

# PWMI Newsletter

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Plastic Waste Management Institute  
JAPAN

## Plastic Products, Plastic Waste and Resource Recovery [1999]

### Information related to the publication of the Flowchart of Plastic Products, Plastic Waste and Resource Recovery (1999)

The Plastic Waste Management Institute distributes questionnaires every year on matters related to plastic waste recycling. This involves a survey on plastic waste discharge, a survey on municipalities regarding general waste management, and a survey on industrial waste management. The results of these surveys are then collated and published in the form of a flowchart that provides information on plastic products, plastic waste and resource recovery. This is an annual document providing quantitative information on a

macro scale related to the degree of plastic production in Japan; manufacture of products from plastic; the extent to which plastic is used or disposed of; and information on disposal and recovery, including ways in which resource recovery is achieved from plastic waste.

The quantities shown in the flowchart are, however, not completely determined by actual investigation, but are in part estimated from statistical data that have been extrapolated from investigation results and adapted according to particular mathematical formulas.

## Explanation of the Construction of each Item in the Flowchart

### (1) Resin Production, Resin Processing and Marketing of Products

#### 1-1 Resin Production :

It has been noted that resin production is constructed from chemical industry statistics provided by the Ministry of International Trade and Industry.

#### 1-2 Reclaimed Products :

For convenience, figures for material recycling provided in the previous year have been used as input for this year. Figures for export and import of plastic waste, parings and scrap (Ministry of Finance, trade statistics) have also been considered and declared.

#### 1-3 Domestic Plastic Product Consumption :

$(\text{Domestic plastic products consumption}) = (\text{Resin production}) - (\text{Resin export}) + (\text{Resin import}) - (\text{Liquid resin, etc.}) - (\text{Resin processing waste}) + (\text{Reclaimed products}) - (\text{Product export}) + (\text{Product import})$

- Resin Export and Import (Ministry of Finance, trade statistics)
- Liquid Resin and resin for synthetic fiber that fall outside plastic waste discharge (Ministry of International Trade and Industry, chemical industry statistics)
- Plastic Product Export and Import (Ministry of Finance, trade statistics)
- Processing Waste :  
By-products below standard in resin processing which are discharged as waste are taken into consideration.

### (2) Plastic Waste Discharge

#### 2-1 Industrial Waste and General Waste :

- Industrial Waste that is a by-product of business activities is subject to the Waste Disposal and Public Cleansing Law.

According to government regulations, the disposal of industrial waste is the responsibility of the waste generator. General waste, which is also subject to the above mentioned law, excludes industrial waste, and its disposal is the primary responsibility of municipalities.

#### 2-2 Post-use Products Discharge :

- The amount of resin used is classified according to fields that generate demand (the amount used has been calculated every year for the past 15 years). This amount and the life-span of products in these fields (discharge distribution model made by this institute) is taken into consideration to determine post-use products discharge according to an estimation system developed by this institute.
- Automobiles have not been included in figures for original plastic products, however, the export and import of automobiles exerts considerable influence over plastic waste discharge in Japan. Classification of amounts of resin used has therefore been conducted according to field demand (estimates from related groups) and revised in the transportation field in accordance with the number of vehicles imported and exported. (Japan Automobile Manufacturers Association, Inc., reports)
- The discharge ratio of both general and industrial waste was estimated according to our classification of fields in demand and discharge model.

#### 2-3 Discharge of Resin Production and Resin Processing Waste :

- Resin production and resin processing waste associated with resin production and resin processing, and plastic-product manufacturing waste associated with manufacturing and production in assembly plants, were investigated using a questionnaire on the business of plastic waste recycling, and information was acquired using extrapolation statistics. The



amount of waste generated as a by-product in resin production was collated separately.

2-4 Total Plastic Waste :

- This is the total amount of post-use products discharge and resin production and resin processing waste.

2-5 The breakdown of resin varieties of total plastic waste :

This evaluation was estimated by calculation on post-use products discharge, that of resin production and resin processing waste and the breakdown of total resin production etc.

### **(3) Disposal and Recovery of Plastic Waste**

3-1 Material Recycling :

- Material recycling amount and its breakdown is estimated by extrapolation from results of a questionnaire given to recycling companies. Here, recycled materials include pellets, flakes, fluff, blocks and ingots, and recycled products include types of film sheet, stakes and piping, etc.

3-2 Utilized Amount in the Form of Densified Refuse Derived Fuel, Liquefied Plastic Waste and Material for Blast Furnace :

- Data from the questionnaire on recycling targeting Densified Refuse Derived Fuel, Liquefied Plastic Waste or material for Blast Furnace were converted into figures for plastic.
- "Liquefaction" , "gasification" , "blast-furnace raw materials" and "coke-oven raw materials" are permitted as recycling methods for "Containers and Packaging Recycling Law" and expected to increase after 2,000th year.

3-3 Disposal and Recovery of General Waste :

- Treatment by Incineration / Disposal by Landfilling:  
Using other investigations conducted by this institute to date, a comparison was made between incineration and landfilling by

municipalities.

• Incineration with Power Generation:

Treatment by incineration by municipalities includes power generation. In order to calculate this ratio, results from the present investigation were used.

• Incineration with Heat Utilization Facility:

Treatment by incineration by municipalities includes incineration having external heat utilization facilities but having no power generation. In order to calculate this ratio, results from the present investigation were used.

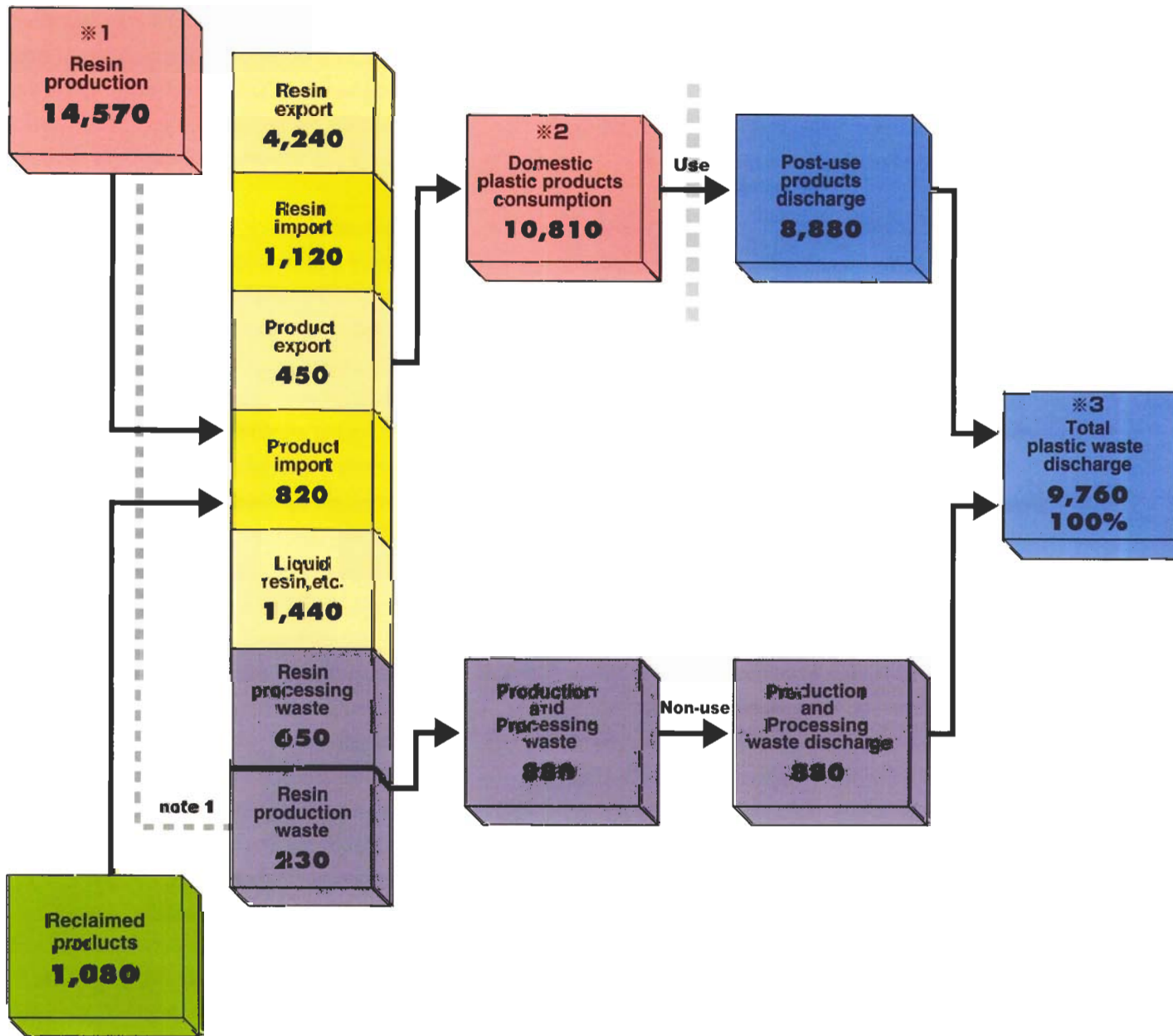
3-4 Disposal and Recovery of Industrial Waste :

- Disposal and recovery of industrial waste is partially commissioned to the municipalities involved. The ratio of this process by waste management business against that by municipalities is calculated according to the results of the present investigation.
- Concerning the ratio of treatment by incineration by municipalities against that of landfilling and the ratio of energy recovery such as power generation, the same predictions are made in relation to general waste materials.
- The ratio of incineration and land filling by industrial waste management contractors is calculated according to results of the present investigation.
- Ratios of energy recovery such as power generation from incineration treatment of industrial plastic waste are based on the results of the present investigation.
- Incineration with heat utilization facility :  
The ratios of heat utilization by municipalities and by industrial waste management contractors involved in treatment of industrial waste by incineration are calculated according to the results of the investigation done by this institute.

# Flowchart of plastic products, plastic waste and resource recovery (1999)

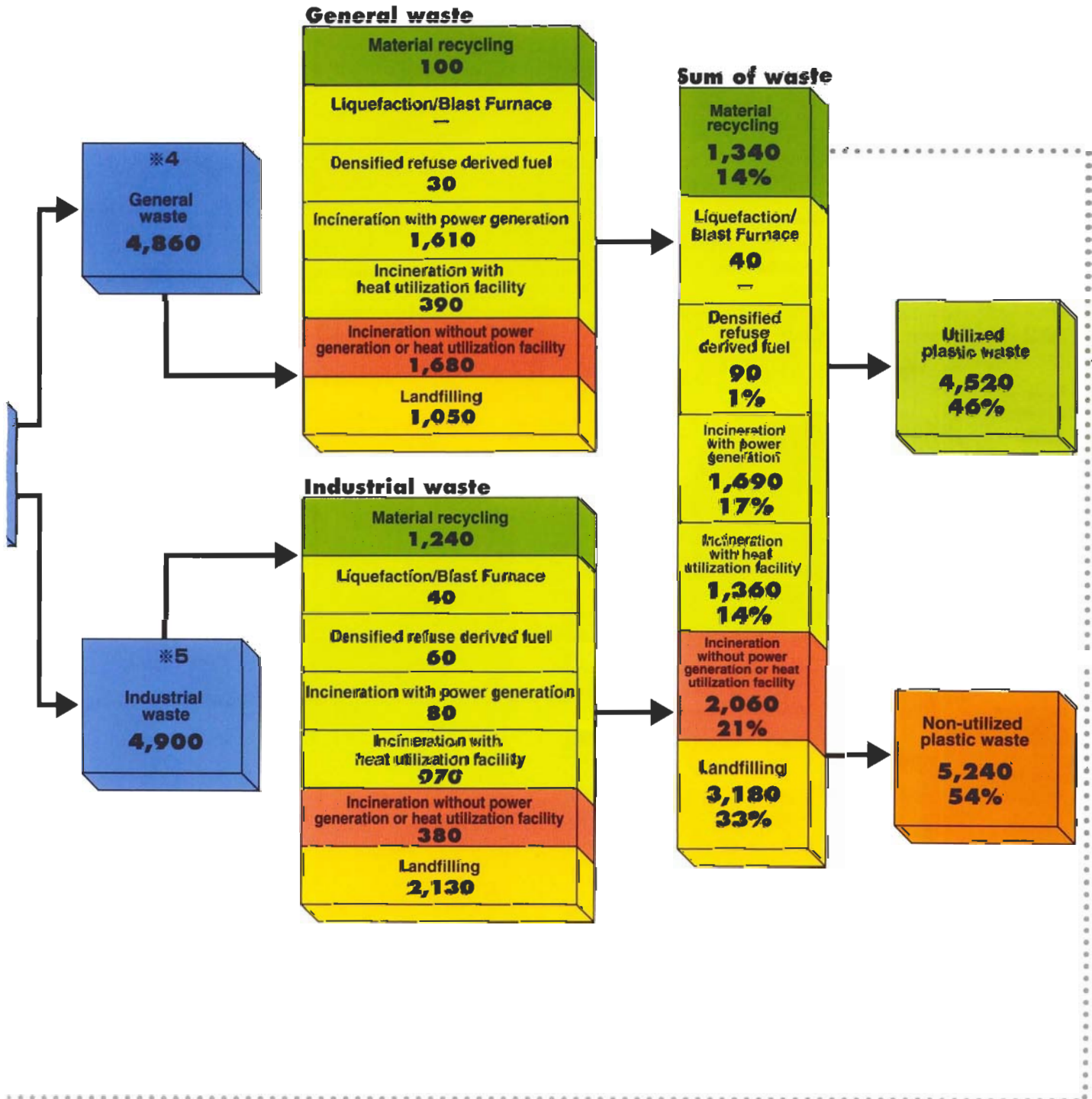
[ Unit; thousand tons ]

**Resin production, Resin processing and Marketing of products**      **Discharge**



**note 1:** Amount of Resin production waste is not included in Resin production.  
**note 2:** For the sake of convenience, the quantities for this year (1,080) are based on those of material recycling from the previous year (1,220) excepting exported quantities (140).

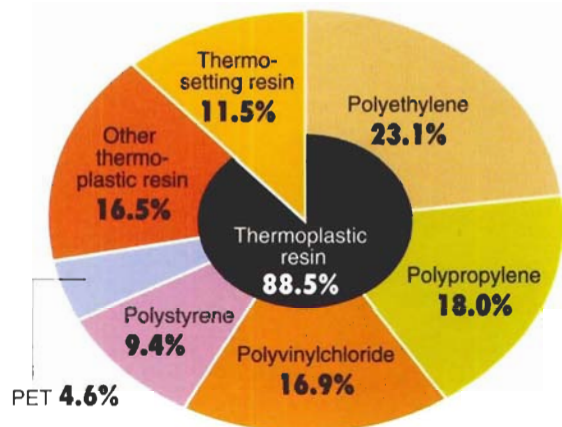
## Disposal and recovery





# Details of construction elements in flowchart

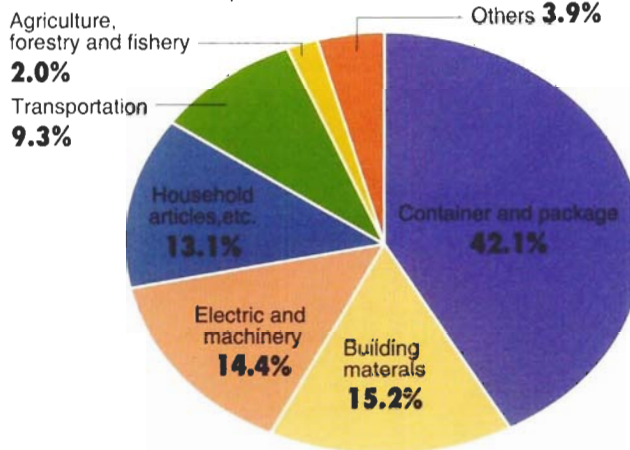
※1 Breakdown of resin production by resin varieties (14,570 thousand tons)



( Source : MITT's chemical industry statistics )

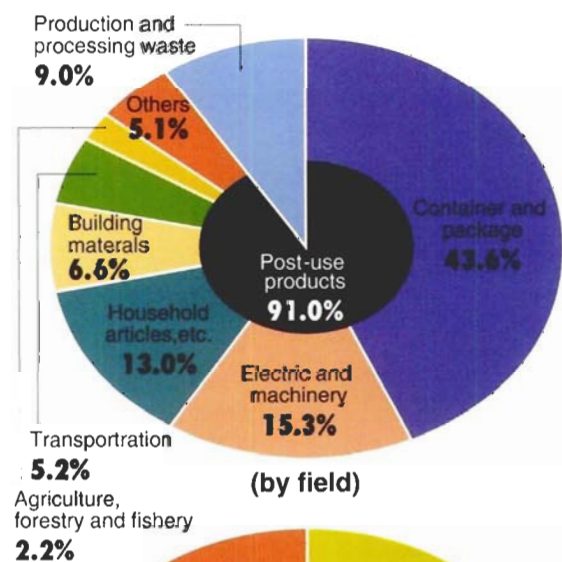
For convenience, 1.3% Others , neither classified in thermosetting resin nor in thermoplastic resin , are included into Other thermoplastic resin.

※2 Breakdown of resin products by field (10,810 thousand tons)



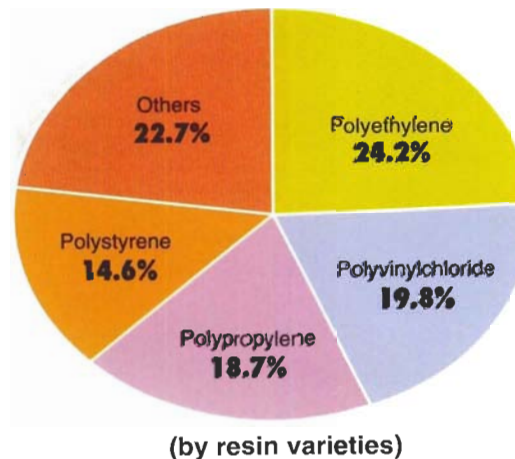
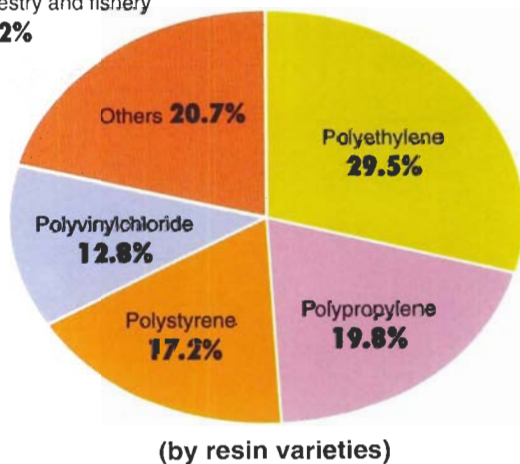
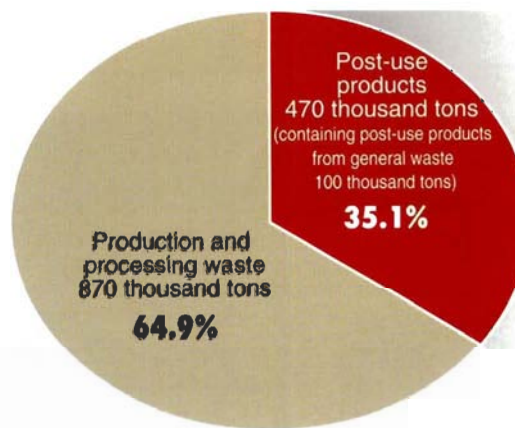
( Source : Estimations by groups concerned, etc. )

※3 Breakdown of total plastic waste by field (9,760 thousand tons)

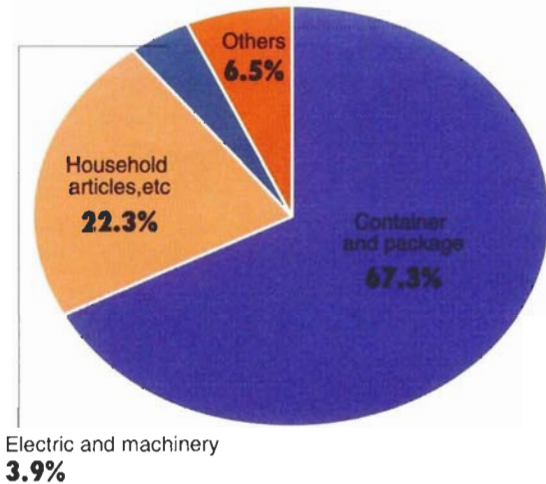


※6 Breakdown of material recycling (1,340 thousand tons)

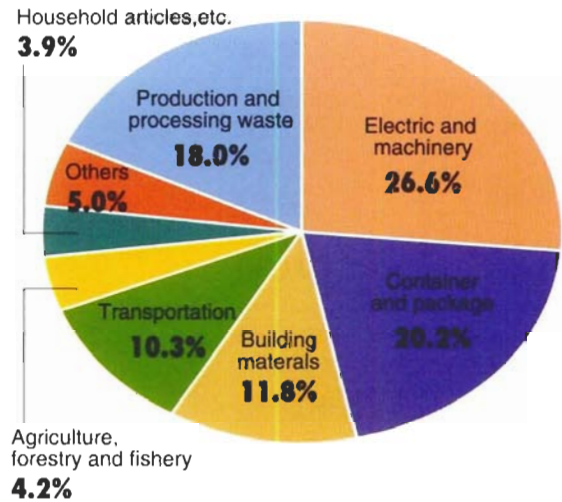
● Breakdown of material recycling resources



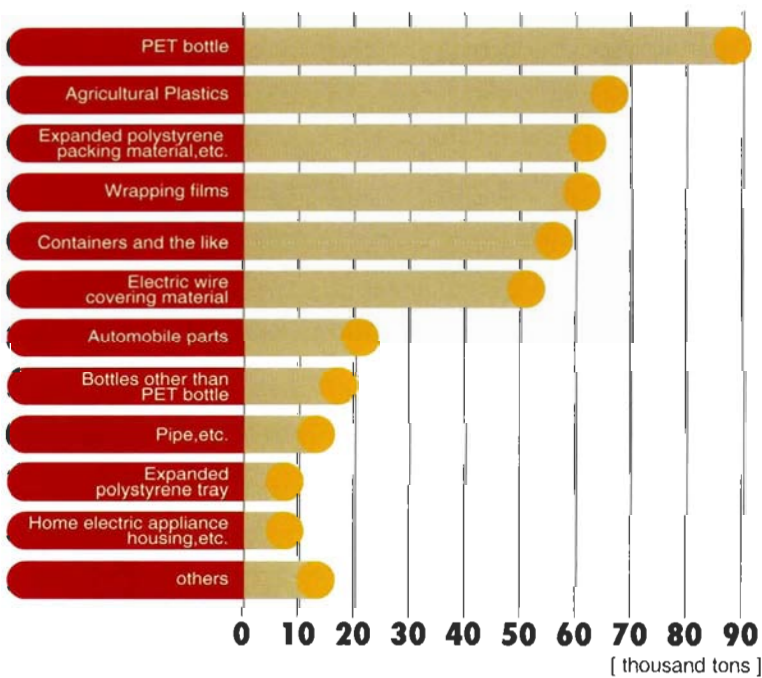
※4 Breakdown of general waste by field (4,860 thousand tons)



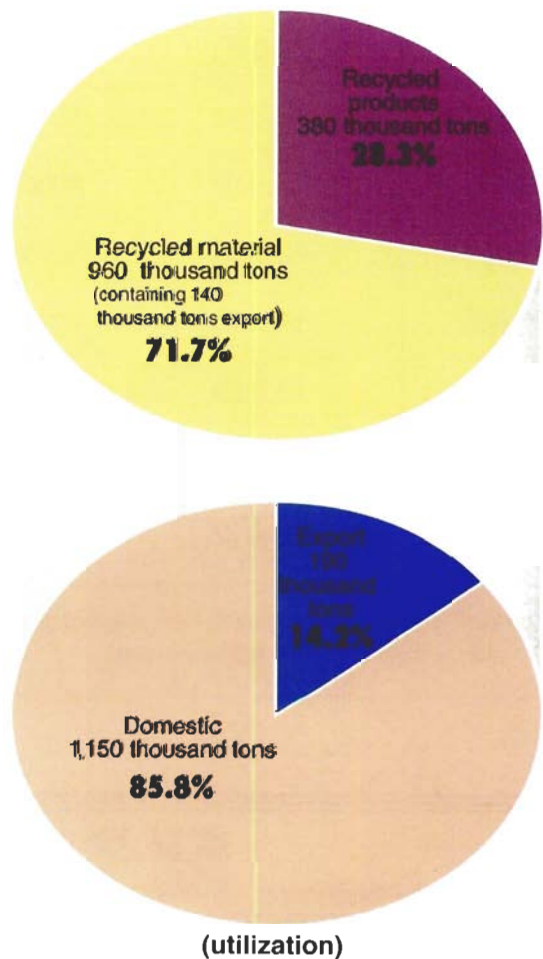
※5 Breakdown of industrial waste by field (4,900 thousand tons)



○ Material resources of recycling



● Breakdown of reclaimed products





# Plastics production and waste discharge

Year	Resin production	Domestic plastic products consumption	Total plastic waste discharge	General waste		Industrial waste	
	1,000t/year	1,000t/year	1,000t/year	1,000t/year	%	1,000t/year	%
1975	5,170	3,150	2,610	1,470	56	1,140	44
1980	7,520	5,520	3,250	1,780	55	1,470	45
1985	9,230	6,990	4,190	2,320	55	1,870	45
1986	9,370	7,300	4,530	2,500	55	2,030	45
1987	10,030	7,920	4,650	2,600	56	2,050	44
1988	11,020	8,610	4,880	2,760	57	2,120	43
1989	11,910	9,570	5,060	2,910	58	2,150	42
1990	12,630	9,990	5,570	3,130	56	2,440	44
1991	12,800	10,070	6,220	3,450	55	2,770	45
1992	12,580	9,280	6,920	3,910	56	3,010	44
1993	12,250	9,020	7,560	4,190	55	3,370	45
1994	13,040	9,660	8,460	4,230	50	*4,230	50
1995	14,030	9,790	8,840	4,430	50	4,410	50
1996	14,660	10,810	9,090	4,550	50	4,540	50
1997	15,210	11,360	9,490	4,780	50	4,710	50
1998	13,910	10,200	9,840	4,990	51	4,850	49
1999	14,570	10,810	9,760	4,860	50	4,900	50

\* From 1994, the estimation method was changed, non-use resin production waste and resin processing waste were added to figures for the industrial waste.