines	Kimberly-Clark Corp	763	110	873	854		854						1200						
TX	Houston	Southland Paper Mills Inc.	800		800	350	300	650						1200						
ME	East Millinocket	Great Nothern Paper Inc.	800		800									1000						
LA	Deridder	Boise Southern Co.	400	450	850	160	1100	1260						980					1070	
TX	Lufkin	St. Regis Paper Co.	830		830									960		125	125			
WA	Longview	North Pacific Paper Co.		720	720									800						
OR	Oregon City	Publishers Paper Co.		450	450				180	180	YES	50	ONP	643						
SC	Catawba	Catawba Newsprint Co.		500	500									600						
VA	Ashland	Bear Island Paper Co. L. P.		500	500									530						
AR	Pine Bluff	International Paper Co.						1262						511						1101
GA	Augusta	Abitibi-Price Southern Corp.	400		400									500						
WA	Steilacoom	Boise Cascade Corp.		480	480									500						
AZ	Snowflake	Southwest Forest Industries	175		175	90	550	640			YES	215	ONP/OMG	450					750	
WA	Port Angeles	Crown Zellerbach Corp.		510										445		YES	YES			
OR	Newberg	Publishers Paper Co.		420	420				250	250	YES	100	ONP	435						
OR	Clatskane	James River Corp.	325	325		898		898						370				200		
AL	Mobile	International Paper Co.	250		250	425	800	1225			YES			343				205		796
ME	Woodland	Georgia-Pacific Corp.				900		900						255				125		
NJ	Garfield	Garden State Paper Co.									YES	600	ONP		600					
GA	Dublin	Southeast Paper Mfg. Co.									YES	450	ONP		450					
IL	Alsip	FSC Paper Co.									YES	360	ONP		300					
CA	Pomona	Garden State Paper Co.									YES	350	ONP		300					
MI	Manistique	Manistique Papers Inc.									YES	YES	OMG		200					

Source: Reprinted from 1981 Post's Pulp & Paper Directory by permission of the Publisher, Miller Freeman Inc.
Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 2. *Free-sheet Paper Mills. USA. 1980.*

St.	Location	Firm	SGW	RMP / TMP	Mech.	SemC	Bl. K.	Ubl. K.	K.	Bl. Sulfite	Ubl. Sulfite	Sulfite	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	Gwd.	C. FS.	U. FS.	FS.	Tissue	SC. CM.	Ubl K. Paper	Other Paper
WA	Wallula	Boise Cascade Corp.				280	465		465										YES	YES		YES	745	
VA	Franklin	Union Camp Corp.					1800		1800											1800				
TX	Evadale	Temple-Eastex Inc.					1500		1500											1400				
ME	Jay	International Paper Co.	130		130				1125											1305				
ME	Bucksport	St. Regis Paper Co.	300	146	446															1160				
MD	Luke	Westvaco Corp.					772		772											992				
ME	Rumford	Boise Cascade Corp.	120		120		610		610											905				
LA	Saint Francisville	Crown Zellerbach Corp.	255		255				550									550	285	835				
NC	Canton	Champion International Corp.					1400		1400										825	825				700
WA	Camas	Crown Zellerbach Corp.							810			440							810	810	290			
NC	Plymouth	Weyerhaeuser Co.					955	450	1405										800	800			1375	
TX	Pasadena	Champion Papers					800		800											780				
MS	Moss Point	International Paper Co.					661		661											760				
AL	Mobile	Scott Paper Co.					1500		1500											710	750			
AL	Courtland	Champion International Corp.					1350		1350											700				
NY	Ticonderoga	International Paper Co.					530		530											689				
MI	Escanaba	Mead Corp.		120	120		700		700											650				
AR	Ashdown	Nekoosa Papers Inc.					1300		1300										640	640				
ME	Westbrook	S. D. Warren Co.					300		300											600				
OR	St. Helens	Boise Cascade Corp.						1000	1000										600	600	100			
NY	Glens Falls	Finch, Pruin, Co.										380								575				
PA	Spring Grove	P. H. Glatfelter Co.					550		550											575				
WI	Kimberly	Midtec Paper Co.	115		115								YES							565				
OH	Chillicothe	Mead Corp.					600		600											550				
WI	Wisconsin Rapids	Consolidated Paper Inc.																536		536			92	
PA	Lock Haven	Hammermill Papers Business																	530	530				
TN	Kingsport	Mead Corp.					250		250											520				
ME	Madawaska	Fraser Paper Lmtd.															670			500				
MN	International Falls	Boise Cascade Corp.					365		365										500	500				
OH	Hamilton	Champion International Corp.																		495				
WI	Nekoosa	Nekoosa Papers Inc.					330		330										470	470				
NH	Berlin	Brown Co.				240			740				YES							450	260			
AR	Crosset	Georgia-Pacific Corp.					1150	1346	2496										446	446	400			436
OH	Chillicothe	Mead Corp.																		424				
PA	Erie	Hammermill Papers				580													422	422				
KY	Wicklife	Westvaco Corp.					660		660											405				
LA	Elizabeth	Calcasieu Paper Co.							300				YES						400	400				
MI	Muskegon	S. D. Warren Co.					230											400		400				
NY	Newton Falls	Newton Falls Paper Mill Inc.											YES	140				400		400				
WI	Port Edwards	Nekoosa Papers Inc.									230	230							385	385				
MN	Brainerd	Potlatch Corp.																370		370				
WI	Brokaw	Wausau Paper Mills Co.									190	190							353	353				
MN	Cloquet	Potlatch Corp.					400		400			180						352		352				
CA	Anderson	Simpson Paper Co.					175		175											350				
PA	Johnsonburg	Penntech Papers					180		180				YES						345	345				
WI	Park Falls	Flambeau Paper									110	110							325	325				
OH	Middletown	Sorg Paper Co.																		320				
MA	Fitchburg	James River Corp.																	300	300				
NH	Groveton	Groveton Papers Co.				250							YES						300	300	50			
WI	Rothschild	Weyerhaeuser Paper Co.									210	210								300				100

Table 2. *Free-sheet Paper Mills. USA. 1980.*

St.	Location	Firm	SGW	RMP / TMP	Mech.	SemC	Bl. K.	Ubl. K.	K.	Bl. Sulfite	Ubl. Sulfite	Sulfite	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	Gwd.	C. FS.	U. FS.	FS.	Tissue	SC. CM.	Ubl K. Paper	Other Paper
WA	Vancouver	Boise Cascade Corp.											YES						285	285				
WI	Rhinelander	Rhinelander Paper Co.								70	80	150		15						285				
CA	Pomona	Simpson Paper Co.											YES	50						280				
WA	Hoquiam	Grays Harbor Paper L. P.																	280	280				
MI	Kalamazoo	Allied Paper Inc.																		250				
PA	Miquon	Simpson Paper Co.																	250	250				
MI	Plainwell	Simpson Plainwell Paper Co.																		230				
AL	Jackson	Allied Paper Inc.					600		600										225	225				
OH	West Carrolton	Appleton Papers Inc.											YES	275					225	225				
OH	West Carrolton	Miami Paper Corp.											YES	100					225	225				
NY	Lyons Falls	Georgia-Pacific Corp.				120														210				
AL	Mobile	International Paper Co.	250		250		425	800	1225				YES			343				205				796
ME	Brewer	Eastern Fine Paper Inc.																	200	200				
MI	Port Huron	Port Huron Paper Corp.																	200	200				
NY	Oswego	Hammermill Papers																	200	200				
OR	Clatskane	James River Corp.	325	325			898		898							370			200	200	240			
VT	Gilman	Georgia-Pacific Corp.																		200				
WI	Combined Locks	Appleton Papers Inc.			200														200	200				
PA	Tyrone	Westvaco Corp.																		190				
PA	Roaring Spring	Appleton Papers Inc.					180		180				YES						180	180				
WA	Longview	Weyerhaeuser Co.				YES	750		750										180	180		YES		750
OH	Hamilton	The Becket Paper Co.																	160	160				
ME	Lincoln	Lincoln Pulp & Paper Co.					350		350										150	150	100			
WI	Peshtigo	Badger Paper Mills Inc.								150		150							140	140				
ME	Jay	James River-Otis Inc.																135		135				
ME	Woodland	Georgia-Pacific Corp.					900		900							255				125				
MI	Port Huron	Dunn Paper Co.																		125				
OH	Dayton	Howard Paper Mills Inc.																	125	125				
MI	Watervliet	Watervliet Paper Co.																		120				
WI	Stevens Point	Consolidated Paper Inc.																119		119				
MI	Vicksburg	Simpson Paper Co.																		100				
WI	Appleton	Riverside Paper Corps.											YES	60					100	100				
WI	Merril	Ward Paper Co.											YES	45					90	90				
CA	Ripon	Simpson Paper Co.											YES							86				
MA	Lawrence	Merrimac Paper Co.																	85	85				
WI	Menasha	Mead Corp., Gilbert Paper Div.																	78	78				
WI	Neenah	Neenah Paper																	70	70				

Source: Reprinted from 1981 Post's Pulp & Paper Directory by permission of the Publisher, Miller Freeman Inc.
Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 3. *Groundwood Paper Mills. USA. 1980.*

St.	Location	Firm	SGW	RMP / TMP	Mech.	Bl. Sulfite	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	C. Gwd.	U. Gwd.	Gwd.	FS.
WA	Port Angeles	Crown Zellerbach Corp.		510						445		YES	YES	
ME	Millinocket	Great Nothern Paper Inc.	700	120	820	660							1440	
MN	Grand Rapids	Blandin Paper Co.			850								866	
ME	Madawaska	Fraser Paper Lmtd.											670	500
WI	Wisconsin Rapids	Consolidated Paper Inc.			269						572		572	
OR	West Linn	Crown Zellerbach Corp.	225		225							500	500	
NY	Corinth	International Paper Co.	151		151		YES				480		480	
WI	Niagara	Niagara of WI Paper Co.	210		210						450		450	
MN	Sartell	St. Regis Paper Co.		130	130								230	
NY	Niagara Falls	Cascades Niagara Falls Inc.	80										200	
ME	Brunswick	Pejepscot Paper		150	150								165	
ME	Madison	Madison Paper Corp.	100		100		YES					140	140	
TX	Lufkin	St. Regis Paper Co.	830		830					960		125	125	

Source: Reprinted from 1981 Post's Pulp & Paper Directory by permission of the Publisher, Miller Freeman Inc.
Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 4. *Tissue Paper Mills. USA. 1985.*

St.	Location	Firm	Mech.	SemC.	Bl. K.	Ubl. K.	K.	Bl. Sulfite	Sulfite	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	U. FS.	FS.	Tissue	Ubl K. Paper	Recycled Paperboard	Other Paper
WI	Oconto Falls	Scott Paper Co.														YES			
PA	Chester	Scott Paper Co.														1058			
AL	Butler	American Can Co.			1000		1000									900			
WI	Green Bay	Fort Howard Corp.								YES		775				800			
AL	Mobile	Scott Paper Co.			1500		1500								710	750			
WI	Green Bay	Procter & Gamble Paper Products Co.							650							650			
ME	Winslow	Scott Paper Co.														580			
WA	Everett	Scott Paper Co.	30					525	525							450			
WI	Green Bay	American Can Co.						150	150							450			
AR	Crosset	Georgia-Pacific Corp.			1150	1346	2496							446	446	400			436
NY	Plattsburgh	Georgia-Pacific Corp.		100												350			
WI	Green Bay	Procter & Gamble Paper Products Co.														350			
WI	Marinette	Scott Paper Co.														350			
TN	Memphis	Kimberly-Clark Corp.														300			
WA	Camas	Crown Zellerbach Corp.					810		440					810	810	290			
NH	Berlin	Brown Co.		240			740			YES					450	260			
SC	Beech Island	Kimberly-Clark Corp.														250			
WA	Bellingham	Georgia-Pacific Corp.						500	500							245			
OR	Clatskane	James River Corp.	650		898		898						370	200	200	240			
SC	Catawba	Bowater Inc.	240		860	140	1000									240			
ID	Lewiston	Potlatch Corp.			1100		1100									225			875
FL	Palatka	Georgia-Pacific Corp.			400	750	1150									220	650		
OR	Halsey	American Conv. Co.			340		340									220			
WI	Neenah	Kimberly-Clark Corp.														215			
CT	New Milford	Kimberly-Clark Corp														200			
CA	Fullerton	Kimberly-Clark Corp														185			
NY	Fort Edward	Scott Paper Co.														180			
ME	Old Town	Diamond International Corp.			600		600									170			
WI	Eau Claire	Pope & Talbot Inc.								YES		200				160			
WI	Shawano	Shawano Paper Mills														160			
ME	Augusta	Statler Tissue Co.														150			
NY	Carthage	Crown Zellerbach Corp.								YES						135			
NY	South Glens Falls	Crown Zellerbach Corp.								YES		65				135			
CA	Antioch	Crown Zellerbach Corp.								YES						120			
MA	Baldwinville	Baldwinville Products Inc.								YES	YES					120			
PA	Ransom	Potlatch Corp.								YES		120				120			
MA	Erving	Erving Paper Mills Inc.								YES	YES					110			
WI	Menasha	Wisconsin Tissue Mills Inc.								YES		250				110			
ME	Lincoln	Lincoln Pulp & Paper Co.			350		350							150	150	100			
OK	Pryor	Robel Tissue Mills										125				100			
OR	St. Helens	Boise Cascade Corp.				1000	1000							600	600	100			
NJ	Elmwood Park	Marcal Paper Mills								YES	YES					80			
NH	Hinsdale	Hinsdale Products Co.										35				75			
NY	Greenwich	Noroton Pulp & Machinery Inc.								YES		70				60			
WI	Ashland	American Can Co.										80				51			
AZ	Flagstaff	Ponderosa Paper Products Inc.														50			
MI	Menominee	Menominee Paper Co. Inc.								YES						50			350
NH	Groveton	Groveton Papers Co.		250						YES				300	300	50			
MA	Otter River	Seaman Paper Co. of MA, Inc.														40			
VT	Putney	Putney Paper Co. Inc.														40			

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.

Recycling Capacity: YES, confirmed recycled capacity.

Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.

Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;

Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.

Unit: Short Tons per day.

Table 5. *Unbleached Kraft Paper and Paperboard. Paper Mills. USA. 1980.*

St.	Location	Firm	Mech.	SemC	Bl. K.	Ubl. K.	K.	Sulfite	Recycling Capacity	Secondary fiber	Wastepaper grades	Newsp.	C. FS.	U. FS.	FS.	Tissue	SC. CM.	Ubl K. Paper	Other Paper
GA	Cedar Springs	Great Southern Paper Co.		400		YES	1860		YES	150	OCC							2420	
SC	North Charleston	Westvaco Corp.				2435	2435											2250	
AL	Montgomery	Union Camp Corp.				2050	2050		YES	250								2188	
MN	Missoula	Stone Container Corp.				1850	1850											1910	
FL	Fernandina Beach	Container Corp. of America		350			1400											1800	
GA	Savannah	Union Camp Corp.		300			2550		YES	300							400	1700	
SC	Georgetown	International Paper Co.		100		1243	365	1608										1699	
LA	West Monroe	Manville Forest Products Corp.		270		1600	1600		YES	150							340	1660	
MS	Monticello	St. Regis Paper Co.				1955	1955											1650	
GA	Krannert	Georgia Kraft Co.				1600	1600											1600	
TN	Counce	Tennessee River Pulp & Paper				1600	1600											1600	
LA	Hodge	Continental Forest Industries		250			1400											1550	
LA	Bogalusa	Crown Zellerbach Corp.		330		1300	1300		YES	75							YES	1400	
OK	Valliant	Weyerhaeuser Paper Co.		500		1500	1500										550	1400	
OR	Toledo	Georgia-Pacific Corp.		250		1100	1100											1380	
NC	Plymouth	Weyerhaeuser Co.			955	450	1405							800	800			1375	
FL	Jacksonville	St. Regis Paper Co.					1400											1300	
OR	Springfield	Weyerhaeuser Co.				1090	1090											1290	
SC	Florence	South Carolina Industries				1300	1300											1250	
MS	Vicksburg	International Paper Co.				1160	1160		YES	YES								1210	
FL	Port St. Joe	St. Joe Paper Co.			450	850	1300											1200	
TX	Orange	Owens-Illinois Inc.				1175	1175											1120	
AL	Pine Hill	MacMillan Bloedel Packaging Inc.				1100	1100											1100	
NC	Roanoke Rapids	Champion International Corp.				1100	1100		YES	25								1100	
VA	Hopewell	Stone Container Corp.				1100	1100		YES	100								1100	
LA	Deridder	Boise Southern Co.	850		160	1100	1260					980						1070	
VA	West Point	Chesapeake Paper Products Co.			300	1150	1450											1060	
AR	Morrilton	Arkansas Kraft Corp.					800		YES	300								1000	
LA	Pineville	Pineville Kraft				985	985											985	
AL	Mahrt	Georgia Kraft Co.				975	975											975	
GA	Macon	Georgia Kraft Co.				900	900		YES	500								900	
GA	Port Wentworth	Continental Forest Industries				700	700											875	
FL	Pensacola	St. Regis Paper Co.			275	645	920											850	
GA	Valdosta	Owens-Illinois Inc.				890	890											850	
LA	Campti	Willamette Industries, Inc.				850	850		YES	100								850	
FL	Panama City	Southwest Forest Industries			1450		1450		YES	20								828	
CA	Antioch	Louisiana-Pacific Corp.		175	600		600		YES	30	OCC						YES	792	
AZ	Snowflake	Southwest Forest Industries	175		90	550	640					450						750	
FL	Jacksonville	Alton Box Board Co.				650	650											750	
OR	Albany	Willamette Industries, Inc.		200		650	650		YES	210							250	750	
WA	Wallula	Boise Cascade Corp.		280	465		465							YES	YES		YES	745	
AR	Camden	International Paper Co.				758	758		YES	28								719	
AL	Brewton	Container Corp. of America					1200											675	475
FL	Palatka	Georgia-Pacific Corp.			400	750	1150									220		650	
OR	Gardiner	International Paper Co.				520	520		YES	80								600	
GA	Riceboro	Interstate Paper Corp.				550	550											530	
OH	Rittman	Packaging Corp. of America																475	
PA	Philadelphia	Container Corp. of America																475	

Table 5. *Unbleached Kraft Paper and Paperboard. Paper Mills. USA. 1980.*

St.	Location	Firm	Mech.	SemC	Bl. K.	Ubl. K.	K.	Sulfite	Recycling Capacity	Secondary fiber	Wastepaper grades	Newsp.	C. FS.	U. FS.	FS.	Tissue	SC. CM.	Ubl K. Paper	Other Paper
WA	Port Townsend	Crown Zellerbach Corp.				475	475											475	
NJ	Clark	United States Gypsum Co.																396	
TX	Dallas	Rock-Tenn Co.							YES	205								350	
PA	Milton	National Gypsum Co.																310	
AR	Pine Bluff	Weyerhaeuser Co.					300											300	
MI	Monroe	Union Camp Corp.																300	
TN	Chattanooga	Rock-Tenn Co.							YES	350								300	
WI	Menasha	Menasha Corp.							YES	300								300	
IL	Quincy	The Celotex Corp.																275	
CA	Santa Clara	Container Corp. of America																270	
WI	Mosinee	Mosinee Paper Corp.				195	195											250	
OK	Pryor	Georgia-Pacific Corp.	50															240	
VA	Richmond	Federal Paper Bond Co. Inc.							YES	300	ONP/OCC							230	
NJ	Delair	Georgia-Pacific Corp.							YES	235								200	
WA	Longview	Longview Fibre Co.		220	500	1650	2150											200	
PA	Philadelphia	Newman & Co., Inc.																190	
OH	Franklin	Stone Container Corp.																180	
WV	Halltown	Halltown Paperboard Co.																180	
OH	Massillon	Greif Board Corp.																175	
OH	Cincinnati	Container Corp. of America																170	
OH	Toronto	Toronto Paperboard Co.																165	
MI	Kalamazoo	Gold Bond Building Papers																160	
PA	Downington	Sonoco Products Co.																160	
SC	Taylors	Carotell Paperboard Corp.																150	
TX	Galena Park	USG Industries Inc.																150	
NY	Lockport	Upson Co., The							YES	YES								140	
WI	Milwaukee	Wisconsin Paperboard Co.																140	
TN	Chattanooga	Container Corp. of America							YES	175								130	
VT	Sheldon Springs	Saxon Industries Inc.	50															130	
NC	Charlotte	Carolina Paperboard Corp.																117	
CA	Vernon	Container Corp. of America															300	100	
PA	Delaware Water Gap	Rock-Tenn Co.																100	
VA	Richmond	Manchester Board and Paper Co.																100	
WI	Wisconsin Rapids	Consolidated Paper Inc.											536		536			92	
WA	Tacoma	Container Corp. of America																65	

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 6. *SemiChemical Corrugating Medium Mills. USA.1980.*

St.	Location	Firm	SemC	Bl. K.	Ubl. K.	K.	Recycling Capacity	Secondary fiber	Wastepaper grades	U. FS.	FS.	SC. CM.	Ubl K. Paper	Recycled Paperboard	Other Paper
CA	Antioch	Louisiana-Pacific Corp.	175	600		600	YES	30	OCC			YES	792		
LA	Bogalusa	Crown Zellerbach Corp.	330		1300	1300	YES	75				YES	1400		
WA	Longview	Weyerhaeuser Co.	YES	750		750				180	180	YES			750
WA	Wallula	Boise Cascade Corp.	280	465		465				YES	YES	YES	745		
WI	Tomahawk	Owens-Illinois Inc.	840				YES	200				1000			
AL	Stevenson	Mead Corp.	550				YES	100				775			
OH	Coshocton	Stone Container Corp.	650				YES	250				700			
MI	Filler City	Packaging Corp. of America	620				YES	200				620			
VA	Big Island	Owens-Illinois Inc.	575				YES	120				620			
LA	Bastrop	International Paper Co.	492				YES	20				606			
VA	Riverville	Virginia Fibre Corp.	600				YES	100				600			
MI	Ontonagon	Champion International Corp.	500				YES	100				565			
OK	Valliant	Weyerhaeuser Paper Co.	500		1500	1500						550	1400		
SC	Hartsville	Sonoco Products Co.	280				YES	900				500		510	
TN	New Johnsonville	Inland Container Corp.	400									500			
IN	Terre Haute	The Weston Paper & Mfg Co.	270				YES	125				425			
GA	Savannah	Union Camp Corp.	300			2550	YES	300				400	1700		
OR	North Bend	Weyerhaeuser Paper Co.	300									400			
MI	Otsego	Menasha Corp.	300									365			
LA	West Monroe	Manville Forest Products Corp.	270		1600	1600	YES	150				340	1660		
KY	Hawesville	Willamette Ind. Il	300				YES	100				330			
CA	Vernon	Container Corp. of America										300	100		
NH	Groveton	Groveton Paper Board Inc.										300			
OH	Circleville	Container Corp. of America (JSC/CCA)	200				YES	100				300			
WI	Green Bay	Green Bay Packaging Inc.	495				YES	150				300			
OR	Albany	Willamette Industries, Inc.	200		650	650	YES	210				250	750		
TN	Harriman	Harriman Paperboard Corp.	185				YES	35				190			
IA	Fort Madison	Consolidated Pack. Corp.	130				YES	50				175			
PA	Philadelphia	Connelly Containers Inc. of Philadelphia										125			

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 7. *Recycled Paperboard Mills. USA. 1980.*

St.	Location	Firm	SemC.	Bl. K.	Ubl. K.	K.	Recycling Capacity	Secondary fiber	Deinked	Wastepaper grades	R P&W	Tissue	SC. CM.	Ubl K. Paper	Recycled Paperboard	Other Paper
IL	Alton	Alton Box Board Co.													600	
SC	Hartsville	Sonoco Products Co.	280				YES	900					500		510	
MI	Battle Creek	St. Regis Paper Co.					YES	500							475	
CT	Sprague	Federal Paper Bond Co. Inc.													450	
IN	Newport	Inland Container Corp.					YES	500							450	
GA	Austell	Austell Boxboard Corp.													355	
MI	Menominee	Menominee Paper Co. Inc.					YES	350				50			350	
NJ	Clifton	Whippany Paper Board Co.													350	
PA	York	St. Regis Paper Co. Recycled Fiber Div.													350	
MN	Saint Paul	Champion International Corp.													310	400
CA	Stockton	Pacific Paperboard Products Inc.					YES	330	15						300	
WI	Neenah	P. H. Glatfelter Co.					YES		200						300	
OH	Middletown	Diamond International Corp.													250	
OH	Baltimore	Crown Zellerbach Corp.													225	
CA	Santa Clara	California Paperboard Corp.													200	
IL	Marseilles	Nabisco Inc.					YES	175							200	
OK	Pryor	Gold Bond Building Products					YES	225							200	
PR	Arecibo	Caribe Inc. Productos Forestales	125												190	
NY	Piermont	Clevepak Corp.					YES	200							185	
CT	Uncasville	Connecticut Paperboard Corp.					YES	200							180	
OH	Cincinnati	Mead Corp.					YES	180							180	
IL	Chicago	Container Corp. of America													175	
CA	Port Hueneme	Western Kraft Paper Group													160	
AL	Mobile	Stone Container Corp.													150	
CA	Newark	Inland Container Corp.													150	
IL	Joliet	Prairie State Papers Mills													150	
MA	Lawrence	Newark Atlantic Paperboard Corp.													150	
CO	Commerce City	Packaging Corp. of America					YES	136							136	
OH	Coshocton	St. Regis Paper Co.					YES	170							135	
IN	Brownstown	Kieffer Paper Mills					YES	170							130	
MO	North Kansas City	United States Gypsum Co.					YES	135		OCC					130	
NY	Oakfield	USG Industries Inc.					YES	125							125	
NJ	Garwood	Millen Industries					YES	110							120	
IN	Carthage	Container Corp. of America					YES	130							100	
IA	Tama	Packaging Corp. of America													100	
MA	Natick	Natick Paperboard Corp.													100	
MI	Constantine	Simplex Products Group					YES	125		OCC					100	
NJ	Camden	United States Gypsum Co.													100	
TX	Forney	Corrugated Services Inc.					YES	110							100	
CT	Manchester	Lydall & Foulds													85	
IN	Gary	Georgia-Pacific Corp.					YES	85	YES						78	
OH	Massillon	Cleaners Hauger Co.					YES	45							70	
CT	Montville	Robertson Paper Box Co. Inc.					YES	60		ONP					65	

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 8. *Other Paper and Paperboard Mills. USA. 1980*

St.	Location	Firm	Mech.	SemC.	Bl. K.	Ubl. K.	K.	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	U. FS.	FS.	Tissue	SC. CM.	Ubl. Paper	K. Recycled Paperboard	Other Paper
VA	Covington	Westvaco Corp.		300	1100		1100											1400
GA	St. Marys	Gilman Paper Co.					1200											1200
AR	Pine Bluff	International Paper Co.					1262				511							1101
GA	Augusta	Continental Forest Industries	400		800		800											1075
LA	Bastrop	International Paper Co.					1014											1049
NC	Riegelwoods	Federal Paper Bond Co. Inc.			685													950
ID	Lewiston	Potlatch Corp.			1100		1100							225				875
TX	Texarkana	International Paper Co.			1288		1288											840
AL	Mobile	International Paper Co.	250		425	800	1225	YES			343		205					796
WA	Longview	Weyerhaeuser Co.		YES	750		750					180	180		YES			750
NC	Canton	Champion International Corp.			1400		1400					825	825					700
WI	Kaukauna	Thilmany					400											550
GA	Brunswick	Brunswick Pulp & Paper Co.			1700		1700											530
AL	Demopolis	Gulf States Paper Corp			500		500	YES	25									500
AL	Brewton	Container Corp. of America					1200									675		475
AR	McGehee	Potlatch Corp.			450		450											450
AR	Crosset	Georgia-Pacific Corp.			1150	1346	2496					446	446	400				436
MI	Kalamazoo	Brown Co.																400
MN	Saint Paul	Champion International Corp.															310	400
MA	Haverhill	Haverhill Paperboard Corp.																300
NJ	Milford	James River Corp.																250
CT	New Haven	Simkins Industries Inc.																220
MI	White Pigeon	White Pigeon Paper Co.																220
MA	Holyoke	Sonoco Products Co.																210
WI	De Pere	Nicolet Paper Co.																140
MI	Monroe	Jefferson Smurfit Corp.						YES										110
NY	Castleton-on-Hudson	Fort Orange Paper Corp.						YES										110
WI	Rothschild	Weyerhaeuser Paper Co.											300					100

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 9. *Newsprint Paper Mills. USA. 1985.*

St.	Location	Mill	SGW	RMP / TMP	Mech.	Bl. K.	Ubl. K.	K.	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	Newsp. 100% R.	C. Gwd.	U. Gwd.	U. FS.	Tissue	Ubl. K. Paper
TN	Calhoun	Bowater Southern Papers	630	880	1510	690		690				2150						
TX	Houston	Champion International Corp.	800	400	1200	350	300	650				1325						
WA	Longview	North Pacific Paper Co.		1450	1450							1300						
AL	Coosa Pines	Kimberly-Clark Corp	763	110	873	850		850				1187						
GA	Augusta	Augusta Newsprint Co.	400	770	1170							1130						
LA	Deridder	Boise Cascade Corp.	305	415	720	180	1095	1275				1000						1070
OR	Newberg	Publishers Paper Co.		550	550				YES	475	ONP	1000						
TX	Lufkin	Champion International Corp.	830		830							980			125			
ME	East Millinocket	Great Nothern Paper Inc.	750		750							920						
AZ	Snowflake	Southwest Forest Industries	200		200	150	550	700	YES	600	ONP/OMG	800						420
SC	Catawba	Catawba Newsprint Co.		500	500							640						
OR	Oregon City	Publishers Paper Co.		370	370				YES	300	ONP	600						
VA	Ashland	Bear Island Paper Co. L. P.		500	500							530						
WA	Steilacoom	Boise Cascade Corp.		480	480							516						
WA	Port Angeles	Crown Zellerbach Corp.		510	510							445			YES			
OR	Clatskane	James River Corp.	300	300	600	775		775				380				275	250	
AL	Mobile	International Paper Co.	180	55	235	53	1019	1072	YES			340						
NJ	Garfield	Garden State Paper Corp.							YES	700	ONP		600					
GA	Dublin	Southeast Paper Mfg. Co.			50				YES	450	ONP		450					
CA	Pomona	Garden State Paper Corp.							YES	400	ONP		370					
IL	Alsip	FSC Paper Co.							YES	360	ONP		305					
MI	Manistique	Manistique Papers Inc.	90		90				YES	110	OMG		200					

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 10. *Free-sheet Paper Mills, USA, 1985.*

St.	Location	Firm	SGW	RMP / TMP	Mech.	SemC	Bl. K.	Ubl. K.	K.	Bl. Sulfite	Ubl. Sulfite	Sulfite	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	Gwd.	C. FS.	U. FS.	FS.	Tissue	SC. CM.	Ubl K. Paper	Other Paper
VA	Franklin	Union Camp Corp.					1950		1950											1800				
AL	Courtland	Champion International Corp.					1393		1393											1656				
ME	Rumford	Boise Cascade Corp.	180	120	300		950		950									1050	400	1450				
TX	Evadale	Temple-Eastex Inc.					1550		1550											1400				
MI	Escanaba	Mead Corp.		200	200		800		800											1314				
ME	Jay	International Paper Co.	130		130				1200											1305				
AR	Ashdown	Nekoosa Papers Inc.					1400		1400										1300	1300				
OH	Chillicothe	Mead Corp.					600		600											1171				
ME	Bucksport	Champion International Corp.	300	146	446															1160				
MD	Luke	Westvaco Corp.					896		896											1144				
WA	Camas	Crown Zellerbach Corp.							810			520							1070	1070	YES			
NC	Plymouth	Weyerhaeuser Co.				220	1070	410	1480										930	930			1020	
WI	Kimberly	Midtec Paper Co.	185		185								YES	150						920				
NC	Canton	Champion International Corp.					1440		1440										900	900				705
AL	Mobile	Scott Paper Co.							1450											800	744			
PA	Spring Grove	P. H. Glatfelter Co.					575		575											800				
LA	Saint Francisville	Crown Zellerbach Corp.	200		200				495									580	215	795				
MS	Moss Point	International Paper Co.					750		750											780				
TX	Pasadena	Champion International Corp.					850		850											780				
NY	Ticonderoga	International Paper Co.					530		530											689				
PA	Lock Haven	Hammermill Papers Business																	675	675				
OR	St. Helens	Boise Cascade Corp.						1000	1000										625	625	100			
SC	Eastover	Union Camp Corp.					700		700										600	600				
WI	Wisconsin Rapids	Consolidated Paper Inc.																600		600			96	
NY	Glens Falls	Finch, Pruin, Co.										380								575				
ME	Westbrook	S. D. Warren Co.					295		295											550				
PA	Erie	Hammermill Papers				680													550	550				
TN	Kingsport	Mead Corp.					320		320											545				
MN	International Falls	Boise Cascade Corp.					365		365										520	520				
OH	Hamilton	Champion International Corp.																		510				
AR	Crosset	Georgia-Pacific Corp.					1500		1500										500	500	440			460
KY	Wicklife	Westvaco Corp.					722		722											500				
LA	Bastrop	International Paper Co.					1200		1200											500				550
WA	Wallula	Boise Cascade Corp.				166	776		776										492	492		288		
WI	Nekoosa	Nekoosa Papers Inc.					335		335										490	490				
KY	Hawesville	Willamette Ind. III																	450	450				
WI	Combined Locks	Appleton Papers Inc.			200														445	445				
MN	Cloquet	Potlatch Corp.					490		490									437		437				
WI	Brokaw	Wausau Paper Mills Co.								220	205	425							435	435				
ME	Madawaska	Fraser Paper Lmtd.															800		430	430				
WI	Port Edwards	Nekoosa Papers Inc.								235		235							405	405				
MI	Muskegon	S. D. Warren Co.					230											400		400				
MI	Parchment	James River Corp.																		400				
NY	Newton Falls	Newton Falls Paper Mill Inc.											YES	140				400		400				
MN	Brainerd	Potlatch Corp.																395		395				
PA	Johnsonburg	Penntech Papers					220		220				YES						380	380				
WA	Hoquiam	Grays Harbor Paper L. P.																	375	375				
WA	Longview	Weyerhaeuser Co.				YES	800		800										375	375		280		565
CA	Anderson	Simpson Paper Co.					225		225											350				
OH	West Carrolton	Appleton Papers Inc.											YES	180					350	350				
WI	Park Falls	Flambeau Paper								120		120	YES						325	325				
OH	Middletown	Mosinee Paper Co.																		320				
WI	Rothschild	Weyerhaeuser Paper Co.								210		210								320				

Table 10. *Free-sheet Paper Mills, USA, 1985.*

St.	Location	Firm	SGW	RMP / TMP	Mech.	SemC	Bl. K.	Ubl. K.	K.	Bl. Sulfite	Ubl. Sulfite	Sulfite	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	Gwd.	C. FS.	U. FS.	FS.	Tissue	SC. CM.	Ubl K. Paper	Other Paper
CA	Pomona	Simpson Paper Co.											YES	50						310				
ME	Woodland	Georgia-Pacific Corp.					800		800											300				
MI	Kalamazoo	Allied Paper Inc.																		300				
NH	Gorham	James River Corp.																	300	300	50			
NH	Groveton	James River Corp.				250							YES						300	300	60			
WI	Rhinelander	Rhinelander Paper Co.										YES	YES	YES						285				
WA	Vancouver	Boise Cascade Corp.											YES						280	280				
OH	West Carrolton	Miami Paper Corp.											YES	100					275	275				
OR	Clatskane	James River Corp.	300	300			775		775							380			275	275	250			
MI	Plainwell	Simpson Plainwell Paper Co.																		245				
AL	Jackson	Allied Paper Inc.					600		600										225	225				
MA	Fitchburg	Fitchburg Paper Inc.											YES	YES						225				
MA	Fitchburg	James River Corp.																	220	220				
AL	Mobile	International Paper Co.	180	55	235		53	1019	1072				YES			340				215				800
NY	Oswego	Hammermill Papers																	212	212				
NY	Lyons Falls	Georgia-Pacific Corp.				120														210				
ME	Brewer	Eastern Fine Paper Inc.																	200	200				
MI	Port Huron	Port Huron Paper Corp.																	200	200				
PA	Roaring Spring	Appleton Papers Inc.					180		180				YES						200	200				
VT	Gilman	Georgia-Pacific Corp.											YES	30						200				
PA	Tyrone	Westvaco Corp.																140	48	188				
ME	Lincoln	Lincoln Pulp & Paper Co.					350		350										165	165	95			
MI	Port Huron	Dunn Paper Co.																		165				
MI	Detroit	Port Huron Paper Co.																		160				
OH	Hamilton	The Becket Paper Co.																	150	150				
MI	Watervliet	Watervliet Paper Co.																		140				
WI	Peshtigo	Badger Paper Mills Inc.									150	150							140	140				
WI	Stevens Point	Consolidated Paper Inc.																136		136				
ME	Jay	James River-Otis Inc.																135		135				
WI	Neenah	Neenah Paper																	135	135				
OH	Dayton	Howard Paper Mills Inc.																	125	125				
PA	Miquon	Simpson Paper Co.																	125	125				
MI	Vicksburg	Simpson Paper Co.																		100				
WI	Appleton	Amrison Corp.											YES	30					100	100				
WI	Menasha	Mead Corp., Gilbert Paper Div.											YES						95	95				
WI	Merril	Ward Paper Co.											YES	60					90	90				
CA	Ripon	Simpson Paper Co.											YES							85				
MA	Lawrence	Merrimac Paper Co.																	85	85				

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 11. *Groundwood Paper Mills. USA. 1985.*

St.	Location	Firm	SGW	RMP / TMP	Mech.	Bl. K.	K.	Sulfite	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	C. Gwd.	U. Gwd.	Gwd.	U. FS.
WA	Port Angeles	Crown Zellerbach Corp.		510								445		YES	YES	
ME	Millinocket	Great Nothern Paper Inc.	737	100	837			710							1400	
ME	Madawaska	Fraser Paper Lmtd.											440	360	800	430
MN	Grand Rapids	Blandin Paper Co.	141	257	298										790	
MN	Sartell	Champion International Corp.	140	400	540								480	240	720	
ME	Madison	Madison Paper Industries	280		280				YES					600	600	
WI	Wisconsin Rapids	Consolidated Paper Inc.			265								590		590	
MS	Columbus	Weyerhaeuser Paper Co.		286	286								550		550	
OR	West Linn	Crown Zellerbach Corp.	225		225									500	500	
NY	Corinth	International Paper Co.	151		151				YES	25			480		480	
WI	Niagara	Niagara of WI Paper Co.	210		210								450		450	
ME	Brunswick	Pejepscot Paper		160	160										165	
TX	Lufkin	Champion International Corp.	830		830							980		125	125	
MA	Otter River	Consolidated Paper Inc.													85	

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 12. *Tissue Paper Mills. USA. 1985.*

St.	Location	Firm	Mech.	SemC.	Bl. K.	Ubl. K.	K.	Bl. Sulfite	Sulfite	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	U. FS.	FS.	Tissue	Ubl K. Paper	Recycled Paperboard	Other Paper
WA	Camas	Crown Zellerbach Corp.					810		520					1070	1070	YES			
PA	Chester	Scott Paper														1060			
WA	Bellingham	Georgia-Pacific Corp.						600	600	YES	775					850			
WI	Green Bay	Fort Howard Corp.									775					850			
AL	Mobile	Scott Paper Co.					1450								800	744			
WI	Green Bay	Procter & Gamble Paper Products Co.							650							650			
WA	Everett	Scott Paper Co.	30					525	525							600			
ME	Winslow	Scott Paper Co.														580			
WI	Green Bay	James River Corp.						170	170							500			
AR	Crosset	Georgia-Pacific Corp.			1500		1500							500	500	440			460
FL	Palatka	Georgia-Pacific Corp.			403	682	1085									415	650		
WI	Green Bay	Procter & Gamble Paper Products Co.														360			
AL	Butler	James River Corp.			1000		1000									350			550
WI	Marinette	Scott Paper Co.														350			
TN	Memphis	Kimberly-Clark Corp.														314			
WI	Menasha	Wisconsin Tissue Mills Inc.								YES	YES					300			
ID	Lewiston	Potlatch Corp.			1100		1100									290			900
WI	Neenah	Kimberly-Clark Corp.														276			
OR	Halsey	James River Corp.														270			
SC	Catawba	Bowater Inc.	210		1050		1050									265			
NJ	Elmwood Park	Marcal Paper Mills								YES	YES					250			
NY	Plattsburgh	Georgia-Pacific Corp.		125												250			
OR	Clatskane	James River Corp.	600		775		775						380	275	275	250			
SC	Beech Island	Kimberly-Clark Corp.														250			
WI	Eau Claire	Pope & Talbot Inc.								YES	300					200			
CT	New Milford	Kimberly-Clark Corp														187			
CA	Fullerton	Kimberly-Clark Corp														185			
NY	Fort Edward	Scott Paper Co.														180			
NY	South Glens Falls	Crown Zellerbach Corp.								YES	210					180			
ME	Old Town	James River Corp.			600		600									170			
WI	Shawano	Shawano Paper Mills														160			
ME	Augusta	Statler Tissue Co.														150			
NY	Carthage	Crown Zellerbach Corp.								YES	YES					150			
PA	Ransom	Potlatch Corp.								YES	180					135			
MA	Baldwinville	Baldwinville Products Inc.								YES	YES					120			
MA	Erving	Erving Paper Mills Inc.								YES	YES					110			
OK	Pryor	Robel Tissue Mills								YES	125					100			
OR	St. Helens	Boise Cascade Corp.				1000	1000							625	625	100			
ME	Lincoln	Lincoln Pulp & Paper Co.			350		350							165	165	95			
NY	Greenwich	Noroton Pulp & Machinery Inc.								YES	10					80			
NH	Hinsdale	Hinsdale Products Co.								YES	35					75			
MI	Menominee	Menominee Paper Co. Inc.								YES						70			400
WI	Oconto Falls	Scott Paper Co.								YES	45					65			
NH	Groveton	James River Corp.		250						YES				300	300	60			
WI	Ashland	James River Corp.								YES	80					55			
AZ	Flagstaff	Ponderosa Paper Products Concel Inc.								YES	80					50			
NH	Gorham	James River Corp.												300	300	50			
VT	Putney	Putney Paper Co. Inc.														40			

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 13. *Unbleached Kraft Paper and Paperboard. Paper Mills. USA. 1985.*

St.	Location	Firm	Mech.	SemC	Bl. K.	Ubl. K.	K.	Sulfite	Recycling Capacity	Secondary fiber	Wastepaper grades	Newsp.	C. FS.	U. FS.	FS.	Tissue	SC. CM.	Ubl Paper	K. Other Paper
GA	Savannah	Union Camp Corp.					2850		YES	300								3370	
GA	Cedar Springs	Great Southern Paper Co.		400		1870	1870		YES	150	OCC/DKL							2420	
WA	Longview	Longview Fibre Co.		220	500	2300	2800											2400	
SC	North Charleston	Westvaco Corp.				2600	2600											2200	
AL	Montgomery	Union Camp Corp.				2050	2050		YES	250								2188	
LA	Mansfield	International Paper Co.				2050	2050											2050	
OK	Valliant	Weyerhaeuser Paper Co.		400		1600	1600										570	1980	
MN	Missoula	Stone Container Corp.				1900	1900											1910	
FL	Fernandina Beach	Container Corp. of America		300			1700											1850	
AL	Pine Hill	MacMillan Bloedel Packaging Inc.		600		1100	1100		YES	300								1800	
GA	Krannert	Georgia Kraft Co.				2000	2000											1800	
SC	Florence	Stone Container Corp.				1400			YES	400	OCC							1750	
LA	West Monroe	Manville Forest Products Corp.		270		1400	1400		YES	250								1710	
SC	Georgetown	International Paper Co.		100		1708	365	2073										1699	
MS	Monticello	Georgia-Pacific Corp.				1955	1955											1650	
TN	Counce	Tennessee River Pulp & Paper				1600	1600											1650	
OR	Toledo	Georgia-Pacific Corp.		260		1140	1140											1520	
LA	Bogalusa	Crown Zellerbach Corp.		330		1300	1300		YES	25							YES	1400	
GA	Macon	Georgia Kraft Co.				950	950		YES	500								1400	
OR	Springfield	Weyerhaeuser Co.				1400	1400										365	1395	
LA	Hodge	Stone Container Corp.		300			1400											1348	
MS	Vicksburg	International Paper Co.				1181	1181		YES	108								1340	
FL	Pensacola	Champion International Corp.			285	1275	1560											1300	
FL	Jacksonville	Jacksonville Kraft Paper Co.					1400											1300	
FL	Port St. Joe	St. Joe Forest Products Co.			500	1200	1700		YES	100	OCC							1145	
VA	Hopewell	Stone Container Corp.				1000			YES	130								1120	
TX	Orange	Owens-Illinois Inc.				1200	1200											1100	
VA	West Point	Chesapeake Paper Products Co.			480	920	1400											1100	
NC	Roanoke Rapids	Champion International Corp.				1100			YES	25								1100	
AL	Phenix City	Alabama Kraft Co.				1100	1100		YES	50								1100	
AR	Morrilton	Arkansas Kraft Corp.				780	780		YES	YES								1100	
LA	Deridder	Boise Cascade Corp.	720		180	1095	1275					1000						1070	
NC	Plymouth	Weyerhaeuser Co.		220	1070	410	1480							930	930			1020	
LA	Pineville	International Paper Co.				985	985											985	
GA	Valdosta	Owens-Illinois Inc.				998	998											950	
LA	Campti	Willamette Industries, Inc.				800	800		YES	130	OCC							930	
GA	Port Wentworth	Stone Container Corp.				900	900											900	
FL	Jacksonville	Alton Packaging Corp.				760	760											850	
OR	Gardiner	International Paper Co.				850	850		YES	85								850	
OR	Albany	Willamette Industries, Inc.		185		580	580		YES	335	OCC						265	835	
FL	Panama City	Southwest Forest Industries			650	800	1450		YES	20								828	
WA	Tacoma	Simpson Tacoma Kraft Co.			220	820	1040											775	
AL	Brewton	Container Corp. of America					1334											760	475
AR	Camden	International Paper Co.				801	801		YES	4.4								714	
FL	Palatka	Georgia-Pacific Corp.			403	682	1085									415		650	
GA	Riceboro	Interstate Paper Corp.				550	550											630	
CA	Antioch	Fibreboard Corp.		175	150	600	750		YES	150	OCC						175	625	
OH	Rittman	Pack. Corp. of America																500	
PA	Philadelphia	Container Corp. of America																495	
AZ	Snowflake	Southwest Forest Industries	200		150	550	700		YES	360		800						420	
TX	Dallas	Rock-Tenn Co.							YES	435								410	

Table 13. *Unbleached Kraft Paper and Paperboard, Paper Mills, USA, 1985.*

St.	Location	Firm	Mech.	SemC	Bl. K.	Ubl. K.	K.	Sulfite	Recycling Capacity	Secondary fiber	Wastepaper grades	Newsp.	C. FS.	U. FS.	FS.	Tissue	SC. CM.	Ubl Paper	K. Other Paper
NJ	Clark	United States Gypsum Co.																	396
WI	Milwaukee	Wisconsin Paperboard Co.																	350
AR	Pine Bluff	Weyerhaeuser Co.					300												320
PA	Milton	National Gypsum Co.																	310
WA	Port Townsend	Port Townsend Paper Corp.				450	450												310
TN	Chattanooga	Rock-Tenn Co.							YES	350									300
CA	Santa Clara	Container Corp. of America																	295
IL	Quincy	The Celotex Corp.																	275
MI	Monroe	Union Camp Corp.																	250
NJ	Delair	Georgia-Pacific Corp.							YES	300									250
WI	Mosinee	Mosinee Paper Corp.				195	195												250
OK	Pryor	Georgia-Pacific Corp.	50																240
VA	Richmond	Federal Paper Bond Co. Inc.							YES	240	ONP/OCC								235
OH	Massillon	Greif Board Corp.																	225
WV	Halltown	Halltown Paperboard Co.																	200
PA	Philadelphia	Newman & Co., Inc.																	195
MI	Battle Creek	Michigan Paperboard Co.																	175
SC	Taylors	Carotell Paperboard Corp.																	175
OH	Cincinnati	Cincinnati Paperboard Corp.																	170
OH	Franklin	Franklin Boxboard Corp.																	165
MI	Kalamazoo	National Gypsum Co.																	160
PA	Downington	Sonoco Products Co.																	160
VT	Sheldon Springs	Boise Cascade Corp.	55																156
OH	Toronto	Toronto Paperboard Co.																	150
TX	Galena Park	USG Industries Inc.							YES	190									150
WI	Menasha	U. S. Paper Mills Co.							YES	155									150
NY	Lockport	Domtar Ind.							YES	250									145
CA	Vernon	Container Corp. of America															375		135
OH	Middletown	Middletown Paperboard Co.																	130
TN	Chattanooga	Chattanooga Paperboard Corp.							YES	175									130
NC	Charlotte	Carolina Paperboard Corp.																	125
PA	Delaware Water G	Rock-Tenn Co.																	120
VA	Richmond	Manchester Board and Paper Co.																	105
WI	Wisconsin Rapids	Consolidated Paper Inc.											600		600				96
WA	Tacoma	Container Corp. of America																	75

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 14. *SemiChemical Corrugating Medium Mills. USA.1985.*

St.	Location	Firm	SemC	Bl. K.	Ubl. K.	K.	Recycling Capacity	Secondary fiber	Wastepaper grades	U. FS.	FS.	SC. CM.	Ubl K. Paper	Recycled Paperboard	Other Paper
LA	Bogalusa	Crown Zellerbach Corp.	330		1300	1300	YES	25	OCC			YES	1300		
WI	Tomahawk	Owens-Illinois Inc.	900				YES	220				1120			
AL	Stevenson	Mead Corp.	650				YES	250				860			
OH	Coshocton	Stone Container Corp.	600				YES	250				800			
MI	Ontonagon	Champion International Corp.	500				YES	200				750			
VA	Big Island	Owens-Illinois Inc.	575				YES	140				650			
VA	Riverville	Virginia Fibre Corp.	600				YES	150				650			
MI	Filler City	Pack. Corp. of America	610				YES	250				620			
LA	Bastrop	International Paper Co.	492				YES	20				606			
OK	Valliant	Weyerhaeuser Paper Co.	400		1600	1600						570	1980		
TN	New Johnsonville	Inland Container Corp.	400									530			
OR	North Bend	Weyerhaeuser Paper Co.	300									470			
MI	Otsego	Menasha Corp.	500									450			
IN	Terre Haute	The Weston Paper & Mfg Co.	300				YES	125				425			
SC	Hartsville	Sonoco Products Co.	280				YES	900				400		450	
CA	Vernon	Container Corp. of America										375	135		
WI	Green Bay	Green Bay Packaging Inc.	220				YES	180				370			
LA	Hodge	Stone Container Corp.	300			1400						365	1395		
KY	Hawesville	Willamette Ind. II	300				YES	225				350			
NH	Groveton	Groveton Paper Board Inc.										300			
OH	Circleville	Container Corp. of America (JSC/CCA)	200				YES	100				300			
WA	Wallula	Boise Cascade Corp.	166	776		776				492	492	288			
WA	Longview	Weyerhaeuser Co.	YES	800		800				375	375	280			565
TN	Harriman	Clinch River Corp.	240				YES	80				270			
OR	Albany	Willamette Industries, Inc.	185		580	580	YES	335	OCC			265	835		
NC	Sylva	Jackson Paper Mfg. Co.										225			
IA	Fort Madison	Consolidated Paper Inc.	150				YES	50				200			
CA	Antioch	Fibreboard Corp.	175	150	600	750	YES	150	OCC			175	625		
PA	Philadelphia	Connelly Containers Inc. of Philadelphia										125			

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 15. *Recycled Paperboard Mills. USA. 1985.*

St.	Location	Firm	SemC.	Bl. K.	Ubl. K.	K.	Recycling Capacity	Secondary fiber	Deinked	Wastepaper grades	R P&W	Tissue	SC. CM.	Ubl K. Paper	Recycled Paperboard	Other Paper
IL	Alton	Alton Packaging Corp.													600	
CA	Antioch	Crown Zellerbach Corp.					YES	600							575	
IN	Newport	Inland Container Corp.					YES	625							550	
CA	Ontario	Inland Container Corp.													515	
CT	Sprague	Federal Paper Bond Co. Inc.													475	
SC	Hartsville	Sonoco Products Co.	280				YES	900					400		450	
MI	Menominee	Menominee Paper Co. Inc.					YES	350				70			400	
WI	Neenah	P. H. Glatfelter Co.					YES		260						370	
PA	York	Champion International Corp.													350	
CA	Port Hueneme	Willamette Industries, Inc.													330	
CA	Stockton	National Gypsum Co.					YES	360	YES						330	
GA	Austell	Sweetwater Paper Board Co.					YES	340							325	
MN	Saint Paul	Champion International Corp.													310	360
MI	Battle Creek	Champion International Corp.					YES	300							300	300
OH	Middletown	Jefferson Smurfit Corp.													300	
OH	Hamilton	Jefferson Smurfit Corp. & CCA													280	
IL	Marseilles	Nabisco Brands Inc.					YES	200							250	
CA	Santa Clara	California Paperboard Corp.					YES	235							210	
CT	Uncasville	Stone Container Corp.					YES	210							200	
MA	Lawrence	Newark Atlantic Paperboard Corp.													200	
NY	Cornwall	Cornwall Paper Mills Co.					YES	180							200	
OK	Pryor	National Gypsum Co.					YES	225							200	
IL	Chicago	Chicago Paperboard Corp.													190	
PR	Arecibo	Caribe Inc. Productos Forestales	125												190	
NY	Piermont	Clevepak Corp.					YES	200							185	
TX	Forney	Corrugated Services Inc.					YES	180							180	
AL	Mobile	Mobile Paperboard Corp.													175	
OH	Baltimore	Crown Zellerbach Corp.													170	
OH	Cincinnati	Mead Corp.					YES	180							157	
CA	Newark	Inland Container Corp.													150	
IL	Joliet	IVEX Corp.													150	
CO	Commerce City	Republic Paperboard Co.					YES								145	
IN	Brownstown	Kieffer Paper Mills					YES	170							130	
IN	Carthage	Container Corp. of America					YES	160							130	
MO	North Kansas City	United States Gypsum Co.					YES	135		ONP/OCC					130	
NY	Oakfield	USG Industries Inc.					YES	130							130	
IA	Tama	Pack. Corp. of America													120	
NJ	Garwood	Millen Industries					YES	110							120	
MA	Natick	Natick Paperboard Corp.													100	
MI	Constantine	Simplex Products Group					YES	125		OCC					100	
NJ	Camden	USG Industries Inc.													100	
CT	Manchester	Lydall & Foulds													90	
IN	Gary	Georgia-Pacific Corp.					YES		85						78	
OH	Massillon	Cleaners Hauger Co.					YES	92							70	
CT	Montville	Robertson Paper Box Co. Inc.					YES	60		ONP					65	

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 16. *Other Paper and Paperboard Mills. USA. 1985.*

St.	Location	Firm	Mech.	SemC.	Bl. K.	Ubl. K.	K.	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	U. FS.	FS.	Tissue	SC. CM.	Ubl. K. Paper	Recycled Paperboard	Other Paper
VA	Covington	Westvaco Corp.		192	1376		1376											1625
GA	Augusta	Federal Paper Bond Co. Inc.	400		600		600											1435
TX	Texarkana	International Paper Co.			1288		1288											1390
GA	St. Marys	Gilman Paper Co.			750	450	1200											1200
AR	Pine Bluff	International Paper Co.	344				1193											1036
NC	Riegelwoods	Federal Paper Bond Co. Inc.			2000													940
ID	Lewiston	Potlatch Corp.			1100		1100							290				900
AL	Mobile	International Paper Co.	235		53	1019	1072	YES			340		215					800
NC	Canton	Champion International Corp.			1440		1440					900	900					705
WA	Longview	Weyerhaeuser Co.		YES	800		800					375	375		280			565
WI	Kaukauna	Thilmany					435											555
AL	Butler	James River Corp.			1000		1000							350				550
LA	Bastrop	International Paper Co.			1200		1200						500					550
AR	McGehee	Potlatch Corp.			525		525											535
AL	Demopolis	Gulf States Paper Corp			500		500		YES									500
AL	Brewton	Container Corp. of America					1334									760		475
AR	Crosset	Georgia-Pacific Corp.			1500		1500					500	500	440				460
MI	Kalamazoo	James River Corp.																450
GA	Brunswick	Brunswick Pulp & Paper Co.			1760		1760											400
MN	Saint Paul	Champion International Corp.															310	360
MA	Haverhill	Haverhill Paperboard Corp.																300
MI	Battle Creek	Champion International Corp.						YES									300	300
MA	Holyoke	Sonoco Products Co.																230
CT	New Haven	Simkins Industries Inc.																220
NJ	Milford	James River Corp.																181
MI	White Pigeon	White Pigeon Paper Co.																170
WI	De Pere	Nicolet Paper Co.																140
MI	Monroe	Jefferson Smurfit Corp.						YES										135
NY	Castleton-on-Hudson	Fort Orange Paper Corp.						YES										110

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 17. *Newsprint Paper Mills. USA. 1990.*

St.	Location	Firm	SGW	RMP / TMP	Mech.	Bl. K.	Ubl. K.	K.	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	Newsp. 100% R.	C. Gwd.	U. Gwd.	U. FS.	Tissue	Ubl. K. Paper
TN	Calhoun	Bowater Inc.	650	1050	1700		700	700	YES	YES		2150						
WA	Longview	North Pacific Paper Co.		1400	1400				YES	YES		1400						
GA	Augusta	Augusta Newsprint Co.	495	825	1320				YES	YES		1360						
TX	Houston	Champion International Corp.	600	400	1000	575		575				1330						
AL	Coosa Pines	Kimberly-Clark Corp	775	120	895	1200		1200				1200						
LA	Deridder	Boise Cascade Corp.	287	388	675	250	1050	1300				1100						1200
OR	Newberg	Smurfit Newsprint Corp.	180	640	820				YES	550	ONP	1060						
TX	Lufkin	Champion International Corp.	800		800							920			300			
AZ	Snowflake	Stone Container Corp.	180	60	240	150	550	700	YES	550		790						460
AL	Perdue Hill	Alabama River Newsprint Co.		600	600			0	YES	400	ONP	680						
SC	Catawba	Catawba Newsprint Co.		664	664							679						
MS	Grenada	Newsprint South Inc.		675	675							625						
VA	Ashland	Bear Island Paper Co. L. P.		600	600							610						
WA	Usk	Ponderay Newsprint Co.		700	700							585						
WA	Steilacoom	Rainy River Forest Products Inc.		450	450							545						
IL	Alsip	FSC Paper Co.							YES	500	ONP	350					200	
OR	Clatskane	James River Corp.	325	325		836		836				350				300	500	
WA	Millwood	Inland Empire Paper Corp.							YES	100		225						
GA	Dublin	Southeast Paper Mfg. Co.			100				YES	1520	ONP		1250					
ME	East Millinocket	Georgia-Pacific Corp.	725		725								920					
OR	Oregon City	Smurfit Newsprint Corp.		350	350				YES	350	ONP		650					
NJ	Garfield	Garden State Paper Corp.							YES	700	ONP		615					
CA	Pomona	Smurfit Newsprint Corp. CA							YES	420	ONP		375					
MI	Manistique	Manistique Papers Inc.							YES	500	OMG		250					

Source: Reprinted from 1991 Lockwood-Post's Directory of the Pulp, Paper and Allied Trades by permission of the Publisher, Miller Freeman Inc.

Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.

Recycling Capacity: YES, confirmed recycled capacity.

Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.

Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;

Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.

Unit: Short Tons per day.

Table 18. *Free-sheet Paper Mills, USA, 1990.*

St.	Location	Firm	SGW	RMP / TMP	Mech.	SemC	Bl. K.	Ubl. K.	K.	Bl. Sulfite	Sulfite	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	Gwd.	C. FS.	U. FS.	FS.	Tissue	SC. CM.	Ubl K. Paper	Other Paper
AL	Mobile	International Paper Co.					345	690	1035			YES							YES				YES
VA	Franklin	Union Camp Corp.					1950		1950										1900				
TX	Silsbee	Temple-Inland Forest Products Co.					1650		1650										1650				
AL	Courtland	Champion International Corp.					1450		1450										1550				
ME	Rumford	Boise Cascade Corp.	170	165	335		1562		1562										1505				
LA	Port Hudson	Georgia-Pacific Corp.					1850		1850									1500	1500				
MI	Escanaba	Mead Corp.		250	250		1050		1050										1480				
WA	Camas	James River Corp.							1000		450							1450	1450	YES			
AR	Ashdown	Georgia-Pacific Corp.					1350		1350									1350	1350				
ME	Jay	International Paper Co.	245		245		1200		1200										1350				
OH	Chillicothe	Mead Corp.					870		870										1248				
MD	Luke	Westvaco Corp.					913		913										1174				
ME	Bucksport	Champion International Corp.	300	150	450														1150				
WI	Kimberly	Midtec Paper Co.	180		180														1140				
LA	Saint Francisville	James River Corp.	200		200				575								700	275	975				
NC	Plymouth	Weyerhaeuser Paper Co.				250	1000	450	1450			YES		OCC				940	940			1100	
NC	Canton	Champion International Corp.					1450		1450									819	819				705
PA	Spring Grove	P. H. Glatfelter Co.					560		560										800				
MS	Moss Point	International Paper Co.					661		661										760				
MI	Quinnesec	Champion International Corp.					825					YES	750				750		750				
NY	Ticonderoga	International Paper Co.					530		530										750				
TX	Pasadena	Simpson Pasadena Paper Co.					725		725			YES	225						750				
PA	Lock Haven	Hammermill Papers Business																725	725				
OR	St. Helens	Boise Cascade Corp.						955	955									700	700	110			
WI	Wisconsin Rapids	Consolidated Paper Inc.										YES		ONP/OCC			680		680			105	
KY	Wickliffe	Westvaco Corp.					930		930										600				
PA	Erie	Hammermill Papers				680												600	600				
SC	Eastover	Union Camp Corp.					600		600									600	600				
WA	Wallula	Boise Cascade Corp.				220	803		803									590	590		305		
NY	Glens Falls	Finch, Pruin, Co.									350								575				
SC	Bennetsville	Willamette Industries, Inc.					790		790									575	575				
WI	Nekoosa	Georgia-Pacific Corp.					335		335									575	575				
MN	International Falls	Boise Cascade Corp.					456		456									570	570				
MN	Cloquet	Potlatch Corp.					520		520								550		550				
TN	Kingsport	Mead Corp.					250		250										550				
OH	Hamilton	Champion International Corp.																	530				
WI	Combined Locks	Appleton Papers Inc.			200													530	530				
AL	Selma	Hammermill Papers					1375		1375			YES	YES					525	525				
KY	Hawesville	Willamette Ind. III																500	500				
AR	Crosset	Georgia-Pacific Corp.					1500		1500									490	490	440			436
WI	Brokaw	Wausau Paper Mills Co.								210	210							480	480				
LA	Bastrop	International Paper Co.					1200		1200										475				575
ME	Madawaska	Fraser Paper Lmtd.														840		450	450				
NH	Gorham	Crown Vantage Corp.																450	450	150			
WI	Port Edwards	Georgia-Pacific Corp.								235	235							440	440				
CA	Anderson	Simpson Paper Co.					250		250										420				
MN	Brainerd	Potlatch Corp.															410		410				
MI	Parchment	Crown Vantage Corp.																	400				
NY	Newton Falls	Papyrus Newton Falls Inc.										YES	YES				400		400				
PA	Johnsonburg	Willamette Industries, Inc.					215		215			YES						400	400				
WA	Hoquiam	Grays Harbor Paper L. P.																375	375				
WI	Park Falls	Cross Pointe Paper Co.								120	120	YES						375	375				
WA	Longview	Weyerhaeuser Paper Co.				240	812		812									360	360		240		630
OH	West Carrolton	Appleton Papers Inc.										YES	180					350	350				
WI	Rothschild	Weyerhaeuser Paper Co.								300	300								350				
ME	Woodland	Georgia-Pacific Corp.					840		840										313				

Table 18. *Free-sheet Paper Mills. USA. 1990.*

St.	Location	Firm	SGW	RMP / TMP	Mech.	SemC	Bl. K.	Ubl. K.	K.	Bl. Sulfite	Sulfite	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	Gwd.	C. FS.	U. FS.	FS.	Tissue	SC. CM.	Ubl K. Paper	Other Paper
NH	Groveton	James River Corp.				260						YES							300	300	50		
NC	Pisgah Forest	P. H. Glatfelter Co.																	300	300			
OH	West Carrolton	Miami Paper Corp.										YES	150						300	300			
OR	Clatskane	James River Corp.	325	325			836		836						350				300	300	500		
WI	Rhinelander	Rhinelander Paper Co.									YES	YES	YES							300			
WA	Vancouver	Boise Cascade Corp.										YES	YES						290	290			
MI	Port Huron	E. B. Eddy Paper Inc.																	270	270			
MI	Plainwell	Simpson Plainwell Paper Co.																		260			
AL	Jackson	Boise Cascade Corp.					600		600			YES	YES							240			
NY	Lyons Falls	Lyons Falls Pulp & Paper Inc.									120									220			
NY	Oswego	Hammermill Papers																	217	217			
PA	Roaring Spring	Appleton Papers Inc.					200		200			YES							210	210			
WI	Peshtigo	Badger Paper Mills Inc.								120	120								210	210			
PA	Tyrone	Westvaco Corp.																	200//40	200			
ME	Lincoln	Lincoln Pulp & Paper Co.					420		420										200	200	110		
ME	Westbrook	S. D. Warren Co.					300		300											200			
VT	Gilman	Simpson Paper Co.										YES	YES							200			
ME	Jay	James River Corp.																190		190			
MI	Detroit	Detroit River Co.																		175			
MI	Port Huron	James River Corp.																		170			
WI	Stevens Point	Consolidated Paper Inc.																163		163			
MI	Watervliet	Watervliet Paper Co.																		160			
OH	Hamilton	The Becket Paper Co.																	160	160			
OH	Dayton	Howard Paper Mills Inc.																	145	145			
PA	Miquon	Simpson Paper Co.																	140	140			
WI	Neenah	Neenah Paper																	125	125			
WI	Appleton	Kerwin Paper Co.										YES	70						120	120			
WI	Stevens Point	Neenah Paper																	120	120			
MA	Lawrence	Merrimac Paper Co.																	104	104			
MI	Vicksburg	Simpson Paper Co.																		100			
WI	Menasha	Mead Corp., Gilbert Paper Div.										YES							100	100			
WI	Merril	Ward Paper Co.										YES	60						100	100			
OH	Middletown	Sorg Paper Co.										YES	100							85			
MA	Fitchburg	Fitchburg Paper Inc.										YES	20							55			

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 19. *Groundwood Paper Mills. USA. 1990.*

St.	Location	Firm	SGW	RMP / TMP	Mech.	Bl. K.	K.	Sulfite	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	C. Gwd	U. Gwd.	Gwd .	U. FS.
ME	Millinocket	Georgia-Pacific Corp.	745	110	855			555							1125	
WI	Wisconsin Rapids	Consolidated Paper Inc.	147	406	553								1100		1100	
SC	Catawba	Bowater Inc.		400	400	1350	1350						920		920	
ME	Madawaska	Fraser Paper Lmtd.													840	450
MN	Grand Rapids	Blandin Paper Co.	550		550										825	
MN	Sartell	Champion International Corp.		250	250								480	230	710	
WI	Niagara	Niagara of WI Paper Co.	350		350								650		650	
WI	Stevens Point	Consolidated Paper Inc.	100	170	270										650	
MN	Duluth	Lake Superior Paper Industries	440		440										600	
ME	Madison	Madison Paper Industries	280		280				YES					550	550	
MS	Columbus	Weyerhaeuser Paper Co.		242	242		1320						550		550	
NY	Corinth	International Paper Co.	160		160				YES				525		525	
OR	West Linn	James River Corp.	120		120									500	500	
WA	Port Angeles	Daishowa America Co. Ltd.		270										400	400	
TX	Lufkin	Champion International Corp.	800		800							920		300	300	
ME	Pejepscot	St. Raymond Corp.	170		170		0								160	
MA	Otter River	Seaman Paper Co. of MA, Inc.													75	

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 20. *Tissue Paper Mills, USA, 1995.*

St.	Location	Firm	Mech.	SemC.	Bl. K.	Ubl. K.	K.	Bl. Sulfite	Sulfite	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	U. FS.	FS.	Tissue	Ubl K. Paper	Recycled Paperboard	Other Paper
ME	Old Town	James River Corp.			600		600									YES			
ME	Winslow	Scott Paper Co.								YES	YES					YES			
NY	Fort Edward	Scott Paper Co.														YES			
PA	Chester	Scott Paper Co.														YES			
WA	Camas	James River Corp.					1000		450					1450	1450	YES			
WA	Everett	Scott Paper Co.						835	835							YES			
WI	Green Bay	Fort Howard Corp.								YES	YES					YES			
WI	Green Bay	Procter & Gamble Paper Products Co.														YES			
WI	Green Bay	Procter & Gamble Paper Products Co.							YES							YES			
WI	Marinette	Scott Paper Co.														YES			
WI	Menasha	Wisconsin Tissue Mills Inc.								YES	YES					YES			
WI	Oconto Falls	Scott Paper Co.								YES	YES					YES			
AL	Mobile	Scott Paper Co.			1400		1400			YES	YES					750			
AL	Pennington	James River Corp.			1100		1100									650			620
FL	Palatka	Georgia-Pacific Corp.			450	750	1200									515	680		
OR	Clatskane	James River Corp.	650		836		836						350	300	300	500			
WI	Green Bay	James River Corp.						160	160							470			
AR	Crosset	Georgia-Pacific Corp.			1500		1500							490	490	440			436
TN	Memphis	Kimberly-Clark Corp.														308			
OR	Halsey	James River Corp.														265			
NY	Plattsburgh	Georgia-Pacific Corp.	120													260			
SC	Beech Island	Kimberly-Clark Corp.														260			
NJ	Elmwood Park	Marcal Paper Mills								YES	275					250			
WA	Bellingham	Georgia-Pacific Corp.	80					650	650	YES	YES					250			
IL	Alsip	FSC Paper Co.								YES	500	ONP	350			200			
CT	New Milford	Kimberly-Clark Corp														198			
WI	Eau Claire	Pope & Talbot Inc.								YES	300					185			
NY	South Glens Falls	James River Corp.								YES	130					180			
ME	Augusta	Statler Tissue Co.								YES	200					165			
PA	Ransom	Pope & Talbot Inc.								YES	200					165			
WI	Shawano	Shawano Paper Mills														160			
NH	Gorham	Crown Vantage Corp.												450	450	150			
NY	Carthage	James River Corp.								YES		ONP				140			
ME	Lincoln	Lincoln Pulp & Paper Co.			420		420							200	200	110			
OR	St. Helens	Boise Cascade Corp.				955	955							700	700	110			
MA	Baldwinville	Baldwinville Products Inc.								YES	140	ONP				100			
MA	Erving	Erving Paper Mills Inc.								YES	60					100			
OK	Pryor	Robel Tissue Mills								YES	100					100			
AZ	Flagstaff	Ponderosa Paper Products Inc.								YES	50					60			
MI	Menominee	Menominee Paper Co. Inc.								YES		OCC				60		360	
WI	Ashland	James River Corp.								YES	65					60			
NY	Greenwich	Stevens & Thompson Paper Co. Inc.								YES	YES					55			
NH	Groveton	James River Corp.		260						YES				300	300	50			
VT	Putney	Putney Paper Co. Inc.								YES	40					36			

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 21. *Unbleached Kraft Paper and Paperboard. Paper Mills. USA. 1990.*

St.	Location	Firm	Mech.	SemC	Bl. K.	Ubl. K.	K.	Recycling Capacity	Secondary fiber	Wastepaper grades	Newsp.	C. FS.	U. FS.	FS.	Tissue	SC. CM.	Ubl K. Recycled Paper Paperboard
GA	Savannah	Union Camp Corp.				3000	3000	YES									3000
MS	Monticello	Georgia-Pacific Corp.				2500	2500										2675
LA	Bogalusa	Gaylord Container Corp.		300		1350	1350	YES		OCC						YES	2600
AL	Prattville	Union Camp Corp.				2280	2280										2450
GA	Cedar Springs	Georgia-Pacific Corp.		525		2300	2300	YES		OCC						630	2395
FL	Fernandina Beach	Container Corp. of America				2200	2200										2300
SC	North Charleston	Westvaco Corp.				2300	2300										2300
GA	Rome	Inland Rome				1800	1800										2280
AL	Mahrt	Mead Coated Board Inc.				1625	1625										2200
LA	West Monroe	Manville Forest Products Corp.		250		1728	1728	YES									2075
OK	Valliant	Weyerhaeuser Paper Co.		500		1650	1650	YES	400							600	2025
TN	Counce	Tennessee River Pulp & Paper				1700	1700	YES	500								2000
MN	Missoula	Stone Container Corp.				1910	1910										1850
SC	Florence	Stone Container Corp.				1530		YES	350	OCC							1800
GA	Macon	Macon Kraft Inc.				900	900	YES	1000	OCC							1700
OR	Springfield	Weyerhaeuser Paper Co.				1090	1090	YES		OCC							1570
MS	Vicksburg	International Paper Co.			300	900	1200	YES									1500
TX	Orange	Inland-Orange Inc.				1150	1150										1490
LA	Hodge	Stone Container Corp.		250		1400	1400									370	1430
WA	Longview	Longview Fibre Co.		120	230	2400	2630	YES		OCC							1400
VA	West Point	Chesapeake Paper Products Co.			480	1450	1930	YES	1000								1340
AL	Pine Hill	MacMillan Bloedel Packaging Inc.		430		1075	1075	YES	250	OCC						600	1250
LA	Mansfield	International Paper Co.		540			1700									750	1250
AL	Brewton	Container Corp. of America			450	650	1100										1200
LA	Deridder	Boise Cascade Corp.	675		250	1050	1300				1100						1200
OR	Albany	Willamette Industries, Inc.		200		680	680	YES	600	ONP/OCC							1200
VA	Hopewell	Stone Container Corp.				1030		YES		OCC							1200
WA	Tacoma	Simpson Tacoma Kraft Co.			500	700	1200										1200
OR	Toledo	Georgia-Pacific Corp.		320		1150	1150	YES		OCC						475	1180
GA	Valdosta	Georgia-Pacific Corp.				1130	1130										1100
NC	Plymouth	Weyerhaeuser Paper Co.		250	1000	450	1450	YES		OCC			940	940			1100
LA	Campti	Willamette Industries, Inc.				750	750	YES									1090
AR	Morrilton	Green Bay Packaging Inc.				800	800	YES		OCC							1075
LA	Pineville	International Paper Co.				975	975										985
GA	Port Wentworth	Stone Savannah River P & P Corp.				850	850										950
OR	Gardiner	International Paper Co.				600	600	YES									900
FL	Jacksonville	Jefferson Smurfit Corp.				1000	1000										850
FL	Panama City	Stone Container Corp.			725	800	1525	YES									800
GA	Riceboro	Interstate Paper Corp.				600	600	YES		OCC							760
AR	Camden	International Paper Co.				723	723	YES									719
FL	Palatka	Georgia-Pacific Corp.			450	750	1200								515		680
WA	Port Townsend	Port Townsend Paper Corp.				550	550										550
AZ	Snowflake	Stone Container Corp.	240		150	550	700	YES	550		790						460
PA	Philadelphia	Container Corp. of America															450
TX	Dallas	Rock-Tenn Co.						YES		ONP/OCC							435
WI	Milwaukee	Wisconsin Paperboard Co.						YES		OCC							425

Table 21. *Unbleached Kraft Paper and Paperboard. Paper Mills. USA. 1990.*

St.	Location	Firm	Mech.	SemC	Bl. K.	Ubl. K.	K.	Recycling Capacity	Secondary fiber	Wastepaper grades	Newsp.	C. FS.	U. FS.	FS.	Tissue	SC. CM.	Ubl K. Paper	Recycled Paperboard
AR	Pine Bluff	Gaylord Container Corp.				350	350										400	
FL	Jacksonville	Stone Container Corp.				1470	1470										400	1000
OH	Rittman	Packaging Corp. of America															400	
NJ	Clark	United States Gypsum Co.						YES		ONP/OCC							390	
TN	Chattanooga	Rock-Tenn Co.						YES		ONP/OCC							390	
OH	Massillon	Greif Board Corp.															350	
MI	Battle Creek	Michigan Paperboard Co.															320	
CA	Santa Clara	Container Corp. of America						YES		ONP/OCC							315	
PA	Milton	National Gypsum Co.						YES		ONP/OCC							310	
WI	Mosinee	Mosinee Paper Corp.				220	220										280	
WI	Menasha	U. S. Paper Mills Co.						YES									265	
OK	Pryor	Georgia-Pacific Corp.	50					YES	80								235	
VA	Richmond	Sonoco Products Co.						YES									230	
MI	Monroe	Monroe Paper Corp.															200	
NJ	Delair	Georgia-Pacific Corp.						YES									200	
VT	Sheldon Springs	Specialty Paperboard Inc.	50					YES		ONP							200	
WV	Halltown	Halltown Paperboard Co.						YES		ONP/OCC							200	
PA	Philadelphia	Newman & Co., Inc.						YES		ONP							195	
OH	Cincinnati	Cincinnati Paperboard Corp.															185	
NY	Lockport	Domtar Gypsum						YES		ONP/OCC							180	
TX	Galena Park	USG Industries Inc.						YES		ONP/OCC							175	
SC	Taylors	Carotell Paperboard Corp.						YES		ONP/OCC							170	
OH	Franklin	Franklin Boxboard Corp.						YES		ONP/OCC							165	
PA	Downington	Sonoco Products Co.						YES		ONP/OCC							160	
PA	Delaware Water Gap	Rock-Tenn Co.															140	
TN	Chattanooga	Chattanooga Paperboard Corp.						YES									140	
OH	Middletown	Middletown Paperboard Co.						YES		ONP/OCC							130	
WA	Tacoma	Container Corp. of America															120	
NC	Charlotte	Carolina Paperboard Corp.						YES		ONP/OCC							115	
VA	Richmond	Manchester Board and Paper Co.						YES		ONP/OCC							115	
OH	Toronto	Valley Converting Co.															110	
WI	Wisconsin Rapids	Consolidated Paper Inc.						YES		ONP/OCC		680		680			105	
NC	Roanoke Rapids	Champion International Corp.				1300		YES									30	

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Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 22. *SemiChemical Corrugating Medium Mills. USA.1990.*

St.	Location	Firm	SemC	Bl. K.	Ubl. K.	K.	Recycling Capacity	Secondary fiber	Wastepaper grades	U. FS.	FS.	SC. CM.	Ubl Paper	K. Other Paper
LA	Bogalusa	Gaylord Container Corp.	300		1350	1350	YES		OCC			YES	2600	
WI	Tomahawk	Georgia-Pacific Corp.	1000				YES					1200		
AL	Stevenson	Mead Corp.	750				YES	350				1030		
OH	Coshocton	Stone Container Corp.	575				YES		OCC			820		
VA	Big Island	Georgia-Pacific Corp.	600				YES					815		
MI	Filler City	Pack Corp. of America	600				YES					800		
LA	Mansfield	International Paper Co.	540			1700						750	1250	
VA	Amherst	Virginia Fibre Corp.	550									725		
MI	Ontonagon	Stone Container Corp.	575				YES					690		
TN	New Johnsonville	Inland Container Corp.	400				YES		OCC			640		
GA	Cedar Springs	Georgia-Pacific Corp.	525		2300	2300	YES		OCC			630	2395	
AL	Pine Hill	MacMillan Bloedel Packaging Inc.	430		1075	1075	YES	250	OCC			600	1250	
OK	Valliant	Weyerhaeuser Paper Co.	500		1650	1650	YES	400				600	2025	
OR	North Bend	Weyerhaeuser Paper Co.	300				YES		OCC			570		
MI	Otsego	Menasha Corp.	310				YES		OCC			550		
OR	Toledo	Georgia-Pacific Corp.	320		1150	1150	YES		OCC			475	290//990	
IN	Terre Haute	The Weston Paper & Mfg Co.	300				YES		OCC			430		
WI	Green Bay	Green Bay Packaging Inc.	220				YES		OCC			410		
LA	Hodge	Stone Container Corp.	250		1400	1400						370	1430	
OH	Circleville	Container Corp. of America (JSC/CCA)	200				YES		OCC			325		
NH	Groveton	Groveton Paper Board Inc.					YES		OCC			305		
WA	Wallula	Boise Cascade Corp.	220	803		803				590	590	305		
KY	Hawesville	Willamette Ind. II	275				YES	450	OCC			265		
WA	Longview	Weyerhaeuser Paper Co.	240	812		812				360	360	240		630
IA	Fort Madison	Consolidated Pack. Corp.	150				YES					220		
PA	Philadelphia	Connelly Containers Inc. of Philadelphia					YES		OCC			150		

Source: Reprinted from 1991 Lockwood-Post's Directory of the Pulp, Paper and Allied Trades by permission of the Publisher, Miller Freeman Inc.
Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 23. *Recycled Paperboard Mills, USA, 1990.*

St.	Location	Firm	SemC.	Bl. K.	Ubl. K.	K.	Recycling Capacity	Secondary fiber	Deinked	Wastepaper grades	R P&W	Tissue	SC. CM.	Ubl Paper	K. Recycled Paperboard	Other Paper
OH	Massillon	Cleaners Hauger Co.					YES								YES	
CA	Antioch	Gaylord Container Corp.			700	700	YES	800							1500	
FL	Jacksonville	Stone Container Corp.			1470	1470								400	1000	
SC	Hartsville	Sonoco Products Co.	300				YES			ONP/OCC					1000	
IL	Alton	Jefferson Smurfit Corp.					YES			OCC					625	
CA	Ontario	Inland Container Corp.													610	
IN	Newport	Inland Container Corp.					YES			OCC					595	
CA	Port Hueneme	Willamette Industries, Inc.					YES			OCC					440	
WI	Neenah	P. H. Glatfelter Co.					YES		YES						400	
MN	Saint Paul	Waldorf Corp.					YES			ONP/OCC					375	355
PA	York	Stone Container Corp.													375	
MI	Menominee	Menominee Paper Co. Inc.					YES			OCC		60			360	
GA	Austell	Sweetwater Paper Board Co.					YES								340	
MI	Battle Creek	Waldorf Corp.					YES			ONP					325	
IL	Quincy	The Celotex Corp.					YES		50	ONP					300	
OH	Middletown	Jefferson Smurfit Corp.					YES			ONP/OCC					300	
OH	Hamilton	Jefferson Smurfit Corp. & CCA													280	
CT	Uncasville	Stone Container Corp.					YES			OCC					240	
NY	Niagara Falls	Cascades Niagara Falls Inc.					YES			OCC					230	
CA	Santa Clara	California Paperboard Corp.					YES			ONP/OCC					225	
OK	Pryor	National Gypsum Co.					YES			ONP/OCC					225	
MA	Lawrence	Newark Atlantic Paperboard Corp.													215	
NY	Cornwall	Cornwall Paper Mills Co.					YES			OCC					200	
NC	Sylva	Jackson Paper Mfg. Co.													200	
PR	Arecibo	Global Fibers Inc.	100				YES			OCC					200	
IL	Chicago	Chicago Paperboard Corp.													190	
CA	Newark	Inland Container Corp.					YES			OCC					185	
OH	Baltimore	Fairfield Paper Co.					YES			OCC					180	
TX	Forney	Corrugated Services Inc.					YES			OCC					180	
IL	Joliet	IVEX Packaging Corp.					YES			ONP/OCC					160	
IN	Hartford City	Visy Recycle													150	
MI	Constantine	Simplex Products Group					YES								150	
NJ	Clifton	Recycled Paper Board Inc. of Clifton					YES			ONP/OCC					150	
CO	Denver	Republic Paperboard Co.					YES								140	
NJ	Camden	Camden Paperboard Corp.													130	
IN	Carthage	Container Corp. of America					YES								122	
IA	Tama	Pack Corp. of America													120	
OH	Cincinnati	Rock-Tenn Co.					YES								120	
NJ	Garwood	Millen Industries					YES			ONP/OCC					115	
MA	Natick	Natick Paperboard Corp.					YES			ONP/OCC					105	
MO	North Kansas City	United States Gypsum Co.					YES			ONP/OCC					105	
NY	Oakfield	United States Gypsum Co.					YES								105	
CT	Manchester	Lydall Inc.					YES			ONP/OCC					90	
IN	Gary	Georgia-Pacific Corp.					YES		80						77	
IL	Peoria	IVEX Packaging Corp.													40	

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Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 24. *Other Paper and Paperboard Mills. USA. 1990.*

St.	Location	Firm	SemC	Bl. K.	Ubl. K.	K.	Recycling Capacity	Deinked	Wastepaper grades	C. Gwd.	U. FS.	FS.	Tissue	SC. CM.	Recycled Paperboard	Other Paper
AL	Mobile	International Paper Co.		345	690	1035	YES					YES				YES
VA	Covington	Westvaco Corp.	170	1400		1400										2000
GA	Augusta	Federal Paper Board Co.		2250		2250										1860
TX	Texarkana	International Paper Co.		1215		1215										1300
GA	St. Marys	Gilman Paper Co.		900	300	1200	YES		OCC							1200
ID	Lewiston	Potlatch Corp.				1300										925
NC	Riegelwoods	Federal Paper Board Co.		2260												900
NC	Canton	Champion International Corp.		1450		1450					819	819				705
AL	Demopolis	Gulf States Paper Corp		660		660	YES	50								660
WA	Longview	Weyerhaeuser Paper Co.	240	812		812					360	360		240		630
AL	Pennington	James River Corp.		1100		1100							650			620
AR	McGehee	Potlatch Corp.		550		550										600
LA	Bastrop	International Paper Co.		1200		1200						475				575
WI	Kaukauna	Thilmany				420										550
GA	Brunswick	Georgia-Pacific Corp.		2000		2000										530
MI	Kalamazoo	James River Corp.					YES		ONP							500
AR	Crosset	Georgia-Pacific Corp.		1500		1500					490	490	440			436
MN	Saint Paul	Waldorf Corp.					YES		ONP/OCC						375	355
MA	Haverhill	Haverhill Paperboard Corp.					YES		ONP							325
CT	New Haven	Simkins Industries Inc.														220
MA	Holyoke	Sonoco Products Co.					YES		ONP/OCC							210
MI	White Pigeon	White Pigeon Paper Co.					YES		ONP/OCC							185
NJ	Milford	Crown Vantage Corp.														175
WI	De Pere	Nicolet Paper Co.														140
MI	Monroe	Jefferson Smurfit Corp.					YES		ONP/OCC							130
NJ	Newark	Newark Boxboard Co.					YES		ONP							130
NY	Castleton-on-Hudson	Fort Orange Paper Corp.					YES		ONP/OCC							105
CT	Montville	Rand Whitney Paperboard Corp.					YES		ONP							65

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 25. *Newsprint Paper Mills. USA. 1995.*

St.	Location	Firm	SGW	RMP / TMP	Mech.	Bl. K.	Ubl. K.	K.	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	Newsp. 100% R.	C. Gwd.	U. Gwd.	U. FS.	Tissue	Ubl. K. Paper
TN	Calhoun	Bowater Inc.	450	1100	1550			1000	YES	300	ONP	2260						
WA	Longview	North Pacific Paper Co.		1600	1600				YES	450		2200						
TX	Houston	Champion International Corp.	500	450	950	575		575	YES	400	ONP/OCC	1375						
AL	Coosa Pines	Kimberly-Clark Corp.	560	120	680	1100		1100	YES	400		1180						
LA	Deridder	Boise Cascade Corp.	287	388	675	250	1050	1300				1150						1350
TX	Lufkin	Champion International Corp.	800		800							1105			115			
OR	Newberg	Smurfit Newsprint Corp.	8	460	468				YES	600	ONP	1080						
AZ	Snowflake	Stone Container Corp.	150	60	210	150	550	700	YES	650		865						465
SC	Catawba	Bowater Inc.		1000	1000	1350		1350				685		985				
AL	Perdue Hill	Alabama River Newsprint Co.		600	600				YES	175	ONP	680						
WA	Usk	Ponderay Newsprint Co.		700	700				YES	120	ONP	680						
MS	Grenada	Newsprint South Inc.		675	675							650						
VA	Ashland	Bear Island Paper Co. L. P.		880	880				YES	220	ONP/OMG	630						
WA	Steilacoom	Rainy River Forest Products Inc.		500	500				YES	224	ONP	545						
IL	Alsip	FSC Paper Co.							YES	440	ONP	400						
OR	Clatskane	James River Corp.	325	325		1000		1000	YES		PSUB	400				300	500	
WA	Millwood	Inland Empire Paper Corp.		240	240				YES	100		250						
GA	Dublin	Southeast Paper Mfg. Co.			100				YES	1520	ONP		1250					
GA	Augusta	Augusta Newsprint Co.	495	1100	1595				YES	407	ONP		1150					
ME	East Millinocket	Great Nothern Paper Inc.	600		600				YES	350	ONP		800					
OR	Oregon City	Smurfit Newsprint Corp.		350	350				YES	350	ONP		650					
NJ	Garfield	Garden State Paper Corp.							YES	800	ONP		640					
CA	Pomona	Smurfit Newsprint Corp. CA							YES	500	ONP		420					
MI	Manistique	Manistique Papers Inc.							YES	500			300					

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 26. *Free-sheet Paper Mills, USA, 1995.*

St.	Location	Firm	SGW	RMP / TMP	Mech.	SemC	Bl. K.	Ubl. K.	K.	Bl. Sulfite	Sulfite	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	Gwd.	C. FS.	U. FS.	FS.	Tissue	SC. CM.	Ubl K. Paper	Other Paper
LA	Bastrop	International Paper Co.					YES		YES										YES				
TX	Silsbee	Temple-Inland Forest Products Co.					1850		1850										2250				
AR	Ashdown	Georgia-Pacific Corp.					2450		2450									2200	2200				
VA	Franklin	Union Camp Corp.					2030		2030			YES	300						1900				
AL	Courtland	Champion International Corp.					2100		2100					PSUB					1830				
ME	Jay	International Paper Co.																	1625				
LA	Zachary	Georgia-Pacific Corp.					1850		1850					PSUB				1570	1570				
MI	Escanaba	Mead Corp.		250	250		1935		1935										1550				
SC	Eastover	Union Camp Corp.					1850		1850					PSUB				1550	1550				
ME	Rumford	Boise Cascade Corp.	170	165	335		1562		1562										1505				
WA	Camas	James River Corp.							YES		450			PSUB				1490	1490	YES			
MN	International Falls	Boise Cascade Corp.					972		972									1461	1461				
WI	Kimberly	Repap Wisconsin Inc.	145		145							YES							1453				
OH	Chillicothe	Mead Corp.					950		950					PSUB					1300				
ME	Bucksport	Champion International Corp.	350	150	500														1275				
WI	Wisconsin Rapids	Consolidated Paper Inc.										YES		ONP/			1250		1250			105	
MD	Luke	Westvaco Corp.					860		860										1249				
FL	Cantonment	Champion International Corp.					1506		1506									1100	1100				
LA	Saint Francisville	Crown Vantage Corp.	200		200				575								730	275	1005				
NC	Plymouth	Weyerhaeuser Paper Co.				250	1090	750	1840			YES		OCC				1000	1000			1100	
PA	Johnsonburg	Willamette Industries, Inc.					600		600			YES		PSUB				1000	1000				
NC	Canton	Champion International Corp.					1450		1450					PSUB				819	819				750
PA	Spring Grove	P. H. Glatfelter Co.					680		680										815				
MS	Moss Point	International Paper Co.					661		661										810				
MI	Quinnesec	Champion International Corp.					1150					YES					750		750				
OR	St. Helens	Boise Cascade Corp.						955	955									700	700	120			
SC	Bennetsville	Willamette Industries, Inc.					750		750									700	700				
MI	Muskegon	S. D. Warren Co.					250							PSUB			675		675				
AL	Selma	International Paper Co.					1375		1375			YES	440					670	670				
PA	Lock Haven	International Paper Co.										YES	250	ONP				650	650				
TN	Kingsport	Willamette Industries, Inc.					360		360					PSUB					630				
NY	Glens Falls	Finch, Pruin, Co.									350			PSUB					620				
KY	Wicklife	Westvaco Corp.					825		825										600				
AR	Crosset	Georgia-Pacific Corp.					1600		1600					PSUB				565	565	440			525
PA	Erie	International Paper Co.				750								PSUB				565	565				
KY	Hawesville	Willamette Ind. III										YES		OCC				550	550				
NY	Ticonderoga	International Paper Co.					530		530										550				
MN	Cloquet	Potlatch Corp.					540		540								540		540				
WI	Port Edwards	Georgia-Pacific Corp.								220	220			PSUB				500	500				
WI	Brokaw	Wausau Paper Mills Co.								230	230	YES						480	480				
ME	Madawaska	Fraser Paper Lmtd.														840		450	450				
NH	Gorham	Crown Vantage Corp.																450	450	150			
OH	Hamilton	Champion International Corp.												PSUB					450				
TX	Pasadena	Simpson Pasadena Paper Co.					875		875			YES		PSUB			450		450				
MI	Parchment	Crown Vantage Corp.												PSUB					420				
WA	Hoquiam	Grays Harbor Paper L. P.																400	400				
WA	Longview	Weyerhaeuser Paper Co.				200	1150		1150			YES		OCC				400	400		340		630
WI	Rhinelander	Rhinelander Paper Co.									YES	YES	YES						400				
MN	Brainerd	Potlatch Corp.															395		395				
WA	Wallula	Boise Cascade Corp.				220	803		803			YES		OCC				390	390		305		
WI	Park Falls	Cross Pointe Paper Corp.								170	170	YES	100					375	375				
OH	West Carrolton	Appleton Papers Inc.										YES	180					350	350				
WI	Rothschild	Weyerhaeuser Paper Co.								200	200								350				

Table 26. *Free-sheet Paper Mills, USA, 1995.*

St.	Location	Firm	SGW	RMP / TMP	Mech.	SemC	Bl. K.	Ubl. K.	K.	Bl. Sulfite	Sulfite	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	Gwd.	C. FS.	U. FS.	FS.	Tissue	SC. CM.	Ubl K. Paper	Other Paper
WA	Vancouver	Boise Cascade Corp.										YES	150					330	330				
ME	Woodland	Georgia-Pacific Corp.					1017		1017					PSUB					318				
WI	Stevens Point	Consolidated Paper Inc.															305		305				
NH	Groveton	Wausau Papers of NH										YES						300	300				
NC	Pisgah Forest	P. H. Glatfelter Co.												PSUB				300	300				
OH	West Carrolton	Cross Pointe Paper Corp.										YES	210					300	300				
OR	Clatskane	James River Corp.	325	325			1000		1000			YES		PSUB	400			300	300	500			
MI	Port Huron	E. B. Eddy Paper Inc.																270	270				
AL	Jackson	Boise Cascade Corp.					600		600			YES	234						260				
MI	Plainwell	Simpson Plainwell Paper Co.												PSUB					260				
CA	Anderson	Simpson Paper Co.					250		250										250				150
WI	Peshtigo	Badger Paper Mills Inc.								155	155							225	225				
NY	Lyons Falls	Lyons Falls Pulp & Paper Inc.									120	YES							220				
NY	Newton Falls	Appleton Papers Inc.										YES					220		220				
WI	Stevens Point	Neenah Paper																220	220				
PA	Roaring Spring	Appleton Papers Inc.					200		200			YES						210	210				
PA	Tyrone	Westvaco Corp.										YES		PSUB				200	200				
ME	Lincoln	Lincoln Pulp & Paper Co.					420		420					PSUB				200	200	110			
ME	Westbrook	S. D. Warren Co.					300		300					PSUB					200				
VT	Gilman	Simpson Paper Co.										YES	YES	PSUB					200				
ME	Jay	James River Corp.															190		190				
MI	Detroit	IPMC Inc.																	175				
MI	Port Huron	Crown Vantage Corp.												PSUB					170				
OH	Dayton	Cross Pointe Paper Corp.																150	150				
WI	Appleton	Kerwin Paper Co.										YES	70					145	145				
OH	Hamilton	The Becket Paper Co.												PSUB				130	130				
MI	Vicksburg	Simpson Paper Co.												PSUB					125				
WI	Neenah	Neenah Paper																125	125				
WI	Menasha	Gilbert Paper										YES						120	120				
MA	Lawrence	Merrimac Paper Co.										YES		ONP/PSUB				104	104				
OH	Middletown	Sorg Paper Co.										YES	YES						85				
WI	Nekoosa	Georgia-Pacific Corp.					380		380									60	60				

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Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 27. *Groundwood Paper Mills. USA. 1995*

St.	Location	Firm	SGW	RMP / TMP	Mech.	Bl. K.	K.	Sulfite	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	C. Gwd.	U. Gwd	Gwd .	U. FS.
MN	Grand Rapids	Blandin Paper Co.	550		550										1450	
WI	Wisconsin Rapids	Consolidated Paper Inc.	120	355	475								1140		1140	
SC	Catawba	Bowater Inc.		1000	1000	1350	1350					685	985		985	
ME	Madawaska	Fraser Paper Lmtd.													840	450
MN	Sartell	Champion International Corp.		370	370								550	280	830	
WI	Niagara	Niagara of WI Paper Co.	250		250								800		800	
ME	Millinocket	Great Nothern Paper Inc.	417	106	523			539							700	
MN	Duluth	Lake Superior Paper Industries	440		440										670	
WI	Stevens Point	Consolidated Paper Inc.	100	170	270										650	
ME	Madison	Madison Paper Industries	280		280				YES					630	630	
MS	Columbus	Weyerhaeuser Paper Co.		242	242		1320						605		605	
NY	Corinth	International Paper Co.	160		160				YES	YES			550		550	
OR	West Linn	Simpson Paper Co.							YES	100					525	
WA	Port Angeles	Daishowa America Co. Ltd.		380					YES	190	ONP			490	490	
AR	Pine Bluff	International Paper Co.											470		470	
TX	Lufkin	Champion International Corp.	800		800							1105		115	115	
MA	Otter River	Seaman Paper Co. of MA, Inc.													75	

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; Bl. K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 28. *Tissue Paper Mills. USA. 1995.*

St.	Location	Firm	Mech.	BL K.	Ubl. K.	K.	BL Sulfite	Sulfite	Recycling Capacity	Deinked	Wastepaper grades	Newsp.	U. FS.	FS.	Tissue	Ubl K. Paper	Recycled Paperboard	Other Paper
ME	Old Town	James River Corp.		600		600					PSUB				YES			
ME	Winslow	Scott Paper Co.							YES	YES					YES			
PA	Chester	Scott Paper Co.							YES		ONP/PSUB				YES			
WA	Camas	James River Corp.				NA		450			PSUB		1490	1490	YES			
WA	Everett	Scott Paper Co.					500	500			PSUB				YES			
WI	Green Bay	Fort Howard Corp.							YES	YES	ONP/OCC/PSUB				YES			
WI	Green Bay	Procter & Gamble Paper Products Co.									PSUB				YES			
WI	Marinette	Scott Paper Co.													YES			
WI	Menasha	Wisconsin Tissue Mills Inc.							YES	YES	ONP/OCC				YES			
WI	Oconto Falls	Scott Paper Co.							YES	YES					YES			
AL	Mobile	Scott Paper Co.		1600		1600			YES	YES					700			
AL	Pennington	James River Corp.		1100		1100			YES		PSUB				650			620
FL	Palatka	Georgia-Pacific Corp.		575	850	1425									575	850		
OR	Clatskane	James River Corp.	650	1000		1000			YES		PSUB	400	300	300	500			
WI	Green Bay	James River Corp.													470			
AR	Crosset	Georgia-Pacific Corp.		1600		1600			YES		PSUB		565	565	440			525
TN	Memphis	Sheperd Tissue							YES		PSUB				308			
NY	Plattsburgh	Georgia-Pacific Corp.							YES						300			
OR	Halsey	James River Corp.							YES	300					265			
SC	Beech Island	Kimberly-Clark Corp.													260			
NJ	Elmwood Park	Marcal Paper Mills							YES	275					250			
WA	Bellingham	Georgia-Pacific Corp.					650	650	YES						250			
NY	South Glens Falls	Encore Paper Co.							YES	200	OCC				200			
CA	Fullerton	Kimberly-Clark Corp.							YES		PSUB				185			
IL	Alsip	Chicago Tissue Co. L. P.							YES	260					170			
NY	Fort Edward	Scott Paper Co.													165			
PA	Ransom	Pope & Talbot Inc.							YES						165			
WI	Shawano	Little Rapids Corp.													160			
WI	Eau Claire	Pope & Talbot Inc.							YES	300					155			
NH	Gorham	Crown Vantage Corp.											450	450	150			
NY	Carthage	James River Corp.							YES		OCC				150			
OR	St. Helens	Boise Cascade Corp.			955	955							700	700	120			
MA	Erving	Erving Paper Mills Inc.							YES	130					115			
ME	Lincoln	Lincoln Pulp & Paper Co.		420		420			YES		PSUB		200	200	110			
ME	Augusta	Statler Tissue Co.							YES	200					100			
MA	Baldwinville	American Tissue Mills of MA							YES	140					100			
AZ	Flagstaff	Wisconsin Tissue Mills							YES	130					90			
OK	Pryor	Orchids Paper Products Co.							YES	100					75			
VT	Putney	Putney Paper Co. Inc.							YES	60	ONP/OCC				70			
WI	Ashland	James River Corp.							YES	65					60			
NY	Greenwich	Stevens & Thompson Paper Co. Inc.							YES	100					55			
MI	Menominee	Menominee Paper Co. Inc.							YES		OCC				50		450	

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Pulps: SGW, stone groundwood; RMP/TMP, refiner/thermomechanical; Mech., mechanical; BL K., bleached kraft; Ubl. K., unbleached kraft; K. non specified kraft.
Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 29. *Unbleached Kraft Paper and Paperboard. Paper Mills. USA. 1995.*

St.	Location	Firm	Mech.	SemC	Bl. K.	Ubl. K.	K.	Recycling Capacity	Secondary fiber	Wastepaper grades	Newsp.	C. FS.	U. FS.	FS.	Tissue	SC. CM.	Ubl Paper	K. Recycled Paperboard
GA	Savannah	Union Camp Corp.				3000	3000	YES		OCC							3400	
WA	Longview	Longview Fibre Co.		120	100	2400	2500	YES	800	OCC							3000	
LA	Bogalusa	Gaylord Container Corp.				2150	2150	YES		OCC						200	3000	
MS	Monticello	Georgia-Pacific Corp.				2500	2500	YES		OCC							2770	
FL	Fernandina Beach	Jefferson Smurfit Corp. & CCA				2200	2200	YES		OCC							2700	
AL	Prattville	Union Camp Corp.				2525	2525	YES		OCC							2600	
OK	Valliant	Weyerhaeuser Paper Co.		500		1650	1650	YES	850	OCC						700	2500	
AL	Cottonton	Mead Coated Board Inc.				1625	1625	YES	1300								2400	
LA	West Monroe	Riverwood International Corp.		250		1728	1728	YES									2325	
GA	Rome	Inland Container Corp.				2200	2200	YES		OCC							2300	
TN	Counce	Pack. Corp. of America				1950	1950	YES	500	OCC							2300	
GA	Cedar Springs	Georgia-Pacific Corp.		525		2300	2300	YES		OCC						665	2270	
LA	Campti	Willamette Industries, Inc.				850	850	YES	1250	OCC							2190	
SC	North Charleston	Westvaco Corp.				2000	2000										2000	
MN	Missoula	Stone Container Corp.				1600	1600	YES		OCC							1970	
OR	Springfield	Weyerhaeuser Paper Co.				1090	1090	YES		OCC							1900	
SC	Florence	Stone Container Corp.				1530		YES	350	ONP/OCC							1800	
TX	Orange	Inland Container Corp.				1150	1150	YES		OCC							1660	
LA	Mansfield	International Paper Co.		540			1700									1000	1600	
MS	Vicksburg	International Paper Co.						YES		OCC							1600	
GA	Macon	Riverwood International Georgia Inc.				900	900	YES	1000	OCC							1550	
AL	Brewton	Jefferson Smurfit Corp. & CCA			450	650	1100										1500	
AR	Morrilton	Green Bay Packaging Inc.				800	800	YES		ONP/OCC							1500	
LA	Hodge	Stone Container Corp.		250		1500	1500	YES		ONP/OCC						400	1500	
NC	Roanoke Rapids	Champion International Corp.				1300		YES		PSUB							1440	
AL	Pine Hill	MacMillan Bloedel Packaging Inc.		550		1150	1150	YES	350	OCC						700	1400	
FL	Port St. Joe	St. Joe Forest Products Co.			500	1200	1700	YES		OCC							1400	
LA	Deridder	Boise Cascade Corp.	675		250	1050	1300				1150						1350	
OR	Albany	Willamette Industries, Inc.		200		680	680	YES	800	OCC							1350	
OR	Toledo	Georgia-Pacific Corp.		400		1100	1100	YES		OCC						670	1300	
GA	Valdosta	Pack. Corp. of America				1130	1130										1250	
VA	Hopewell	Stone Container Corp.				1030		YES		OCC							1250	
WA	Tacoma	Simpson Tacoma Kraft Co.			500	700	1200	YES		OCC							1100	
LA	Pineville	International Paper Co.				1100	1100										1100	
NC	Plymouth	Weyerhaeuser Paper Co.		250	1090	750	1840	YES		OCC			1000	1000			1100	
VA	West Point	Chesapeake Paper Products Co.			480	1450	1930	YES	1000	ONP/PSUB							1010	455
FL	Jacksonville	Jefferson Smurfit Corp.				1000	1000	YES		OCC							950	
GA	Port Wentworth	Stone Savannah River P & P Corp.			745	845	1590	YES		OCC							950	
OR	Gardiner	International Paper Co.				900	900	YES									950	
FL	Panama City	Stone Container Corp.			846	790	1636	YES									859	
FL	Palatka	Georgia-Pacific Corp.			575	850	1425								575		850	
GA	Riceboro	Interstate Paper Corp.				680	680	YES		OCC							760	
AR	Camden	International Paper Co.				723	723	YES		ONP/PSUB							719	
WA	Port Townsend	Port Townsend Paper Corp.				550	550	YES		ONP							575	
AR	Pine Bluff	Gaylord Container Corp.				350	350										500	
CA	Vernon	Jefferson Smurfit Corp. & CCA						YES		ONP/OCC							500	
OH	Rittman	Pack. Corp. of America						YES		ONP/OCC							500	
PA	Philadelphia	Jefferson Smurfit Corp. & CCA						YES		ONP/OCC							500	

Table 29. *Unbleached Kraft Paper and Paperboard. Paper Mills. USA. 1995.*

St.	Location	Firm	Mech.	SemC	Bl. K.	Ubl. K.	K.	Recycling Capacity	Secondary fiber	Wastepaper grades	Newsp.	C. FS.	U. FS.	FS.	Tissue	SC. CM.	Ubl Paper	K. Recycled Paperboard
AZ	Snowflake	Stone Container Corp.	210		150	550	700	YES	650		865						465	
TX	Dallas	Rock-Tenn Co.						YES		ONP/OCC							440	
WI	Milwaukee	Wisconsin Paperboard Co.						YES		ONP/OCC							435	
NJ	Clark	United States Gypsum Co.						YES		ONP/OCC							390	
TN	Chattanooga	Rock-Tenn Co.						YES		ONP/OCC							390	
WI	Menasha	U. S. Paper Mills Co.						YES		ONP/OCC							375	
OH	Massillon	Greif Board Corp.						YES		OCC/PSUB							350	
MI	Battle Creek	Michigan Paperboard Co.						YES		ONP/OCC							340	
CA	Santa Clara	Jefferson Smurfit Corp. & CCA						YES		ONP/OCC							315	
PA	Milton	National Gypsum Co.						YES		ONP/OCC							310	
FL	Jacksonville	Idle															300	1200
WI	Mosinee	Mosinee Paper Corp.				250	250										280	
OK	Pryor	Georgia-Pacific Corp.	50					YES	80	ONP/OCC							220	
VA	Richmond	Sonoco Products Co.						YES		ONP/OCC							220	
PA	Philadelphia	Newman & Co., Inc.						YES		ONP/OCC							205	
NJ	Delair	Georgia-Pacific Corp.						YES		OCC/PSUB							200	
VT	Sheldon Springs	Rock-Tenn Co.						YES		ONP							200	
WV	Halltown	Halltown Paperboard Co.						YES		OCC							200	
NY	Lockport	Domtar Gypsum						YES									190	
OH	Cincinnati	Cincinnati Paperboard Corp.						YES		ONP/OCC							185	
OH	Franklin	Franklin Boxboard Corp.						YES		ONP/OCC							185	
TX	Galena Park	United States Gypsum Co.						YES		ONP/OCC							175	
SC	Taylors	Carotell Paperboard Corp.						YES		ONP/OCC							170	
PA	Downington	Sonoco Products Co.						YES		ONP/OCC							160	
NC	Charlotte	Carolina Paperboard Corp.						YES		ONP/OCC							155	
TN	Chattanooga	Chattanooga Paperboard Corp.						YES									150	
OH	Middletown	Middletown Paperboard Co.						YES		ONP/OCC							140	
PA	Delaware Water Gap	Rock-Tenn Co.						YES		ONP/OCC							140	
WA	Tacoma	Jefferson Smurfit Corp. & CCA						YES		OCC							120	
VA	Richmond	Richmond Paperboard Corp.						YES		ONP/OCC							115	
OH	Toronto	Valley Converting Co.						YES		ONP/OCC							110	
WI	Wisconsin Rapids	Consolidated Paper Inc.						YES		ONP/OCC		1250		1250			105	

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Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 30. *SemiChemical Corrugating Medium Mills. USA. 1995.*

St.	Location	Firm	SemC	Bl. K.	Ubl. K.	K.	Recycling Capacity	Secondary fiber	Wastepaper grades	U. FS.	FS.	SC. CM.	Ubl K. Paper	Recycled Paperboard
WI	Tomahawk	Pack. Corp. of America	1100				YES					1370		
AL	Stevenson	Mead Corp.	750				YES	350	OCC			1030		
LA	Mansfield	International Paper Co.	540			1700						1000	1600	
MI	Filler City	Pack. Corp. of America	600				YES	325	OCC			900		
OH	Coshocton	Stone Container Corp.	575				YES		OCC			845		
MI	Otsego	Menasha Corp.	320				YES		OCC			830		
VA	Big Island	Georgia-Pacific Corp.	600				YES		OCC			830		
VA	Riverville	Virginia Fibre Corp.	550				YES	700	OCC			800		365
MI	Ontonagon	Stone Container Corp.	600				YES					730		
AL	Pine Hill	MacMillan Bloedel Packaging Inc.	550		1150	1150	YES	350	OCC			700	1400	
OK	Valliant	Weyerhaeuser Paper Co.	500		1650	1650	YES	850	OCC			700	2500	
TN	New Johnsonville	Inland Container Corp.	400				YES		OCC			680		
OR	Toledo	Georgia-Pacific Corp.	400		1100	1100	YES		OCC			670	1300	
GA	Cedar Springs	Georgia-Pacific Corp.	525		2300	2300	YES		OCC			665	2270	
IN	Terre Haute	The Weston Paper & Mfg Co.	300				YES		OCC			550		
KY	Hawesville	Willamette Ind. II	180				YES	350	OCC			485		
LA	Hodge	Stone Container Corp.	250		1500	1500	YES		ONP/OCC			400	1500	
NH	Groveton	Groveton Paper Board Inc.	260									395		
WA	Longview	Weyerhaeuser Paper Co.	200	1150		1150	YES		OCC	400	400	340		
OH	Circleville	Jefferson Smurfit Corp. & CCA	200				YES		OCC			325		
WA	Wallula	Boise Cascade Corp.	220	803		803	YES		OCC	390	390	305		
IA	Fort Madison	Four M Paper Co.	150				YES					220		
LA	Bogalusa	Gaylord Container Corp.			2150	2150	YES		OCC			200	3000	

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Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 31. *Recycled Paperboard Mills. USA. 1995.*

St.	Location	Firm	SemC	Bl. K.	Ubl. K.	K.	Recycling Capacity	Secondary fiber	Deinked	Wastepaper grades	R P&W	Tissue	SC. CM.	Ubl K. Paper	Recycled Paperboard	Other Paper
SC	Hartsville	Sonoco Products Co.	300				YES			ONP/OCC					1200	
CA	Antioch	Gaylord Container Corp.			700	700	YES	950		OCC					1000	
CA	Ontario	Inland Container Corp.					YES			OCC					820	
KY	Maysville	Inland Container Corp.					YES			OCC					800	
IN	Newport	Inland Container Corp.					YES			OCC					772	
IA	Cedar Rapids	Cedar River Paper Co.					YES			OCC					750	
GA	Conyers	Visy Paper					YES			OCC					650	
IL	Alton	Jefferson Smurfit Corp.					YES			OCC					650	
WI	Green Bay	Green Bay Packaging Inc.					YES			OCC					650	
CA	Port Hueneme	Willamette Industries, Inc.													480	
CT	Montville	Rand Whitney Paperboard Corp.					YES			ONP/OCC					474	65
CT	Uncasville	Stone Container Corp.					YES			OCC					465	
VA	West Point	Chesapeake Paper Products Co.		480	1450	1930	YES	1000		ONP/PSUB				1010	455	
MI	Menominee	Menominee Paper Co. Inc.					YES			OCC		50			450	
WI	Neenah	P. H. Glatfelter Co.					YES		370	PSUB					450	
MN	Saint Paul	Waldorf Corp.					YES			ONP/OCC					430	430
NY	Niagara Falls	Cascades Niagara Falls Inc.					YES			OCC					400	
MI	Battle Creek	Waldorf Corp.					YES			ONP/OCC					375	
VA	Riverville	Virginia Fibre Corp.	550				YES	700		OCC			800		365	
OH	Middletown	Jefferson Smurfit Corp.					YES			ONP					330	
CA	Santa Clara	California Paperboard Corp.					YES			ONP/OCC					320	
PA	York	Stone Container Corp.					YES			OCC					320	
PA	Reading	United CorrStack Inc.					YES			OCC					300	
MA	Boston	Bay State Paper Co.					YES		200						285	
NY	Oswego	International Paper Co.					YES			OCC					260	
OH	Middletown	Bay West Paper Corp.					YES		290	ONP/OCC					260	
IL	Quincy	The Celotex Corp.					YES		50	ONP/OCC					250	
MA	Lawrence	Newark Atlantic Paperboard Corp.					YES			ONP/OCC					240	
NC	Sylva	Jackson Paper Mfg. Co.					YES			OCC					240	
OH	Massillon	Cleaners Hanger Co.					YES			OCC					225	
OK	Pryor	National Gypsum Co.					YES			ONP/OCC					225	
TX	Forney	Corrugated Services Inc.					YES			OCC					225	
IN	Hartford City	Visy Paper					YES			ONP/OCC					210	
NJ	Clifton	Recycled Paper Board Inc. of Clifton					YES			ONP/OCC					210	
MI	Kalamazoo	Portage Paper Co., Inc.					YES								200	
CA	Newark	Inland Container Corp.					YES			OCC					196	
CA	Pomona	Simpson Paper Co.					YES		YES	OCC	180				180	
OH	Baltimore	Ohio Paperboard Corp.													180	
IL	Joliet	IVEX Packaging Corp.					YES			ONP/OCC					160	
CO	Commerce City	Republic Paperboard Co.					YES			OCC					150	
MI	Constantine	Simplex Products Group					YES			OCC/PSUB					150	
NJ	Garwood	Garwood Paperboard					YES			ONP/OCC					150	
NJ	Camden	Camden Paperboard Corp.					YES			ONP/OCC					140	
IA	Tama	Pack. Corp. of America					YES			OCC					135	
IN	Carthage	Jefferson Smurfit Corp.					YES			OCC					130	
PA	Philadelphia	Connelly Containers Inc. of Philadelphia					YES			OCC					125	
OH	Cincinnati	Rock-Tenn Co.					YES			OCC					120	
MA	Natick	Natick Paperboard Corp.					YES			ONP/OCC					115	
MO	North Kansas City	United States Gypsum Co.					YES			ONP/OCC					105	
NY	Oakfield	United States Gypsum Co.					YES			ONP/OCC					105	
PR	Arecibo	Global Fibers Inc.					YES								80	
IN	Gary	Georgia-Pacific Corp.					YES		80	PSUB					77	
IL	Peoria	IVEX Packaging Corp.					YES			OCC					40	

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Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.

Table 32. *Other Paper and Paperboard Mills. USA. 1995.*

St.	Location	Firm	SemC	Bl. K.	Ubl. K.	K.	Recycling Capacity	Deinked	Wastepaper grades	C. Gwd.	U. FS.	FS.	Tissue	SC. CM.	Recycled Paperboard	Other Paper
VA	Covington	Westvaco Corp.		1600		1600	YES		ONP							2900
GA	Augusta	Federal Paper Bond Co. Inc.		2250		2250										1860
TX	Texarkana	International Paper Co.														1750
GA	St. Marys	Gilman Paper Co.		900	300	1200										1200
AR	Pine Bluff	International Paper Co.								470						1116
NC	Riegelwoods	Federal Paper Bond Co. Inc.		2260												965
ID	Lewiston	Potlatch Corp.				1300	YES		ONP							925
MI	Kalamazoo	James River Corp.					YES		ONP							800
AL	Demopolis	Gulf States Paper Corp		850		850	YES	50								750
NC	Canton	Champion International Corp.		1450		1450	YES		PSUB		819	819				750
WA	Longview	Weyerhaeuser Paper Co.	200	1150		1150	YES		OCC		400	400		340		630
AL	Pennington	James River Corp.		1100		1100	YES		PSUB				650			620
AR	McGehee	Potlatch Corp.		550		550										600
WI	Kaukauna	Thilmany				420										550
GA	Brunswick	Georgia-Pacific Corp.		2000		2000										530
AR	Crosset	Georgia-Pacific Corp.		1600		1600	YES		PSUB		565	565	440			525
MN	Saint Paul	Waldorf Corp.					YES		ONP/OCC						430	430
MA	Haverhill	Haverhill Paperboard Corp.					YES		OCC							350
MA	Holyoke	Sonoco Products Co.					YES		ONP/OCC							210
MI	White Pigeon	White Pigeon Paper Co.					YES		ONP/OCC							200
NJ	Milford	Crown Vantage Corp.														175
CA	Anderson	Simpson Paper Co.		250		250						250				150
WI	De Pere	Nicolet Paper Co.														140
MI	Monroe	Jefferson Smurfit Corp.					YES		ONP/OCC							130
NJ	Newark	Newark Boxboard Co.					YES		ONP/OCC							130
NY	Castleton-on-Hudson	Fort Orange Paper Corp.					YES		ONP/OCC							115
CT	Montville	Rand Whitney Paperboard Corp.					YES		ONP/OCC						474	65

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Recycling Capacity: YES, confirmed recycled capacity.
Watepaper grades: OCC, old corrugated containers; ONP, old newspapers; PSUB, pulp substitutes.
Paper grades: Newsp., newsprint; Newsp. 100% R., 100% recycled newsprint; C. Gwd., coated groundwood; U. Gwd., uncoated groundwood;
Paper grades: U. FS., uncoated freesheet; C. FS., coated freesheet; SC. CM., semichemical corrugating medium.
Unit: Short Tons per day.