

TOWARDS A SUSTAINABLE  
**Paper  
Cycle**

**Sub-Study Series**

**16** Paper Recycling and  
the Waste Paper  
Business in Japan

**Sayuri Carbonnier**



International  
Institute for  
Environment and  
Development



# **PAPER RECYCLING AND THE WASTE PAPER BUSINESS IN JAPAN**

**Sayuri Carbonnier**

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**Sayuri Carbonnier is an independent consultant based in Japan.**

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## **1. INTRODUCTION**

### **1.1 Background**

This report is a sub-study that has been completed for an IIED project entitled *The Sustainable Paper Cycle* which aims to assess the implications of commitment to the principle of sustainable development by the paper industry world-wide.

The first stage of *The Sustainable Paper Cycle* involved a global view of literature. This resulted in the identification of a number of key issues which were considered to be of importance for research in the second stage. One key issue is the destination of used paper given the increasing concerns about disposal. Recycling offers one alternative but what are its technical and economic limits? Incineration with energy recovery is another option that is widely advocated but concern is often raised about its environmental impact. Community opposition to siting of incineration facilities can be an important constraint.

In this respect, a country of particular interest is Japan. Historically, Japan has exhibited relatively high waste paper recovery and utilisation rates which are roughly in balance with each other. In contrast to the experience of other countries, imports and exports of waste paper have been insignificant. Furthermore, Japan also has a high proportion of its waste paper going to incineration with energy recovery. The Japanese Paper Association set a target of 55% waste paper recovery rate by 1995. The failure to meet this target and its subsequent amendment to 56% has been taken by some observers as indicative of a practical limit to recycling.

For a number of reasons therefore it is important in the context of sustainability to examine the case of Japan in detail. Are there indications that it has reached its limit for waste paper recovery and what conclusions can be drawn for other countries? The present report aims to determine the factors behind the country's high rates of recycling and incineration with energy recovery (the role of legislation will particularly be considered), and also what the costs and benefits of such high rates are. Further the study seeks to ascertain whether Japan provides a model for other countries to follow and what lessons can be learned from the Japanese experience.

### **1.2 Terms of Reference**

In addition to key questions summarised in the above paragraphs the Terms of Reference specify the main issues to be addressed as follow:

#### *1. Recycling and Waste Statistics*

- Obtain latest figures on recovery and utilisation rates.

- Establish the proportions of pre-consumer and post-consumer waste paper as well as the amount coming from households.

Ascertain how much paper is collected from:

- kerbside collection of household recyclable
- bring schemes for household recyclable
- industry collection schemes
- private collectors
- other

Establish how much waste paper goes where:

- recycling
- landfill
- incineration with energy recovery (municipal mass burn)
- dedicated paper fuel for industry

## *ii. Policy Approaches Used to Promote Recycling*

Recycling collection schemes

- How financed? are they subsidised?
- Cost per tonne of waste collected (with and without revenues from sale of collected materials - under municipal schemes and/or industrial schemes).

Participation rates and average efficiency of separation

Regulation eg the Recycling law, recycled content requirements, recycling targets

Economic instruments

- pay as you throw - waste collection charges for households
- waste disposal subcharges
- product taxes
- subsidies for de-inking and technology for utilisation of waste paper
- others

Which approaches have been most effective? Which have been most efficient? Which have been generally accepted? Which approaches have been proposed but not adopted because of public opposition or other factors.

Other driving factors

- waste disposal costs-per tonne cost for landfill and incineration with energy recovery - trends
- prices for waste paper - trends

### *iii. Incineration with Energy Recovery*

- What policy approaches have been used to promote incineration?
- How have they overcome public opposition or changed people's attitudes?
- What are the prospects for further incineration?
- Do paper recycling programmes affect volumes of combustible waste available for incinerators? or vice-versa?
- Environmental standards achieved by incinerators.

### **1.3 The Itinerary**

Research work for this report was carried out during March and April 1995 and it included a visit to Japan from March 11th to March 22nd. The following organisations were visited by this consultant:

Japanese Paper Association, Paper Recycling Promotion Centre, Ministry of International Trade and Industry and Ministry of Health and Welfare and the Bureau of Public Cleansing Tokyo Metropolitan Government. Officials from these organisations made arrangements with relevant private companies and associations enabling this consultant to visit some waste paper dealers, wholesalers, co-operatives and incineration plants and examine some routes for waste collection service.

### **1.4 The Approach and Form of this Report**

The specific issues listed in the above terms of reference are examined in chapters 2 to 7. Conclusive remarks related to key questions mentioned in the background to this report are summarised in Chapter 8. The structure of the report reflects the functions of organisations concerned with recycling and disposal of waste paper in Japan.

The information required to assess the waste paper issue in Japan originates from two separate sources, because waste paper collection and recycling have had two different objectives over the last 40 years. Statistics on waste paper and related data on production and consumption of paper and paper board products are vast and compiled by the Paper Recycling Promotion Centre, the Japanese Paper Association, and by the Ministry of International Trade and Industry (MITI). Government campaigns through MITI were aimed at strengthening the paper industry and households were encouraged to help recycling.

The Japanese Government has undergone two phases concerning its policy on waste paper. The first phase lasted from 1950 to 1990 and the second phase from 1991 onwards. During the first phase waste paper had been used for fibre cost reductions, and the amount collected was to meet recycled fibre requirements. A strong waste paper business entirely based on market forces was in charge of waste paper collection, sorting and supplying the paper industry.

The second phase started in 1990 when the Government of Japan introduced amendments to the Waste Disposal Law 1970, motivated by capacity limitation of waste management. Greater emphasis on the need to pursue recycling in Japan was provided by the enactment of the Law for Promotion of Utilisation of Recyclable Resources - The Recycling Law 1991. This law contains guidelines and targets for recycling of both municipal and industrial solid wastes. The target utilisation rate of waste paper for the paper and paperboard industry was established for 1995 at 55 per cent.

Many waste paper group collection schemes are now being subsidised by the local authorities. Subsidised collection schemes are resulting in over-supply of low grade waste paper adversely affecting the waste paper business. Composition of wastes as well as waste statistics and data on waste paper going to recycling, to incineration and to landfills are provided by the Ministry of Health and Welfare through the Bureau of Public Cleansing of each municipality.

In view of the above facts and because of the complex structure of the waste paper business and collection system in Japan, the issues in the terms of reference have been addressed by dividing the report into:

- Chapter 2: Recycling and waste paper statistics in the paper and paperboard industry
- Chapter 3: Japanese paper and paperboard industry - Policy and legislative measures on waste paper recovery and utilisation
- Chapter 4: Structure and distribution channels of the waste paper business - collection of waste paper from large scale sources
- Chapter 5: Collection of waste paper from households and other disperse sources: group collection schemes
- Chapter 6: Price trends of main waste paper grades and imported woodchip
- Chapter 7: Waste disposal, recycling, incineration and landfilling
- Chapter 8: Conclusions

## 2. RECYCLING AND WASTE PAPER STATISTICS IN THE PAPER AND PAPER BOARD INDUSTRY

This chapter provides various statistics related to waste paper recovery and utilisation rates for the manufacturing of paper and paper board products in Japan. The emphasis is on the amount and sources of different grades of waste paper, and the utilisation ratio for each product category. Many of these product categories have reached saturation point whilst the waste paper utilisation rates for printing and communication paper are still very low. These statistics therefore are meant to provide an overview on future requirements of different grades of waste paper and technologies required for increasing paper recycling.

This chapter also looks at the waste paper grading system in Japan and makes comparisons with grading systems from other countries. The establishment of a compatible grading system becomes very important because of increasing international trade in waste paper. The price of waste paper varies widely between the groups depending on the quality and price of the paper products which will be produced from it.

Most of the historical time series presented in this chapter are self explanatory and provide a view on the evolution of waste paper usage in Japan. Projected demand for waste paper for the year 2000 is also included based on newly established utilisation targets for various product categories.

### 2.1 Trends in Waste Paper Recovery

In 1940 just before the Second World War, consumption of paper and paperboard in Japan was 1,550,000 metric tonnes and waste paper consumption was 260,000 metric tonnes with a recovery rate of 17 *per cent*. During that time there was hardly any waste paper from households, so most of the waste paper used for recycling was pre-consumer waste, generated from paper mills, converters, printers, publishers and manufacturers. The amount of postconsumer waste collected from wholesalers, retail stores, offices and residences was only about 15-18 *per cent*<sup>1</sup>.

After the end of the war while the pulp industries in many Western countries developed toward an improved pulping process from virgin fibre, the Japanese paper and paperboard industries started to consider recycling and increased use of waste paper as a strategy to meet the expansion in demand.

However in 1953, waste paper recovery in Japan was still only 19.6 *per cent*, with 20.2 kg per capita consumption. Until 1953 waste paper was mainly utilised to produce low-grade papers, paperboard and toilet papers. Trends in shipment [production plus stock] of paper and paperboard and waste paper recovery rate are shown in Table 2.1

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<sup>1</sup> /*Kami no ressaikuru to saissei shi*, 1992. Tokyo

**Table 2.1 Trends in Waste Paper Recovery Rate: Paper and Paperboard Shipment and Consumption [ in 1,000 metric tonnes]**

Year	Shipment			Imports	Exports	Appar. consump.	Trade of waste paper			Deinked market pulp	Waste paper recovery	Utiliz. rate %	Recov. rate
	Paper	Paperboard	Total				Import	Export	Supply				
	A	B	C				E	F	G				
						A+B+C					C+(F-E)+(G-H)		100(%)
1958	2,104	934	3,037	3	102	2,961	9	2	850		843		28.5
1959	2,484	1,301	3,785	8	110	3,683	19	1	1,238		1,221		33.2
1960	2,836	1,618	4,454	1	169	4,287	27	1	1,492		1,466		34.2
1961	3,279	2,040	5,320	3	236	5,086	40	3	1,792		1,755		34.5
1962	3,397	2,239	5,636	2	183	5,455	44	1	2,063		2,020		37.0
1963	3,810	2,630	6,460	4	195	6,269	55	1	2,432		2,378		37.9
1964	4,152	3,076	7,228	103	206	7,125	88	0	2,937		2,849		40.0
1965	4,216	3,106	7,322	17	230	7,108	76	1	2,800		2,725		38.3
1966	4,632	3,389	8,221	28	323	7,926	95	0	3,223		3,129		39.5
1967	5,073	3,966	9,039	60	257	8,842	103	0	3,508		3,405		38.5
1968	5,444	4,483	9,927	131	293	9,766	75	2	3,587		3,515		36.0
1969	6,127	5,170	11,298	188	363	11,123	89	2	4,247		4,160		37.4
1970	7,004	5,663	12,669	100	508	12,260	110	6	4,837		4,733		38.6
1971	7,092	5,800	12,892	66	503	12,455	84	9	4,551		4,476		35.9
1972	7,430	6,259	13,688	141	583	13,327	96	12	5,131		5,046		37.9
1973	8,276	7,730	16,006	270	464	15,812	176	12	6,445		6,281		39.7
1974	7,980	6,845	14,825	429	678	14,576	231	8	6,031	62	5,870		40.3
1975	7,853	6,032	13,885	107	653	13,339	121	39	5,202	34	5,154		38.6
1976	8,526	6,760	15,287	165	578	14,874	126	153	6,225	67	6,319		42.5
1977	8,767	6,946	15,713	216	588	15,341	125	63	6,591	78	6,607		43.1
1978	9,321	7,210	16,531	339	539	16,331	102	58	6,836	89	6,880		42.1
1979	10,145	8,001	18,146	325	639	17,812	131	33	7,743	89	7,732		43.4
1980	10,191	7,465	17,656	493	656	17,493	224	20	8,171	95	8,063		46.1
1981	10,128	7,055	17,183	488	673	16,998	81	83	7,925	85	8,013		47.1
1982	10,416	7,070	17,485	630	740	17,375	94	26	8,378	88	8,397		48.3
1983	10,905	7,477	18,382	683	738	18,328	277	2	9,180	91	8,996	47.1	49.1
1984	11,383	7,863	19,246	696	843	19,100	312	8	9,837	102	9,635	47.8	50.4
1985	11,736	8,633	20,369	701	869	20,201	390	18	10,326	107	10,151	49.3	50.2
1986	12,173	8,851	21,024	853	839	21,040	352	127	10,627	108	10,510	49.4	50.0
1987	12,851	9,691	22,542	866	814	22,594	616	59	11,631	124	11,198	49.6	49.6
1988	14,294	10,233	24,527	1,045	636	24,936	588	6	12,391	132	11,941	49.4	47.9
1989	15,514	11,037	26,551	1,173	540	27,184	438	51	13,335	151	13,698	49.9	48.2
1990	16,391	11,703	28,095	1,032	900	28,227	634	22	14,474	160	14,021	51.5	49.7
1991	16,983	11,848	28,831	1,076	1,039	28,866	851	3	15,358	158	14,667	52.2	50.8
1992	16,646	11,697	28,343	1,045	1,049	28,339	444	36	14,718	156	14,466	52.5	51.0
1993	16,245	11,586	27,831	1,086	763	28,153	417	46	14,610	147	14,386	53.0	51.1
1994	16,606	11,921	28,527										51.7

\* Shipment is production plus stock

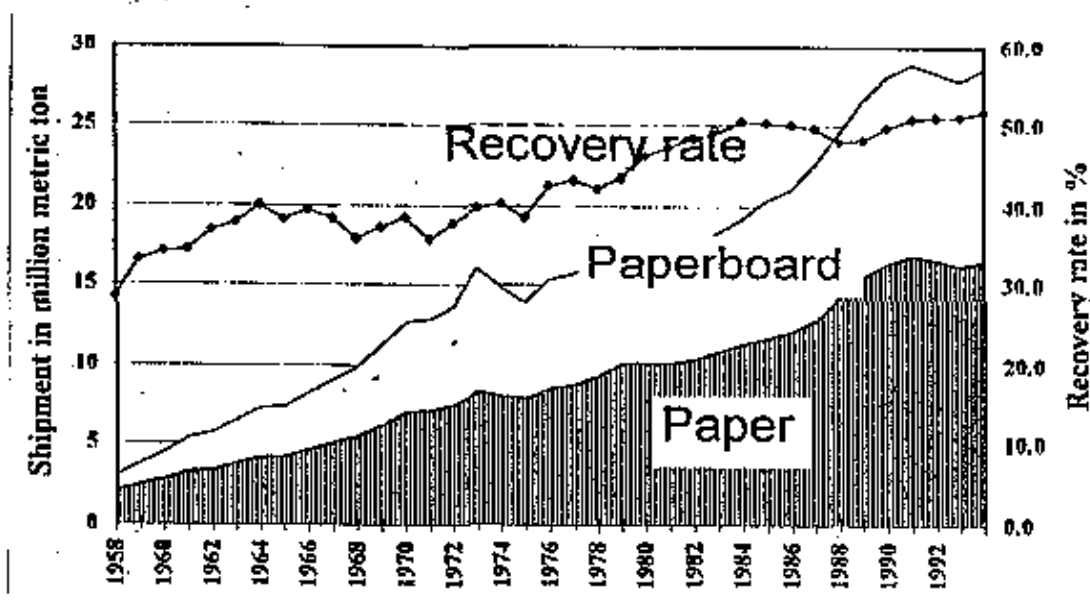
Source: 1993, Statistics of Waste Paper in Japan - Paper Recycling Promotion Centre

The recovery rate in 1953 was 25 per cent <sup>2</sup>/. It increased to 40 per cent by 1964. In the 1950s corrugated container made its debut as packaging, and rapidly took a dominant share. For corrugated medium, old newspaper was used, and Kraft brown for jute liner. In those days, rice straw had been used as raw material for rope, mats and bags for packing, which were re-used to make straw board and low grade papers <sup>3</sup>/. The increasing dependence of paper makers on waste packaging material recovered from wholesalers and retail outlets caused an expansion of waste paper business.

During the period of economic boom from 1960 to 1975 consumption of paper and paperboard in Japan increased from 4,510,000 to 13,600,000 metric tonnes, an average increase of 7.6 per cent per annum, but the recovery rate hovered around 40 per cent. The oil crisis in 1973 caused a sharp increase in transport costs of pulpwood imports which made increased use of wastepaper economically attractive.

The Japanese paper industry was then committed to increased recycling and the Paper Recycling Promotion Centre was founded in March 1974. From 1974 to 1984 the recovery rate increased from 41.3 to 50.4 per cent. During this period newspaper publishers wanted to maintain a stable supply of newsprint from domestic papermakers. waste paper business became increasingly more efficient and improved de-inking technologies enabled the increased utilisation of old news as a substitute for mechanical pulp. From 1984 to 1994 the recovery rate was rather stagnant increasing from 50.4 to 51.7 per cent as shown in Figure 2.1

**Figure 2.1** *Shipment of Paper and Paperboard and Waste Paper Recovery Rate*



<sup>2</sup> /Oye, R. 1995. Recovery and utilisation of waste paper in Japan, Technology of Paper Recycling, RWJ McKinney

<sup>3</sup> /same as 2/

The recovery rate seems to change periodically with sharp increases being followed by stable rates for ten years <sup>4</sup>/. It is likely that such a pattern is based on the economic cycle and on the time required to develop and incorporate new technologies for the utilisation of new waste grades and to introduce the end-use product to the market.

As the recovery and utilisation rates of old corrugated containers and old newspapers have now reached the maximum technical limit the Japanese paper industry and the waste paper business are focusing attention on the recovery and utilisation of office wastes for recycled writing and communication papers.

Industry, government and community groups are trying to improve methods for the collection, grading and sorting of waste paper from sources which have not responded to the promotional efforts so far made. It can be expected that following the stagnation period of 1984-1994 the recovery rate will sharply increase, when an efficient office waste paper collection and sorting system is established.

## **2.2 Wastepaper Grading System**

The 26 grades of waste paper are grouped by the Paper Recycling Promotion Centre and the Paper and Paperboard Producers Association into nine statistical groups. Each of these nine groups consists of grades that share some general characteristics with regard to the suitability for recycling into new products. With increased international trade in waste paper there have been many attempts to establish a compatible grading system.

As each waste paper group is used to manufacture a range of products with widely differing prices, prices of waste paper vary according to the grade group. It is therefore important to have a classification system easily understood by the international traders to establish adequate prices and to improve their marketing system.

The compatibility of CEPAC, US, West German, UK and Japanese recycled fibre classification systems with the FAO system is shown in Table 2.2

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<sup>4</sup> /same as 2/



**Table 2.2 Comparison of the FAO Recycled Fibre Classification with the CEPAC, USA, West German, UK and Japanese Systems**

FAO grade	CEPAC	US	WEST GERMAN	UK	JAPANESE
Group 1	A6 to A10 B1, B2	No.6 to 9,22,24 to 27,44,48	D11, D22, D29, D31, D39, E12, F12	Group 5	No. 10 to 15,16,17
Group 2	A4, A5, D1 to D7	No.5, 11 to 13	B19, V11, W12, W13, W41, W52, W63	Group 6 to 8	No 18 to 22
Group 3	B8, C1 to C22	No. 5 to 21,28 to 31,33 to 43,45 to 47,49,1S to 31S	G12,KO2,K1 2,K22,K51,K 59,L11,O14, P22,P23,P32, Q14,R12,S12 ,T14,U31,U3 3	Group 1 to 4	No. 1 to 9
Group 4	A1 to A3 B3 to B7	No. 1,3,4	A00,B10,B12 ,B42,CO2,H1 2,H22,J11,J1 9,X09	Groups 9 to 11	No. 23 to 26

Source:1990, VolII, Global Markets for Recycled Fibre-Jaakko Poyry

Waste paper is classified into 49 grades within 4 groups in Europe by CEPAC (Confederation of the European Paper Industries), 51 grades in USA and 26 grades in the 9 statistical groups in Japan. Details of the Japanese grades are given in Table 2-3. Standard quality purchase specifications for waste paper, such as the content of objectionable materials, the condition of baling and the method for labelling are specified and described for each grade in the 9 groups by the Paper Recycling Promotion Centre. *Table 2.3 with the List of Japanese Standard Qualities of Waste Paper is shown in Appendix 1.*

### **2.2.1 Old Corrugated Containers(OCC)**

The waste paper used most extensively in Japan so far has been Old Corrugated Containers or Danboru (Japanese grade 22 which is equivalent to FAO grade 2). The category includes used boxes collected from offices, stores and residences and the cuttings generated during the manufacture of box boards and corrugated containers.

Old corrugated containers of higher quality are limited in supply as they are used as packaging material for export products. With regard to comparability to FAO grade 2 it should be noted that, in Japan, grade 22 (OCC) does not include the Kraft browns (brown Kraft grocery bags).

The share of this grade in the total supply of waste paper has been stable for 20 years at around 40 per cent. The highest share was in 1991 with 44.6 per cent amounting to 6.5 million tonnes of collected corrugated materials. Kraft browns account for 2 to 4 percent of the total volume of waste paper recovered.

These data may be compared with FAO grade 2 statistics which include Kraft browns as grade 2. Long term time series of OCC prices at paper mill gate show that they are historically higher than old newsprint and magazines. However the present prices at 14 000 yen/Mt. (US\$ 157) are comparable to the old newspaper prices.

### **2.2.2 Old Newspapers (ONP)**

The second most recovered grade is old newspaper. In Japan this is classified as grade n.16 and it consists of newspaper wastes, including old newspapers collected from residences and offices, and both printed and unprinted trimmings and over-issues from newspaper printing plants.

This grade is used in the manufacture of newsprint, cardboard for shoe boxes, food packaging and book covers, etc. The FAO grade 1 includes wood-containing colour printed, coloured manila, newspapers and magazines (Japanese grades 10 to 15, 16 and 17). Japanese classification system provides for separate data for newspapers only.

The percentage share of this grade increased during the 1970s but was stagnant during the 1980s. From 1990 there has been a slight increase. The highest amount so far collected was in 1991 when 3.7 million tonnes of newspaper (24.4 per cent of total waste paper) was collected.

Today's price of 14 000 yen/Mt. is at the same level as OCC (Normally OCC would have a higher price, however there is currently an oversupply of this grade).

### **2.2.3 Old Magazines (Zashi)**

Magazines are classified as grade 17 in the Japanese system and consist of old magazines and magazines which were unsold as pre-consumer waste. The share of magazines in the total amount of waste paper recovered has been increasing in the last 10 years, but stagnated during the last 3 years at 13.7 per cent.

The highest amount so far recovered was about 2.07 million tonnes in 1991. Magazines are used to manufacture box boards and corrugated boxes. At present they are being sold at mill gate by 7 000 yen/Mt. (US\$ 77).

A long term time series on the amount of unsold magazines is not available. However data from 1988 to 1993 is given in Table 2.3 as follows:

**Table 2.4** *Estimated Weight of Returned Magazines as Pre-consumer Waste (in tonnes)*

year	number of magazines	% of returned magazines	number of returned magazines	Weight of returned magazines
1988	3,374,240,000	20	688,344,960	275,338
1989	3,484,820,000	19	658,630,980	263,452
1990	3,588,920,000	19	681,894,800	272,758
1991	3,696,350,000	20	754,055,400	301,622
1992	3,762,050,000	20	748,647,950	299,459
1993	3,903,850,000	21	804,193,100	321,677
1994	3,879,310,000	22	845,689,580	338,276

Source: 1993, Kami no Ressaikuru, Honshu

According to "Suppangetspo" (statistical guide for publishers) in 1990, about 3.5 billion magazines were sold and 19 per cent of them were returned. The monthly average of returned magazines accounted for 56.8 million units which converted into weight was 27 280 tonnes. The average weight for the magazine was 400 grams<sup>5</sup> / for that particular month.

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<sup>5</sup> /same as 1/

**Table 2.4A Unsold Magazine Share in Recovered Grade 17**

year	Old magazines	Unsold magazines	% of unsold magazine in Gr-17
1988	1,580,289	275,338	17
1989	1,730,023	263,452	15
1990	1,960,909	272,758	14
1991	2,071,998	301,622	15
1992	2,030,891	299,459	15
1993	2,022,437	321,677	16
1994	2,024,000	338,276	17

Source: Paper Recycling Promotion Centre

Table 2.4 shows that the amount of unsold magazines varied from 14 to 17 per cent of the total amount recovered as grade 17 (old magazines-zashi).

Dealers prefer to treat unsold magazines as post-consumer material as these are placed in the waste paper route. Specialised agents buy them from publishers (once returned from magazine dealers) to deliver them to wholesalers.

#### **2.2.4 Pulp substitutes and high-grade de-inking**

Grades 1 to 9 are high quality grade waste paper equivalent to FAO grade 3. They are used as pulp substitute in printing and writing and tissue grades and as a high-grade de-inking waste for tissue mills in particular. Most high quality pulp substitute waste, such as unprinted clippings and shavings (Jouhaku-grade 1) from printers and converters is already collected (JP).

Most of these grades are statistically grouped as hard white shavings and white cards, and fall in pre-consumer wastes category generated by paper mills, printers, bookbinders, etc. High quality de-inking wastes (Mozou - grade 8) consist of bleached paper stock, usually white which has some printing, though not with heavy ink coverage. They are generated by offset printing plants as well as other manufacturers, converters and finishing houses producing envelopes, boxes, folders and similar products. This waste paper category also includes computer print-out papers collected from offices. High quality wastes are used to make printing and communication papers, tissue papers, etc.

Also included in this high quality waste group (grade 12 -tokujougiri) are unsold books which are returned to the publisher in form of pre-consumer industrial waste. The percentage of

returned books for the period 1988 - 1994 varied from 34 to 37 per cent of total printed books. In 1990 the number of books sold was 911,310,000 and 35.6 per cent were returned. The weight of books varied widely therefore total weight cannot be estimated. The share of books in total waste paper collected in the last 10 years ranged from about 12 to 13 per cent. Data on the rate of pre-consumer waste is not available.

The Japanese Government is concentrating efforts to increase collection of high grade waste paper from offices, for de-inking, to be used in tissue and communication papers. These grades of wastepaper are the most expensive as they yield higher value paper but also because of high collection and sorting costs. Detailed data on sorting office automation paper is given in Chapter 5. Prices for four different grades included in this group are given in chapter 6, Table 6.1. The Table shows that the highest quality waste paper grade fetches about 49 000 yen/Mt. (US 500/Mt.), which is comparable to virgin fibre price.

### 2.2.5 Mixed waste - box board cuttings

This group include grades 23, 24, 25, and 26 and is equivalent to FAO grade 3. It originates from Mill wrapper(Wampu) and from residues of carton box makers. Because of continuous improvement in the sorting of waste paper at all levels (from households to wholesalers) the share of mixed waste paper has decreased from 4.4 to 3.7 percent in the last 5 years as shown in Table 2.5.

## 2.3 Trends in Consumption of Waste Paper by Grades

Trends in consumption of waste paper stock classified by grades for production of paper and paperboard are given in Table 2.6 for the period 1986 to 1993

**Table 2.5 Trend in Consumption of Waste Paper Stock Classified by Grades**

year	Item	Total	Hard white shavings, white card	White woody shavings, white manila	Fine paper printed	Kraft browns	Quires woody paper printed	Old news	Old magazines	Old corrugated containers	Boxbo cutti
1989	consumption	13374	145	82	1167	375	259	3055	1730	5969	5
	proportion	100	1.1	0.6	8.7	2.8	1.9	22.8	12.9	44.6	4
1990	consumption	14486	161	83	1218	472	275	3497	1961	6187	6
	proportion	100	1.1	0.6	8.4	3.3	1.9	24.1	13.5	42.7	4
1991	consumption	15176	154	75	1298	557	291	3710	2072	6408	6
	proportion	100	1.0	0.5	8.6	3.7	1.9	24.4	13.7	42.2	4
1992	consumption	14798	146	77	1313	372	290	3526	2031	6467	5
	proportion	100	1.0	0.5	8.9	2.5	2.0	23.8	13.7	43.7	3
1993	consumption	14722	128	77	1338	333	295	3425	2022	6559	5
	proportion	100	0.9	0.5	9.1	2.3	2.0	23.3	13.7	44.6	3

Source: 1993, Statistics of Waste Paper in Japan by Paper Recycling Promotion Center

## 2.4 Trends in Consumption of Waste Paper for the Manufacturing of Paper and Paperboard

Table 2.6 shows that in the period 1991 to 1994, about 27.5 per cent of recovered waste paper was used for the manufacture of paper and about 72.5 per cent was used for the manufacture of paperboard products.

Most of the waste paper grades 1 to 9 (high quality grades) were used for making paper products. About 75 to 78 per cent of old newspapers were consumed for the manufacture of various paper grades, most magazines (over 97 per cent) were used for paperboard products.

Almost 100 % of OCC was used for making corrugated containers.

**Table 2.6 Trends in Consumption of Waste Paper Stock with Breakdown for Paper and Paperboard**

To be used for	Year	Item	Total	Hard white shavings, white card	White woody shavings, white manila	Fine paper printed	Kraft brown	Quires woody paper printed	Old news	Old magazines	Old corrugated containers	Box 1 ou
Paper	1991	Consumption	4,179,951	42,313	3,976	1,033,527	23,668	212,507	2,798,362	56,516	8,175	
		% of total	100.0	1.0	0.1	24.7	0.6	5.1	66.9	1.4	0.2	
		% of total cons.	27.5	27.5	5.3	79.6	4.2	73.0	75.4	2.7	0.1	
	1992	Consumption	4,087,725	37,513	3,563	1,033,867	19,277	210,429	2,724,756	50,103	7,288	
		% of total	100.0	0.9	0.1	25.3	0.5	5.1	66.7	1.2	0.2	
		% of total cons.	27.6	25.6	4.6	78.7	5.2	72.6	77.3	2.5	0.1	
	1993	Consumption	4,043,063	31,584	3,578	1,044,631	20,965	217,323	2,665,900	51,755	7,271	
		% of total	100.0	0.8	0.1	25.8	0.5	5.4	65.9	1.3	0.2	
		% of total cons.	27.5	24.7	4.6	78.1	6.1	73.6	77.8	2.6	0.1	
	1994	Consumption	4,149,000	1,191,000					2,733,000	62,000	7,000	246
		% of total	100.0	28.5	0.0	0.0	0.0	0.0	65.9	1.5	0.2	
		% of total cons.	27.4	70.4					79.0	3.1	0.1	
Paperboard	1991	Consumption	10,995,634	111,481	71,336	264,300	533,345	78,779	911,706	2,015,482	6,400,044	609
		% of total	100.0	1.0	0.6	2.4	4.9	0.7	8.3	18.3	58.2	
		% of total cons.	72.5	72.5	94.7	20.4	95.8	27.0	24.6	97.3	99.9	
	1992	Consumption	10,710,553	108,745	73,478	279,345	352,942	79,459	801,224	1,980,788	6,459,428	575
		% of total	100.0	1.0	0.7	2.6	3.3	0.7	7.5	18.5	60.3	
		% of total cons.	72.4	74.4	95.4	21.3	94.8	27.4	22.7	97.5	99.9	
	1993	Consumption	10,678,677	96,304	73,796	293,380	312,056	78,106	758,994	1,970,682	6,551,316	544
		% of total	100.0	0.9	0.7	2.7	2.9	0.7	7.1	18.5	61.3	
		% of total cons.	72.5	75.3	95.4	21.9	93.7	26.4	22.2	97.4	99.9	
	1994	Consumption	10,987,000	463,000					725,000	1,962,000	6,886,000	97
		% of total	100.0	4.2	0.0	0.0	0.0	0.0	6.6	17.9	62.7	
		% of total cons.	72.6	29.6					21.0	96.9	99.9	

Source: 1993, Statistics of Waste Paper in Japan by Paper Recycling Promotion Center

## 2.5 Sources of Waste Paper

There are four main sources of waste paper:

- households: most of the grades coming from this source is newspaper and magazines (35%)
- town centres: wholesale stores for food, spirits, fruits, clothing, etc. (12%)
- smaller scale sources: retailers such as groceries, offices, stations, etc.(12%)
- larger scale sources such as: corrugated cardboard and paper products manufacturing plants, printing and book binding plants, publishing and press offices and workshops, department stores and supermarkets.(41%)

## 2.6 Recoverable Waste Paper

An upper limit for the recovery of paper and paper board is widely believed to be 66 per cent. The current recovery rate is 51.7 per cent, whilst the unrecoverable rate is believed to be about 18 percent. Table 5 in chapter 5 shows a long time series on unrecoverable rates of waste paper in Japan.

### 2.6.1 Waste paper recovery rate

Recovery rate calculations underestimate the proportion of waste paper recovered, since no allowance or adjustments are made for products which are not available for recycling, for example, liners used in plasterboard production, tissue, wall paper, and other non-recoverable products<sup>6</sup>/. The apparent recovery rate (%) is given by

$\text{Recovery rate} = (\text{Waste paper recovered} / \text{Apparent consumption of paper \& paperboard}) * 100$
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<sup>6</sup>/same as 2/

## 2.6.2 Comparing main grades of waste paper and recovery rates

Table 2.7 gives data on *total net paper and board supply for domestic consumption, net wastepaper recovery and waste paper consumption by grades*.

**Table 2.7 Net Waste Paper Recovery and Waste Paper Consumption by Main Grades**

Year	Waste paper imports, exports and receipts in metric tons					Waste paper consumption by main grades in metric tonnes				
	Total consump. (A)	Imports (000's) (B)	Exports (000's) (C)	Receipts at mill (D)	Net Recovery (E)=(D)-(B)+(C) (E)/(A)	Corrugated Containers	Newspapers Magazines	Miscellaneous	TOTAL	
1989	27,181,539	438	50	13,478,413	13,090,920	48.2	5,968,721	4,785,330	2,620,162	13,374,213
1990	28,226,860	634	21	14,634,873	14,022,477	49.7	6,187,499	5,458,051	2,840,493	14,486,043
1991	28,868,070	852	3	15,515,757	14,666,253	50.8	6,408,219	5,782,066	2,985,300	15,175,585
1992	28,339,435	444	35	14,873,942	14,465,613	51.0	6,466,716	5,556,871	2,774,691	14,798,278
1993	28,148,031	417	46	14,756,781	14,385,956	51.1	6,558,371	5,447,319	2,716,394	14,722,084
1994	28,852,000	808	630	15,096,000	14,918,000	51.7	6,853,000	5,487,000	2,795,000	15,135,000

Source: Pulp and Paper Statistics 1994, Japan Paper Association

Note: Receipts means pulp and paper mills' receipts of waste paper

## 2.6.3 Estimated recovery rates by grades

Table 2.8 below gives an estimate of recovery rates for five main waste paper grades. The recovery rate of old news increased from 93.7 per cent in 1988 to 102.8 per cent in 1993. The recovery rate is higher than 100 per cent due to an increased volume of advertisement inserts in the newspapers. Advertisement inserts account for on average about 35 per cent of the newspaper's weight, as inserts are printed on woodfree and coated papers.

Recovery rates of OCC have increased an additional 2 per cent to 72.6 per cent. The recovery rate for printing and communication grades is at 31.2 per cent in 1993 still very low. As this grade accounts for a large share in overall consumption, recovery rates should be improved.

**Table 2.8 Estimates of Recovery Rates by Grades**

Grades	Recovery in metric tons			Consumption in metric tons			Recovery rates in percent					
	1989	1991	1993	1989	1991	1993	1988	1989	1990	1991	1992	1993
Hard white shavings, white card, White woody shavings, white manilla, fine paper print, old mag.	3,423,725	3,947,239	3,893,627	11,881,067	12,408,176	12,493,693	28.1	28.8	30.8	31.8	31.7	31.2
Old news 1/	3,067,305	3,649,743	3,451,522	3,427,318	3,718,129	3,357,805	93.7	89.5	96.9	98.2	97.8	102.8
Kraft browns	343,604	308,147	291,257	708,715	752,514	684,927	41.9	48.5	56.9	67.5	47.4	42.5
Old corrugated containers	5,660,216	5,973,414	6,208,514	7,977,093	8,638,536	8,532,972	70.5	71.0	68.3	69.1	71.8	72.6
Box board cuttings	596,070	538,710	541,048	3,187,343	3,357,665	3,063,889	18.8	18.7	18.5	17.5	18.0	17.7
<b>Total</b>	<b>13,090,920</b>	<b>14,667,253</b>	<b>14,385,956</b>	<b>27,181,539</b>	<b>28,870,070</b>	<b>28,153,488</b>	<b>47.9</b>	<b>48.2</b>	<b>49.7</b>	<b>50.8</b>	<b>51.0</b>	<b>51.1</b>

Sources: Paper recycling promotion centre and Marubeni Trading Co.

1/ Recovery rate higher than consumption due to advertisement inserts.



## **2.7 Wastepaper Utilisation Rates by Grades**

Utilisation rates for several products are expressed as unit ratio (i.e. equal to waste paper consumed for a unit of product). Considerable variations in the unit utilisation ratio can be noted depending on the time of year, even if the annual average remains fairly stable.

### **2.7.1 Utilisation rate**

When utilisation rates are estimated, no corrections are normally made to compensate either for losses during the recycling of paper or board making, so for specific product groups apparent utilisation rates may be overestimated and may be higher than 100 per cent<sup>7</sup>/. The apparent utilisation rate(%) is given by:

$$\text{Apparent Utilisation Rate} = (\text{Waste Paper Used/Paper or Paperboard Production}) * 100$$

### **2.7.2 Utilisation rates for main grades of paper and board products**

Estimated rates of waste paper consumption for various paper and board grades production are given in Table 2.9 for the period April to September 1993, as compiled by the Paper Recycling Promotion Centre.

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<sup>7</sup> /same as 2/

**Table 2.9 Estimated Ratio<sup>a</sup> of Waste Paper Consumption for Paper Production (April-September 1993)**

Grades	Hard white shavings, whitewood	White woody shavings whitewood	Fine paper printed	Kraft brown	Quire woody paper printed	Old news magazines	Old Corrugated Containers	Box board cuttings	Total
Newsprint			0.0003			0.4982	0.0003		0.4988
Print & writing paper	0.0004	0.0003	0.0132		0.2180	0.1259	0.0030		0.1686
Packaging paper	0.0001	0.0002		0.0194	0.0096	0.0065			0.0361
House hold tissue	0.0115		0.5855						0.5970
Other paper	0.0092		0.0015		0.0018	0.0150	0.0032	0.0061	0.0235
Total Paper	0.0200	0.0002	0.0641	0.0013	0.0136	0.1617	0.0037	0.0004	0.2465
Kraft Liner	0.0007		0.0094	0.0268		0.0034	0.0416	0.0171	0.7330
Auto Liner	0.0183	0.0076	0.0213	0.0663	0.0020	0.0432	0.1945	0.0768	1.0427
Recycle Liner	0.0364	0.0634	0.0189	0.0102	0.0098	0.2844	0.3106	0.2245	1.0386
High grade medium				0.0280		0.0194	0.0959	0.8823	1.0463
Recycle medium			0.0018	0.0245		0.0080	0.1287	0.9095	1.1069
Mamla paperboard	0.0041	0.0231	0.0479		0.0510	0.1921	0.0949	0.0655	0.5146
White paperboard	0.0194	0.0114	0.1411		0.0272	0.2042	0.5366	0.0069	0.9923
Chipboard	0.0654	0.0022				0.1224	0.5035	0.1268	1.1053
Coam board	0.0174		0.0240	0.0257	0.0123	0.0886	0.5049	0.1248	1.1042
Roofing felt						0.2111	0.2417	0.3845	0.8388
Gypsum board	0.0192	0.0492				0.3968	0.4098	0.0685	1.0957
Other paperboard	0.0142	0.0062	0.0398	0.0321	0.0069	0.0680	0.1679	0.5142	0.9079
Total Paperboard	0.0985	0.0666	0.0255	0.0273	0.0067	0.0653	0.1708	0.5666	0.9241
Grand total	0.0647	0.0629	0.0479	0.0122	0.0107	0.1231	0.0733	0.2371	0.5315

Source: Paper Recycling Promotion Centre

### 2.7.3 Comparison of utilisation rate for five most consumed grades of paper and paperboard.

**Table 2.10 Average Waste Paper Consumption in the Manufacture of Different Grades of paper and Paperboard in 1,000 metric tons (1988,1993)**

	1988			1993		
	Paper & PB production	Wastepaper consumption	Utilization rate	Paper & PB production	Wastepaper consumption	Utilization rate
Newsprint	3,067	1,295	42.2	2,917	1,455	49.9
Printing & writing	6,747	872	12.9	9,477	1,598	16.9
Tissue	1,281	739	57.7	1,528	912	59.7
Liner & fluting	7,103	6,330	89.1	8,394	7,881	93.9
Cartonboards	1,980	1,965	99.2	2,134	1,807	84.7
Other paper & board (including packaging paper)	4,746	1,116	23.5	3,315	1,069	32.2
Total paper & board	24,924	12,317	49.4	27,765	14,722	53.0

Source: Jaako Poyry for 1988 ; JPA for 1993

<sup>a</sup> /The ratio is calculated as the waste paper consumption for each grade divided by the total production

#### 2.7.4 Utilisation rate: targets 55 and 56

In April 1990, the Japan Paper Association announced "Recycle 55 plan", which aims to increase waste paper utilisation rate to 55% by the end of March 1995. However this target was not be reached as the rate by 31 March was 53.3 per cent.

The Japanese Paper Industry established a new target for the utilisation rate at 56 per cent to be achieved in the year 2000.

#### 2.7.5 Estimates of waste paper amount required to meet target 56 percent

Table 2.11 shows the required increase in waste paper recovered for the year 2000 under two alternatives:

- if the utilisation rate is to be maintained at its current level
- if the utilisation rate of 56 per cent is to be achieved

Consumption of paper and paperboard products for the year 2000 was calculated on the basis of the assumption that it will continue to grow at an average annual rate of 2.5 per cent from 1993 to 2000.

**Table 2.11 Two Scenarios for Waste Paper Demand by year 2000 (1,000 metric tons)**

	1993 (1)	Scenario A U.Rate 53% (2)	Scenario B U.Rate 56% (3)	Difference (3)-(2)
1. Consumption of raw material from:	28,010	32,455	32,777	322
a) pulp (virgin fibre)	13,109	15,212	14,225	(987)
b) market pulp (waste paper)	119	161	164	3
c) waste paper	14,722	17,017	18,322	1,305
d) non-wood materials	60	65	66	1
2. Utilization rate in % (b+c)/1	53	53	56	
3. Production Paper & Board	27,766	32,134	32,134	
4. Consumption Paper & Board	28,153	32,919	32,919	
5. Domestic Waste Paper Recovery	14,386	16,629	17,904	1,275
6. Waste Paper Recovery Rate	51	51	54	

Note: Utilization rate for paper and paperboard products by end of March 1995 was 53.3 %

Source: Japan Paper Association and MITI

#### 2.7.6 Increased recovery rate requirements by waste paper grades

Table 2.12 shows the amounts which need to be recovered for each of the main waste paper grades. Figures for Table 2.12 are originated from Table 2.11

**Table 2.12 Projected Increase in Demand for Different Waste Paper Grades if the Utilisation Rate Increases to 56 per cent by Year 2000 (1,000 metric tons)**

Wastepaper grades	1993 (1)	2000 (2)	(2)-(3) (3)
Old newspapers	3,425	4,415	990
Wood free high quality white shv	1,543	2,357	814
Middle grade printing & comm.	295	371	76
Old corrugated containers	6,559	7,976	1,417
Old magazines	2,022	2,289	267
Others	877	914	37
<b>Total</b>	<b>14,721</b>	<b>18,322</b>	<b>3,601</b>

Source: JPA, March 1995

### 2.7.7 Utilisation rate for newsprint

Published rates vary but consensus among members of the Japan Paper Association is that the maximum achievable utilisation rate for newsprint is 50 per cent with today's technology. The Japanese rotary presses run very fast thus it is mandatory for the Japanese papermakers to keep high strength as required by the rotary press. For example the largest newspaper company "Yomi uri shinbun" produces 10 million copies a day at a speed of 40 copies per second.

Another very important quality for the newsprint is the weight: some years ago the grammage of newsprint was 53 gr/m<sup>2</sup>. At present its grammage is only 43 gr/m<sup>2</sup><sup>9</sup> as a result of considerable recent investment in technology.

A further increase in newspaper utilisation rates is possible, by improving supply of waste paper and developing more efficient waste paper processing facilities.

### 2.7.8 Utilisation rate for paperboard

Utilisation of waste paper for paperboard production seems to have reached a saturation point at around 92 per cent.

### 2.7.9 Utilisation rate for tissue products

Utilisation rate of tissue products by the end of 1993 was 60 per cent. Japan produces five main types of tissue products which are: tissue paper, tirigami (toilet paper in 15 x 15cm sheet, greyish colour, made with 100 per cent waste paper), white toilet paper in roll made with about 30 per cent waste paper, tampax-cotex type (100 per cent virgin fibre), towel paper (50 to 100 per cent waste paper) and other high quality tissue based products (100% virgin fibre).

<sup>9</sup> / Personal communication from T Kondo, Japan Paper Association, March 1995

The high quality tissue includes window screen, lampshade, special white envelope for money given during ceremonial events such as births, deaths, weddings etc, and wall art printings for calligraphy.

According to the Tissue Products Manufacturers Association, the main constraints on achieving an increase in the utilisation rate of this product category are:

- high appreciation of the yen, favouring import of woodchips
- quality of end-products based on waste paper
- consumers' preference for white toilet paper
- high quality tissue products require 100 per cent virgin fibre
- lack of a stable supply of high grade waste paper (OA papers and Milk cartons) at lower prices.

Monthly production for six grades of tissue products and recycled fibre content is given below:

**Table 2.13 Production of Different Tissue Products During 1994 (1,000 metric tons)**

Average percent virgin fibre	Total	Tissue paper 100%	Tirigami 0%	Toilet paper 30%	Tampax/ cotex 100%	Towel paper 0-50%	Other high quality 100%
1994	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Jan	119,924	40,033	5,226	62,306	2,606	5,865	3,888
Feb	122,301	41,489	5,172	62,817	2,681	6,129	4,013
Mar	137,897	47,164	5,493	72,214	3,042	6,049	3,935
Apr	132,511	44,877	5,413	69,501	2,979	5,586	4,155
May	127,976	43,969	4,961	66,468	2,575	6,507	3,496
Jun	132,324	43,985	5,030	70,240	2,637	6,522	3,910
Jul	121,444	38,999	4,984	64,171	2,792	6,402	4,096
Aug	118,655	38,227	4,855	63,604	2,413	6,272	3,284
Sep	130,471	44,241	4,778	68,252	2,618	6,868	3,714
Oct	134,165	45,309	5,037	70,011	2,646	7,386	3,776
Nov	135,406	45,633	5,419	70,520	2,752	7,413	3,669
Dec	134,884	45,366	5,683	70,455	2,800	6,773	3,807
Total 1994	1,547,958	519,292	62,051	810,559	32,541	77,772	45,743
Total 1993	1,527,739	527,050	71,633	771,551	32,012	75,841	49,652
1994/1993	101.3	98.5	86.6	105.1	101.7	102.5	92.1

Source : Association of Tissue Products Manufacturers, Tokyo - Japan

Milk cartons in the form of pre-consumer waste paper are imported from the USA at 30 000 yen/metric ton. Milk cartons recovered domestically are increasing as a result of efforts from consumer co-operatives and group collectors.

#### 2.7.10 Utilisation rate for printing and communication paper

In the paper sector, the most significant growth has been in the production of printing and communication papers. However the amount of waste paper consumed in the manufacture of several types of printing and writing papers continued to be low although there was an increase of 4 per cent (from 13% in 1988, to 17% in 1993).

The main grades of printing, writing and communication paper produced in 1993 are as follows in 1,000 tonnes:

<i>Production in Japan, 1993, by Grade</i>		<i>'000 tonnes</i>
Uncoated		5,277
	Wood Free	3,154
	Printing & Writing	1,566
	Communication	1,588
	PPC Paper	501
	Business Forms	375
Coated	Other	712
	Wood Containing	2,173
		4,265
	Wood Free	3,025
	Wood Containing	2,123
Total		9,542

Communication paper which is uncoated and woodfree includes: PPC paper (Plain Photocopying Paper), business forms, etc. Among these grades the growth of coated printing paper is the most significant, increasing by 1.83 million tonnes (103%) between 1984 and 1989, while uncoated papers grew by only 566,000 tonnes (20%). The production of PPC grew by 282,000 tonnes(238%)<sup>10</sup> /.

The share of printing and communication paper in total paper and board production at 9.5 million tonnes in 1993 was 34 per cent and the current utilisation ratio is 0.16. This ratio would increase to 0.20 if target technical improvements are implemented.

<sup>10</sup> /Penna, I. An overview of the structure and market trends - Japan's Paper Industry, 1992

*High grade quality paper* - The waste paper most consumed by this product category is pulp substitutes in the form of pre-consumer wastes from papermaking factories, converters, etc. Pulp substitutes are easy to recover, so as much as possible is already recovered and there is supply constraint. De-inking or other grades can have increased recovery but are not acceptable to papermakers without considerable improvement in the sorting business.

For example, A4 copy paper is now being produced with 70 per cent waste paper. Further improvement is not expected in this product because of the level of brightness and capacity of absorbing heat [if more waste paper is used, the edges will curl in the photocopier due to limited heat absorbing capacity].

Japanese A4 paper weighs 64 gr/m<sup>2</sup> compared to European similar weighing 64 gr/m<sup>2</sup> and USA of 75 gr/m<sup>2</sup>. Further increases in the utilisation rates of several grades included in this product category demand a better sorting system for office waste paper. The main difficulty in collection and sorting office wastes is the taboo papers. These are fax, photocopied papers, etc. which if not eliminated make recycled paper black and not usable. The cost of such operations is very high.

*Medium to low grade quality paper* - The utilisation rate for this paper grade is 40%. Sources for use in medium to low grade paper are waste paper of medium and also high quality. The particular aspect of this paper grade is that if old newspaper is used as a source the colour and thickness will be a problem. Technology could be improved but the cost will be too high and uncompetitive.

However, medium grade papers are easily made by using high quality waste paper from offices. Adequate subsidies to improve office waste sorting are needed. At present the demand for printing and communication paper is for high quality paper, so if such a demand could be shifted to medium and low grade papers, then the usage of waste paper could be expanded.

*Wrapping paper* - The current utilisation rate for this grade is at 3%. This paper grade consumes mostly Kraft waste paper and in lesser proportion old newspaper and medium grade waste paper. Increased use of waste paper is not feasible due to the relatively high strength required in the end products, such as bags, envelopes, etc.

#### **2.7.11 Expected increase of utilisation rate for each product category**

If the utilisation rate of 56 per cent for paper and papeboard products is to be achieved in the year 2000 the expected rate for each product category should be:

Product category	Present rate(53%)	Expected rate(56%)
newsprint	50%	60%
paperboard	92%	94%
tissue products	60%	65%
high grade paper	0%	10%
medium to low grade	40%	46%
wrapping paper	3%	4%

Source: Japan Paper Association - MITI, 1995

## 2.8 Structure and Profitability of Paper and Paperboard Industry

*Structure* - The industry is dominated by a very small number of companies. They specialise in the production of a limited number of paper types, thus smaller market sectors are dominated by one or a few companies. Oji Paper Co. is the industry leader with 9.5 per cent of total production and has top market share for newsprint (29.8%) and A-grade printing paper (20.3%). The sources of fibre supply are also controlled by these large companies. As shown in Table 2.14 in 1988, *five companies consumed 32 per cent of all waste paper recovered*, while 10 companies used 48 per cent. Six companies alone accounted for more than 60 per cent of Japan's pulp imports <sup>11</sup> /.

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<sup>11</sup> /same as 10/



**Table 2.14 Japan's five largest waste paper consumers in 1989**

	Consumption of waste paper	Paperboard production	Sales Revenue million yen 1/
	-----metric tonnes-----		
Honshu Paper	1,256,000	1,175,000	1,393,069
Settsu	947,000	909,000	982,772
Daishowa Paper	776,000	607,000	622,699
Jujo Paperboard	694,000	656,000	672,646
Sanko Paper	605,000	522,000	583,477

Source: JP&P, 1990d (Compiled by I. Penna)

1/ These figures should be taken as indicative only as breakdown by raw material type and products is not available.

*Profitability* - Between 1977 and 1988 the turnover of Japan's paper industry doubled, while its profit rate was the highest ever. The record profit rate continued through 1988 to the end of March 1989 because of increased demand stimulated by the active domestic economy. The factors contributing to this long period of high profits were

- increased value of the yen (lowering fuel and chips prices)
- increased use of wastepaper
- increased productivity
- reduced labour and energy costs
- declining interest rates

Following a four year period of lower profitability caused by over-capacity, imbalance between supply and demand, in 1992 the industry strove to reduce stocks by curtailing production. Consumption of virgin fibre fell by 3.5%. For waste paper, this was the first time that consumption had declined since 1975.

The average growth rate for *waste paper consumption from 1976 to 1991 was 6% a year*, three times as high as for pulp. The reason for the reversal of this trend in 1992 was that production of board and newsprint, both of which have a high recycled fibre content, declined.

Profits have fallen for four consecutive years from 1989. Combined profits of the 24 companies were estimated at 28,500 million (nearly US\$ 230 million) which is about 14 per cent of the record level attained in 1988<sup>12/</sup>

<sup>12/</sup> Pulp and Paper International, July 1993

Data from the profit and loss statements and balance sheets of paper making companies showed that the net profit per tonne of recovered waste paper used in manufacture in the third quarter of 1994 was about US\$ 55.

**Table 2.15 Estimated Profit of Recycling one tonne of Waste Paper**

Company	waste paper consumed-	net profit in yen/quarter	profit yen/tonne	net profit yen/ton 1/	net profit US\$/ton 2/
A	147000	936000000	6367	5306	53
B	180000	117000000	6500	5417	54
C	207000	138000000	6667	5556	56

Source: Personal communication - K. Fukushima from Jujo Paper, March 1995.

1/ Net profit was calculated by using a conversion factor of 1.2 for the fibre losses; 2/ Exchange rate used US\$/100 yen

Note: Figures were not taken from annual reports but from verbal communication and should be taken solely as indicative.

## 2.9 Summary

The Japanese paper industry is dependent on imported wood and recycled waste paper because of limited forest resources. In response to high domestic fibre, energy and wage costs and to wide price fluctuations of imported pulpwood, the Japanese paper industry has gradually expanded waste paper usage. At present more than 50 per cent of total raw material consumption is met from waste paper.

The sharp price rises of imported woodchip and oil that followed the first oil shock threatened the viability of producing mechanical pulp for newsprint in Japan in the mid-seventies, but the industry responded by increasing the utilisation of recovered waste paper in production of newsprint from 10 per cent to 40 per cent. Overall the industry doubled its consumption of waste paper from 1975 to 1984, whilst the recovery rate increased sharply from 38.6 to 50.4 per cent.

The waste paper business became increasingly more efficient and improved de-inking technologies allowed increased utilisation of recovered newspaper. An active government campaign calling for households to step in to help recycling ensured a stable supply of newspaper and magazine. Waste paper generated from households accounts for about 35 per cent of the total amount recovered each year.

From 1985 to 1993 recovery rates were stable, increasing only from 50.2 to 51.7 per cent. Recovery rates seem to change periodically, with sharp increases being followed by stable rates

for 10 years. Apparently, this pattern is based on the economic cycle and the time required to develop new technologies for the utilisation of new waste paper grades and to market the end-use products. The utilisation rates of old corrugated containers and old newspapers are now reaching their maximum technical limit.

In 1993, out of 14.7 million tonnes of recovered waste paper, 45 per cent consisted of corrugated paperboard, 37 per cent newspaper and magazine, and the remaining 18% was of mixed grade waste. Most recycled paper is used for the production of low quality products, especially cardboard and newsprint. A considerable increase in the recovery of higher grade waste paper such as pulp substitutes from offices is needed to increase the utilisation rates in printing and communication papers.

Office buildings generate even larger volumes of waste paper than households. If the recycling rate is to be increased, the recovery rate of office automation papers must be increased by devising a cheap and efficient sorting and collecting system. So far, most of this waste paper grade is left by the kerbside to be collected by special dealers or by local authorities. Waste paper collected from the kerbside account for about 16 per cent and includes magazines, cardboard boxes, corrugated containers, old newspapers and office automation waste paper.

In 1990, the Japan Paper Association initiated the "Recycle 55 Movement" to promote the recovery and the use of recycled paper, and increase the utilisation rate to 55% by 1995, concentrating on the recovery of high quality waste paper. A 1984 survey of waste paper use indicated that about 66% of waste paper was potentially reusable whilst the utilisation rate by March 1995 was 53.3%.

The target of 55% could not be reached due to demand related factors. However the paper industry is confident that although some paper and paperboard products have almost reached their saturation points, the overall utilisation rate can be increased to 56% by the year 2000, mainly by improving office automation waste paper collection systems for the increased utilisation of recycled fibre in the manufacture of printing and communication papers.

It appears the industry now has the technology to recycle increased volumes of waste OA paper, which it had avoided in the past since it is more expensive to process. The great increase in paper consumption coupled with recent drops in waste paper utilisation rates have created major problems for local government waste disposal. Thus, increased paper recycling would have major waste disposal benefits in Japan. However, recycling rates can only be increased by the increased recovery and utilisation of high grade waste paper, otherwise waste paper as combustible waste will be in constant over-supply and continue to adversely affect the waste paper business.

The Japanese paper and paperboard industry in Japan is dominated by small number of large companies. The sources of fibre supply are controlled by these companies. In 1988, five

companies consumed 32 per cent of all waste paper recovered. Corporate profits were remarkably high between 1977 and 1988. From 1990 to 1994, there was a sharp decrease in profitability but even so, the net profit from a tonne of recycled fibre was about US\$55 in the third quarter of 1994.

### 3. JAPANESE PAPER AND PAPERBOARD INDUSTRY: POLICY AND LEGISLATIVE MEASURES ON WASTE PAPER USAGE

This chapter summarizes the present legislation regulating the recycling of waste paper, the tax incentives and promotion programs for the increased usage of waste paper established by the Ministry of International Trade and Industry (MITI). It also looks at the new policies and guidelines suggested by *Study Committee on Basic Issues of the Japanese Paper and Pulp Industry (Study Committee)*. The main reason for MITI establishing the Study Committee is to encourage firms to form their own strategies as MITI seeks to discourage excessive reliance on the Government. Particular attention is paid to MITI's double attributions, first as the Government Department primarily concerned with country's industrial development and export performance and more recently as one of the ministries having a central role in the legislation and strategy for recycling and waste disposal. Reconciling these two missions is proving increasingly difficult.

#### 3.1 Legislative measures currently in force

The Waste Disposal Law, enacted in 1970, was amended in October 1991 when the "The Resource Recycling Facilitation Law" or "Recycle Law" was added. The Recycle Law became effective on 25th October 1991. Article 1 describes the purpose of the law: "Considering that Japan relies on importing many important resources, but a large part of these resources are now being discarded without being used, the purpose of this law is to provide the basic mechanism for promoting the use of recyclable resources, and thereby promote the healthy development of the nation's economy".

The paper industry was specified as being one of the specially designated industries, and required to make an effort to increase the utilisation rate of waste paper according to Ministerial Ordinance N. 53, Ministry of International Trade and Industry(MITI). Article 1 of this Ordinance states that:" taking into consideration that the low ratio of waste paper used in printing paper, information-related paper, and wrapping paper, and the different uses of waste paper depending on the kind of paper, the industry shall, in cooperation with consumers as well as central and local governments, *strive to increase to 55 per cent the amount of waste paper that is used in domestic paper production by the end of Fiscal Year 1994(March 1995)*". In addition, paper manufacturers are required to execute the following:

- Provide the necessary stock yard for waste paper and the installation of facilities or equipment necessary for waste paper use
- Improve technology for waste paper treatment, such as pulping, screening and cleaning, de-inking and strength improvement, in cooperation with machinery and chemical suppliers

- Prepare a plan for waste paper utilisation for each business year, which should include concrete utilisation conditions
- Give information on the percentage of waste paper used"

### **3.2 Government action to promote increased recycling**

MITI's commitment to increased usage of waste paper includes the provision of financial and fiscal incentives to the waste paper business and to paper manufacturers:

*For waste paper businesses:*

- reduction of corporate tax
- special depreciation rate for the purchase of waste paper bonding machines
- low interest rate loans for the purchase of waste paper handling machines
- a model waste paper collection system project

*For paper manufacturers.*

- tax reduction/special depreciation rate for recycling paper production facilities, de-inking facilities and recycling fiber production facilities.
- low interest loans for de-inking facilities.

Additional MITI promotion programs include:

a) The Energy & Resource Saving Measures Promotion Committee, consisting of Vice Ministers of several government agencies, which holds regular meetings coordinated by MITI to promote use of recycled paper within government agencies. Regional committees of the Energy & Resource Saving Committee such as representatives of municipal governments, consumer groups, commercial, industrial, cultural, educational, press and advertising associations take part in the promotion program. Consequently many of these organizations have adopted procurement policies to increase recycled paper usage as much as possible.

b) Two private associations are also promoting recycled paper usage to consumers. Unfortunately, both programs have had a limited impact on consumers decisions, due to vague definitions of recycled fibre.

-*The Paper Recycling Promotion Center*, in addition to its several functions to assisting the waste paper business, is promoting increased recycled paper products usage. Students from primary or junior school collect the Green Mark labels from magazines, toilet paper, books printed on recycled paper and exchange them for a set of seedlings to plant in school recreation areas.

-*The Japan Environment Association* introduced the "Eco-Mark" project for products made with recycled fiber. This project was initiated in 1989 by the Japan Environmental Agency with the hope of encouraging a nationwide "ecological life-style" movement.

The "Eco-Mark" secretariat was placed in the Japan Environment Association and has approved 2,600 products for "Eco Mark" labeling in the last five years. However, the program has been criticized for its non-transparent selection criteria, which were set only for consumption and disposal of products and not for production.

The program was reviewed and modified in April, 1994 to rectify these problems. While some improvements may be achieved in the future, the "Eco Mark" program is still not a big movement in Japanese society.

Currently, Eco-Mark products are listed in 58 product categories. However, content requirements for recycled fibre are different for each "Eco-Mark" product. It is unclear what the true content requirements are, because the definitions of recycled fibre are not clear.

### **3.3 Issues related to the target of 55%**

The target waste paper utilisation rate of 55% for Fiscal Year 1994 (April 94-March 95) was established in 1989 when the rate was 50%. The target rate was then entirely accepted by the industry as a plausible figure. Indeed, production in FY 1991 and 1992 was very high (29.1 million tonnes and 28.3 million tonnes respectively). However in 1993 production had fallen to 27.7 million metric tonnes, especially production of paperboards which consume a higher amount of waste paper. By the end of March 1995, the utilisation rate was 53.3 %. The target of 55% could not be achieved despite over-supply of waste paper. Some of the factors in the failure to increase utilisation rate are: consumer demand for high quality products; increased costs in processing recycled fibre because of environmental restrictions; industry eagerness to increase profits; inefficient legislative measures.

Up to 1990, waste paper was used to reduce the cost of fibre and the amount collected was in balance with recycled fibre requirements. However increased recovery is now generating more waste paper than economically required. Recently reasons for increased waste paper collection have been by the environmental and natural resources conservation, and waste reduction. Waste paper utilisation rates higher than 55% are being questioned by the industry as many products have reached saturation points.

Recycling as an economic activity has not progressed as expected because the prices of recycled products have dropped in recent years. The paper industry is requesting government intervention more to increase demand for recycled paper products, than to increase the supply of waste paper.

Concerning the failure of the paper industry to meet the target of 55%, MITI stated that the Government of Japan hoped that private companies will voluntarily increase recycled paper usage rather than having to use more coercive measures to ensure compliance. The Ministry of Health and Welfare(MHW) seems to believe that MITI should have taken stronger stand against paper manufacturers, especially on industrial wastes where the "Polluter Pays Principle" is not being applied. Studies on economic method for disposal of paper industry waste concerning manufacturers, distributors, and consumers responsibilities are being carried out by Industry/University Foundation.

Difficulties of dialogue between MITI and the industry resulted in a decision to conduct a survey on recycled paper usage by private companies. This survey was carried out between November 1993 and January 1994 by the Paper Recycling Promotion Centre. The survey covered the types of firms using recycled paper, the reasons for using recycled paper and the types of recycled paper most used by consumers.

The results showed that:

- end-users want recycled paper to perform at the same level as virgin pulp paper, or else to be available at much lower prices.
- in order to increase recycled paper usage, the level of awareness and understanding of recycled paper needs to be increased.

### **3.4 MITI's new approach to pulp and paper industry and recycling**

In response to the problems besetting the Japanese pulp and paper industry, MITI organised the " Study Committee on Basic Issues of the Japanese Paper and Pulp Industry" (Study Committee). This committee comprises representatives from the newspaper, banking, trading company, pulp and paper manufacturing, paper distribution, paper converting, printing and waste paper industries. MITI supported the committee's research and deliberations, and are using them to establish new policies. MITI's policy in convening this committee was to encourage firms to form their own strategies and to prevent excessive reliance on the government.

### **3.5 Policies and recommendations suggested by the Paper and Pulp Industry Basic Issue Study Committee (Recycle 56 target)**



In June 1994, the Study Committee announced a target of 56% for several paper products (see chapter 2.6) and submitted a draft on a new approach to the recycling of waste paper to MITI. The draft can be summarized as follows:

*i) Consideration of the need to expand the usage of waste paper*

The use of waste paper was originally promoted to make effective use of resources, to save energy and to protect forest resources. However from now on the main objectives of promoting recycling of waste paper are:

- to decrease the amount of waste - Landfill disposal is becoming critical, and waste minimization by promoting increased recycling is considered as a major challenge.
- to ensure availability of resources to meet the increasing demand for paper and paperboard. The industry should ensure that raw material supply sources suffice to meet increasing demand, domestically and worldwide, in particular in the rapidly growing economies such as the South-East Asian countries. If pulp resources are limited an increased amount of waste paper is required. As shown in chapter 2, to meet domestic consumption alone, an additional 2,1 million tonnes of pulp (equivalent to 6,9 million m<sup>3</sup> of woodchips) is required for year 2000.

*ii) Strategies to increase waste paper usage in the future*

Before raising the 55% target, it is necessary to review the reasons for failure to achieve the target. Since the waste paper utilisation rate in Japan is one of the highest in the world, the following issues need to be addressed:

- a) recycling problems of a general nature
- b) structure of demand
- c) cost of manufacturing
- d) supply of waste paper
- e) specific aspects of each end-product.

Since the use of waste paper as the main raw material for manufacture of paperboard products is reaching "saturation point", any further increase in use of waste paper will focus on the manufacture of paper products, especially newsprint and printing and communication paper.

a) Recycling issues of a general nature - There are two types of problems which need to be solved:

a1) technological issues:

e.g. fibre worn from recycling; technology for de-inking and wash de-inking require further improvement; cost of maintaining comparable quality to virgin fibre is high due to low fibre/paper ratio; sludge and drainage problems.

a2) Economic issues:

e.g. use of waste paper should take international competitiveness into account. If waste paper is to be main raw material in manufacture of paper and paperboard, it should be made available at international prices, otherwise the recycling industry will not be competitive and factories will close. International competitors such as Germany and the USA subsidise part of waste paper collection. Japanese paper industry claims that subsidies for the collection and sorting of supply-constrained grades of waste paper are needed in Japan to improve competitiveness. The industry is also asking for subsidy for transport cost - Average current cost to deliver waste paper from the generating points to mills is 6 Y/kg.

b) structure of demand - In order to increase the demand for recycled paper products promotion should be intensified and compulsory use may have to be enforced such as:

- Promote educational campaigns nationwide for consumers understanding of the importance of using more recycled printing and communication paper, and recycled sanitary products.
- Promote the use of "pilots" (textbooks, post cards, etc.).
- Promote the use of recycled paper by the government and local authorities.
- Encourage positive use of "green mark".
- Seek cooperation from the relevant industry sectors (large consumers such as printing houses, newspaper companies, and publishers)
- Make clear agreement on the standard of quality by both, suppliers and consumers. Acceptance of standard type of recycled paper should be promoted.
- Make agreement in advance - if the Japanese paper makers should move overseas, demand of waste paper to manufacture paperboard for corrugated containers will be a problem.

c) cost of manufacture - Increase operating rates, etc.

#### d) Waste paper supply

d1) Availability of supply for a specific grade of waste paper is vital [Old newspaper should be readily available for an increased utilisation rate for a specific end]. The main sources of waste paper such as the Old Newspaper(ONP) and Old Corrugated Containers (OCC) have high recovery rates. A further increase in the recovery rate will have an extra cost, as the collection sources will be places not yet included in the present route (farm warehouses, etc.). These grades should then be either collected by the authorities or by providing fees for private collectors.

d2) Improvement of collecting efficiency-local authorities should encourage sorting of waste paper at source, especially office waste paper. High quality waste paper is generated from offices. The supply of 1.5 Million tonnes is currently used mostly in sanitary products.

#### e) Specific aspects of each end-product:

Mixed grades can only be used to make low grade paper products - Efforts to increase collection rates will result in a larger amount of mixed grade waste papers. These grades should be used for energy recovery (incinerated).

#### iii) *Consideration of future legislative measures on waste paper utilisation*

a) Taxing the use of virgin pulp - This could be done to improve the competitiveness of waste paper, but since virgin pulp is essential for paper production it would raise production costs and the Japanese Paper Industry would lose its competitive edge. This is not appropriate for Japan because the waste paper utilisation rate is already high and the country should not be penalized for it. This would only be fair if other countries also applied taxes on the use of virgin fibre.

b) Mandatory obligation to increase the utilisation rate for each product category - Legal regulation would not be effective unless it is also applied to imported papers. There are no means to check the proportion of waste paper in imported papers.

c) Establishing guidelines for manufacturers - Guidelines should be established for incorporating recyclability in the manufacturing process. For example, promote the use of 'hot-melt' ink that is good for recycling, and tax non-recyclable products.

### 3.6 Viewpoints on the target of 56% for year 2000

The Japanese paper industry's views on the suggested increase in the utilisation rate for each product category are:

- The whole of society should participate in the efforts to reduce waste and increase recycling. In view of the high appreciation of yen, the involvement of waste paper collectors and paper making companies only is not sufficient. In fact these two sectors are reaching their limits in this respect.
- The paper industry is capable of increasing utilisation rate to 56% by year 2000, to participate in waste reduction and general environmental improvement. However the industry requires government support to:

a) establish a policy of improving the sorting of waste paper at source. The participation of local authorities, collectors, and consumers should be clearly defined.

b) expand collection of office waste paper by establishing a support system, e.g. "Local Committee for the Recovery of Office Wastes".

c) expand consumer demand for recycled paper.

d) negotiate an agreement between industry and consumers on standard qualities for printing and writing paper, with a clear statement on the content of recycled fibre. Promote increasing transparency in the domestic and export market of recycled products.

e) subsidise improved waste paper processing methods. The amount of Taboo paper (thermal) is increasing, thus usage of these wastes should be developed.

f) re-evaluate the tax system to promote increased use of recycled products

g) establish a policy to reduce waste paper transport cost.

h) develop alternative waste paper uses, other than recycling into paper and board products.

i) increase recycling for energy recovery and international recycling - Environmental hazards from incineration of waste paper are less than from other products so low grade waste paper should be used for energy recovery. "International recycling" means increased waste paper export. Japan could be a major supplier of waste paper as international demand is on the increase. The need to protect world forest resources will result in the increased trade of waste paper.

### **3.7 Paper industry's future policy recommended by MITI and the "Study Committee"**

The overall policy for the sector can be summarized as follows: Taking into account the a) lowering profitability; b) the development of the Paper Industry in East Asian Countries; c) the increased requests for improved market access and d) the growing concern over environmental

protection, the configuration of the future industry will be characterized by *the promotion of internationalization*, and further promotion of *environmental stewardship*.

i) *Promotion of internationalization* - this will include internationalization of enterprises and internationalization of market.

a) internationalization of enterprises

*further promotion of restructuring and streamlining* - The pulp and paper industry should enhance corporate strength and improve profitability comparable to industry leaders internationally, through broad restructuring such as mergers, joint ventures, and cost reduction.

*positive expansion to foreign countries* - Industry should respond positively to overseas markets in terms of capital participation and technical assistance taking full responsibility for environmental protection - here profitability should be estimated taking country risk into account. Other strategies must be developed such as diversification of business, transfer of production facilities and cooperation among countries involved.

b) internationalization of the market

*further improvement of access to the Japanese market* - Japan is certain to remain one of the largest paper markets in the world and therefore should make further efforts to eliminate trade barriers even further.

*further improvement in the domestic market* - restructuring and streamlining of distributors and reduction of distribution costs are needed. The Japanese market should become as efficient as any other developed country.

ii) *Further Promotion of Environmental Stewardship*

a) a new target should be set for the utilisation rate of waste paper, and new uses for waste paper should be developed.

b) in response to growing pulp and paper demand in the world, in particular the East Asian countries, collaboration should be sought with Europe and North American countries

- to expand afforestation
- seek new uses for waste paper
- develop technology for waste paper utilisation and for pollution control, including effluent - treatment in order to become the most environmentally advanced industry in the world.

### 3.8 Summary

Government pressure on the paper industry to increase recycling in order to reduce waste disposal, has reached a critical point. The waste paper business is collapsing and the paper industry is facing increasing difficulties in coping with the prospects for the "internationalisation of the market" forced on MITI.

- In accordance with the Paper Agreement signed in 1992 between the Japanese and U.S. government, business practices are being reviewed and guidelines are being drawn up to comply with the Anti-Monopoly Law, and to improve access to the Japanese paper market.
- The internationalization of the enterprises as recommended in the sector policy implies transferring production capacity to Asia. There is a climate of nervousness as the Japanese paper industry fears "hollowing out" of domestic industry. By moving production to East Asian countries the advantage of close supplier-purchaser relations will be lost.
- Concerning waste paper utilisation, local recovery may be promoted in these Asian countries, damaging even further the troubled Japanese waste paper business. MITI and sector representatives are working to reach a consensus on legislation that can be enforced.
- Recycling and waste disposal issues are stated as a matter of principle, but the best methods of implementing these principles are not clearly established.
- There is an assumption that industry should be recovering and utilising more waste in an ever-rising production, but very little discussion of ways to reduce consumption.

#### **4. STRUCTURE AND DISTRIBUTION CHANNELS OF THE WASTE PAPER BUSINESS AND LARGE SCALE SOURCES OF WASTE PAPER**

This chapter summarises the structure of Japanese waste paper business specially the distribution channels and the main large scale sources of waste paper. The structure of Japanese waste paper business developed entirely on the basis of market forces. The system had survived wide price fluctuations ranging high prices during the early 1980s to current low prices. The sources of waste paper are the same as in many other countries but the Japanese waste paper business has some unique characteristics, such as the importance of wholesalers in the control of supply and demand of the product. The recovery of office automation papers is becoming increasingly important for further increase of utilisation rate for paper and paperboard products. Some aspects of office waste recovery are also included in this chapter.

##### **4.1 The Wholesaler**

The wholesaler (paper stock dealer or wholesaler - tonya) plays a major role in the waste paper supply system which support Japanese recycling business.

Wholesalers' three main functions are to provide papermakers with:

- stable supply
- good quality waste paper
- ready availability of the grades in demand

A difficulty experienced in other countries such as Germany, as it is often mentioned in Japan, is that local government establishes norms which are not based on real demand, but on political expediency. "It is hard to make people realise recycling is a moral must, to persuade people about ideals. To achieve targets, volunteers with enthusiasm are needed, and yet this will not be sufficient. The vital point is that recycling has to be economic" said a manager.

In Japan the three economic stages are:

- 1) waste paper is collected by collectors
- 2) waste paper is then sorted either by originators, collectors, dealers or wholesalers,
- 3) waste paper is delivered to papermakers

The wholesalers have to be licensed (Tshokuno) to supply waste paper to papermaking company directly. Conditions for granting a license are: dependability, tradition and professionalism. Professionalism means the ability to supply all year around despite the fluctuations in supply. Collecting waste paper is easier at the beginning and the end of year. It is harder to collect in July and August.

The wholesaler buys waste paper from collectors at prices which will cover the cost of storage space, a depot to sort and to pack, machinery, vehicles, an office for administration, skilled personnel and management. These are all necessary before waste paper can be delivered to papermakers

The challenge for wholesaler is the management of stocks. They must build and finance stocks to match the papermakers' demand with the grades supplied by collectors. The production of waste paper is not controlled in a factory: it depends on when and if a paper consumer decides if it will become a raw material or a piece of rubbish.

To balance supply and demand is the wholesalers' contribution to the waste paper industry. To achieve a balance, the wholesaler usually increases or decreases the prices paid at his gate to collectors (shiirekakaku). If the stock is low for a grade with high demand, higher prices are offered and vice-versa. Wholesalers vary the price to papermaking companies as well.

The weakness of the system is that the collectors' reaction is not quick enough when prices increase, leading to market volatility. To overcome this in the early 1980s the paper industry started the keiretsu system - to incorporate wholesalers as subsidiary companies. Utilisation rate was over 40 per cent, i.e. waste paper was already the main raw material. The paper and board industry needed to ensure a more stable supply source to decrease production cost and improve international competitiveness.

Waste paper imports also helped to stabilise prices of domestically collected waste paper. Wholesalers are now doing their job as small to medium companies - Small wholesaling business can be started with a capital investment of about 50 million yens whereas papermaking companies need about 10 billion yen.

The keiretsu system may have minimised the large gap between waste paper consumers and suppliers. A better balance of supply/demand contributed to price stabilisation. Many wholesalers merged and co-operatives were founded to strengthen their position: Tokyo Koshi Shori Diguio Kiodo Kumiai (Wholesalers Association) is a good example. It was founded in 1983 with 11 wholesalers and an initial capital of 10 million yen.

#### **4.1.1 Current Wholesalers' Profit Margin**

Wholesalers pay agents/dealers/collectors according to market prices. These are prices paid by the papermakers. Wholesalers current total costs including sorting, financial, equipment, power etc., is about 7 yen/kg. Table 4.1 shows that the present profit margin is very low. Wholesalers Co-operative Association are now requesting the government to provide financial and technical assistance to increase the collection of office waste paper.



**Table 4.1 Waste paper current prices at mill gate and at wholesalers' gate in yen per kilogram**

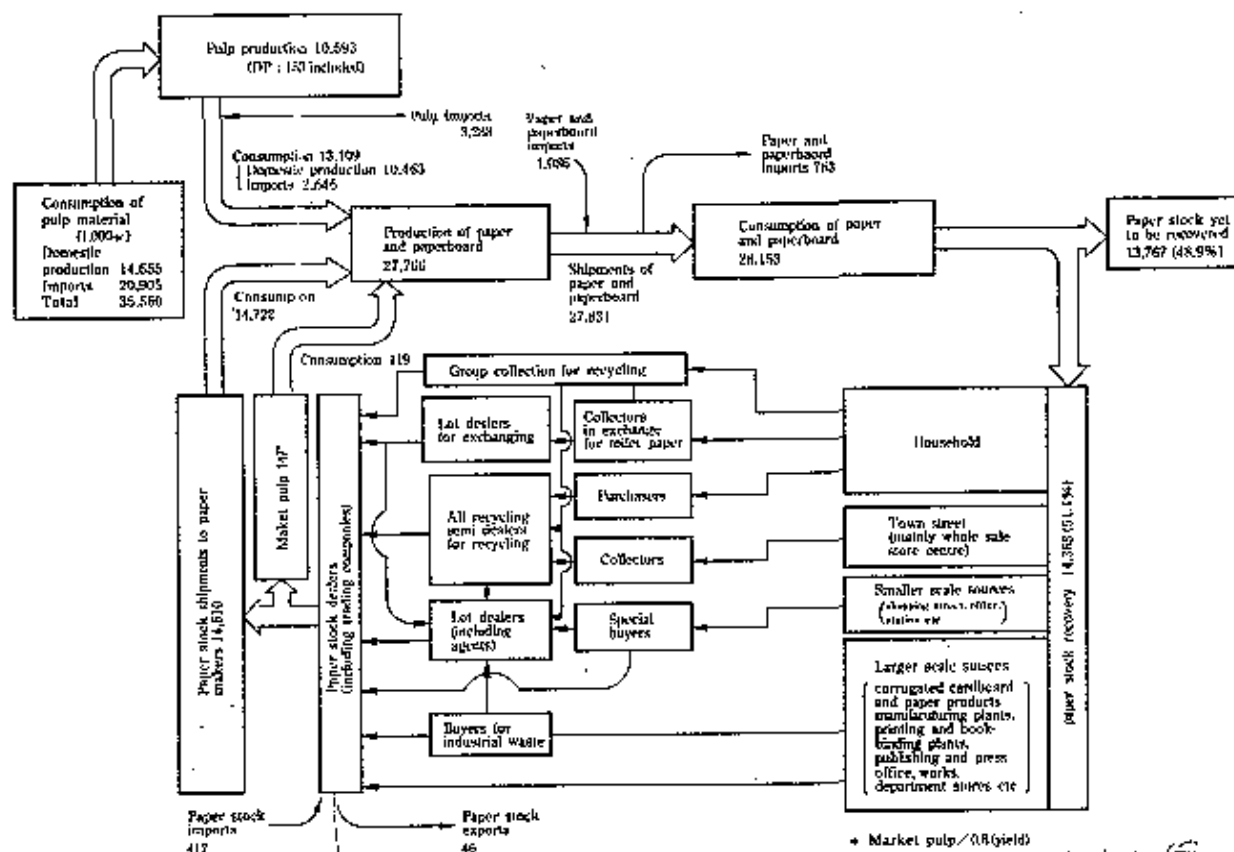
Grades	mill gate	whosaler' gate	wholesaler's margin
OCC	13	7	6
Old newspaper	14	7	7
Old magazine	7	3	4
Computer print-out	30	20	10

Source: Tokyo Koshi Shori Diguio Kumiai, March 1995

## 4.2 Waste Paper Stock Generation and Distribution Channels

Figure 4 shows the many business participants. The system is flexible and efficient allowing participation of small as well as large companies.

**Figure 4 Paper stock generation / distribution route (1992, in 1,000mt, %)**



*Sources of waste paper* - Figure 4 shows four main sources of waste paper: 1) households; 2) town centres; 3) smaller scale sources :retailers such as groceries, offices, stations, etc.; and 4) larger scale sources such as: corrugated cardboard and paper products manufacturing plants, printing and book binding plants, publishing houses, department stores and supermarkets.

Most waste paper generated by the *households* consists of old newspapers and magazines. They account for *35 percent of total waste paper recovered annually*. Traditionally waste paper from households is collected by three ways: group collection for recycling(18%); collectors in exchange for toilet paper(12%); and purchasers(5%). Operating systems of group collection scheme and collectors in exchange for toilet paper are included in chapter 5.

There are many wholesale stores ( food, clothing, spirits, electrical components, etc.) located in town centres. The waste paper generated by this source is sold to *Collectors and it accounts for 12 percent*.

The waste paper from *small scale sources such as shops, offices, bars and stations* located in shopping streets is collected by *special buyers and it accounts for 12 percent*.

The major source of waste paper is the converters, publishers, book binders, printing houses, cardboard and paper products manufacturers, newspaper companies, department stores and super markets. The waste paper from these larger scale sources is sold to "Special buyers" whom in general have long-term contract with the suppliers and it accounts for 41 percent /.

#### **4.3 Summary of Agents Functions and Their Characteristics**

Table 4 summarises the functions and characteristics of each of several agents participating in the waste paper business. Papermakers establish exclusive contracts with wholesalers who in turn have their own lot dealers. Supplying each lot dealer there are many small collectors and buyers who collect from various sources such as stores, households, buildings, etc. Nowadays is not uncommon for generators of pre-consumer waste paper to have direct contracts with the wholesalers.

Table 4.2 Roles of waste paper Agents

Channel Agents	Waste paper grade	Sellers	Buyers	Role of Agents and some characteristics of their tasks
(1)	(2)	(3)	(4)	(5)
Purchasers and Collectors	Old newspapers Old magazines Old corrugated containers	Home In cities	Semi-dealers Yosseya(buys and stores all recyclable)	a) Both types of agents collect waste paper from generating sources b) Collectors recover without compensation c) Purchasers buy with cash
Collectors in exchange for toilet paper	Old news paper Old magazines Old corrugated containers	Home	Lot dealer #1 Semi-dealers Paper stock dealers	a) Exchange of waste paper against toilet paper b) Always use small truck c) The number of these Agents increase or decrease according to the supply/demand situation
Special buyers	Old newspapers Old corrugated containers, Kraft paper waste	Super markets, Office buildings, Shops in cities	Lot-dealers#2 Paper stock dealers	a) They have a fixed route already b) They buy in cash but in some cases receive a fee.
Buyers of industrial waste	Trimming, Old corrugated containers, cartonboards box	Paper converter and printer	Lot-dealers #2 Paper stock dealers	a) They already have fixed routes
Lot-dealers #1 (Collectors in exchange of toilet paper)	Old news Old magazines Old corrugated containers	Collectors in exchange for toilet papers	Lot-dealers #2	a) In some cases, lot dealers lend the collectors a small truck, b) In some cases paper stock dealers follow lot-dealers as a side job
Semi-dealers (they collect many kinds of recyclable)	Old newspapers Old magazines Old corrugated containers	Purchasers Collectors Collectors in exchange for toilet paper	Semi-dealers Paper stock dealers	a) They make the sorting out, clean up and bailing of waste paper b) In some cases they share a fixed point of collection system
Lot dealers #2 as Agents	All kind of waste paper	Semi-dealers Lot dealers #2 Special buyers Buyer of industrial waste	Paper stock dealers	a) Sometimes they carry waste paper to the paper maker by order of paper stock dealers
Paper stock dealers	All kind of waste paper	Buyer of industrial waste Lot-dealers #1 Lot-dealers #2 Semi dealers Collectors in exchange for toilet paper	Paper makers and Trading concerns	a) clean up, bailing of waste paper and b) they have a measure of the demand and supply control function c) they must be registered as trader and have a special contract with the paper maker
Trading concerns	All kind of waste paper	Buyer of industrial waste Lot dealers #1 Lot dealers #2 Paper stock dealers	Paper maker	a) most times they have the same function as paper stock dealers

Note : Paper stock dealers are the wholesalers who has control over the supply/demand of waste paper

Source: Paper Recycling Promotion Centre

With the distribution channels shown in Figure 4 and the agents' roles, trading connections and characteristics shown in Table 4, the whereabouts of any person involved in waste paper chain can be identified. For example, Purchasers col(1) row(1) buy wastepaper such as old

newspapers, col(2) from households col(3) paying them in cash as they are the generating source col(5) and sell it to semi-dealers col(4), who deals with all kinds of recyclable material. The semi-dealers in row 6, col(1) may buy old newspapers col(2) from purchasers col(3)[who bought from household] and sell them to paper stock dealers or wholesalers col(4), after sorting out in grades. Semi-dealers own machinery for sorting and baling, and in general are family businesses. In general terms the size of waste paper business depends on their ability to sell collected material as direct as possible to papermakers.

#### **4.4 Additional Observations on Some of Agents**

##### **4.4.1 Bring system - Skips in town centre**

In addition to buying waste paper from collectors, purchasers, dealers and semi-dealers, wholesalers also collect waste papers from skips. These skips are placed in strategic locations where many people bring all grades of waste paper. Renting space in busy urban areas is very costly.

Currently most of the wholesalers' supply comes from small collectors, who gather from sources such as shops/retailers/offices and deliver to semi-dealers or wholesalers. In general wholesalers pay collectors with promissory notes(tegata), an old tradition which is no longer acceptable in other modern businesses.

Most of the waste paper collected and traded through channels shown in Figure 4 and Table 4 is consolidated at the wholesaler's yard where it is sorted and packed before being delivered to papermakers.

##### **4.4.2 Pre-consumer wastes**

Industrial waste paper is generally traded by buyers of industrial waste. These wastes originate from large scale sources, such as corrugated containers and boxboard converting plants, printing and bookbinding plants, publishing and press works, etc. Buyers of industrial waste are called (giokay tsubo). They either buy from small collectors or have contracts with the main suppliers and sell the waste paper to lot-dealers#2 (tuboaguegocha) who sell them to wholesalers. They enjoy better conditions as they in general deal with uncontaminated material: the highest grades of waste paper -pulp substitutes and high grade de-inking wastes- such as cuttings of white unprinted woodfree cuttings and shavings from converters and bookbinders (sussumono). They specialise in preconsumer wastes and often deal with unsold books and "magazines", test printed newspapers, cuttings from converters, printers, etc.

Demand for waste paper generated from these industrial sources is high. This means that they are fully recovered and supply from these sources can only increase at the rate of the total paper and board consumption in the generating sources. Eventually the rate of increase will slow as converters and printers make continuous efforts to reduce waste.

Historically large price differentials between waste paper grades, fixed channels and regular supply of easily collectable material, are some of advantages which lead to higher profit

margins for these agents than small collectors. However, the pattern of their business has recently changed, as labour and transport costs have risen.

**Returned books and magazines** - Most unsold books or magazines go into waste paper recycling channel but sometimes they are sold as second hand items. Large proportion of recovered magazines was consumed in 1993 for the daily production of about 200 000 new magazines. Twenty per cent of the total recovered waste paper is collected from large industrial pre-consumer sources by the buyers of industrial waste.

#### **4.4.3 Post-consumer waste paper from large scale sources**

Collection of waste paper from sources generating large quantities in one place such as supermarkets/department stores is done by special buyers or buyers of industrial waste. The quantity of, for example corrugated boxes often justifies pressing and baling at the source with resulting saving in transportation cost.

The most valuable grades of waste paper from these sources are Kraft-containing packaging grades such as corrugated boxes and Kraft sacks as well as wood-free printing and writing papers. With an increased consumption of paper and board products by these large sources, there has been an increase in the number of dealers in industrial waste.

Energetic pensioners start business investing in a truck with hauling, compressing and sorting equipment. These specialised trucks cost about 6 million yen but can be operated by the driver alone instead of 3 people with manual collection. This makes the business economically viable if the truck collects and transports about one to two tonnes daily.

Supermarkets and department stores used to sell their waste paper. Today they pay to remove the waste paper as they cannot afford to have an unpleasant sight of shoppers.

How much waste paper is generated in a supermarket?

One of the largest supermarket chains in Tokyo with 160 stores outlets produced the following amount of waste paper:

-The daily recovery of cardboard boxes in the largest store was 1 tonne, in a middle sized store was 500 kg and in small stores 250 kg. The daily average amount of waste paper recovered was 313 kg. The monthly amount varied from 1,500 to 2,000 tonnes depending on the period of year. Due to high labour costs and the cumbersome nature of collecting bulky old cardboard containers, cartonboard boxes, etc., most of special buyers have mechanised their operations.

#### **4.4.4 Office Automation waste paper from large office buildings**

With the increasing paper consumption, the waste paper content in urban garbage has risen as high as 49 percent in the Tokyo area in 1987, compared with 27 percent in 1967. Most important has been the introduction of computer and copying machines in offices and the subsequent generation of so-called OA (office automation) waste paper. This was rather unexpected following predictions of the paper-less society. However this type of waste paper has been collected rather like ordinary waste paper by "Collectors". The Paper Recycling Promotion Centre is assisting industrial buyers to plan the collection of OA waste paper from large office buildings.

More than half of office waste consists of OA paper such as computer print-outs, facsimiles and copy papers, most of them recyclable products (colour printed and black ink printed high quality papers, called komipeigi).

In the capital city, most office waste paper collecting companies are members of Tokyo Koshi Senbun Kyodo Kumiai - The Waste paper Collectors Co-operative. Half of the members are limited companies and half are family businesses. In 1991, sixty seven of these business collected an average of 12,000 tonnes of waste per month, recovering about 6,000 tonnes of recyclable waste paper with a turnover of US\$ 10 000 to US\$ 20 000 per business.

In 1990, MITI and the Paper Recycling Promotion Centre initiated a OA waste paper recovery program by financing technical assistance, publishing guidelines and carrying out surveys. The results of the surveys indicated that every office worker is aware and willing to participate in waste paper recycling.

One of most important aspect for efficient OA recovery is the managers' commitment; recovery of confidential documents was mentioned as one of major burden, as they have to be shredded which make the load very bulky. There is an extra cost as it requires a special shredding machine, reliable people, etc.

Currently only about 75,000 tonnes of waste paper from offices is being collected. The waste from computer print-out reaches the highest price, at 30 yen/kg at wholesaler gate.

Examples of results from the survey:

Collection and sorting of OA paper in ten office buildings in central Tokyo showed that the average OA waste paper generated per office worker was 4 kg per month (min of 1.4 to max 14.2 kg/month)

At the head office of a an electrical equipment manufacturing company with 8000 employees, the waste paper collected was 35 tonnes per month. When OA paper collection started the waste paper recovered increased to 60 tonnes per month.

The main benefits of the increased recovery of high quality grade waste paper are the reduction of solid waste for landfill and income from sales.

### *How difficult is the office waste paper collection?*

The difficulties of waste paper recovery from office buildings are summarised in the following interview:

A day in the life of a Koshisenbunguiosha - Aoki-san is a Koshisenbunguiosha - he is an OA collector who sorts office rubbish into recyclable OA paper. He lives in Adati-ku district, a historical place in the suburb of Tokyo where the largest flea market is located as well as waste paper wholesalers and shops for second hand stuffs; there many recyclable were used, exchanged, reconditioned, after the second world war.

Mr Aoki and two colleagues start the day at 4.30 AM, and drive a 4 ton truck to Marunouchi (centre for office buildings) in Tokyo. Aoki has contracts with 3 office buildings. They go there every day except weekends and holidays. They arrived at these buildings at about 5 AM before the cleaners comes in. There are no automated systems to bring the garbage down from offices so they have to run up and down.

They park the truck in the basement and bring down the garbage from each floor. The sorter removes office rubbish from bags for combustible wastes [measure established by Tokyo Metropolitan Government], transfers them into their own bags and carries them to load on the truck. These bags weigh each about 50 kg.

There are about 20 to 30 bags in each building. They have to complete this three K operation (Kitsui, Kurai, Kitanai meaning dirt, hard, tiring) before 8.00 AM so they move fast. After they complete 3 building they get home at 9.30AM and then eat breakfast and rest. About 10.00 AM the sorting starts at tonya place by pouring the rubbish into conveying chain and 2 hand sorting labours do the separation by waste paper grades. Sometimes apples, banana peels, McDonald boxes, have to be removed. Aoki complains that there is far too much garbage these days.

When they finish this sorting and waste paper is placed into a container is around 3.00 PM. Aoki is ready to deal with koshitonya the wholesaler. The waste paper is of a mixed grade (komipeigi-recycled into tirigami) which is a blend of calendars, posters, copy paper, faxes, recycled A4 standard paper, etc.

Aoki gets as an average 700-800 kg/trash a day and sorts it into 500kg of waste paper and 200 to 300kg of disposable waste. He transports the latter to landfill on Saturdays where he pays 7 yen/kg for dumping. The more the garbage, more he has to pay. Perhaps is getting harder for everybody he says, more people is eating on their desks.

Koshisenbunguiocha is a family business with low income. No matter how hard they work the income might be just a bit higher than that of a salaryman. Many of these business closed during the recession. Recently even with the Office Building Administration paying them a fee,

the proceeds from their sales are not covering the costs. Table 4.3 show the costs and proceeds of an office waste paper collector.

**Table 4.3 Costs and proceeds of an OA waste paper collector**

Items	Case A	Case B
1. Amount of rubbish collected in a day (in kg)	800	800
2. Percentage of O.A paper	0.7	0.7
3. Total amount of O.A paper (in kg)	560	560
4. Fee from building management ( 7 yen/kg for rubbish disposal *(item 1)	7	12
5. Proceeds from O.A sales ( 15 yen/kg)	5600	9600
6. Dumping cost (7 yen per kg)	8400	16800
7. Gross income (4)+(5)-(6) in yen/day	1680	1680
8. Gross income in US\$/day (90 yen per US\$)	12320	24720
	136.89	274.67

Note : market price for OA paper varies according to type, the average current price is around 15 yen/kg (case A), many sorters can get 30 yen/kg for the highest grade. Building management can pay up to 12 yen/kg to have the rubbish removed(case B)

Source: Waste Paper Collectors' Co-operative, 1995

#### 4.5 Summary

The structure of the Japanese waste paper business developed entirely on the basis of market forces in this last 40 years. Much of Japan's waste paper is collected through complex but well organised channels allowing the participation of small and large companies. However several changes occurred during the period of 1990 to 1994 due paper industry's low profitability, the increased amount of virgin fibre imports and over supply of domestic low grade waste paper. As the waste paper prices have fallen to record low levels, many small waste paper dealers, as well as wholesalers became financially very weak leading to a poor elasticity of supply.

Consequently paper industries owned by large financial groups - keiretsu- incorporated the main waste paper wholesaling companies. As a result wholesalers which were left out became even less competitive. In addition the Government started to subsidise collection of waste paper as a mean to minimise waste disposal.

It appears that there will be a shift on the emphasis from household collection to office buildings collection. Important future changes in the structure of waste paper business could include government assistance in establishing collection depots in centre towns where office



buildings are concentrated and revising of legislative measures targeting office waste paper recovery.

Two main points should be noted:

- first, the Government should assist the koshisenbunguiocha by supporting them to continue to stay in business if its policy is that OA paper should be recovered.
- second, the offices should take measures to exclude non-recyclable (e.g. banana peel) so that sorting productivity increases and the business can become more efficient.

## **5. COLLECTION OF WASTE PAPER FROM HOUSEHOLDS AND OTHER DISPERSE SOURCES - GROUP COLLECTION SCHEMES**

Up to mid 1970s the supply of waste paper for the paper industry was sufficient without the need for a public campaign or official measures to increase recovery. Waste paper dealers and wholesalers have rationalised their operations which soon became capital intensive industries and waste paper from large sources was recovered efficiently.

After the mid 1970s waste paper stocks decreased and waste paper prices increased the Government of Japan decided that an increase supply must be secured mainly from household collection, which had remained largely untapped. More recently, subsidies began to be paid with the aiming of reducing volume of municipal solid wastes. The various group collection schemes, methods used and some productivity data are also described in this chapter.

### **5.1 Recoverable and Non-recoverable Waste Paper**

The waste paper recovery rate depends to a certain degree on the proportion of non-recoverable waste paper. The non-recoverable percentage varies from country to country and this variation can be caused by several factors. It could be because of permanent conservation, or on the other hand because of excessive contamination or total destruction caused by secondary uses, e.g. use of newspapers as wrapping material.

The percentage of non-recoverable paper and paper board in Japan was for some time much higher than in other industrialised countries. At present the recovery rate has stabilised around 51 percent and the non-recoverable percentage around 18 percent. Examples of non-recoverable paper and paperboard in Japan are: printing and writing papers retained in libraries and archives as books and permanent records, household and sanitary papers, vegetable parchment; greaseproof and glassine, carbonising tissue, condenser and capacitor paper, cable paper; cigarette paper; photographic paper, wallpaper base stock, construction paper and paperboard. About 5 percent of paper and paperboard is used for packaging export products, therefore cannot be recovered domestically.

Figures on the recovered and non-recoverable percentage of waste paper in Japan, compiled by the FAO are shown in Table 5. From column(5) it can be seen that in 1991 to 1994 there is an additional 31 percent of waste paper which could be theoretically recoverable.

**Table 5. Percentage of non-recoverable and potentially recoverable waste paper 1972 - 1994**

*in 1,000 metric tonnes*

year	consumption of paper and paperboard	non-recoverable	non-recoverable (in %) (2) as % of (1)	recovery rate	potentially recoverable 100-(3)+(4)
	(1)	(2)	(3)	(4)	(5)
1972	13,828	3,340	24.2	37.9	37.9
1973	15,937	3,985	25.0	39.7	35.3
1974	14,615	3,705	25.4	41.3	33.3
1975	13,315	2,620	19.7	38.7	41.6
1976	14,865	3,000	20.2	41.5	38.3
1977					
1978	16,322	4,694	28.8	42.1	29.1
1979	17,790	5,654	31.8	43.4	24.8
1980	17,492	6,998	40.0	46.1	13.9
1981 to 1985	not available				
1986	21,040	7,365	35.0	50.0	15.0
1987	22,594	7,908	35.0	49.6	15.4
1988	25,035	4,506	18.0	47.9	34.1
1989	27,433	4,940	18.0	48.2	33.8
1990	28,203	5,076	18.0	49.7	32.3
1991	29,105	5,211	17.9	50.8	31.3
1992	28,350	5,075	17.9	51.0	31.1
1993	28,153	na	na	51.1	
1994	28,852	4,985	17.3	51.7	31.0

Source : Fao - Forestry Department

## 5.2 Government Campaign and Promotion Activities for Group Collection

In 1974 the Government, in support of all sectors related to waste paper use, established the "Paper Recycling Promotion Centre". The main functions of this Centre were defined as: to conduct studies for increased recovery of waste paper; to promote public campaigns; to compile statistics; to publish guidelines for waste paper recovery; and to provide loans for the modernisation of waste paper business. The Centre also provides financial assistance for the establishment of stock facilities. As soon as it was founded, the Centre began to establish and manage nation-wide waste paper stocking facilities.

### **5.2.1 Group collection of waste paper - collective scheme**

Group collection of waste paper started in 1977. But it was only in 1986 that sorting was introduced by various grades of waste paper. Group collection is based on voluntary work, and payment of subsidies is never made to individual collectors but to the collecting group as a whole <sup>1</sup> /.

Groups collect mainly from households, stations, schools, small shops, stations and parks. Skips are placed on the routes used by the groups. Often groups use school playgrounds or community clubs, where waste paper collected during weekend is deposited. This is because appropriate locations to place skips are not available <sup>2</sup> .

The common features of group collection are the following:

- they are co-ordinated by self-governing municipal units which provide them with the guidelines;
- they follow a time schedule established by the supervising authority;
- they allocate a range of different businesses (collection outlets) to each group to make the task more exciting;
- the recovery groups are designated to 12 sub-areas within the city (one company for each group of 10 blocks)
- the city government pays for the valuable items found in the waste recovered.

Several groups were formed as a result of Government campaigns. These are: Block Associations in residential districts, Women's groups, PTA (Parent Teachers Associations), Nurseries, Boy Scouts and Consumers' Co-operatives. Besides increasing waste paper recovery group collection schemes have played an important role in increasing awareness on the waste disposal and environmental issues on a local level .

### **5.2.2 Reasons for waste paper group collection**

The Paper Recycling Promotion Centre carried out a survey in October 1989 in order to establish the participation rate of municipalities in group collection schemes. This survey included 655 cities in addition to Tokyo city. A total of 401 cities replied to questionnaires (reply ratio 61.1%). The survey showed that group collection was under way in 196 cities, and in the remaining 205 cities group collection was in the planning and organisation stage.

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<sup>1</sup> /1993, Kami no ressaikuru -Tokyo, Japan

<sup>2</sup> /Paper Recycling Promotion Centre - Personal communication by M. Hirose

The reasons given for organising group collection were, in order of priority:

- to decrease the volume of total waste
- to re-utilise resources
- to improve the environment
- to improve community spirit among the citizens.

### **5.2.3 Local authorities participation: subsidies and rewards**

Local authorities co-ordinate and supervise collective recovery schemes. They keep records, including achievement reports for the groups involved. The government started to pay subsidies in April 1989 (in most cases 3 to 10 yen/kg) depending on the location. In Tokyo the subsidy is 3 yen/kg. In other cities the payment of subsidy only started in late 1990. Local authorities also provide materials, such as notice boards indicating the day and time of collection, stickers, flags, waterproof covering for protection.

The authorities' active campaigning includes:

- PR in the local official bulletins
- issuing and distribution of leaflets and posters
- implementation of seminars, group discussions, etc.

The groups with the larger numbers of participants were found to be the children groups followed by resident of block of flats, schools P.T.A. and women's associations. Other groups included: Association of Elderly Citizens, Youth Associations, Young Sportsmen Club, Kindergartens and Nurseries<sup>3</sup>.

The collective recovery system adopted depends on local authorities and associations but in general the waste paper collected is deposited in a designated container which is removed at a specified time by the waste paper dealer.

The first collective recovery was initiated by the Toshima-ku prefecture in Tokyo and the second was in Hiratsuka. Hiratsuka city - Kanagawa Prefecture - has the best collection records in the Kanto area (around Tokyo), there the local authorities initiated this recovery activity.

### **5.2.4 Independent Group collection with no authorities intervention**

The first private group was organised by a consumer co-operative in Hoya city (Tokyo outskirts) in 1973 as a result of the oil crisis. At first it was an experiment - members collected all re-usable waste items such as empty cans, bottles, furniture, clothes, etc. not only waste paper.

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<sup>3</sup> / 1993, Kami no ressaikuru, Tokyo - Japan

The main objectives of the Recovery Co-operative were identified as

- to reflect about their own life style
- to avoid wasting resources
- to improve consumer habits aiming at a sustainable use of resources (learning self discipline through contact with used materials)

Soon the co-operative started to buy recovered items from collectors and sold them to dealers. For about 10 years (1974-84) the activities developed well. Sales of waste paper were by far the most important source of income, responsible for the maintenance of these co-operatives. However in 1985 waste paper prices plummeted, and local authorities started to give some assistance by providing vehicles to recover recyclable wastes from routes previously established by the co-operative.

The Recovery Co-operative still collects waste paper in several areas, but because of the current low price they are at a turning point and might soon close down.

#### **5.2.5 Issues on group collection from households**

The idea of re-utilisation of resources and recycling is not sufficient to keep the activity going. Recent findings from the Paper Recycling Promotion Centre indicate three following problems:

- wide fluctuation in waste paper prices
- a stable supply of waste paper cannot be guaranteed. Dealers will not collect if prices are too low.
- lack of suitable collecting points
- costs of local authorities are far too high.
- it is very time consuming for households to perform the paper waste collection, sorting and carrying to collecting points.

Under the current recovery system the local authorities are spending about 40 yen/kg for collected waste paper. When prices paid by the wholesalers are too low, waste paper dealers do not pick up the material gathered by the groups.

Recently group collectors started to recover milk cartons.. Participation by households is increasing through consumer co-operatives. In 1993 the Co-op Kanagawa recovered 19 million milk cartons. The municipal authorities in Kanagawa Prefecture save about 27 million yen in refuse collection costs for every tonne of milk cartons recycled in the prefecture. However, the corresponding cost of recycling is 156 million yen. Collectors are discouraged as recovered material often ends up in the incinerators. "Co-op is willing to promote a renewable society in which authorities, citizens and corporations deal with recycling together. However, Co-op believes that rather than just consider the alternatives of disposal or recycling, it is imperative

that we change our way of life<sup>4</sup>. Suppliers must take responsibility for part of the recycling cost", commented the Co-operative group co-ordinator.

The principal groups promoting the recovery of milk cartons are: residential groups, primary schools, farmers co-operatives and local consumers' co-operatives. Some superstores have collection boxes in their shops. As only a few agents deal with milk cartons, collection channels need to be established.

### 5.3 Exchanging Waste Paper With Toilet Paper

Until the late 1950s, recovery of household waste paper was generally by the following route: Household-> Purchaser-> Dealer-> Wholesaler-> Paper maker

During the period 1963 to 1973, when economic growth was high, the consumption of paper and paperboard products increased sharply. However, households showed no interest in recovering waste paper.

To meet increased waste paper demand, households had to be encouraged to step in and improve the supply situation. The exchange of household waste paper for home delivered toilet paper became popular. Most of waste paper recovered from households originated from the tissue paper exchange scheme. Guifu Prefecture in Osaka registers that this exchange system occurred in 1920 when brown tissue paper manufacturers exchanged their products with waste paper from households.

Collectors in exchange for toilet paper (tirigami dealers) started as follows: In Shizuoka, during the beginning of 1960s, trucks transporting unsold tissue papers decided to exchange them with waste paper from apartment blocks with many residents. As they collected frequently, households were relieved as most urban inhabitants are space-constrained. They got rid of a bulky volumes of waste paper and in addition were supplied with toilet paper.

This system was copied nation-wide mainly in housing compounds such as apartment blocks. It reached a peak in late 1960s and gradually decreased. At present some 12 percent of waste paper from households is being collected by this method. The amount of labour involved in this operation is no longer compensated - it is impossible to make living with it (koredewakuenaizo) say the collectors.

During the early 1980s as a result of the second oil crisis, taxi drivers and salary men quit their jobs to become waste paper dealers as it was a profitable business. They were called temporary dealers as they disappeared when business became difficult. Traditional dealers are still in business and they are responsible for the recovery of about 40 percent of waste paper generated from households<sup>5</sup>.

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<sup>4</sup>/Kanagawa Co-operative, Tokyo - Japan

<sup>5</sup>/ Honshu Seishi, 1993 - Kami no ressaikuru, hiaku no tishiki

Nowadays tirigami dealers are seldom seen in urban landscapes. Many depots where tissue papers were exchanged have disappeared. Another factor making business harder for these dealers is that houses are empty during the daytime as housewives are out at their job.

Many households prefer to hand over their waste paper to newspaper distributors. Newspaper companies promote their environmentally friendly image by collecting waste paper free of charge when they deliver the newspaper. This seems to be more convenient than exchanging 10 kg of waste paper for a pack of tissue paper.

#### 5.4 Collectors' Productivity, Costs and Proceeds

In 1982 there were 1200 dealers in Tokyo. Now there are only 300. This means that productivity has increased, since the recovery rate has also increased. Indeed the recovery system improved and the amount collected per person has increased. Collectors for exchange with toilet paper collected one tonne/day at maximum; whereas assisted by newspaper offices, they can now collect 3 tonnes in half a day. Group collectors can recover as much as 4 tonnes in two hours. In terms of index, the productivity is as follows: Collectors in exchange for toilet paper = 1; Newspaper distributors = 6; and Group collection = 16.

Table 5.2 shows different collecting systems, productivity's and collection costs. These costs include transport and cost of purchasing waste paper from generating sources. Figures from Table 5.2 refer to 1990 when waste paper prices were higher.

*Table 5.1 Productivity and cost of some collecting methods*

collecting system	amount collected (ton/day)	time spent (hours/day)	number of person	cost yen/kg	newspaper shūrekin 1/ yen/kg	subsidies (in kind or services)
collectors in exchange for toilet paper nagashi (independent)	1.5	6 to 8	1	2	0.75	nil
collector in exchange of toilet paper with a fixed route- tirashi	2	6		2	1.5	nil
street collectors (small shops)	2.5 to 3.0	4 to 6	1 (plus shop assistant)	1.75 (1.5 to 2)	1.5	They get support from the shop also some small gifts such as bags, foods as they promote the shops.
group collection for recycling	2 to 4	2 to 4	1 group co-ordinator plus volunteers)	1.5 (1 - 2)	1.5	Local authorities pay from 3 to 10 yens/kg. PR and some (1 - 2) assistance for group's meetings
Collection by local authority directly or by a contractor	2 to 3	4 to 6	2 or according to contractor	40 to 50	0	

1/ shūrekin is the price collectors pay to waste paper generators and it refers to old newspaper price only.

Note: Cost includes fuel and other minor expenses - salary is excluded.

Source: Kanti no Ressaikun to Saisei Shi, 1992, Shūgyō Taimuzu



*Independent collectors in exchange for toilet paper (nagashi)* - The cost of these collectors was about 2.75 yen/kg, including transport and shiirekin. Shiirekin is "price" paid by collectors and it refers to old newspaper grade. In addition to toilet paper, collectors paid from 0.5 to 1.0 yen/kg for waste paper. The transport cost including fuel and other minor expenses amounted to 2 yen/kg. They collect from households.

*Collectors in exchange for toilet paper (tirashi)* - These collectors have a fixed route and they distribute pamphlets or any other advertising material. Their productivity is higher than of nagashi but their cost is also higher. Their cost amounted to 3.5 yen/kg, and they collect from households.

*Small street collectors* - They collect from 2 to 3 tonnes in about 5 hours. They work together with a shop assistant from one of several shops in a busy street. Shop owners want to get rid of their bulky waste paper and enjoy having a clean street to attract customers. They collect good quality wrapping paper and Kraft bags, old newspapers and old corrugated cardboard and cardboard boxes from stores, shops and offices. Their cost ranged from 2.5 to 4 yen/kg.

*Group collection scheme for recycling* - These groups are very efficient and collect about 3 tonnes in only 3 hours. The group consists of one co-ordinator and several volunteers, up to ten in a group. They sell the waste paper to dealers or if prices are low they just hand it over and get subsidies from local authorities. The collection cost ranged from 2 to 4 yen/kg. A subsidy of 3-10 yen/kg is paid by the local government.

*Collection by government order or contractors* - This type of collection is made through the waste disposal routes as established by the local waste disposal authorities or by contracting companies, together with the municipal solid waste. Costs are same as for waste disposal, in Tokyo is about 40 to 50 yen/kg. If a revenue is obtained from the sales, the cost is reduced accordingly.

In 1990, the average collecting cost for small collectors and collectors in exchange for toilet paper was 3 yen/kg [excluding salary]. The current collecting cost are about the same as collectors pay much less [if any] for waste paper but pay more for transport. Old newspaper price at wholesaler's gate is at 7 yen/kg. Most collectors however have no direct access to wholesalers. Consequently they have to sell the waste paper to dealers thereby decreasing their income even further. A result of the subsidy is over supply of poor quality waste paper which depresses the market more. Dealers' costs are high and often lower grade waste paper is left in containers uncollected. The waste paper business community is asking government to promote demand instead of paying subsidies for waste paper collection. The number of dealers is decreasing with the increase in the number of cities subsidising waste paper collection.

## **5.5 Summary**

Group collection scheme have proved successful in Japan. Government campaigns are effective, and people's main motivation for joining these campaigns is their concern for environmental conservation. Compared to other collecting methods such as "collectors in

exchange for toilet paper" the productivity of group scheme was 16 times higher, with a collecting rate of 2 tonnes per hour.

At present about 35 percent of waste paper is generated by the households, small shops, and other dispersed sources such as parks, schools and stations. This waste paper is collected and gathered in school playgrounds or waste paper banks owned by wholesalers. Currently about 1 to 1.4 million tonnes of waste paper is recovered through local authorities solid waste management schemes, at an average cost of 40,000 for unsorted and 50,000 yen/tonne of sorted waste paper. Part of the 1.4 million tonnes of waste paper recovered by citizens group is subsidised. The average subsidy is of 3,000 yen /tonne. As collection's cost increased and waste paper prices decreased, small collectors are having difficulties to cover cost which is about 3000 yen/tonne.

Recently many of these groups have start to question the purpose of waste paper collection, as it is not being consumed by industry. The over supply of waste paper collected from households is having an adverse effect on the waste paper business and some proportion of waste paper recovered with government subsidies is having to be incinerated.

The main problems identified by the waste paper business concerning the efficiency of group collection are as follows:

- wide price fluctuations
- stable supply of waste paper cannot be guaranteed. Dealers will not collect if prices are too low.
- lack of suitable collecting points
- costs of local authorities are far too high.
- it is very time consuming for the households to perform the waste collection, sorting and carrying to collecting points.

The waste paper industry is cyclical. Should the present structure be dismantled, when prices rise in future it may prove difficult to restore the channels which used to respond to fluctuations of demand. Some representatives of group collecting scheme suggest that rather than just consider the alternatives of disposal or recycling, it is imperative to change the present life style. Suppliers must take responsibility for part of the recycling cost, and government should stimulate demand for waste paper and make available suitable collecting points. The present "bring" system is not efficient. Subsidised collection is pushing collectors out of business.

## 6. PRICE TRENDS OF MAIN WASTE PAPER GRADES AND IMPORTED WOODCHIP

This chapter summarises the price trends for various grades of waste paper from 1981 to 1994. Waste paper prices may vary according to woodchip and recycled product prices. International chip price trends from major suppliers are given for the period of 1990 to 1994. Movements of waste paper from generating places to paper manufacturing places are also included in this chapter.

### 6.1 Trends of Waste Paper Prices

Figure 6 shows price trends for four grades of waste paper for the period of 1972 to 1992. These prices are monthly averages and refer to paper makers purchase price in Tokyo with exception for the grade "fine paper printed" which refers to prices in Shizuoka. Figure 6 also shows trends of consumption, supply and buffer stock over the 20 years period. The price differentials between grades are in general large when prices are low but tend to be smaller when prices rise. As a rule, old magazines fetch lowest price except during the first oil crisis in 1973 when prices reached the highest historical record of 60 yen/kg regardless of grade. There has been a wide price fluctuations over this last 20 years showing a cyclical trend in the waste paper business.. Table 6.1 shows price trends for seven grades of waste paper for the period of 1981 to 1993

Waste paper prices have been falling since 1984. Comparing prices from June 1984 to April 1992 there has been a decrease of 8 yen/kg (old news); 9 yen/kg (magazines) and 12 yen/kg (cardboard boxes). Taking June 1984 prices as 100, prices in April 1992 would be: newspaper 68; magazine 59 ; cardboard 60. The price decrease in real terms for the period 1984-92 was more than 30 per cent. In June 1986 prices at mill gate were at the bottom and many wholesalers bankrupted.

Figure 6 shows that in December 1991, buffer stock reached the highest point at 900,000 metric tonnes of waste paper. A supply surplus period during 1992 to 1994 was responsible for low current prices. However the stocks are now at lowest tonnage as most of it was exported by the end of 1994. Wholesalers were confident about future market prospects, but they are now disturbed as over supply may continue due to government subsidies.

When waste paper prices paid by papermakers [mill gate prices] are low, wholesalers and intermediary dealers make losses. However when costs exceeds revenues for small collectors, they are unable to pay for the paper collected. Instead a fee is paid at the sources for removing waste paper. If removal is government responsibility a subsidy is paid.

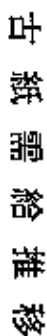
**Table 6.1 Price Trends for Waste paper**

yen/kilogram

Year	Month	Hard white shavings* (1)	Woody paper shavings* (2)	Printed woodprint * (3)	Colour printed woodfree * (4)	Old news. (5)	Old magazines (6)	Old corrugated containers (7)
1981	Mar	72.5	56.0	54.0	21.5	23.0	14.5	26.0
	Jun	68.5	52.0	50.0	16.5	19.0	10.5	20.0
	Sep	79.0	52.0	50.0	18.0	19.0	12.0	20.0
	Dec	80.0	52.0	50.0	19.5	19.0	13.0	20.0
1982	Mar	81.5	54.0	51.0	20.5	19.0	14.0	20.0
	Jun	79.0	54.0	51.0	20.5	21.0	14.0	20.0
	Sep	79.0	54.0	51.0	21.0	21.0	15.0	20.0
	Dec	77.5	54.0	51.0	28.5	28.0	24.0	28.0
1983	Mar	77.0	54.0	51.0	32.5	34.0	28.0	33.0
	Jun	77.0	54.0	51.0	25.5	25.0	20.0	27.0
	Sep	78.0	54.0	51.0	27.0	25.0	22.0	29.0
	Dec	81.0	54.0	51.0	32.5	25.0	25.0	33.0
1984	Mar	81.0	54.0	51.0	33.0	26.0	25.0	34.0
	Jun	81.0	54.0	51.0	28.5	26.0	22.0	31.0
	Sep	81.0	54.0	51.0	28.5	25.0	22.0	28.0
	Dec	81.0	54.0	51.0	28.5	25.0	22.0	27.0
1985	Mar	78.5	54.0	50.0	26.5	25.0	21.5	25.0
	Jun	78.0	54.0	47.0	21.0	21.0	16.0	20.0
	Sep	78.0	54.0	47.0	21.0	20.0	16.0	20.0
	Dec	69.5	50.5	41.5	21.0	18.5	13.0	18.0
1986	Mar	67.0	50.5	41.5	20.0	18.0	12.0	18.0
	Jun	65.0	50.5	41.5	19.0	17.5	11.0	17.0
	Sep	64.0	50.5	41.5	18.0	16.5	9.5	17.0
	Dec	64.0	50.5	41.5	18.0	16.0	10.5	18.5
1987	Mar	64.0	45.0	27.0	20.0	16.0	12.0	23.0
	June	64.0	45.0	27.0	18.0	16.0	11.5	23.0
	Sept.	64.0	45.0	27.0	18.0	16.0	12.0	23.0
	Dec.	64.0	45.0	27.0	20.0	16.0	15.0	24.0
1988	Mar	64.0	45.0	27.0	20.0	19.0	16.5	23.0
	June	64.0	45.0	25.0	18.0	20.0	15.0	20.0
	Sept.	64.0	45.0	25.0	18.0	18.5	14.0	18.0
	Dec.	64.0	45.0	26.0	19.0	17.0	14.0	18.0
1989	Mar	65.5	42.5	27.0	19.0	16.5	14.0	17.0
	June	66.5	45.0	26.0	18.0	16.0	12.0	17.0
	Sept.	66.5	45.0	26.0	18.0	16.0	12.0	17.0
	Dec.	68.5	45.0	26.0	18.0	16.0	12.0	17.0
1990	Mar	68.5	45.0	30.0	22.0	16.0	11.0	17.0
	June	68.5	45.0	30.0	22.0	16.0	11.0	17.0
	Sept	68.5	45.0	30.0	22.0	16.0	11.0	17.0
	Dec	68.5	45.0	30.0	22.0	16.0	11.0	17.0
1991	Mar.	67.0	45.0	28.0	20.0	16.5	13.5	17.0
	June	67.0	44.0	27.0	20.0	18.0	14.0	17.0
	Sept.	67.0	44.0	27.0	19.5	18.0	14.0	18.0
	Dec.	65.0	43.0	27.0	19.5	18.0	14.0	18.0
1992	Mar.	58.5	39.5	26.0	18.5	17.5	13.5	18.0
	June	58.5	39.5	24.0	17.0	17.0	12.0	17.0
	Sept.	58.5	39.5	24.0	17.0	16.0	10.5	17.0
	Dec.	58.5	39.5	24.0	17.0	16.0	10.0	16.0
1993	Mar.	55.5	39.5	24.0	17.0	15.0	10.0	16.0
	June	54.5	38.5	23.0	16.0	14.5	9.0	15.5
	Sept.	49.0	37.5	19.0	12.0	14.5	8.5	14.5
	Dec.	49.0	35.5	19.0	12.0	14.0	7.5	14.0

Source : 1993 Statistics of wastepaper in Japan - Paper Recycling Promotion Centre

1972-1992 [in yen/kg and 1,000 tonnes]

[illegible]

## 6.2 Relation Between Waste paper and Woodchip Prices<sup>1</sup>

Waste paper prices are influenced by prices of imported pulpwood. Recent trends of waste paper prices converted in US dollars are given in Table 6.2. Figures in this table should be taken only as an indicative as averages (some monthly, other annual average) are not consistent.

**Table 6.2 Mill gate waste paper prices - annual average in US\$/tonne**

Year	Exchange rate in yen/US\$	Hard white shavings	Woody shavings	Printed woodprint	Colour print woodfree	Old news	Old magazines	OCC
1989	130	513	341	202	140	124	96	131
1990	150	457	300	200	147	107	73	113
1991	139	480	318	197	143	127	100	126
1992	135	433	293	181	129	123	85	126
1993	135	385	280	157	106	107	65	111
1994	120	417	317	183	108	117	67	117
1995	100	na	300	na	na	140	70	130

Note: Price for 1995 refers to March price

Source: Paper Recycling Promotion Centre

**Pulpwood prices** - Pulpwood demand in Japan fell for the second consecutive year in 1993. Softwood consumption totalled 15.5 million cubic metres, down 7 per cent on 1992. Hardwood consumption totalled 20 million cubic metres in 1993, down 2 percent on 1992. Even with the increased demand for woodchips in late 1994, there has been adequate supplies, and as the market continued to improve, prices in early 1995 started to move upwards. However, the contribution of imported pulpwood to the total supply continued to increase as domestic production was further reduced. Imports totalled 59 percent in 1993, up from 53 per cent in 1990, and had increased to 63 percent in 1994.

<sup>1</sup>/The international woodchip trade: supply and demand trends and the outlook for 1995  
A comprehensive analysis by: D.A. Neilson & Associates, Rotorua, New Zealand-Robert F. & Associates, Tacoma, Washington, USA.

**Table 6.3 Recent data on Japanese pulpwood supply** (in 1,000 cubic metres)

Pulpwood supply	1990	1991	1992	1993
Domestic	17,965	17,188	15,925	14,482
Imported	19,983	22,572	21,275	21,041
Total	37,948	39,760	37,200	35,524
% imported	53	57	57	59

Source: D.A. Neilson & Associates, Rotorua - New Zealand

Almost all (98%) of pulpwood imports into Japan are in chip form. The United States Pacific Northwest (USPNW) still continues to be the major supplier of softwood chips to Japan with 3.8 million cubic metres imported in 1993 out of a total of 7.1 million cubic metres. Other suppliers are shown in Table 6.4. With regard to the hardwood chips, Australia and Chile are the major suppliers. International chip price trends are shown in Table 6.4 and 6.5.

**Table 6.4 International Japanese Softwood Chip Price Trends in US\$ per BDU FOB 1/**

location type supplier	US PNW Douglas fir Tacoma	Canada SPF Vancouver	Australia P.radiata Portland	Chile P.radiata San Vicente
1990	117.0	118.5	107.0	87.0
1991	122.0	123.6	110.5	87.0
1992	122.0	123.0	112.0	87.0
1993	125.0	122.0	112.0	87.0
1994	122.0	126.0	109.0	88.0
1995			(112)	

Source: D.A. Neilson & Associates, Rotorua - New Zealand

1/ 2.35 green metric tonnes = 1.0 bone dry unit (BDU) for softwood

**Table 6.5 International Japanese Hardwood Chip Price Trends in US\$ per BDU FOB 1/**

location type supplier	US PNW Alder Various	US South Oak/Hickory Mobile	Australia Eucalyptus NFP	Chile Beech Various
1990	113.0	91.0	116.0	90.0
1991	120.0	91.0	115.0	90.0
1992	117.0	91.0	114.0	91.0
1993	120.0	95.0	102.0	91.0
1994	123.0	97.0	116.0	95.0

Source: D.A. Neilson & Associates, Rotorua - New Zealand

1/ 2.0 green metric tonnes = 1.0 Bone dry unit (BDU) for hardwood

### 6.3 Prices of Some Paper Products

Table 6.6 gives prices of several types of tissue products. It shows that prices of tissue products (toilet paper-tirigami) made out of 100 per cent recycled fibre are higher than those made of virgin fibre.

**Table 6.6 Prices of Tissue and Toilet Paper Products, 1994 (in yen/kg)**

year/month	Total	Tissue paper	Tirigami	Toilet paper	sanitary towels	Towel paper	other high quality	(3)-(4) in % premium-
--	-50% virgin	100% wp	100% virgin	100% virgin	50% wp	100% virgin		
1994	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Jan	189.8	201.4	183.9	171.8	367.8	195.6	236.7	6.6
Feb	190.5	205.6	181.5	170.0	375.2	202.0	233.5	6.3
Mar	188.5	199.2	180.7	169.8	370.8	207.2	237.4	6.0
Apr	187.5	198.5	182.9	168.1	381.7	206.9	233.4	8.1
May	184.2	193.1	180.5	167.2	372.3	197.7	232.5	7.4
Jun	185.6	198.6	179.2	166.3	376.2	201.3	231.7	7.2
Jul	186.6	200.6	180.2	166.3	381.1	200.8	230.7	7.7
Aug	185.6	198.2	175.0	166.1	390.2	201.3	238.3	5.1
Sep	185.9	198.0	179.8	167.2	374.1	200.1	241.2	7.0
Oct	182.9	196.7	178.9	162.7	387.5	194.9	232.7	9.1
Nov	183.4	198.0	179.2	162.2	391.6	196.0	226.0	9.5
Dec	183.6	198.4	178.2	162.6	392.0	199.4	237.2	8.8
Avg 1994	186.2	198.9	180.0	166.7	380.0	200.3	234.3	7.4
Avg 1993	209.6	239.4	189.6	182.0	379.1	212.7	239.8	4.0
1994/1993	88.8	83.1	94.9	91.6	100.2	94.2	97.7	

In US\$ per tonne for average tissue product:

Avg 1993 - US\$1,552/tonne

Avg 1994 - US\$ 1,550/tonne

Source: Association of tissue products manufacturers - Tokyo, Japan

Tirigami is almost entirely consumed by companies. They pay a premium to promote environmentally friend image. The quality of tirigami is inferior to toilet paper made out of 100 percent virgin fibre. Young consumers (below 20 years old) do not know what tirigami means. Retailers do not stock this product.

### 6.4 Comparison Between Waste Paper, Woodchips and Paper Product Prices

	waste paper (old news)	woodchips * (from US)	in US\$/tonne tissue paper (average-all)
1993	107	120	1,552
1994	117	123	1,552

\* US\$ per BDU, refers to Alders price from USPNW



This table only indicates that all three columns follow the same price trend. A more detailed study is needed to find out how these data are correlated. Among difficulties to establish a comparison between waste paper, woodchips and paper products prices are the following factors:

- there are large differentials between waste paper grades
- the availability of stocks at paper makers factories
- clear record of utilisation rates for each paper product
- woodchips prices - trading pattern, etc.
- manufacturing costs are not easily available

The Paper Recycling Promotion Centre is currently carrying out a study using a long term price series of waste paper and several paper products. Several questions need to be answered : Stabilisation of prices by buffer stock, woodchip import prices, recycled paper prices, etc.

## **6.5 Waste Paper Export Prices**

Figures from Table 6.2 and 6.3 show that woodchip prices had increased from 1990 to 1992. Waste paper prices should have increased as result of increased demand compensating for the woodchip price increases. However waste paper prices continued to fall due to over-supply. According to a major wholesaler " Araishoten " from Arati-ku (Tokyo) the waste paper exports have increased since 1992 because: The USA started to recycle the old newsprint wastes (target to increase utilisation rate for 40%) which used to be exported to Asian countries such as Taiwan, Korea and Indonesia.

These Asian countries then turned to Japanese suppliers who were willing to decrease their stock in order to get higher prices from local papermakers. During the first quarter of 1992, OCC export fob price was 7 yen/kg, about half of the domestic price. At present the OCC export price has increased and is comparable to domestic price at about 14 yen/kg. Although this price level is not satisfactory for the wholesalers they are confident that prices will soon move up as the waste paper demand increases and paper and board product prices have been increasing.

Comparing these prices for first quarter of 1993 and 1994 there has been an increase of 10% indicating demand overtaking the supply. During the last 2 years paper companies with considerable over capacity increased production to take advantage of low woodchip and waste paper prices. As demand for paper products maintained depressed papermakers could not afford to rise waste paper prices until recently. Now there are no stocks of either waste paper or paper products.

Wholesalers are confident that prices will now move upwards due to higher virgin pulp prices and increased international demand for waste paper. There are at present some 200 wholesalers

of waste paper in Japan. In Arati-ku alone there are twenty. Together the amount of waste paper handled is about 600,000 metric tonnes/year.

#### **6.6 Movements of Waste Paper Stock in Japan**

Waste paper has to be transported to areas where the paper factories are located. The generating places and consumption places are listed in Table 6.7 The average waste paper transport cost within the country is quoted as 6 yen/kg. Papermakers have asked the government to provide some financial assistance to make recycling more competitive.

**Table 6.7 Movement of waste paper in Japan - from generating points to paper mills**

	Generation												
	Hokkaido	Tohoku	KantoKe-Shinetsu	Shizuoka	Chubu	Hokuriku	Kinki	Chugoku	Shikoku	Kyushu	Total	Proport	
Consumption													
Hokkaido	522,784	105,544	537,865				88,763				1,254,756	10.1	
Tohoku		562,184	268,345	29,852							858,181	7.1	
Kanto		11,526	2,027,840	55,287	12,137		11,460				2,118,350	18.1	
Shizuoka			1,585,852	8,313	347,273	212,426	114,892		110.00		2,288,668	19.1	
Hokuriku			39,884	42,669	42.00	131,989	247,821	197,471	593.00	102.00	660,551	5.7	
Chubu			40,501	78,831		880,497	17,069	187,346	133.00		1,184,377	10.1	
Kinki						12,649	113.00	1,231,386	772.00	1,278	1,246,098	10.1	
Chugoku								22,339	145,452	8,898	184,643	1.6	
Shinkoku			118,939		58,998		301,789	144,988	164,068	149,126	855,888	8.3	
Kyushu							5,188	84,747	22,137	844,832	756,675	6.6	
Total	522,784	678,254	4,614,906	214,752	347,315	1,268,596	285,003	2,160,805	377,663	218,383	800,912	11,488,183	100.0
Proportion	4.6	6.9	40.2	1.9	3.0	11.2	2.3	18.5	3.3	1.9	7.0	100.0	

Table 6.7.1 Supply of old news classified by regions in Japan (Jan-Dec 1993)

Table 6.7.1 Supply of old news classified by regions in Japan (Jan-Dec 1993)												(million)	
	Generation												
Consumption	Hokkaido	Tohoku	KantoKe-Shinetsu	Shizuoka	Chubu	Hokuriku	Kinki	Chugoku	Shikoku	Kyushu	Total	Proportion	
Hokkaido	211,644	76,433	357,273				50,759				696,109	23.3	
Tohoku		155,379	149,359	55.00							304,793	10.3	
Kanto		2,068	204,913	9,799	257.00		3,016				220,093	7.3	
Shizuoka			384,123	3,183	45,135	26,816	57,558				518,815	17.3	
Hokuriku			14,506	12,458		9,165	52,832				108,825	3.6	
Chubu			1,371	1,883		266,730	41,481				311,465	10.4	
Kinki							82,827				82,827	2.8	
Chugoku							821.00	20,212	40.00	68.00	21,139	0.7	
Shikoku			88,815			35,688	252,760	88,886	68,970	83,041	619,160	20.7	
Kyushu								75.00		112,011	112,088	3.7	
Total	211,644	233,800	1,200,360	27,378	45,135	338,656	52,832	508,686	110,173	69,010	195,116	2,991,072	100.0
Proportion	7.1	7.8	40.1	0.9	1.5	11.3	1.8	16.9	3.7	2.3	6.5	100.0	

Table 6.7.2 Supply of Old corrugated containers classified by regions in Japan (Jan-Dec 1993)

Table 8.7.2 Supply of Old corrugated containers classified by regions in Japan (Jan-Dec 1993)												(metric tons)	
	General												
Consumption	Hokkaido	Tohoku	KantoKe-Shinetsu		Shizuoka	Chubu	Hokuriku	Kinki	Chugoku	Shikoku	Kyushu	Total	Proportion
Hokkaido	222,424	25,036	174,873					38,004				460,337	
Tohoku		324,428	61,377	22,150								407,955	
Kanto		2,958	1,005,609	39,321		5,966		3,238				1,057,092	100.0
Shizuoka			704,876	173	186,382	135,848		15,670				1,042,749	100.0
Hokuriku			3,698	28,384	42.00	112,309	147,452	154,058	434.00			447,277	
Chubu			14,090	58,201		395,395	9,746	81,684	133.00			539,231	
Kinki						9,812	113.00	729,974	772.00	1,278		741,749	100.0
Chugoku								9,472	52,556	7,358	6,809	76,295	
Shinkoku			19,273			22,141		38,946	52,946	92,713	64,663	290,882	
Kyushu									66,693	17,240	375,688	459,621	
Total	222,424	352,422	1,983,796	148,229	186,424	681,071	167,313	1,051,926	173,534	118,589	447,680	5,523,388	100.0
Proportion	4.0	6.4	36.9	2.7	3.4	12.3	2.8	19.0	3.1	2.1	8.1	100.0	

Source: Paper Recycling Promotion Centre

## 6.7 Summary

Waste paper prices decreased sharply in real terms from 1984 to 1992. During 1983 and 1984 collectors had an income of about 300,000 yen/month and the system was working well. In 1986 papermakers prices to wholesalers went below 10 yen/kg and many dealers/collectors went out of business. In 1982 there were 1200 people but now it is reduced to 300 in Tokyo city.

Many co-operatives bankrupted in these last 10 years and although some price improvement took place along this period, there has been an acute shortage of people willing to join the business. As a result there has been an sharp increase in the productivity: the recovery system improved and the amount collected per person has increased.

However due to low market prices wholesalers were operating with reduced profit and in some cases with losses during the last four years. As the papermakers and wholesalers run out of stocks and as the international demand for waste paper seems to improve, and with the trend of increasing woodchip prices the long-term market prospect for the Japanese waste paper could be brighter.

## 7. WASTE DISPOSAL: RECYCLING , INCINERATION AND LANDFILLING

This chapter looks into the structure of the waste management sector in Japan. Special importance is given to municipal waste and the implications of the increasing proportion of waste paper in total waste disposal. About 50 per cent of waste paper is recycled. The remaining 50 percent is used as feedstock for incinerators and goes to landfill either as incinerators ash or directly. The policy of minimising landfill resulted in increased *recycling* and incineration of waste paper. Companies engaged in waste paper recycling are becoming less competitive and siting new incinerator plants in densely populated cities is proving increasingly difficult. Although in the past Japan has paid little attention to cost effectiveness because of the availability of low cost capital, this trend is rapidly changing. The Ministry of Health and Welfare organised a Study Council to draw up proposals for economic methods of waste reduction. Suggestions from the Council are also included in this chapter.

### 7.1 Background

There is an acute shortage of landfill because the area is so densely inhabited , with a population of 124 million, combined with a fast growing economy. Specialists who have recently visited Japan recognised the excellence of the waste management system. The main factor in the success of reducing waste in Japan has been the high participation of households: about 90 percent participate in sorting waste according to recyclability and combustibility. The second most important factor has been community participation in the local authorities' decisions about siting waste disposal facilities, such as waste processing plants and incinerators, in the Centre of towns.

However the behaviour of the Japanese people seems to be changing. Events in 1994, such as the replacement of the prime minister every second month, reflected a growing social unrest. In July 1994, anti-government demonstrations were reported in Arachi ward, where most of the recycling business is concentrated. Demonstrators there wanted the government to stop subsidised collection of waste paper. In another Tokyo ward, a project for a new incinerator was cancelled because of local opposition. Land price is at a premium and residents claim that prices of real estate will halve due to continuous noise, smell and smoke <sup>1/</sup>.

At present municipal solid waste is controlled by local government. So far incineration with heat or power recovery has been the major disposal method. The option of recycling as a strategy of waste minimisation was introduced in 1991. Legislative measures in force are flexible allowing negotiations between local authorities and communities.

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<sup>1/</sup> Ministry of Health and Welfare, March 1995.

## 7.2 Waste Management Policy and Legislation

In Japan policy on waste management is set at the national level by three governmental bodies:

- Ministry of Health and Welfare (MHW), responsible for municipal solid waste
- Ministry of International Trade and Industry (MITI), responsible for industrial wastes, and
- Ministry of Environment, responsible for setting standards.

Incineration has been much promoted in Japan as an appropriate means of waste disposal in terms of sanitation and energy conservation. The Water Supply and Environmental Sanitation Department of the MHW states that "incineration plants, if fitted with suitable end-of-pipe abatement technologies, or indeed, if designed specifically to eliminate air pollution, provide numerous advantages, ranging from the lack of need to store waste, to the benefits of recycling heat and certain product categories as a result of the process. The ratio of incinerated waste to landfill is therefore important as an index of progress towards fully integrated and sustainable waste management"<sup>2</sup> /.

Although there has been an increase in the ratio of incinerated waste, excess waste still has to be disposed of in landfills. Availability of landfill sites is currently an urgent problem, especially in urban areas. The metropolitan area (Tokyo, Saitama, Kanagawa, Chiba) which produces one quarter of the total volume of waste in Japan has almost exhausted its local sites.

Over 30 per cent of local governments in the metropolitan area depend on private companies from other prefectures to treat waste which exceeds their own capacity. This has become a big threat not only to the environment but also to the finances of local government.

The cost of landfill operation has increased because of stricter environmental regulations. Waste disposal in landfill creates potentially dangerous air pollutants (e.g. methane) and water pollution from run-off and leachate as shown by a case study in Fukuoka<sup>3</sup> /.

### Roles of ministries involved in waste management

*Ministry of Health and Welfare* - This ministry has overall responsibility for waste handling and for administering the Waste Disposal law 1970. This law establishes the following:

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<sup>2</sup> / Quality of the environment in Japan 1990. Environment Agency, Government of Japan

<sup>3</sup> / Matsufuji, Y. and Hanashima, M. 1994. Remediation Technology at Illegal Dumping Site and Landfill site in Japan. Fukuoka University.

- classification of wastes [ *industrial wastes*, generated by business and industrial activities and *general*, all other wastes including residential wastes]
- definition of responsibilities [ *Industries* are responsible for their industrial wastes; *Prefectural governments* are responsible for monitoring the generation and movement of industrial wastes *Municipal governments* are responsible for public cleansing by performing waste disposal operations]
- allocation of financial support [ regulates the provision of financial support by the National Government to the municipalities for waste processing and disposal facilities]
- regulation of landfills standards [ establishes the requirements for provision of liners and leachate collection and treatment system]

The Waste Disposal Law was amended in 1991 to take into account developments in waste management since 1970. This amendment established the waste management hierarchy and enacted the Recycling Law.

The waste management hierarchy is established as:

- waste avoidance
- waste minimisation
- reuse and recycling , and
- sanitary disposal (incineration)

*Ministry of International Trade and Industry* - The Recycling law was pioneered by MITI, which has a central role in its implementation and seeks specifically to-

- promote the use of recycled resources as raw materials within the relevant industries.
- promote the use of by-products (e.g. ash from incinerators)

The Recycling law establishes guidelines for recycling of both municipal and industrial solid waste. Targets are set for the utilisation of collected waste paper, glass, etc. These targets relate to materials recycling only although MITI is keen to promote waste-to-energy "recycling"<sup>4</sup>/. MITI provides several fiscal and financial incentives to the recycling industry . Research and public education on recycling is carried out by the Clean Japan Centre which is supported by MITI (see chapter 3).

*Ministry of Environment* - In 1991, this Ministry created the Japanese Environment Agency. This agency has now been elevated to full cabinet position and is responsible for setting national minimum standards, after negotiations with MITI, for air emissions from waste incineration plants.

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<sup>4</sup> / Waste management in Japan, 1994. Institute of Waste Management, Northampton, England

Air pollution control is regulated by the -Air Pollution Control Law- with municipalities usually imposing more stringent requirements on any plant within their jurisdiction"<sup>5</sup> /. The incineration process is managed in order to ensure that operation meets the standards that have been agreed upon with the neighbourhood residents.

As a measure to deal with hydrogen chloride and sulphur oxide in exhaust gas, scrubbers utilising sodium hydroxide have been installed, and they have been highly effective in removing these pollutants. In order to deal with nitric oxide, catalytic and non catalytic denitrification equipment is being used in addition to the present incineration control equipment. Mercury and dioxin in the emissions are measured on a continuous basis. At present, they are at a level where no harmful effects on human health can be found. Table 7.1. showing pollutants in exhaust gases and drainage from incineration plants in 1992 is attached as appendix 2.

### **7.3. The Effects of 1991 Amendments to the Waste Disposal Law**

The amendments introduced in 1991 did not produce results as expected. The amount of waste has continued to rise drastically in recent years, because of life styles and industrial development in which large quantities of products are produced, consumed, and disposed of. The capacity of waste treatment facilities has not kept pace, especially that of landfill. The increase in expenditure for waste disposal is becoming critical. The market prices of recycled products have fallen, and industries are reluctant to increase recycling. Attempts at legal enforcement to improve this situation have failed. The MHW is considering the introduction of economic methods [charging fees] for waste disposal.

*Legal enforcement* -Two bills aimed at strengthening the regulations on waste were approved in October 1992: the amendment of the Waste Disposal and Public Cleaning Law, and the Law for the Promotion of Recyclable Resources. But both were watered down to the point where they will do little to improve the situation. The legislation was intended to curb pollution at the source, both by suppressing the production of goods that cannot be recycled and by placing responsibility on manufacturers for the disposal of their products when they are eventually discarded, but the relevant provisions were robbed of their substance <sup>6</sup> /.

-When the revision of the Public Cleaning Law was being drafted, the Ministry of Health and Welfare fought for the inclusion of a no-fault liability clause that would have obliged polluting companies to pay compensation, but when this draft was circulated every single Ministry except the Imperial Household Agency objected, and the provision was scrapped.

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<sup>5</sup> / Same as 4

<sup>6</sup> /Yorimoto,K. 1994. Building a recycling society. Look Japan, December 1994.



-The amended Public Cleaning Law provides for prison terms of up to three years and fines of up to 3 million yen. Many agree that what is really needed is the introduction of the "polluter pays" principle. Large corporations now pass the responsibility for waste disposal on to medium-sized subcontractors, which in turn pass the buck to the small businesses under them. Naturally, these small firms do not have the funds to dispose of the refuse properly<sup>7</sup> /.

*Economic measures* - The Ministry of Health and Welfare, set up a "Study Council to study alternative methods for waste reduction". The study council main recommendations were published in September 1993 and can be summarised as follows:

Simultaneous implementation of three economic measures should be adopted because they are fair, efficient and feasible. These are

- 1) collection of fees according to the quantity of solid waste in the collection stage
- 2) collection and processing (including recycling) by manufacturers and distributors in the production and distribution stage
- 3) recycling of recovered waste material according to established targets

The council reported that the measures need to be introduced together because if any one of them is introduced alone, its effectiveness is limited. It suggested that not only the administration take responsibility for waste reduction and recycling, but also producers and consumers should play active roles, and it called for a new system to be set up.

#### *Rationales to charge waste disposal fees for reducing waste*

*Disposal stage* - In Japan there is no charge for the collection and waste disposal. People only pay a small fee for disposing of large items such as beds, t.v.'s, fridges, etc. It is suggested that it is unfair that no distinction is made between those who make an effort to reduce waste and recycle and who do not.

*Production and distribution stages* - Manufacturers and distributors do not pay the cost of waste disposal, so they are not interested in developing recyclable products or avoiding excessive packaging. Companies making efforts to reduce waste pay the costs, reducing their competitiveness.

*Recycling stage* - Collected resources are not all recycled. The recycling system does not promote the principle of waste minimisation. The economic limit of use of recovered wastes in industrial production has been reached (chapter 2).

The Study Council conclusion is that the current waste treatment system does not minimise the costs: As only the public sectors is responsible for waste treatment, the costs of waste reduction

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<sup>7</sup> / Nishigawa, K. 1994. Today's issues on waste disposal .Waste Management Association, December report. Tokyo.

and recycling are not imposed on each economic unit<sup>8</sup>/. Government agencies are continuing discussion with representatives of the private sector on the feasibility of new measures

#### 7.4 Classification of Waste

Waste is classified in Japan as either general waste or industrial waste.

General wastes are the municipal solid waste consisting of household and business waste and night soil. Municipal wastes [household and business] are further subdivided into combustibles, non-combustibles (sorted waste), recyclable, bulky and hazardous.

Industrial wastes are treated in principle as the responsibility of producers. The volume of industrial waste in recent years has been more than 300 million tons per year. This is 6 times the volume of general waste. The main items of industrial waste are cinders, sludge, oil, acid, alkali, plastic, etc. Part of these are recycled. Recycling rates vary according to the nature of the waste. Metal and paper are some of the most recycled materials<sup>9</sup>/.

Classification of waste in Japan

wastes	a) general waste	a1) municipal waste	a1.1.household	-combustibles
	b) industrial waste	a2) night soil	a1.2 business	-non-combustibles -recyclable -bulky wastes -hazardous wastes

Source: Ministry of Health and Welfare

#### 7.5 Composition of Waste

Official nation-wide statistics on the composition of waste are not available. Figures from the Japan Paper Association indicate that waste paper accounts for 27 percent of total municipal solid waste<sup>10</sup>/.

<sup>8</sup> / Tanaka, M. 1994. Waste Reduction by Economic Methods, The Institute of Public Health, Tokyo

<sup>9</sup> / Public Cleansing Services, 1994, Tokyo Metropolitan Government

<sup>10</sup> / Quoted from Miti's Study Committee report, 1994. "in view of the shortage of final disposal facilities for municipal solid waste and, in order to conserve resources, the paper and pulp industry is required to use even more waste paper, which accounts for 27 percent of total municipal solid waste according to Japanese Paper Association"

However data on composition of waste in Tokyo are published on a regular basis. The Bureau of Public Cleansing carries out regular surveys on the composition of combustible and sorted wastes (include non-combustible and waste unfit for incineration). In this survey the Bureau collects samples from 12 incineration plants four times a year for combustible wastes, and from 18 waste collection points twice a year for non-combustible wastes. A typical composition of combustible wastes and sorted wastes is as follows:

**Table 7.2 Composition of Combustible and Non-Combustible Waste, FY 1992, Tokyo**  
By weight, wet basis (in %)

type of waste	combustibles	non-combustibles
waste paper	44.2	12.9
food waste	33.4	4.4
textiles	3.8	-
plastics	7.4	21.4
glass	0.6	27.9
metals	0.3	25.1
grass, wood, etc		1.5
others	10.3	6.8
Total	100.0	100.0

Source: Bureau of Public Cleansing - Tokyo Metropolitan Government

It was noted that only 90.6% of combustible waste was in fact combustible. About 7.7 per cent was unfit for incineration and 1.6 per cent non-combustible. Food waste has been recently decreasing while waste paper sharply increasing. This increase of waste paper contributed to an increase in calorific value of the total waste during incineration, which diminishes the capacity of incineration plants.

On the other hand, non-combustible wastes and wastes unfit for incineration have been separated incorrectly. Combustibles make up 20% of sorted wastes. Results from a survey of waste composition from households and offices carried out by the Bureau are shown in Table 7.3

**Table 7.3      Composition of General Wastes From Households and Business**

Type of waste	households	business
waste paper	22.1%	46.4%
food waste	48.6%	21.7%
non-combustible waste	11.4%	11.4%
unfit for incineration	9.4%	13.1%
wood,etc	6.7%	5.3%
textiles	1.8%	2.0%

Source : Bureau of Public Cleansing - Tokyo Metropolitan Government

## **7.6    Collection   and   Sorting   of   Wastes**

"The sorting of waste by the householder became more efficient in mid 1980s. The sorting was initiated to counter the rising calorific value of the wastes and the subsequent damage that this caused in incineration facilities. Combustible waste is taken to incinerators, recyclable to merchants, and non-combustible waste is directly landfilled whilst the bulky waste, after crushing and recovery of metals, is also incinerated with the combustible fraction"<sup>11</sup> /.

Instructions on the proper way to put out waste in Tokyo's 23 wards are placed everywhere and discussed continuously on TV. The main points contained in the instructions are:

*How to sort* - Household waste should be sorted into three main categories:

a-Combustible waste (burnable)-Collected three times a week.

b-Non-combustible waste (unburnable and unfit for incineration)-Collected once a week.

Instructions for recycling of combustible and incombustible wastes are:

For both types of waste - recover all recyclable wastes. These are: milk cartons, newspapers, magazines, cardboard boxes, bottles, cans, Styrofoam trays, etc. For enquires about recycling contact the nearest City Hall in your ward. In Adachi and Shinagawa wards the Bureau collects certain kinds of recyclable twice a week.

<sup>11</sup> /Patel, N.M. 1992. Some observations on municipal solid waste management in Japan. Report for the Department of Trade and Industry, Ontario

c-large-sized waste- Collected upon application (two collection days per month are designated in each area) - Collection of this type of waste is charged, fees vary with size and type.

Examples of some current fees for the disposal of large-sized wastes: Refrigerator(Yen 1,900);TV set(Yen 1,400); Living room sofa for 3 persons(Yen 1,400); Aquarium(Yen500);Dead animal(Yen2,600),etc.

*How to put out waste* - Combustible and non-combustible wastes should be placed in a plastic container with lid or in Tokyo Metropolitan Government approved semi-transparent waste bags or any other transparent bags.

## 7.7 Quantity of Wastes - Statistics of Waste Treatment

*Generation of wastes* - The quantity of waste generated increased steadily until around 1970, but temporarily decreased after the oil crisis in 1973 <sup>12</sup>/. Later the amount of waste generated levelled off. From 1986 on it suddenly increased. The total quantity generated in fiscal 1990 was 50.4 million tonnes and in 1991 was 50.7 million tonnes. Although the rate of increase slowed from the preceding year, the quantity is still increasing.

*Disposal of wastes* - Disposal of general waste matter is the responsibility of Municipalities according to waste disposal law. However, figures from 1991 show that 48.8 % of waste was collected under the direct control of municipal authorities, whilst 31.9% was entrusted to subcontractors, and the remainder including recyclable was collected by licensed subcontractors. Methods of waste disposal are classified into: *incineration, direct reclamation (landfilling), composting and recycling*.

Table 7.4 shows the amount of waste generated and treated in Japan from 1982 to 1987. It should be noted that percentage of incinerated waste increased from 65 percent to 73 percent during the period 1982 to 1987.

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<sup>12</sup> /Tanaka, M. 1994. Institute of Public Health, Tokyo

**Table 7.4 Waste Disposal in Japan - 1982 to 1987**

	1982	1983	1984	1985	1986	
a. Total population (in thousand persons) 1/	118,581	119,210	120,166	120,774	121,801	122
b. Total waste disposal [b1+b2+b3] (t/day) 2/	121,857	116,864	117,916	119,041	122,598	126
b1. planned collection volume (t/day)	93,230	92,529	94,740	96,940	99,419	104
b2. direct bringing-in volume (t/day)	22,026	18,447	17,850	16,842	18,274	18
b3. self-treatment [recycled] (t/day)	6,601	5,888	5,326	5,259	4,905	4
c. Waste per person [a/b] (gr/day)	1028	980	981	986	1007	
<b>Planned treatment volume</b>						
d. incineration (t/day)	75,264	75022	77841	80370	84548	8
e. percentage of incinerated waste	65%	68%	69%	71%	72%	
f. landfilling (t/day)	37261	32841	31535	30007	29008	2
g. percentage of landfilled waste	32%	28%	27%	26%	25%	
h. composting (t/day)	165	211	206	184	163	
i. percentage of composting (t/day)	0%	0%	0%	0%	0%	
j. others	2566	2901	3008	3221	3974	
k. percentage of others	2%	3%	3%	3%	3%	
l. Total [d+f+h+j] or [b-b3] (t/day)	115256	110975	112590	113782	117693	12
f. Total in tonnes/year	42068440	40505875	41095350	41530430	42957945	4480
<hr/>						
m. Total disposal of waste generated in people's life [b1+b3] (t/day)	99831	98417	100066	102199	104324	10
n. Total disposal per person (gr/day)	842	826	833	846	857	

Source: Ministry of Health and Welfare, 1990

Statistics of waste treatment for 1990 and 1991 are given in Table 7.5 The Table shows that the ratio of waste disposal by volume reduction [percentage of wastes that underwent intermediate treatment, such as incineration and crushing, to the quantity of wastes collected] is continuing to increase each year. It was 79.6% in 1990 and 83% in 1991. This increase indicates that waste treatment facilities have improved and intermediate treatment has been promoted. In 1991, incineration accounted for 74.3 percent and the other intermediate treatments such as composting, and crushing, accounted for 8.7 percent.

**Table 7.5 Incinerated and landfilled municipal wastes in 1990 and 1991- in metric tonnes**

Japan	1990	1991
waste generated	50,440,000 (100%)	50,770,000 (100%)
volume reduction 1/	40,150,240 (79.6%)	42,139,100 (83.0%)
-incinerated waste	36,720,320 (72.8%)	37,722,100 (74.3%)
-other waste reduction	3,429,200 ( 6.8%)	4,213,910 ( 8.7%)
landfilled waste	10,289,760 (20.4%)	8,460,000 (17%)

Source : The Institute of Public Health, Ministry of Health and Welfare

1/ Refers to the percentage of the quantity of wastes that underwent intermediate treatment, such as incineration and crushing, composting, etc.

The proportion of waste going to landfill is gradually declining, showing the success of the policy of increasing intermediate facilities in order to reduce landfill. Environmental quality requirements have been given priority over costs.

Waste matter as resource material - The amount of recyclable material is not included in Table 7.5 This consists of glass bottles, aluminium and steel cans, newspapers, magazines, cardboard, and textiles. It amounted to an additional 2.7 million metric tonnes in 1990, and increased by 50% in 1991 as shown in Table 7.6. The increase was in subsidised waste collection. Breakdown on types of waste matter collected for recycling could not be obtained.

**Table 7.6 Recyclable Materials Collected for Intermediate Treatment**

Waste for recycling 1/	1990 (tonnes/year)	1991(tonnes/year)
a) intermediate treatment	1,680,000	1,690,000
b)waste matter collected by community groups	990,000	1,410,000

Source: The Institute of Public Health, Ministry of Health and Welfare

1/ Waste paper and metals account for most of recovered material for recycling. It should be noted that there has been an increase of about 50% from 1990 to 1991 [subsidies paid by the authorities]

*Collection costs for recyclable materials* - These materials can be collected in two different ways: by the government route or by the private - recycling sector. If collected by the government the disposal cost is Yen 48 per kilo. If collected by citizens' groups, subsidies are paid, or a revenue is obtained according to market prices. If the market does not buy, the collecting groups present a receipt from recycling industries or dealers to the local authorities. A subsidy is paid in form of credit to group collecting scheme. *The Tokyo average subsidy in 1991, for waste paper was Yen 3.5/kilo.*

**Table 7.7 Metropolitan Government's collection cost - recyclable**

Recycling routes	
government route	40 to 50 yen/kg
private - group collection (waste paper)	3.0 yen/kg

Source - Tokyo Metropolitan Government



## 7.8 Expenditure for Municipal Solid Waste Treatment in Japan - Costs

Each year about 50 million tonnes of municipal waste are collected and disposed of. Table 7.8 shows the budget for 1989 which resulted in an average cost of US\$ 205 per tonne without including operational costs.

**Table 7.8 Budget and Public Financing for Environmental Conservation : FY 1989**

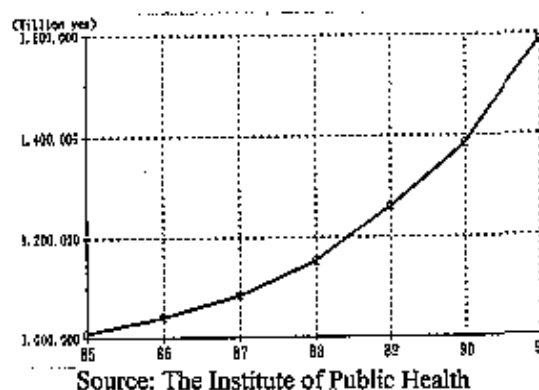
Ministry/Agency	million yen	million US\$	US\$/tonne 1/
Prime Minister Office (PMO)	216,663	1667	33
Ministry of Finance (MOF)	229,618	1766	35
Ministry of Construction (MOC)	688,902	5299	106
Ministry of Health and Welfare (MHW)	63,447	488	10
Ministry of Transport (MOT)	63,944	492	10
Ministry of Agriculture, Forestry, Fishery (MAFF)	28,845	222	4
Ministry of Education (MOE)	14,719	113	2
Joint Management	14,126	109	2
Ministry of Trade & Industry (MITI)	9,578	74	1
Total for 1989 1/	1,329,842	10230	
Cost per tonne of disposed waste			205

Source: Environmental Statistics published by Environmental Agency, 1990 [exchange rate=130Y/US\$]

Note: Expenditure allocated under operating programs are excluded; municipal waste in 1989 was 50 million tonnes

Expenditures for waste treatment operations are increasing yearly. In 1991 was about 1,587,000 million yen resulting in Yen 31,259/tonne (US\$232/tonne). Figure 7.3 shows the increasing trend in expenditure for waste treatment for the period 1985 to 1991. Spending for the improvement of landfill capacities and volume reduction of wastes were responsible for the sharp increase in expenditure in recent years.

**Figure 7.3 Expenditure of Municipal Solid Waste in Japan**



## 7.9 Expenditure for Waste Disposal in Tokyo

The Bureau of Public Cleansing for the Tokyo Metropolitan Government reports on expenditure in Fiscal Year 1992 as follows:

" The budget for the Bureau of Public Cleansing accounts for about 6.5% of the total general account budget of the Tokyo Metropolitan Government. This was about Yen 437 billion in fiscal 1993, which represented an increase of Yen 173 billion over the previous year. This comes to Yen 54,000 per resident and Yen 127,000 per household in the wards area. As for the revenue source, 86 percent of the budget comes from the *general account budget of the Tokyo Metropolitan Government*, mainly because *waste collection service is generally provided free of charge*. In terms of expenditures, the ratio of personnel and operations expenses is 1:2".

By type of operation, the collection and transport of wastes make up the largest portion, while incineration and landfill make up for smaller proportion. The disposal cost for one tonne of wastes is given as Yen 48,000. Because of the need for a large personnel staff and vehicle stock, Yen 34,000 or 76 per cent is spent for collection and transport .

**Table 7.9 Disposal Cost for One Tonne of Waste in Fiscal Year 1992 - Tokyo 23 wards**

by operation	cost per tonne (yen)	cost per tonne (US\$)
Collection/transport	34,000	252
Incineration	10,000	74
final disposal (landfill)	4,000	30
<b>Cost per tonne of input waste</b>	<b>48,000</b>	<b>356</b>

Source: Bureau of Public Cleansing - Tokyo Metropolitan Government

## 7.10 Estimated Amount of Waste Paper in the Municipal Solid Waste

Assuming that the share of waste paper in the general municipal solid waste is about 27% as mentioned in paragraph 7.5, the approximate quantity of waste paper destined for incinerators and for landfill is calculated for 1991 as follows:

**Table 7.10** *Estimated Quantity of Waste Paper in Municipal Waste*  
in metric tonnes

a) municipal solid waste in Japan	50,770,000
b) waste paper , 27% of (a)	13,707,900
b1) waste paper for incineration , 74.3 %of (b)	10,184,970
b2) waste paper for landfill , 25.7% of (b)	3,522,930

Source : Ministry of Health and Welfare and Japanese Paper Association

Table 7.11 shows the share of waste paper for recycling, incineration and landfill in 1991 and its share in the total amount of paper and paperboard consumed during that year.

**Table 7.11** *Quantity of waste paper for recycling, incineration and landfilling - 1991*  
(m/tonne)

Paper and paperboard consumption	28,868,000 (100%)
a) recovered waste paper (1 million subsidised)1/	14,666,000 (51%)
b) waste paper for incineration	10,184,970 (35%)
c) waste paper for landfill	3,522,930 (12%)
d) unknown	494,100 (2%)

Source : Ministry of Health and Welfare and Japanese Paper Association

1/ Estimate from Table 7.7 is included in the amount of waste paper recovered for recycling.

National statistics for waste paper used as fuel for incinerators or landfills are not available. Estimates included in Tables 7.10 and Table 7.11 should be taken as an indicative.

### **7.11 Incineration**

The solid waste management policy in Japan is based on the principle of conservation of limited landfill capacity. Consequently incineration with or without energy recovery is the major method of waste disposal in Japan. General wastes are treated in line with the treatment programs formulated by municipalities which have modernised incinerators and other intermediate facilities for volume reduction. The ratio of waste disposal by volume reduction increased each year as shown in Table 7.4. In 1991 out of 50.7 million tonnes of wastes collected by municipalities, about 74.3 percent was incinerated. The target for incineration is 80 percent, so new projects are under implementation.

Waste Processing facilities (incinerators and composting plants) - The number of these facilities decreased from 1,899 in 1990 to 1,870 in 1993. The number of facilities decreased because facilities built between 1965 and 1974 were merged to increase the total processing capacity.

By the end of 1993, there were about 1, 873 incineration plants handling 74.4% of municipal waste, 26 mechanical/composting plants handling 5.2% of municipal waste; 2,336 landfill sites handling accepting the incineration residues (13.7%) as well as the 20.4% of municipal waste which is directly landfilled<sup>13</sup> /.

Statistics show that in 1989, 89 industrial plants across the nation generated electric power by utilising waste heat from waste incineration plants, and the total electric power generation capacity reached about 254 000 kilowatts as of January 1987. 11 waste incineration plants in Tokyo are capable of generating about 56 000 kilowatts. They generated about 370 million kilowatts an hour in fiscal 1988, of which 53% or about 190 million kilowatts an hour was sold to the electricity distribution company. Waste heat from waste incineration plants is also used as the heat source for regional heating systems and other purposes.

*Table 7.12 Actual Power Generation with heat from incineration of wastes-Tokyo*

FY	n. of power plants	generation output	total power generation	in house consumpt	electric power sold
		kW	1,000 kWh	1,000 kWh	1,000kWh
1980	9	34,400	169,339	112,030	57,309
1981	9	34,400	181,931	115,472	66,459
1982	10	52,400	223,305	119,641	103,664
1983	11	56,400	276,418	136,519	139,899
1984	11	56,400	305,522	151,420	154,102
1985	11	56,400	329,586	162,261	167,325
1986	11	56,400	360,853	168,934	191,919
1987	11	56,400	380,670	180,756	199,914
1988	11	56,400	369,414	179,139	190,275
1990	12	na	na	na	na

Source: Environment Agency-Government of Japan, 1990

note: na stands for not available

<sup>13</sup> / Same as 4/

Table 7.12 shows that since 1983 the number of incineration plants remained unchanged until 1990 when a new plant was built. It is possible that these plants became less cost competitive with the decrease of oil prices in addition to environmental constraints<sup>14</sup>/. Additional data on the use of surplus heat produced by these incinerators, and on construction and re-construction schemes for incinerators in Tokyo<sup>15</sup> / for the period of 1991 to 1993, are given in Table 7.13.

**Table 7.13 List on incinerators in Tokyo - Power and Heat Supply for Community Services**

Plant name	Construction Period	Area sq. metre	construction cost (mil. Yen)	Maximum heating val. (kcal / kg.)	Power capacity(kw)	Heat supply	Heat supplied to :
Setagawa	1966	27,846	3,136	1,500	2,500	warm water,	Recreational home for handicapped
Ohi	1970	53,767	5,737	1,800	2,500	warm water,	Hall for elderly, housing complex
Tamagawa	1971	26,948	2,997	1,900	2,000	hot water	Citizens centre.
Koto	1970	86,738	9,339	1,800	15,000	hot water, vapor	Facilities for the elderly & gardens.
Itabashi	1971	44,424	4,548	1,900	3,200	hot water	Social service centre, heated pool.
Katsushika	1973	42,311	14,897	2,500	12,000	hot water	Citizens' centre, heated pool, gym.
Adachi	1974	37,103	15,668	2,500	6,000	hot water	Heated pool, centre for the elderly.
Suginami	1979	36,958	17,787	2,100	6,000	hot water	Heated pool, centre for the elderly.
Hikarigaoka	1980	23,690	10,547	2,700	4,000	hot water	Citizens hall, housing complex.
Ohta	1987	92,017	52394	6,500	27,000	—	—
Nerima	1989	17,563	10,548	2,500	1,500	hot water	Heated pool, hall for the elderly.
Ariake*	1991	24,000	na	3,400	5,600	—	Heat supply
Chitose**	1991	17,560	na	2,900	12,000	—	Swimming pool
Edogawa**	1992	28,483	na	2,900	12,300	—	Ward facility
Kita**	1993	18,300	na	2,900	11,500	—	Ward facility

\* currently under construction \*\* currently under reconstruction

Source : Tokyo Metropolitan Government

In Tokyo, these plants incinerate all the combustible waste that the Bureau collects and some of the waste that is brought in from outside. In 1991, a total of 3.1 million tonnes of combustible waste was incinerated, which produced nearly 0.5 million tonnes of incineration residue. Thus, an efficiency rate of 85 per cent was achieved in terms of reduction of waste. In 1991 there were about 0.4 million tonnes of combustible waste in excess of the capacity of the incineration plants. This went direct to landfill, although the plants operated 24 hours a day.

<sup>14</sup> / Quality of the Environment in Japan, 1990, Environment Agency, Government of Japan

<sup>15</sup> /Public Cleansing Services in Tokyo, 1993. Tokyo Metropolitan Government

Even though the construction of an additional plant and the reconstruction and renovation of three older plants are underway, it will still not be enough to process all combustible waste<sup>16</sup>. The Bureau aims to build ten additional plants by the year 2010.

#### **7.12 Landfill - Condition of Final Disposal Sites**

According to 1990/1991 data there are some 2,336 landfill facilities in Japan operating in the municipal sector, with a further 1,500 in private hands. By the end of 1994 there were 2,250 final disposal sites in Japan. Their residual capacity amounts to 156,830,000 cubic metres, the number of landfill sites is decreasing as their capacity is being exhausted. The remaining number of years is about 7.6 at the current rate of landfill use.

The development of landfill sites is the responsibility of municipalities, but central government subsidises 25 percent of its cost. Even with this subsidy, municipalities are having financial problems. Building new landfills is expensive due to stricter environmental standards required both by government and the by local communities.

On a national basis, some 20 percent of municipal solid waste is landfilled in crude form. Municipal authorities of densely populated areas such as Tokyo have increased the incinerating capacity and the proportion of landfilled municipal waste in Tokyo was reduced from 20 to 10 percent between 1990 and 1993. The Tokyo Metropolitan Government has set a target that landfill dependency should be totally eliminated by 1996.

The lack of suitable locations for final waste disposal has forced municipalities to develop alternatives. Some municipalities use the facilities of others and they may develop a common administration scheme. Others construct offshore landfills. The largest off-shore landfill is the Phoenix Project in Osaka Bay, which was initiated in 1990. It includes detailed environmental protection and monitoring programmes, the annual operational cost of which is about 4.4 million yen. The total capacity is 45 million cubic metres in an area of 316 has.

#### **7.13 Summary**

Japan has a high population density. The country has a population of 124 million, fast growing economy and only 10 percent of the land is suitable for residential purposes. People are mostly concentrated in villages and large cities. As a land and resources constrained country, it is natural that preservation of the environment is the main principle guiding waste management strategy. Recycling, re-use of waste, and the restoration of wastes to their original stable state in nature (reclaimed) have been part of the strategy for the rational use of country's limited natural resources.

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<sup>16</sup> /Waste Management in Japan, 1993. Institute of Waste Management , Northampton, England

During the 1960s Japan launched a major programme of incinerator construction and has set a target of 80 percent for incineration of all municipal solid wastes. The municipalities, which are in charge of carrying out the waste collection, treatment and disposal, maintain lengthy dialogues planning trade-offs with the local communities benefiting in leisure facilities as listed in Table 7.13

Participation by the people is very high. About 90 percent of households follow government instructions for sorting their wastes according to recyclability and combustibility. The participation of communities in the authorities' decisions on siting intermediate waste treatment facilities, such as incinerators, transfer stations and crushing and composting plants, has helped to overcome residents opposition's in the past.

However the escalation in housing costs in densely populated urban areas is making negotiations more difficult. Plans to build a new incinerator in Tokyo had to be cancelled. Although the rate of incineration has increased, meaning that intermediate treatments were successfully implemented, the total amount of municipal solid waste as well as the treatment cost continue to increase. In 1991, total municipal waste was over 50 million metric tonnes. Expenditure on environmental conservation related to waste management resulted in US\$ 232/tonne, while the operational costs in Tokyo including collection, transport, and final disposal was about US\$356/tonne. Locating landfills in convenient places is no longer possible. Off-shore landfills are under construction but they are expensive, and a focus for criticism by the international environmental community.

In 1991, the government amended The Waste Disposal Law to take into account developments in waste management since 1970. The amendments establish new policies and accepted the waste management hierarchy as: waste avoidance, waste minimisation reuse and recycling, and sanitary disposal (incineration). In addition the amendments establish the duties of municipalities, citizens and corporations, and tightens the regulations on the operations of contractors working for waste treatment facilities.

A Recycling Law was added aimed at reduction of industrial wastes. It defines for the first time MITI legislative participation in waste disposal. In 1994 the Ministry of Health and Welfare organised a Study Council to evaluate the effects of the above amendment and to propose economic measures for waste reduction. The Study Council concluded that not all collected resources are recycled and that the recycling system does not promote waste minimisation, because the costs of waste reduction and recycling are not imposed on each economic unit.

The change in the composition of wastes in the last two decades is marked by a sharp increase in paper and plastic content, and a decrease in organic matter. In Tokyo, waste paper accounts for 45 percent of combustible waste. The waste paper share for the entire country averages

about 27 per cent. Out of 28.8 million metric tonnes of paper and paperboard consumed in 1991, about 14.6 million Mt.(51%) was recovered; 10.1 million Mt. (35%) was incinerated and 3.5 million Mt. (12%) was directly landfilled.

An increase in demand of about 1.5 million metric tonnes of waste paper is projected for the year 2000, if utilisation rates increase to 56 percent as paper industry expects. The waste paper industry has shown cyclical variations in the past and many forecast sharp price recovery strengthening the long-term future of the waste paper market. The Japanese waste paper business is requesting government assistance, to promote export markets for subsidised grades, and to improve recovery of high quality waste paper for domestic consumption.



## 8. CONCLUSIONS

As in most countries the degree to which waste paper is recycled is based on economic factors. In Japan it is clearly related to the scarcity of forest resources, the high population density and unique cultural characteristics.

However, the striking point is that the Japanese paper and paperboard industry has maintained competitiveness against imports supplying a domestic market of 28 million tonnes in 1993, second in volume only to the United States. The Japanese paper industry has been until now very isolated, being virtually self-sufficient with negligible imports.

The raw material supply in 1993 included 53 percent waste paper, 37 percent domestic pulp [over half of it made of imported woodchips] and 10 percent imported pulp.

In response to high domestic fibre, energy and wage costs and to wide price fluctuations of imported pulpwood, the Japanese paper industry has gradually expanded waste paper *utilisation*. Waste paper utilisation was more profitable than using imported virgin fibre; waste paper recovery has responded to meet the demand for utilisation.

During the last 40 years, there have been two decades when utilisation and recovery rates increased sharply: from 1953 to 1964 [from 25 to 40 percent] and from 1974 to 1984 [from 41.3 to 50.4 percent]. The common factors during both periods were:

- development of technology to process the waste paper for production of paper and paperboard products,
- demand for the final recycled products
- a good balance of supply and demand of each waste paper grade required

Japan's industrial economy is very advanced in research and technology; it pioneered the development of de-inking technologies, which stimulated the use of waste paper. [Industrialisation was sponsored by the state as reconstruction strategy after the war].

Two factors other than demand, work in favour of a high *recovery* rate.

Japanese people have a strong respect for authority derived perhaps from emperor worship. They have responded to the Government's call for everyone to participate in sorting waste paper at source, which makes the waste paper industry efficient. People also show great concern for environmental conservation, in part perhaps because they relate to nature in a religious way; the word for old paper - *koshi* - means also reverence. This helps to make recycled products acceptable to consumer and to ensure that recovery rate are high.

During these two periods waste paper prices were gradually increasing. But in 1974, with the sudden rise in transport cost which followed the oil price shock, stocks decreased and a sharp price increase occurred. The government helped the industry by promoting increased recovery from households.

Conditions in other countries may differ in many aspects from those of the Japanese paper and paperboard industry. However to replicate Japanese experience in achieving high recovery and utilisation rates of waste paper, three factors must be present:

- recycling must be economically competitive
- people should have high environmental awareness ( to consume recycled products)
- people and firms should participate in carrying out the segregation of wastes at source, to make the recovery business more efficient

The structure of the waste paper business in Japan consisting of complex but efficient distribution channels allowed for a variety of ways to collect waste paper as wholesalers coped with the cyclical nature of the waste paper business by keeping a control over supply and demand. The ability of small collectors to gather waste paper in a cost effective way must also be emphasised.

By the late 1970s, the recovery of waste paper was much higher, with the new group collection scheme, and up to 1984 the waste paper business developed strongly as entrepreneurs responded to market forces.

No subsidies or any other compulsory legislative measures were needed. In Japan the recovery and utilisation rate remained roughly in balance because the purpose of recovery was to supply paper industry requirements .

However, between 1984 and 1990 the recovery rates decreased from 50.4 to 49.7 percent. The main reason for this was the economic slow down together with the previous high investment which resulted in over capacity.

In 1991, The Waste Disposal Law enacted in 1970, was amended and the "Recycle Law" was added. This law has two main objectives, first to promote reduction of municipal solid waste and second to increase industry's participation in waste minimisation by increasing utilisation rate.

It established that industry should strive to increase to 55 per cent the amount of waste paper that is used in domestic paper production by the end of fiscal year 1994.

The recovery rate of paper and paperboard products by the end of March 1995 was 51.7 percent. The estimated recovery rate by grades was as follows:

- Old newspaper (102%)
- Old corrugated container (73 %)
- Kraft browns (43 %)
- High quality grade (31%)
- Mixed grade (18%)

The utilisation rate in production of all paper and paperboard products for the same period was 53 percent. The utilisation rate in paperboard products was 92 percent, close to

saturation point. Although the utilisation rates in newsprint at 50 percent and tissue products at 60 percent are high, further increases are expected. Utilisation rate for printing and communication papers is low. No waste paper is used for the manufacture of high grade paper and the utilisation rate for medium to low quality printing paper is 40 percent. For wrapping paper it is only 3 percent because high quality is demanded..

The target of 55 percent utilisation could not be reached because of demand related factors. However the Japanese paper industry is confident that although some paper and paperboard products have almost reached their saturation point, overall utilisation can be increased to 56 percent by the year 2000 if the Government gives some assistance.

The utilisation rate of waste paper in printing and communication papers can only be increased if recovery of high quality office waste paper grades is increased. Industry now has the technology to recycle increased volumes of office automation (OA) paper, which it had avoided in the past since it is more expensive to process and because its price is high..

The success of the current government appeal [to reduce waste] will depend on office workers' and industry commitment to increase recycling and to minimise waste.

Japanese people seem now more sceptical if not critical towards the government's policy. At the same time, international pressures to improve access to the Japanese paper market are growing, and this could lead to decreasing profitability. In this climate, campaigns and guidelines alone may not be sufficient to achieve the government's aims.

The Japanese paper industry is requesting government assistance or subsidies to promote:

- increased recovery of office automation waste paper
- improved waste paper processing methods
- change in the structure of demand towards acceptance of recycled products
- increased waste paper exports
- increased energy recovery.

There are at present several study groups consisting of inter-ministerial committees and private industry representatives working together in an attempt to reach a consensus on new legislative measures.

Two of these study groups are relevant for waste paper utilisation:

- 1) The Study Committee on basic issues of the Japanese paper and pulp industry organised by MITI. MITI's policy in convening this committee was to encourage firms to form their own strategies and to avoid excessive reliance on the government. The recommendations made by the MITI Study Committee are to increase the waste paper utilisation rate from 53 percent to 56 percent by the year 2000, as follows:

- paperboard from 92 to 94%
- newsprint from 50 to 60%
- tissue products from 60 to 65%
- high grade paper from zero to 10%

- medium to low grade from 40 to 46%, and
- wrapping paper from 3 to 4%

The increase recommended is small because the paper industry's future growth will be slow, and as the recovery and utilisation rate are already very high a further increase is more costly.

2) The Study Commission to study economic measures for waste reduction organised by the Ministry of Health and Welfare (MHW). Similar to MITI, the MHW's policy is to transfer waste disposal responsibilities from the government to private sectors. The main recommendations from MHW's Study Commission for industries and trade in general are:

- imposition of a charge for waste collection
- collection and processing by manufacturers and distributors of their own waste
- establishment of a target for the percentage of waste recycled.

These recommendations indicate that the paper industry may have to implement further measures related to growing proportion of waste paper in combustible municipal waste.

The volume of municipal solid waste has increased to over 50 million tonnes, costs are over US\$500, sites for incinerators are becoming limited and landfill capacities are becoming exhausted. Currently about 74 percent is incinerated, 17 percent landfilled and 9 percent undergoing intermediate treatment.

Concerning the paper industry, 51 percent of waste is already recycled and further recovery of at least another 5 percent is expected up to year 2000. The industry feels that its contribution to waste minimisation is good as the recovery rate is one of the highest in the world. However, if the paper industry is to be responsible for the waste paper destined to incineration plants and to landfills, new strategies have to be established taking into account costs and benefits of waste paper use for each destination.

Paper industry representatives consider that *waste paper used as feedstocks for incinerators is not a waste but recycling for energy recovery*. They also advocate donation of surplus waste paper as bilateral aid to eastern European countries, and the re-use of waste paper for agriculture or as pressed panels for building material.

Nation wide statistics on waste composition are not available. The proportion of waste paper in municipal waste varies, in Tokyo is about 45 percent. The Japanese Paper Association estimate for whole country is at 27 percent, in which case the proportion of waste paper [excluding unrecoverable] according to destination is estimated at:

- collected for incineration (35%)
- disposed for landfill (14%)
- recovered for recycling (51%)

Collection costs are different for each destination. Costs of waste paper recovered for the paper and paperboard industry are limited by the waste paper market price. However collection costs for combustible municipal wastes used for the fuelling of incinerators have not been limited by financial returns, but simply implemented as policy for environmental conservation. As environmental protection measures became stricter, large investments were made.

**Incineration:** The cost for collection and transport of municipal waste to incineration plants in Tokyo is US\$252/tonne and the cost for incineration is US\$ 74/tonne. Incineration with or without energy recovery is the major method of waste disposal in Japan. Out of about 1,873 incineration plants, 89 industrial plants across the nation generated electric power by utilising waste heat from waste incineration plants. Although these plants provide many forms of benefit for the local community, priority to cost effectiveness was not given, because low cost capital was available.

The cost of waste for final disposal, ie. including removing of ashes from incinerators and transporting them to landfill is about US\$ 356/tonne. This includes: collection and transport (US\$252/tonne); incineration (US\$74/tonne) and landfill (US\$30/tonne).

In Japan statistics on waste paper recovered for the paper industry are given by grade and by the method of trading. This is because waste paper prices vary according to grade, and the cost/benefit ratio is related to trading method.

Waste paper originating from large sources [printers, converters, book binders, department stores and supermarkets] which accounts for 41 percent of all waste paper recovered for the industry is traded by *industrial buyers*. Their operations are simpler and more profitable compared to dealers and small collectors. Recently they have not been paying for the waste paper collected, as costs have increased and prices decreased. The collection and transport costs vary from US\$ 52 to US\$ 74/metric tonne<sup>1</sup>.

Waste paper originating from smaller scale sources is collected by small collectors, collectors in exchange for toilet paper, group collection schemes and by the government. These sources are: household accounting for 35 percent; wholesale stores from town centres accounting for 12 percent and shops, offices, stations, schools, etc. accounting for 12 percent. Their operational cost excluding labour is about US\$ 23/tonne.

While group collection schemes receive a subsidy of US\$ 23 to US\$ 74/tonne, small collectors have to sell their product to intermediary dealers as they often do not have direct access to wholesalers. The participation of small collectors has been important for the strength of the waste paper industry, but now they are being penalised as subsidy is depressing the market even further.

When the government collects the waste paper for recycling the cost is high, from US\$ 296 to US\$ 370/tonne. About 1 million metric tonnes is collected in this way. The volume of waste paper collected by community groups has increased in recent years amounting to about 1 million metric tonnes.

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<sup>1</sup> / Exchange rate used was 135 yen/US dollar, original figures were 7 to 10 yen in 1991.

The paper and paperboard industry made high profits recycling waste paper during the 1974-1988 period, but these gradually decreased. Currently the profit for a tonne of recycled waste paper is about US\$ 50 whereas the incineration cost is of the order of US\$ 75 and landfilling is at US\$30.

The Japanese economy has been stagnant since 1990. In response to low profit, companies are restructuring, looking for cost reductions and mergers. In the decade 1982 to 1992 demand had been growing at an annual average rate of 5 percent. Projected growth, from now to 2000, is less than half at 2.3 percent.

As circumstances change, studies on the optimal allocation of waste paper for various destinations could be in order. Industry claims that if government is not able to assist the supply of high grade waste and if subsidy to group collection continues there will be a permanent over supply of low grade waste paper.

Appendix 1  
Table 2.3 The list of Japanese Standard qualities of waste paper

Statistical classification	Grade	Classification	Contents	Objectionable materials (%)
Hard white shavings	1	Japanese (Jouhaku) (white shavings)	Shavings and sheets of white unprinted woodfree paper from bookbinders, printers and sheets converters	0
	2	Cream Jouhaku (cream shavings)	Shavings, cuttings and sheets of cream coloured unprinted woodfree paper from bookbinders, printers & cutting factories	0
	3	Keihaku (ruled lines shavings)	Shavings, cuttings and sheets of white or cream coloured woodfree paper, with red or blue ruling or register mark from bookbinders, printers and cutting factories	0
	4	Cards	Used tabulating cards made in Japan or imported	0
White woody shavings White manilla	5	Tokuhaku (high grade white woody shavings)	Shavings and sheets of white unprinted, mainly bleached chemical pulp based paper from bookbinders, printers and sheet converters.	0
	6	Chuuohaku (white wood containing manilla)	Shavings, cuttings and sheets of woody paper from book-generated from bookbinders, printing and news-paper printing factories.	0
	7	Shiro manila (white manilla)	Shavings, cuttings and sheets of uncoloured and unprinted manila boards generated from carton makers	0
Fine paper printed (include coated)	8	Mozou (printed woodfree)	White woodfree paper only black printed, computer print-outs	max 1%
	9	Iroujou (Colour printed woodfree)	White wood free papers, printed with various colours, including art papers.	max 1%
	10	Kento (woodfree shaving incl. colour printed)	Shavings of white uncoated and coated woodfree paper, including some colour printed originated from bookbinders and printing houses	0
	11	Shiroeato-Shiro art (white coated shavings)	Shavings and sheets of unprinted art papers from bookbinders and printers.	0
Quires woody paper printed	12	Tokujoujiri (high grade colour printed woody shavings)	Shavings of high grade wood-containing paper, printed with various colours originated from bookbinders and printers	max 1%
	13	Be tsu Joujiri (Colour printed woody shavings)	Shavings of white woody paper, printed with various colours originated from bookbinders and printers	max 1%
	14	Cyuu Shiteuhogo (high grade wood containing waste)	Sheets of high grade wood containing paper originated from bookbinders and printers	max 2%
	15	Kento manila (coloured manila)	Cuttings of manila board, printed with various colours, originated from carton makers	max 1%
Old news	16	Shinbun (newspapers)	Old newspapers	max 2%
Old magazines	17	Zasshi (magazines)	Old magazines	max 2%
Kraft browns	18	Kricha (New brown kraft cuttings)	cuttings of unprinted brown kraft paper, originated from kraft paper sack factories	0
	19	Mujicha (unprinted brown kraft)	Waste sheets of unprinted brown kraft paper from kraft paper sack factories	0
	20	Zettaf (used brown kraft sacks)	Brown kraft sacks used for cements, chemicals, fertilizers, foods and others	0

	21	Kurafuto danboru (kraft lined corrugated waste)	New kraft corrugated cuttings, mainly imported	max 2%
Old Corrugated Containers	22	Danbounu (corrugated con- tainer waste)	Old Corrugated Containers	max 3%
	23	Wanpu (papermill paper)	Wrapping pape used for newsprint rolls and other rolls	max 2%
Box Board Cuttings	24	Joudaishi (white paperboard cuttings)	cuttings of white paperboard originated from carton box makers	0
	25	Dajishi (chipboard cutts)	Cuttings from coloured chipboards and colour chipboards from carton box makers	max 3%
	26	Boru	Shavings and die cutting wastes of straw board and old cartons of white board, chipboard, coloured chipboard	max 2%



## Appendix 2

Table 7.1 Pollutants in Exhaust Gases and Drainage from Incineration Plants in 1992

Plant name	tonne/day	Smoke-dust & soot stack(m)	gr/nm3	Sox (ppm)	NOx (ppm)	HCl (ppm)	Hg (mg/Nm3)	PCDD (ng/Nm3)
Koto	1,800	100	0.014 (0.135)	42 (840)	71 (300)	280 (300)	0.1	5
Itabashi	1,200	130	0.02 (0.095)	42 (1,300)	63 (300)	320 (430)	0.07	1.7
Katsushika	1,200	130	0.006 (0.095)	24 (1,100)	46 (300)	230 (430)	0.07	6.3
Adachi	1,000	130	0.005 (0.095)	36 (620)	67 (300)	270 (430)	0.12	0.88
Suginami	600	160	0.009 (0.095)	21 (730)	53 (250)	4 (430)	0.03	1.9
Hikarigaoka	300	150	0.006 (0.100)	12 (1,000)	65 (250)	5 (430)	0.01	0.6
Ohta 1	600	41	0.007 (0.08)	2 (100)	41 (250)	ND (430)	0.01	3
Ohta 2	600	41	0.003 (0.08)	ND (100)	30 (250)	4 (430)	0.02	16
Meguro	600	150	0.003 (0.08)	ND (620)	53 (250)	ND (430)	0.01	1.5
Nerima	600	100	0.036 (0.08)	41 (400)	50 (250)	270 (430)	0.07	6.1

## Drainage

Plant name	discharged to	drainage volume	pH	BOD (mg/l)	SS (mg/l)	Lead (mg/l)	Zinc (mg/l)	Cadmium (mg/l)	Chromium (mg/l)
Koto	Sewerage	282	7.4	35	28	0.05	0.19	ND	ND
Itabashi	Sewerage	165	7	11	9	0.07	0.3	ND	ND
Katsushika	Sewerage	336	7.4	3	5	ND	0.06	ND	ND
Adachi	Sewerage	303	7.8	4	6	ND	0.16	ND	ND
Suginami	Sewerage	262	7.6	7	11	0.05	0.03	ND	ND
Hikarigaoka	Sewerage	198	7.4	5	3	ND	0.04	ND	ND
Ohta 1	Sewerage	316	7.4	3	4	ND	0.04	ND	ND
Ohta 2	Sewerage	640	6.9	3	8	0.05	0.05	ND	ND
Meguro	Sewerage	143	7.2	4	3	0.06	0.06	ND	ND
Nerima	Sewerage	127	7.2	19	11	0.05	0.05	ND	ND

Notes: 1. The figures in parentheses refer to the control standards.

2. "ND" indicates that measurement was below the quantitative limit

3. The density for SOx, NOx and HCl is expressed equivalent to the value on the basis of 12% oxygen

4. The figures are the averages of figures measured once two months for exhaust gas and once a month for drainage  
As measures to deal with hydrogen chloride and sulfur oxide in exhaust gas, scrubbers utilising sodium hydroxide have been installed[they have been effective in removing pollutants]. In order to deal with nitric oxide, catalytic and non-catalytic denitrification equipment is being added to the present incineration control equipment. Mercury and dioxin in the emissions are measure on a continuous basis. At present, they are at level where no harmful effects on the human health can be found.

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## References

### Persons contacted:

Wakano, Tadao - General Manager Pulpwood Division  
Japan Paper Association  
Kami Parupu Kaikan 9-11, Ginza 3 -Chome  
Chuo-ku, Tokyo, 104 Japan  
Tel 03-3248-4806, fax : 03-3248 - 4827

Masahiko Oi - General manager  
Pulp and Wastepaper Division - Japan Paper Association  
Same address as above Tel 03-3248-4805

Takeshita Masafumi - General Manager  
Arai Shoten, Trading Co. - Kabushiki Gaisha  
Tel 03 - 3606 60 11, fax 03 - 3606 6911  
Arachi-ku, Tokyo

Kasabayashi Takashi - Director  
Nationwide Paper Producing Resources Federation and  
Wastepaper Wholesalers Cooperative  
Tel 03 3833 - 4105, fax 03 3833 -4106

Tadahiro Kondo - General Manager  
International Division - Japan Paper Association  
Kami-Parupu Kaikan 9-11 3 chome  
Tokyo,104, Japan  
Tel 03 3248 4802, fax 03 3248 4826

Koji Sudo - Senior Commercial Specialist  
Foreign Commercial Service - American Embassy  
Akasaka - Minato-ku - Tokyo,107, Japan  
Tel 03 3224 5072, fax 03 3589 4235

Kazuhiko Hirose - Manager-Business Division  
Paper Recycling Promotion centre  
Ginza-Otsuka building 2-16-12  
Ginza, Chuo-ku, Tokyo, 104, Japan  
Tel 03-3541 9171, fax 03-3544 0139

## References

Yukichi Yamada - Deputy Director  
Paper, Pulp Printing Industry Division - Consumer Goods Industries Bureau  
Ministry of International Trade and Industry  
Kasumigaseki  
Chiyoda-ku, Tokyo, Japan  
Tel 03 3501 1089, fax 03 3501 6793

Kohji Molimoto - Manager Overseas Liaison Dept  
Jujo Kimberly K.K. - Konwa Building  
Chome, Tsukiji  
Chuo-ku, Tokyo, 104 Japan  
Tel 03 3546 1545, fax 03 3543 2367

Dr B.C.Y. Freezailah - Executive Director  
International Tropical Timber Organization - 5th Floor  
Pacifico-yokohama, 1-1-1 Minato-Mirai  
Nishi-ku, Yokohama, 220 Japan  
Tel (045) 223 1110, fax (045) 223 1111

Steven E. Johnson  
International Tropical Timber Organization  
Same address as above

## References

### Persons contacted:

Wakano, Tadao - General Manager Pulpwood Division  
Japan Paper Association  
Kami Parupu Kaikan 9-11, Ginza 3 -Chome  
Chuo-ku, Tokyo, 104 Japan  
Tel 03-3248-4806, fax : 03-3248 - 4827

Masahiko Oi - General manager  
Pulp and Wastepaper Division - Japan Paper Association  
Same address as above Tel 03-3248-4805

Takeshita Masafumi - General Manager  
Arai Shoten, Trading Co. - Kabushiki Gaisha  
Tel 03 - 3606 60 11, fax 03 - 3606 6911  
Arachi-ku, Tokyo

Kashbayashi Takashi - Director  
Nationwide Paper Producing Resources Federation and  
Wastepaper Wholesalers Cooperative  
Tel 03 3833 - 4105, fax 03 3833 -4106

Tadahiro Kondo - General Manager  
International Division - Japan Paper Association  
Kami-Parupu Kaikan 9-11 3 chome  
Tokyo,104, Japan  
Tel 03 3248 4802, fax 03 3248 4826

Koji Sudo - Senior Commercial Specialist  
Foreign Commercial Service - American Embassy  
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Paper Recycling Promotion centre  
Ginza-Otsuka building 2-16-12  
Ginza, Chuo-ku, Tokyo, 104, Japan  
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## References

Yukichi Yamada - Deputy Director  
Paper, Pulp Printing Industry Division - Consumer Goods Industries Bureau  
Ministry of International Trade and Industry  
Kasumigaseki  
Chiyoda-ku, Tokyo, Japan  
Tel 03 3501 1089, fax 03 3501 6793

Kohji Molimoto - Manager Overseas Liaison Dept  
Jujo Kimberly K.K. - Konwa Building  
Chome, Tsukiji  
Chuo-ku, Tokyo, 104 Japan  
Tel 03 3546 1545, fax 03 3543 2367

Dr B.C.Y. Freezailah - Executive Director  
International Tropical Timber Organization - 5th Floor  
Pacifico-yokohama, 1-1-1 Minato-Mirai  
Nishi-ku, Yokohama, 220 Japan  
Tel (045) 223 1110, fax (045) 223 1111

Steven E. Johnson  
International Tropical Timber Organization  
Same address as above