

What a Load of Rubbish: Japan's Problem with Increasing Disposable Container and Packaging Waste

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Abstract

Huge amounts of plastic are used in everyday life. However, much of the plastic used for disposable containers and packaging is used once and then discarded. This can then cause a serious environmental problem. After describing the environmental effects and possible ways of treatment, this paper examines the situation in Japan, particularly with respect to how reuse and waste reduction can be achieved in Japan by adopting better extended producer responsibility schemes, introducing bans or fees for shopping bags etc. The specific roles that governments, companies and individual people can play are discussed in detail, and a comparison is made with some of the methods that have been adopted in other countries and which may be applicable to Japan.

Key Words

Plastic waste, environmental pollution, Japanese studies,
extended producer responsibility, reuse and recycling

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Introduction

Vast amounts of plastic waste are finding their way into the world's oceans. In the northern Pacific Ocean, for example, a huge area contains what is essentially a vast expanse of debris that has the appearance of a plastic soup. Termed "The Great Pacific Garbage Patch", it is twice the size of the continental United States and consists of small pieces of plastic garbage. Not only is this unsightly, but it can have devastating effects on

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wildlife. For instance, it has been estimated that it causes the deaths of more than a million seabirds and 100,000 marine mammals every year because they eat and digest the plastic, mistaking it for being food (Marks & Howden 2008). To hungry marine mammals, floating plastic bags can closely resemble tasty jellyfish or squid, which are a staple of their diet.

The situation is in fact rapidly becoming more serious. In 2010, it was estimated that about 8 million metric tons of plastic were entering the oceans every year, with the cumulative quantity of plastic waste increasing tenfold by 2020 (Connor 2015). All of this plastic waste of course comes from somewhere – in this case from the countries that surround the Pacific Ocean. Similar ‘garbage patches’ can also be found elsewhere (Freinkel 2011:131).

Much of the waste comes from disposable plastic containers which are used only once and then discarded. If we buy a drink at a convenience store, we want the liquid inside, not the container itself. In the case of plastic bags, we want to carry items home with us, but do not need the bags themselves.

This paper will examine the situation regarding single-use containers and packaging waste in an attempt to elucidate whether there are better methods of treating the waste, with a particular focus on Japan.

Plastic waste: Dangers and Treatment

Plastics in the environment

The existence of plastic has several adverse effects on the environment. Firstly, it is toxic. Not only does it cause wildlife deaths but it can act as an endocrine disruptor mimicking the action of natural hormones in animals, thereby preventing the delivery of messages to cellular receptors (Freinkel 2011:93). Besides being poisonous themselves, certain types of plastic can also soak up other toxic chemicals that are widespread in the ocean, thus increasing the toxicity. Making the situation worse is that plastic is a persistent pollutant which does not biodegrade. Instead it tends to photodegrade, causing the plastics to lose tensile strength and break up into smaller pieces (Freinkel 2011:128). It is virtually impossible to remove all the pieces from the ocean as such an action would also scoop up phytoplankton and zooplankton which are the cornerstone of the food web (Freinkel 2011:131). As the plastic becomes smaller it is eaten by marine creatures and in the process becomes bioaccumulated as it moves up the food chain.

It is very difficult to treat plastic waste. One obvious way might be to incinerate it, but this actually is rather problematic. Heating to high temperatures increases the likelihood that dioxins could be formed; these are highly toxic chemically related compounds that “can cause reproductive and developmental problems, damage the immune system, interfere with hormones and also cause cancer” (World Health Organization 2010). In addition, incinerating plastic (which is derived from petroleum) results in abnormally high temperatures which could damage the incinerator (Iwasa 2009:74–75).

The next obvious solution is to bury the plastic in landfills. However, there are also problems here. The plastic can prevent the effect of chemicals that are used to keep the ground sanitary, e.g. fly repellent, from permeating through the landfill (Freinkel 2011:15–16). Japan, however, faces an additional serious problem in that the high population density means that it is difficult to find sufficient sites for landfills as the existing ones rapidly become filled up. The number of disposal sites in Japan dropped to 1853 in 2006 from 2679 in 1976 (Komiya 2010). The remaining landfills are also becoming full; for instance, at the large landfill at Hinode in western Tokyo, in 2000 the Tokyo municipal government decided to impound more land in order

to increase the capacity of the rapidly-filling site (Aritake 2000). It is extremely hard to find potential new sites because of the “NIMBY” (“not-in-my-backyard”) attitude, whereby people object to having a landfill site near them because of the popular image being very negative.

Plastics are derived from petroleum. As Americans throw away some 100 billion plastic bags each year, this is equivalent to dumping nearly 12 million barrels of oil (Mieszkowski 2007). Worldwide it is said that one trillion plastic bags are consumed annually, meaning that the equivalent of 120 million barrels of scarce oil are dumped each year because of plastic bags.

Treatment of plastic waste by recycling

As plastic has serious adverse effects on the environment, and incineration or landfills seem inappropriate methods of treating the waste, let us examine one other potential alternative: recycling. The term recycling means that the material is collected and then transformed into something else. Indeed, plastic recycling is carried out fairly widely, as is evidenced by the number of products carrying recycling logos, but unfortunately this is still not an ideal way.

First of all, recycling can be extremely costly. Many of the processes require substantial amounts of money and resources: separation, transportation, washing, fragmentation and reformation (the latter being the process by which new products are formed). Some of these steps are exceedingly difficult, rendering the process very expensive. Whereas metals can be separated relatively easily due to their diversified electrical and magnetic properties, the same is not true of plastics because of their similarity with each other. Thus separation becomes almost impossible (Biddle 2011). In addition, in the case of plastic bottles, the type of plastic used for the caps and lips are harder and entirely different from the plastic used for the rest of the bottles and labels (Iwasa 2009:104). If these are not separated by the user when finished with the bottle, different types of plastic will become mixed, yielding much poorer finished products as the texture would be very frail (Funaki 2006:170–171).

Secondly, collection and transportation of the plastic waste involves the use of vehicles, necessitating the consumption of oil. Many journeys may be necessary as plastic rapidly fills up the available space in trucks.

Thirdly, plastic waste is extremely light weight (especially plastic bags), which means that even if the waste is thrown away into a special container for recyclable plastic, the wind may blow it away, meaning it becomes merely litter (Mieszkowski 2007).

In this manner, recycled products may either be cheap but low quality or exorbitantly expensive but ordinary quality. Economically this does not make sense when there are cheap newly-made plastic products, unless the government provides subsidies. So-called cascade recycling can be carried out whereby materials are converted into an entirely different form because of quality degradation (e.g. converting plastic bottles into shirts); chemical recycling can, however, result in the same products being regenerated (e.g. collected steel is turned into new steel).

Cascade recycling, though, requires a lot of resources and energy. For example, milk cartons can be converted into postcards or toilet paper. However, several exhausting steps are required in order to achieve this (Torigoe 1996:121–122). In addition, a lot of trees need to be cut down in order to provide the raw materials.

Policies to encourage reuse

A greener alternative: reuse or reduction of waste

The reuse or reduction of waste means that there is no need for raw materials, and the environmental impact is therefore much less. Since consumers tend to make shopping-related decisions based on economic interest, one approach to encourage reuse or reduction of waste would be allow people to benefit financially from choosing these methods. There are three possible approaches.

a) Extended producer responsibility (EPR)

Traditionally the cost of waste disposal has been borne by the consumer. Under the EPR system, however, this responsibility is also absorbed by the producers, manufacturers and retailers. The manufacturers are required to pay a fee dependent on the amount and types of their products to an organization which would dispose of the product after use. This naturally increases the cost of the product. As consumers will choose their purchases on the basis of the price, manufacturers come under pressure to reduce the costs incurred. This could include discarding unnecessary parts from the products, reducing unnecessary wrapping and packaging, making it easier to deal with the final product, and stopping the use of materials which are difficult and expensive to dispose of. Komiyama (2010:63–64) also points out that this is sensible because it is the manufacturer that best knows how to deal with the finished end product. A further example is that the producer may stop using containers such as plastic bottles and instead ask the consumer to provide their own e.g. hair shampoo containers. In addition, manufacturers might alter the product so that it is easier to be reused or recycled.

b) Imposing a fee on waste from individual households

Besides the manufacturer, the individual consumer who uses the product and eventually generates the trash also needs to take some responsibility for waste disposal. This is a way to make environmental costs visible, making the consumer aware of the costs involved and hopefully affecting their behaviour. In practice, for example, consumers can be required to pay a sum for the plastic bags they throw away; the more bags they use, the greater the cost. This would encourage people to not use so many plastic bags, and would mean they use non-disposable bags instead.

There is one potential drawback to such a scheme in that it may encourage unlawful dumping in order to evade the fee. To avoid this, the government may need to exempt poor people from paying the fees involved.

c) A systematic charging mechanism that reflects the scarcity of dumping grounds

As the limited space for dumping trash becomes scarcer, gradually increasing costs could be imposed on the fees for both the manufacturer and the consumer. In time, this would increase to the point where it would become economically attractive to pursue the environmentally friendly option of product reuse. The government would probably need to be involved in order to ensure that the costs imposed were fair and did not encourage practices such as unlawful dumping.

Weaknesses of reuse

While reuse is environmentally friendly, there are a few problems.

a) Reusable products require a delivery process

The use of oil is necessary because the discarded products must be transported from the consumer to a

central collection point, where they will be washed for use again, and then transported back to the shop.

b) Health risks associated with reusing shopping bags

Repeated reuse of the bags can result in a health risk. For example, several members of a women's soccer team were reported by the Los Angeles Times in May 2012 to have suffered norovirus-induced diarrhea and nausea that was allegedly attributed to a reusable grocery bag left in the hotel bathroom. (Ponnuru 2013) Some experts studied reusable bags in California and Arizona and found that 51% of the bags they examined contained coliform bacteria. This suggests that consumers need to be educated about the risks involved. It has been estimated that 75% of people do not realize the dangers of leaving meat and vegetables for a long time in a hot car, and 97% never washed their bags (Ponnuru 2013).

The Situation in Japan

Three policies have been suggested to promote reuse and waste reduction, namely EPR for manufacturer, a fee on waste from individual households, and a charging system that reflects the lack of available landfill. Let us now consider to what extent these proposals have been adopted in Japan.

A. Extended Product Responsibility in Japan

a) The Containers and Packaging Recycling Law

This law (known in Japan as *Youki Housou Risaikuru Hou*) was established in 1995 and then revised in 2005 with the aim of achieving better quality and more sophisticated separation, collection and re-commodification of disposal containers and packaging waste. Under this law, the responsibility for waste disposal is broken down into three parts, each of which falls into different groups. Ordinary people are responsible for the separation of waste; they are supposed to properly separate single-use containers and packaging trash from other types of waste to facilitate the following collection phase. Local governments are in charge of collecting the plastic waste that has been separated by the citizens and send it to The Japan Containers and Packaging Recycling Association. Companies that receive a benefit from packaging or containers in one way or another, including manufacturers and retailers, are required to pay a commission fee to the association to have them conduct recycling on their behalf (The Japan Container And Packaging Recycling Association 2008).

b) Responsibility of waste separation imposed on local governments

EPR is practiced in Japan, but it cannot be said to be done effectively. The main burden of cost falls on the local governments rather than the companies. It is estimated that local governments pay about 70% to 80% of the costs for the entire recycling processes, whereas companies spend only 20% to 30% (Funaki 2006:233). According to Takeda, no less than 423 billion yen is spent every year in the form of taxes by local governments for the disposal of containers and packaging (Takeda 2007a:152). The collection phase that local governments are responsible for poses a much greater financial burden than at first appears. After collecting the waste which has been separated by their citizens, the waste is wrapped in plastic film which greatly reduces the volume in order to reduce delivery costs and prevent spread of the unpleasant odour. The recycling association then classifies the waste according to the purity of the waste. If two successive deliveries are assessed as having the lowest quality of waste (a purity less than 85%) the recycling association will refuse to collect garbage from that jurisdiction, and the local government would be faced with paying the full recycling costs.

It has been estimated that it costs from 60,000 to 90,000 yen per ton to recycle. Because of this, a local government that receives a low grade would take precautions such as educating citizens or constructing a facility that would manually remove unintended waste from that collected in order to improve the quality. In fact, the number of local governments that receive the lowest evaluation is surprisingly high: 20% in 2006 and 13% in 2007 (Sugimoto & Hattori 2009). There is a further financial burden on local governments as they need to secure sites for separating large quantities of recyclable waste, especially in populous areas.

c) There is little incentive for companies to use reusable containers

It is very laborious and expensive for local governments to conduct the recycling of packaging and container waste under Japanese law, whereas the companies have relatively few payments and therefore they have little incentive to reduce their waste. According to Funaki, the required commission payment for a 198 yen bag of rice crackers, each of which is packaged individually with a paper tray underneath within the larger package, is only 0.7 yen. He points out that the amount of packaging waste that results from each bag is no less than the amount that the person can eat; it generates a large quantity of waste while the company pays only a little commission (Funaki 2006:218, 232). A more deplorable example is that the container and packaging recycling law has actually stifled a practice that is far more sustainable than recycling; the amount of reusable drink containers used dropped drastically from 4.5 million tons in 1996 to 1.9 million tons in 2003 (Iwasa 2009:90–96, and Kumamoto 2009:183). By contrast, the amount of single-use plastic bottles skyrocketed from 120,000 tons in 1993 to 510,000 tons in 2004 (Takeda 2007b:12–15). The market share of reusable bottles has plummeted over the years from 36.3% in 1997 to 19.9% in 2002 and they are now no longer so common, implying that the number of plastic bottles has greatly increased (Funaki 2006:205). This lamentable situation is a result of the fact that single-use containers, namely plastic bottles, became cheaper *because* of the law. Ever since the law was introduced, local governments have been asked to take care of the collection, delivery, and storage of disposable containers, all of which are immensely costly. Instead, companies have been exempted from all of these responsibilities. This lessens the cost to a great degree for companies to use disposable containers as opposed to reusable ones, the responsibility for the collection of which companies are still made to fully bear (Iwasa 2009:90–96).

d) The real intention of the recycling law

Kumamoto asserts that there are two reasons for the establishment of the faulty EPR system and failure to revise the law. First, businesses have disapproved of and have been suppressing the introduction of the demanding EPR for fear that the implementation will hike the market price of their products and weaken their competitive edge. Second, although not stated publicly, the main focus of the Japanese system is not so much to solve the waste problem or make society more sustainable, but is instead to stimulate the recycling industry to make it profitable. Thanks to the law, recycling companies are able to obtain decent raw materials with little cost because they are collected and delivered by local governments using taxes (Kumamoto 2009:95). In addition, plastic bottle manufacturers and companies that provide the raw materials also stand to profit. The greater the demand for plastic bottles, the greater the profit (Takeda 2007b:159). Hence the dramatic rise in the number of plastic bottles. There is no incentive in the law to encourage reuse, which would decrease the amount of raw materials.

e) Improper disposal of collected waste

According to Takeda, matters are made worse by the fact that the collected waste is not always recycled

properly, and he claims that it is difficult to obtain information about how the recycling is actually carried out. When he questioned a recycling association they said that they merely collected waste, and referred him to a recycling company; however, they refused to give out information, stating that it was confidential. He therefore began to suspect that some of the waste is in fact combusted, noting that Japan is the only country that calls the process of incineration recycling due to the fact that thermal energy is gained from the combustion process (Takeda 2007a:43). Junichi Hashimoto, a journalist who specializes in waste problems, says that in Japan recycling is well advertised so that people have the feeling that the recycling of plastic bottles is properly practiced; however, that is not true. In 2010, the amount of collected plastic bottles reached 620,000 tons, while only 242,000 tons (which is equal to only 38.3%) was recycled, and surprisingly 330,000 tons (52.5 %) went overseas, mostly to China, despite the Japanese waste disposal law which stipulates that waste generated in Japan must be properly disposed of domestically (Hashimoto, date unknown).

B. The fee on waste from individual households in Japan

a) The case of Fukuoka city

In Fukuoka prefecture, the local government started a levy in 2005 on prescribed plastic bags that people are required to use to put their waste in of one yen for every litre. As a result, the amount of waste that each citizen generated annually decreased from 1531g in 2005 to 1279g in 2007 (Sugimoto & Hattori 2009:44-45). Although this decrease cannot simply be attributed to the levy since the local government might have carried out other campaigns to encourage waste reduction, the levy must have played a role.

b) The relationship between the fee and plastic grocery bags

A report entitled “*Zenkoku Mai Baggu Foramu in Shizuoka* (A nationwide forum regarding the ‘bring your own bag campaign’ in Shizuoka)” revealed a relationship between plastic shopping bags and plastic garbage bags. It states that whether or not a levy on waste from individual households becomes successful hinges on whether or not the plastic shopping bags people get at grocery stores can be used to put their household waste in. According to the report, in a place where plastic shopping bags can be used as trash bags, most people do not bring their own reusable bags to grocery stores in hopes of getting free plastic shopping bags they can use later to discard their trash; there is no motivation for people to reuse shopping bags. This can have a large impact on the environment. The percentage of people that bring their own reusable shopping bags to grocery stores ranges from 14% to 32% in a place plastic shopping bags cannot be used as trash bags but where instead people are required to use specific bags, while it drops to 8% to 18% where people can use any bags, including plastic shopping bags (Funaki 2006:44). To sum up, the introduction of specified bags for household trash is advantageous to waste reduction for two reasons: first, this makes it possible for local governments to levy fees on waste by simply charging people for every bag, thus encouraging waste reduction at home. Second, it substantially mitigates people’s motivation to ask for plastic bags when shopping because bags from retailers are no longer acceptable for dumping their household waste. This simultaneously spurs people to bring in their own reusable bags to stores, curtailing the wasteful use of free shopping bags. Local governments could require the use of designated garbage bags, the *only* bags that can be used for dumping waste, then charge individual households a fee for the bags. This leads to an environmentally friendly result.

c) Efforts to discourage the use of free plastic shopping bags

One ward in Tokyo (Suginami ward) found that by imposing taxation on plastic shopping bags, shoppers could be discouraged from using them. The ward has levied 5 yen on every plastic shopping bag since 2008. As a result the average rate of those people who carry their own reusable bags increased a year later by approximately 10% from 21.6% to 32%; simultaneously the number of disposable plastic bags used decreased by 10 million from 100 million to 90 million (Suginami Ward, date unknown).

This movement to stop the squandering of plastic shopping bags was not only initiated by government but also by retailers. The major interest of retailers is obviously not a greener society, but to reduce expenditure by stopping the distribution of free plastic bags and de-necessitating the payment of a disposal fee as the plastic bags are subject to the Containers and Packaging Recycling Law. Nevertheless, it incidentally encourages people to choose the more sustainable decision: the use of reusable shopping bags (Sugimoto & Hattori 2009:173-175). It is said the inception of a large scale retailer-driven free plastic shopping bag ban in Japan can be traced back to January 2007 when AEON, one of the major retail companies in Japan, started to charge 5 yen for every bag at one of its stores in the Sakyo ward of Kyoto as a pilot experiment. As a consequence, the rate of those who brought reusable bags rose from 22% to 80%, and surprisingly, and also contrary to the company's primary concern that its customers would begin to shop elsewhere, the store experienced no more than a 2% decrease in the number of customers, which in fact recovered shortly after. Having witnessed the success of the experiment, AEON gradually expanded the ban to other stores, and other retail companies followed in their footsteps (Soma 2007). Now the ban has been executed by a number of retail companies and the Japan Chain Stores Association, which has a membership of 58 retail companies and 462 retail companies as supporters, has been taking the initiative to discourage the wasteful distribution of plastic bags. Overall, the shopping bag refusal rate among its members has been increasing: 8% in 2002, 13.2% in 2005, 15.72% in 2008, 31.03% in 2011 and 47.17% in 2013 (Japan Chain Stores Association).

d) Failure of a fee on plastic bags in Toyama prefecture

The situation in Toyama prefecture is an example of a case in which a local government is struggling with getting people to stop using plastic shopping bags and have them start bringing their own reusable bags. In April 2008, Toyama decided once and for all to stop giving out plastic shopping bags free of charge across the prefecture. As a result, many people started to steal shopping baskets or hampers from stores. More than 200 baskets were stolen from five *Parufe* locations, a chain grocery store operating only in Toyama. Additionally, people started to take the small plastic bags that are usually used to separate one type of food from other products, as they were not subject to the ban and remained free. Furthermore, people began to take a lot of plastic bags from drug stores where they were still available for free. The biggest problem with the policy in Toyama was that people could still use plastic shopping bags from grocery stores to dump their household waste, and therefore there was still an absolute demand for shopping bags (Sugimoto & Hattori 2009:173-175). Hence, there is a lingering concern over a ban on the distribution of free plastic bags among retailers who foresee trouble with customers, especially those from outside of the city that are not well informed about the charge. Although the introduction of the ban can be beneficial for retailers as was explained earlier, there is an entrenched opposition against the ban, especially from those who run a store located adjacent to the boundary of another city that does not have the ban and still has plastic bags available for free, fearing that customers will flee to those stores that do not charge for them (Funaki 2006:69-71).

e) Three necessary conditions for the free shopping bag ban to be successful

From the above discussion, it appears that there are three conditions necessary for the ban on the free distribution of plastic bags to be successful. First, the introduction of the ban must coincide with a prohibition on the use of plastic shopping bags at home for throwing away household trash; people must be required to use specified bags. This enables local governments to put a levy on individual household waste, which is crucial for accelerating reuse and waste reduction. Second, local governments need to exhibit leadership so that no shop fears the loss of customers should it be the first place to charge for plastic bags. Third, the education of citizens is of paramount importance. One major grocery chain, OK, attributes the lack of negative feedback to the ban to the fact that they explain to customers that the profit from charging for bags means they can lower the price of other goods, and it is not merely a decline in service. (Funaki 2006:117) According to a survey carried out by Funaki, people tend to be very co-operative with the ban; 78.1% were in favour and only 20.6% opposed., whereas the figures were 43.8% were in favour and 52.1% opposed in the distribution and retail industries. Thus the worries of retailers that people demand free plastic bags is an illusion.

C. A systematic charging mechanism that reflects the scarcity of dumping grounds in Japan

a) The absence of a mechanism and taxes spent on waste disposal

The discarding of trash has often been viewed in Japan as a free service., and people tend not to realize the true costs involved or how sparse the sites for landfill have become. Under EPR, companies pay only a small amount for waste disposal when there is recycling; this does not apply to waste that is incinerated and then dumped in a landfill.

Individual people also do not bear the disposal cost. In the case of Urayasu city in Chiba prefecture, the price of designated bags is clearly stated, but according to the website of the Urayasu municipal government, this does not actually include the cost needed to dispose of the waste (Urayasu city 2013). In Japan the cost of using designated shopping bags is predominantly covered by taxes. People are generally not aware of the great expense involved and the lack of suitable landfill sites. Indeed, it has been calculated that the amount of taxes spent on waste disposal in Japan in 2012 reached approximately two trillion ten billion yen (Ministry of Internal Affairs and Communications 2013).

b) Existence of governments that are unhappy about decreasing waste

Unfortunately there are also governments that tend not to take waste disposal seriously because they can use taxes that they have collected effortlessly. Indeed there are some governments that actually do not want the volume of waste to decrease. In 1997 the Japanese government started to subsidize the construction of incinerators, and one of the conditions for the subsidy was that the incinerators must have a combusting capacity of over 100 tons, based on the premise that the amount of trash was going to increase in the future. As a result, local governments began to construct large incinerators that met the requirement hoping to win the subsidy, and those incinerators mushroomed across Japan. What the policy left behind was a lot of gigantic local incinerators that barely had enough trash to keep the combusting temperature over 850 degrees Celsius, an essential condition to curb the emission of dioxins. This forced governments to pay an additional cost in order to deal with the dioxin and for the purchase of fuel needed to have their incinerator continuing to burn on minimum amounts of trash. Having received plenty of criticism that claimed the subsidy is unfavourably encouraging construction of unnecessarily large incinerators, the government amended the decree

in 2000 and has since started to subsidize the construction of incinerators whose combusting capacity is smaller than 100 tons, given the condition that they are capable of incinerating more than 5 tons a day. Even with the amendment and recent trends in the decreasing amount of waste (Ministry of the Environment 2009), huge incinerators that were constructed before are still in existence, and will be for quite some time since it is said that the longevity of an incinerator is at least twenty years (Iwasa 2009:27–32). A dearth of trash has become a vexing issue for many local governments. Nagoya city, a major city in Aichi prefecture, is one of those cities that are concerned over the lack of waste. The city initially tried to reduce the amount of waste to save money. Nevertheless, this triggered the completely opposite outcome; waste disposal became more expensive. This is because they tried to reduce waste solely by means of recycling, which, as mentioned earlier, is quite expensive, and did not bother to employ reduction or reuse. Consequently, they coined the expression “*Risaikuru Binbo* (recycle poverty)”, meaning to be poor as a consequence of a commitment to recycling.

Since then, many local governments have been using this expression carelessly as an excuse not to make any recycling efforts, sending trash directly to an incinerator instead, as this is easier and does not lessen the amount of necessary waste. It is said one of the main tasks for the manager of an incinerator is to procure enough waste to keep the facility running. In order for local governments to make sure they have enough trash, in many places across Japan, plastic waste, which is potentially very troublesome has been labeled as combustible waste rather than incombustible. It seems more sensible to shut down unnecessary incinerators in response to the decreasing amount of waste, but instead many local Japanese governments have chosen to take another route that magically transforms waste that used to be considered unburnable into trash that is burnable. This is the case except for a few cities such as Yokohama, in Kanagawa prefecture, or Kyoto, which are all devoted to waste reduction and have already closed any unneeded incinerators. They insist that they do not think waste is going to decrease very drastically in the near future, and also a certain amount of extra room is needed in case there is an unexpected increase in waste (Sugimoto & Hattori 2009:70–71). This shows an explicit lack of aspiration among local governments to reduce waste. As a matter of fact, Japan has been largely dependent on combustion as a means of waste disposal, and the waste incineration rate in Japan has been on an upward trend from 72.7% in 1991, to 77.4% in 2000 and to 79.1% in 2009 (The Ministry of the Environment 2009) South Korea’s rate, in tandem with the decreasing amount of waste generated in Japan, was 28.6% in 1999 (Funaki 2006:209) and 16% in 2005 (Iwasa 2009:200–208).

Thus there is little incentive for Japanese citizens, companies or even local government to start waste reduction and reuse. In order for the mechanism to work, governments must stop spending taxes on waste disposal and make the cost of generating waste commensurate with the insufficiency of landfills. Here, education is crucial. People should be informed of how dire the waste problem is and of the benefits they could actually receive from the introduction of the mechanism, as less taxes spent on waste disposal means more spending on other public services, including welfare, education, and health services, just to name a few.

What Japan can learn from overseas

As can be seen, Japan has various problems with the treatment of waste. However, many countries are grappling with similar problems, and it is worthwhile examining the situation overseas as some solutions in other countries might also be applicable to Japan.

A. Green measures adopted by governments

a) Policies against plastic bags

Restrictions on the use of plastic bags have been implemented in many countries, although the inducement for their execution seems to vary within those countries. For example, the city of Mumbai in India has completely banned its citizens from using plastic bags since 2000 when they concluded that plastic bags clog storm drains and disturb its fragile sewer system while exacerbating monsoon-induced floods; this is also the dominant reason for the prohibition of plastic bags among most developing countries (Freinkel, 2011:151). In neighbouring Bangladesh, it is said that the ban has invigorated the industry for the alternatives to plastic in the country, especially jute. Jute grows abundantly in Bangladesh, and bags made of jute require a lot less energy for processing than polyethylene, the chemical used to produce plastic bags. In 2006, the Australian organization “Keep Australia Beautiful” awarded a “Plastic Bag Reduction Award” to a trading company that sustainably provides Australian retailers with Bangladesh-made jute bags, boosting sustainable living in both countries (Reuseit).

Similarly, restrictions on plastic bags can be seen in developed countries as well. In the case of Italy, which has become a precursor of plastic shopping bag restrictions in the EU, an ordinance that completely bans storekeepers from giving out thin plastic shopping bags that are not biodegradable or compostable was officially announced in March 2013 and then became law in June. Despite some tenacious objections (the UK lodged a claim that the control would breach free trade laws within EU countries), Italy remained adamant about obtaining their goal, which in contrast with developing countries was to protect the environment from the dispersion of plastic bags and to simultaneously bolster technological and industrial developments related to renewable sources (Paun 2013). The fines for violation range from 2,500 euros to 25,000 euros and could be more, depending on the quantity of illegal bags used (Environment News Service 2013). The movement gradually begun by Italy gradually spread throughout Europe. According to McDermott, the EU has set a target to reduce the use of plastic bags by 80% by 2017 (McDermott 2013).

A similar movement has taken place in North America too; Hawaii enacted a statewide ban on the use of plastic bags in May 2012, making it the very first U.S. state to adopt the ban. The state plans to enforce the ban gradually so residents can learn what the ban is for and how to use reusable bags while the businesses involved may adopt it accordingly. The state of Hawaii stated that it aimed to entirely forbid the distribution of plastic bags by July 1, 2015. Any business caught not complying with the law would face a fine between \$100 and \$1,000 per violation (Environment News Service 2012).

It has been pointed out, though, that the ban can have an adverse effect, as illustrated by the events in San Francisco. The city became the first in the U.S. to ban plastic grocery bags in 2007. After the ban, storekeepers started to give out bags made of paper instead of plastic. As a result of the ban, the consumption of paper bags in San Francisco shot up fourfold to 85 million annually. Paper bags also have a massive environmental impact; as a matter of fact, compared to plastic bags, paper bags are far more energy-and-water-intensive in both their production and transportation and emit twice as much greenhouse gas throughout their life cycle. It is said that if one looks at the issue of global warming alone, plastic is undoubtedly a much greener option than paper (Freinkel, 2011:158). Hence, people must be very prudent in banning plastic bags so they will not ironically replicate the same mistakes that harm the environment.

While a lot of countries have adopted an outright ban on the distribution of plastic bags from retailers,

Ireland on the other hand has introduced a charge on plastic shopping bags, which in fact the plastic shopping bag tax law in Sugunami ward, Japan, was modeled after. In 2002 Ireland passed a plastic bag tax a.k.a. plastax, which at first levied 15 euro cents (now 22 euro cents) on each plastic grocery bag. Weeks later, the number of bags used in the country dropped 94%, and within a year nearly everyone brought reusable cloth bags that they keep in their offices and cars. The amount of money generated from the so-called plastax amounted to 12 to 14 million euros, which went directly to the environment ministry to support a variety of environmental programmes (Freinkel, 2011:151). In this way, the introduction of the tax decreased the amount of plastic bag litter in the country significantly, and the use of plastic shopping bags has become virtually obsolete. In Britain, Deputy Prime Minister Nick Clegg in September 2013 unveiled a plan to charge 5 pence in England for every plastic bag in supermarkets and other large stores from 2015 onwards (McDermott 2013). In Wales a 5 pence levy resulted in a 96% drop in the use of plastic bags within a year (Mathiesen 2015).

However, Rosenthal claims it is no easy task for other countries to replicate the success of Ireland. She attributes the success to two factors that are indigenous to the country. First, there were no plastic bag makers in Ireland, and therefore they did not have to confront strong opposition from domestic plastic manufacturers over the implementation of the tax; they had imported most shopping bags from China. Second, they had a very powerful Environment Minister who was steadfast in environmental protection. They never allowed shopkeepers to pay for the bags on behalf of their customers or merely switch from plastic bags to paper (Rosenthal 2008).

b) A policy against plastic bottles: the deposit system in Denmark

Many countries operate a deposit scheme for plastic bottles whereby the customer pays a deposit fee which is added to the cost of the bottled drinks. This deposit is returned when the shopper returns the used bottle to the retailer. This reduces litter and bolsters reuse and recycling. Denmark introduced such a system in 2002 for plastic and glass bottles as well as aluminium cans. There is a small logo on the product to indicate the amount of the deposit. To have their deposit refunded people use automated bottle banks, known locally as "Flaskautomater". Alternatively they can transfer their deposit proceeds to a charity using the machine (Graham 2012). It is said that the same beer bottle can be used up to 33 times while reusable plastic bottles can be used up to 20 times. Funaki contends that since the deposit is relatively expensive, few people discard containers and even if someone did there would be people that would pick them up in an effort to earn some money. By using the machines the collection rate reached 98.5%. The deposit system is also convenient for merchants because customers constantly come back to their stores in order to return used drink containers (Funaki 2006:142).

c) A policy against one-time use products in South Korea

Plastic bags and bottles are not the only type of disposable waste that has been extravagantly used and generated much trash that harms the environment. South Korea enacted a law in 1994 that bans the use of various single-use products such as disposable tableware made of plastic, paper or wood at restaurants, and complimentary disposable toothbrushes and razors at hotels, not to mention free plastic bags at retailers. As an exception, fast food restaurants and coffee chains are allowed to dispense disposable products such as paper cups and plastic utensils to customers that prefer taking their food outside of their stores on the condition that the stores are capable of achieving a collection rate of over 90% for the disposable trash. Nonetheless,

those restaurants are also very keen to utilize reusable products to reduce waste. Lotteria, the biggest fast food chain in South Korea, opened a store in Seoul during 2001, the first in the world where food is only served inside and with reusable tableware, with several other locations following its success. Even stores that still use single-use products utilize reusable ones whenever possible; they serve hot drinks in a reusable mug and cold drinks in a reusable plastic cup when customers dine inside. When they are asked to serve in disposable containers so customers can eat outside, they charge a deposit fee: 100 won on paper cups (around 10 yen) so as to improve their collection rate (Friends of the Earth 2003). In this way, following several modifications, the law has made companies in South Korea environmentally sustainable while significantly contributing to waste reduction in the country. Iwasa deplores the fact that while Japan and South Korea are similar in many ways when it comes to their waste problems, such as having relatively small land areas for their large populations and the insatiable consumption habits of their nationals, the way the two countries tackle their problem of decreasing waste disposal grounds are completely different; South Korea, as described above, has been fervently trying to reduce waste by supporting reuse, whereas Japan has been foolishly burning waste to compact the amount that goes to landfills (Iwasa 2009:200–208).

d) Extended producer responsibility (EPR) in Germany

It has been mentioned that Japan does not practice EPR efficiently, with little incentive for companies to reduce their waste. There is one country, though, that has embedded the concept of EPR into its waste management policy and where businesses take the entire responsibility of the garbage disposal process, including the collection of used wastes: Germany.

In Germany, there is a law that was enacted in 1991 entitled “Verpackungsverordnung” which specifies that it is the responsibility of manufacturing and retailing companies which produce or use containers and packages, to fully take care of garbage disposal including collection, sorting, and recycling of their container and packaging trash. The law was adopted after it was found that container and packaging waste made up of 50% of the total garbage generated from households. In 1991, in response to the adoption of the law, manufacturers and retailers got together to found a nonprofit organization named “Duales System Deutschland GmbH” (DSD) as the world’s first union of its kind to take leadership of the nationwide recycling system. On behalf of manufacturers and retailers, DSD first collects container and packaging waste that has been put into special bags or boxes for DSD by consumers and then sorts the waste according to what it is made of: tin, aluminium, plastic, glass, paper or mixed compounds, and then finally they recycle the sorted trash. DSD conducts all of these processes with the involvement and cooperation of numerous other organizations (Matsuda 2008). The reason behind the name dual system is that it is another, or the second method of, waste disposal as opposed to the one for non-container-or-packaging waste conducted by local governments (Kawasaki, date unknown). In order for manufacturing and retail companies to have DSD recycle waste on their behalf, companies are required to pay a fairly expensive commission fee to DSD; in return companies are permitted to use the ecolabel logo called “Grüne Punkt”. By looking at the mark on containers and packages, people can tell which products can be recycled via DSD as well as which companies are involved in this sustainable system. Due to this system, the more packages and containers companies use, the more it costs them, thereby greener products, such as goods with less packaging or drinks in reusable containers, become more economically competitive (Der Grüne Punkt). It is said that the annual amount of container and packaging waste generated in Germany per person went down from 94.7kg in 1991 to 82.3kg in 1997 (Juba).

Moreover, since the other garbage disposal service conducted by the public sector charges people for throwing away waste, whenever products bear the DSD logo, people enthusiastically opt for them because DSD is financed by companies and therefore free for citizens to use. There is data that shows the collection rates of various materials through DSD: 97% for plastic, 99% for glass, 121% for tin, 128% for aluminum and 161% for paper (since there is garbage that is collected in DSD that does not have the mark and is not supposed to be collected, such as goods from overseas, which puts the rate above 100% (which in fact is controversial) (Funaki 2006:150). Today, Grüne Punkt is being used in 28 European countries and appears on more than 460 billion packages every year. In Germany, no less than 98% of people acknowledge the logo (Der Grüne Punkt). The trademark that is only given to businesses that finance and participate in DSD is considered to be a symbol of EPR and a commitment to environmental protection, strengthening environmental awareness among people.

B. Green measures initiated by companies

a) Businesses that reduce waste by reuse

1. Waste reduction at retailers (IKEA and in.gredients)

IKEA, the Swedish retailer that sells and designs ready-to-assemble furniture, appliances, and home accessories, is one of the companies that have been devoted to waste reduction. In October 2008, the company stopped offering any disposable bags, and therefore reusable bags have become the only option at their stores. It is different from the government-led policies introduced earlier and more progressive in that people are no longer able to buy disposable bags, including plastic or even paper, which are still available in many countries. While a lot of retailers in the world are struggling to increase the rate at which customers bring their reusable shopping bags, astonishingly, the rate is undoubtedly 100% at IKEA. Pernille Spiers-Lopez, president of IKEA North America, said that IKEA believes one's home is more important than any other thing in the world and therefore it places great value on life at home. The earth is home to all of us living on this planet. We shall all work together to be sustainable and environmentally responsible (Liss 2008).

There is one retailer that has gone above and beyond in its reuse of shopping bags. A grocery store called "in.gredients" that opened in 2011 in Austin, Texas, was established with an uncompromising mission to minimize waste while offering fresh, seasonal, and local foods that thereby promote a healthy and sustainable lifestyle. A salient feature of the store is that in.gredients has completely eliminated all kinds of wasteful packages, which is an uncharted frontier for the grocery industry. The following is a description of how the package-free system works: 1. Bring clean containers from home. 2. Weigh and label your containers if you have not before. 3. Fill your containers with whatever you want to purchase. 4. Bring your purchases to the counter. 5. Pay. This system also enables the customers to adjust the amount they want to buy, reducing potential unconsumed food waste (Lane 2010). Regarding the concern about reusing the same containers many times at grocery stores, they claim that they follow the best possible practices to prevent cross-contamination, meticulously washing the containers several times a day and educating customers about container safety and the potential danger. They aim to show the world that it is indeed possible to shop sustainably and that package-free shopping is feasible (Nunnery 2011).

2. Waste reduction of drink containers (Starbucks and Cup Concept)

As for an antidote to the wasteful use of disposable drink containers, Starbucks, the biggest coffeehouse

company in the world, seems to be one step ahead of its competition. The company has been discounting 10 cents off the price of drinks in the U.S. for customers that show up with their own reusable beverage containers for the last several years. It is estimated that the number of drinks served in reusable containers in 2011 was 34 million, which is a 30 percent increase from 2009. It can be clearly seen that the company is committed to green business. Those 34 million drinks, however, in fact accounts for only 2% of the total drinks served at the company, meaning the vast majority of Starbucks customers still use disposable cups (Kaye 2013). It seems similar yet is different from the situation of South Korea's Lotteria in that the measure is not backed by a government, and therefore they do it voluntarily wherever possible in the world, including those places where environmental protection is still not a well acknowledged topic. Furthermore, another critical difference is that Starbucks discounts drinks so they do not need to give customers free cups instead of charging a deposit fee for their use. In this way, people do not get the feeling that they are losing money when using seemingly free disposable cups, which probably explains the comparatively low rate of customers bringing reusable containers. But Starbucks has been striving for waste reduction and continues to come up with miscellaneous campaigns to urge more and more people to bring their own containers. On Earth Day, which falls on April 22, the coffeehouse provides free coffee to those who bring in their own beverage container to raise awareness of how environmentally sustainable reusable containers are. Moreover, in 2012 they launched \$1 reusable cups that are designed to be so cheap that they pay for themselves after 10 uses, and they are durable enough for people to reuse them around 30 times. They expect that by introducing inexpensive reusable cups, people will consider starting to carry their own and stop using disposable ones. The company aimed to more than double the rate of those who bring in their own drink containers to 5% by 2015 (Miller 2012).

"Cup Concept" has brought the idea of reusable drink containers outside of stores. Cup Concept is a German company based in Sexau, near Freiburg. The company has been providing a comprehensive service concerning the rental and sale of reusable plastic cups for over a decade, primarily to businesses that hold large events. When receiving inquiries from clients, the company advises them on which type of cup and how many of them should be used, and delivers the cups, brings them back after the event, and finally washes them using a professional machine so the cups can be used again. At events, the refundable deposit system is adopted to ensure a high cup return rate. They use cups that are made from durable plastics, display color brilliantly, are highly scratch-resistant and look like glass. In an effort to further get people to use their reusable cups, they made it possible to have a picture printed on the surface, which they claim has immense advertising potential (Cup Concept, date unknown). Their six cleaning facilities are scattered across Germany and are all equipped with state-of-the-art cleaning technology that has minimum impact on the environment. Aside from its environmental benefits, Cup Concept insists that the use of their plastic reusable cups is especially advantageous over its traditional reusable alternative (i.e. glass cups) at events where people get excited and glass would constitute a safety risk. Now the company has close connections with many of the German soccer league stadiums and is present at almost all the big Rock concerts in Germany. They have also acted as the exclusive supplier for huge international events including the EXPO 2000 in Hannover, the FIFA Confederations Cup in Germany in 2005, the football World Cup championship in Germany in 2006 and UEFA EURO 2008, having kept countless disposable cups from going into landfills. At the 2006 FIFA World Cup, the company was applauded in "the Green Goal Legacy Report": "... *The use of*

returnable beakers was the most important measure in the area of waste within the framework of Green Goal. As a result, a decisive contribution was made to a low-waste World Cup, reduced litter and clean stadiums. The returnable beaker was therefore a symbol for waste avoidance and for a successful overall waste and environment management concept. . .” It is said that their reusable cups contributed remarkably to the clean appearance of the stadiums and also reduced litter volume by more than 17%. Furthermore, according to the study investigated by three governments (i.e. Germany, Austria, and Switzerland) on the ecological impact of various cup systems including single-use cups made of several materials and multiple-use cups in the case of UEFA EURO 2008, even from a pessimistic point of view, a returnable cup system is considerably more environmentally friendly than any single-use system. The greenest single-use scenario has twice as much the environmental impact as the least green returnable cup system. They assert that being able to bring reusable cups to large-scale events such as music festivals and professional football games is very important from an environmental point of view because those are a major attraction for the younger generations that will shape the future. They see those events as the ideal opportunity to instill environmental awareness among the youth (Cup Concept, date unknown).

b) Businesses that control disposable waste

There are some businesses that have embarked in the garbage business and have partially replaced the governments' duty by optimizing different waste collecting processes.

1. Reversed vending machines (RVM) in Beijing (Incom)

Machines deployed at subway stations in Beijing that look like vending machines have been changing the situation surrounding plastic bottles in the city. Beijing Incom Resources Recovery Recycling Company (Incom) made what is called the Reversed Vending Machine (RVM) that takes used plastic bottles, and then automatically crushes them and stores the remains for future recycling purposes (Yiqian 2012). In fact, this kind of RVM is fairly common nowadays in developed countries that are concerned about environmental protection, and the idea itself is said to have existed since as long ago as the early 1970s (Caldwell 2012). But the machine here is innovative in that people can receive a credit of 0.1 yuan (1 yuan = 16.81 yen as of December/1/2013) per plastic bottle inserted which is then directly applied to the users' rechargeable subway cards (Lutz 2013); there is no need to receive a receipt from the RVM or take it to a certain store checkout to have it redeemed, which has previously inconvenienced and held back those who wished to employ this system. Moreover, the machine is incredibly intelligent and is able to send a signal to the company's information center when it becomes full or has a malfunction. It can also distinguish plastic bottles from other types of garbage, such as apple cores or cigarette cartons, which the machine will spit back out via its label scanning technology. Incom hopes to make use of the data that they garner through the machines to aid the government in introducing new environmental policies and help businesses currently engaged in the recycling industry (Yiqian 2012). After two of the RVMs were installed in the terminal of Beijing Capital International Airport and four in the city's subway stations, Feing Juan, a marketing expert with Incom, said in an interview with by China Daily in May 2013, *“they (the machines) have been well received so far. More than 30,000 empty bottles have been collected since December. People are encouraged and rewarded for turning trash into treasure”* (Xin 2013). To further the collection of recyclable trash, the company now aims to expand the types of waste accepted to items such as used books. Furthermore, while they are planning to install more machines at subway stations that do not yet have one, they are also taking the machine outside subway

stations to various places including universities, shopping malls, office buildings, bus stops, parking lots, and eventually to other developed cities in China. The company expects to see 2000 RVMs placed throughout Beijing in the next few years. Furthermore, in accordance with the forthcoming installation of the RVMs in more diversified areas, the company is now also developing more ways to reward people with incentives, including IC cards for use at cafeterias (Xin 2013).

2. Reversed vending machines (RVM) in Boston (Greenbean recycle)

While Incom found a lucrative business opportunity in subway stations, Boston Massachusetts has seen RVMs unique to local colleges. The machine is the brainchild of a startup software technology company called Greenbean Recycle (GBR). The company has turned the drudgery of recycling drink containers into a competitive, fun, and engaging game in the Boston area. To use the machine, the creation of a Greenbean account is required in advance using a phone number, email address or Facebook account at either the machine or on the GBR website, which distinguishes the service from similar kinds. When signing up, users are given the option to choose a fraternity or sorority as a sub team, and then to decide if they want to receive a 5-cent refund in their paypal account or make a donation to a charity of their choice. The machine takes various types of beverage containers, including glass bottles, plastic bottles, and aluminium cans. With its barcode scanning technology the machine is smart enough to recognize, count, crush, and separate each material as well as notify the company when it is full (Greenbean Recycle).

This RVM is exceptional because of the following three unprecedented features. First, the machine gives instant and measurable feedback on the users' (or their team's if they have registered as a group member) environmental impact and contribution through recycling with the GBR machine: the number of Kwh of energy that they have saved and the number of containers they have diverted from entering landfills. Users can check their record through the GBR website using their computer or cell phone. Shanker Sahai, the founder and CEO of GBR, insists "*recycling is a boring chore and sometimes you don't know how your effort makes a difference or even if it is recycled and re-used, so by showing a user that even one bottle or can makes a difference in real time the user is encouraged to keep recycling*" (James 2013). Second, based on the visualized personal data, GBR allows users to compare with and compete against each other over each other's environmental contribution. If they have set it as a preference, the RVM will even post their environmental performance through recycling on the user's Facebook page. In addition, when they log into the GBR website using their GBR account, they can find the list of the top recyclers, and it tells them how many more drink containers are necessary to catch up (Daltas 2012). Sahai says that when their names are displayed on the website, users become more motivated to recycle (James 2013). Furthermore, GBR also allows users to compete against each other by team or school, thereby constituting positive peer pressure to avoid being a laggard within a team (Kamal 2013). As of December 2nd, 2013, GBR had installed its RVMs at eight universities in the Boston area, some of which have a historically strong rivalry with others (e.g. Massachusetts Institute of Technology and Harvard University), and GBR's online homepage shows the top three universities that have recycled the most. The rivalry between schools would fuel this green competition and make it more appealing. Third, the rewards that GBR offers in return for drink containers have gone beyond mere 5-cent deposits. In addition to an ordinary monetary reward, participants that have succeeded in accomplishing certain activities specified by GBR during a given time period can earn prizes through competitions. Partnering with environmentally friendly sponsors, GBR has hosted several interesting challenges, stimu-

lating a spirit of competition among users. Here are a couple of examples that have occurred in the past: the Burritos challenge (Nov 15th 2011 to Dec 15th 2011) in which users that have posted a picture of them recycling using the company's RVM were given a free burrito from Boloco, a local burrito chain restaurant. Also, there was the iPad mini challenge (Jan 31st 2013 to Feb 15th 2013) in which one of the top five recyclers was awarded with an iPad mini while the other four received a \$15 iTunes gift card. The Orientation Challenge (August 26th 2013 to September 2nd 2013) was one in which the top ten recyclers won a \$50 driving credit from Zipcar, a car-sharing company, and a \$10 gift card from Barnes and Noble, a book store. (Greenbean recycle) The whole idea of these three events was to entice people into recycling more.

Harvard University's Associate Manager for Recycling and Waste Management Rob Gogan says, "*In our waste audits from student houses and dorms, we often find bags from student parties: lots and lots of soda and beer cans and bottles. It frustrated us that despite our best efforts, students cleaning up after an event would not separate their cans for recycling. In talking with student sustainability REPs, they agreed that having a convenient way to redeem cans and bottles to get the nickel deposit back would get more people to recycle. We decided that the Greenbean would be a great way to make redeeming and recycling more convenient*" (Hammer 2013). From the time their first RVM debuted as a pilot programme in MIT's student center at the beginning of August 2011 until December 2nd 2013, GBR had recycled 316,947 containers, diverted 24,286.95 kg from entering landfills and saved 50,853.99 kwh of energy (Greenbean Recycle).

Acknowledging the environmental hazards posed by drink container waste and the urgency of the situation, the company is deeply committed to shaping an environmentally responsible society. Kristina Momchilova, the marketing manager for Greenbean Recycle, says to students, "*It all depends on you guys; if five cents doesn't mean anything to you, don't you think it could still mean the world to a charity? College students should be encouraged to recycle more. We are trying to show you the true impact that your actions have.*" Sahai strongly encourages students to vocalize who they want to support through charity and how they want to impact society. He says, "*We really want students to come to us and tell us which groups they want us to donate to*" (Weiner 2012). While GBR is a company that aims to collect used drink containers, they are also providing young people with opportunities to think about what kind of difference they want to make and how it is possible by connecting them with people in need via their donations. Sahai emphasizes the importance of the recycling business in universities. "*This is the demographic that is going to change how we recycle and also how we move into the next generation of recyclers*" (Averret 2011). Although the company is currently only targeting college campuses, they envision installing RVMs in many places with a high traffic of recyclables, including stadiums, airports, and condominiums (Greenbean Recycle).

3. The differences between the two types of RVMs

Although both the RVMs initiated by governments and companies share some common benefits, as was mentioned above, there are several distinctive differences between them. This section will clarify those differences so the advantages and disadvantages of each side can be discussed. First, the amount of the refunds that people receive in return for inserting drink containers is quite different because RVMs that were designed in response to the government-led deposit system return the expensive deposit initially added on the price of the drink, as is in the case with Denmark from 1 to 3 DKK (around 18 to 55 yen). On the other hand, RVMs operated solely by companies collect containers that do not include a deposit and therefore are able to refund only 0.1 yuan (around 1.7 yen) in the case of Incom and 5 cents (around 5 yen) in the case of

GBR, which is far less motivating.

Second, perhaps not necessarily always true, but when looking exclusively at the cases inspected in this paper, government-led RVMs in Denmark not only recycle collected containers but also reuse them. In contrast, the cases initiated by businesses only recycle containers. Although there are absolute environmental advantages to RVMs even when they only aid in recycling, some people are in fact pessimistic about the environmental benefits of RVMs that only recycle. Their criticism is that the operation of many RVMs necessitates large amounts of energy, and moreover, the programme would overly protect and bolster recycling, interfering with a habit of reuse which has far less of an environmental impact (Lutz 2013).

Third, RVMs initiated by companies are innovative whereas ones backed by governments are rather run-of-the-mill. It does not mean government-led machines cannot be innovative, but in general, companies that are profit-driven tend to be more motivated and ingenious. Because these companies mainly gain profit by selling collected containers to recycling companies, their foremost interest is how best to collect used drinks containers. Hence, they are always ardently thinking of the most effective way to achieve their goal, making their RVMs more innovative.

Fourth, company-led RVMs can be placed anywhere, while RVMs based on a government-led deposit system are available only in retail stores. The reason why the places that government-led RVMs can be installed are fairly limited is due to the fact that they require users to take the printed receipt from the RMS and go to retail checkout counters to have them redeemed. On the other hand, RVMs launched by companies often have removed this inconvenience and can also be installed in places where there is no counter, exposing the machines to more people carrying used drink bottles and making them more convenient for people to use.

Conclusions

Let us conclude by examining what various actors could do to relieve the situation whereby there is a major waste problem that causes environmental damage and is also a financial burden.

A. What governments in Japan should do

a) *EPR*

It seems necessary for Japan to revise “The Containers and Packaging Recycling Law” to shift responsibility for the costs from the government to companies so that the latter will be encouraged to reduce waste. The German DSD model might be one way to do this. This would make recycling more expensive but could reinvigorate the reusable drink container industry.

b) *Fees on household waste*

The use of shopping bags as trash bags needs to be forbidden so that fees can be levied by government. The Irish example is possible as an option. Education on using reusable bags may be necessary.

c) *A systematic charging mechanism*

Instead of disposing of waste using taxes, it may be better to charge for waste disposal through EPR and fees. Local governments should consider closing unnecessary incinerators.

d) *Other additional measures*

One additional approach would be to adopt the deposit system that is common in Europe. Implementing a

ban on single-use products as done in South Korea could also help.

e) Strong leadership

It is necessary for government to take a strong leadership role. Besides this making the situation fair for everyone, there may be a need to confront opposing interest groups.

B. What companies should do

a) Compliance

Companies can play a bigger role by abiding with green initiatives established by the governments. While there could be negative effects (e.g. plastic bag makers would be adversely affected by a ban on plastic shopping bags), it could have positive outcomes for others, as was found with jute in Bangladesh. Indeed, jute bags could be used in Japan.

b) Innovation

Here, profit-driven companies could have an impact e.g. the reversed vending machines designed by Green-bean Recycle. Other developments may also be possible.

c) Localization of businesses

Some innovations abroad may not be applicable to Japan. For example, the system established by ingredients in Texas may be good for Texas, where the majority of shoppers travel by car, but in Tokyo it is not so easy for people to, say, go to work by train carrying containers and then shop when returning home. Thus consideration needs to be given to the local situation in Japan.

One possibility might be to have more easily portable containers (especially folding ones) that people would be more willing to carry around. Another possibility might be to have rental bags (or bags for sale) at shops; to ensure the safe return of the bags, a deposit system could be introduced. These containers could also be used to carry advertisements and therefore help the shop's business. Such a system with bags for sale carrying advertisements has been followed by two supermarkets (Miuraya and Kinokuniya) in the west Tokyo city of Kunitachi. (Personal observation)

C. What individual people in Japan should do

a) Green consumerism

One characteristic of Japanese society is that people tend to prefer new products and look down on used ones. People need to adjust their way of thinking and become green consumers. For example, Japanese use single-use wooden chopsticks, but in South Korea reusable metal chopsticks are used. In places such as Denmark, drinks in reusable bottles are common, but not in Japan.

b) Reusable bags

Ordinary people can be more environmentally responsible by starting to use reusable bags instead of waiting for legislation to be introduced.

D. Summary

The vast majority of disposable containers and packaging waste is only used once for just a few minutes to carry a purchase. Nevertheless, this meaningless waste makes up around 40 to 50% of household waste, and once it gets into nature it will stay there for decades, greatly devastating the environment. However, there

seem to be several practical ways to resolve this situation.

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