Paper Recycling in the United States:
How Are We Doing Compared to Other Nations?

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April 19, 2005

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Introduction

Surveys of a wide variety of groups over a 15-year period have shown substantial misperceptions regarding the extent to which waste paper is collected and used in the manufacture of paper and paperboard[1] within the United States. Responses have consistently shown pervasive and substantial underestimation on both counts. For example, in one survey involving almost 2,000 college students at eleven major universities, 71 percent of respondents estimated U.S. recycled paper production to be less than one half of what it really is, and 45 percent estimated it to be one-fifth or less of actual. Subsequent surveys, including one comprehensive statewide survey of Montana residents, have yielded similar results.

The U.S. has a long history of paper recovery and reuse. Today, paper and paperboard collection and reuse rates in the United States are 50% and 37%, respectively, with both numbers representing record or near record levels for the nation. While comparison of these numbers to those of other technologically advanced nations can be misleading, it is clear that the U.S. lags behind a number of other developed nations in paper recovery for recycling. However, the differences are considerably less than perceived by the general public. Moreover, recent gains in domestic paper recovery and reuse are narrowing the gap between the U.S. and other nations.

Recycling technology improvements are ongoing and are likely to translate into increased rates of fiber recovery and reuse. Such increases will help to blunt harvest pressures on domestic and global forests, but, in light of ever increasing consumption, recycling efforts alone are unlikely to significantly reduce the current level of consumption of virgin fiber.

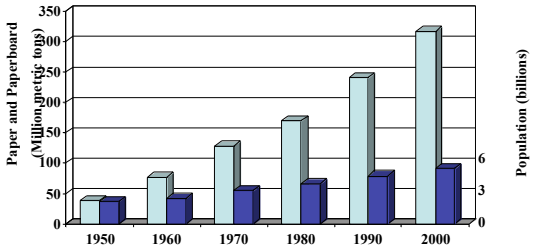
Pulp and Paper Production and Consumption Trends

Global

Paper and paperboard consumption globally has been rising faster than population growth for more than 50 years; this translates to rising per capita consumption. As illustrated in Figure 1, the increase in consumption has been substantial and increasingly rapid up to the present. The greatest increase in both production and consumption in recent years has occurred in Asia (Figure 2), home to 59 percent of the world's people.

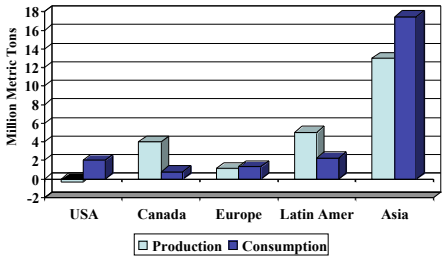
[1] **Paperboard** is the term used to describe a thick fibrous sheet that is often made of two or more plies to provide stiffness. Examples of paperboard include cardboard, posterboard, linerboard used in making corrugated cartons, and foodboard used for packaging of foodstuffs.

Figure 1
World Paper and Paperboard Consumption vs. Population, 1950 -2000



Source: FAO, Forestry Statistical Database, 2003; U.S. Census B ureau, International Division, 2003.

Figure 2
Global Growth in Pulp Production and Consumption – 1990s

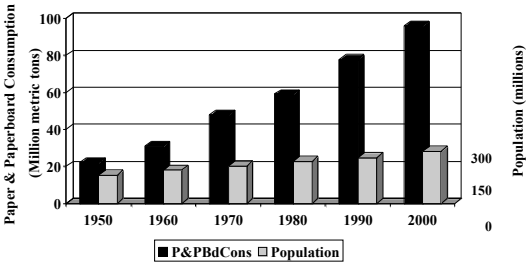


Source: PPI Pulp and Paper International Fact & Price Book as reported by Ince et. al., 2004.

U.S. and North America

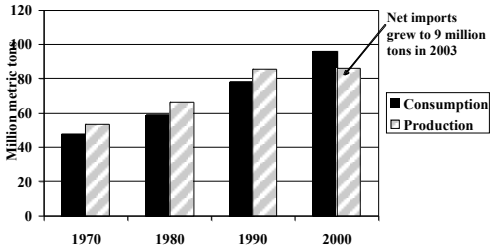
The growth of paper consumption in the United States is a bit less dramatic than for the world as a whole, but dramatic nonetheless (Figure 3). As is the case globally, consumption of paper continues to rise on a per capita basis (i.e. more rapidly than population growth). Although the U.S. has long been a net exporter of paper and paperboard, this situation changed in the course of the past decade, resulting in a net import status for the country; net U.S. imports of paper and paperboard reached 9 million tons in 2003, a record figure (Figure 4).

Figure 3
U.S. Paper and Paperboard Consumption, 1950-2000 vs. Population



Source: FAO, Forestry Statistical Database, 2003; U.S Census Bureau.

Figure 4
U.S. Paper and Paperboard Production and Consumption, 1970 -2000



Source: 1950 and 1960 data from the American Paper Institute; other data from the American Forest and Paper Association.

North America as a whole is currently a net exporter of paper and paperboard products, continuing a long history as a global supplier. However, the margin between imports and exports has narrowed considerably in recent decades.

Paper Recycling

U.S.

Wastepaper recovery and recycling has long been practiced in the United States. For many years the primary source of recovered paper was newsprint, and the primary organization involved in wastepaper collection the Boy Scouts of America. Unsold magazines and scrap paper generated in the paper manufacturing process accounted for most of the remaining volume of recovered paper. As long ago as 1965 the U.S.

wastepaper recovery and reuse rates were about 23%, and these figures remained nearly constant through the early 1980s.

In the mid 1980s the American paper industry initiated a program to increase wastepaper recovery and reuse. Thereafter, the recovery rate began to rise steadily; by 1993 the waste paper recovery rate surpassed 39%, and by 2004 this number reached 50.3%, the highest point thus far in the history of U.S. wastepaper collection. Accordingly, the volume of paper discards entering the solid waste stream dropped. In the period 1987 through 2003, the volume of waste paper that was landfilled in the U.S. dropped from 47.1 million tons to 37.7 million tons, while paper recovery rose from 24.0 to 49.3 million tons. Paper reuse rates (i.e. the use of recovered paper in domestic papermaking) also climbed significantly over the same period, rising from about 24% in 1987 to 37% in 2004. Viewed from a global perspective, the reuse rate for wastepaper collected in the United States is 50%, since virtually all recovered paper not used in production of new paper in domestic mills goes into paper made in other countries.

The U.S. Recycling Record in a Global Context

Year by year recovery and recycling values by country are not readily available. However, published 1999 data for a number of countries (Table 1) provides an interesting comparison. The paper recovery rate is measured by dividing the quantity of paper collected by the quantity of paper consumed. In 1999 the U.S. recovery rate was 44 percent (it is slightly over 50 percent today). In contrast, recovery rates ranged from a high of 76 to a low of 16 percent for the nations listed. High collection rates in Japan, South Korea, and in a number of western European nations suggests that there is room for improvement in waste paper recovery within the U.S.

Table 1
Paper and Paperboard Recovery and Reuse Rates - 1999

Country	Recovery Rate	Reuse Rate
Netherlands	76%	74%
Germany	73%	61%
S. Korea	70%	79%
Sweden	60%	18%
Japan	56%	55%
Australia	51%	78%
Hong Kong*	46%	100%
United States	44%	38%
Canada	43%	25%
UK	41%	72%
Brazil	38%	35%
China	32%	46%
New Zealand	16%	2%

* Figure for Hong Kong for 1997.

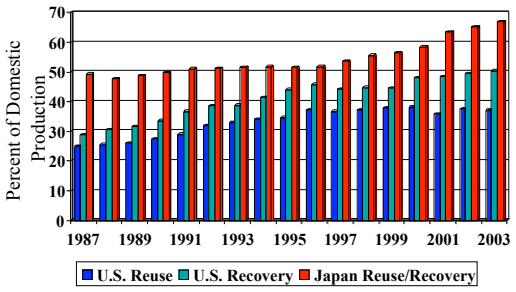
Source: www.paperloop.com/pp_mag/paperhelp/9_1.shtml

In attempting to evaluate recycling performance, it is important to recognize that the reuse rate numbers for a single country cannot be taken at face value. Paper reuse rates are calculated by dividing the quantity of recovered paper by domestic paper production. The fact that the reuse rate is a function of paper production partially explains the large differences between countries. A country or region having a large population base but little paper production capacity (such as Hong Kong) is likely to have a high reuse rate. Conversely, a country with a large paper industry and a relatively small population (Sweden) is likely to have a low reuse rate. Another factor that substantially affects reuse rates is global trade of waste paper. A country that has a reuse rate that is significantly higher than the recovery rate, such as South Korea, is likely a net importer of waste paper. When the reuse rate is markedly lower than the recovery rate, this may indicate a pattern of net exports of waste paper; this scenario characterizes the U.S.

Given the difficulty of comparing reuse rates, it is fortunate that there is one technologically advanced country with high paper quality standards, that has a long history of recycling, and that is not a significant net importer or exporter of paper products or of waste paper. Because of these characteristics, this country – Japan – is widely viewed as providing the most realistic standard for comparison of recycling performance.

How, then, does the U.S. paper reuse rate compare with that of Japan? At first glance, (Figure 5) not very well. After a number of years with a reuse and recovery rate of just over 50%, aggressive action within Japan to increase corporate responsibility for material recovery has driven the reuse/recovery rate up substantially since the mid 1990s. The 2003 Japanese reuse rate of 66.9% is well above the U.S. rate of 38.2%. It is worth noting, however, that virtually all of the fiber exported from the U.S. winds up being made into paper. In effect, the reuse of U.S. waste paper is about the same as the collection rate, or about 50%. This reduces the reuse difference, but still translates to a U.S. reuse rate that is only 75% that of Japan. Again, there appears to be considerable room for improvement in U.S. paper recycling performance.

Figure 5
Paper and Paperboard Reuse Rates – United States and Japan, 1987 -2003



Source: American Forest and Paper Association and Japan Informa tion Network, 2005.

Another measure of U.S. recycling performance is provided by recent European data. In 2003 the EU-wide reuse rate reached 53.9%. In comparison, the U.S. recovery rate in 2003 was 49.5 percent, meaning that the effective reuse of recovered fiber was about 50 percent.

Why Isn't the Recycling Rate 100 Percent?

A relevant question when evaluating recycling performance is what reuse rate is possible. Put more simply, why isn't the recycling rate 100%?

As already noted, for any one country the reasons for low reuse rates include high paper production capacity in relation to population and net export of waste paper. More fundamentally, however, there are at least five reasons why total reuse of paper has not been achieved. These reasons are that:

- Some paper is not collected for reuse.

  Paper that is discarded along with general garbage, used to start a campfire, or that is used as a source of fuel in a district heating system is effectively removed from the recyclable waste stream.

- Some paper is used for things that are not compatible with reuse (i.e. tissues, food papers).

- Some paper is put into long term use (i.e. library books, photographs, and papers used to coat gypsum board and as a part of other construction products).

- A significant portion of the weight of some papers is composed of non-recyclable inorganic materials (i.e. binders and fillers).

  In some highly coated, glossy papers, such as those used to produce high quality calendars, posters, brochures or greeting cards, the clay filler used to produce a smooth, glossy and highly printable surface may comprise as much as 40% of the weight of a sheet of paper. In recycling, this becomes sludge that cannot be reused in the coating process.

- Fiber is degraded each time it is recycled.

  Each time a sheet of paper is re-pulped and prepared for reuse in a sheet of paper the fiber that makes up the paper is degraded. Eventually a given fiber is broken down into tiny molecular-level microfibrils that are lost in the manufacturing process. Depending upon the grade of paper being made, a fiber can be reused about 3 to 9 times. This reality means that from 11 to 33% of fiber is lost each time through the recycling process, requiring a continual source of virgin fiber in the paper manufacture.

So, if the maximum recycling rate for an array of paper products is not 100%, what is it? Again looking to Japan for answers, it appears that with current technology the practical maximum is about 70%.

Might More Paper Recycling Eliminate the Need for Harvesting of Trees?

In the student surveys referenced earlier, one statement posed in a True/False format is consistently marked as "true" by about 80 percent of respondents. That statement is the following: "More aggressive recycling of paper could reduce the domestic timber harvest by 60 percent or more." The response is interesting since this is not remotely close to being a true statement.

The fact that the U.S. paper and paperboard reuse rate is 37% means that if the U.S. were to go to the practical limit of recycling (70%) overnight, the reduction in wood harvest would be approximately:

$$\frac{70 - 37}{70} \times 0.28 \times 100 = 13.2\%^{2} \qquad \text{[Eq. 1]}$$

- where 0.28 is the portion of the domestic harvest that is in the form of pulpwood.

Moreover, if the transition to a 70% reuse rate does not occur overnight, but rather requires 10 to 20 years to accomplish, then increased consumption linked to population growth more than erases the potential reduction in harvest. The inescapable conclusion is that as long as per capita consumption remains at or near current levels, the harvest of virgin fiber for papermaking is likely to increase rather than decrease in the future regardless of what is accomplished on the recycling front.

To be clear about what is being said here, the preceding discussion is not a condemnation or attempt to marginalize the importance of recycling efforts. Recycling is tremendously important. Were it not for recycling, timber harvesting to support domestic consumption would be significantly greater than today.

However, it is quite important that the potential gains from recycling not be overestimated, since resource policies based on misperceptions may lead to large and unintended consequences. For instance, if a majority of policymakers incorrectly believe that current recycling efforts are miniscule and that simply carrying a few more cans, bottles, and waste papers to the curb will allow massive reductions in domestic timber and minerals production, then we are likely to see more policy initiatives aimed at achieving just that. The obvious environmental downside of such policy is that the effect can be to simply transfer the environmental impacts of basic raw materials production

[2] Some would argue that 40%, rather than 28%, should be used in the calculation above. The basis for this argument is that 40% of the annual harvest actually goes into paper making. This includes pulpwood that goes directly into paper making, as well as chips, sawdust, and other residues from lumber and plywood manufacturing operations. However, it is not clear that replacement of mill residues by greater use of recycled paper would reduce the overall rate of timber harvest, since residues would be created by these other industries anyway, and would more likely be directed to manufacture of products such as fiberboard or bio-energy. Nonetheless, even if 40% rather than 28% is used in this calculation, the potential reduction in forest harvest is still less than 20%.

and use to other regions of the world, while at the same time magnifying them. It is clearly important that policy be informed by realistic assessment of available information.

The Bottom Line

Waste paper recovery and recycling in the United States has increased substantially over the past several decades, with the current recovery rate over 50%. However, U.S. waste paper recovery and reuse lags that of a number of developed nations, including Japan, indicating the potential for further improvement in U.S. performance. Technology improvements are ongoing and are likely to translate to increased rates of fiber recovery and reuse in the future. Such increases will help to blunt harvest pressures on domestic and global forests, but are unlikely to significantly reduce the current level of consumption of virgin fiber.

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This Dovetail Report is made possible through the generous support of the Rockefeller Brothers Fund, Surdna Foundation, the Laird Norton Endowment Foundation and the McKnight Foundation.

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