

PAPER RECYCLING IN JAPAN

April, 2024

Paper Recycling Promotion Center

Table of Contents

1 Definition of Recovered Paper	1
2 Sources and Types of Recovered Paper	2
1) Types of Recovered Paper	2
2) Sources of Recovered Paper	3
3) Paper Collection and Role of Supplier	3
3 Products from Recovered Paper	4
1) Recovered Paper as Raw Material for Paper Manufacture	4
2) Use for Non-Paper-Items	5
4 Current State of Paper Collection.....	5
1) Recovery Rate	5
2) Trends in Recovery Volumes and Recovery Rates	5
3) Upper Limit of Recovery Rate	6
5 Trends in Recovered Paper Consumption and Utilization Rates	6
1) Utilization Rate	6
2) Trends in Consumption Volumes and Utilization Rates	6
6 Recovery Volumes and Consumption Volumes	7
1) Recovery Volumes Exceed Consumption Volumes.....	7
2) Exports of Recovered paper	8
7 Importance of Paper Separation	8
1) Why Paper Is Separated	8
2) Recovered Paper Quality Standards	9
8 Recovered Paper Treatment Process	10
9 Supply and Quality of Recovered Paper	11

Paper Recycling Issues

1 Paper Recycling Efforts by Local Authorities and Citizens.....	12
2 Paper Recycling and the Environmental Problem	12
3 Recovered Paper vs. Wood Pulp	12
4 Paper Recycling at the Office.....	13
5 Legal Framework for Paper Recycling	14

Appendix

Grouping and Major Grades of Recovered Paper.....	15
Recovered Paper Quality Standards	16
Guidelines for sorted residential old paper and paperboard, and sorted office paper.....	19
Paper Recycling Statistics in Japan	21

In 2023, Japan's total production of paper and paperboard produced 22.0 million tons, making the country the third largest producer after China and the USA. Paper (Newsprint, Printing & communication paper, Wrapping paper, Sanitary paper, etc.) accounted for 47 % of the total (at 10.4 million tons), while paperboard (Corrugated paper base, White paperboard, Patent coated paperboard, Building board, etc.) accounted for 53% (11.6 million tons).

Paper and paperboard are made from wood pulp and recovered paper. In 2023, use of recovered paper for this purpose stood at 14.9 million tons, while use of wood pulp came to 7.4 million tons.

1 Definition of Recovered Paper

The term of *recovered paper* generally refers to used paper recovered for use as raw material in the manufacture of new paper and paperboard.

Under government notification (3 Consumer Goods Industries Bureaus Notification no.343, December 24, 1991) issued pursuant to the Law for Promotion of Utilization of Recyclable Resources (put into force on October 25, 1991), now the Law on the Promotion of Effective Utilization of Resources (hereinafter “the Recycling Law”), recovered paper is defined as:

Material that is known or believed to have value in use as an ingredient in the production of paper, where such material comes from an article (such as stationery, paper products, and books) that consists in whole or in part of paper and that has been used, or discarded, or collected unused (and inclusive of such material imported into Japan following collection abroad).

But the law also specifically excludes from the definition

...those materials generated during the process of paper production at paper-making mills and operational sites operated by paper manufacturers, and also, in case of processing at paper-making mills (including those processed by other business operators commissioned by paper manufacturers before shipping products) and used by the paper manufacturers as paper stock without being shipped as goods.

The Place of Recovered Paper in the Paper/Pulp Industry

Use of recovered paper as raw material for new paper is an important means for reducing waste and effectively using resources, and is therefore of considerable social importance. In 2023, recovered paper (including pulp from recovered paper) accounted for 66.8% of the raw material for production of new paper, making it the significant resource for paper production.

2 Sources and Types of Recovered Paper

1) Types of Recovered Paper

Recovered paper can be divided into two main categories, according to source: *post-consumer recovered paper* from residences, stores, and other such end users, and *pre-consumer recovered paper* from paper processing sites. An intermediate category may also be defined: *commercial recovered paper*, consisting of empty corrugated containers and other such material generated in large quantities by shopping malls, supermarkets, and other such businesses. The figure 1 shows the types and sources of recovered paper.

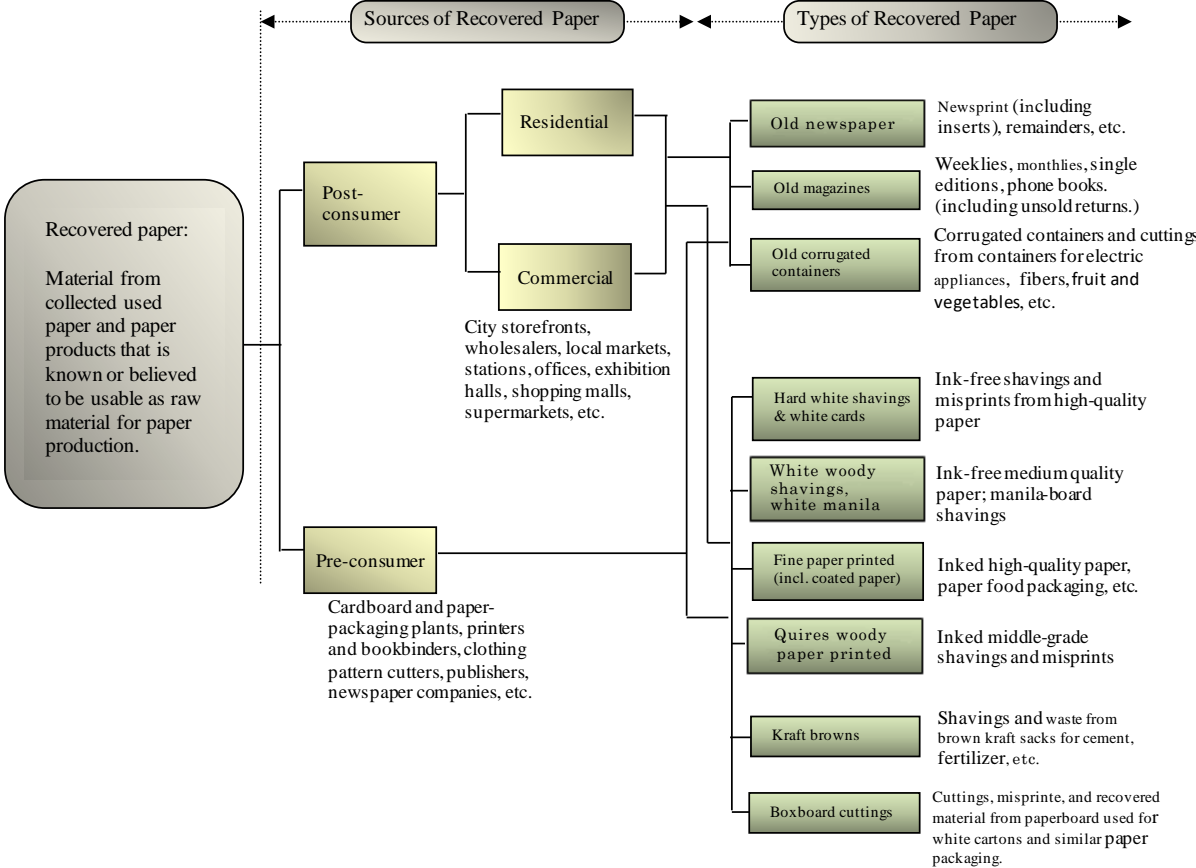


Figure 1 Sources and Types of Recovered Paper

In The Ministry of Economy, Trade and Industry, Recovered Paper defines nine statistical groups that serve as general categories. It subdivided into 26 grades in Paper Recycling Promotion Center (Source: Grouping and Major Grades of Recovered Paper).

Three categories—*old newspaper*, *old magazines*, and *old corrugated containers*—account for about 87% of all recovered paper. Pre-consumer paper recovered from printing and bookbinding plants, sheet cutting facilities, newspaper plants, and similar businesses is divided into categories such as *white shavings and cards*, *high-grade white wood-containing shavings and white wood-containing shavings* (high-grade white unprinted wood-free), and *white ledger and color ledger* (printed).

2) Sources of Recovered Paper

As previously mentioned, recovered paper is generated by residences, offices, shopping malls, grocery stores, printers and bookbinders, carton box and corrugated container manufacturers, and other such sources. Throughout the world, recovered paper is generated from the following four sources.

① Residential

Single family and multi-family residences generate newspaper, magazines, corrugated containers as well as sorted mixed paper.

② Office and institutional

Business offices generate copier paper, classified documents, shredded paper, newspaper as well as magazines, etc.

③ Commercial

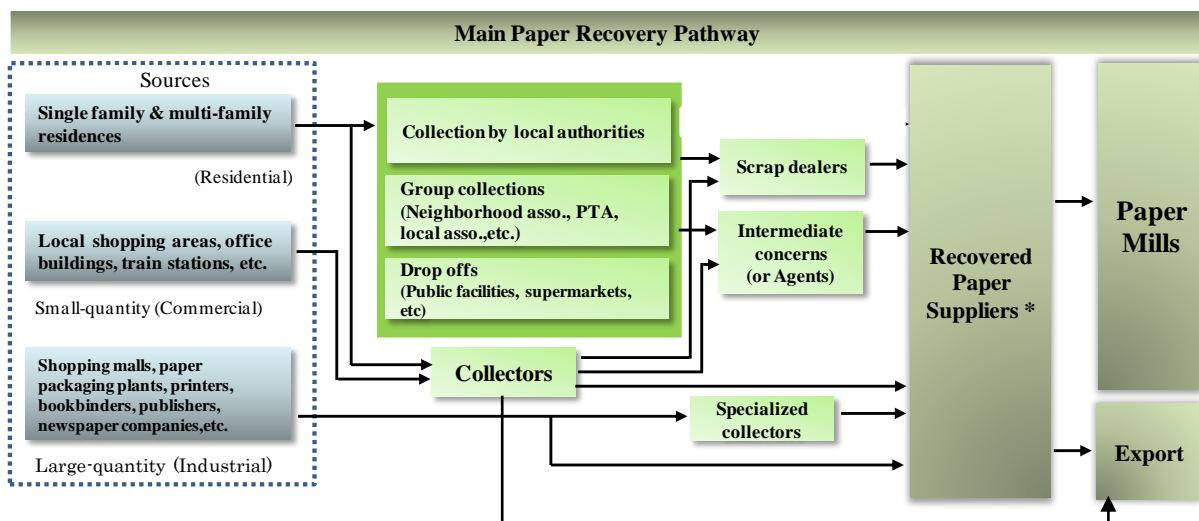
Shopping malls, stations, local markets, and supermarkets, etc. generate large quantities of corrugated containers.

④ Industrial

Paper processing concerns (printers, bookbinders, newspaper companies, and others) generate shavings, misprints, and leftovers, etc.

3) Paper Collection and Role of Supplier

Specialized collectors collect paper from large-quantity sources, and then pass the paper to a supplier* who can then deliver it to mills for use as raw material (Figure 2). Some suppliers also undertake collection on their own. While recovered paper follows a variety of pathways from its source, it ultimately lands in the hands of the supplier. The supplier weighs the paper, presses it with a pressing machine into approximately 1-ton units, and sells it to mills. The supplier is responsible not only for gathering the requisite quantities, but also for ensuring that the delivered paper is of uniform quality and contains no constituents unsuitable for reuse as raw material. Accordingly, the supplier must check quality when purchasing and shipping, and sort the recovered paper carefully prior to packaging it for delivery.



* Supplier refers to recovered paper dealers entitled to deliver recovered paper to paper making mills by paper and paperboard manufacturers.

Figure 2 Paper Collection and Supplier

3 Products from Recovered Paper

1) Recovered Paper as Raw Material for Paper Manufacture

The most prominent characteristic of paper recycling is that it converts paper back into new paper. In 2023 Japan recovered about 17.2 million tons of paper, of which it exported about 2.2 million tons. The country also imported about 0.02 million tons. Domestic reuse, therefore, came to about 15.0 million tons. The collecting Recovered Paper of 99% was used as raw material for new paper manufacture.

Recovered paper is suitable for producing a wide variety of papers and paperboards. Paper uses include newsprint, magazines, printing paper, communication paper, and tissue paper. Paperboard uses include boards for corrugated containers and paper containers (Figure3).

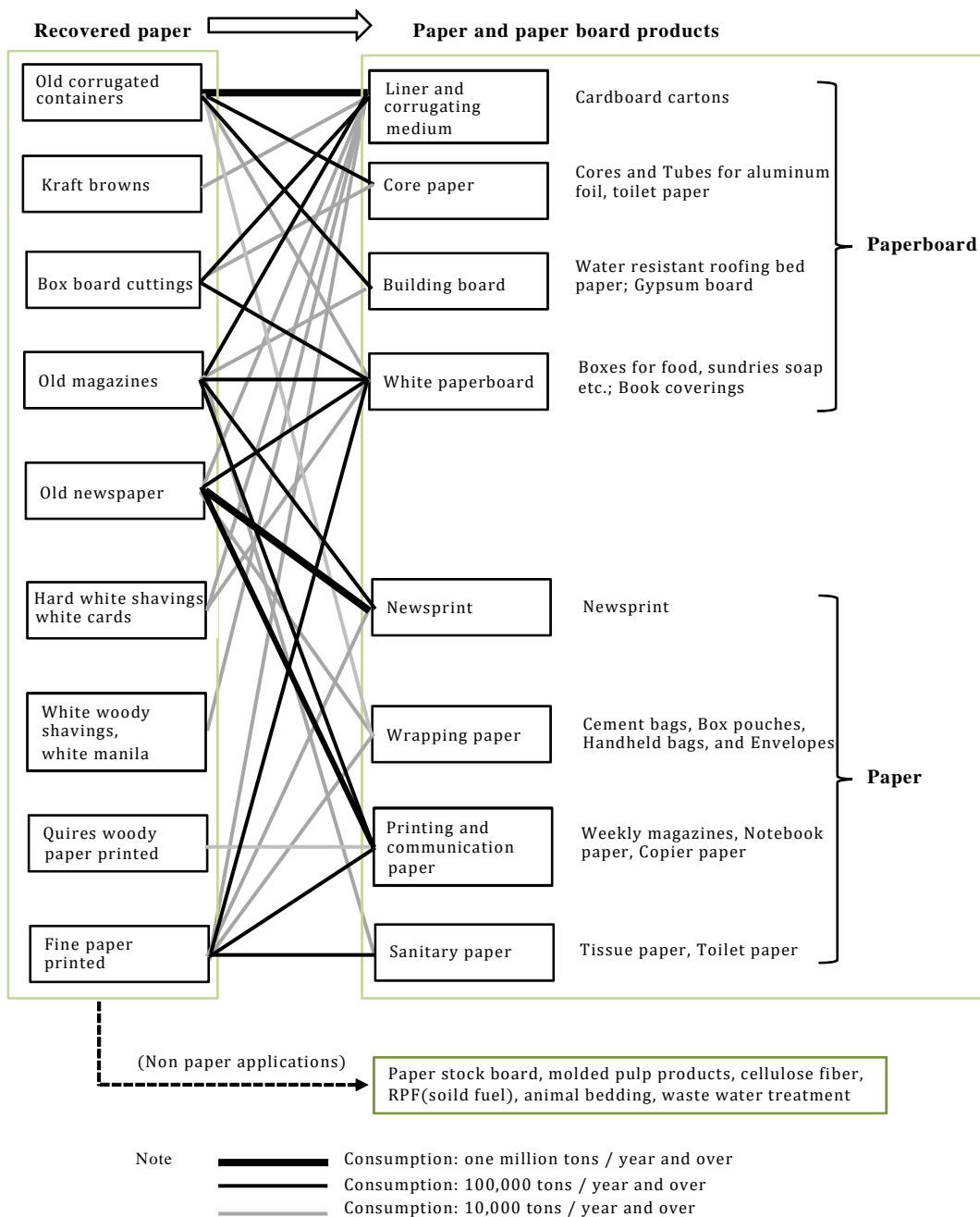


Figure 3 Products from Recovered paper

2) Use for Non-Paper-Items

The remaining 1% was used as raw material for producing non-paper items such as molded pulp products, paper stock board, animal bedding, solid fuel, road paving and waste-water treatment (where recovered paper is mixed with fibers to absorb moisture).

4 Current State of Paper Collection

1) Recovery Rate

The recovery rate can be defined as the total amount of P&PB (paper and paperboard) recovered as a percentage of the total amount consumed RP (recovered paper) fiber. Within this document, we use the term to refer exclusively to consumption and recovery within Japan.

$$\text{Recovery rate (in Japan)} = \frac{\text{Amt recovered RP in Japan (Amt shipped RP to manufacturers + Amt exported RP - Amt imported RP)}}{\text{Amt consumed P\&PB in Japan (Amt sold P\& PB by manufacturers + Amt exported P\&PB - Amt Imported P\& PB)}} \times 100$$

*includes shipments of pulp generated from recovered paper, converted to corresponding paper amount.

2) Trends in Recovery Volumes and Recovery Rates

●Trends in recovery rates

Annual recovery volume has risen steadily since the 1980s and peaked in 2007 (23,325 thousand tons). Recovery volume has been decreasing with the decrease in paper consumption, reaching 17,237 thousand tons in 2023.

Since 1980s the recovery rate increased from 46% to 50%, and remained stagnant at about 51% for the five-year period from 1992 to 1996, but then began a rapid and long-term rise as recovery efforts were boosted by an increased awareness of environmental problems and resource recycling, and efforts by local authorities to reduce waste, with recovery outpacing recovered paper supply and demand. Strong overseas demand for recovered paper also contributed to the increase in the recovery rate. Paper and Paperboard consumption declined due to the Lehman Brothers bankruptcy in 2008, the earthquake in 2011, and the corona crisis that began in 2020, but the recovery rate remained flat at around 80%, reaching a peak of 84.9% in 2020. In 2023, the recovery rate reached 81.6% (Figure4).

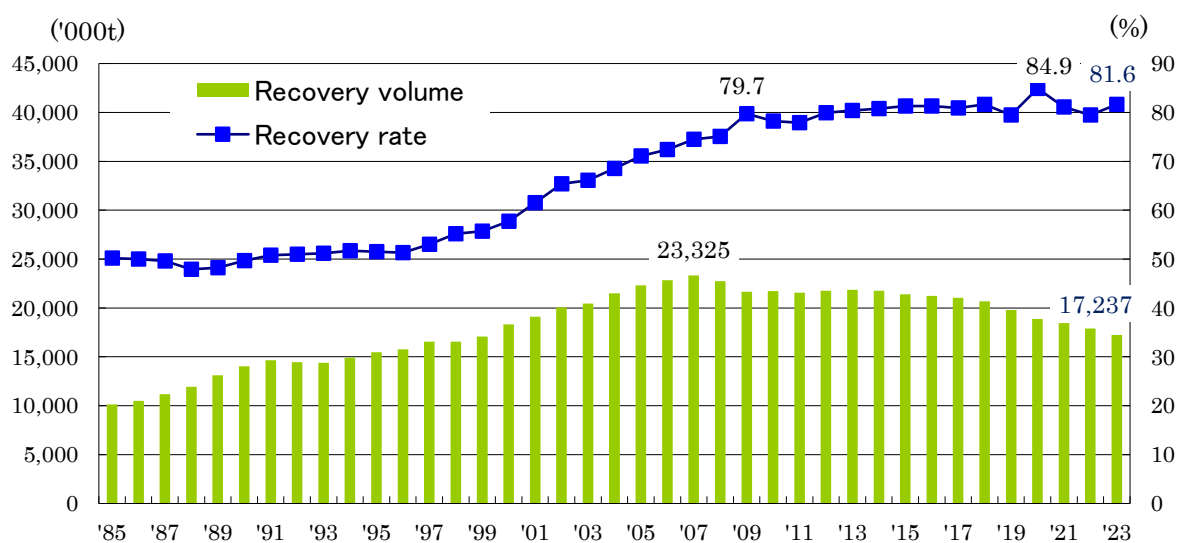


Figure 4 Trends in Recovery Rates

●Recovery Rates by Category

The 2023 recovery rate of pure old newspaper, discounting the large volume of advertising inserts that are mixed in (estimated at 36% by weight), is calculated to have been about 86%. Recovery of printing & communication paper, inclusive of the aforementioned advertising inserts, was approximately 60%. Recovery of old corrugated container is estimated to have been about 98%, derived by discounting the published figures by about 17% to eliminate the impact from the counting of corrugated container that entered the country as packaging for imported goods.

3) Upper Limit of Recovery Rate

It should be kept in mind that the denominator used to calculate the recovery rate (that is, the total quantity of paper consumed in Japan) includes non-recoverable and non-recyclable items such as sanitary paper (tissue paper, etc.) and water-resistant and humidity-resistant processed papers. This fact effectively places an upper limit on the achievable rate. This limit is provisionally calculated to be about 83% (in 2022, a rough calculation that includes consideration of recovery of import/export packaging materials and of other potentially relevant parameters).

In view of this upper limit, the current recovery rate appears to be very high and can be considered a very significant achievement.

5 Trends in Recovered Paper Consumption and Utilization Rates

1) Utilization Rate

The *utilization rate* for recovered paper can be defined as the volume of RP (recovered paper) consumption in paper production as a percentage of the total volume of fiber consumption as raw material for this purpose. Specifically;

$$\text{Utilization rate (in Japan)} = \frac{\text{Amt of RP consumption and deinking pulp from RP that is used in paper production}}{\text{Total fiber used in paper production (wood pulp + recovered paper + deinking pulp from RP + other fiber*)}} \times 100$$

* Fiber that does not originate from wood pulp. Accounts for less than 1% of total figure used. Includes viscous staple fiber, knot screen waste, manila fiber, mitsumata fiber, etc.

2) Trends in Consumption Volumes and Utilization Rates

●Trends in Utilization Rates

Annual consumption of recovered paper has been rising since the 1980s, peaked in 2007 (19,314 thousand tons). In 2009, paper and paperboard production decreased significantly due to the impact by Bankruptcy of Lehman Brothers, and wastepaper consumption decreased to around 17,000 thousand tons. After that, it remained flat, but since 2018, it has been on a downward trend due to the effects of digitalization and the corona crisis.

Consumption of recovered paper has decreased to 14,920 thousand tons in 2023.

The utilization rate has been on the rise since the 1980s (with actual rates of 41.5% in 1980), surpassing 50% in 1990 (51.5%) and 60% in 2003 (60.2%). Paper manufacturers and other stakeholders have achieved the 2005's utilization rates target of 60%, 2010's target of 62%, 2015's target of 64%, and 2020's target of 65% set by the Recycling Law, as a result of their efforts. The utilization rate target announced in April 2021 was set at 65%, based on demand forecasts for paper and paperboard.

However, since 2020, the production of paperboard with a high utilization rate has exceeded that of paper with a low utilization rate, and the recovered paper utilization rate has been raised, reaching 66.8% in 2023. (Figure5).

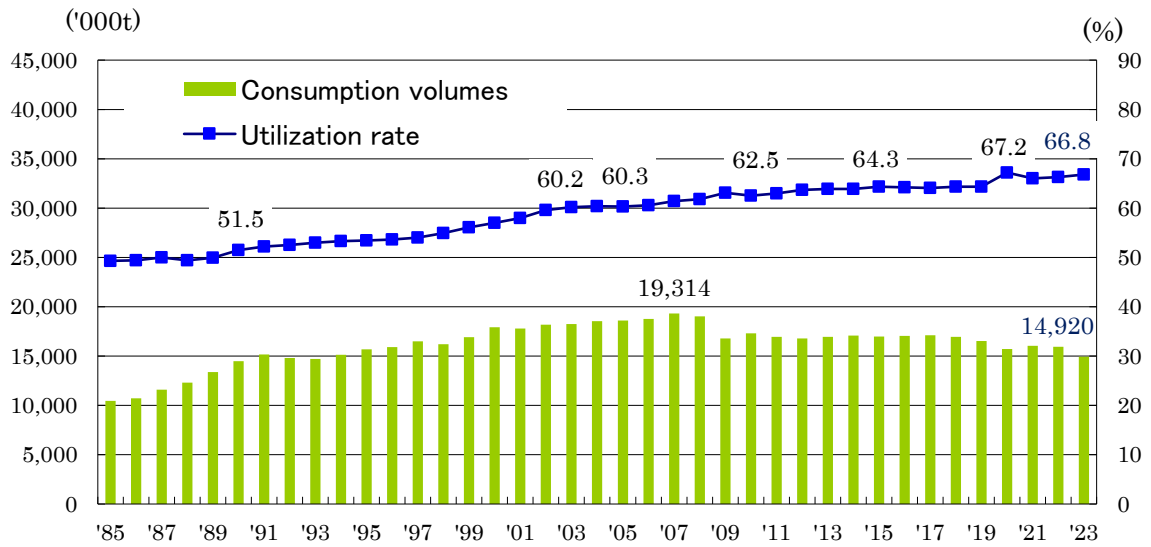


Figure 5 Trends in Utilization Rates

●Utilization Rates for Paper and Paperboard

In 2023, the utilization rates of recovered paper in paper manufacture stood at 34.9%, while the rate in paperboard manufacture reached 93.6%. The utilization rate of paper manufacture in will gradually decrease due to the decrease in production of newsprint, which uses a high percentage of recovered paper. The utilization of paperboard manufacture is nearing its limit, and the utilization rate is expected to remain flat. On the other hand, the ratio of paperboard in the production of paper and paperboard is increasing. As a result, it is expected that the overall the utilization rate of recovered paper will gradually increase depending on the utilization rate of paperboard manufacture.

6 Recovery Volumes and Consumption Volumes

1) Recovery Volumes Exceed Consumption Volumes

Collection and supply of recovered paper had been driven up by increased awareness of environmental problems, stronger interest in recycling, and constant efforts by local authorities to reduce waste. As a result, supply has exceeded demand.

In 2023, the recovery Volumes was 17,237 thousand tons, and the Consumption Volumes was 14,920 thousand tons. The difference is 2,317 thousand tons, which greatly exceeds the amount of recovered paper consumption. Table 1 shows figures since 2013.

Table 1 Trends in Recovery Rates and Utilization Rates

year	Recovery Volumes ('000 tons)	Consumption Volumes ('000 tons)	Difference ('000 tons)
2013	21,864	16,933	4,931
2014	21,750	17,091	4,659
2015	21,401	16,984	4,417
2016	21,233	17,031	4,202
2017	21,047	17,114	3,933
2018	20,673	16,957	3,716
2019	19,794	16,521	3,273
2020	18,878	15,708	3,170
2021	18,456	16,044	2,412
2022	17,886	15,947	1,939
2023	17,237	14,920	2,317

2) Exports of Recovered paper

Exports of recovered paper exceeded 1 million tons for the first time in 2001. Exports have been growing ever since and peaked in 2012 (4,924 thousand tons). After that, it decreased, and it was 2,224 thousand tons in 2023.

As of 2023, the ratio of recovered paper exports is 12.9%. The recovered paper supply and demand balance in Japan is maintained through recovered paper exports, but dependence on exports is declining.

The table 2 shows yearly export volumes for each year since 2013, both by weight and as a percentage of total recovered paper volume in Japan for that year.

Table 2 Trends in Recovered Paper Export

Year	Exported Recovered Paper ('000 tons)	Recovery volume ('000 tons)	As Share of Recovery volume (%)
2013	4,890	21,864	22.4
2014	4,619	21,750	21.2
2015	4,261	21,401	19.9
2016	4,138	21,233	19.5
2017	3,734	21,047	17.7
2018	3,779	20,673	18.3
2019	3,141	19,794	15.9
2020	3,188	18,878	16.9
2021	2,365	18,456	12.8
2022	1,833	17,886	10.2
2023	2,224	17,237	12.9

7 Importance of Paper Separation

1) Why Paper Is Separated

A noteworthy characteristic of paper recycling is that each type of paper tends to have its own specific destination: old newspaper are mainly turned into new newsprint; old corrugated containers become input for new corrugated containers (cardboard boxes); old magazines are turned into paper boxes; computer paper and copier paper are processed into new printing & copier paper; and so on. This in turn suggests how important it is to separate paper correctly at a source, and to remove *any prohibitive materials* that may interfere with subsequent processing. Such *prohibitive materials* include not only foreign matters such as metals and cloth, but also any paper that has plastic film or adhesive tape attached to it. The *prohibitive materials* refer to all non-paper materials as well as those paper materials that are unsuitable for paper recycling (Figure 6).

Table 3 Troubles from Prohibitive Materials

Troubles in processing and production control	Troubles in product quality
<ul style="list-style-type: none"> ● Damage to facilities ● Increased burden for cleaning and maintenance because of clogged screens and dirt in places in the process (adhesive substances, etc.) ● Unusable for paper stock, increasing the amount of waste 	<ul style="list-style-type: none"> ● Poor appearance (dust, specks, glittering, holes, uneven surface, low whiteness level, poor color, etc.) ● Odor (other than paper odor) adherence

8 Recovered Paper Treatment Process

The basic treatment processes in recycling recovered paper into recovered pulp are: defibering, dust removal, dispersing, deinking, bleaching, washing and drainage. Because paperboard mills do not have to make pulp white, they usually do not have the ability to conduct the dispersing, deinking, and bleaching processes. In these processes, the following treatments are carried out.

1) Defibering

Recovered paper is thrown into water and stirred. Then recovered paper is defibered by kneading. At the same time, large foreign objects are removed. This is carried out in a device called a pulper (Figure 7).



Figure 7 Pulper

2) Dust removal

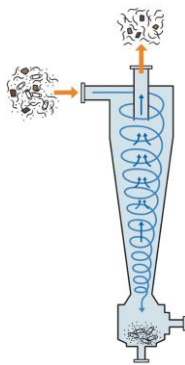


Figure 8 Cleaner

Foreign particles (dust) in recovered paper are removed by a cleaner and a screen (Figures 8,9,10). The cleaner uses centrifugal force to remove stones, sand, and metal that are heavier than the recovered fiber. The screen uses its slits or round holes to remove foreign objects that are larger than recovered fiber.

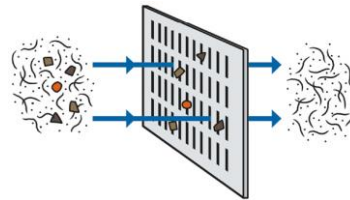


Figure 9 Screen A

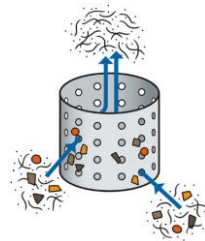


Figure 10 Screen B

3) Dispersing

By strongly kneading recovered fiber, the ink, adhesives, and other foreign objects are peeled off the recovered fiber. At the same time, these foreign objects are broken down to a size indiscernible to the naked eye and dispersed. This is carried out in a device called a kneader or a disperser (Figure 11).

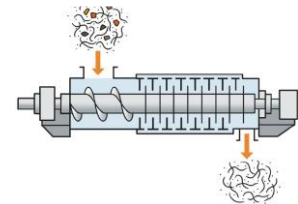


Figure 11 Kneader, Disperser

4) Deinking

Detergent is added to the recovered fiber and air bubbles are blown in. These bubbles adhere to the ink and float. By removing these bubbles, the ink is removed. This is carried out in a device called a flotator (Figure 12).

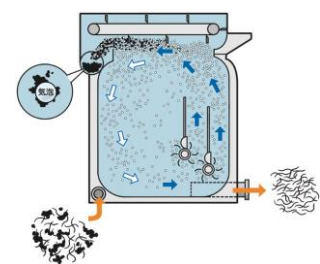


Figure12 Flotator

5) Bleaching

Recovered fiber is turned white with a bleaching agent such as hydrogen peroxide (Figure 13).

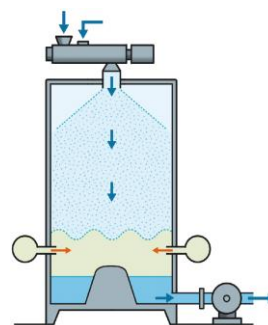


Figure13 Bleaching Tower

6) Washing and drainage

By repeated rinsing and drainage, fine foreign objects are removed. This is carried out in a device called a washer (Figure 14).

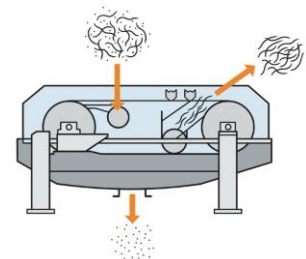


Figure 14 Washer

9 Supply and Quality of Recovered Paper

Since recovered paper is generated as waste at a wide variety of indeterminate sources and variable amounts and qualities, paper manufacturers may find it somewhat less reliable in terms of quality and supply than wood pulp, which is produced specifically for use as a raw material (Table 4). For recovered paper to serve effectively as a raw material, the following conditions should hold.

- ① Recovered paper must be assembled into units suitable for delivery to and handling at the yard (Figure 15).
- ② Assembled units must offer uniform quality (must consist of the uniform grade).
- ③ It must be possible to maintain a stable quantity of supply.



Reference: After recovered paper has been fully sorted, the recycler presses each type into units suitable for transport by truck to the paper mill. The unit size is approximately 1m (H)×1m (W)×1.8m (L). Each unit weighs approximately 1 ton.

Figure 15 Pressed Recovered Paper

Table 4 Supply and Quality Characteristics

Items	Characteristics
Supply	<ul style="list-style-type: none"> ● As the generated supply and the manufacturer demand both vary, supply and demand are subject to imbalance. ● Supply tends to peak in December and to drop to a low in January and February. ● Demand is affected by current production levels of paper and board products.
Quality	<ul style="list-style-type: none"> ● Initial separation at the collection source has an important impact on ultimate quality as a raw material. ● Subsequent rounds of sorting during the distribution stage are required to reach the quality required for use as a raw material.

~ Paper Recycling Issues ~

1 Paper Recycling Efforts by Local Authorities and Citizens

We do not have data showing separate recovery and utilization rates by residences, offices, local authorities, and the government. It is known, however, that the government and local authorities are making considerable progress in raising their recovery rates and their use of recovered-paper products.

For example, in a 2023 survey by the Paper Recycling Promotion Center, all responding prefectures and local authorities indicated that they were carrying out separate collection of recovered paper.

The Green Procurement Law passed in April 2003 obligates the government to use recovered-paper products, and local authorities are obliged to make an effort to use such products.

2 Paper Recycling and the Environmental Problems

Environmental issues, and in particular the appropriate handling of waste, are particularly important concerns in Japan. These issues merit attention and cooperation from all members of society. The country's Waste Management and Public Cleansing Law establishes a basis for developing measures for managing waste. While people have long known that recovered paper can be recycled, they are often less aware that inappropriate handling of such paper can turn it into waste. Accordingly, it is necessary to educate and gain cooperation from all paper users—residences, offices, industrial users, and so on. Effective recycling is also important in terms of protecting forest resources and reducing energy use. For this reason, the government and local authorities are tasked with developing systems, application technologies, and distribution methods that support effective recycling.

The relationship between paper recycling and the carbon dioxide it produces is a little complicated. Wood fiber is largely divided into mechanical pulp, which is made from wood chips by mechanical force, and chemical pulp, which is made using chemicals. Using recovered fiber, compared with using Wood fiber (mechanical pulp and chemical pulp) can reduce the total amount of carbon dioxide produced, which is the total of carbon dioxide from biomass fuel, waste fuel and fossil fuel. However, chemical pulp produces less carbon dioxide from fossil fuel because black liquor can be used as energy of biomass fuel. Black liquor's main ingredient is lignin, which is separated and extracted from wood chips with chemicals. Therefore, chemical pulp produces less carbon dioxide from fossil fuel than recovered fiber does.

To avoid increasing carbon dioxide in the atmosphere, it is also important to promote the metabolism of planted trees and to try not to lose accumulated carbon storage in forests.

3 Recovered Paper vs. Wood Pulp

As the base for paper stock, there is wood fiber and recovered fiber. Recovered fiber is weakened each time paper is recycled. The use of wood fiber is effective to compensate for this weakening. For this reason as well it is necessary to use a certain amount of wood fiber as a raw material for paper and paperboard. However, which paper and paperboard products use wood fiber and how much of it to mix in should be considered carefully in terms of environmental implications as well as product quality. A good balance with the use of recovered fiber is desirable.

The wood chips used for pulp material are mostly from scrap wood from furniture and housing materials, or low-quality wood and thinning-out trees from natural or artificial forests. Therefore, even wood fiber is an effective use of forest resources.

4 Paper Recycling at the Office

1) Major challenges for paper recycling at the office

① Shredded paper and Sorted office paper

It was revealed that recovery rates are higher than 90% for newspaper, magazines, and corrugated containers, but lower than 70% for Shredded paper and Sorted office paper.

② Recovered paper from small offices

The recovery rates for Shredded paper, Sorted office paper and Confidential document are small low at offices with few employees.

2) Sorted office paper recycling

Sorted Office paper is recyclable paper and paper products other than newspapers, magazines, and cardboard generated from business establishments. It mainly consists of unbound black and color printed materials, used copy paper, flyers, business cards, envelopes, wrapping paper, paper bags, etc.

Check with your recycler or building management company to see if they can collect office paper, and if so, secure a place for employees to discharge it, and post a sign around the area so that employees know what types of paper qualify as office paper and what types of paper are not suitable for recycling. Doing so will promote office paper recycling!

3) Shredded paper recycling

If well separated, shredded paper can be treated as ordinary recovered paper. However, if it is not well separated, shredded paper needs to be treated in a paper mill with facilities for treating difficult-to-defiberize-paper.

Therefore, shredded paper is not used at all paper mills. It is difficult to recycle shredded paper in areas where there are no recovered paper wholesalers or recovered paper collectors with distribution routes to those mills.

Outsourcing the destruction of confidential documents without shredding is also one of the methods of resource recovery.

4) Confidential document destruction

Protection of corporate confidential information is very important in avoiding corporate risk. Confidential information must be securely erase, there are two processing methods, internal shredder processing and external consignment processing.

When outsourcing confidential document destruction, it is vital that a processing company that is fully equipped with security measures conducts it.

There are three main methods of processing confidential documents when outsourcing.

① Mobile shredding

In this method, a vehicle equipped with a shredding machine visits the office and deletes the confidentiality law onsite.

Entry and exit of the vehicle is managed, remove prohibitives in the vehicle, and shred confidential documents.

② Stationary shredding

Collection haulers and processing companies collect confidential documents from business establishments, transport them to grinding facilities, and delete confidential information. In the treatment process, there are cases where it is crushed after sorting and crushed by unopened.

③ Direct defibering

It is a method to input confidential documents to the pulper at a paper mill or the like.

It is called "direct melting" or "unopened dissolving".

Since it is thrown directly into the pulper, it is a premise to remove foreign matters.

Appendix

Grouping and Major Grades of Recovered Paper

Paper Recycling Promotion Center
 Enacted: March 1979
 Revised: June 5, 2000
 Revised: Sept. 30, 2004
 Revised: Sept. 29, 2008
 Revised: April 22, 2010
 Revised: Jan. 29, 2015
 Revised: May. 26, 2016

Statistical Group	No.	Grade	Description
Hard white shavings, white cards	1	White shavings	Shavings or sheets of white unprinted wood-free paper collected from bookbinders, printers, and sheet cutting facilities.
	2	Cream shavings	Shavings or sheets of cream-colored unprinted wood-free paper collected from bookbinders, printers, and sheet cutting facilities.
	3	Ruled-paper shavings	Shavings or sheets of white or cream-colored unprinted wood-free paper with red or blue ruling or register marks, collected from bookbinders, printers, and sheet cutting facilities.
White woody shavings, white manila	4	High-grade white wood-containing shavings	Shavings or sheets of white unprinted high-grade wood-containing paper collected from bookbinders, printers, and sheet cutting facilities.
	5	White wood-containing shavings	Shavings or sheets of white unprinted groundwood paper collected from bookbinders, printers, and newspaper printing plants.
Fine paper printed (incl. coated paper)	6	White ledger	White wood-free paper printed with black ink.
	7	Color ledger	White wood-free uncoated or coated paper printed in color.
	8	Wood-free shavings with partial color print	Shavings of white uncoated or coated wood-free paper, some of which is color printed, collected from bookbinders and printers.
	9	Coated white shavings	Shavings or sheets of unprinted coated paper collected from bookbinders and printers.
	10	Fliers	high-grade wood-containing white paper, etc.
	11	Beverage paper carton	Washed used household beverage paper cartons, and shavings and sheets of industrially generated beverage paper carton board, with no aluminum content.
	12	Sorted office paper	Paper and paper products from businesses, consisting primarily of loose black-printed or color-printed paper and copier paper.
Quires woody paper printed	13	High-grade color-printed wood-containing shavings	Shavings of high-grade wood-containing white paper printed in various colors, collected from bookbinders and printers.
	14	Color-printed wood-containing shavings	Shavings of groundwood paper printed in various colors, collected from bookbinders and printers.
	15	High-grade wood-containing waste	Sheets of high-grade wood-containing paper, black-printed or color-printed, and groundwood paper collected from bookbinders and printers.
Old newspaper	16	Old newspaper	Old newspapers and Inserts collected from residences, businesses, public offices, etc.
Old magazines	17	Old magazines	Bound papers such as magazines, books, returned and remaindered books, user's manuals (including brochures), and booklets (pamphlet, catalogues and guidebooks, etc.) collected from residences, businesses, and public offices, etc.
Kraft browns	18	New brown kraft cuttings, unprinted brown kraft	Cuttings and sheets of unprinted brown kraft paper collected from kraft paper sack factories.
	19	Used brown kraft sacks	Used brown kraft sacks for rice, wheat, etc.
	20	Kraft lined corrugated container	Kraft corrugated cuttings and old kraft corrugated containers (Comprised mainly of imports), Unbleached six pack beer carrier, etc.
Old corrugated containers	21	Old corrugated container	Old corrugated containers collected from businesses, residences, etc.
	22	New Double-lined kraft corrugated cuttings	New corrugated cuttings and sheets from packaging products factories.
Box board cuttings	23	Mill wrapper	Used wrapping for paper and paperboard.
	24	White paperboard cuttings	Cuttings and die cuttings of white paperboard, chipboard, etc. collected from carton makers.
	25	Chipboard cuttings(Carton)	Old cartons from businesses, etc.
	26	Sorted residential old paper and paperboard	Paper, paperboard, and products thereof, collected from residences, exclusive of (separated from) old newspaper, old magazines, old corrugated containers and milk cartons.

Recovered Paper Quality Standards (Five Grades)

I. Standards

1. Scope of application

The standards set forth hereinafter refers to the quality standards of recovered papers including Old newspaper, Old corrugated containers, Old magazines, Sorted residential old paper and paperboard, and Sorted office paper (hereinafter collectively referred to as “Recovered Papers”), which is to be traded. The trades of Recovered Papers shall be conducted by abiding by the standards contained herein unless otherwise agreed by buyers and sellers.

Under these standards, Old newspaper, Old corrugated containers, Old magazines, Sorted residential old paper and paperboard, and Sorted office paper refer to the following type of paper.

- The Old newspaper refer to the newspaper (including inserted flyers) and over-issue newspaper, generated by residences, businesses, public offices, etc.
- The Old corrugated containers refer to those generated by paperboard and paper container plants, residences and businesses, etc.
- The Old magazines refer to bound papers such as magazines, books, returned and remaindered books, user's manuals (including brochures), and booklets (pamphlet, catalogues and guidebooks, etc.) collected from residences, businesses, and public offices, etc.
- The Sorted residential old paper and paperboard2 refer to the papers, paper boards, and the products made of them, which are not classified as Old newspaper, Old corrugated containers, Old magazines or Beverage paper carton.
- The Sorted office paper refer to the papers and paper products generated by businesses, including unbound, color- or ink-printed matters and used copier papers

2. Quality

The qualities of Recovered Papers shall be as defined in II. “Recovered Paper Quality Standards.” The materials meeting the “Waste Paper Quality Standards” shall be referred to as standard materials.

3. Prohibitive materials

The prohibitive materials shall be classified into the categories A (A-1 and A-2) and B as shown below.

Category A: The foreign substances or other substances which are irrelevant to the raw materials for paper manufacturing and may cause serious troubles if they are mixed with the raw material as listed below.

A-1 Items other than paper products

- 1) Stone, glass, metal materials (incl. tools, machine parts, etc.), earth and sand, wood pieces, cloths, plastics, etc.
- 2) Synthetic paper and stone paper (technically not “paper”, as it is made of plastic and mineral)
- 3) Nonwoven fabric (surgical mask, disposable wet towel. etc.)
- 4) Disposable diaper, sanitary napkin, sheet for pet, etc. (incl. unused items)
- 5) Those which may significantly damage other paper manufacturing processes or products

A-2 Items which can't be used for paper manufacturing although those are paper products

- 1) Aromatic paper, perfumed paper (wrapping paper, paper box, corrugated container for detergent, soap, incense, etc.)
- 2) Cushioning material for bag, shoes, etc. (used dye-sublimation papers are often reused as cushioning material)
- 3) Dye-sublimation paper (textile printing paper, iron-printed papers, mainly paper that is heated to print a design on fabric)

- 4) Thermo-sensitive foaming coated papers (where heat causes paper to rise; mainly used for printing of Braille)
- 5) Waxed corrugated container (eg. corrugated containers for fruit and vegetable, processed sea foods, etc.)
- 6) Food-stained paper
- 7) Stained paper (paper that has had oil spilled on it, used tissues and paper towels, paper stained with pet excrement, etc.)
- 8) Papers which may have come into contact with infectious waste in medical facilities and other facilities
- 9) Other items which bring extreme damage for paper manufacturing process or paper products

Category B: Items which may bring unfavorable influences for paper manufacturing if they are mixed with the raw materials as listed below.

- 1) Paper stamped with metallic (gold, silver, etc.) leaf
- 2) Paper used as building materials such as plaster boards, tarpaulin papers, etc.
- 3) Sealed postcards (confidential postcards, etc.)
- 4) Seals, adhesive tapes, etc. (in case of old corrugated containers, adhesive tapes aren't classified as prohibitive materials)
- 5) Water-resistant processed paper (paper cups, paper plates, paper instant-ramen containers, paper yogurt containers, etc.)
- 6) Resin-coated papers made of plastics, polyethylene, aluminum and laminated papers
- 7) Resin-impregnated papers, parchment papers, waxed papers
- 8) Photo print paper (photo, inkjet photo printing sheets, album)
- 9) Carbon paper, carbonless paper (package/parcel delivery service forms, etc.)
- 10) Thermal papers (fax paper, receipt, etc.)
- 11) Colored paper (excl. judgmental criteria A and B) ※
- 12) Commodity samples (shampoo, cosmetics, etc.) accompanying insert in newspapers, magazines and catalogs
- 13) Other items (papers made of composite material, etc.) which are unsuitable for consumption as raw materials for paper manufacturing

※ Paper manufacturers rank colored papers based on recyclability judgmental criteria. Refer to home pages of paper manufacturers.

4. Packing and wrapping styles

In principle, the standard materials shall be press-packed. The prohibitive materials shall not be used for wrapping. However, the strings, iron wires, etc. used for packing shall be excluded.

5. Indications

The standard materials shall have the indications identified by buyers and sellers.

6. Non-standard materials

The materials which have deteriorated, sunburned or contaminated with soil or rust, those containing moisture or prohibitive materials, other outthrows or those whose wrapping style does not meet the standards shall be referred to as non-standard materials.

7. Sorted materials

Those sorted in order to meet the conditions stricter than those contained herein shall be referred to as sorted materials.

II. Waste Paper Standard Quality Standards

1. Old newspaper

- 1) Mixing of prohibitive materials
 - (1) Prohibitive material category A ... Not allowable.
 - (2) Prohibitive material category B ... In principle, it is not allowable. However, the following value may not be exceeded even if it is unavoidable.0.3%
- 2) If any grades other than Old newspaper (excluding inserted flyers) are mixed, the following value may not be exceeded. 1%
- 3) The moisture content may not be exceeded as shown on the right. 12%

2. Old corrugated containers

- 1) Mixing of prohibitive materials
 - (1) Prohibitive material category A ... Not allowable.
 - (2) Prohibitive material category B ... In principle, it is not allowable. However, the following value may not be exceeded even if it is unavoidable. 0.3%
- 2) If any grades other than Old corrugated containers are mixed, the following value may not be exceeded. 3%
- 3) The moisture content may not be exceeded as shown on the right. 12%

3. Old magazines

- 1) Mixing of prohibitive materials
 - (1) Prohibitive material category A ... Not allowable.
 - (2) Prohibitive material category B ... In principle, it is not allowable. However, the following value may not be exceeded even if it is unavoidable. 0.5%
- 2) If any grades other than Old magazines are mixed, the following value may not be exceeded. 5%
- 3) The moisture content may not be exceeded as shown on the right. 12%

4. Sorted residential old paper and paperboard

- 1) Mixing of prohibitive materials
 - (1) Prohibitive material category A ... Not allowable.
 - (2) Prohibitive material category B ... In principle, it is not allowable. However, the following value may not be exceeded even if it is unavoidable. 0.5%
- 2) The moisture content may not be exceeded is as shown on the right. 12%

5. Sorted office paper

- 1) Mixing of prohibitive materials
 - (1) Prohibitive material category A ... Not allowable.
 - (2) Prohibitive material category B ... In principle, it is not allowable. However, the following value may not be exceeded even if it is unavoidable. 0.5%
- 2) The moisture content may not be exceeded as shown on the right. 12%

Guidelines for Sorted residential old paper and paperboard, and Sorted office paper

Paper Recycling Promotion Center

Enacted: May 25, 2005

Revised: Feb. 24, 2011

Revised: Sept. 21, 2012

Revised: May. 26, 2016

Overview

These guidelines present information essential for proper separation of recovered paper falling into the categories of *Sorted residential old paper and paperboard*, and *Sorted office paper*. It is assumed that issues not covered herein shall be worked out through mutual agreement of generator and collector.

Handling of shredded paper shall be decided through mutual agreement of generator and collector.

1 Sorted residential old paper and paperboard

(1) Content

Sorted residential old paper and paperboard denotes paper and paperboard, and products thereof, generated by residences, and not separable into categories of old newspaper (including inserted flyers), old magazines, old corrugated container, and Beverage paper carton. In general, *Sorted residential old paper and paperboard* consists of items such as discarded loose fliers, copier paper, wrapping paper, paper bags, and paper boxes.

(2) Items not to be included in Sorted residential old paper and paperboard

- Water-resistant processed paper (paper cups, paper plates, paper instant-ramen containers, paper yogurt containers)
- Carbon paper, carbonless paper (package/parcel delivery service forms, etc.)
- Sealed postcards (confidential postcards)
- Seals, adhesive tapes, etc.
- Thermal papers (fax paper, receipts, etc.)
- Colored paper (excl. judgmental criteria A and B)※
- Photo print paper (photo, inkjet photo printing sheets; album)
- Commodity samples (shampoo, cosmetics, etc.) accompanying insert in newspapers, magazines and catalogs
- Paper compounded with plastic film, aluminum leaf, etc.
- Paper stamped with metallic (gold, silver, etc.) leaf
- Nonwoven fabric (surgical mask, disposable wet towel, etc.)
- Aromatic paper, perfumed paper (wrapping paper, paper box, corrugated container for detergent, soap, incense, etc.)
- Cushioning material for bag, shoes, etc. (used dye-sublimation papers are often reused as cushioning material)
- Dye-sublimation paper (textile printing paper, mainly paper that is heated to print a design on fabric)
- Thermo-sensitive foaming coated papers (where heat causes paper to rise; mainly used for printing of Braille)
- Synthetic paper and stone paper (technically not “paper,” as it is made of plastic and mineral)
- Food-stained paper
- Stained paper (paper that has had oil spilled on it, used tissues and paper towels, paper stained with pet excrement, etc.)
- Any other paper that is unsuitable for use as raw material for new paper manufacture

※ Paper manufacturers rank colored papers based on recyclability judgmental criteria. Refer to home pages of paper manufacturers.

(3) Steps to take prior to discharging Sorted residential old paper and paperboard

- Remove any attached stickers from postcards and envelopes.
- Remove any attached plastic film from paper (for example, plastic film at outlet of tissue boxes and over address windows of envelopes).
- Where plastic film is adhered to the cover of magazine, remove the corresponding part of the cover.

- Remove all metal and plastic from folders, binders, etc.
- Remove all adhesive tape from paper and paper boxes.

(4) Tying Sorted residential old paper and paperboard for discharge

Paper and paperboard should be arranged into groups according to size (with small items set into paper bags), and groupings tied crosswise with paper cord or similar material.

2 Sorted office paper

(1) Content

Sorted office paper denotes paper and paper products from businesses, consisting principally of loose black-printed and color-printed matter and copier paper. In general, the term refers to discarded office items such as copier paper, paper slips, business cards, envelopes, wrapping paper, and paper bags.

(2) Items not to be included in Sorted office paper

- Water-resistant processed paper (paper cups, paper plates, paper instant-ramen containers, paper yogurt containers)
- Carbon paper, carbonless paper (package/parcel delivery service forms, etc.)
- Sealed postcards (confidential postcards)
- Seals, adhesive tapes, etc.
- Thermal papers (fax paper, receipts, etc.)
- Colored paper (excl. judgmental criteria A and B)※
- Photo print paper (photo, inkjet photo printing sheets; album)
- Commodity samples (shampoo, cosmetics, etc.) accompanying insert in newspapers, magazines and catalogs
- Paper compounded with plastic film, aluminum leaf, etc.
- Paper stamped with metallic (gold, silver, etc.) leaf
- Nonwoven fabric (surgical mask, disposable wet towel, etc.)
- Aromatic paper, perfumed paper (wrapping paper, paper box, corrugated container for detergent, soap, incense, etc.)
- Cushioning material for bag, shoes, etc. (used dye-sublimation papers are often reused as cushioning material)
- Dye-sublimation paper (textile printing paper, mainly paper that is heated to print a design on fabric)
- Thermo-sensitive foaming coated papers (where heat causes paper to rise; mainly used for printing of Braille)
- Synthetic paper and stone paper (technically not “paper,” as it is made of plastic and mineral)
- Food-stained paper
- Stained paper (paper that has had oil spilled on it, used tissues and paper towels, paper stained with pet excrement, etc.)
- Any other paper that is unsuitable for use as raw material for new paper manufacture

※ Paper manufacturers rank colored papers based on recyclability judgmental criteria. Refer to home pages of paper manufacturers.

(3) Steps to take prior to discharging Sorted office paper

- Remove any attached stickers from postcards and envelopes.
- Remove any attached plastic film from paper (for example, plastic film at outlet of tissue boxes and over address windows of envelopes).
- Where plastic film is adhered to the cover of magazine, remove the corresponding part of the cover.
- Remove all metal and plastic from folders, binders, etc.
- Remove all adhesive tape from paper and paper boxes.

(4) Tying Sorted office paper for discharge

Paper and paperboard should be arranged into groups according to size, and groupings tied crosswise with paper cord or similar material.

(5) Handling of paper that has been through a shredder

Handling of shredded paper shall be decided through mutual agreement of generator and collector.

Paper Recycling Statistics in Japan

1 Trends in paper and paperboard production

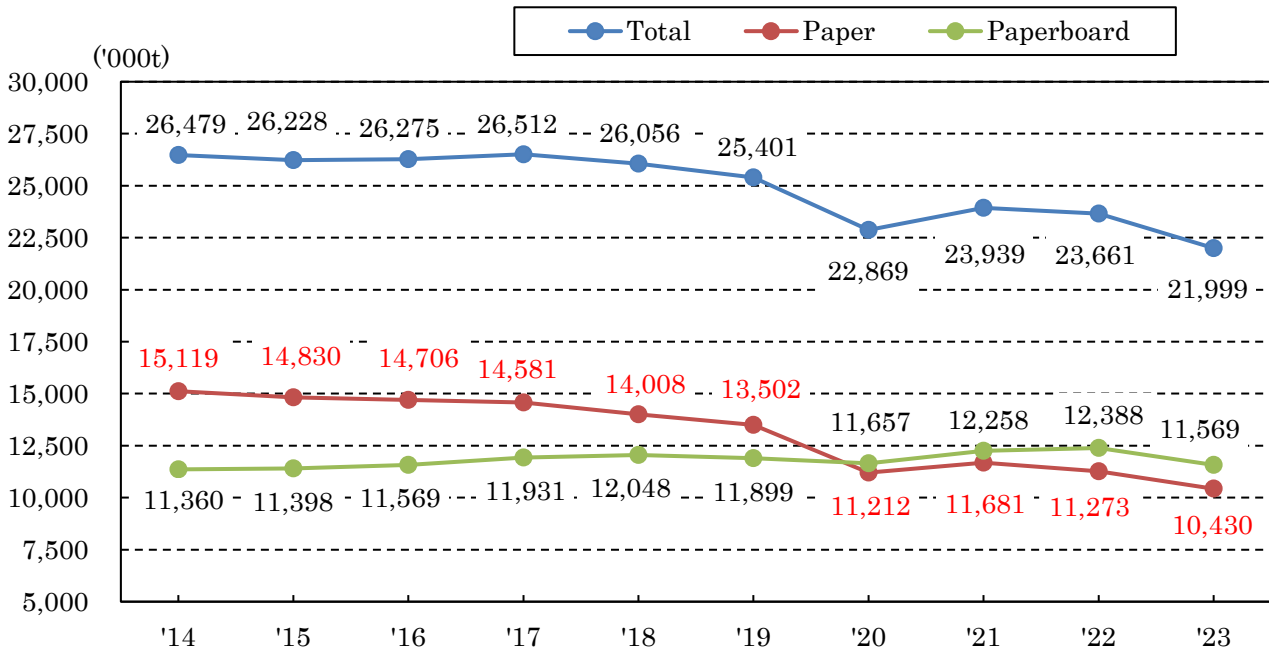


Figure A1 Trends in paper and paperboard production

Source: Monthly statistics for paper, print, plastic, and rubber products

Table A1 Paper and paperboard production by grades

Grades	Years	('000 ton; %)							
		2020		2021		2022		2023	
		Qty.	'20/19	Qty.	'21/20	Qty.	'22/21	Qty.	'23/22
Newsprint		2,061	85.1	1,978	96.0	1,854	93.7	1,666	89.9
Printing and communication paper		5,877	78.2	6,314	107.4	5,997	95.0	5,552	92.6
Wrapping paper		759	84.4	831	109.5	842	101.3	764	90.7
Sanitary paper		1,833	100.1	1,797	98.0	1,872	104.2	1,823	97.4
Miscellaneous paper		681	81.3	760	111.6	708	93.2	624	88.1
Paper total		11,212	83.0	11,681	104.2	11,273	96.5	10,430	92.5
Corrugated fiber		9,701	100.4	10,131	104.4	10,201	100.7	9,511	93.2
White paperboard and patent coated paperboard		1,378	86.2	1,501	108.9	1,562	104.1	1,491	95.5
Building board and other paperboard		579	90.2	625	107.9	624	99.8	567	90.9
Paperboard total		11,657	98.0	12,258	105.2	12,388	101.1	11,569	93.4
Total		22,869	90.0	23,939	104.7	23,661	98.8	21,999	93.0

2 Trends in consumption of recovered paper and wood pulp

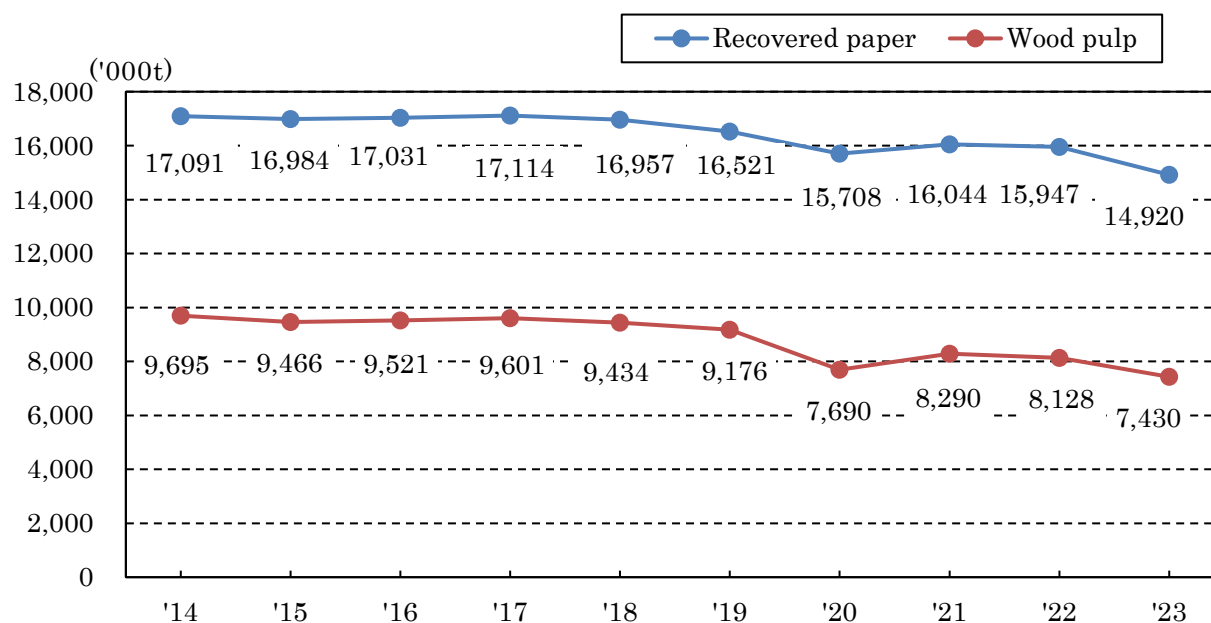


Figure A2 Trends in consumption of recovered paper and wood pulp

Source: Monthly statistics for paper, print, plastic, and rubber products

Table A2 Consumption of recovered paper by grades and wood pulp

Years		2020		2021		2022		2023	
		Qty.	'20/19	Qty.	'21/20	Qty.	'22/21	Qty.	'23/22
Grades									
Old newspaper		2,491	83.6	2,403	96.5	2,219	92.3	1,996	90.0
Old magazines		2,261	97.0	2,300	101.7	2,159	93.9	1,922	89.0
Old Corrugated containers		8,837	99.6	9,292	105.1	9,552	102.8	9,052	94.8
Other grades		2,119	90.6	2,049	96.7	2,018	98.5	1,950	96.6
Recovered paper total		15,708	95.1	16,044	102.1	15,947	99.4	14,920	93.6
Pulp total		7,690	83.8	8,290	107.8	8,128	98.0	7,430	91.4

3 Trends in import and export of paper and paperboard

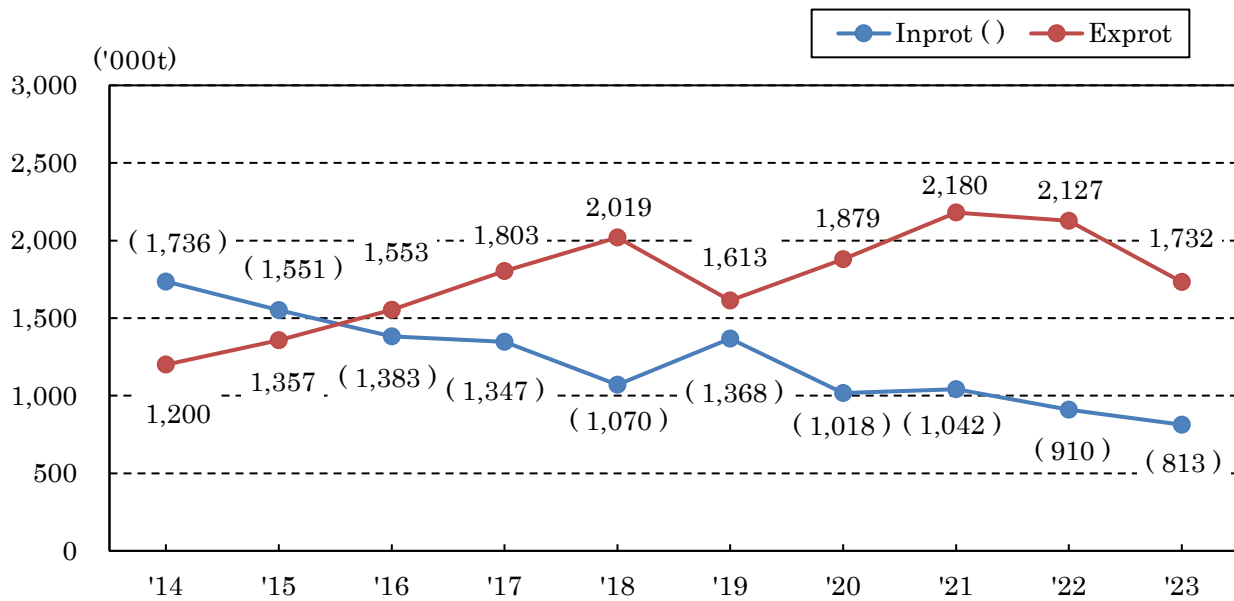


Figure A3 Trends in import and export of paper and paperboard

Source: Monthly trade report

Table A3 Import of paper and paperboard

Years		2020		2021		2022		2023	
		Qty.	'20/19	Qty.	'21/20	Qty.	'22/21	Qty.	'23/22
Paper		738	69.8	756	102.4	616	81.5	573	93.0
Paperboard		280	90.0	285	101.8	294	103.2	240	81.6
Total		1,018	74.4	1,042	102.4	910	87.3	813	89.3

Table A4 Export of paper and paperboard

Years		2020		2021		2022		2023	
		Qty.	'20/19	Qty.	'21/20	Qty.	'22/21	Qty.	'23/22
Paper		922	86.5	1,064	115.4	997	93.7	872	87.5
Paperboard		958	175.1	1,115	116.4	1,131	101.4	860	76.0
Total		1,879	116.5	2,180	116.0	2,127	97.6	1,732	81.4

4 Trends in import and export of recovered paper

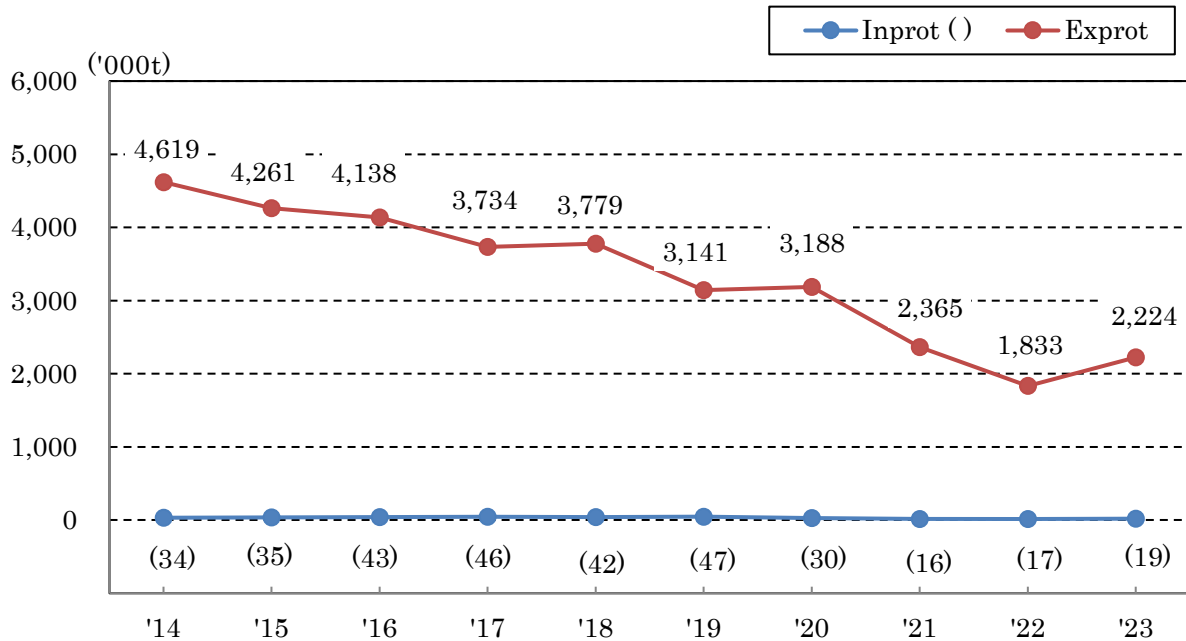


Figure A4 Trends in import and export of Recovered paper

Source: Monthly trade report

Table A5 Import of recovered paper by grades

(‘000 ton; %)

Grades \ Years	2020		2021		2022		2023	
	Qty.	'20/19	Qty.	'21/20	Qty.	'22/21	Qty.	'23/22
OCC and Kraft	11	45.8	3	27.3	4	133.3	3	75.0
ONP and OMG	2	100.0	0	—	0	—	0	—
Others	17	81.0	13	76.5	13	100.0	16	123.1
Total	30	63.8	16	53.3	17	106.3	19	111.8

Notes: OCC; Old corrugated containers, ONP; Old newspaper, OMG; Old magazines

Table A6 Export of recovered paper by grades

(‘000 ton; %)

Grades \ Years	2020		2021		2022		2023	
	Qty.	'20/19	Qty.	'21/20	Qty.	'22/21	Qty.	'23/22
OCC and Kraft	1,937	105.2	1,550	80.0	1,061	68.5	1,551	146.2
ONP and OMG	993	105.5	652	65.7	628	96.3	533	84.9
Others	258	72.1	163	63.2	144	88.3	141	97.9
Total	3,188	101.5	2,365	74.2	1,833	77.5	2,224	121.3

Table A7 Export of recovered paper by countries

(‘000 ton; %)

Grades \ Years	2020		2021		2022		2023	
	Qty.	'20/19	Qty.	'21/20	Qty.	'22/21	Qty.	'23/22
Vietnam	812	138.8	772	95.1	667	86.4	1,027	154.0
Taiwan	403	131.7	587	145.7	406	69.2	470	115.8
Indonesia	298	144.0	280	94.0	235	83.9	240	102.1
South Korea	220	94.0	394	179.1	353	89.6	204	57.8
Malaysia	55	392.9	83	150.9	40	48.2	136	340.0
Thailand	171	123.9	229	133.9	127	55.5	122	96.1
China	1,199	73.1	0	—	0	—	0	—
Others	30	176.5	20	66.7	5	25.0	25	500.0
Total	3,188	101.5	2,365	74.2	1,833	77.5	2,224	121.3

5 Trends in recovery rate and utilization rate of recovered paper

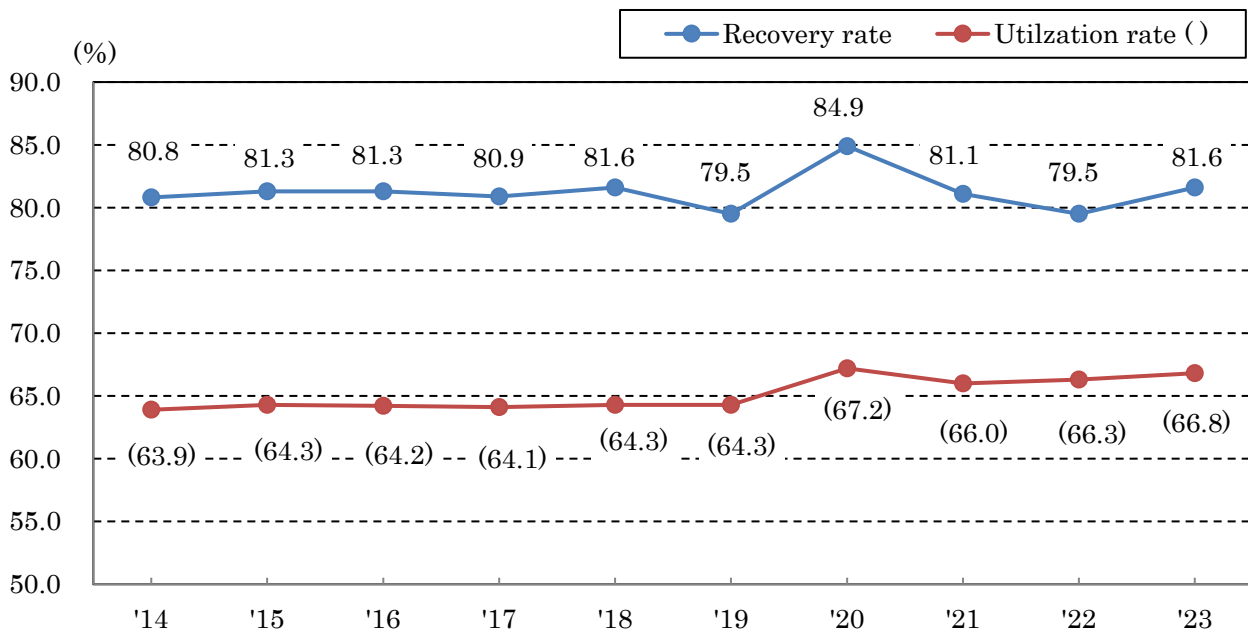


Figure A5 Trends in recovery rate and utilization rate of recovered paper

Source: Monthly statistics for paper, print, plastic, and rubber products

Table A8 Utilization rate of recovered paper by grades

		(%)									
Grades \ Years	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
Paper	40.3	40.2	39.2	37.9	37.3	36.6	37.4	34.7	34.1	34.9	
Paperboard	93.2	93.5	93.8	93.8	93.4	93.5	94.2	93.8	93.7	93.6	
Total	63.9	64.3	64.2	64.1	64.3	64.3	67.2	66.0	66.3	66.8	

Table A9 Recovery rate of recovered paper by grades

		(%)									
Grades \ Years	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
OCC and Kraft	112.7	112.9	111.7	111.5	112.4	111.7	115.9	112.7	110.3	114.5	
ONP	149.5	148.6	147.3	146.6	149.6	145.1	140.9	137.2	135.7	134.0	
Recovery of printing & communication paper	44.7	45.2	45.4	45.3	48.5	47.4	53.6	50.1	49.8	50.4	
Others	47.9	49.9	51.9	49.3	30.9	26.7	25.3	20.3	18.5	18.5	
Total	80.8	81.3	81.3	80.9	81.6	79.5	84.9	81.1	79.5	81.6	