PWMI Newsletter

NO 44 2015.4

Plastic Waste Management Institute
JAPAN

Plastic Products, Plastic Waste and Resource Recovery [2013]

Background information and notes on the publication of the Flowchart of Plastic Products, Plastic Waste and Resource Recovery (2013)

Thanks to the Abenomics effect, 2013 saw improvement in many economic indicators including stock prices, economic growth, corporate performance, and employment. Resin production remained at nearly the same level as 2012, and while the drop in resin production that began in 2010 came to a halt, its current level is still about 4,000 kt short of the 2007 level prior to the Lehman Brothers collapse (Lehman Shock).

In preparing this flowchart for 2013, we reflected the results of a "Survey on Industrial Plastic Waste Discharge and Disposal and Recovery" (Large-scale Survey on Industrial Plastic Waste) conducted in fiscal year 2013 (this was the fourth of such surveys conducted every five years). This survey revealed that the incineration/landfilling ratio changed from 80/20% to 85/15% indicating that the landfilling ratio decreased.

2013 Highlights

(1) Resin production increased by only 60 kt (+0.6%) relative to 2012, which means that it was essentially the same as the previous year. Domestic plastic products consumption increased by 50 kt (+0.6%) in step with resin production.

(2) Total plastic waste discharge increased modestly by 110 kt (+1.2%) relative to 2012 to 9,400 kt.

(3) Effectively used plastic waste increased by 240 kt (+3.2%) relative to 2012 to 7,670 kt pushing the effective plastic utilization rate up to 82%, two points higher than the previous year.

In 2013, resin production remained essentially unchanged from the previous year at 10,600 kt (+60 kt relative to 2012; +0.6%). Resin export, resin import, and product export showed little change from the previous year at 3,440 kt (+20 kt; +0.5%), 2,460 kt (-20 kt; -0.6%), and 790 kt (-10 kt; -1.0%), respectively. Product import, on the other hand, increased somewhat to 1,930 kt (+50 kt; +2.6%). As a result, domestic plastic products consumption increased to 9,660 kt (+50 kt; +0.6%).

Total plastic waste discharge showed no major change at 9,400 kt (+110 kt; +1.2%). It can be broken down into domestic (general) plastic waste at 4,540 kt (+80 kt; +1.7%) and industrial plastic waste at 4,860 kt (+30 kt; +0.7%).

Turning to disposal and recovery methods, the portion of total plastic waste discharge applied to mechanical recycling was about the same as the previous year at 2,030 kt (-10 kt; -0.4%) and that to feedstock recycling*1 decreased to 300 kt (-80 kt; -22%). The portion applied to energy recovery*2 increased overall to 5,350 kt (+330 kt; +6.5%).

The percentage contributions to the effective plastic utilization rate by mechanical recycling, feedstock recycling, and energy recovery were 22%, 3%, and 57%, respectively, showing that the plastic utilization rate increased by two points overall to 82% relative to 2012.

Exports of plastic waste for mechanical recycling were about the same as the previous year at 1,680 kt (+10 kt; +0.5%).

*1: feedstock recycling = blast/coke furnaces + gasification + liquefaction
*2: energy recovery = densified-refuse derived fuel and cement material/fuel + incineration with power generation + incineration with heat utilization facility

Explanation of flowchart items

(1) Resin production, resin processing, and marketing of products

1-1 Resin production

This figure was determined on the basis of chemical-industry statistics from the Ministry of Economy, Trade and Industry (METI).

1-2 Reclaimed products

For convenience sake, the figure used here as input is that of mechanical recycling from the previous year taking figures for export and import of plastic waste into account (Ministry of Finance, trade statistics).

1-3 Domestic plastic products consumption

・(Domestic plastic products consumption) = (Resin production) - (Resin export) + (Resin import) - (Liquid resin, etc.) - (Resin processing waste) + (Reclaimed products) - (Product export) + (Product import)

・Resin export and import figures are based on trade statistics from the Ministry of Finance.

・Figures for liquid resin, synthetic fiber, etc. that fall outside plastic waste discharge are based on chemical-industry statistics from the Ministry of Economy, Trade and Industry.

・Figures for plastic product export and import are based on trade statistics from the Ministry of Finance.

・Figure for processing waste considers discharged waste from the processing step that is not turned into products.

1-4 Domestic plastic input

・(domestic plastic input) = (domestic plastic products consumption) – {(exported plastic parts from assembled products) – (imported plastic parts from assembled products)}

・Assembled products: automobiles, home appliances (televisions, refrigerators, freezers, air conditioners, washing machines and dryers)

・Number of exported/imported assembled products: Automobile figures are based on Monthly Motor Vehicle Statistics of Japan from Japan Automobile Manufacturers Association (JAMA); home appliance figures are based on "Current Production Statistics" from Ministry of Economy, Trade and Industry (METI).

(2) Discharge

2-1 Post-use products discharge

・This figure is determind by an estimation system developed by PWMI based on usage quantities by demand-generating fields and by resin type (usage quantities have been calculated annually from 1976) and on product lifetimes by demand-generating fields (using a PWMI discharge model for the last 60 years)

・Since the export of used automobiles affects the amount of plastic waste in Japan, corrections are made to plastic waste discharge in the transport industry. Here, the number of used automobiles is based on "number of post-use automobiles" issued by JAMA and the number of exported used automobiles is based on data released by Japan Automobile Dealers Association (JADA).

・Discharge ratios for domestic waste and indust-rial waste have been estimated using a PWMI discharge model for demand-generating fields.

2-2 Production and processing waste discharge

・Amount of production waste is not included in amount of resin production, and amount of processing waste is extrapolated from the re-sults of questionnaires.

2-3 Total plastic waste discharge

・(total plastic waste discharge) = (post-use products discharge) + (resin production waste) + (resin processing waste)

2-4 Breakdown of total plastic waste discharge by resin type

・These breakdown figures were estimated from amounts for post-use products discharge, production and processing waste discharge, breakdown of resin production, etc.

(3) Disposal and recovery

3-1 Mechanical recycling

・Figures for the mechanical recycling of domestic plastic waste are based on the volume of collected PET bottles (The Council for PET Bottle Recycling) and volume of collected white trays (Japan Plastic Food Container Industry Association), and figures for the mechanical recycling of other plastic containers and packaging are based on data released by The Japan Containers And Packaging Recycling Association. From this year on, residual amounts after the mechanical recycling of other plastic containers and packaging will be allocated to densified-refuse derived fuel and other items using figures released by The Japan Containers and Packaging Recycling Association as coefficients. (In previous years, residual amounts were all allocated to landfilling.)

・Total figures and breakdowns for the mechanical recycling of industrial waste are extrapolated from the results of questionnaires sent to recycling companies.

3-2 Densified-refuse derived fuel, liquefaction, gasification, blast furnace raw material

・Figures for liquefaction, gasification, blast furnace raw materials, and coke-oven chemical materials approved as product recycling procedures by the Containers and Packaging Recycling Law have been determined on the basis of bids announced by the Japan Containers and Packaging Recycling Association and results of question-naires.

・The figure for densified-refuse derived fuel includes energy recovery as cement kiln fuel and power-generation.

3-3 Disposal and recovery of domestic waste

・Incineration/landfilling ratio

This ratio is determined on the basis of past surveys conducted by PWMI.

・Incineration with power generation / incineration with heat utilization

"Incineration with power generation" means incineration processing by an incinerator equipped with power-generation facilities and "incineration with heat utilization" means incineration proce-ssing by an incinerator that, while not equipped with power-generation facilities, has facilities for utilizing heat externally. The ratios shown are determined by PWMI surveys based on values published by the Ministry of the Environment. The announcement of these values, by the way, is now made at an earlier date by the ministry, and this report therefore uses actual values from the previous fiscal year .

3-4 Disposal and recovery of industrial waste

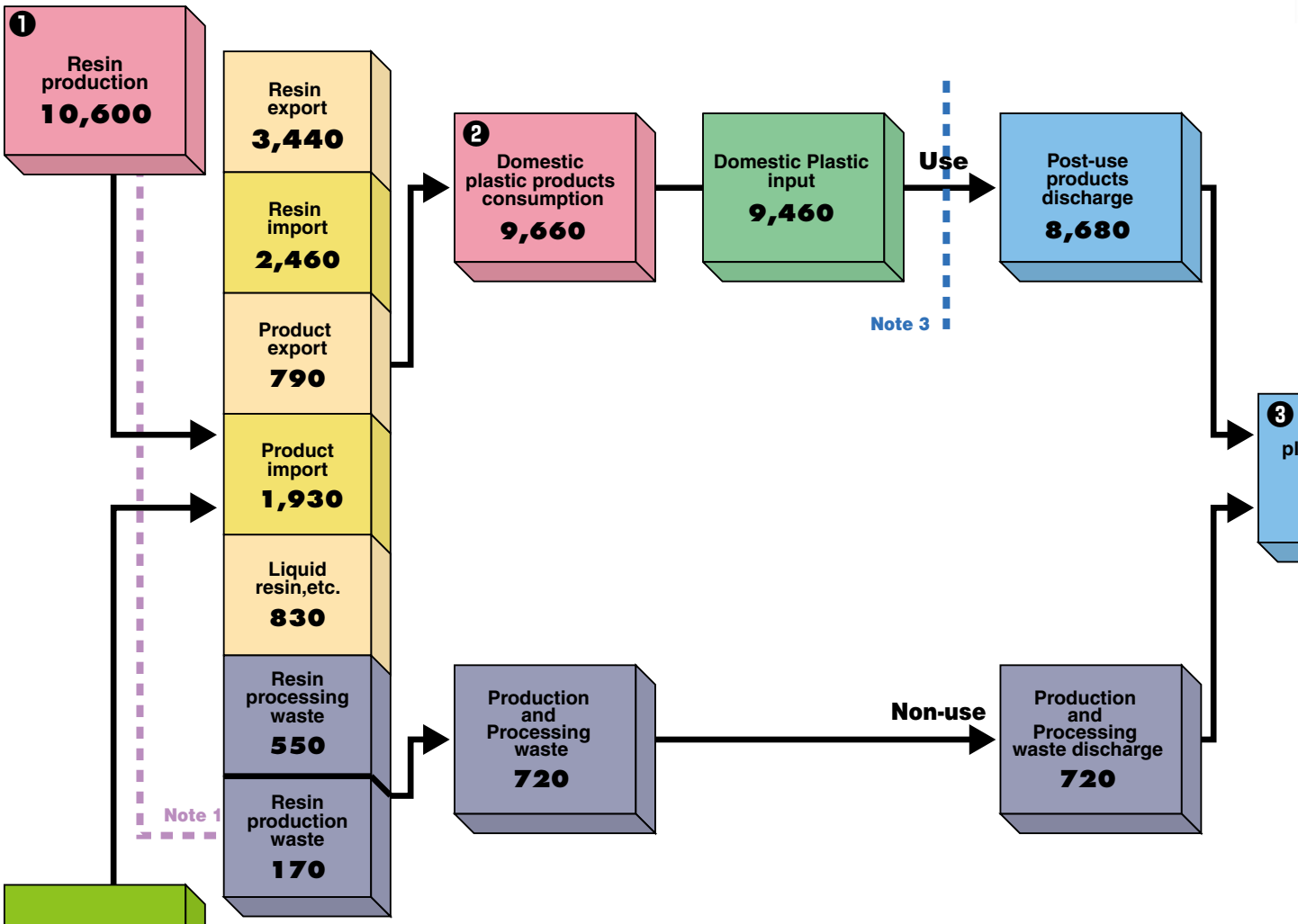
・Disposal and recovery of industrial waste is partially commissioned to local governments as business-related waste. The ratio of such processing by business to that commissioned to local governments is determined on the basis of PWMI surveys. The percentage breakdown of commissioned processing into incineration with power generation, incineration with heat utilization facility, incineration without power generation or heat utilization facility, and landfilling is based on figures for domestic waste processing.

The incineration/landfilling ratio in the processing of industrial waste and the energy recovery rate in incineration with power generation are based on the latest surveys conducted by PWMI in fiscal years 2006/2008.

Flowchart of plastic products, plastic waste and resource recovery 2013

[Unit; kt（thousand tons）]

Resin production, resin processing, and marketing of products | **Discharge**



Note 1: Resin production does not include the quantity shown for resin production waste

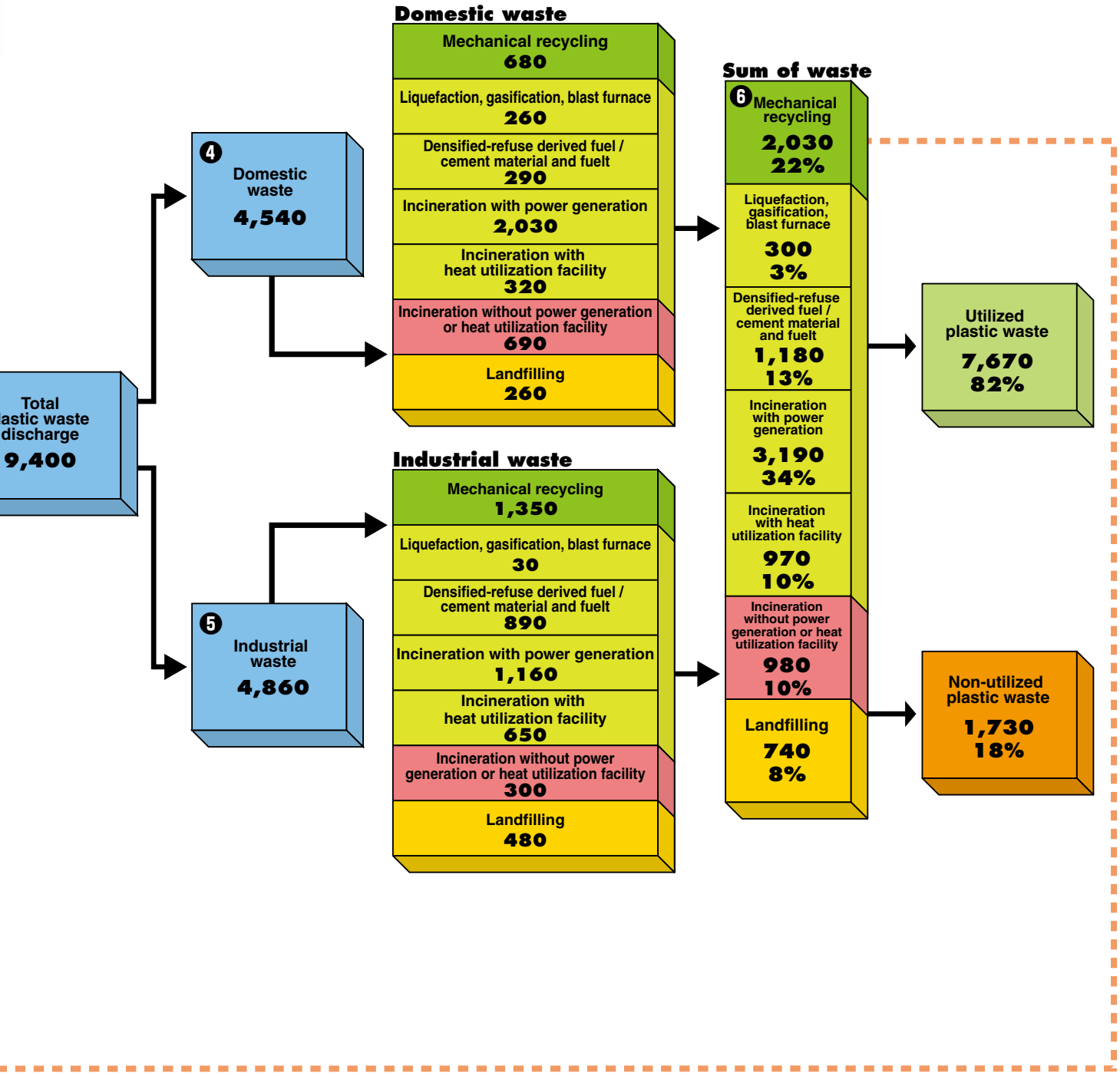
Note 2: The quantity shown this year for reclaimed products is based on that of mechanical recycling from the previous year (2,040 kt) excluding exported portion (1,670 kt) and the amount used for fiber from PET bottles (80 kt).

Note 3: The figure for post-use products discharge is computed by a PWMI estimation system based on usage for different demand areas and different resin types (from 1976) and product lifetimes for different demand areas (60-years discharge model created by PWMI).

Note 4: Some figures may not exactly match due to rounding.

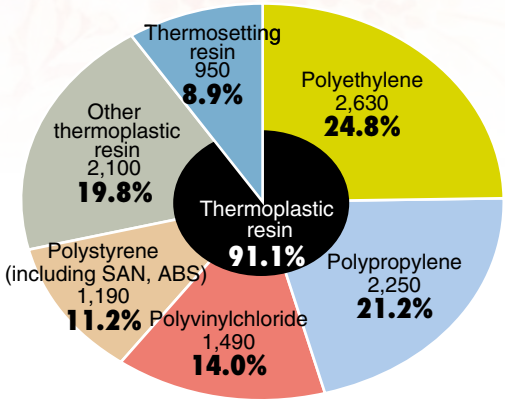
※ ❶~❻ corresponds to the graph of next page.

Disposal and recovery



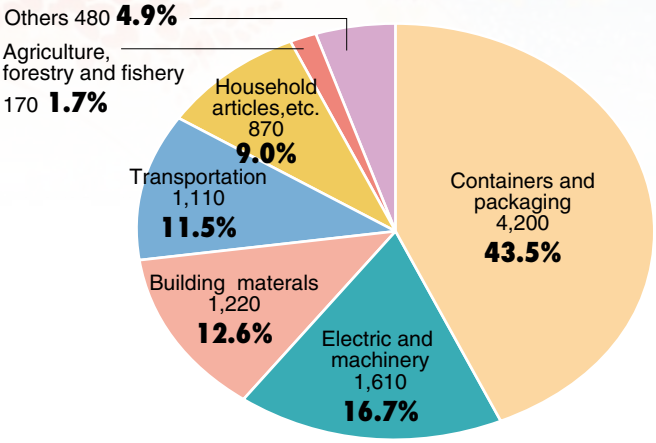
Details of flowchart elements (unit : kt (thousant tons))

❶ Breakdown of resin production (10,600kt) by resin type



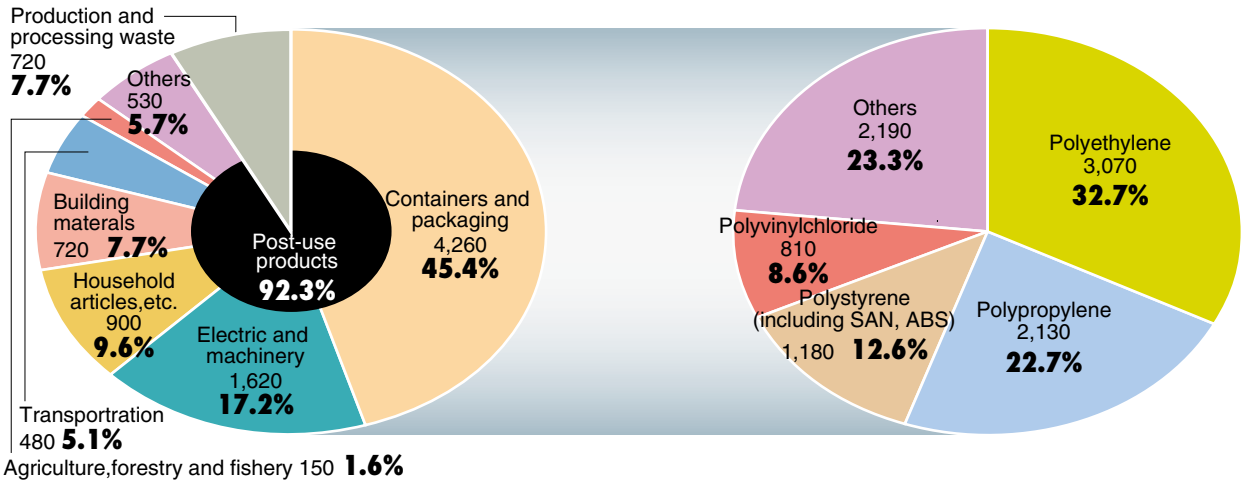
(Source: METI chemical-industry statistics)

❷ Breakdown of resin products by field (9,660kt)



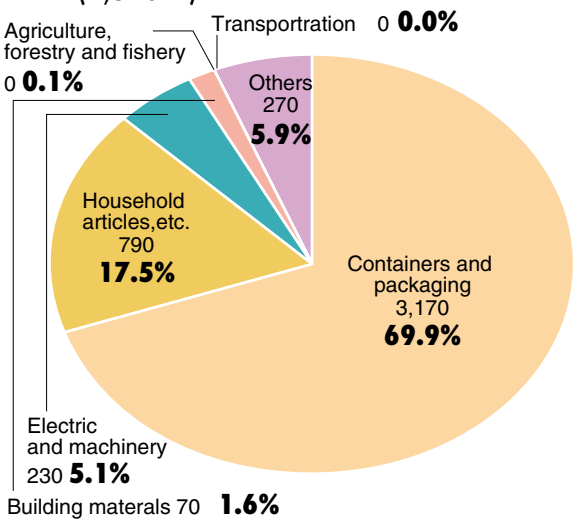
(Source: estimates from related organizations)

❸ Breakdown of total plastic waste by field (9,400 kt)



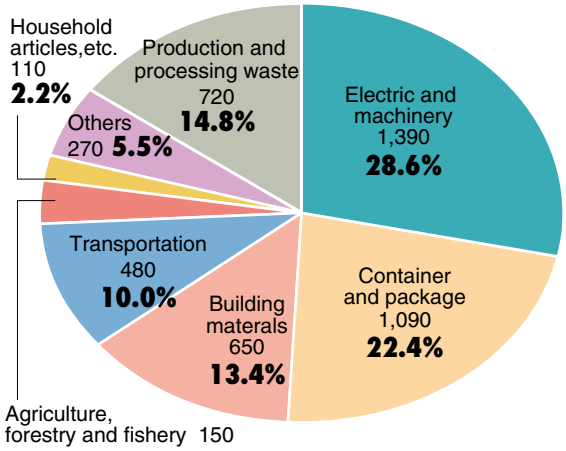
(by field) (by discharge type)

❹ Breakdown of domestic waste by field (4,540 kt)



(by resin type)

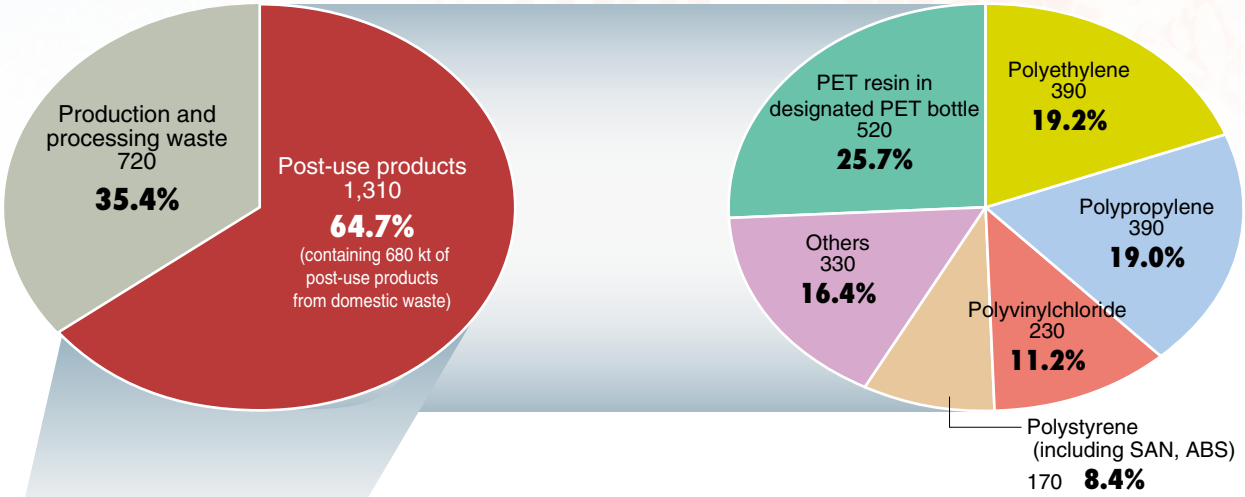
❺ Breakdown of industrial waste by field (4,860 kt)



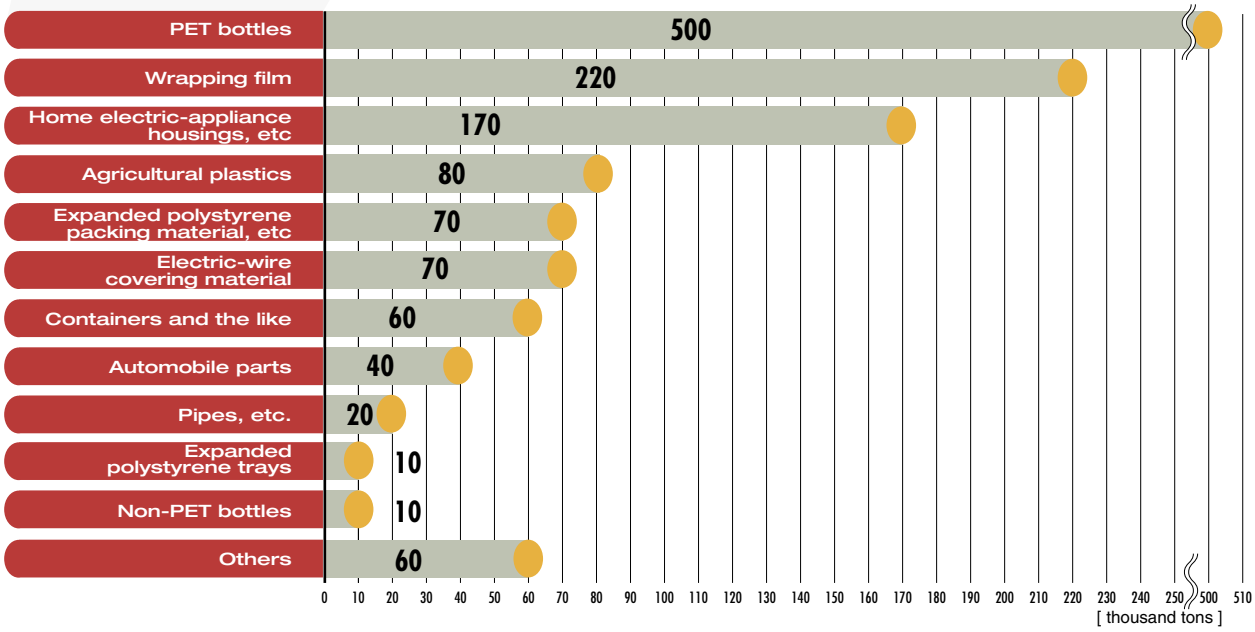
(by resin type)

❻ Breakdown of mechanical recycling (2,030 kt)

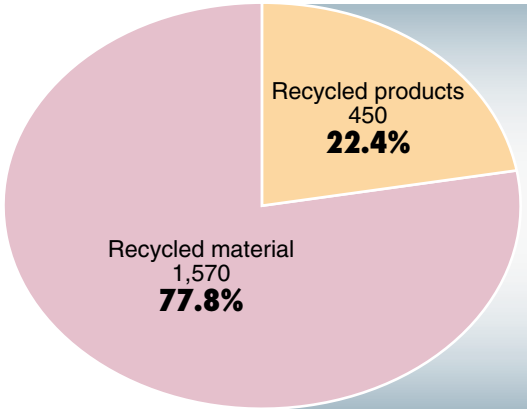
○ Breakdown of mechanical recycling resources



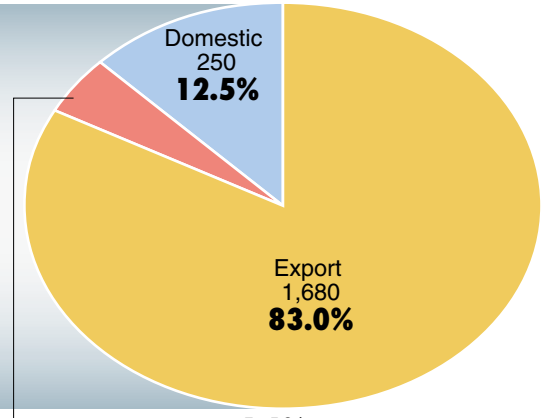
○ Breakdown of post-use products for mechanical recycling (1,310 kt)



(by type of reclaimed products)



(by destination of recycling use)



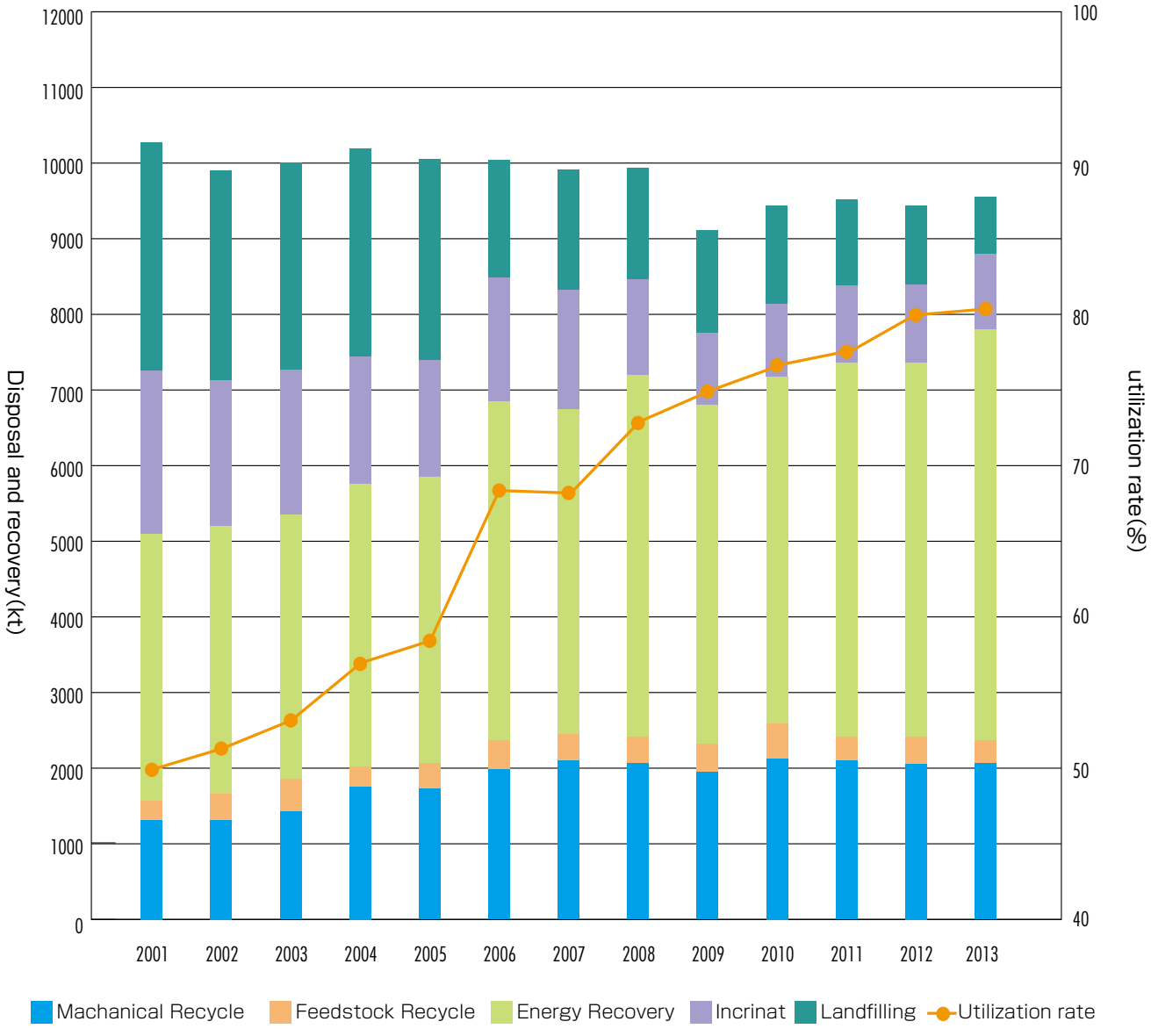
Plastics production and waste discharge

Year	Resin production	Domestic plastic products consumption	Total plastic waste discharge	Domestic waste		Industrial waste	
	kt/year	kt/year	kt/year	kt/year	%	kt/year	%
1980	7,520	5,520	3,260	1,780	55	1,470	45
1985	9,230	6,990	4,190	2,320	55	1,870	45
1990	12,630	9,990	5,570	3,130	56	2,440	44
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
2000	14,740	10,980	9,970	5,080	51	4,890	49
2001	13,880	10,960	10,160	5,280	52	4,890	48
2002	13,850	10,570	9,900	5,080	51	4,820	49
2003	13,980	11,010	10,010	5,130	51	4,880	49
2004	14,460	11,360	10,130	5,190	51	4,940	49
2005	14,510	11,590	10,060	5,200	52	4,860	48
2006	14,450	11,200	10,050	5,080	51	4,980	50
2007	14,650	11,030	9,940	5,020	51	4,920	49
2008	13,450	10,890	9,980	5,020	50	4,960	50
2009	11,210	8,430	9,120	4,440	49	4,680	51
2010	12,700	9,700	9,450	4,590	49	4,860	51
2011	11,590	9,870	9,520	4,650	49	4,860	51
2012	10,540	9,600	9,290	4,460	48	4,820	52
2013	10,600	9,660	9,400	4,540	48	4,860	52

Change in Utilized Plastic Waste by Amount and Rate Over Time

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total Plastic waste discharge (kt)	10,160	9,900	10,010	10,130	10,060	10,050	9,940	9,980	9,120	9,450	9,520	9,290	9,400
Utilization amount (kt)	5,130	5,160	5,410	5,750	5,820	6,880	6,920	7,330	6,890	7,230	7,440	7,440	7,670
Utilization rate(%)	50	52	54	57	58	69	69	73	75	77	78	80	82

Please see the PWMI Web site for detailed data on the production, discharge, reuse, and disposal of plastic products.



Business Overview

History

Originally founded in December 1971 as the Plastic Management Research Association, the Plastic Waste Management Institute (PWMI) received its current name in July of the following year as operations expanded. For the last 40 years or so, PWMI has endeavored to research and develop technology for the optimal processing and effective use of plastic waste and to publicize its findings. In addition, PWMI re-defined its mission in April 2013 as Through conducting researches relating to cyclical use of plastic aiming to contribute to the reduction of environmental impact through the life cycle of plastic, PWMI well contribute to the construction of a sustainable society as well as healthy development of plastic related industries.

Business Content

(1)LCA based study on environmental impact of plastic and its products.
(2)Research and study relating to cyclical use of plastic, generation of plastic waste etc.
(3)Enhancing public awareness and supporting school education about plastic.

Activities

The three core activities of PWMI are summarized below.
(1) Provision of life cycle assessment (LCA) base data and LCA evaluation of recycling & recovery (R&R) technologies. PWMI provides scientific and high-reliability data for widespread use by related industries and general citizens for application to carbon footprint systems, etc. It also works to solve technical issues so that the effective use of plastic waste can be evaluated by LCA.
(2) Preparation of the Flowchart of Plastic Products, Plastic Waste and Resource Recovery and ongoing improvements to its accuracy

PWMI strives to obtain a clear understanding of the entire lifecycle of plastic from its production stage to its disposal and R&R and to prepare and provide a highly accurate flowchart of this process.
(3) Support of environmental education

PWMI continues to hold instructor training courses and on-site classes and works to raise the level of consciousness in society regarding the usefulness of plastic. In addition to holding on-site classes on plastic R&R at primary and middle schools especially in Japan's Kanto region, PWMI will honor as much as possible requests for instructor training courses in line with new teaching guidelines and for lectures at universities specializing in environmental science.

Members (as of July 2014)

Regular members: 17 corporations and 3 organizations
Supporting members: 3 organizations

Regular members

Asahikasei Chemicals Corporation
DuPont-Mitsui Polychemicals Co. Ltd.
Japan Polyethylene Corporation
Japan Polypropylene Corporation
JNC Corporation
Kaneka Corporation
Maruzen Petrochemical Co., Ltd.
NUC Corporation
Prime Polymer Co., Ltd.
Shin Dai-Ichi Vinyl Corporation
Shin-Etsu Chemical Co., Ltd.
Sumitomo Chemical Co., Ltd.
SunAllomer Ltd.
Taiyo Vinyl Corporation
Tosoh Corp.
Tokuyama Sekisui Co., Ltd.
Ube-Maruzen Polyethylene Co., Ltd.

Trade organizations

Japan Petrochemical Industry Association
Japan Plastics Industry Federation
Vinyl Environmental Council

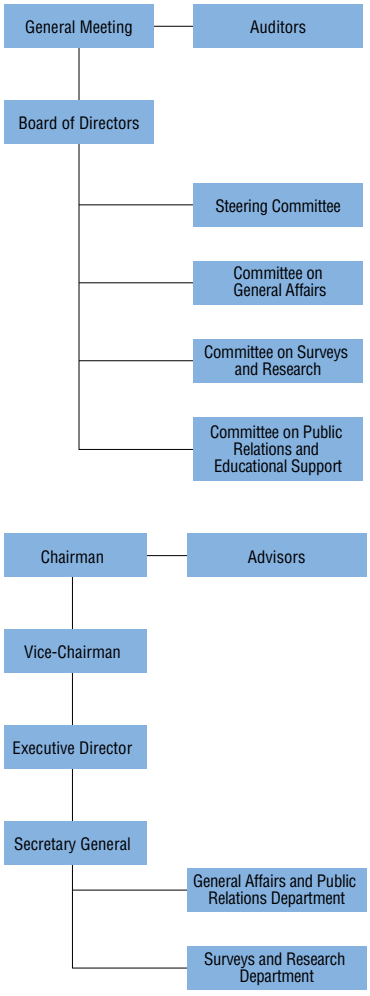
Supporting members

Japan PET Bottle Association
Japan Expanded Polystyrene Recycling Association
Japan PVC Environmental Affairs Council

Directors

Chairman: Toshio Asano
Vice-Chairman: Kenichi Udagawa
Executive Director: Hisao Ida
Directors: 10
Auditors: 2

Organization



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