PWMI Newsletter

NO 45 2016.4

Plastic Waste Management Institute
JAPAN

Plastic Products, Plastic Waste and Resource Recovery [2014]

Background information and notes on the publication of the Flowchart of Plastic Products, Plastic Waste and Resource Recovery (2014)

Against the background of a gradual economic recovery, 2014 saw improvement in stock prices, corporate performance, and other economic indicators in a trend continuing from the previous year. Resin production remained about the same as that of 2013, and while the drop in resin production that began in 2010 has definitely halted, its current level is still about 4,000 kt short of the 2007 level prior to the Lehman Brothers collapse (Lehman Shock).

Within densified-refuse derived fuel in energy recovery, the amount of plastic waste effectively used for refuse paper and plastic fuel (RPF) was estimated to be about 500 kt in 2013 based on a questionnaire-based survey. The 2014 flowchart reflects the results of a PWMI-original survey titled “Supply and Demand Trends in Plastic Waste used for RPF” (released March 2015) using a revised method of estimation. In these results, the amount of plastic waste effectively used as RPF raw material came out to about 700 kt for 2014, indicating an increase of about 200 kt over that of 2013 based on a questionnaire-based survey.

As for exports of plastic waste for mechanical recycling, we have been using the value for “plastic scrap” from trade statistics. By closely inspecting the content of trade statistics and making appropriate corrections, we have been able to improve the accuracy of our figures.

2014 Highlights

(1) Resin production increased by only 10 kt (+0.1%) relative to 2013, which means that it was essentially the same as the previous year. Domestic plastic products consumption increased by 110 kt (+1.1%).

(2) Total plastic waste discharge decreased by 140 kt (-1.5%) relative to the previous year to 9,260 kt.

(3) Effectively used plastic waste increased by 10 kt (+0.1%) relative to the previous year to 7,680 kt pushing the effective plastic utilization rate up to 83%, one point higher than the previous year.

In 2014, resin production was practically unchanged from the previous year at 10,610 kt (+10 kt relative to 2013; +0.1%). Resin export, resin import, product export, and product import, meanwhile, increased to 3,520 kt (+80 kt; +2.3%), 2,630 kt (+170 kt; +6.8%), 810 kt (+20 kt; +2.0%), and 1,970 kt (+40 kt; +2.3%), respectively. As a result, domestic plastic products consumption increased to 9,770 kt (+110 kt; +1.1%).

Total plastic waste discharge decreased to 9,260 kt (-140 kt; -1.5%). This result can be broken down into domestic (general) plastic waste at 4,420 kt (-120 kt; -2.5%) and industrial plastic waste at 4,830 kt (-30 kt; -0.5%).

As for disposal and recovery methods, the portion of total plastic waste discharge applied to mechanical recycling decreased to 1,990 kt (-40 kt; -1.7%) and that to feedstock recycling*1 increased to 340 kt (+40 kt; +15.8%). The portion applied to total energy recovery*2 came to 5,340 kt (-10 kt; -0.1%).

The percentage contributions to the effective plastic utilization rate by mechanical recycling, feedstock recycling, and energy recovery approximately were 22%, 4%, and 58%, respectively, showing that the plastic utilization rate increased by one point overall to 83% relative to 2013.

Exports of plastic waste for mechanical recycling came to 1,510 kt as a corrected value. Using the past calculation method, this figure would be 1,670 kt (-10 kt; -0.7%), which is about the same as the previous year.

*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 prepared by the Ministry of Economy, Trade and Industry (METI) on the basis of chemical-industry statistics.

1-2 Reclaimed products

- For convenience sake, the figure used here is that of mechanical recycling at 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 METI.
- Figures for plastic product export and import are based on trade statistics from the Ministry of Finance.
- Figure for resin processing waste is 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 calculated 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 60-year discharge model).
- 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 industrial waste have been estimated using a PWMI discharge model by demand-generating fields.

2-2 Production and processing waste discharge

- Amount of resin production waste is not included in amount of resin production, and amount of resin production waste and amount of resin processing waste are estimated using each predefined waste ratio.

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 of post-use products discharge, production and processing waste discharge, resin production, etc.

(3) Disposal and recovery

3-1 Mechanical recycling

- Figures for the mechanical recycling of domestic plastic waste are based on the weight of collected PET bottles (The Council for PET Bottle Recycling) and weight 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. Residual amounts after the mechanical recycling of other plastic containers and packaging will be allocated to densified-refuse derived fuel and other items using as coefficients figures released by The Japan Containers and Packaging Recycling Association.
- Total figures and breakdowns for the mechanical recycling of industrial waste are extrapolated from the results of questionnaires sent to recycling companies. Production waste and processing waste are taken to be the total of mechanical recycling.
- "Recycled material" indicates pellets, flakes, fluff, blocks, and ingots, while "recycled products" refer to film sheets, stakes, pipes, etc. other than the above.
  The export figure under "destination of recycling use" for mechanical recycling is based on "scrap plastic" statistics from Ministry of Finance trade figures.

3-2 Densified-refuse derived fuel, blast-furnace/coke-oven raw materials, gasification, liquefaction

- Figutures for densified-refuse derived fuel includes plastic waste for power generation; figures for densified-refuse derived fuel and cement kiln fuel are based on the results of surveys targeting industry associations.
- With respect to domestic waste, figures for blast furnace raw materials, coke-oven chemical materials, gasification, and liquefaction approved as product recycling methods by the Containers and Packaging Recycling Law are based on data released by The Japan Containers And Packaging Recycling Association.
- With respect to industrial waste, these figures are based on the results of questionnaires.

3-3 Disposal and recovery of domestic waste

- Incineration/landfilling ratio
  This ratio is determined from the results of past PWMI surveys based on the "FY2013 Nation Survey on the State of Discharge and Treatment of Municipal Solid Waste" of the Ministry of the Environment.
- 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 processing 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 released by the Ministry of the Environment.

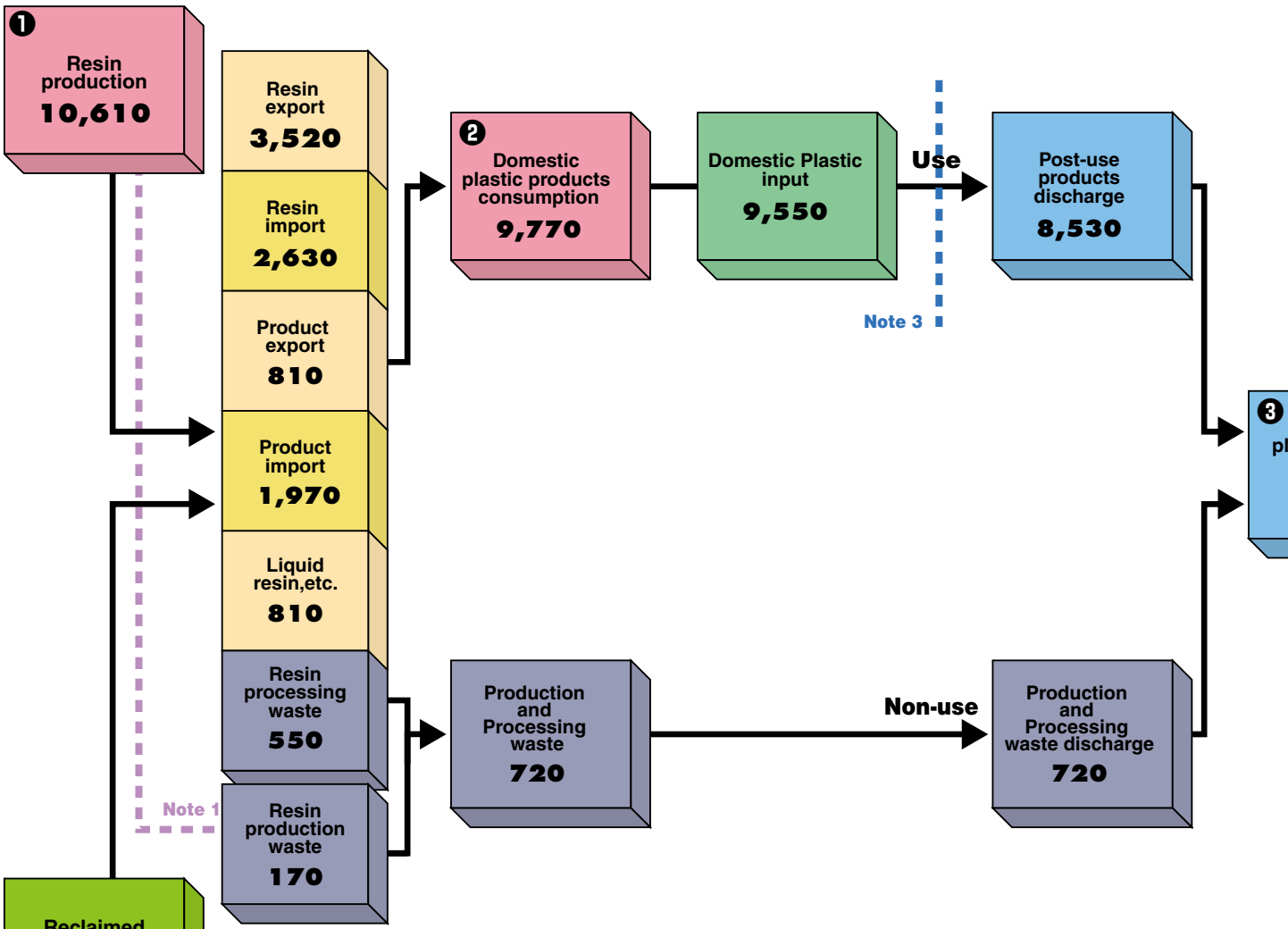
3-4 Disposal and recovery of industrial waste

- Disposal and recovery of industrial waste is partially commissioned to local governments as business-related waste. The ratio of such processing by business operators 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 is based on the latest survey conducted by PWMI in fiscal year 2013. The energy recovery rate in incineration by power generation, etc. is taken to be the same as the results of previous surveys conducted by PWMI in fiscal years 2006/2008.
- Figtures for incineration with power generation includes plastic waste traded for a price.

Flowchart of plastic products, plastic waste and resource recovery 2014

[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

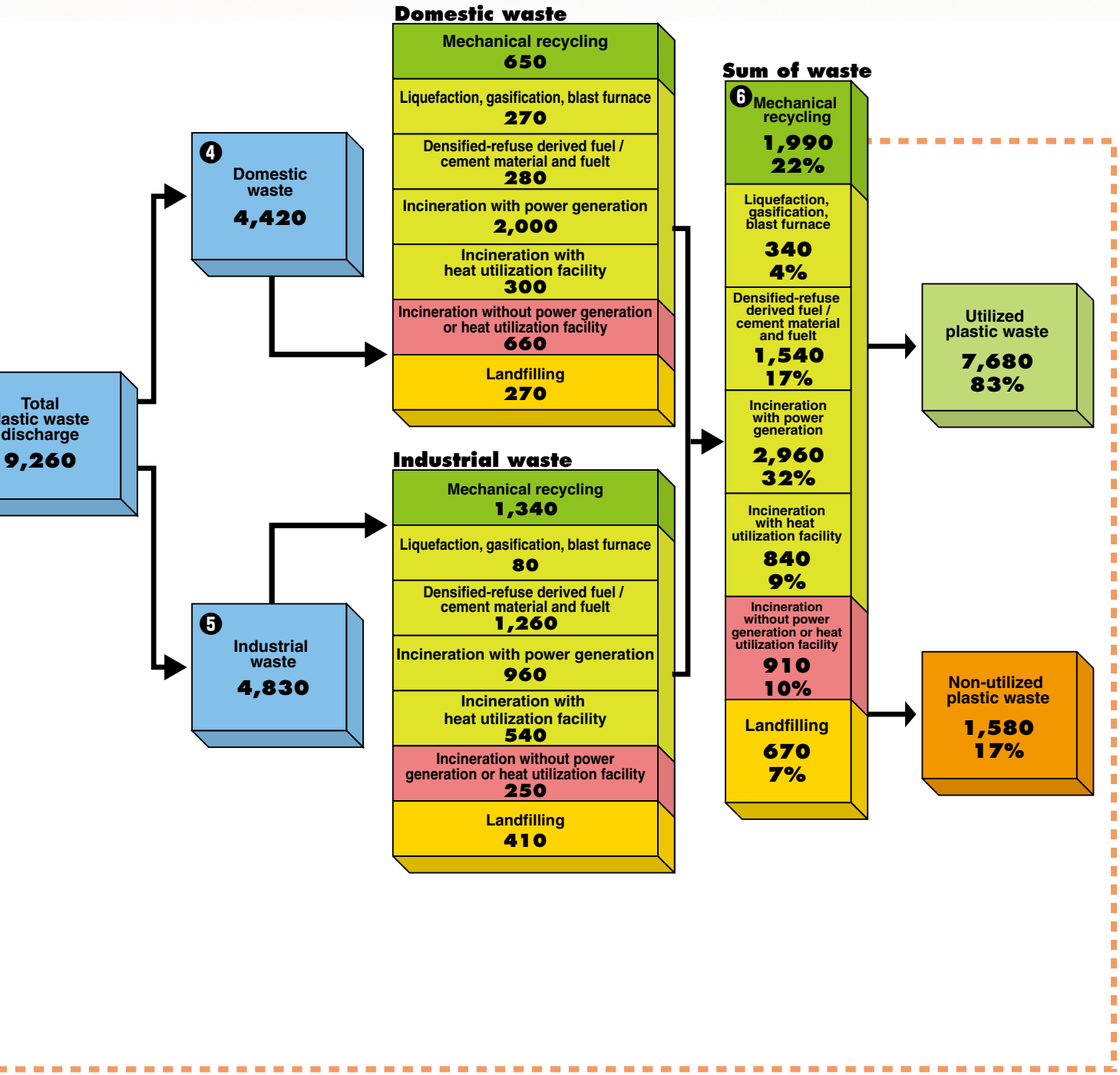
Note 2: The quantity shown this year for reclaimed products is based on that of mechanical recycling from the previous year (2,030 kt) excluding exported portion (1,680 kt) and the amount used for fiber from PET bottles (90 kt).

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.

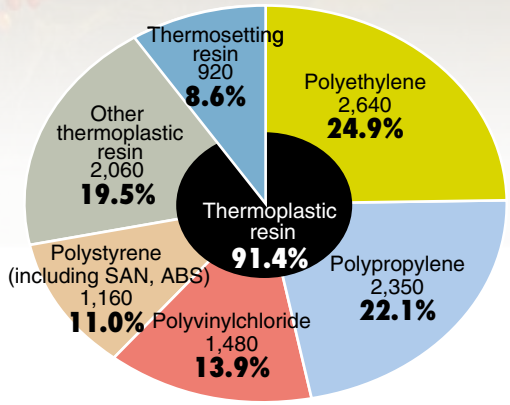
※ ❶~❻ corresponds to the graph of next page.

Disposal and recovery

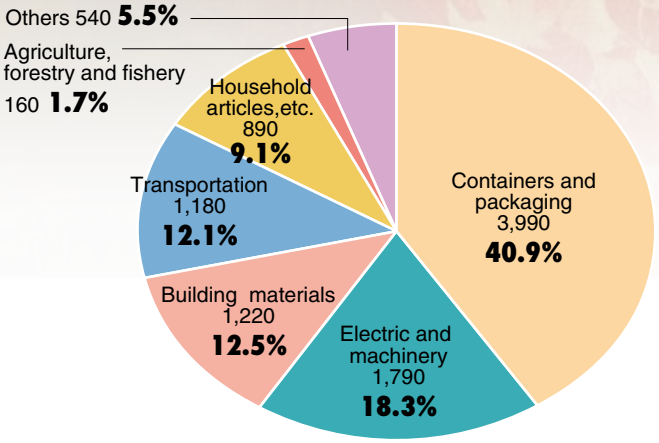


Details of flowchart elements (unit : kt (thousant tons))

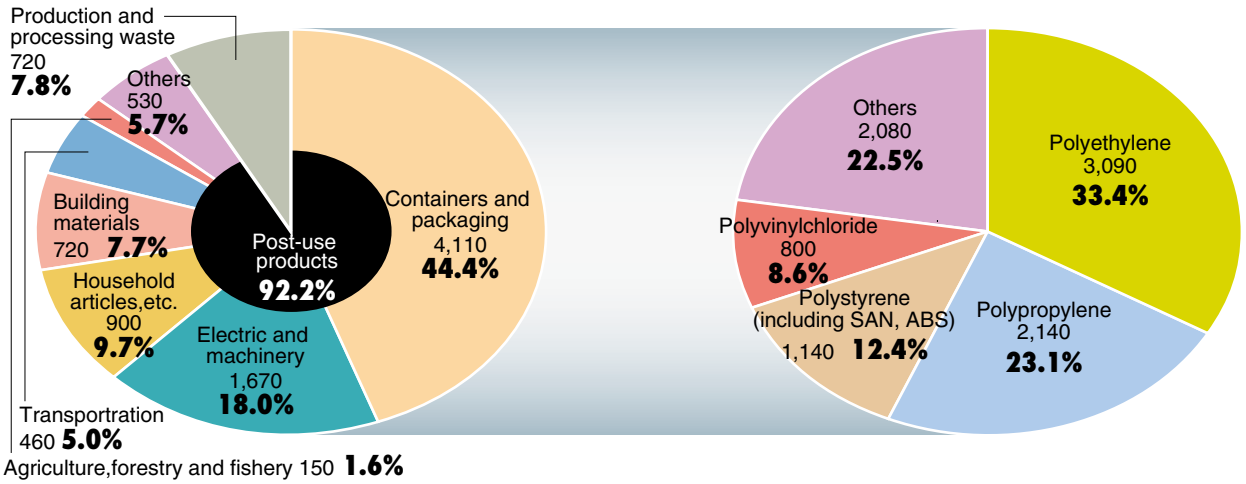
❶ Breakdown of resin production (10,610kt) by resin type



❷ Breakdown of resin products by field (9,770kt)

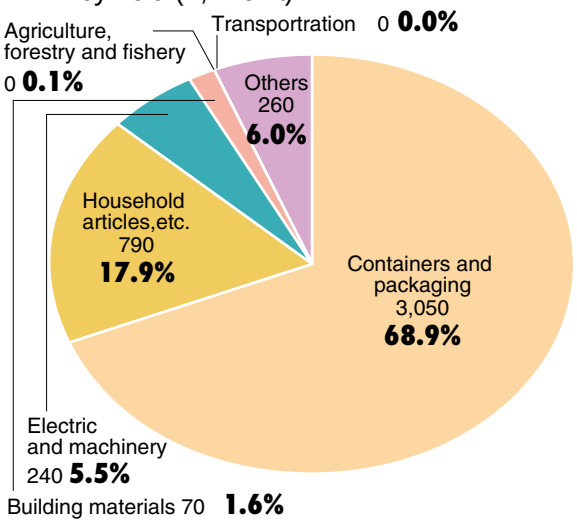


❸ Breakdown of total plastic waste by field and resin type (9,260 kt)

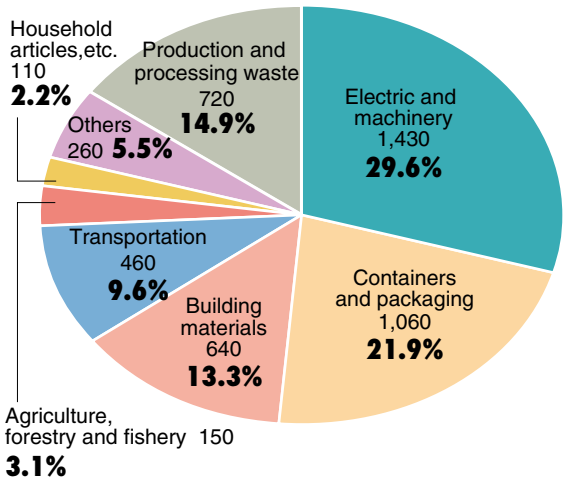


(by field) **(by resin type)**

❹ Breakdown of domestic(general) waste by field (4,420 kt)

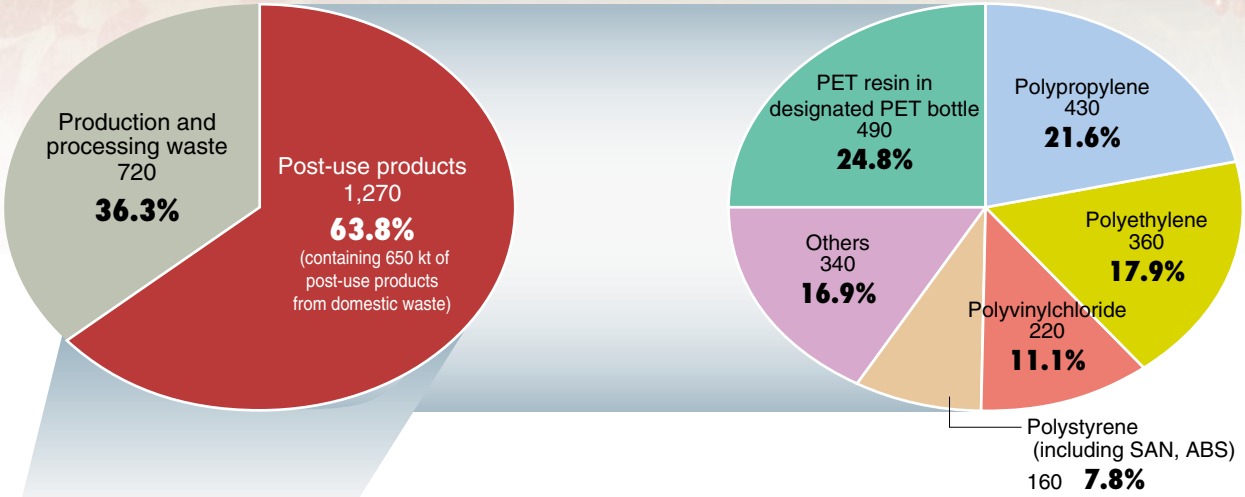


❺ Breakdown of industrial waste by field (4,830 kt)

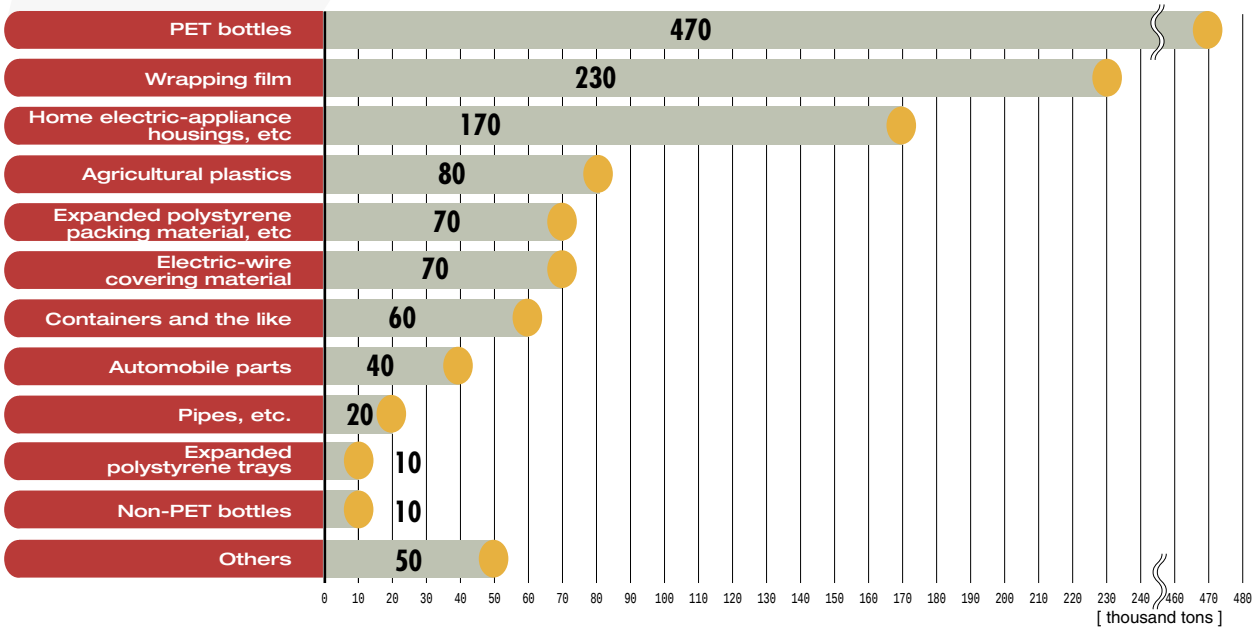


❻ Breakdown of mechanical recycling (1,990 kt)

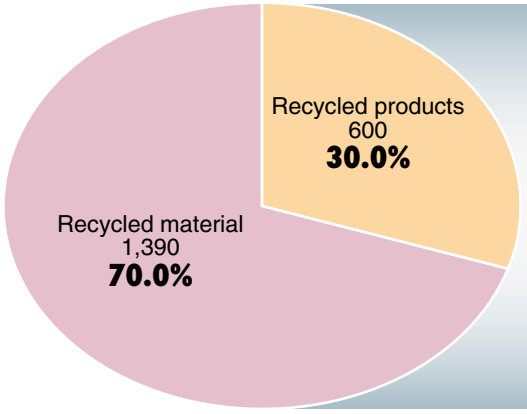
○ Breakdown of mechanical recycling resources and resin type



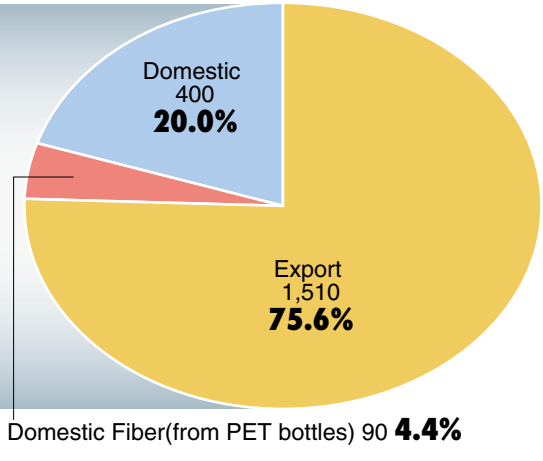
○ Breakdown of post-use products for mechanical recycling (1,270 kt)



(by type of reclaimed products)

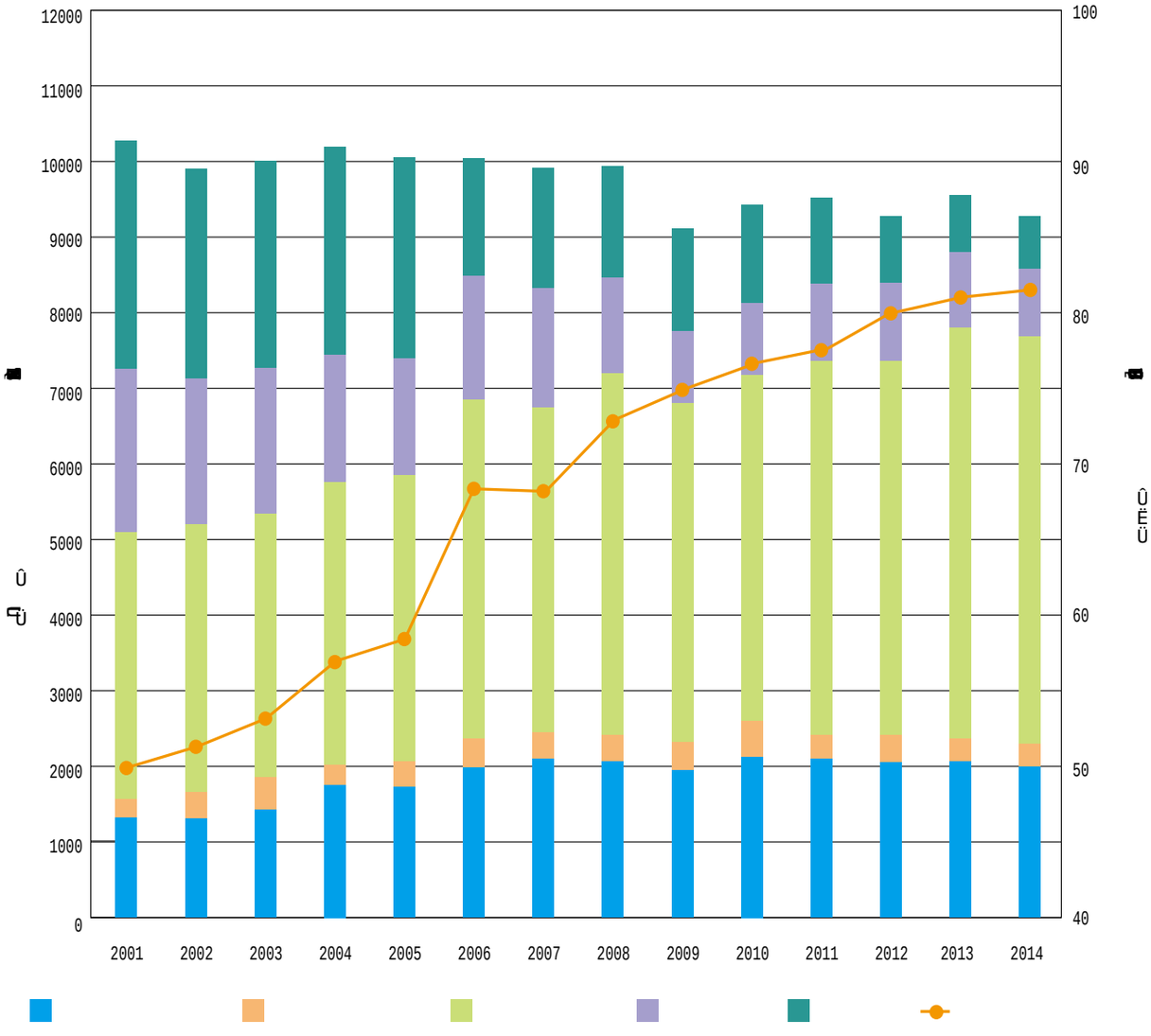


(by destination of recycling use)



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	2014
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	9,260
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	7,680
Utilization rate(%)	50	52	54	57	58	69	69	73	75	77	78	80	82	83



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 January 2016)

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

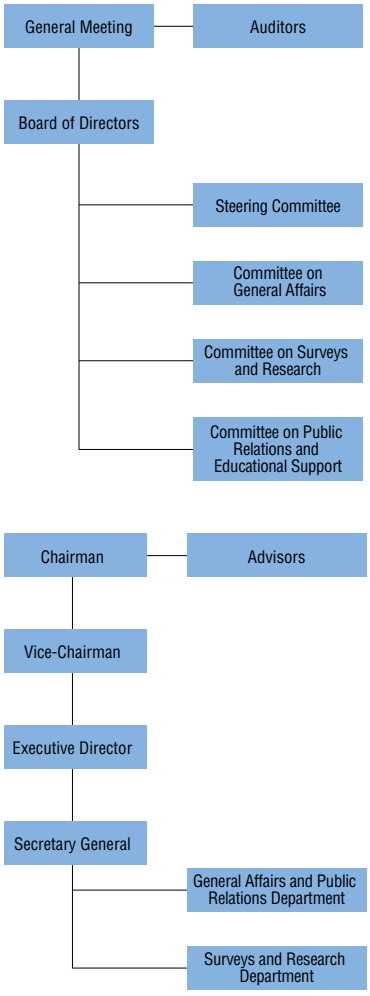
Supporting members

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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