

Market Study Report on the Recycling of Used Plastic Bottles (Summary)

October 2023



Purpose of Survey

- Consumers are familiar with plastic bottles as materials, and recycling activities for these materials are a part of our daily lives.
- In recent years, distribution channels have been varied and diversified, including the spread of **bottle-to-bottle recycling efforts**, in which used plastic bottles are recycled back into plastic bottles again, and a shift toward trading used plastic bottles for positive value.
- In light of these circumstances, the Japan Fair Trade Commission (JFTC) conducted the Market Study on the Recycling of Used Plastic Bottles in order to indicate policy approaches under the Antimonopoly Act and competition policies.

			Target Groups	Number
Questionnaire Survey		Municipalities	50 entities	
Target Groups	Number of Subjects	Response Rate	Collection and transport services / intermediate treatment business operators	5 entities
Municipalities	1,741 entities	79.9%	Recyclers	27 entities
everage manufactures	1,139 entities	65.8%	Beverage manufactures	8 entities
	47	00.40/	Generators of used plastic bottles	6 entities
Recyclers	47 entities	ties 89.4%	Business operator associations, etc.	5 entities
			Experts	5 persons

Overview of Used Plastic Bottles (1)



Overview of Plastic Bottles

- A plastic bottle is a container in which the bottle body is manufactured using polyethylene terephthalate (plastic resin) as a single raw material.
- It is used in a wide range of products and demands for beverages, specific seasonings, or alcoholic beverages accounted for 91.3% (in 2021).

Procurement Channels of Plastic Bottles for Manufacturers and Distributors of Products in Plastic Bottles



Source: Prepared by the JFTC based on interviews with beverage manufacturers, etc.

Collection of Used Plastic Bottles

 Used plastic bottles from households are collected by municipalities as general waste. Waste generated by business operators and other entities (business waste) is collected by industrial waste disposal services as industrial waste.

(The amount that municipalities collected and that of business waste were almost the same in FY2021.)

Status of Recycling

 The recycling rate for plastic bottles is approximately 86% (FY2021), one of the highest in the world.



Source: Prepared by the JFTC based on materials from the Council for PET Bottle Recycling

Sales Volume, Recycling Rate, etc., of Plastic Bottles in Japan



The Act on the Promotion of Sorted Collection and Recycling of Containers and Packaging

Purpose of the Act on the Promotion of Sorted Collection and Recycling of Containers and Packaging (the Containers and Packaging Recycling Act)

• The Containers and Packaging Recycling Law aims to reduce the amount of general waste and effectively utilize resources by establishing a recycling system for **containers and packaging generated by households as general waste**. The law stipulates that municipalities must take necessary measures for sorted collection, and that **business operators that use or manufacture containers and packaging (specified business operators) must recycle them** (enacted in April 1997).

Containers and Packaging with Recycling Obligations

• There are four types of **containers and packaging waste with recycling obligations** among the containers and packaging waste subject to sorted collection under the Containers and Packaging Recycling Law: **plastic bottles**, plastic containers and packaging, glass bottles, and paper containers and packaging.

(Since these four in question had low resource values and were disposed of without being recycled, it was deemed necessary to establish a system that requires specified business operators to recycle them.)

*There is no obligation to recycle business waste, and business operators are only obligated to dispose of such waste properly in accordance with the Waste Management and Public Cleansing Act.

Business Operators Required to Recycle (Specified Business Operators)

• Based on the concept of "Extended Producer Responsibility," the obligation and cost of recycling are borne by **business operators** that use, manufacture, import, and perform other such processes for containers and packaging.



Source: Prepared by the JFTC based on data from the Japan Containers and Packaging Recycling Association (JCPRA)

Containers and Packaging Subject to Sorted Collection and Recycling

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Transaction Status of Used Plastic Bottles (1)



Method of Fulfillment of Recycling Obligations (Processing Route)

Distribution of Used Plastic Bottles From Households (General Waste)



(1) Designated Juridical Person (JCPRA) Route	(2) Independent Route
Municipalities enter single-year contracts with designated juridical persons* and deliver to recyclers selected by bidding (If the recycler cannot pick up materials, the JCPRA will transfer the materials to a new delivery destination) *The Japan Containers and Packaging Recycling Association (JCPRA) is the only designated juridical person	Municipalities deliver to recyclers without going through the designated juridical person (There is also a trend toward forming agreements with beverage manufacturers and other entities for implementation)

Transaction Status of Used Plastic Bottles (2)

System of Designated Juridical Person (Bidding System of the JCRPA)

- The JCRPA conducts competitive bidding regarding plastic bottles twice a year, in the first and second halves of the year, and selects the successful bidders for each designated storage facility specified by municipalities.
- In the bidding process, although recyclers are commissioned to carry out the recycling, there is no requirement as to what kind of product should be made by the recycling. In other words, no requirement regarding how the product should be used after it is recycled.
- If the bid price (unit price per successful bid) is positive, the amount multiplied by the quantity is paid to the recycler as a recycling consignment fee (called "contracts for negative value") from the JCPRA.
- On the other hand, if the bidding price is negative, the recycler pays the consignment amount to the JCPRA (called an "contracts for positive value").
- Since the resource value of plastic bottles has recently increased, and in many cases, except in distant areas such as some remote islands, the bidding for plastic bottles is conducted under an contracts for positive value in the JCPRA's bidding process.

Since a specified business operator is obligated to recycle, in case where it concludes a recycling consignment contract with a designated juridical person and fulfills its own obligations under the contract, it is deemed that the specified business operator has recycled the amount equivalent to the entrustment (Article 14 of the Containers and Packaging Recycling Act).

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Overview of Recycling Obligations Regarding

Source: Prepared by the JFTC based on materials provided by the JCPRA



Bottle-to-Bottle Initiatives

- There is a trend toward municipalities specifying how used plastic bottles should be used after being sold, which means that the requirement to ensure bottle-to-bottle recycling is set when municipalities decide where to sell the used plastic bottles to educate residents and raise environmental awareness among them.
- Beverage manufacturers and other companies are also working with municipalities and other entities to implement bottle-to-bottle initiatives, and it appears that some generators of used plastic bottles also collaborate with beverage manufacturers and recyclers <u>to carry out bottle-to-bottle initiatives</u>.

<Initiative Examples>

Examples of agreements between municipalities and beverage manufacturers	 Hakone, Kanagawa Prefecture (July 2022, Suntory Group) Yoshimi, Saitama Prefecture (April 2022, Coca-Cola Bottlers Japan Inc.)
Examples of agreements among municipalities, beverage manufacturers, and recyclers	 Himeji City, Hyogo Prefecture (August 2021, Itoen, Ltd., Far Eastern Ishizuka Green PET Corporation, and Kinkisain Co., Ltd.)
Examples of municipalities conducting general competitive bidding with bottle-to- bottle practice requirements	 Minato Ward, Tokyo (in operation since FY2022)
Example of agreements between business operators	 Odakyu Electric Railway Co., Ltd. (January 2022, Japan Soft Drink Association, and Kanagawa Prefecture)

Source: Prepared by the JFTC based on public information and interviews with municipalities, beverage manufacturers, etc. 6



Bidding System of the JCPRA as Designated Juridical Person (General Waste)

Challenges in the Actual Bidding System of the JCPRA

Although the bidding system of the JCPRA offers some benefits, <u>there is a concern that such benefits under the System</u> of <u>Designated Juridical Person are not being maximized</u> if there are municipalities that avoid the designated juridical person route simply because they cannot designate the intended end-usage, or if there are recyclers that have not been able to enter the market due to a lack of capital investment to be required.



Result of Questionnaire Survey

- <u>Sixty-two percent</u> of municipalities used the **designated juridical person route**, <u>29.9%</u> used the **independent route**, and <u>9.9%</u> used **both**.
- As is often the case with recyclers that have registered with the JCPRA, they adopt multiple procurement methods, such as
 using not only the designated juridical person route but also the independent route or procuring the used plastic bottles, which
 are industrial waste.





Approach Under Competition Policies

The JCPRA is the only association that has been designated under the Containers and Packaging Recycling Law, and in reality, it handles about two-thirds of the used plastic bottles, which are general waste. In light of this, the bidding in the JCPRA plays an important role in the trade of used plastic bottles between municipalities and recyclers. In this regard, some municipalities seem to avoid the designated juridical person route for the sole reason of being unable to designate the intended use. Some recyclers cannot enter the market because they cannot make the necessary capital investments. Therefore, if these parties use or participate in the JCPRA's bidding, a greater variety of recyclers will participate in the bidding for items delivered by a greater number of municipalities. Thus, it is assumed that competition will function more effectively. In conclusion, the designated juridical person should constantly review the bidding system to promote competition among recyclers while taking into account the demands of municipalities and other entities as much as possible.



Contract Method Under Municipalities' Independent Processing, Bottle-to-Bottle, etc. (General Waste)

Result of Questionnaire Survey

It was found that **many municipalities answered that the contract method** used under municipalities' independent processing, bottle-to-bottle, and other forms of processing **was private contracts** (percentages of respondents who answered that they were covered by a private contract were, for example, **61.0%** for the independent processing and **50.0%** for bottle-to-bottle initiatives).

Result of Interviews Opinions from Municipalities

(Independent Processing)

- Independent processing is conducted twice a year and is determined through bidding. The bidding specifications stipulate, as terms and conditions of participation in a bidding process, that the delivered plastic bottles must be recycled domestically and not exported overseas and that they must be recycled as resources through chemical or material recycling rather than thermal recycling. As a result, hurdles as high as those for bidding in the JCPRA are firmly set, and only credible business operators are allowed to participate in the bidding.
- Recyclers in the independent processing are selected through a restricted general competitive bidding targeted at business operators that can realize bottle-to-bottle recycling.

(Bottle-to-Bottle)

- Agreements have been signed with beverage manufacturers. The municipality's direct contractor under the
 agreement is the recycler selected through a private contract to purchase used plastic bottles collected by
 the municipality.
- The business operator was solicited through an open call for proposals to maintain the yield rate at a certain level by bottle-to-bottle recycling.

Approach Under Competition Policies

Many of the responses in municipalities were based on private contracts. Competition is expected to function more effectively if general competitive biddings and other methods are used instead of private contracts, making it possible to contract with more efficient recyclers on more favorable terms and conditions. The results of the economic analysis also **showed a trend toward higher delivered prices when the contract method was the general competitive bidding**, **etc.** Therefore, **it is desirable to constantly review the contract method** from the viewpoint that it is more appropriate to use general competitive bidding and other methods instead of private contracts.



Purpose of the Economic Analysis

The price of the used plastic bottles that the recycler receives from each municipality is examined in the empirical analysis to determine what factors the price reflects in the designated juridical person route and the independent route, respectively.

Methods of Economic Analysis

<u>Dependent Variable</u>: Successful bid price (designated juridical person route) and delivered price (independent route) for designated storage facilities of the municipality

<u>Explained Variables</u>: Successful bid amount (tons), distance between the designated storage facility and the take-back plant of the recycler (km), dummy variable for cases where the municipality is located on a remote island, dummy variable for sorting quality, dummy variable for collection method on how used plastic bottles are collected (mixed collection or not), dummy variable for intermediate treatment, dummy variable for whether or not bottle-to-bottle initiatives are in place, and dummy variable for the method to determine the recycler as the contracting party for delivery

$$Price_{it} = \alpha_i + \lambda_t + \beta_1 Amount_{it} + \beta_2 Distance_{it} + \beta_3 Iland_{it} + \beta_4 QA_{it}$$

+ $\beta_5 QB_{it} + \beta_6 Mixed_{it} + \beta_7 INTV_{it} + \beta_8 BTB_{it} + \beta_9 Comp_{it} + e_{it}$... Independent route

These regression equations (see right for each variable) are estimated by least squares dummy variables (LSDV)

Result of the Economic Analysis

<Designated Juridical Person Route>

- Used plastic bottles tend to be accepted at higher prices when they are of higher quality and are not collected in mixed collections
- Used plastic bottles tend to be accepted at lower prices when the distance is farther away and in the case of remote islands

<Independent Route>

- Used plastic bottles tend to be accepted at higher prices when municipalities use competitive bidding or other competitive methods in deciding who to select as recyclers
- Used plastic bottles tend to be accepted at higher prices in the case of independent routes that involve bottle-to-bottle initiatives

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Regression analysis	s with	price _i ,	as th	he suo	ccessfu	l bid/deli	vered

price (yen/ton)

Depen	dent Variable: Price _{it}	
	Designated Juridical Person	Independent
	Route	Route
Successful bid amount (tons) Amount	-12.03119***	-4.145138
	(2.064334)	(16.78331)
Distance (km) Distance	29.79285***	7.296097
	(4.101249)	(37.56876)
Remote Island Dummy Variable I land	21730.28***	5646.361
	(3007.148)	(4855.775)
	-9730.644***	-18445.24***
Sorting Quality Dummy Variable QA	(1678.598)	(6886.381)
	-2253.126	-
Sorting Quality Dummy Variable QB	(2607.953)	
	13152.6***	-5056.395
Collection Method Dummy Variable Mixed	(1851.744)	(8118.419)
	679.3133	373.9641
Intermediate Processing Dummy Variable INTV	(698.7793)	(2825.335)
	123.6853	-14973.31***
Bottle-to-Bottle Dummy Variable BTB	(783.7652)	(3405.063)
	-	-26361.12***
Contract Decision Method Dummy Variable Comp		(3237.37)
Observations	11359	728
F Statistic	1061.37***	62.37***

Note: ***, **, and * indicate the statistical significance levels of 1%, 5%, and 10%. The numbers in parentheses indicate robust standard errors (cluster-robust standard errors) assumed to be correlated with the error terms of the same business operator. The F-statistic is for the null hypothesis that all regression coefficients are zero except for the constant term.

As for the null hypothesis that all fixed effects are the same in the designated juridical person route and the independent route, the results of the F-test were $F(72, 957) = 1090.78^{***}$ and $F(34, 406) = 57.51^{***}$, respectively, and the null hypothesis was rejected in both routes.

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Promotion of Recycling of Used Plastic Bottles as Industrial Waste

Market Overview

It can be seen that used plastic bottles, which are industrial waste, are handed over under inverse onerous contracts from generators. On the one hand, some opinions reported that it is difficult to get used plastic bottles accepted as industrial waste with value. On the other hand, some opinions found the transaction unit price of used plastic bottles as industrial waste also increasing due to the growing demand for used plastic bottles.

Result of Questionnaire Survey

 When we look at the price transitions of used plastic bottles delivered from beverage manufacturers to industrial waste disposal services and others, it is clear that the used plastic bottles are delivered under contracts for negative value and that the unit price of delivery increased in FY2022 (the amount paid under inverse onerous contracts decreased).



Source: Prepared by the JFTC based on responses from beverage manufactures

When we look at the unit price per ton of the used plastic bottles purchased by the recyclers and its transition, it can be seen that there is no significant difference in the purchase unit price between the designated juridical person route and the independent route.



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Result of Interviews



Manufacturers that Conduct Collections



Opinions from Collection and Transport Services / Intermediate Treatment Business Operators



Our company decides on the industrial waste disposal service with the highest evaluation through a competition method that includes not only the price but also the nature of the work as a whole, regardless of the waste type. As a result, some are paid 10 to 20 yen per kilogram by us to pick them up, while we are paid about 5 yen per kilogram.

The used plastic bottles that our company collects from recycling boxes next to vending machines are taken back to business operators by paying a disposal fee for industrial waste. It is difficult to have used plastic bottles in recycle boxes picked up as valuable resources because of poor quality and the presence of other waste in the boxes. Although opportunities to review the processing fee arise less than once a year, the fee is automatically renewed unless there are special circumstances for both our company and the business operators to whom we deliver. Treatment costs are often set as a fixed monthly or yearly price based on the market unit price by weight.

Beverage containers discharged from business operators are basically never separated by item but collected as a mixture of bottles and cans. Since recyclers handle only single items, the most important part of the intermediate process is to separate beverage containers by item and remove foreign materials. Before the intermediate treatment, the costs of collection, transportation, intermediate treatment, and disposal of residuals are required. However, the intermediate treatment cost, including investment in machinery, accounts for a large proportion of these costs.

Regarding the used plastic bottles from business waste, they are grouped together with bottles, cans, etc., and are of poor quality. The quality has improved since a sorting machine was installed through subsidies and proper intermediate treatment was implemented. However, the quality is still inferior to that of municipal collections, which are cleaned by each citizen.

In general, the purchase price of used plastic bottles for municipalities to collect is higher than that of business waste. However, with the recent increase in demand for recycled plastic resin, the price of used plastic bottles for business waste has also increased.

Approach Under Competition Policies

As the distribution of used plastic bottles diversifies and demand increases, <u>recycling efforts are expected to be</u> <u>promoted through the market function</u>, even for used plastic bottles that are industrial waste without obligation to be recycled.



Discharge of Used Plastic Bottles for Further Recycling

Issues in Actual Transactions, etc.

- Various measures are being taken to promote the utilization of used plastic bottles as resources, such as having the labels perforated so that they can be easily peeled off at the manufacturing stage, and setting up recycling boxes throughout the city that are shaped to prevent foreign objects from being mixed in.
- In order to further promote the recycling of used plastic bottles, basic actions on the consumer side, such as not disposing of used bottles with leftover products inside, are considered important.

Result of Questionnaire Survey

According to responses from recyclers, the top three factors that have the greatest impact on the production costs of recycled plastic resins are shown in the table on the right.

Degree of residual foreign matter, such as leftover drink or contamination other than caps and labels (53.8%)
Degree of caps and labels remaining
Others (contaminated by glass fragments, etc.) ······ (5.1%)

Approach Under Competition Policies

Recycling costs are lowered by reducing the degree of remaining foreign matter, such as caps, labels, and leftover drinks, as well as contamination. In addition, the results of the economic analysis show that the higher the quality of the used plastic bottles, the higher the delivered price tends to be.

Therefore, if each consumer understands the value of the plastic bottle as a resource and discharges it in a way that increases its value as a resource, such as not leaving it partially filled, not mixing it with other waste, and removing its cap and label, it will lead to a reduction in the production cost of recycled plastic resin and the supply of high-quality, inexpensive recycled products along with the supply of high-quality and inexpensive recycled products. This will make the market for recycling used plastic bottles more attractive and is <u>a desirable action from</u> the perspective of competition policies, which encourage the realization of a green society.



Sending of Letters, etc., by the JCPRA

- In October 2021, the JCPRA sent a letter to the Japan Soft Drink Association (JSDA), a business operator association comprised
 of beverage manufacturers and other organizations. The letter stated that the JCPRA hopes for an appropriate response from the
 JSDA because the JCPRA considered it "not in line with the policy (spirit) of the Containers and Packaging Recycling Law" that
 beverage manufacturers concluded an agreement with municipalities to promote bottle-to-bottle recycling, and that they were taking
 measures to recycle beverage bottles without going through the JCPRA, among other reasons.
- As the JCPRA visited municipalities that had newly started independent processing to confirm the reasons for this and other matters, some examples could have arisen regarding the independent processing in some municipalities to promote bottle-to-bottle: <u>Misinterpretation</u> that stopping use of the designated juridical person route can be considered a problem under the Containers and Packaging Recycling Law as well as <u>concerns</u> that selecting the independent route would cause inconvenience in using the designated juridical person route.

Result of Interviews	 The JCPRA once told us that while it was -no problem that municipalities were increasingly switching to the independent route on plastic bottles, it would not be easy to get back into the designated juridical person route once they stopped delivering bottles to the JCPRA. 	Plastic Bottles Collected by Municipalities
Opinions from Municipalities	We think this kind of talk runs counter to the movement to promote bottle-to-bottle initiatives.	(2) Independent route (About 1/3 of the total amount) Beverage Manufacturers, etc. (Agreements With Municipalities)

Approaches Under the Antimonopoly Act and Competition Policies

- There is no problem under the Antimonopoly Act or competition policies for the JCPRA, a designated juridical person, to
 present the provisions of the laws and regulations to municipalities, beverage manufacturers, and other entities, or to
 encourage municipalities to utilize their own biddings. However, in relation to such actions, <u>if they discourage</u>
 <u>municipalities or beverage manufacturers from carrying out independent processing or restrict their involvement,
 such actions may give rise to problems under the Antimonopoly Act and competition policies.
 </u>
- When the designated juridical person contacts the When designated juridical persons contact municipalities and other entities, it is desirable to take care not to cause any misinterpretation and the like regarding the Containers and Packaging Recycling Law system, which would prevent municipalities and other entities from using the independent route.



Agreement by the JSDA

- In December 2021 and January 2022, the JSDA agreed that <u>beverage manufacturers would not encourage municipalities to</u> take the independent processing and other matters on behalf of the designated juridical person.
- In response to the agreement by the JSDA, <u>there is a concern</u> over each JSDA member beverage manufacturer <u>being prevented</u> <u>from</u> conducting sales activities to encourage municipalities toward concluding bottle-to-bottle agreements or carrying out any other independent processing for the designated juridical person, at least <u>in a manner where beverage manufacturers actively offer</u> <u>municipalities to do so</u>.

Result of Interviews Opinions from Beverage Manufacturers	 During a JSDA committee meeting, it was decided that the JSDA would not actively engage in a so-called "JCPRA exclusion," in which the JSDA does not switch from the original designated juridical person route to its independent route based on the agreement. From the JSDA, there was an indication that the initial agreements with municipalities were to be uniformly terminated. However, since some municipalities offered to talk to us, it was decided that we did not have to refuse in such cases. Nevertheless, we think this can hinder beverage manufacturers that are pressing ahead with such agreements. We believe that the beverage industry should respect the system under the Containers and Packaging Recycling Law since it has contributed to Japan's high recycling rate. There were various discussions within the JSDA, but in the end, all beverage manufacturers reached a consensus on the idea.
Opinions from Recyclers	 The JCPRA may feel that it has played a role in recycling up to now, while beverage manufacturers may want to promote measures for the goals of bottle-to-bottle. It is difficult to figure out how to approach this since we both know what each side is saying.

Approaches Under the Antimonopoly Act

The procurement method of plastic bottles and other products manufactured by beverage manufacturers is a matter concerning an important means of competition for each business operator and should be voluntarily determined by each beverage manufacturer. Depending on the circumstances related to the subsequent independent processing and other matters, the agreement <u>may become problematic under the Antimonopoly Act</u> in that it may substantially restrict competition in certain business fields or unfairly restrict the business activities of JSDA member beverage manufacturers.

- In the course of this survey, the JFTC notified the JSDA of the above-mentioned approach, and in September of 2023, the JSDA revoked the said agreement.
- Although the said agreement has already been revoked, the JFTC requested the JSDA to conduct voluntary inspections, make improvements, and promptly report the results of the inspections and other items.



Future Actions of the Japan Fair Trade Commission

This report clarifies the current status of transactions and other facts in the field of recycling used plastic bottles as a part of specific market studies / fact-finding surveys related to the market among various measures taken by the JFTC to encourage the realization of a green society and presents the approaches under the Antimonopoly Act and competition policies.

As a result of this survey, it was confirmed that municipalities and each business operator were implementing many initiatives to promote recycling. At the same time, it was also confirmed that some activities potentially problematic under the Antimonopoly Act were being carried out.

- As indicated in this report, in order to increase the value of used plastic bottles and to ensure efficient recycling, it is desirable not only to rely on the originality and ingenuity of business operators but also for each and every consumer to understand the importance of recycling efforts to reduce environmental impact and to properly sort and dispose of bottles.
- As indicated in the Approach to the Activities of Business Operators, etc., Toward the Realization of a Green Society (Green Guidelines), the Antimonopoly Act and competition policies promote competition among business operators, which encourages the efficient use of resources and provides an impetus for innovation in new technologies and other areas. From this perspective, the Antimonopoly Act and competition policies will indirectly contribute to realizing a green society. In other words, the Antimonopoly Act will play a complementary role to environmental policies and other measures. The JFTC will continuously engage in measures to encourage the realization of a green society.
- The JFTC will continue to closely monitor trends in the market for recycling used plastic bottles and will take strict action against any violations of the Antimonopoly Act.