Challenges Associated with Municipal Curbside Recycling in Matsudo City, Chiba, Japan

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CHALLENGES ASSOCIATED WITH MUNICIPAL CURBSIDE RECYCLING IN
MATSUDO CITY, CHIBA, JAPAN

by

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Improper waste disposal and management globally is linked to a variety of problems with the environment and health. This problem can be addressed by following the 3 R’s; reduce, reuse, and recycle. Japan is continually aiming towards becoming a sustainable, recycling oriented society with the implementation of the 3 R’s, reducing GHG emissions, and innovating new technologies for recycling and waste management. This research aims to expand the knowledge on the challenges and ways to improve curbside recycling systems and to be able to provide suggestions for improvements to the system with input from Japanese middle school students from a survey, observational information from an area survey, and a one month observation of curbside recycling sites done in Matsudo City, Chiba Prefecture, Japan. The main research question is to identify the challenges associated with municipal curbside recycling in Matsudo City, Chiba, Japan.
Matsudo City, 15 years after the full implementation of the Containers and Packaging Recycling Law in 2000. This could be significant to other rapidly developing countries, especially in Asia, as Japan’s history could provide useful information and insight for sound waste management and more opportunities for Japan to display waste management techniques and recycling innovations will come with the nearing 2020 Tokyo Olympics. The main challenges found which were concerned with attracting animals like crows and cats to curbside recycling sites, illegal dumping of oversized trash, and possible issues with knowledgeable volunteers to watch over the curbside recycling sites. Possible suggestions for the system to become more efficient include informing volunteers who monitor curbside recycling sites, choosing volunteers wisely, informing residents on correct disposal requirements to avoid attracting animals, make curbside recycling sites harder for animals to get into, use less packaging on products, create an online based oversized trash pick-up reservation system, and increasing quotas for oversized trash.
Preface (Acknowledgements)

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Introduction

One of the greatest problems that plague modernizing societies seeking economic growth is the need of efficient ways to deal with the increasing material wastes produced daily. With globalization, more countries are striving for advanced economic development; however, this is associated with growing concerns over an unstable use of earth’s limited resources as well as a growing trash problem, both linked to the production of greenhouse gases connected to climate change. If left unmanaged, material waste can have deep implications on health and the environment as well as it is costly to deal with, it lessens the aesthetic value of the community, and it causes harm to wildlife (EPA, 2012). To deal with this issue, garbage has traditionally been taken a landfill or incinerated, which both are associated with problems concerning water quality and air quality, among others (Guerrero et al., 2013; Firdaus, 2012). This problem can largely be addressed by remaking discarded items into something usable again, decreasing the overall amount of natural resources consumed, and using items until it can no longer be used, otherwise known as the 3 R’s; recycle, reduce, and reuse.

Japan has taken hold of the 3 R’s concept as the Ministry of Environment stated their intent on becoming a zero waste society that with the promotion “of the 3Rs, such as separated collection, reduction of waste through separation, and composting”, the development “and improvement of final landfill sites to contribute to the prevention of landfill gas emissions”, and through the implementation “of environmentally sound management and energy recovery from organic wastes disposed by businesses”, the country is continually facing towards establishing a sustainable society (Ministry of Environment, Government of Japan, 2008). The definition of sustainability by the Brundtland Report in 1987 was deduced upon by Gallego-Álvarez et al. (2015) as “current and future balance must be sought in three aspects that affect humanity as a whole: the economic aspect, with an optimum combination between economic development and conservation of the natural environment; the social aspect, which involved guaranteeing intergenerational equity in social matters and quality of life; and finally the environmental aspect, which means maintaining the continuity of environmental resources over time” which can be achieved by limiting the amount of easily worn out products consumed, lessening waste and pollution in every situation possible, and wise use of energy and recycling (Gallego-Álvarez...
et al., 2015). The establishment of a municipal curbside recycling system is one of the ways to work towards becoming a sustainable society.

The goal of this research was to expand the knowledge on the challenges and ways to improve curbside recycling systems and to be able to provide suggestions for improvements to the system with input from Japanese middle school students and observational information from an area survey and a one month observation of curbside recycling sites in Matsudo City, Chiba Prefecture. The main challenges associated with municipal curbside recycling in Matsudo City are issues concerning attracting animals like crows and cats, illegal dumping of oversized trash, accountability and knowledge of volunteers watching curbside recycling sites, and ambiguity concerning particular materials for separation.

**Literature Review**

There were few studies focusing on the challenges of curbside recycling in Japan. Research in this is field is limited as most of the “discussions and data in this field are not published in academic journals, and the reports of the national government, municipalities and companies are mostly written in Japanese” making it difficult for many to access the data (Kodera, 2012:201). Some of these studies include a study done by Iris Ohyama (2009) looking at complaints and troublesome aspects of separating, a study by Kyotonabe City (2012) also looking at the previously mentioned concerns and awareness of the 3 R’s, and a report by Matsudo City (n.d.) on the concerns and aspects citizens want changed on the curbside recycling system. Also, of the few studies that are published in English, few have viewed the Japanese waste management system from its historical evolution while linking the concerns of societal backgrounds, policy design, technological development, and system innovations (Hara & Yabar, 2012).

Of the studies focusing on the challenges with curbside recycling in Japan, a study by Suwa and Usui (2007), found that garbage pricing serves as an economic incentive to reduce waste as recyclables as they usually can be disposed of free of charge, encouraging citizens to separate their trash; however, it may also cause a rise in composting and illegal dumping (Suwa & Usui, 2007). Kodera (2012) found that after ten years since the laws have been implemented, the major challenges are “high recycling costs, low quality of recycled resin with respect to the market value, and so on” but do not discuss the challenges still faced by the households (Kodera,
2012:201). In a study by Sakata (2006) looking at waste management services in Kagoshima City, it found that when first implemented, it was a great burden for citizens, leading the government to try to introduce a systems that was less burdening (Sakata, 2006:639). It was shown that when they gave the citizens an opportunity to choose the way the waste was managed, there were three main implications: “(1) a user charge is not popular as it reduces utility substantially; (2) residents tend to prefer working rather than making direct monetary payments; and (3) residents react strongly to environmental risks” revealing there are trade-offs exist between the risk, payments, and handling costs (Sakata, 2006:639, 643). In a study by Ohnuma et al. (2005), it looks at the challenges citizens face when they must accept a demanding recycling rule and it was found that unfairness could play a role as if “one perceives that some people do not follow the rules, the perception of unfairness and social benefit increases individual cost and a preference for strict rules” or if a person felt “discontented with those who break the rules, and will make statements like “It is not fair that they are underhanded and not penalized, while I take on a burden honestly. The government should levy a fine on them!” or make use of surveillance (Ohnuma et al., 2005:8). It was also found that an important factor to the success was to give the chance for citizens to voice their concerns and let them participate in creating the policy as when governments do this (Ohnuma et al., 2005:7). Overall, there is potential for more research to be done in this area as it is important to look at how people view waste management systems and what makes them more accessible to people when looking to create these types of programs.

I was unable to find any that focus on the how middle school or elementary school students view the recycling system in Japan specifically. In general, there have been studies showing that students’ attitude towards environmental issues may be different from factors based on gender, age, and the level of education (Ma & Bateson, 1999) (Yilmaz, 2004;) (Zimmermann, 1996). Results may possibly differ in terms of Japan as recycling is mandatory by law. In a study by Smeesters et al. (2003), it was found that when recycling is mandatory, consumers do not seem to lack intrinsic motivation except when they are severely constrained and are sensitive to the constraints due to the characteristics of the residence and program, a lack of knowledge, and perceived unfairness (Smeesters et al., 2003). It is also suggested that social context of pro-social environmental behavior is significant in behavior change and the people who are in an
individual’s social environment can serve as examples for others to imitate as well as observers to activate the social norms and to uphold accountability (Smeesters et al., 2003). Ando et al. (2010) studied the determinants of individual and collective pro-environmental behaviors in Japan and Germany, finding that subjective “norms had larger influences on individual behaviors’ in Japan, indicating the relative importance of interpersonal relationship in Japan” as well as that subjective norms played a much greater role in Japan in comparison to Germany, possibly indicating that they pay much more attention to the expectations of others (Ando et al., 2010: 30). Overall, the Japanese respondents showed more collective pro-environmental behaviors possibly as “harmonious interpersonal relationship is more important in Japan” than in Germany and emphasize that in denser neighborhoods with neighbor interactions were high and volunteers knew of each other, recycling participation rates were higher (Ando et al., 2010:23). Overall, there are many factors that could play into how middle school students may view the recycling system such as gender, age, education level, subjective norms, and the importance of interpersonal relations within a culture.

There are several studies looking at the effectiveness of the Japanese municipal curbside recycling policies which rate effectiveness in various ways. In a study Matsumoto (2010) on the efficiency of municipal curbside recycling in Japan found that more comprehensive recycling programs are adopted by municipalities that have a significant amount of elderly households while simpler programs are more often seen in municipalities with more single-recycler families, where assistance would need to be more accessible to single-recycler families to be efficient (Matsumoto, 2010). It was also found that labor force participation by wives increases the number of categories for waste separation while labor force participation of husbands decreases the number of categories as well as thorough “recycling programs are adopted when wives’ working hours are short and husbands’ working hours are long” suggesting that it is not gender neutral (Matsumoto, 2010:332). In addition, it was found that when municipalities increase the recyclable pick-up frequency, it increases costs but without it, households would not separate wastes and instead dispose of the trash all together, toughening the job for municipalities (Matsumoto, 2010). Another study by Kinnaman et al (2014), addresses efficiency by looking at the socially optimal recycling rate by comparing other densely populated cities like Tokyo to London and New York (Kinnamen et al., 2014). Overall, the big difference between Tokyo and
the other cities is that Tokyo relies much more on incineration for waste disposal since land fill disposal is more common in New York and London so Tokyo was less efficient at recycling the materials that were collected by municipalities (Kinnamen et al., 2014). Hara and Yabar (2012) judge the effectiveness of the program by its impacts on the environment and society by looking at waste management from its historical evolution in Japan, finding that “dioxin law was also effective in promoting the emergence of waste management alternative technologies” which has been essential in the promotion of recycling as it lead to various development and breakthroughs that increased the recycling ratio (Hara & Yabar, 2012:304). When looking at the effectiveness of recycling programs, it would be important to look at how the people carrying out the separation view the process as it could potentially make a big difference.

**Culture and Society**

Cultural factors can be significant to look at when looking at participation in recycling programs in the Japanese society. Japan is often termed as a collectivist culture which highly values keeping the harmony among the group (Ando et al., 2010). One of the most famous Japanese proverbs is *deru kui wa utareru* which is translated as the stake that sticks out gets hammered down. This idea still plays a strong role on how people may act in Japan and could play a role in the recycling system. Kimura and Nakajima (2011) explain how people living in a collectivist society tend to avoid being isolated from the group, which may be why some may say that they recycle because the people around them are doing it, as “confirming that other people do the same activities would lessen the person’s feeling of isolation” (Kimura & Nakajima, 2011:13). Also in collectivist cultures, the “feature of watching others reveals a person’s contribution in the group” so when the contribution made “is smaller than others, the person feels the pressure to contribute more” or perhaps if the person feels too much pressure, they may end up contributing (Kimura & Nakajima, 2011:13). It is also emphasized how when “someone else is watching, a person performs better at a task” and even more so if that task is recognized within the group as a recommended behavior to follow, everyone is more aware of the roles each person plays in accumulating virtues for the group (Kimura & Nakajima, 2011:13). In everyday life in Japan, there are various times you may be reminded that someone is always watching. With trash separation, in some apartments, when trash is not separated correctly, signs will be put up on the community message board or on the elevator reminding residents that they will be monitoring surveillance cameras to find out who is not separating
correctly. When walking about the city, on community message boards or stuck onto trucks and businesses, at times there are signs that say things such as *dare ka miteruzo*, meaning “someone is watching you!” but with the cultural context, it could be translated as, “Someone is always watching you, so you better think before you do something that you wouldn’t want someone else to see”. Another example is sometimes in the train station, there are signs that say *sutenaide, kodomo ga mitieiru, otona no mana*, which could translate to “Do not litter, the children are watching the manners of adults”. Some other examples include the efforts of the Ministry of Environment to call upon the people to wear light clothing without ties and the efforts of airline companies like All Nippon Airways, the second largest airline company in Japan, which offers travelers carbon offsetting programs to lessen their effect on the environment which are both considered good behaviors in society, making them work in a collectivist society (Kimura & Nakajima, 2011:12). As people in collectivist cultures may monitor the actions of others to address accountability and to uphold harmony among a group, these could have significant impacts on curbside municipal recycling.

Another cultural factor strong throughout Japan and other Asian countries is public shame and losing face. In Japanese language, there are many words and phrases that provide evidence for these ideas and encompass the significance of status ranking, where reputation is of major importance (Ho et al., 2004). As Ho et al (2004) explains, no matter how humble a person is, they can bring pride to a group by not doing things that are considered embarrassing or shameful within the group (Ho et al., 2004). In Japan, there is a large distinction between how one can act in the privacy of one’s home, away from the public eye, and when outside the home, as well as within expressing one’s feelings and if one is unable to distinguish when to use these ideas, it could lead to public shame or loosing face (Ho et al., 2004). This idea is known as *tatema*, the publicly accepted moral standards, and *honne*, how one feels truly inside, which due to its dualist nature makes it difficult for “adolescents and moral educators, and interferes with effective cross-cultural communication” (Ho et al., 2004:78). Many of the things considered shameful, embarrassing, or guilt causing occur within social contexts but a more significant proportion of these events occur in privacy; however, when brought to the attention in the public sense, it can intensify the feelings or responses that occur (Ho et al., 2004). Mostly done more so in the past and occasionally in the present, is the action of *dogeza*, to bow on one’s knees while
putting one’s forehead to the ground, which is either ordered to someone to do when they need to apologize for their actions that are seen as shameful or enacted by the person themselves when seeking forgiveness and to show their guilt (Yamazaki, 2004). Basically, the cultural concepts of shame and loosing face are used for control in society and could play a large role in the upholding of the recycling system as not correctly following the rules or making a mistake could be a large source of embarrassment.

Another aspect in addition to collectivist cultures and the concept of shame is the teaching of correct public order in elementary schools in Japan. In 2006, the Fundamental Law of Education was revised to officially declare “moral education to be subject matter with clearly defined objectives and guidelines and restored the status of moral education to that of pre-war and war-time Japan” which was met with strong criticism as it did not match with the current goals of democracy and a constitutionally law driven society (Anzai & Matsuzawa, 2014:366). Some of the values to be taught under this law include encouraging harmony, discouraging competition, recognizing the power of nature, and respect for all beings in the universe, but lack emphasis of the importance of individual growth and development that allows children to explore their own possibilities, which contradicts the long held values in Japan as a collectivist society and traditions of Confucianism (Anzai & Matsuzawa, 2014). Also, from a young age, it is expected that it is “the school’s responsibility to socialize children in group behavior” and to emphasize that the way children can act at home with their mother and the way they can act at preschool and elementary school is very different (Peak, 1989:93). Children must participate in shuden seikatsu at preschool and elementary schools, the life in a group, meaning they must they must learn how to hold back one’s own feelings, be willing to participate in a group with enthusiasm and in a harmonious way, let go of selfishness, and that it “is not the teacher, or the school rules, but "all of your friends," "everyone else," or "group life" that places limits on children's ability to indulge their own desires” (Peak, 1989: 122). For children, this is their first step into becoming a part of the Japanese society and these ideas play a big impact in how they must act throughout the rest of their lives, displaying how this aspect of Japanese culture and society is reflected in the cooperation of the recycling system.
Last of all, the concept of *mottainai*, or the concept of wastefulness in Japanese culture could also be a factor to affect the recycling system. As Maruko Siniawer (2014) explains, this word and concept can be widely used in many different situations and it can describe concerns over “resource scarcity, food security, the proliferation of garbage, and a throw-away culture, and the term was used to push back against the perceived prevalence of consumerism, materialism, and environmental degradation” with just the use of one word (Maruko Siniawer, 2014: 166). As the Japanese have long lived with under the idea that as Japan has limited natural resources, they must learn to use the limited resources in the most effective manner, which suggests this idea may come easier to the Japanese than to others (Maruko Siniawer, 2014). This idea can be used to describe concerns beside ones that concern the environment and use of resources. Some examples commonly heard could be one not efficiently using the night before a test to study and getting a bad score, not living up to one’s potential that was expected of you, being angry and not enjoying the little things in life, and not working your hardest at something. In addition, it could be associated with “consciousness of wastefulness, such as regret and shame for the loss of things, appreciation and respect for things as well as those who made them, and empathy and compassion” (Maruko Siniawer, 2014: 166). One recent example of the *mottainai* concept was after earthquake, tsunami, and nuclear disaster on March, 11th, 2011, when citizens were called upon to save electricity and use it wisely when the nuclear power plants were suspended (Maruko Siniawer, 2014). This idea is still practiced today, three years after the event with actions such as rarely using A/C or heat in one’s home. Although these are only a few of the aspects of Japanese culture and society that could have an impact on the recycling system, these factors are important concepts that make up some of the basic ways Japanese society works.

**History**

Japan has come a long way historically in terms of waste management. In the 1890s, the population of Tokyo, was estimated to be around 1,300,000, and began to see rapid population increases as people moved in from farming villages to work cheap labor jobs with machinery (Irokawa, 1985). Many of the prints made at the time showed themes common with any rapid industrialization, “urban problems to come, smog, traffic jams, a bureaucracy indifferent to approaching disaster” (Seidensticker, 1983:49). By the 1890s, the agricultural crisis had gotten increasingly worse due to engaging in wars and the people were engulfed in a sea of problems including, “not only crop failures, starvation, and bankruptcy, but also in filth, hunger, apathy,
resignation, ignorance, trachoma, rheumatism, asthma, tuberculosis, insanity, alcoholism, prostitution, water blisters” and much more (Irokawa, 1985:242). As most of the buildings and homes were made of wooden frames, the whole city was seen as a firetrap, particularly after earthquakes, leading the city to gradually work towards becoming more fire resistant (Seidensticker, 1983). Today, fire is still an issue that plagues Japan, as around Matsudo City, there are fliers on community message boards warning locals to avoid placing trash too close to their homes with recent events of people lighting trash on fire, leading to homes being burnt down.

In terms of trash disposal, it is difficult to find much information on how things were in the past. In the early 1920s, the fish market near Shimbashi Station in Tokyo sent odors to nearby areas, with only two latrines and fish innards were left on the ground (Seidensticker, 1983). The market was blamed several times for the Cholera outbreaks and it was closed at one point when Cholera germs were found at the market, leading many to want more cleanliness and sanitation (Seidensticker, 1983). Nearby, in Kanda, kitchen wastes were disposed of in a tile-lined ditch and bodily wastes were left out to be collected by the owaiya, the person who gathers night soil (Seidensticker, 1983). The night soil was used on farmlands as fertilizer but as the city grew, the time it took to reach the farmlands increased which contributed to the issue as it grew to a crisis level during the Taisho Period (1912-1926) (Seidensticker, 1983). As the seller’s market changed to a buyer’s, it would be extremely difficult to get rid of the wastes daily, which lead to a rush hour every evening in Shinjuku “when great lines of sewage carts formed a traffic jam” (Seidensticker, 1983:83). Since much of the waste could not be disposed of properly, this increased health risks as water from the wells became too murky to drink (Seidensticker, 1983). By the end of the World War I, no longer would anyone buy the night soil so people were desperate enough to get rid of it to have to hire someone to take it away, and when this was not possible, it lead to dumping of the wastes through the night (Seidensticker, 1983). Despite these issues in the 1920s, the situation began to get better than before as the city started to take more responsibility for the sanitation issues. The city was only disposing of around one fifth of the total mass of trash formed by the end of the Taisho Period. Similar problems that troubled citizens during this time period continued as Japan moved more towards industrialization.
After World War II, similar problems with the environment and waste management of the past continue with another massive migration of people from rural to urban areas in the 1950s (Hara & Yabar, 2012). With rapid industrialization came even more waste being produced, leading to enactment of the Public Cleansing Law of 1954 which “introduced three main waste treatment and disposal options for domestic wastes, namely incineration, disposal at home, and landfilling” (Hara & Yabar, 2012:297). Into the late 1970s, rapid economic growth came with higher incomes; greatly changing the way people lifestyles and product consumption to the point where the waste generated significantly exceeded the local government’s ability to deal with it, leading some to dump wastes on countryside mountains (Hara & Yabar, 2012). During this time, there were worries about power “shortages, environmental damage, and a culture of disposability” which were largely blamed on the consequences of economic growth or the absence of expected affluence (Maruko Siniawer, 2014). A number of health problems followed this waste problem such as the “Minamata disease (mercury poisoning), Niigata Minamata disease, Yokkaichi Asthma, and Itai-itai disease” drawing eyes on Japan worldwide (Hara & Yabar, 2012:297). Eventually in 1970, the Waste Disposal and Public Cleaning Law was enacted which “classified wastes into domestic and industrial wastes and placed the responsibility for the management of the industrial wastes on the industrial sector while local governments were responsible for dealing with domestic wastes”, setting strict standards (Hara & Yabar, 2012:298). These two laws that were passed were the essential framework for the waste management laws that are present in Japan today (Hara & Yabar, 2012). In the 1980s, there was another increase in income and consumers began to demand more variation in the products available but in small volumes which increased the frequency of the use of small plastic containers as well as wrapping materials (Hara & Yabar, 2012). The government dealt with the lack of space for landfills by incinerating the trash which consequently caused issues with air pollution due to the dioxins released in the process (Hara & Yabar, 2012). In the 1990s, there was a sense of vulnerability that came with the burst of the economic bubble which shocked previous assumptions people had about the power of Japan’s economic growth and wealth, leading many to have to adjust their lifestyles and minds to a more sluggish economy than they were used to (Maruko Siniawer, 2014). Despite the slowing of the economy in the 1990s, this is the time when the government enacted many laws that lead to the present system for waste management.
In sum, following World War II, waste management policies have changed greatly to be able to reach the policies available today that promote the 3 R’s and sustainable lifestyles (Yabar et al., 2012). The policies went through four main phases which include; (1) post-war policies, which targeted public sanitation issues resulting from rapid industrialization and urbanization; (2) the policies of the mid-1950s to the late 1970s, which created classifications for waste from general and industrial sources and standards for waste disposal; (3) policies of the 1980s through the mid-1990s that based on the 3R (reduce, reuse and recycle) principle; and (4) the current policies that focus on detaching economic development from environmental pressure while promoting sustainability based on sustainable production and consumption methods, improving quality of life by environmental risk minimization and protecting biodiversity, as well as making efforts to prevent climate change through low-carbon measures (Yabar et al., 2008). Next, the current environmental waste management laws will be discussed.

**Current Governmental Policy**

Japanese waste management and environmental policies evolved greatly since the 1990s into the laws that are present today aiming towards become a recycling oriented society in order to address the limited landfill capacities, lessen the need to rely on importing for natural resources, and solve issues concerning illegal dumping (Hara & Yabar, 2012) (Bleischwitz, 2002) (Hotta, 2003). In 1993, the Basic Environmental Law was passed to deal with domestic environmental issues as well as environmental issues around the world with three main objectives: (1) preserving the environment for future and present generations; (2) becoming more sustainable by minimizing environmental impacts; and (3) cooperating internationally in order to promote preserving the environment on a world wide scale (Hara & Yabar, 2012). By the 2000s, Japan took majors steps towards eco-efficiency as in June 2000, the Basic Law for the Promotion of the Formation of Recycling-Oriented Society was enacted which consequently brought other laws with the 3 R’s of recycling at its focus, such as the Containers and Packaging Recycling Law, the Household Electrical Appliance Recycling Law, the Food Recycling Law, the Construction Waste Recycling Law, the Waste and Disposal and Public Cleansing Law, the Law for the Promotion of Effective Utilization of Resources, and in January 2005, the Automobile Recycling Law (Bleischwitz, 2002) (Tamagawa, 2006). The Basic Law for the Promotion of the Recycling-Oriented Society first established a ranking order which begins with resource reduction, on to reuse, recycling, thermal recycling (the conversion of municipal waste into
electricity or steam via incineration), and disposal (Bleischwitz, 2002). The government has committed to this by setting up programs for the industry and private households to undertake, focusing on the responsibility held by the producers (Bleischwitz, 2002). The Japanese government made great efforts to create laws to focus on the environment and waste management, along with goals to address climate change.

In 2001 and 2002, the Japanese government established the Ministry of the Environment and signed the Kyoto protocol, among others, displaying its tight commitment towards the environment (Takeda & Tomozawa, 2008). The new ministry was placed in charge of any “basic questions of environmental policy, basic environmental plans, waste, water and air pollution, nature protection, and biological diversity, liability for damages, and international environmental cooperation (e.g. climate change)” while the former agency, the Ministry for the Economy (METI) is still in charge of “chemicals and hazardous substances, recycling, measures to combat global warming, and environmental impact assessments” (Bleischwitz, 2002:14). In February 2005, the Kyoto Protocol came into effect and which “obliges developed countries (Annex I countries) to reduce their greenhouse gas (GHG) emissions by at least 5% below 1990 levels in the first commitment period (2008–2012)” (Sampei & Aoyagi-Usui, 2009:204). This also lead the Japanese Government to adopt the Kyoto Protocol Target Achievement Plan (Kyoto Giteisho Mokuhyo Tassei Keikaku) in 2005 and revised in 2008 to request the cooperation of all stakeholders involved to play their part in reducing GHG emissions (Sampei & Aoyagi-Usui, 2009). The action of signing the Kyoto Protocol was very significant as it showed the Japanese government’s firmness on the importance of the environment, even in times of less economic growth.

This research will focus on the Containers and Packaging Recycling Law as it deals with the municipal curbside recycling schemes seen throughout Japan. This law was originally enacted in 1995 but did not come into full force until about 15 years ago in April 2000 to deal with the commercial recycling of plastics which made up approximately 60% of all household waste in Japan (Hotta, 2003) (Ueta & Koizumi, 2001) (Dubey, 2008). This law requires consumers to separate plastic containers and packaging when discarding so that they can be collected and sorted under certain requirements, and then stored by municipalities with contracts
with the Japan Containers and Packaging Recycling Association (JCPRA) to collect the items to be recycled into usable materials later on (Hotta, 2003). This can be done about in two ways. The first way is called an own-recycling route where companies that are legally required to recycle cosigns the recycling work to a recycling company approved officially by the JCPRA (Hara & Yabar, 2012). The other way is the designated organization route where local councils collect the containers and packages and the companies that are legally obliged to recycle these wastes but do not have the capacities to do so can cosign the recycling work to the JCPRA by paying a fee, depending on the material to be recycled (Hara and Yabar, 2012). This law also allows local municipal governments to decide the separation rules for the collection of wastes, making the rules for separation vary across Japan (Kodera, 2012). Although the rules, the amount required to be separated, and the strictness can vary, this law basically set up municipal curbside recycling across Japan.

Besides plastic containers and packaging, there are a variety of materials that can be required for separation. The main target container wastes of this law are those made of glass, paper, metal, and for plastics specifically, Polyethylene terephthalate (PET bottles), food trays that are made of polystyrene sheet and mixed plastics from other plastics (Kodera, 2012) (The Japan Containers and Packaging Recycling Association, n.d.). Some specific examples of the types of containers and packaging included are the Styrofoam trays that hold meat and fish from supermarkets, jams in glass jars, bottled water, and paper cookie containers (Dubey, 2008). Once each municipality collects the waste as a part of the garbage collection process, the materials can be pretreated using processes to sort, compress, and bundle the materials and then store them until they are delivered to recycling operators (Hotta, 2003). As mentioned previously, under this law, the firms that manufacture and or use containers and packaging for their businesses are referred to as “specified business entities” and they must pay for the cost of operating the recycling system (Hotta, 2003:161). Basically, these businesses and retailers must take the responsibility to recycle the waste they produce with packaging (Ueta & Koizumi, 2001). Supermarkets, convenience stores, and other stores have also areas where bottles and other containers can be collected (Dubey, 2008). For the plastics in particular, once collected, the PET bottles are shredded after being compressed and then are transformed into pellets or flakes which will later go through a series of processes in order to make a variety of products such as textiles, stationary sets, trays, and detergent bottles (Hara & Yabar, 2012). It is much more difficult to
make PET bottles into the same product again without further processing due to health safety risks and this was relatively expensive until recent new technologies were created (Hara & Yabar, 2012). This law currently still allows municipals to “choose mixed collection of waste plastics with the other general wastes for incineration or separate collection of waste plastics for recycling” which means that some still rely on incineration of mixed plastics or using landfills to avoid the high cost that comes along with this process (Kodera, 2012:206). Unfortunately, since it can be expensive and very difficult to recycle certain materials, less of what is collected in curbside recycling can actually be recycled, which could be a potential area of concern when trying to establish a recycling oriented society.

Some companies had already started recycling PET bottles as these bottles are used widely in Japan as containers for a variety of products. Some of the common products using PET bottles as containers are soy sauce, soft drinks, bottled water, and alcoholic beverages (Hotta, 2003). The consumption of PET bottles alone reached 400,000 tons in 2001 and about 170,000 tons were recovered by the municipalities (Hotta, 2003). The Containers and Packaging Recycling Law was effective quickly as the collection ratio was (10%) in 1997, increasing to (44%) by 2003 (Hotta, 2003). By 2008, the collection rate was (77.9%) for PET bottles (Welle, 2011). There are many economic benefits for recycling PET bottles, leading to an increased rate of how much is recycled after being separated and collected as it reached (99.1%) and population coverage of (99.5%) in 2012 (Kodera, 2012). There is little information in English how the Japanese reacted when the recycling laws were first implemented; however, Ohnuma et al. (2005) describes how when Nagoya City implemented the new rules, it was highly demanding and required citizens to separate trash into many different categories, such as washing vinyl wrap and plastic trays before taking them to a curbside recycling site and using designated vinyl bags instead of the ones you can get for free from the supermarkets (Ohnuma et al., 2005). This was met with many inquiries and complaints on the separation process being difficult to understand but there was an immediate (25%) reduction in the amount of wastes sent to the landfill compared to the year before (1999) (Ohnuma et al., 2005). In sum, as explained by the Ministry of Economy, Trade and Industry, Japan, “each person has a role to play in recycling from his or her respective position” (Ministry of Economy, Trade and Industry, Japan, 2003). In other words, the specified business entity must bear an obligation to recycle while the municipality is in...
charge of the selective collection, and the consumer must selectively discard their wastes so if all three of these aspects of the system do not cooperate and do their jobs individually, the materials cannot be recycled into new resources for the country (Ministry of Economy, Trade and Industry, Japan, 2003). Next, the general rules of the Containers and Packaging Recycling Law will be discussed.

**General Separation Rules**

Before the new laws and policies previously mentioned were implemented, the governments held meetings to get ideas from the residents for waste management policies and optimum waste collection methods, coming to the conclusion that it may be better to set up each separation scheme for each specific city since the locals did not know the what methods are most feasible or how their ideas would result (Sakata, 2006). Many of the locals voiced interests for smaller fees for handling costs, a higher recycling rate, and an eco-friendly waste management methods which are difficult to achieve all of these simultaneously (Sakata, 2006). Also, in many of the programs, locals are required to sort the recyclable materials before taking them out for pick up, leading the time-cost or the recycling participation to vary from home to home (Matsumoto, 2010). In some areas, there is a “unit-based method of charging is widely employed in Japan via a system of selling waste bags for a fee” which in 2001 was about “37.9 yen (US$ 0.33) on average” (Sakata, 2006:639). Usually, citizens are charged based on the how many of the bags or tags of burnable, non-burnable, and mixed wastes disposed of while the municipality decides price levels for purchase (Suwa & Usui, 2007). The prices are not usually charged on recyclables separated from waste, finding that the amount to recyclables increased and trash disposed of decreased in many situations (Suwa & Usui, 2007). Along with the differences of the charges on certain types of trash, there are differences in the amount of materials that require separation.

In many municipalities, the wastes are separated in over 10 different categories and in some cases, residents must wash and store the recyclables at their homes until the taking them to the designated curbside recycling collections sites on the days specified for the collection of that type of material (Suwa & Usui, 2007). By 2008, of all the municipalities in Japan, over 92% had recycling programs and since the programs are set to match local conditions, there is a great deal of variation across the country (Matsumoto, 2010). In many cities, waste collection is a daily
process as each day will correspond to the collection of a particular type of trash or material. For example, Monday is the day PET bottles and plastics are picked up or Thursdays are when burnable garbage is picked up. This can sometimes be a problem if a certain type of trash is not accepted on particular days, as the homes are small and there is not much room to store trash, along with other problems such as smell and attracting pests into the home. Other areas in Japan require more thorough separation of materials than others such as in Minamata, Kumamoto Prefecture and Kamikatsu, Tokushima Prefecture “the residents must separate over 20 types of garbage and recyclable goods” every time trash is taken out (Sakata, 2006:639). The separation by citizens is often monitored by either someone who volunteers to watch over the curbside recycling site or someone who is paid to do so, usually found in apartment complexes. Sometimes there is only one volunteer in charge of this process or the volunteer could change, every week, every month, etc. This is usually decided upon those users of the specified site on a particular street or even neighborhood. There are usually times set by municipalities for when trash must be taken out by in order to be picked up on that day. Some apartments lock their curbside recycling bins up so that they can be used by people who do not live there or are not assigned to that site, and so that people living there cannot drop their trash off during times other than specified limited time. If not done correctly, there could be an official notice used by a town or notes are left on trash for people to take care of whatever problem was violated. In some cases, if recycling is not done correctly in apartment complexes, tenants names will be reported on a board containing all of the tenants names, making it easy for all living there to know who did not comply with the rules, displaying how shame may be a primary factor to getting others to comply with recycling laws. Since this law requires a lot from households, the ways that the government informed the public about climate change and the laws will be discussed.

**Outreach by the Japanese Government**

Interestingly, the Japanese government has some control over the media in what is shown on climate change and environmental issues. The Ministry of the Environment began a national campaign to reduce greenhouse gas emissions (GHG) called the *Chikyu Ondanka Boushi Daikibo Kokumin Undo* which still as of 2008, which was designed to make heavy use of mass media platforms such as newspaper advertisements, TV programs, events, and advertisements, and magazine articles by collaborating with advertising agency in the organization (Sampei & Aoyagi-Usui, 2009). The goal of this campaign is to “inform the public of the global warming
crisis and encourage people to take pro-environmental actions to reduce GHG emissions” (p. Sampei & Aoyagi-Usui, 2009:204). Due to this campaign, Sampei and Aoyagi-Usui (2009) identified that opinions have gradually become increasingly focused on global warming issues from 1997 to 2007 and that there are positive correlations between exposure to mass media and a concern about environmental issues (Sampei & Aoyagi-Usui, 2009). In 2007, the Japanese media coverage of climate change related issues increased greatly, driven by other issues overseas as well as more of the front pages of newspapers were increasingly occupied by global warming topics, becoming the key moment climate change captured people’s attention and influenced their environmental concerns (Sampei & Aoyagi-Usui, 2009). It is argued that the Ministry of Environment may need to reconstruct the campaign to continually capture climate change issues in mass media and to make sure that journalists are posting worthy events to the front pages by providing information (Sampei & Aoyagi-Usui, 2009). Although this advertisement campaign focuses on climate change awareness, there are other efforts by the government to outreach to the public about the waste management laws and their importance.

Other smaller campaigns have been held to promote environmental laws in Japan. In order to promote the Containers and Packaging Recycling Law, the JCPRA holds promotional and education events such as providing explanatory meetings, supplying information on their website, publishing newsletters, producing pamphlets and videos, and participating in forums and exhibitions (The Japan Containers and Packaging Recycling Association, n.d.). The JCPRA website has a vast amount of information including informational graphics, cartoons, quizzes, and more on how to recycle, what can be recycled, where to take the recycling, etc. There are also extensive videos explaining why this law was created, how it works, and how to get involved. Also, local governments do informative campaigns to provide explanations on the methods require for the waste collection process using the city’s papers and meetings (Sakata, 2006). Many of cities have their own website where they publish their own information on recycling and waste management systems of that area and provide ways for the public to make their concerns known. Besides these outreach efforts, there are many other ways in Japan that helps the locals become more aware about climate change and other environmental issues.

Other outreach for information on being eco-friendly and climate change issues varies across many types of approaches based on general observations. Around Japan, there are many
festivals held annually such as the Eco-festival in Shingawa City as well as festivals for Earth Day such as the one held in one of the most famous parks in Tokyo, Yoyogi Park. Other big festivals are held all year round at Yoyogi Park which recruit volunteers from high schools help with the massive amounts of trash produced from various food stalls. There are also earth day farmers markets that bring in local farmers to the big cities to sell organic vegetables, food, and tea. Another big festival held in Tokyo is called the Tokyo Green Festival, which provides a list of where one can visit around the city to see ways in which parks and businesses are becoming more green and sustainable. Other fairs are held by companies such as one I came across promoting Natural Gas Vehicles and informing children about the environment, held in Akihabara ward of Tokyo in September, 2012. At this fair, people had the opportunity to receive eco-friendly goods such as eco-bags or school supplies by participating in a few of the booth events. At another festival I came across in the Jiyugoaka neighborhood of Meguro City, there were booths teaching children how paper is recycled and gave the chance for people to try out the paper making process and design their paper after it was dried as well as designing their own eco-bag. Examples such as these are seen all over Japan, especially in the larger cities, providing opportunities for everyone to get involved and become more aware about environmental issues.

There are also various museums and exhibitions that promote learning about the environment and sustainability, especially for children. At Miraikan, the National Museum for Emerging Science and Innovation in Odaiba on the Tokyo Bay, which was once a landfill site until it was reclaimed, there are exhibits to show children all about how the environment works and how to lead a sustainable lifestyle. There is even section of the exhibit called Lifestyle 2050 that allows children to explore and imagine what the earth would look like in 2050 if we were to create a sustainable society. At another museum, called Orbi Yokohama in Yokohama, Kanagawa Prefecture, there is a collaborative exhibit between BBC Earth and SEGA geared towards children and families allows children to interact and learn about the earth and the issues that the environment faces. For example, children can learn about the lives of endangered animals and the significance of biodiversity. Both of these museums where extremely popular with children and families, making learning about the environment and the future of climate change interactive and engaging.
Advertisements can also be seen throughout trains and bullet trains, buses, billboards, TV ads, and local city lectures promoting greening the city, sustainable lifestyles, or the purchasing of eco-friendly products. Other ads promote how Japan’s top companies are creating innovative ways to become more sustainable. Even at sporting events, it is not uncommon to see information being shown on the jumbotron screen about where to go to separate your trash within the stadium. In addition, there are various business, shopping malls, and train stations promoting eco-friendly building designs, renewable energy sources, and green roofs. For example, at Kyoto Station in Kyoto Prefecture, people can go to the open roof top of the station where they are growing bamboo plants and have unique designs to catch rainwater at the top and feed it down to plants along the stairs below. At Ginza Station in Tokyo Prefecture, solar panels are used on the roof to power the station. Also in Odaiba and near Tokyo Station, there are green roofs that people can take walks around and sometimes dine in. Also in Tokyo, there are many tall businesses and government buildings that allow people to ride to the top where one can view the many solar panels on roofs and green roofs around the city. Overall, besides efforts made by the government, there are numerous examples of innovative outreach efforts by businesses and communities to improve awareness on environmental ideas and climate change in Japan.

**Purpose Statement and Research Questions**

The primary focus of this research is to investigate the challenges associated with municipal curbside recycling in Matsudo City, Chiba, Japan in order to suggest ways to make the system more efficient. This research will also discuss how cultural and societal factors affect the success of this system. This research hopes to expand upon the knowledge on ways to improve recycling systems in Japan incorporating input from those who have lived following the system most of their lives, Japanese middle school students, as laws came into full force in the year 2000. The goal is to provide suggestions for improvements to the system based on the previously mentioned input as well as information collected from daily observations. This information is significant as in a world looking to combat the potential detrimental effects of climate change on societies and species livelihoods, developing effective, efficient, and accessible recycling policies is a key to creating a change in how waste is managed and greenhouse gases are reduced. The recycling system in Japan should be used as an example to other nations looking to implement these types of systems, paying special attention to how the cultural and societal aspects of the country can play a pivotal role in the success of the recycling system and the
overall contribution to becoming a more sustainable world. The central research question was: What are the challenges associated with municipal curbside recycling in Matsudo City, Chiba, Japan? These Research Questions included:

RQ1: How do Japanese middle school students view the Japanese municipal curbside recycling system (how accessible is it for anyone to understand) and does it differ based on gender or housing type?

RQ2: How do Japanese middle school students perceive that Japanese municipal curbside recycling could be improved and does it differ by gender or housing type?

RQ3: How do Japanese middle school students rate the difficulty of municipal curbside recycle and do the reasons for how difficult or easy the system differ by gender or housing type?

RQ4: How do Japanese middle school students view climate change as a problem for Japan?

RQ5: What are the major challenges faced by the Japanese in participating in municipal curbside recycling?

RQ6: How can the municipal curbside recycling system in Japan become more effective?

**Hypotheses**

It is hypothesized that there will be a difference between gender and for housing type for how the Japanese middle school students view curbside recycling, how they perceive it could be improved, and how the municipal curbside recycling is difficult or easy. It is also hypothesized that the reasons Japanese middle school students separate is not based on viewing recycling as eco-friendly. It is hypothesized the Japanese middle school students do view climate change as a problem for Japan. It is also hypothesized that the major challenges are concerning compliance with municipal curbside recycling.

**Significance**

This research is significant as this topic of waste management and sustainable solutions is becoming a hot topic around the world. As Ueta and Koizumi (2001) explain about Japan’s recent past, solid waste was a “particularly acute in Japan, where the combination of dense population, a productive economy, and limited landfill space exacerbate the situation” and the
incineration “of solid waste—a known source of dioxins—contributes to air pollution in Japan” (Ueta & Koizumi, 2001:22). Also, with the 2020 Olympics in Tokyo nearing, many eyes will be on Japan in terms of sustainability (Kikuchi et al., 2014). Hara and Yabar (2012) explain how by reviewing Japan’s past waste management systems and current recycling innovations, this could “provide useful implications and insights in terms of policies, technologies, and practices of sound waste management to rapidly developing countries especially in Asia, such as Vietnam, where building sound waste management and material-cycle systems is an urgent task, given increasing waste generation in the middle of economic development” (Hara & Yabar, 2012:297). When looking at the differences similarities between waste management and recycling systems, it becomes “more convincing that countries could learn each other through international cooperation and initiatives” as it is “highly essential to enhance such international cooperation to share important knowledge about waste management and recycling schemes” (Hara & Yabar, 2012:302). It is also described how recently, the 3R’s (reduce, reuse, recycle) have been promoted as Japan hopes to cooperate with other developed and developing countries by sharing information, exchanging of researchers, and by doing joint studies” (Hara & Yabar, 2012). As sustainable waste management strategies are essential tools for minimizing the effects waste has on the environment and health, it must be “economically affordable, environmentally effective, and socially accepted” to be a sustainable system, which Japan has strived to do by evolving their waste management systems (Hara & Yabar, 2012:296). When collaborating and sharing ideas, these countries must also keep in mind the roles culture and society will play on waste management designs, as there is no one size fits all method that will work for every country.

**Methods**

**Research Design and Approach**

Although there is various data looking at the effectiveness of the municipal curbside recycling in Japan, most studies are more quantitative than qualitative. This study was approached from the lens of applied anthropology, which combines “the use of anthropological data, perspectives, theory, and methods to identify, assess, and solve contemporary problems” and may be “assembling relevant knowledge and collecting data, developing plans and policies, assessing the likely social and environmental impacts, implementation, and evaluating the
projects and its effects” rather than “constructing policy or initiating action” (Kottak, 2013) (Ember et al., 2015). This research was based off of qualitative inquiry and a mixed-methods approach by incorporating ethnographic data from participant observation, a survey, an area survey using GIS/GPS technology, extended observation of two particular sites, and interviews. During the four month long study, diary entries were written daily and photographs were taken whenever possible.

**Study Site: Municipal Curbside Rules in Matsudo City, Chiba Prefecture**

Matsudo City was chosen due to it being a smaller suburban town about 30 minutes away from Tokyo by train and it was easily accessible as I was participating in an internship at Senshu University Matsudo Junior High School from August 2014 to December 2014. Ethnographers mention how most who go to Japan but only study Tokyo, when Tokyo is not representative of Japan, and they recommend that other places be studied instead (Hidenobu, 1995) (Daniels, 2010). This city was a good in-between city to look at as it was not too rural or too densely populated as Tokyo. Curbside recycling sites were easily spotted and neighborhoods are small enough where many people know the other living on the street. Despite this being a convenience sample, there are several reasons why it is important to look at how the middle school students view curbside recycling. The first reason is that these students are taught by their families to separate correctly or may be in charge taking out the household’s trash, meaning they must understand what materials are made of and know where to correctly place certain materials from a young age as if done incorrectly; it could be a source of shame for the family. Another reason is that these middle school students may someday become parents themselves so their viewpoints could potentially influence the next generation of separators. Last of all, this reason is specific to this school as it is a unique private school where all of the students are required to take a two week visit to the U.S. and stay with a host family, meaning they have all have exposure to the waste management in another country and could have gathered insight from this trip based on the differences between the U.S. and Japan.

In Matsudo City specifically, burnable trash was collected on Monday, Wednesday, and Friday mornings. Aluminum cans could also be collected on Fridays. On Tuesdays, PET bottles would be collected. Glass and other materials such as cosmetics, knives, umbrellas, and aluminum foil were collected on the second Wednesday of the month. The recyclable plastics
were taken on Thursdays and other plastics trash was taken on Saturdays. Other potentially hazardous trash such as batteries would be taken on Tuesdays as well but these are subject to change. For certain materials, some curbside recycling sites required more detailed separation than others. For example, some places required the cap was removed from pet bottles while other didn’t. There is a website and mobile phone application that people can use to check the calendar for their area that tells you when things and tells you when things change in Matsudo City (Gomi Calender, n.d.). On certain days of the month, paper recycling or leaves could be picked up with specific bags that could be bought at the super market. When trash was not thrown out correctly, the person in charge of watching over the curbside recycling site would put an official rule violation notice on the trash bag or item placed in the site. The trash could not be collected for various reasons which include: (1) the trash was not properly separated out (e.g. plastic bottle mixed in with other trash); (2) the trash was not taken out on the right day; (3) the trash was not placed in the correct bag; (4) large trash was dumped without proper stickers and pickup reservations made; (5) the trash was unable to be taken in this city such as steel; and (6) other various reasons that are written on the notice by the person monitoring the site. Once this notice was placed on the trash bag or item, it was up to the person who took out that trash to take it back into their home and redo it correctly.

Sampling Methods and Data Collection and Analysis

Survey

First of all, 190 students were surveyed with 5 demographic questions on sex, age, housing type, location, and the year in school, and 9 questions concerning separating trash in Japan was conducted at Senshu University Matsudo Junior High School in Matsudo, Chiba. 148 students responded to the survey. Using these responses, the goal was to identify answers to research questions: (1) How do Japanese middle school students view the Japanese municipal curbside recycling system (how accessible is it for anyone to understand) and does it differ based on gender or housing type?; (2) How do Japanese middle school students perceive that Japanese municipal curbside recycling could be improved and does it differ by gender or housing type?; and (3) How do Japanese middle school students rate the difficulty of municipal curbside recycle and do the reasons for how difficult or easy the system differ by gender or housing type? For question 1, the possible responses include that the Japanese recycling system as being good/bad,
efficient/inefficient, organized/disorganized, detailed/not detailed enough/too detailed, etc. For question 2, the possible responses include that the rules could be made easier to understand, the rules could be changed to be the same across Japan, trash could be picked up more often, separating rules and the importance could be taught from a younger age in elementary schools, and other personal responses. For research question 3, the responses are rated from 1 to 5, (1 = very difficult, 1 = very easy). Also, it was hoped to learn more about how Japanese middle school students perceive climate change as a problem for Japan, research question 4.

This survey was first made by using existing questions from survey questions for K-12 by the Pennsylvania Department of Environmental Protection (Pennsylvania Department of Environmental Protection, n.d.). These questions were then altered and translated into Japanese to fit the Japanese recycling system with the help of one Japanese college student and two Japanese high school teachers. Following various pre-surveys, it was discovered that the word for “recycling” in Japanese has a different context in than in English. In Japanese, the term recycling incorporates the idea of recycling as not a step in the process where materials are separated out to later be recycled, but rather the entire process and end result (e.g., recycled paper). With this in mind, the survey was changed to use the term, “separation” known as *bunbetsu* in Japanese to previously describe anywhere in the survey that recycling was mentioned. After various alterations, the survey was reviewed by the Assistant to the Vice-Principal of the middle school. Originally, the survey was to be distributed to the entire middle school and one of the high school classes. Students were told the purpose of the research was for undergraduate thesis research; however, once the survey was approved by the school, it was decided to only distribute the survey to students from the 3rd year of middle school from ages 14 to 15 in their homeroom classes in Japanese only. Students were also told that participation was optional and that they could opt out at any time. Names were not collected on the surveys to insure privacy and the survey would be used for thesis research only. The non-opened ended questions would be analyzed by finding percentages and graphing the results while the 3 opened ended questions would be analyzed statistically with the X² test, looking specifically if the type of housing or sex showed any variation in the responses to answer research questions 1 through 3. Age was not used in this test as all the students were either 14 or 15 years old.
Second, an area survey was conducted within a 0.25 mile radius of the middle school, utilizing a mobile phone with GPS capabilities turned on in order to take photos where GPS locations would be recorded with the photo automatically, to find any noticeable challenges that may be present and get an overall idea of the variation within a small area within the city. Also, this area survey could potentially identify what the challenges are to identify ways the system could be more efficient, research questions 5 and 6, looking at challenges of curbside recycling and how it could be more efficient. This technique was based off one taught from an online class from the University of Nebraska-Lincoln, NRES 498: Introduction to Geospatial Technologies. Initially, a 0.50 mile radius was used but it was soon that this was too big of an area to cover within a limited amount of time. Using a map created using Google Maps to find the radius, I walked around the neighborhood streets taking photos of any curbside recycling sites, paying special attention to any signs, official notices, animals, and the amount of trash in the sites. The sites were surveyed on Saturday, 11/22/14 and Sunday, 11/30/14, when most curbside recycling sites should be empty if they are being properly cared for as the survey was taken place after any pick-ups would have happened during the day. The photos with GPS locations imprinted into the image data would be uploaded onto ArcGIS online where the pictures and their locations could
be simultaneously viewed. Due to limitations with the ArcGIS Online application, only 99 pictures could be uploaded per map, so two maps were made and were combined with Corel Paint Shop Pro.

**One month Observation of Two Sites**

Third, two sites were chosen nearby the middle school, both that were outside apartment complexes and the contents inside the curbside recycling sites were easily viewable from the outside in order to again address research questions 5 and 6, to identify the major challenges as well as how the process could be more efficient. The two sites observed from 11/05/14 to 12/05/14. The sites were observed around 8:00am from mostly Monday through Friday when there was school and occasionally on Saturdays when there were events at the school as well as after school around 3:30pm. The contents found inside the curbside sites were recorded daily, paying special attention to dumped items and official notices placed on garbage bags that are not thrown out correctly. The data would be analyzed by looking at the frequency of official notifications and how long dumped items stayed at the curbside recycling sites.

**Confidentiality Issues and Possible Assumptions**

Potential issues with the survey include that as an intern at the middle school, I was not allowed to speak Japanese in front of the students. As my survey was in Japanese, the school decided to have the survey distributed by the homeroom teachers who explained the research. Possible students could have felt pressure from their peers to participate in the study if they did not want to be the person who did not participate. As the students were familiar with me, this could sway how the students answered the questions or the problem that occurs with many surveys where the respondents try to answer by what they think should be the right answer rather than what they really feel. Also, in order to make a survey that could be done in a short time, answers were written in for responses for all of the questions except for the three open-ended questions which could have swayed the students’ real opinions. There is also a problem with surveying the students as it is a convenience sample. Students were not given letters of consent and were told not to include their names on the surveys. If at any time they were uncomfortable answering a question, they could discontinue participation. With the two surveys, I could have already had assumptions about what was going in the area as I was placed in an apartment nearby the school.
Results

For Research Questions 1-4

For the survey, 148 students out of 190 participated, an overall (77%). For general demographics, there were (46%) males, (50%) females, and no data for 6 students which is about (4%). (23%) of the students were 14 years old, (73%) were 15 years old, and there was no data for 6 students. (57%) of the students indicated they live in a home while (39%) lived in apartments, again no responses for six of the students. About (70%) of the students lived in Chiba Prefecture, (27%) in Tokyo Prefecture, and (3%) in Saitama Prefecture.

For the first question, “Do you separate your trash?” about (96%) of the students replied “yes” and the other (4%) replied “no”.

![1. Do you separate your trash?](image)

Figure 2: The amount of students who separate their trash.

For the second question, “What do you think of the Japanese separating system?” about (83%) of the students responded that they believe the system is doing a good job while the other (16%) thought the system was not as efficient as it could be and there is no data for one person (1%).
For the third question, students were asked, “How could the Japanese curbside recycling system be improved?” and students could chose up to three answers. Out of 237 answers, (25%) of the students were for making the separating rules easier to understand, about (40%) of the respondents wanted to make the separating rules the same across Japan, around (11%) of the students wanted trash to be picked up more often, (19%) thought more should be taught about separating from a younger age, about (4%) had original answers, and there was no data for 3 students (1%).

Figure 3: How students view the separating system in Japan.
For the fourth question, “Who does most of the separating at home?” about (60%) of the students indicated that everyone in the house equally participates in separating, (2%) indicated that the father did most of the separating, (32%) indicated that the mother did the most separating in the home, (3%) of the students said both parents separate the most, and about (3%) of the students indicated “other” such as siblings or everyone except their grandparents.
For the fifth question, “Do you feel pressure that you must separate? If so, why?” about (16%) of the students indicated that they felt pressure from the person who monitors the curbside recycling site, about (63%) felt obligated to separate for the sake of the environment, and around (21%) felt no pressure or that separating was common sense.
The sixth question asked, “Do you think separating trash is directly related to preserving the environment?” with (97%) of the students replying “yes” and (3%) replying “no”. When asked why the students think that separating contributes to preserving the environment, about (18%) said that it contributes to decreasing air pollution, about (27%) said it minimizes other pollution, about (50%) says separating allows for efficient use of natural resources, (3%) indicated other, and there was no data for 3 students (2%). When asked why the students do not think separating contributes to conserving the environment, 3 students indicating that separating alone does not do enough to protect the environment, 1 student indicated other, and there was no data for 1 student.

![Figure 7: Students' view on the effect of separating trash on the environment.](image)

For the seventh question, “Where have you learned about climate change?” students could chose up to two answers. Of 235 answers, (29%) of the students indicated that they learned about climate change at school, about (56%) of the students said they learned about it from the news, about (13%) indicated they learned about it in their daily lives, about (1%) of the students indicated other, and there was no data for (2%) students.
For the eighth question, “Do you think climate change is a problem that will affect Japan?” about (92%) of the students indicated “yes”, about (5%) indicated “no”, and there was no data for about (3%) of the students. Why asked why the students think climate change will be a problem for Japan, about (16%) indicated that because of air pollution there will be more cases of respiratory disease, about (68%) indicated increasing ocean temperatures will cause the sea level to rise, about (13%) indicated “other”, and there is no data for (3%) of the students. When asked why the students thought climate change would not be a problem for Japan, 2 students said they did not think a small country such as Japan would be affected by climate change, 5 students indicated that climate change would not have an effect on their lives, and 1 student indicated other.
8. Do you think climate change is a problem that will affect Japan?

The ninth question asked, “On a rank of 1-5, how difficult is separating the trash? (1 being the most difficult and 5 being the easiest)”, about (1%) of the students thought it was very difficult, about (16%) thought it was difficult, about (34%) thought it was not easy but not difficult, about (33%) thought it was somewhat easy, about (14%) thought it was very easy, and there was no data for (2%) of the students. There are mixed results on how the difficult the curbside recycling system is for students.
With the help of the UNL Statistics Help Desk, chi-squared analysis was performed on questions 1a. “Why do you separate?”, 2a.”Why do you think the trash separating system is good?”, 9a. “Why do you think separating is easy?”, and 9b. “Why do you think separating is difficult?” with the significance level at 0.05% (or 5%) by gender and by housing type.

The reasons for why participants separate did not differ by gender, $c^2(5, N = 128) = 7.7698, p = 0.1694$. The reasons for why participants separate did not differ by housing type, $c^2(5, N = 128) = 1.7402, p = 0.8838$. The reasons for why participants thought the trash separating system is good did not differ by gender, $c^2(3, N = 102) = 6.5065, p = 0.0894$. This value was the closest to the critical p value out of all the values. The reasons for why participants thought the trash separating system is good did not differ by housing type, $c^2(3, N = 102) = 2.8945, p = 0.0894$. The reasons for why participants thought separating was easy did not differ by gender, $c^2(2, N = 64) = 0.4595, p = 0.70946$. The reasons for why participants thought separating was easy did not differ by housing type, $c^2(2, N = 64) = 0.4595, p = 0.70946$. The reasons for why participants thought separating was difficult did not differ by gender, $c^2(2, N = 59) = 2.8913, p = 0.0894$. The reasons for why participants thought separating was difficult did not differ by
housing type, $c^2(2, N = 59) = 0.8478, p = 0.6545$. Since the P values for all of these questions are not < 0.05, it can be concluded that there was no significant variation found by gender or housing type for the reasons why the students separate, for why the students thought the system was good or bad, and for why students thought the system was easy or difficult. Overall, any deviation in the answers found was not significant by gender or by housing type for all of the open ended questions listed was due to random variation.

For Research Questions 5 and 6

![Legend](image)

For Research Questions 5 and 6

![Figure 11: Map of curbside recycling sites near Senmatsu.](image)

For the area survey, Of the 179 drop-off sites recorded, 6 sites displayed signs of trouble. Two of the sites showed trouble with stray cats which were found occupying drop-off receptacles that were dirty and easily accessible. At the other four sites that showed signs of trouble such as multiple old official violation notices, opened bags of trash, trash all over the ground around and inside the curbside recycling site, and dumped items.
For the one month observation, both sites had illegally dumped items such as a TV, skis, and a microwave which remained at the sites for the entire month. At site 1, a TV and skis were dumped illegally and were there before the observation started. These items were never moved and no official violations were put on them. At site 2, there was a microwave that was dumped illegally at the site before the observation and it also did not move or have an official violation notice on it. During the month, site 1 had an official violation placed on trash twice, which were both taken care of immediately the next day. At site 2, an official violation notice was placed on the trash once, which was also taken care of immediately the next day.

Discussion

For research question 1, “How do Japanese middle school students view the Japanese municipal curbside recycling system (how accessible is it for anyone to understand) and does it differ based on gender or housing type?”, the majority of the students positively view the curbside recycling system and separate because of the top 5 reoccurring themes, the society is set up where recycling can be done everywhere, it is the law, that it is common sense, it is eco-friendly, and that it is easier for workers to recycle when materials are separated from the beginning.

For research question 2, “How do Japanese middle school students perceive that Japanese municipal curbside recycling could be improved and does it differ by gender or housing type?”, 
the majority of the students think the curbside recycling program is good because of the top 4 reoccurring themes, that it is organized and clean, that it is easier for workers to recycle the materials later when separated from the start, that it is eco-friendly, that separating is set up to be done everywhere around Japan, and that it was easy to understand. A majority of the students suggested that the curbside recycling system could still be improved by making the same separating rules countrywide which was also suggest in the study by Iris Ohyama (2009) where (19%) of the respondents thought the system was troublesome because it varied from city to city (Iris Ohyama, 2009). I have spent time with the curbside recycling systems in Kanagawa Prefecture, Tokyo Prefecture, and Chiba Prefecture in 4 different cities and I could understand how time consuming it can be to keep all of the rules straight. For people moving to new areas, it can be a big adjustment if they move somewhere where the rules are stricter. For one family I knew of, they lived on the border of two cities. Their grandparent’s home was in the other city only separated by a highway. Although it was just a short walk from the family’s home to the grandparent’s home across the street, the rules, stickers, and bags required for recycling were completely different, making it hard on the family when they wanted to take the trash out for their grandparents. Since there is no one-fix-all policy for recycling programs, it is understandable that each program must be different for the various areas in Japan, but there are opportunities for it to become more standardized, especially when the cities are very close together as the previous example.

For research question 3, “How do Japanese middle school students rate the difficulty of municipal curbside recycle and do the reasons for how difficult or easy the system differ by gender or housing type?”, the students are mixed on if they view the curbside recycling as difficult or easy. The top 4 reoccurring themes for why it is easy is that all that is required is to separate materials into their corresponding bin, that it is a habit, natural, and common sense to do so, the city they are living in makes it easy to separate, and there are labels on the containers that tell you what type of material it is made of. The top 3 reoccurring themes for why it is difficult to separate are that there is too much ambiguity such as what is considered burnable and unburnable and with objects made of multiple materials such as the cap and label of a PET bottle, it is troublesome to think over every single object thrown to separate, and there are too many materials that require separation. The same themes were found in a study conducted across Japan with the top 5 reoccurring themes being there is no place for temporary trash, it is hard to
understand, ambiguity of certain materials, trash is not collected enough, and there is too much wrapping (Iris Ohyama, Inc., 2009). Ueta & Kozumi (2001) also address the idea of too much wrapping as it is customary of Japanese culture to wrap individual food products and nowadays many things are considered over packaged but any change to this system would be contradictory to a long held culture but would be necessary to become a sustainable society (Ueta & Koizumi, 2001).

Based on the results above, since all of the p values are not < 0.05 for all of the open ended questions stated, there was no difference found by gender and housing type, meaning the hypotheses for research questions 1, 2, and 3 (“How do Japanese middle school students view the Japanese municipal curbside recycling system (how accessible is it for anyone to understand) and does it differ based on gender or housing type?”), “How do Japanese middle school students perceive that Japanese municipal curbside recycling could be improved and does it differ by gender or housing type?”, and “How do Japanese middle school students rate the difficulty of municipal curbside recycle and do the reasons for how difficult or easy the system differ by gender or housing type?”) are rejected as the null hypothesis, that the factors are independent was accepted. It is interesting that there was no significance found between gender and housing type, and it could be looked into more with a larger sample size. It could possibly suggest that within this school, the students are mostly on the same page when for the reasons why they separate their trash, why the system is good or bad, and why it is difficult or easy. As there are still some existing cultural preconceptions that woman are still largely in charge of the home affairs which would include recycling, that the girls in the home might be more informed or more experienced with separation; however, this would require more research and possibly another area future research could look into.

It was also rejected that the reasons for why Japanese middle school students separate is not based on viewing recycling as eco-friendly as this was found to be a top reoccurring answer for question 1a. “Why do you separate?” The hypothesis that middle school students view climate change as a problem was accepted. Also, the hypothesis that the major challenges are concerning compliance with municipal curbside recycling is slightly accepted as it was found that there is some difficulty with compliance in recycling large items like TVs and microwaves.
For research question 4, “How do Japanese middle school students view climate change as a problem for Japan?”, a majority of students view climate change as a problem for Japan and a majority of the students were concerned with the rise in sea temperature due to climate change which would cause a rise in sea level. Another interesting finding from the survey with the middle school students was that most students learned about climate change from TV news which is similar to the results Sampei and Aoyagi-Usui (2009) found as they identified that most people in Japan learn about environmental issues from daily TV news and newspapers (p. 205). This could suggest that the campaigns by the government to raise awareness about climate change are reaching middle school students. It was also interesting that a majority of the students made the connection that by separating, that their actions would lead to recycling of the material, and potential environmental benefits. Many have done research as well on the earlier blooming of cherry blossoms in Japan due to climate change (Aono & Kazui, 2008) (Higuchi, 2008) (Miller-Rushing et al., 2007). Cherry blossoms have deep cultural roots that could have impacts on important events such as the annually Hanami or flower viewing parties where people gather under the cherry blossoms to drink, share food, and chat, the teaching of impermanence, the spring seasonal foods which many desserts are cherry blossom flavor based, and the start of the school and fiscal year is associated with the cherry blossoms (Sakurai et al., 2011).

For research question 5, “What are the major challenges faced by the Japanese in participating in municipal curbside recycling?”, the major challenge faced by Japanese participating in municipal curbside recycling concern dealing with large item trash such as TVs, beds, refrigerators, etc. There were also many cats found inside curbside recycling sites which could suggest that sites that are not cleaned and managed daily by volunteers could attract unwanted animals. Very few drop-off recycling sites displayed signs of trouble such as a lack of volunteers to monitor drop-off sites, uninformed volunteers, and a lack of compliance. One man was asked about the cat problem specifically, and he replied the does not mind the cats much since his daughter loves them but there are many others in the neighborhood that are troubled by them. Also in a report by Matsudo City government, many voiced their concerns with the crows that often sit on or near curbside recycling receptacles or sites which scares many from wanting to use these sites or go near them (Matsudo City, n.d.). Locals voiced in the report that they want more curbside recycling sites to have steel fences installed around drop off area receptacles to deal with the cat and crow problem (Matsudo City, n.d.).
For research question 6, “How can the municipal curbside recycling system in Japan become more effective?”, the municipal curbside recycling system could become more effective if it focused more on making the process to get rid of larger items easier to do so that more of these items could be returned to businesses where they can be deconstructed and the materials could potentially be recycled. This problem with the illegal dumping of large items is not new for Japan. It was also found in the study by Iris Ohyama (2009) that (23%) of the people surveyed across Japan were most troubled by oversize trash as if you miss the day of your reservation you cannot get of the item quickly, certain items cannot be picked up often, it costs money, it is troublesome to go to the convenience store, and you have to leave your house to do it (Iris Ohyama, 2009). In order to get rid of these large items, a person must first call a designated pick up service to make a reservation for the item well in advance. Once the item to be picked up is described, they will tell the person the fee required and the type of stickers or labels to purchase from a local convenience store. If the convenience store is out of stickers, it can be troublesome for locals to do this process. This fee was created in an attempt to reduce waste and to increase public awareness on recycling (Tasaki et al., 2005). This fee also was designed to allow the manufacturers who are obliged by law to carry out the recycling of a set quota of items they produce to have a predictable income and to be able to fund research for better eco design of products which was found very unrealistic (Aizawa et al., 2008). The person must set the item out on the day of the pick-up before the reserved pick-up time with the correct stickers and if this date is missed for whatever reason, it could take weeks or months before the item could be scheduled to be picked up again. Aizawa et al., (2008) found that a majority of consumers do dispose of the large items properly but there was (19%) of the respondents found that they avoided paying the high fees and chose the cheapest method possible, which would be illegal dumping (Aizawa et al., 2008). It is also stated that overall, illegal dumping decreased from 2004 to 2006 but it is still at a higher rate than before the implementation of the recycling system (Aizawa et al., 2008). To deal with this it is suggested that the recycling fee should be reduced, the fees should be more transparent so that the public can develop a better understanding as to what purpose they serve, more enforcement is needed, and the quotas for target appliances should increase for items such as clothes dryers (Aizawa et al., 2008).

It was also interesting that the most of the students did not feel pressure from the others around them to separate but felt more of an obligation to separate for the sake of preserving the
environment. In addition, although a majority of the students indicated that their families equally share the load of separating in the household, between those who indicated that their father or their mother did most of the separating, there are more students who indicated that their mother did most of the separation in comparison to fathers, similar to the findings Matsumoto (2010) that suggest it is not gender neutral when women’s working hours are shorter than men’s (Matsumoto, 2010). This would not be uncommon in Japan as there is still lingering expectations on women in society to quit their jobs once they are married and become stay at home mothers, but more thorough research would be needed for this.

**Conclusion**

In sum, this research was done to in hopes to expand upon the knowledge on the challenges and ways to improve recycling systems and to be able to provide suggestions for improvements to the system by using input from Japanese middle school students who potentially have to learn the rules of the system correctly from a young age and will pass on the knowledge they have now potentially when they become parents later on, as well as data from an area survey and a one month observation to get an image of the curbside recycling system as a whole. The main question was to discover what the challenges associated with municipal curbside recycling in Matsudo City are, which were found to be issues concerning attracting animals like crows and cats and illegal dumping of oversized trash.

For research questions 1-3, (“How do Japanese middle school students view the Japanese municipal curbside recycling system (how accessible is it for anyone to understand) and does it differ based on gender or housing type?”, “How do Japanese middle school students perceive that Japanese municipal curbside recycling could be improved and does it differ by gender or housing type?”, and “How do Japanese middle school students rate the difficulty of municipal curbside recycle and do the reasons for how difficult or easy the system differ by gender or housing type?”), looking at how the Japanese middle school students view the accessibility of the system, how it can be improved, and its difficulty, did not differ based on gender or by housing type. Overall the middle school students separate because the society is set up where recycling can be done everywhere, it is the law, it is common sense, it is eco-friendly, and that it is easier for workers to recycle when materials are separated from the beginning and they think the
recycling system is good because it is organized and clean, it is easier for workers to recycle the materials later when separated from the start, it is eco-friendly, separating is set up to be done everywhere around Japan, and it was easy to understand. Students would like to improve it by making the rules more standardized across Japan which has potential but it would be difficult to be done completely since each city has different aspects to take into consideration. The students are split on the relative easiness and difficulty of the recycling system and those who think it is easy think this because all that is required is to separate materials into their corresponding bin, that it is a habit, natural, and common sense to do so, the city they are living in makes it easy to separate, and there are labels on the containers that tell you what type of material it is made of. Those who think it is difficult think this because there is too much ambiguity such as what is considered burnable and unburnable and with objects made of multiple materials such as the cap and label of a PET bottle, it is troublesome to think over every single object thrown to separate, and there are too many materials that require separation.

For research question 4, “How do Japanese middle school students view climate change as a problem for Japan?”, the middle school students do view climate change as a problem for Japan mostly out of concern for rising sea level. This makes sense as if the sea level were to rise, it would have deep implications for the many people living near the Tokyo Bay and other areas of Japan that are largely already at sea level elevations. There are various other implications of climate change on Japan that could be detrimental culturally such as the earlier blooming of cherry blossoms and extreme drought that could cause rice crop failures, Japan’s cultural staple food. Other effects could be increased frequency and intensity of storms such as typhoons and along with that flooding. Other concerns with rising temperatures and climate change in Japan include increased risks of death from heat related illnesses such as heat stroke. This makes older members of the population who stay indoors especially at risk as when the Earthquake and Tsunami hit in March 2011, power usage was limited in cities, so many used the A/C less or not at all. As Kondo et al. (2011) found, in all of the indoor heatstroke incidents found in 2010, nearly 68% were of elderly individuals (Kondo et al., 2011). Although this question does not directly relate to the main question concerned with the challenges of municipal curbside recycling, more studies in the future could look at the influence of being aware of the problems of climate change and if this has become an important motivator in Japan for curbside recycling
after the efforts from the government to increase awareness on climate change through the media.

For research questions 5 and 6, “What are the major challenges faced by the Japanese in participating in municipal curbside recycling?”, fifteen years after the Containers and Packaging Recycling Law was enacted, the main issues concern ambiguity with what to do with certain materials and a lack of space to store trash, and dealing with oversized trash which has to do much with the Household Electrical Appliance Recycling Law. For suggestions on how the system could be more effective, volunteers need to be informed well and chosen wisely to avoid the buildup of trash in curbside recycling sites as well informing residents about correct disposal requirements to avoid attracting cats and crows in to the sites in addition to making curbside recycling sites harder to enter as the people of Matsudo suggested (Matsudo City, n.d.). In general terms, the government could strive to recycle more of what is collected and increase quotas on oversized items for manufacturers to collect so that possibly the large sized items could be collected more often as suggested previously (Aizawa et al., 2008). Also, although this contradicts with the culture of gift giving and the packaging of fruits in vegetables in Japan, if there was a campaign done on the importance of lessening packaging to overall decrease the amount of materials coming into the system, it could make a big impact and potentially lessen the burden on individuals as they would have to separate less material.

The main limitations include the language barrier and inadequate knowledge of qualitative and quantitative research methods design. Also, there was a very limited time frame available to do research while in Japan as daylight is very short in the winters in Japan and the internship had long hours. Also, my role as an intern at the middle school could have influenced how students responded on the surveys. Since I was a mentor to these students in their English classes, the students could have answered the questions based on what they thought was the expected answer or right answer rather than how they really feel. Data was limited from observations of the area survey and the one month observation as there was no input directly from people doing the separating, and could have been more useful if direct local opinions were included.

In the future, it would be interesting to explore more on the differences in how the Japanese view the curbside recycling system based on age, especially if there is a difference between middle school and high school students as interviews indicated that much more is taught on the
environment in elementary and middle school compared to high school. The Japanese government or local communities could incorporate crowdsourcing with GIS and GPS technologies to report troubled curbside recycling sites. To prevent dumping, the system for large item pickup could become Internet based for more ease of access as the current system requires people to spend a lot of time calling for a reservation and getting the right stickers needed. Other future studies could incorporate participatory research as it involves working together with researchers and the locals affected most to develop a system that better benefits all (Cornwall & Jewkes, 1995). In this way, locals could work with anthropologists or others in the human sciences to develop a plan that best works for them and with the local government. Since the people have been doing this program for at least 15 years now, many know the pros and cons from experience and have a lot of information to offer on how it could be changed in order to make the burden less on everyone and aim for Japan’s goal of becoming a recycling oriented society.

**Appendices**

**Appendix A: Recycling Survey in Japanese**

ゴミの分別について論文アンケート

1. 性別：男性 女性
2. 年齢：
3. 家のタイプ：一軒家 マンション
4. どこに住んでいますか？ ______県／都________市／区／郡
5. 現在、中学・高校の何年生ですか？ 中／高／___________年生

ゴミの分別に関する質問

1. あなたはゴミの分別をしますか？（ビン・缶・プラスチックなど）
   はい／いいえ 理由__________________________________________
   ________________________________________________________________________________

2. 日本のゴミの分別システムについてどう思いますか？
   いいと思う／あまり良くない 理由______________________________________________
3、もっと改善できるとしたら、どんなことがありますか？以下の5つから、最大2つまで選んで下さい。

（1）ゴミの分別をもっと分かりやすくする
（2）自治体分類方法が異なるので全国で統一したほうがいい。
（3）ゴミの収集日をもっと増やす
（4）小学校・中学校において、ゴミの分別に対する教育を徹底する
（5）その他 ________________________________

4. 主に誰が家の中でゴミの分別をしますか？

（1）家族全員 （2）父親 （3）母親 （4）自分のみ
（5）その他 ________________________________

5. ごみをしっかり分別しなければいけないというプレッシャーを感じますか？何故ですか？

＊以下からひとつだけ選んで下さい。

（1）他人の目を気にするから
（2）環境を守るという意味で大切だと思うから
（3）その他 ________________________________

6. あなたはゴミの分別することが、環境を保護することにつながると思いますか？

「はい」の方はその理由を一つ選んで下さい。

（1）ダイオキシン等の有毒ガスは、環境汚染につながってしまうから
（2）環境汚染を最小化することができるから
（3）ゴミの分別は、天然資源を大切に使うことにつながるから（ペットボトル・ビンの再利用等）
（4）その他 ________________________________

「いいえ」の方はその理由を一つ選んで下さい。

（1）ゴミの分別をしたところで、環境を保護するための貢献度が低いと思うから
（2）自分がやっても、多くの人がやらないければ、意味がないと考えるから
（3）その他 ________________________________
7. 今までにあなたは、異常気象や環境変化、または地球温暖化について聞いたことがありますか？また、どこでそういったことを聞いたのですか？*いくつか選んで構いません。

(1) 学校 (2) ニュース (3) 日常生活の中 (4) その他__________________________

8. あなたは、気候変動が将来、日本にとって問題になると思いますか？

はい／いいえ
「はい」の方はその理由を一つ選んで下さい。

(1) 空気環境が悪くなることによって、多くの人に呼吸障害が起こりうるから
(2) 地球温暖化現象によって、海面の気温上昇がし、沿岸部に住む人たちの住家が失われる。
(3) その他________________________________

「いいえ」の方はその理由を一つ選んで下さい。

(1) 地球は大きいので、日本は大してダメージを受けないと思う。
(2) 別に自分の生活には関係ないと思う。
(3) その他________________________________

次の質問について、それぞれ5段階の数字のうち一つに丸をつけて下さい。

9. ゴミの分別は難しいですか・簡単ですか？

1 2 3 4 5
かない難しい 難しい 難しいが気をつけている まあ間簡単 とても簡単

なぜ、難しいと思いますか／なぜ、簡単だと思いますか？その理由を書いて下さい。

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

ご協力、ありがとうございました。
Appendix B: Recycling Survey English Translation

Trash Separation Thesis Survey

1. Gender: Male  Female

2. Age:

3. Housing Type:  House  Apartment

4. Where do you live?  _______Prefecture／Special Prefecture
                        _______City／Ward／District

5. What year in school are you?  Jr. High School／High School／_______Grade

Questions about Trash Separation

1. Do you separate your trash? (Ex: Cans, glass, plastic, etc.)
   Yes/No  Reason: ____________________________________________________________
                                                                                   ____________________________________________________________

2. What do you think of the Japanese separating system?
   Good/Not Good  Reason: ____________________________________________________________

3. How could the trash separation system be improved? Choose up to 2 answers.
   (1) Make separating rules easier to understand
   (2) Make the separating rules the same country wide
   (3) Pick up trash more often
   (4) Teach more about separating trash from a younger age (ex: elementary school/middle school)
   (5) Other:                                                                                           ____________________________________________________________

4. Who does most of the separating at home?
   (1) Everyone does an equal amount (2) Father (3) Mother (4) Oneself
   (5) Other:                                                                                           ____________________________________________________________
5. Do you ever feel pressure that you must separate correctly? If so, why?

*Please chose one answer.

(1) Pressure from the person who watches over the trash drop off
(2) Pressure from feeling obligated to preserve the environment
(3) No feeling of pressure/other: ________________________________

6. Do you think separating trash is directly related to preserving the environment?

Yes/No

For those who said [Yes], please identify one reason why.

(1) It contributes to decreasing air pollution
(2) It minimizes pollution
(3) It allows us to use natural resources efficiently (PET Bottles, cans, etc.)
(4) Other: ________________________________

For those who said [No], please identify one reason why.

(1) Separating is not enough to protect the environment
(2) Even if one person does it, it everyone doesn’t do it, it has little meaning
(3) Other: ________________________________

7. Where have you learned about climate change in your life thus far? *Chose all that apply.

(1) School   (2) News   (3) At home/daily life   (4) Other: ________________________________

8. Do you think climate change is a problem that will affect Japan?

Yes/No

For those who said [Yes], please identify one reason why.

(1) Air pollution will cause more cases of respiratory disease
(2) Increases in ocean temperature will cause the ocean level to rise
(3) Other: ________________________________
For those who said [No], please identify one reason why.

(1) Since the earth is large, Japan will not be largely affected by climate change

(2) It will not directly affect my life

(3) Other: ____________________________________________________________

For the next question, please circle an answer between 1 and 5.

9. On a rank of 1-5, how difficult is separating the trash? (1 – most difficult/5 – easiest)

1 2 3 4 5
(Very difficult) (Difficult) (Not difficult but not easy) (Somewhat Easy) (Very Easy)

Why do you think it is easy?/Why do you think it is difficult? Please write your reasoning below.

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

Thank you for participating in this survey.

Appendix C: Chi-square Tests
Analysis provided by the UNL Statistics Help Desk. F denotes female, M denotes male, A denotes apartment, and H denotes house.

1a. Why do you separate (by gender)?

Categories:
- Eco-friendly / saves energy (eco)
- It’s the rule (rule)
- Common sense (cs)
- Recycle later (recyc)
- Set up for it (setup)
- Other (includes “easy”, “clean”, “parents taught me to do it”, “family/neighbors do it”, and “if we don’t they don’t take the trash” categories)
The FREQ Procedure

<table>
<thead>
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Statistics for Table of gender by response

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</tr>
</tbody>
</table>

Sample Size = 128

The p-value for the chi-square test above is 0.1694. There is no difference in why students separate, by gender.
1a. Why do you separate (by housing type)?

Categories:

- Same categories as above

The FREQ Procedure

<table>
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<tr>
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Statistics for Table of housing by response

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Sample Size = 128
The p-value for the chi-square test above is 0.8838. There is no difference in why students separate, by housing type.

2a. Why do you think the trash separating system is good (by gender)?

Categories:
- Eco-friendly / saves energy / efficient (eco)
- Organized / detailed / clean (clean)
- Easy to understand / easier for others (easy)
- Other (includes “set to be done everywhere”, “doing something”, “used to it”, “other countries”, “can’t do more than we are”, “somehow”, “good thing to do”, “many benefits”, “everyone does it”, and “if we don’t, ambiguous” categories

The FREQ Procedure

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<tbody>
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Statistics for Table of gender by response

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</table>

Sample Size = 102

The p-value for the chi-square test above is 0.0894 (still not significant at the alpha = 0.05 level). There is no difference in why students feel that the separating system is good, by gender.

2a. Why do you think the trash separating system is good (by housing type)?

Categories:
- Same as above
The FREQ Procedure

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<tr>
<th>Frequency</th>
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**Table of housing by response**

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<td>12.75</td>
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<td>11</td>
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<td>10.78</td>
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**Statistics for Table of housing by response**

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</tbody>
</table>

**Sample Size = 102**

The p-value for the chi-square test above is 0.4082. There is no difference in why students feel the separating system is good, by housing type.
9a. Why do you think separating is easy (by gender)?

Categories:
- Only need to separate materials into corresponding box / the label describes where the materials goes (clear)
- Used to doing it / habit / common sense (habit)
- Other (includes “can separate everywhere”, “my city makes separating easy”, and “organized compared to other countries” categories)

<table>
<thead>
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<td>34</td>
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**Statistics for Table of gender by response**

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</table>
The p-value for the chi-square tests above is 0.8811. There is no difference in why students feel that separating is easy, by gender.

9a. Why do you think separating is easy (by housing type)?

Categories:
- Same as above

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Statistics for Table of housing by response
### Statistic Table

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</tr>
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</table>

**Sample Size = 64**

The p-value for the chi-square test above is 0.7946. There is no difference in why students feel that separating is easy, by housing type.

9b. Why do you think separating is difficult (by gender)?

Categories:
- Inconvenient (incon – includes “It can be troublesome to think over each material you throw away”, “lack of places to separate trash in public”, and “it takes up too much space at home” categories)
- Ambiguity (ambig)
- Other (includes “too many different materials require separating”, “some people do not do it”, “I don’t know if it makes a difference”, and “rules are unorganized” categories)
### The FREQ Procedure

#### Table of gender by response

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#### Statistics for Table of gender by response

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The p-value for the chi-square test above is 0.2356. There is no difference in why students feel that separating is difficult, based on gender.

**Sample Size = 59**
9b. Why do you think separating is difficult (by housing type)?

Categories:
- Same as above

The FREQ Procedure

<table>
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</tr>
<tr>
<td></td>
<td>70.97</td>
</tr>
<tr>
<td>Total</td>
<td>52.54</td>
</tr>
</tbody>
</table>

Statistics for Table of housing by response

<table>
<thead>
<tr>
<th>Statistic</th>
<th>DF</th>
<th>Value</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>2</td>
<td>0.8478</td>
<td>0.6545</td>
</tr>
<tr>
<td>Likelihood Ratio Chi-Square</td>
<td>2</td>
<td>0.8375</td>
<td>0.6579</td>
</tr>
<tr>
<td>Mantel-Haenszel Chi-Square</td>
<td>1</td>
<td>0.8334</td>
<td>0.3613</td>
</tr>
<tr>
<td>Phi Coefficient</td>
<td></td>
<td>0.1199</td>
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</tr>
<tr>
<td>Contingency Coefficient</td>
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<td>0.1190</td>
<td></td>
</tr>
<tr>
<td>Cramer's V</td>
<td></td>
<td>0.1199</td>
<td></td>
</tr>
</tbody>
</table>

Sample Size = 59

The p-value for the chi-square test above is 0.6545. There is no difference in why students feel that separating is difficult, based on housing type.
References Cited:


