

Citizen Activity May Be Effective in Reducing General Waste

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Citation

Yukihiro Ikeda. Citizen Activity May Be Effective in Reducing General Waste. *American Journal of Environmental Engineering and Science*. Vol. 5, No. 4, 2018, pp. 72-76.

Received: July 2, 2018; **Accepted:** July 25, 2018; **Published:** August 10, 2018

Abstract: Reduction of household waste is an environmental concern. I report how activities involving citizens contribute to general waste reduction. In 2010, a citizen group for waste reduction was established in Osaka-sayama city. Not only citizens but city administrative staff participated in this organization. We examined the composition of waste discharged from home. We held monthly regular meetings and shared methods of waste reduction and ideas practiced by individuals. At event, we introduced the resent situation report of Osaka-sayama City and these waste reduction methods. The city provided free lending of compost and support for purchasing cost of kitchen waste dryer. Waste discharges per person began to decline following the start of the citizen group activities. In five years Osaka-sayama city per person discharges were at the same level as neighboring municipalities. Citizen activity may be useful for reducing general waste in a region.

Keywords: General Waste Reduction, Citizen Activity, Household Waste

1. Introduction

Reduction of household waste is an environmental concern. In Japan, the amount of waste per day per person is small compared in other OECD countries [1]. In recent years, discharges of general waste have declined in Japan [2]. But since about 80% of general waste is incinerated, it has a bad influence on the environment. Various methods have been considered and tried to reduce household waste. There are ten ways to reduce the household waste [3].

1. Refuse plastic bags and remember to bring your own re-useable bags from home instead.
2. Rehome. Use op-shops or sites like Gumtree and Freecycle to re-home unwanted household items from clothes to collectables and puzzles to plants.
3. Recycle. We all know how to recycle, but some items can be tricky. Batteries, mobile phones, fluorescent lights and old appliances can all be recycled. Visit Recycling Near You or contact your local Council to find out how.
4. Rethink how you dispose of rubbish while you are out of the house. Littering is never okay. Take your rubbish with you and dispose of it responsibly at home.
5. Rot. About half of the waste we send to landfill can be

safely composted at home using a worm farm or bokashi bucket. You'll be saving loads of greenhouse gas emissions and you'll get back nutrients that you can use on your garden.

6. Return the nutrients from your garden clippings back to the earth by composting or mulching, your plants will thank you and you'll save money using this natural fertiliser.
7. Request your free Switch your thinking 'No Junk Mail' sticker for your letter box (available to Perth residents only). In Australia, 8.2 billion articles of junk mail are produced every year. If you're not reading it, stop receiving it.
8. Reduce the amount of chemicals and plastic waste in your home by making your own natural cleaners. Mix one part water with one part vinegar and a squeeze of lemon juice for an effective all-purpose cleaner.
9. Reuse, not single use. Switch to re-usable water bottles and coffee mugs instead of the throw-away alternative.
10. Repurpose. Before throwing it away, think of how it can be put to use a different way. Old clothes and linen make great dusting rags, chipped coffee cups make great indoor plant pots and an old suitcase can even be repurposed as a dog bed.

In Japan, methods such as charging general waste disposal

fees [4-8], used paper collection [9], composting organic materials [10], etc. has been done.

There are three methods for Waste disposal fee. The first is a simple volume specific fee system. In this system, citizens purchase garbage bags designated by the municipality, put the garbage in it, and put it out of the house or garbage collection sites. The second one is an excess garbage charge system. In this system, a certain number of specified garbage bags are distributed free from municipalities, but if it exceeds this amount, citizens must purchase designated garbage bags at a considerable high price. The third one is a two-stage excess garbage charge system. In the two-stage garbage charge system, designated garbage bags are distributed from municipalities at a low price up to a certain number of sheets, but if it exceeds this, citizens must buy the designated garbage bag at a high price. In the simple volume specific fee system, the survey results indicate that the higher the charge of designated garbage bags, the more incentive for waste reduction [11]. On the other hand, the comparison between the excess garbage charge system and the two-stage excess garbage charge system shows that the two-stage excess garbage charge system has more incentive to waste reduction [12]. The effect of the citizen's burden on garbage disposal costs on emission reductions will be the greatest in the next year when charging begins. However, there are many cases where the amount of emissions has gradually increased to return to the original emissions, which is the rebound phenomenon [13]. This phenomenon is seen in many municipalities in Japan, it is known that the effect of garbage reduction by citizens burdening waste disposal costs is temporary. Regarding used paper collection, it has been practiced mainly in paper manufacturing companies since long ago in Japan. Recovery rate has exceeded 80% in recent years [14]. However, it cannot be said that the collection of

used paper is sufficiently advanced in general households. There are few cases where municipalities are mainly conducting. In general households, the neighborhood association collects it mainly. For composting organic materials, land is needed to practice this. In Japan, there are many people living in apartments, so it is difficult situation. On the other hand, municipality carries out very few garbage composting facilities [15]. The reason why municipalities do not advance garbage compost is due to the difficulty of management [16]. The biggest reason is that the quality of compost produced from garbage is not constant. Food waste is discharged from home every day, but its composition varies from day to day, and it varies depending on the season. Some municipalities have shown that the quality of compost is stabilized by mixing animal hunks when fermenting garbage [15], but the area where dairy farming exists in Japan is limited, it is difficult to apply.

A certain degree of effect was recognized in these methods. However, in order to promote further reduction of general waste, it is important for each citizen to take action to reduce household general waste. The Minami-Kawachi area is located in the south-eastern part of Osaka Prefecture and consists of six municipalities (Figure 1). Emissions per citizen of general waste are somewhat higher than the average across Japan [17]. General waste is incinerated in one incinerator operated jointly by six municipalities. Operating costs of incinerators are paid according to the amount of general waste by each municipalities. Therefore, to reduce operating cost, general waste reduction is important. For a long time, Osaka-sayama city in Minami-Kawachi area had the largest waste discharge per person compared with the five neighboring municipalities. I report how activities involving citizens contribute to general waste reduction.

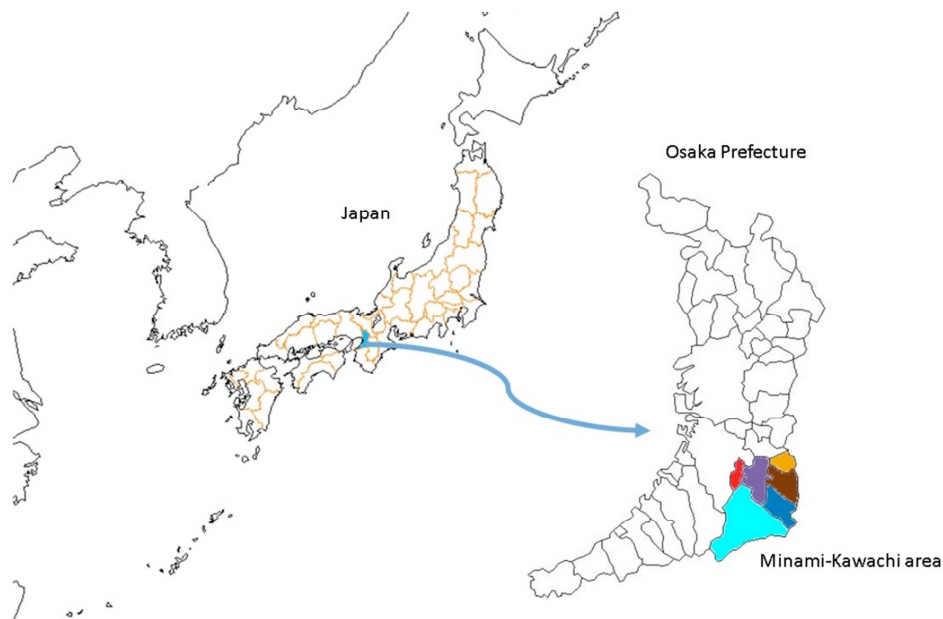


Figure 1. Study location.

Municipalities targeted for research are indicated by color coding. Osaka-sayama (red), Tondabayashi (purple), Kawachinagano (light blue), Taishi (orange), Kanan (brown), Chihaya-akasaka (blue).

2. Methods

2.1. Recruitment of Members

In 2010, a citizen group for waste reduction was established in Osaka-sayama city. We invited participation by public information magazines and posters of the city. We also advertised to other volunteer groups already participating in individuals by word of mouth and solicited participants. Not only citizens but city administrative staff participated in this organization.

2.2. Activities

First, we examined the composition of waste discharged

Table 1. Summary of activities to support waste reduction.

Activities	Frequency	Number
Regular Meeting	Monthly	15 core members
Introduction of waste reduction method at event	Biannually	300-500 participants per event
Waste separation education at elementary school	Annually	Fourth grade at an elementary school (200 students)
Waste reduction news	Biannually	All household (25,300)

2.3. Acquisition of General Waste Emission Data

General waste emissions data has been issued every fiscal year. Population data is released by each municipality, and the amount of general waste per day per person has been released by each municipalities.

3. Results and Discussions

The weight of household waste was kitchen waste, paper, plastic in descending order (Figure 2). Therefore, the main purpose of the home waste reduction promotion activities was to reduce Kitchen waste. Since 70% of Kitchen waste is considered to be moisture [18], we encouraged citizens to dry the moisture of Kitchen waste. The easiest way to reduce Kitchen waste is to not let Kitchen waste out of the home. We visited residential areas and made proposals to fill the kitchen waste in the soil for homes with gardens or fields, or that the city lends compost containers for free. For a house not having a garden or a field, we suggested that the city supplemented the purchase price of garbage dryer to dry kitchen waste, and distributed a net for squeezing the moisture of Kitchen waste. Moreover, we distributed net for squeezing water of Kitchen waste at event venues and encouraged use. The event was held twice a year, and 500 nets were distributed per one event. The second largest amount were waste papers. In Japan, waste paper collectors buy used paper discharged from home. However, since it cannot be done unless certain quantities are gathered, I asked each local self-government association to do it. Waste discharges per person began to decline following the start of the citizen group activities.

from home. We randomly selected 40 waste bags each, twice in summer and winter. The collected waste bags were opened at a wide place, and then we classified the waste into 9 types, and then weighed.

We held monthly regular meetings and shared methods of waste reduction and ideas practiced by individuals. At event, we introduced the present situation report of Osaka-sayama City and these waste reduction methods. We published "The waste reduction news" biannually. We introduced waste reduction method to local residents. We went to elementary school and carried out education on waste separation. The city provided free lending of compost and support for purchasing cost of kitchen waste dryer. A summary of these activities is shown in Table 1.

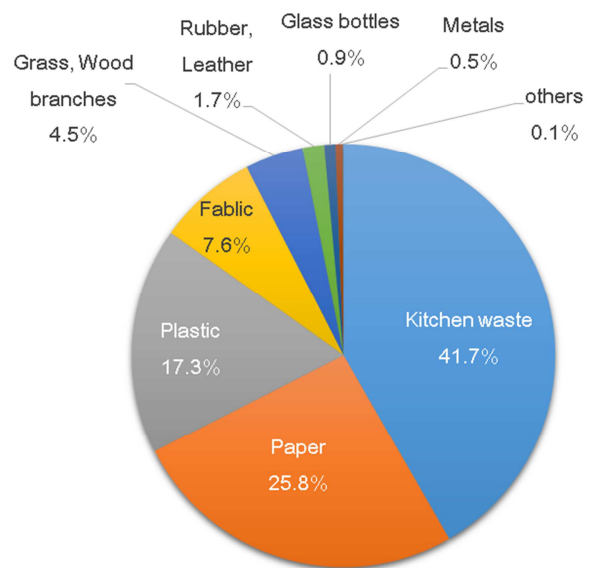


Figure 2. Composition of Osaka-sayama city general waste

Meanwhile, there were hardly any changes in waste discharges in the five neighboring municipalities (Figure 3). Why did General Waste emissions decrease only in Osaka-sayama? There are several possible reasons. First, Citizen activities of waste reduction were conducted only by Osaka-sayama. Neighboring municipalities did not engage in such an approach. Second, as can be seen from Figure 1, Osaka-sayama has a smaller area than neighboring municipality. Therefore, it is easy for citizens to be informed about activities even if the number of active people is small. Third, it may have been good to have elementary school students teach separating. Because elementary school students may have returned home and talked about waste reduction to their parents. Further investigation is necessary to understand

these effects reliably. Osaka-sayama city general waste discharges per day per person became the same level as five neighborhood municipalities in six years. I think that further

waste reduction from this state is more difficult than before. From now on, we will focus on used paper collection.

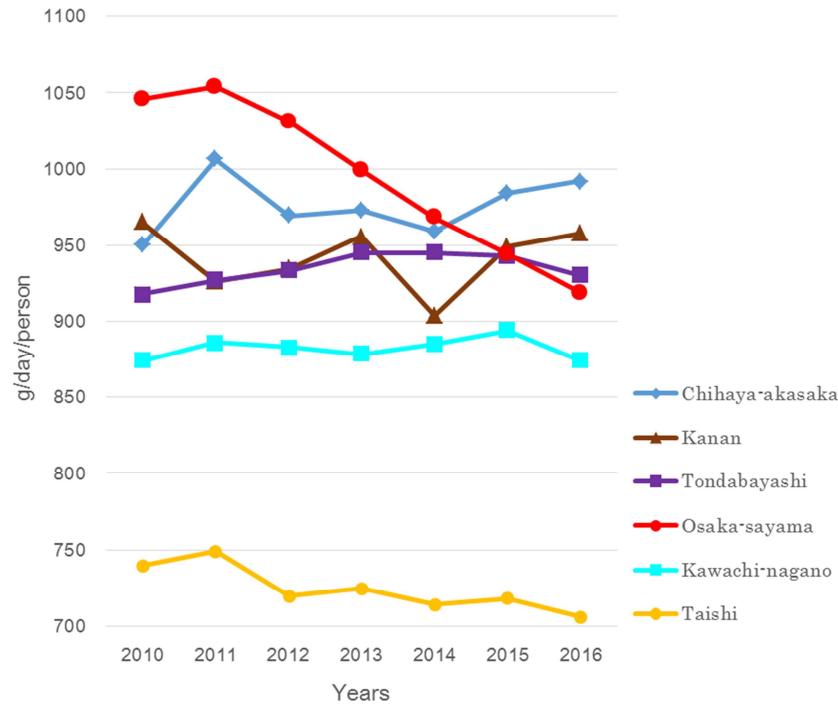


Figure 3. Trend of waste discharges per day per person in the Minami-Kawachi area

4. Conclusions

In this research, it was shown that it is important for each citizen to be actively involved in the reduction of general waste by citizen activities. In addition to monthly meetings and activities at events, the influence of what I taught elementary school students may have been great. From this situation further cooperation of citizens is needed to further reduce waste. I will continue to promote and to evaluate this activity in the future.

Acknowledgements

I gratefully acknowledge Osaka-sayama city waste reduction promotion committee members.

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