

GREENHOUSE GAS REDUCTION POTENTIAL OF HOUSEHOLD WASTE PREVENTION INCLUDING SINGLE-USE PRODUCTS

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1. Introduction

Waste prevention has the highest priority among the waste management hierarchy. Household waste consists of avoidable fractions such as food loss and single-use products. Estimating greenhouse gas (GHG) reductions achieved by preventing those fractions is meaningful when considering priority of the target for the prevention. This study aimed to clarify life cycle GHG reduction potentials by household waste prevention.

2. Materials and method

Based on household waste composition survey in Kyoto City [1], avoidable products in household waste were identified. Among 457 g/day per capita of household waste generated, avoidable fractions, such as food loss and single-use products, accounted for 52.5% (240 g/day per capita). Reduced amounts of GHG emission by preventing avoidable fractions by 50% (120 g/day per capita). were estimated as GHG reduction potentials.

Functional unit of the analysis was set as “providing services of products annually consumed at households within Kyoto City.” System boundary includes production, usage, and disposal (treatment) of avoidable household waste. Incineration with energy recovery and landfilling of the ash residue were considered as treatment methods.

**Table 1 Avoidable products and prevention behaviors
which need alternative products**

| Avoidable products | Prevention behavior | Alternative products |
|--|------------------------------|----------------------------------|
| Disposable diapers | Use reusable diapers | Reusable diapers (textile) |
| Single use shopping bags | Use reusable shopping bags | Reusable shopping bags (textile) |
| Plastic commodity bottles | Purchase refillable products | Products for refill |
| Single-use beverage packaging (steel cans, etc.) | Purchase reusable bottles | Reusable bins (glass) |
| Single-use cups | Use reusable bottles | Reusable bottles |

Totally, 18 prevention behaviors were considered. As shown Table 1, alternative products have to be determined for five prevention behaviors of avoidable products.

For instance, to avoid single-use shopping bags, shopping by reusable shopping bags is needed as alternative behavior. It should note that using reusable shopping bags results in GHG emissions during the production of them. For to avoid single-use cups, GHG emissions during use stage (washing reusable bottles) also need to be considered. Therefore, such GHG emissions related to the prevention behaviors and alternative items were also considered by expanding system boundary to life cycle of alternative items.

3. Results and discussion

Life cycle GHG reduction potentials estimated to be 141,000 t-CO₂eq/yr. Among material composition, foods accounted for 31.2% followed by 18.8% of plastics, 16.9% of textiles, and 15.9% of papers. This distribution differed from household waste composition. Among prevention behaviors, “avoiding leftovers” reduced GHG emissions by 28,700 t-CO₂eq/yr, which showed the highest effect followed by 19,800 t-CO₂eq/yr of “use recycle markets” and 16,300 t-CO₂eq/yr of “use reusable products.” “Proper food purchasing”, “avoiding single-use products”, and “use reusable diapers” also contributed to reduce GHG emissions by more than 10,000 t-CO₂eq/yr, respectively.

This study confirmed that single-use products is one of the fractions in household waste which has higher priority to be avoided from the viewpoint of GHG reduction. As there are still many types of single-use products which cannot be identified, GHG reduction potentials need to be more carefully evaluated in the future study. According to the household waste composition survey in Kyoto City as of 2018, single-use products (except food packaging, single-use diapers, and tissue) in household waste amounted to 24-46 g/day per capita. Beverage plastic bottles and single-use plastic shopping bags (top two products as weight basis) accounted for approximately 40% of them.

4. Conclusion

This study revealed that 50% of household waste prevention potentially contributed to reduce GHG emissions by 141,000 t-CO₂eq/yr. This amount exceeded 120,000 t-CO₂eq/yr of GHG emissions from waste sector in Kyoto City. As the actual prevented amount differ among avoidable products and prevention behaviors, prevention scenario considering these aspects would be developed in the future study.

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Reference

[1] Kyoto City Environmental Policy Bureau (2017) Report on household waste composition survey in Kyoto.