

# Quality of containers and packaging plastics and its impact on recycling

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## Introduction

For the transition to resource conservation through a carbon neutrality, the establishment of a circular economy through recycling, in addition to reducing the use of plastics, is an urgent issue. Recycling of plastics requires attention to the quality of plastic waste that can be recycled. High-quality plastic waste can be recycled horizontally; however, if the quality declines, it must be cascade-recycled or it becomes non-recyclable. This study focused on the disposal stage of plastic waste and empirically analyzed the actual situation of sorting and cleaning by residents.

## Materials and methods

Figure 1 shows the concept of a circular economy for plastics. Multiple processes occur throughout the life cycle. Each process includes elements that influence the quality of plastic waste. The elements targeted in this study are shown in red. Factors that should be considered when residents dispose of plastic waste include (1) whether it is sorted as recyclable waste, (2) which sorting routes are used to collect recyclables, and (3) whether the plastic waste is adequately washed when it is sorted for collection. Plastic waste must first be sorted and collected as recyclable waste. At that time, it is important that the plastic waste is washed. In FY2021, only approximately 59% of the plastic containers and packaging collected in Japan were recycled (Japan Containers and Packaging Recycling Association, 2023; Japan Ministry of the Environment, 2023). Multiple factors, including contamination, contribute to the low recycling rate. Sorting routes include municipal collection, group collection, community collection, and private collection, and the degree of washing can vary depending on which sorting route is used.

A questionnaire survey was conducted to determine the collection routes used by residents to dispose of containers and packaging plastics and how much they wash them. The target population comprised 1,652 men and women aged 20 years or older residing

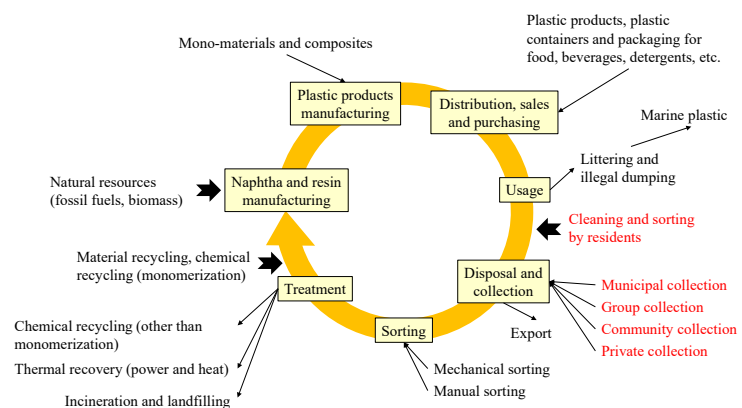


Figure 1. Circular economy concept for plastics

in Kobe, Japan. The questionnaire survey covered six types of plastic containers and packaging (beverage bottle caps, non-plastic bottle caps, frozen food trays, used Tupperware containers, tofu containers, and jelly containers) and asked about their sorting methods, the collection route selected when sorting them as recyclables, and the degree to which they were washed. The survey period was from January 19 to 31, 2024.

### Results and discussion

Table 1 shows the percentage of the containers and packaging plastics sorted based on the respondents' answers. The results revealed that 75.7% of the respondents sorted six types of containers and packaging plastics as recyclables. Most of the recyclable waste was sent to municipal collection routes. Very few other collection routes were available. Nineteen percent of the six types of plastic containers and packaging items were disposed of as combustibles. The amount of waste recycled could be increased by separating combustibles as recyclables.

In the results of the degree of cleaning of the six types of plastic containers and packaging, 15.5% of overall respondents answered, "I would wash off all stains using detergent." In addition, 49.6% of respondents answered "I would wash them with water roughly until all the stains were removed." However, 35.9% answered, "I do not care if there are still stains" and "I do not wash." Because the quality of the waste is lower if dirt remains on it, even after it is sorted as recyclables, local governments are required to publicize the degree of washing to increase the level of washing.

### Conclusions

The questionnaire survey allowed us to perform a quantitative analysis of the factors that affect the quality of containers and packaging plastics at the disposal stage. By analyzing the impact of the collection route and degree of cleaning on the carbon footprint of products, the quality of containers and packaging plastics can be evaluated from multiple perspectives.

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Table 1. Percentage of the containers and packaging plastics sorted

|                |                      |        |
|----------------|----------------------|--------|
| Recyclables    | Overall              | 75.70% |
|                | Municipal collection | 70.2%  |
|                | Group collection     | 1.9%   |
|                | Private collection   | 2.6%   |
|                | Community collection | 0.9%   |
|                | Miscellaneous        | 0.1%   |
| Combustibles   |                      | 19.0%  |
| Incombustibles |                      | 4.8%   |
| Miscellaneous  |                      | 0.5%   |

Note: Percentage of recyclables sorted by collection route is also shown.