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Influential socio-economic factors on the satisfaction of household to domestic household recycling schemes in Minamata City Japan

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Abstract: Household recycling as one of the effective ways to increase recycle rate has been promoted widely in Japan. Minamata City is known for its great number of recycling categories and high recycling rate in Japan. As a successful implementation of household recycling, this study took Minamata City as an example to clarify the socio-economic factors that impact on the attitude of households to the recycling scheme . A full sampling survey to the households of the city was conducted and statistical analysis was applied to the collected 4000 samples. The result showed a significant satisfaction of respondents to current household recycling scheme in general. However, there is difference in the satisfaction from family structures and dwelling types. The number of children of households shows a negative correlation to the satisfaction while the number of elders of households shows a positive attitude to the recycling scheme. Regarding to the impact of dwelling types, people who live in purchased house/apartment are more cooperative, in comparing with people who live in rental house/apartment. In short, we conclude that family structure and dwelling type, the identities of a community, are the most influential factors in the attitude to the household recycling scheme in Minamata City. This could be a hint for local governments/communities to design their waste management systems and improve the community engagement.

Keyword: household recycling scheme, socio-economic factors, satisfaction degree, questionnaire survey, municipal waste treatment

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1. Introduction

Japan has shifted the purpose of municipal solid waste management from mitigating environmental pollutions to a sustainable development from 2000 along the international major trend of integrated waste management. In that year, "Basis act on establishing a sound material-cycle society" with the main idea of promoting 3Rs (Reduce, Reuse, Recycle) to achieve a sustainable society has been launched. From then, the municipal solid waste management in Japan entered to a new era. During the past 2 decades, many municipalities established unique waste management schemes to increase the recycling rate. The most popular idea of the waste management schemes is to separate household waste in the source, so-called household recycling.

Different from the majority countries adopting the idea of separate household waste into 2-5 categories, Japanese municipalities tend to ask the residents to separate their household waste into more categories. Fig. 1 shows the municipality distribution of number of garbage separation. More than 99% of municipalities decided to separate the garbage into more than 5 categories, more than 78% set the separation category up to more than 10. Due to the household recycling scheme, the recycle rate has been almost doubled with in 20 years, the concept of 3Rs also permeated through the country.

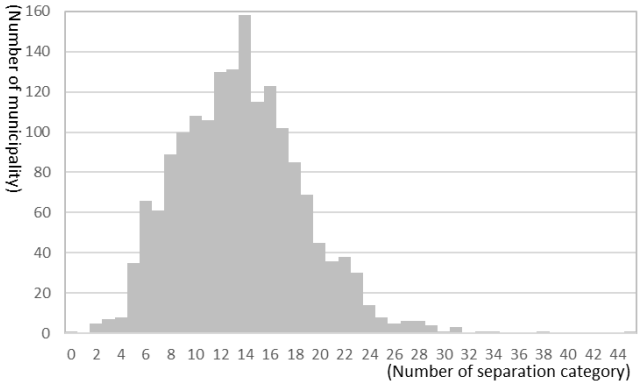

Fig. 1 The municipality distribution of the number of garbage separation[3]

While the household recycling has been successfully spread in Japan, Thi indicated the difficult for household recycling in other countries that the various program of waste separation at source deployed over several decades have only existed in the form of pilot-programs and have generally not been replicable on large scales (Thi Thu Phuong Nguyen, 2015). Thus, to investigate the key factors of spreading household recycling scheme is very important.

There are some researches work on investigating the influential factors to household recycling behaviors. Besides the convenience of system itself or the awareness of environment, socio-

[3] Source: Ministry of Environment Japan http://www.env.go.jp/recycle/waste_tech/ippan/index.html

economic factors of the households play an important role. Azilah pointed out that there is a positive relationship of socioeconomic and demographics factors such as age, home ownership and income with a frequency of recycling and option to improve solid waste management service, and any initiatives by the government will have to be based on such demographic variable (Azilah M. Akil, 2015). Zen also indicated that the non-recycler group is dominated by the low-income people and the household recycler group described in a middle-income group of people (Irina Safitri Zen, 2014). The objective of this study is to investigate how the socio-economic factors of each household influence on the degree of satisfactions of household recycling schemes.

2. Study area

Minamata City Kumamoto Prefecture located at Kyushu land, the Southwestern part of Japan. The population is around 24,493 (March 2019), the area is 163.29 km^2[4]. Minamata City is famous for Minamata Disease and Minamata Convention on Mercury. After experiencing one of the most severe environmental problem, Minamata Disease, in the middle to late 20st century, Minamata City published "Declaration on environmental and development" in 1992 to revitalize the city to an environmentally friendly city.

As the environmental capital of Japan, Minamata City has started household recycling from 1993 to separate waste into more than 20 categories, which was the first group of municipalities that started advanced waste management at that time (Table 1). For the recyclable garbage, there are more than 300 garbage stations in the city and will be collected once to twice every month depend on the different categories. For the kitchen garbage and burnable garbage, due to its large generation amount compare to the recyclable garbage, the city collects twice a week from more than 700 garbage stations. Kitchen garbage should be throwed with a special biodegradable plastic bag. The effect of household recycling scheme is significant (Fig.2). The recycle rate has been increased to around 40% within the 25 years, which is also double as the national average.

Minamata City has introduced many environmental events and campaigns related to waste management. Sending junior high school students to the elders houses to help on garbage separation, asking the citizens to bring and use the own bags, own bottles and own chopsticks while they are outside. Out of a series of policies, "Rotation Volunteer System" is thought to be the key that Minamata City successfully maintains the household recycling at a high quality. "Rotation Volunteer System" is a system that, several volunteers, decided within each community at the beginning of every year based on rotation, help on preparing, tidying up the containers at garbage stations and provide a double check of garbage stations while other residents come to throw their garbage.

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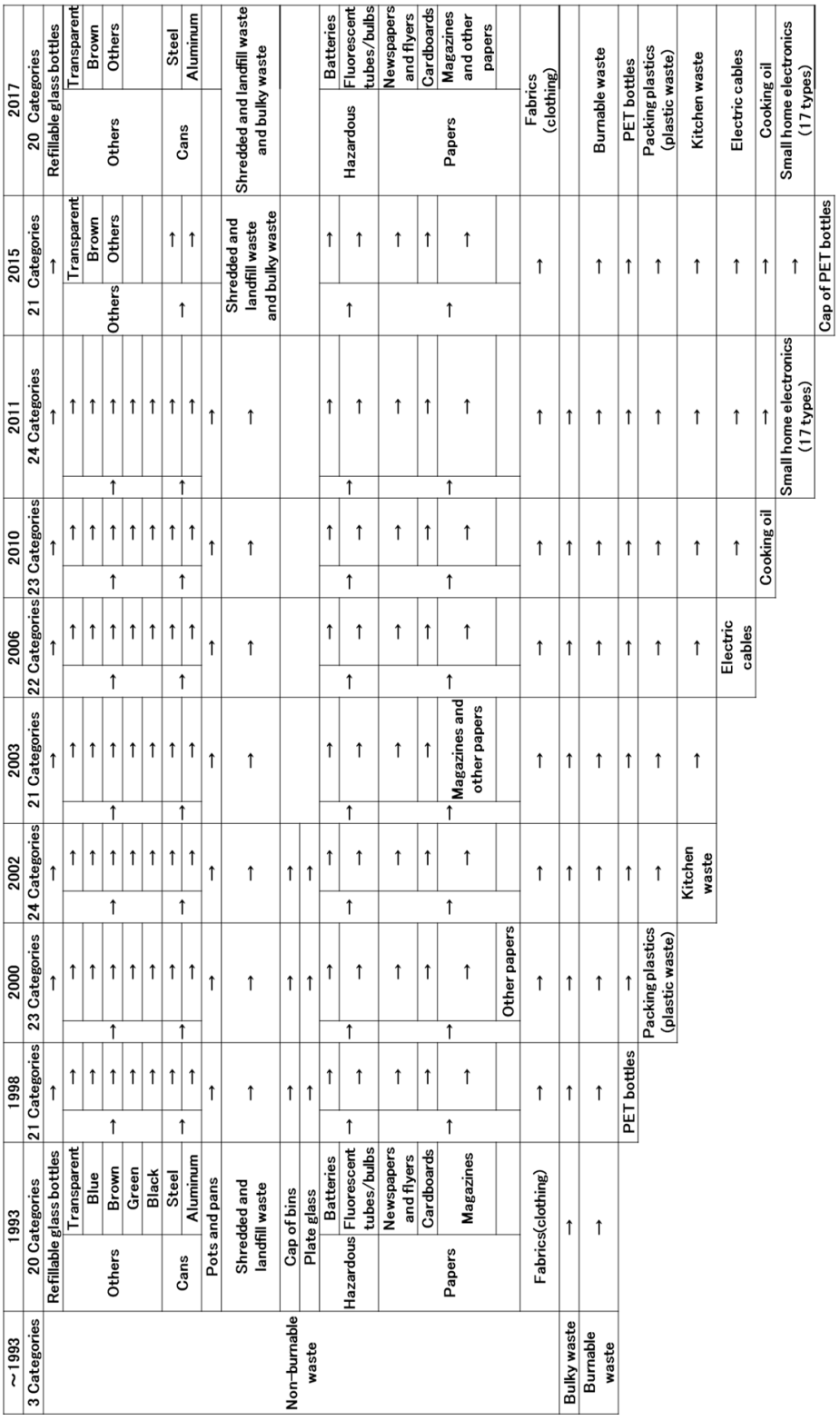
[4] Minamata City Official Homepage http://www.city.minamata.lg.jp/

Table 1 Changes of separation category in Minamata City[5]



[5] Source: Minamata City Official Homepage http://www.city.minamata.lg.jp/

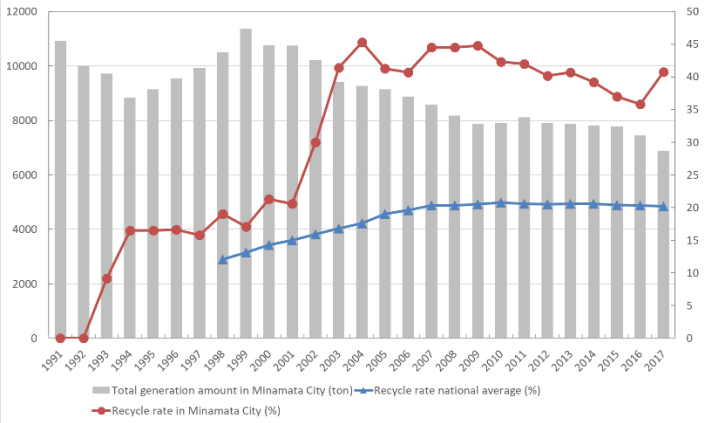


Fig. 2 The total generation amount and recycle rate of municipal solid waste in Minamata City[6]

3. Methodology

An originally designed questionnaire survey cooperated with Minamata City and Kyushu University conducted in Minamata City from December 2016 to January 2017. The questionnaire was designed based on existing academic researches and existing social questionnaire surveys. It consists 8 parts of questions, which are questions "About Daily life", "About Health and Welfare", "About Education and Culture", "About Industry", "About Disaster and Crime Prevention", "About Environment", "About Community", and "Basic Information".

Despite the facts about throwing garbage in daily life, the questions related to waste management in existing questionnaire surveys ask the satisfaction degree on waste management policies (Isezaki City, 2015) (Hiratsuka City, 2013) (Kawaguchi City, 2014) (Higashimurayama City, 2015), the importance of waste management policies (Isezaki City, 2015) (Hiratsuka City, 2013), the awareness on waste management (Kyotanabe City, 2013), the degree on recognition (Kyotanabe City, 2013), the participation to the related events (Kyotanabe City, 2013) as well.

Separation garbage in the household is the duty to every Minamata households, therefore, on the premise that household recycling has been done in Minamata households, the question to exam current waste recycling scheme asked about the degree on satisfaction in this questionnaire. The questionnaire was distributed to all 11,891 households in Minamata City at that time. The people who do garbage separation and bring it to the garbage station in the households have been asked to answer the questionnaire to assure a high reality of the answers.

Despite the questions related to waste management and recycling, some basic information of each household has been asked in the questionnaire as well. 6 questions on basic information are the total population in the household, the number of children that under 18 year-old in the household, the number of elders that over 60 year-old, the dwell type, the occupation that makes

[6] Source: Ministry of Environment Japan http://www.env.go.jp/recycle/waste_tech/ippan/index.html

major income, the annual income for the household. The analysis used IBM Statistics 25 and Microsoft Excel.

4. Results

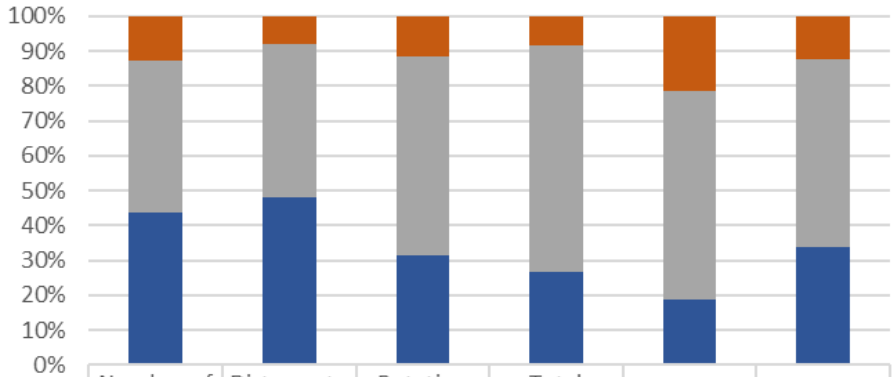
The basic information of responders is shown in Table 1. 76.8% households have less than 3 people, 18.1% households have more than 1 child under 18 year-old, 70.3% households have more than 1 elder over 60 year-old, 7.7% household have non child neither elder. Minamata City is confronting serious declining birth rate and an aging population problem.

Table 1 Basic information of responders

Family size	*Degree*	*Ration*
1 people	838	19.8%
2 people	1603	38.0%
3 people	800	18.9%
4 people	447	10.6%
5 people	215	5.1%
More than 6	121	2.9%

	Degree	*Ration*		*Degree*	*Ration*
Number of children in the household			Number of elders in the household		
Non children	3061	72.5%	Non elders	1042	24.7%
1 child	339	8.0%	1 elder	1314	31.1%
2 children	264	6.3%	2 elders	1484	35.1%
3 children	116	2.7%	3 elders	148	3.5%
4 children	30	0.7%	4 elders	17	0.4%
More than 5	16	0.4%	More than 5	6	0.1%

The satisfaction degrees of household recycling scheme are surprisingly high (Fig. 3). Averagely only 12.5% of responders answered negatively to current household recycling scheme. The number of separation category which is around 20 categories and the rotation volunteer system have 12.7% and 11.7% of negative answers, the distance to the garbage station and the total burden on the garbage include separation in the household and bring it to the garbage station have only 8.0% and 8.6% of negative answers. The total cost on garbage has 21.6% of negative answers which is the highest rate out of the 5 aspects of the household recycling scheme.



	Number of separation category	Distance to garbage station	Rotation volunteer system	Total burden on garbage	Total cost on garbage	Average
Unsatisfied	12.7%	8.0%	11.7%	8.6%	21.6%	12.5%
Neither	43.7%	43.8%	56.8%	64.7%	59.6%	53.7%
Satisfied	43.6%	48.2%	31.5%	26.8%	18.8%	33.8%

Fig. 3 The satisfaction degrees of household recycling scheme

Table 2 The correlation among the socio-economic factors and the satisfaction degree of different aspects of household recycling scheme

	Number of separation category	Distance to garbage station	Rotation volunteer system	Total burden on garbage	Total cost on garbage
Family size[7]	- 0.13	- 0.07	- 0.13	- 0.13	- 0.15
Number of children in the household[6]	- 0.18	- 0.11	- 0.20	- 0.19	- 0.22
Number of elders in the household[6]	**0.08**	-	**0.08**	**0.03**	-
Dwelling type[8]	0.21	0.20	0.20	0.20	0.19

Table 2 shows the correlation among the socio-economic factors and the satisfaction degree of different aspects of household recycling scheme. While the family size, the number of children in the household and the annual income of the household increase, the satisfaction degree on the household recycling scheme decrease. However, for the number of elders in the household, which is the only one out of all the socio-economic factors in this survey that have the positive correlation with the satisfaction degree on the household recycling scheme, the satisfaction degree

[7] Family size, Number of children in the household, Number of elders in the household, Annual income were calculated with Spearman's Rand-Order Correlation

[8] Dwelling type and occupation were calculated with Cramer's coefficient of association

increases along with the number of elders in the household.

While for the dwelling type, it would also influence on the attitude to household recycling scheme (Fig. 4). The correlation with the satisfaction degree on rotation volunteer system showed that people who live in a rental apartment or house have a relatively low satisfaction, people who live in purchased house have a higher satisfaction than people who live in purchased apartment.

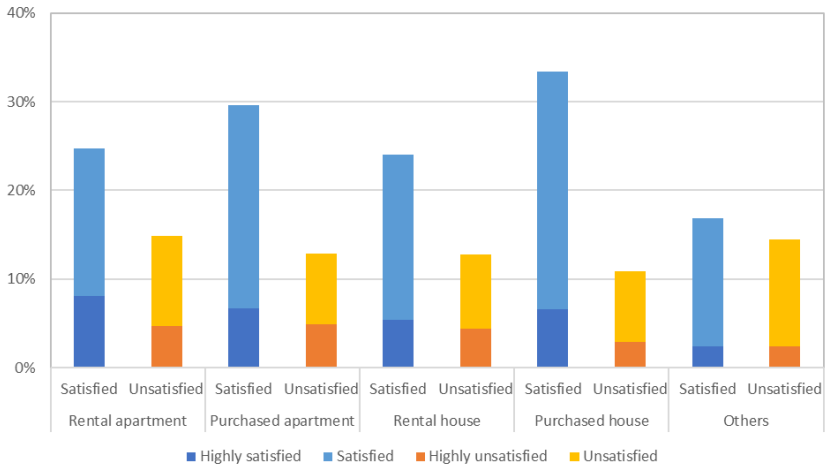


Fig.4 The dwelling type and the satisfaction degree on rotation volunteer system

5. Discussion and Conclusion

The satisfaction of respondents to current household recycling scheme is significantly high in general. From the residential point of view, the household recycling scheme in Minamata City could be regarded as a successful example. Well, the only cost on biodegradable bags which may cost averagely 3000 yen per household per year causes the highest unsatisfaction degree out of all the aspects of household recycling scheme, thought Minamata City is proud of their system which based on the cooperation from citizens and charge nothing as sanitation fees that many municipalities do.

Minamata City provides a lot of environmental campaigns and education program targeting children. During the pre-survey, the interviewer from local government mentioned that by these events, they expected the environmental awareness of children could be enhanced and they can bring a positive influence within the households. However, the effects are not significant from this survey. It shows that the number of children has a negative impact on the satisfaction degree of household recycling scheme. On the other hand, for the elders, the household recycling scheme hasn't existed when they were young, so the interviewer from local government worried that they might feel extra burden by doing household recycling or the complex separation might make them confused. However, the survey showed an opposite result. This result is very similar to Azilah's one, while the elder people are found to be more active in recycling compared to the younger ones

(Azilah M. Akil, 2015).

For the dwelling types, the order of satisfaction on rotation volunteer system is people who live in the rental house < rental apartment < purchased apartment < purchased house. According to Takahashi, people who live in a purchased apartment or house will have a stronger connection with neighbors and a stronger sense of belonging to the community, on the other hand, people who live in the rental apartment or house may not worried that much what neighbors think about them (Takahashi Wakaha, 2013). The satisfaction degree on rotation volunteer system in this survey which could exam the connection with neighbors and the sense of belonging to the community, showed the same order to the connection with neighbors and the sense of belonging to the community according to Takahashi. Therefore, the conclusion of this study is that, family structure and dwelling type, the connection with neighbors and the sense of belonging to the community are the key factors that impact on the satisfaction of household recycling scheme in Minamata City. Since the elders live in Minamata City for a longer time and the people who live in purchased apartment/house have a stronger sense of belonging to the community, thus, they are much willing to participate to the household recycling.

Thi mentioned that only by knowing what drives people to participate in separation of waste at source and whether they are ready to cooperate or not can we find conditions and interventions that effectively maximize cooperation for the implementation of waste separation programs (Thi Thu Phuong Nguyen, 2015). There is no need to emphasis the importance of investigating the impacts that socio-economic factors of the households on their attitude to the household recycling scheme. In this research, Minamata City as a successful implementation has been adapted. Though the impact of family structure and dwell type on the satisfaction of household recycling scheme has been proved, there are still some questions remains. An extend research will be conduct as soon as possible.

References

Azilah M. Akil, F. J. (2015). *The Effects of Socio-Economic Influences on Households Recycling Behaviour In Iskandar Malaysia.* Procedia - Social and Behavioral Sciences.

Daito City. (2015).

Daito City. (2015). *Questionnaire survey on waste management.* Retrieved from Daito City official site: https://www.city.taito.lg.jp/smph/index/kurashi/gomi/keikaku/kateisoseitoankeito.html

Higashimurayama City. (2015). *Citizens' consciousness survey.* Retrieved from

Higashimurayama city official site: https://www.city.higashimurayama.tokyo.jp/shisei/keikaku/sogo/shiminishikichousa/index.files/H27shiminishikichosa.pdf

Hiratsuka City. (2013). *Citizens' consciousness survey.* Retrieved from Hiratsuka city official site: http://www.city.hiratsuka.kanagawa.jp/tokei/page-c_02354.html

Irina Safitri Zen, Z. Z. (2014). *The profiles of household solid waste recyclers and non-recyclers in Kuala Lumpur, Malaysia.* Habitat International.

Isezaki City. (2015). *Citizens' consciousness survey.* Retrieved from Isezaki City official site: https://www.city.isesaki.lg.jp/material/files/group/14/H27houkokusyo.pdf

Kawaguchi City. (2014). *Citizens' consiousness survey.* Retrieved from Kawaguchi city official site: https://www.city.kawaguchi.lg.jp/material/files/group/7/26shiminnishikichousahoukokusho.pdf

Kyotanabe City. (2013). *Citizens's consciousness survey.* Retrieved from Kyotanabe City official site: https://www.kyotanabe.jp/0000005411.html

Mikołaj Czajkowski, T. K. (2014). *We want to sort! Assessing households' preferences for sorting waste.* Resource and Energy Economics.

Takahashi Wakaha, I. S. (2013). *Waste sorting/ disposal in Swedish houseoholds - Relations with facilities, gender and knowledge of waste treatment.* Journal of the Faculty of International Studies, Utsunomiya University.

Thi Thu Phuong Nguyen, D. Z. (2015). *Factors influencing waste separation intention of residential households in a developing country: Evidence from Hanoi, Vietnam.* Habitat International.