

Food waste law and policy in Japan:
The model of Atsugi City adopted by the Ministry of
the Environment as a prospect of harmonization of
solutions to a multifaceted problem

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1. Introduction, Theoretical approach and Method

Food loss and food waste are topics that are gaining increasing visibility worldwide due to their direct role in threatening the sustainability of the environmental, social and economic arenas. According to the United Nations' Food and Agricultural Organization (FAO, 2011) food loss refers to the decrease in the quantity or quality of edible food mass available for human consumption that occurs at early stages of the food supply chain (i.e. production, postharvest and processing). Whereas food waste refers to food discarded at the end of the food chain (i.e. retail and final consumption). As it has been pointed out by Allen et al. (2016) FAO's 2011 numbers show that 32% of the food produced worldwide for human consumption was either lost or wasted across the whole food supply chain in 2009, amounting to roughly 1.3 billion tons of food. More specifically, it is the burden of wasted food from households, retail, and manufacturing sectors that amounts to approximately

US\$ 680 billion in industrialized countries and to US\$ 310 billion in developing countries respectively (Arshadi et al., 2019 citing FAO, 2019). These numbers shown by the literature on the matter are likely to increase over the next thirty years due to world population growth. Projections made by FAO in 2015 portrayed an increase of one billion people within the next decade, and of 9.6 billion of people by 2050 (Arshadi et al., 2019).

Food loss and food waste reflect food systems and allow evaluation of the functioning of food value chains. Therefore, they have non negligible implications for poverty, nutrition, urbanization and economic growth. Likewise, their effects on the environment are dramatic, bearing in mind the energy, biodiversity, greenhouse gases, water, soil and other resources entrenched in food that is not eventually eaten. Along with food waste, packaging and non-edible material add a high burden on the environment as well as on the consumers and producers along (Ferreira da Cruz et al., 2012; Ferreira da Cruz et al., 2014; Olsmats and Wallteg, 2009; Williams et al., 2012, Arshadi et al., 2019).

Therefore, the design of a law frame that is accompanied by consequential supportive policies to address food loss and food waste is considered essential to reduce the environmental negative externalities of food systems, and to improve global food security as suggested by the United Nations Environment Program (UNEP, 2012). Generally speaking, “Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life.” (FAO, 2003).

However, to date, in the current practice, most initiatives have not been enclosed within a universal perspective. An effort to address food loss and food waste through the articulation of food loss reduction and food waste

valorization approaches, respectively, should be set in a non-fragmented analysis, including various disciplines and therefore, various choices. Such choices should comprise individual choices, policy choices and business choices aiming at circular and sustainable models of production. To this goal, interdisciplinary cooperation in order to address concerns for a nascent bio-economy has been acknowledged by scholars like Ingrao et. al (2018) who defined bio-economy as “... an economy where renewable biomasses are produced and converted into value-added materials, chemicals, foods, feeds, fuels and energy; therefore, it represents one valid, reliable way to transition to equitable, sustainable, post fossil-carbon societies.”

In Japan, due to its low food self-sufficiency rate and the scarcity of available landfill places for waste disposal, food waste remains a serious issue to be addressed. Although Japan's Food Waste Recycling Law and other correlated initiatives have made progress in encouraging recycling and waste minimization since 2001, supplementary efforts to systematically reduce and recycle food wastes are needed, especially at the consumer level of the food supply chain.

The authors want to present an evidence-based approach to food education that strengthens municipal solid waste management, which can promote cross-sectoral cooperation among residents as well as among stakeholders to design and execute annex strategies to avert and alleviate food wastes. The case of the Atsugi Microbial Waste “Trash” Reduction Unit, adopted by the Japanese Ministry of the Environment in April 2021, is an example of the concretization of an institutional frame into a policy choice that can develop further promotion of a universal and harmonized approach for the identification of shared solutions to the food waste problem.

In order to comprehensively and coherently study the food waste law and

its correspondent policy in Atsugi, Japan, the authors consider fair to present an initial frame that portraits food loss/waste policies overseas and the overall food waste trends in Japan since 1960 (Section 2). Following, a qualitative study of the Japanese Act on Promoting Food Loss/Waste Reduction will be addressed in order to identify supportive supplementary initiatives made by the Japanese government to tackle this challenge. Special attention will be drawn to what preventable and non-preventable food loss concerns as matter of policy designing (Section 3). Then, the policy qualitative analysis of food waste for the Atsugi case will start. First part of Section 4 will display an introductory assessment of the Ministry of Environment's adoption of Atsugi's Microbial Waste Reduction Unit "Trash" project. Formerly, a narrative of the discussions with City officials that precede the policy making towards the implementation of Atsugi's Microbial Waste Reduction Unit "Trash" will be outlined. Lastly, Atsugi City Officials visiting lecture will be explained as a supportive policy tool that has been inspired from domestic prior examples in order to further develop/enrich a consequential policy making process that is concerned with the adoption of the "Trash" Waste Reduction Unit in Atsugi schools.

Theoretical approach and method

At first, a local level of governance approach framework of the "Trash" policy will be used to organize our analysis into a possible multiple level of governance. Multi-level governance is a concept initially proposed to capture the changing nature of policymaking and policy implementation (J. Szulecka et al. (2019) as citing Hooghe & Marks, 1996). The approach builds on the growing complexity of designing accurate policy measures in modern states. As J. Szulecka et al. (2019) points out, Marks was one of the first to introduce

the phenomenon in the 1990s (J. Szulecka et al. (2019) as citing Stephenson, 2013, p. 818), and the concept has picked up a great deal of academic interest since, mostly, the principle of subsidiarity takes place (exclusive national competences Vs. local competences depending on which way is more effective).

The diffusion of authorities and competences, the proliferation of public-private partnerships, etc. are all trends that challenge the traditional forms of hierarchical authority and undermine traditional centralised forms of government (J. Szulecka et al. (2019) as citing Hooghe & Marks, 2010). “Multi-level” refers to different levels of “governance”, i.e. national and sub-national, but it also implies the involvement of both public and private actors at these levels (J. Szulecka et al. (2019) as citing Van Kersbergen & Van Waarden, 2004).

Multi-level governance studies are concerned with the move from centralised forms of authority to more fluid, problem-focused networks (J. Szulecka et al. (2019) as citing Smith, 2007). Therefore, as it may be noted by the reader, it is both a descriptive and an analytical framework for studying change in public policy making. At the same time, multi-level governance is simultaneously a framework for analysis, a solution for collaboration between stakeholders and a strategy for better policy implementation, improved information, and should improve the quality of rational decision-making and implementation (J. Szulecka et al. (2019) as citing Gollata & Newig, 2017).

Empirical evidence indicates that polycentric governance systems produce greater environmental outputs than monocentric ones (J. Szulecka et al. (2019) as citing Newig & Fritsch, 2009). In the context of food waste, multi-stakeholder collaboration and public-private partnerships are necessary to find sustainable solutions to reducing food waste (J. Szulecka et al. (2019) as citing Halloran et al., 2014). In this regard, the hypothesis held that the development of a Local Council for Promotion of Environmental Education (as motivated

by the “TRASH” policy) is a more effective way to implement environmental policies proves itself right.

In this analysis, we try to provide an overview of how the Model of Atsugi City concerning food waste was negotiated, how this triggered the complementary policies and governance arrangements that led to recognize the need to develop a Local Council for Promotion of Environmental Education and so we employ multi-level governance as an analytical framework operationalizing empirically. In the conclusion, drawing lessons and recommendations from our research, we reflect on food waste multi-level governance as a benchmark for good governance and effective policy.

2. A roadmap tour through food loss/food waste polices and the overall Japanese food waste trends since 1960

Before fully developing qualitative aspects of food loss in Japan since 1960, it is pertinent to highlight some initiatives that have been designed overseas to tackle food loss and food waste. One example is the initiative led by FAO and the OECD (Organization for Economic Co-operation and Development) “Save Food”. This initiative provides a platform for discussion on food loss and food waste. Then, committing to create, supply and reinforce food bank networks worldwide is the “Global Food Banking Network”. Also, there is the “EU-FUSIONS” initiative (Food Use for Social Innovation by Optimizing Waste Prevention Strategies) which established a multi-stakeholder platform in Europe with the goal of creating a common frame to prevent food loss and food waste through social innovation. These initiatives, through collaboration of other actors, mainly domestic, have demonstrated the effectiveness of their material scope. For example, EU-FUSIONS’s partner, “Stop Wasting Food Movement

Denmark”, has reported that food waste in Denmark was reduced by 25% between 2010 and 2015. Likewise, the United Kingdom’s “Waste and Resource Action Programme” (WRAP) accomplished 21% reduction of avoidable food waste (household food waste reduced by 15%) between 2007 and 2012 (Allen, 2016).

However, despite growing public attention and current policy of these challenges, Parfitt et al. (2010) point out that the current international literature review on food waste and food loss holds data that varies widely, and that this is due to a lack of a standardized measurement protocol. Therefore, Bagherzadeh et al. (2014) have signaled that what is really at heart of any institutional and policy frame addressing the issue of food waste and food loss is the harmonization of the multiple definitions of food waste. Along the same reasoning, authors like Lipinski et al. (2013) consider that to have a harmonized frame would allow to target correctly how to reduce waste in the food production and food consumption cycle (Life Cycle Assessment, LCA). As a result of these scholars’ observations, in 2013, the World Resources Institute (WRI) began to lead a multi-stakeholder process and developed a Food Loss and Waste Standard draft in 2014.

With the above preliminary notes to this section and considering what was announced in the introduction, it is noteworthy to clarify that the scope and the meaning of the Japanese definition of “food waste” diverges from that of the FAO. In Japan, ordinances on food waste are outlined in the Food Waste Recycling Law as follows:

- (1) Food materials which are disposed of after being served or without being served as food; and/or;
- (2) Materials that are not able to be provided as food and are derived as by-products in the process of manufacturing, processing and cooking.

Thus, as recalled by Allen et al. (2016), the Japanese definition is built on the conjecture that non-edible portions of food and by-products are included in the category of food waste. Particularly, it includes the residues/by products generated from the food manufacturing and processing industries; unsold food and food past its expiration date at selling points; left-overs; food that was not eaten; food preparation scraps from households, commercial establishments like restaurants, institutional sources like school cafeterias; etc. On the other hand, edible food which is subsequently disposed of is conventionally classified as “food loss”.

Allen et al. (2016) identified a conceptual visualization of a five life cycle stage in the food supply chain where food waste may be present in the Japanese domestic case. That means that no wastage that might have taken place in food exporting countries prior to being distributed in Japan was considered. Those five life cycle stages include:

- (1) The agricultural production stage (food waste on farms);
- (2) The storage and transportation stage (food waste during post-harvest handling, storage and transportation before processing);
- (3) The commercialization stage (food waste at food manufacturing industries, food waste from wholesale, retail, catering and restaurant sectors);
- (4) The household consumption stage (food waste from household preparation) and;
- (5) The end-of-life stage (including recycling for use as animal feed, compost, energy generation, and incineration and landfill treatment).

In methodological terms, to approximately estimate food waste before pertinent data could be available to be analyzed, Allen et al., 2016; Parry et al., 2015 and Marra, 2013, recognize that food waste is acknowledged when the total amount of available food substantially exceeds the total amount of food

consumed “...any breach between the amount of calories and protein supplied and the amount of actual daily individual intake theoretically indicates calorie and protein loss encompassed by food waste ...”. Accordingly, a synthetic analysis of food waste in Japan between 1960 and 2012 was portrait by Allen et al. (2016) where only the edible part of food which was wasted during the food manufacturing, wholesale, retail and by end-consumers, was considered. Their study suggest that the general trend of food waste in Japan between 1960 and 2012 can be divided into three periods:

- (1) Low level of food waste during 1960 to mid-1970s;
- (2) Increasing levels of food waste, mid-1970s to end-1990s; and
- (3) Decreasing levels of food waste since 2001.

One main significant observation made by Allen et al. (2016) is that, although the generation of food waste in the commercial stage aggregates a considerable contribution to food waste, the recycling rate is also high. Allen et al. (2016) point out that of the 19.96 million tons of food waste produced at the commercial stage, 52% is recycled as animal feed, 13% is recycled as compost, 3% is recycled as energy, 12% is reduced through dehydration treatment, and 19% is treated by incineration or disposed of in landfills.

Multiple factors contribute to the scale of food waste in Japan. The articulation of institutional/legal frames with policy frames that address this issue has to effectively adapt the country's high level of economic development, the changes of population and the employment structure, as well as the shifting in consumption patterns. When Japan's Environmental Agency was upgraded to a Ministry in 2000 (the Ministry of the Environment, MOE), the focus of its waste management and recycling policy shifted from sanitation and disposal to resource utilization. In this sense, the need of food education should be encouraged since there is a lack of connection between producers and

consumers, where lambda citizens remain unacquainted with the causes and consequences of food waste.

The authors of this paper humbly suggest that further efforts are needed to systematically reduce and recycle food wastes generated particularly at the consumer/household level. In order to achieve this, strengthening of food waste laws/regulations through local policies like in the Atsugi case to better highlight waste prevention is one possible strategy among others. Therefore, a synthetic study of the Japanese food loss and waste reduction law (recycling law) is pertinent to be presented first, as follows.

3. The Japanese Act on Promoting Food Loss/Waste Reduction: Preventable and non-preventable food loss

In Japan, in the 1990s, the notion of Sound Material-Cycle Society was stressed for waste management and recycling policies with the aim of increasing resource efficiency and productivity. A Sound Material-Cycle Society would be a society in which the consumption of natural resources would be conserved and the environmental charge would be reduced to the greatest extent possible. Particular elements associated with sustainable consumption and production (SCP) were incorporated in this strategy. Several existing and new measures were included within the framework of the “Fundamental Law for Establishing a Sound Material-Cycle Society” (2000).

As Shekdar (2009) and Hotta (2011) suggested, Japan was one of the first countries to address food waste and food loss by introducing a policy initiative focused on food waste management. Following the “Fundamental Law for Establishing a Sound Material-Cycle Society”, in 2003, there was a “Fundamental Plan for Establishing a Sound Material-Cycle Society” which was more precise.

It established targets, designated roles for stakeholders, and provided guidance to encourage individual collaboration.

Later on, since the “Law for Promotion of Recycling and Related Activities for Treatment of Cyclical Food Resources” (“Food Waste Recycling Law”) was enacted in 2001 (Ministry of Agriculture and Fisheries, MAFF, 2013), an array of measures have been incorporated at the institutional level to address these challenges. For example, official surveys with government reports on food waste among food manufacturing companies, as well as among households were achieved; and notably academic research by Japanese scholars has been carried out. Allen et al. (2016) acknowledge Shoji (2014) who provides a sketch of the current status and future outlook on food waste recycling; Sakai and Yano (2014) who provide an outlook for municipal solid waste management strategies; Takata et al. (2012) who assess the environmental and economic efficiency of food recycling facilities, among the main scholars on the food loss/food waste question. As for the matters of this paper, the authors give particular attention to Sakai and Yano (2014) to enrich municipal initiatives on solid waste management.

Once enacted, the Japan’s Food Waste Recycling Law was revised twice, in 2007 and in 2015. After a 5-year implementation period, it was made executable in 2020. The main target of this law concerns food waste generated by food related industries requiring these actors not only to promote the reduction of food waste but also, the recycling of food. Along with the target of this law, MOE and MAAF have fixed recycling/reduction targets to evaluate the performance of food-industries. In this last case particularly, large-volume generators of food waste, those food manufacturers/food businesses that generate more than 100 tons per year, became a target for a “periodic reporting system.” In addition, the government calculated a “reference

generation unit” which measures the specific generation of food waste per volume of sales, production, etc. for each of the manufacturers/business in order to identify the most suitable reduction/ (non) prevention target.

As for what concerns reduction/ (non) prevention targets, Arshadi et al. (2019) have developed extensively what does each strategy should encompass. It should be considered reduction of preventable food waste:

- (i) Evaluation of consumer habits and awareness with respect to food consumption and food waste;
- (ii) Improvement of stock management and marketing strategies;
- (iii) Increases in food shelf life through the use of active and sustainable food packaging; and
- (iv) Utilization of biodegradable food packaging.

On the other hand, it should be considered valorization of non-preventable waste:

- (i) Fractionation, reutilization and valorization of non-preventable waste from the manufacturing sector;
- (ii) Bio-refinement of non-preventable waste streams for the production of products ranging from specialties to commodities (including food additives, chemicals, biodegradable polymers, etc.);
- (iii) Development of processing schemes based on case-specific life cycle steps of a chosen food supply chain;
- (iv) Creation of cascade processing, (re-utilization of products generated from a waste stream); and
- (v) Simultaneous assessment of proposed valorization technologies through multi-objective optimization.

Another strategy introduced by the government that complements the Japan’s Food Waste Recycling Law is the certification system for a business

plan on recycling called “Recycling Loops.” Under such initiative, three groups of food-related industries/businesses are invited to form a waste exchange network qualified for government certification. Upon being certified as a “Recycling Loop”, businesses are entitled to an exemption from regulations on loading/unloading of food waste as authorized under the Public Cleansing and Waste Management Law. Moreover, in order to promote the recycling of food waste, the government introduced a certification system for animal feed comprised of food waste called “Eco-feed”, as well as for fertilizers and agricultural products which use food waste. It is called the “Food Recycle Mark” certification. Parry et al., (2015) also picture the Japanese strategy “No Food Loss Project”, which is jointly conducted across six Ministries and aims to reduce food waste at all stages of the food supply chain. All these are examples of complementary strategies to the Food Waste Recycling Law that take place at the macro level of action. Now, an example of bottom-top complementary policy will be developed in detail.

4. Assessing Food Loss/Waste in Atsugi City

There is a meaningful gap between the ways individuals and institutions make policy. A review of Cerna (2013) suggests that policy research is concerned up to 65% with the education sector. However, other policy areas such as environment and health have increased also in the last years (Cerna 2013 citing Saetren 2005).

Cerna (2013) suggests that the fact that makes the local implementation of policy difficult (particularly in education or environment) is the fact that individuals focus on agents’ sense-making with regard to reform initiatives. Cerna (2013) explains that the framework of local policy implementation

considers three aspects: individuals and their beliefs and experiences, the importance of the context, and the role of external representation in the sense-making process. Complexity of sense-making is substantial since sense-making goes beyond decoding policy messages but is rather “the process of comprehension as an active process of interpretation that draws on the individual’s rich knowledge base of understanding, beliefs and attitudes” (Cerna 2013 citing Spillane, Reiser and Reimer 2002).

However, many implementing agents are neophytes and thus miss deeper interconnected relationships. The social context influences the ways in which make sense of policy is made and the challenges of implementation differ given the level of social change, ranging from incremental change, change requiring growth on the part of those undertaking change and change that represents loss for the implementing agent (Cerna 2013 citing Marris 1975). Therefore, it is not surprising that the more essential changes are sought, the more existing frameworks need to be restructured (Cerna 2013 citing Spillane, Reiser and Reimer 2002). Cerna (2013), Majone and Wildavsky (1978) have claimed that implementation equals evolution. According to Fullan (2007), nine critical factors affect the implementation of policy. They vary from characteristics of change (need, clarity, complexity and quality/practicality), local characteristics (district, community, etc) to external factors (government and other agencies). Thus, change is a dynamic process which involves interacting variables over time.

In this section it is going to be assessed the policy that led Atsugi to be able to adopt Microbial Waste Reduction “Trash” Unit as well as the further continuing reinforcing/supporting policies within Atsugi’s environmental policy department. Four aspects are going to be evaluated. First two aspects concern

4.2.1 Discussions with City officials at City council (including questioning time)

and 4.2.2 Public policy process concerning the adoption of “Trash” in Atsugi. Second two aspects concerning supporting policies are 4.3.1 Inspection of prior examples of supporting policies (including questioning time at City council) and 4.3.2 Public policy process after “Trash” in Atsugi.

4.1 Ministry of Environment adopts Atsugi’s project

Ministry of Environment adopted Atsugi City’s project as a “School lunch food waste measure model project” on 9th April, 2021. MOE rendered public offers to launch projects subscriptions in terms of food waste measures to local governments and companies by the beginning of March.

Is important to consider that Japan’s total food waste is as follows.¹⁾ Food waste as recalled earlier is abandoned edible food.

	2017 fiscal year	2018 fiscal year
Total of food waste	6,120,000 ton	6,000,000 ton
Business garbage	3,280,000 ton	3,240,000 ton
Household garbage	2,840,000 ton	2,760,000 ton

Ministry of Agriculture, Forestry and Fisheries released data on 27th April, 2021

The model projects which the Ministry of Environment adopted are as follows.

1) As Japanese government announced on 27th April, 2021.

Field I (Food loss reduction, Food recycle model project)

	Name of project	Outline of project
Kawasaki City, Kanagawa Prefecture	“Nutrition cycle community” creation project	Composting of household garbage.
General incorporated association Loss reborn center	Reduce and recycle of liquid milk	REDUCE Development of cooking with liquid milk and establishment of sales routes. RECYCLE Establishment of expired freshness date of liquid milk in sales route as is being disposed.
JEMS Co., Ltd	Discharge rule for food garbage at supermarkets	Simulation of discharge rules at supermarkets.

Field II (mottECO introduction model project)²⁾

	Name of project	Outline of project
Gunma Prefecture	mottEco introduction model	Use of a bag to take home leftovers from restaurants.
Seven & i Food Systems Co., Ltd. and Royal Holdings Co., Ltd	Consistence of “food loss reduction” and “Non plastic society” project through mottEco	Major restaurants lead “mottEco project” and encourage to change behavior of consumers. The purpose is to recreate taking home leftovers culture. Also, use of 100% plant based container. Consistence of “food loss reduction” and “Non plastic society”.

2) mottEco is mean to use a bag to take home leftovers from restaurants. Ministry of Environment recommends.

Field III (Food garbage zero area model project)

	Name of project	Outline of project
Kyoto City	Kyoto City food garbage zero area model project through the extension of sales limit and so on	Recommendation for companies and consumers to buy food which is closed to the freshness date.
ABC Style Co., Ltd	Food garbage zero area model project at ABC cooking studio	Use of food garbage for lessons at ABC Cooking Studio all over Japan; free provision and internet sales. The object is to achieve zero disposal.

Field IV (School lunch food waste measure as the model project)

	Name of project	Outline of project
Atsugi City, Kanagawa Prefecture	Prevention and reduction of food garbage from schools	“Energy change through methane fermentation”. It is biomass power generation. Also use of Microbial waste reduction unit. Both are used for schools. In addition, city officials visit schools and give lectures. Garbage disposal sites tours among pupils is carried out for environmental education.
Mie Prefecture	Mottainai	Through several kind of experience activities, pupils and students reduce leftovers. Establishment of a network and system of food garbage composting. Enlightenment of food loss reduction to citizens. Enhance awareness to pupils and students.

[Source] “Results of adoption of food loss reduction / food recycling promotion model projects, etc. by local governments and businesses in Reiwa 3” (Ministry of the Environment) .

The population of Atsugi is 223,678 inhabitants as in March, 2021. All other adopted local governments projects concerned prefectures or ordinances in designated cities. The reason why Atsugi's model was elected to be implemented nation-wide/domestically is that "It seems there is no other clear example of all thirty-six elementary schools and Jr high schools in one single local government that tackles the issue like Atsugi. The numerical data will be published later."³⁾

The Atsugi's project can be studied as "Energy exchange through methane fermentation". That is, biomass power generation. In technical words, bio-economy. This is what was proposed by city officials. The costs to Atsugi are of 300 yen per 1 kg of raw garbage.

In terms of energy exchange through methane fermentation, there is an example in Nagaoka City, Niigata Prefecture. However, although household garbage has been reduced by 30%, it seemed rather difficult to answer/measure about the exact counting of reduction.

Machida City, in Tokyo has stopped a similar facility project for many times. In terms of questioning "are the measures to reduce food waste/loss exact or not?" their reply was "we do not know whether we have calculated accurately for several years or not".

One economic advantage of biomass power generation is that it is not necessary to do a big investment such as is the case with oil. Local government collects raw garbage as their work. On the other hand, the demerit is that biomass power generation depends only on raw garbage. In the case of Nagaoka, due to the quantity, the operation of optimal transformation rate

3) Hearing to Ministry of Environment on 12th April, 2021

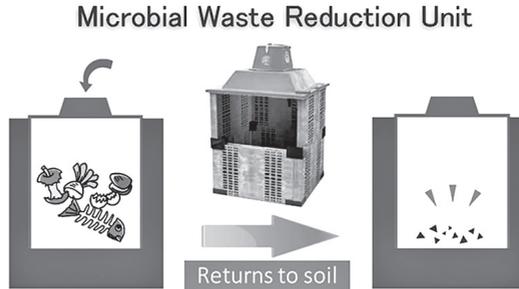


Figure 1

is 60%. If businesses' garbage does not increase, the operation of optimal transformation rate risks from becoming more severe.⁴⁾

The garbage disposal unit that transforms trash proposed by Atsugi developed since 2020 as visiting lectures offered by city officials in charge of global warming education at elementary schools have been presented. The Garbage disposal site tour is an environmental study targeting fourth grade pupils. By the beginning, only some elementary school visited the site, all of elementary schools have started to visit such places since 1988.

4.2 First level of governance “Policy-driven and Industry-driven”: Microbial Waste Reduction “Trash” Unit

Atsugi implemented the Microbial Waste Reduction “Trash” Unit in four Jr. high schools in the 2020 fiscal year (See Figure 1) . Raw garbage is cleared naturally by bacteria in soil through this facility.⁵⁾

4) H. Takada interviewed Nagaoka Biomass power generation center on 6th February, 2020

5) H. Takada saw this facility at an event “Eco Product 2014, Tokyo Big Site” for the first time on 12th December, 2014.

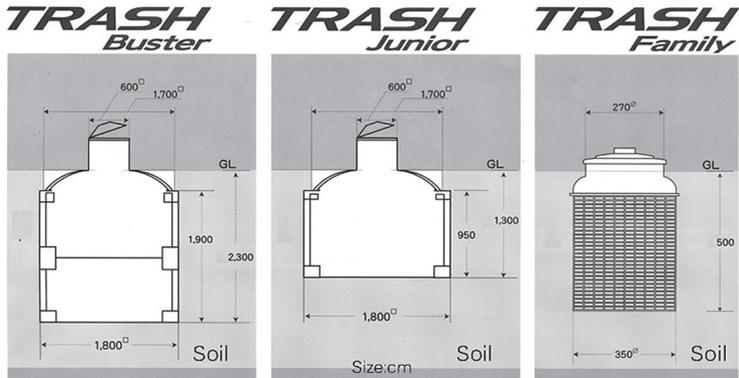


Figure 2

School lunch centers, universities, nursery schools, welfare facilities, hotels and so on are places where the introduction of TRASH is being examined. There are examples of small island local governments in Tokyo and Okinawa Prefecture as well.

There are three types of TRASH: Buster (volume 4 tones) , Junior (volume 1.5tomes) and Family. H.Takada proposed the introduction to Atsugi City in question time of city council, on the other hand, he has established four Trash Family in his garden for its demonstration since March 2018.



The way of use is just to put food garbage in it. Smell only happens if its cover is opened. Also, any insect comes out.

However, the quantity of decrease has gradually gotten fewer. By the beginning of September 2019, the height of food waste in the Trash Family is the same as that of the surface. After it becomes full, another unit should be used. According to the company, four pieces of Trash Family is proper for four family members.



Following numbers are the transition of food waste that have been reduced naturally in the Trash Family.

1 st August, 2019	0 cm
1 st September, 2019	11 cm
1 st October, 2019	17 cm
1 st November, 2019	18 cm

In Japan, usually, local governments burn garbage. Even if companies or schools purchase this facility, it will be not necessary for them to pay local government as a garbage disposal cost. In addition, it is linked to CO2 reduction directly.

Facility	Garbage quantity	Cost for carrier	Cost for burn
4 schools	12,475.3 kg	960,597 yen	311,882 yen

$960,597\text{yen} + 311,882\text{yen} = 1,272,479\text{yen}$. The budget will be not necessary after 2021 fiscal year.⁶⁾

6) Hearing from school lunch division of Atsugi on 28th April, 2021.

Atsugi City established four Trash Buster in four junior high schools in 2020. As an important result, the budget 1,272,479 yen will be not necessary after the 2021 fiscal year.⁷⁾

The establishment costs for every type of Trash are as follows:

	Base price	Average Installation cost	Carriage
Trash Buster	1,650,000 yen	220,000 yen	
Trash Junior	1,078,000 yen	165,000 yen	
Trash Family	19,800 yen		1,500 ~ 2,000 yen

Even if an initial cost is needed, it can be payed back a few years later. The meaningful result is that the establishment is going to contribute to the budget of Atsugi City as a manner of trade-off. In addition, it is linked to CO2 reduction directives.

The process of how Atsugi decided to introduce the Microbial Waste Reduction “Trash” Unit and how it plans to embed it in is further development of support environmental policies is described in four steps (4.2.1, 4.2.2; 4.3.1 and 4.3.2) as follows.

7) Hearing from school lunch division of Atsugi on 28th April, 2021.

4.2.1 Discussions with City officials and questioning time at City council

2016

17th March, four Atsugi city officials and H. Takada visited a worldwide company Anritsu. Anritsu develops communication systems. The head office is in Atsugi. Following is from question time on 29th February.

H. Takada: Two years ago, I saw a huge microbial waste reduction unit at Tokyo Big Site. Every school, Atsugi City Hospital, nursery school and so on put out food waste. Why don't you have a look at and research the unit? One of the companies in Atsugi has established the unit.

Chief director of environment and agriculture Masao. Yano: We recognize the necessity of countermeasures for food waste. There is a high ratio in burnable rubbish. It is important for the aspect of garbage disposal budget reduction. We will research those examples.

2017

Atsugi City Officials showed their intention to introduce Trash to a new school lunch facility which will be built in June, 2022. The question time on 1st March was as follows.

H. Takada: In February, 2016, I asked you a question in terms of a huge microbial waste reduction unit. Do you have any countermeasure for leftover at schools?

Chief director of education general affairs Akio Kato: There are several ways to process food waste. I have heard a company in Atsugi

City uses a microbial waste reduction unit. We are going to refer this kind of example and choose the best way for our new school lunch centre project.

2019

H. Takada had a meeting with the superintendent of education of Atsugi and other officials on 29th August. The subjects were new educational guidelines (notice: March, 2017) and Trash. Three effects of microbial waste reduction unit introduction were shown there. They were “contribution to city’s budget”, “contribution to running cost for garbage disposal site”. and “environmental education”.

H. Takada proposed to introduce TRASH to each school. The price is about 2 million yen per unit. The superintendent of education reacted as “One unit costs 2 million yen? It is difficult to take that into the budget”. H. Takada told that the initial investment is 2 million yen. Although, since budget for garbage disposal will be not necessary for schools, this unit can generate a profit after 4 or 5 years.

During Question time at council meeting on 6th September, H. Takada used numeric data of raw garbage quantity and its cost. The expected saving budget effect was shown if the unit was introduced in the 2018 fiscal year.

Facility	Garbage quantity	Cost for carrier	Cost for burn
Atsugi City Hospital	31,283 kg	1,220,000 yen	563,000 yen
North school lunch centre and South school centre	4 8,654 kg	204,3468 yen	875772yen
17 elementary schools which has own school lunch centre	111,383 kg	6,237,448 yen	2,004,894 yen
Nursery school	9009.2 kg	801,819 yen	162,166 yen

There are 23 elementary schools and 13 Jr high schools in Atsugi.

Atsugi City Hospital responded negatively. On the other hand, city officials in charge of schools or nurseries were positive. They stated “We would like to discuss with the garbage disposal site department”.

Education board made it a subject for discussion at monthly principal meetings in November.

4.2.2 Public policy process concerning the adoption of “Trash” in Atsugi

Based on the discussions of Atsugi City Council, Atsugi City started to discuss about the introduction of TRASH. The policy making process inside of Atsugi is as follows. In addition, in this kind of case, local governments do not invite nor welcome opinions from the public and/or citizens.

2019 fiscal year

May

Discussion between garbage disposal site department and education department about food waste towards 2020 fiscal year budget planning.

September

They decided future trends to take advantage of Biomass energy and Microbial Waste Reduction Unit Trash both.

October

Budget planning. Including them in the 2020 fiscal year budget.

November

Education department explained them at monthly principal meeting.

December

Education department investigated the will of introduction of TRASH.

January

Garbage disposal site department and education department discussed about schools where Biomass energy and TRASH would be introduced.

February

Discussing the budget for the 2020 fiscal year.

March

The budget was given final approval by city council.

2020 fiscal year

April

Preparation for materializing the policy started.

February

TRASH was established at four Jr high schools.

In the 2019 fiscal year, the burnable rubbish was 55,153 tons. As its breakdown, household garbage was 35,777 tons and business related garbage was 19,376 tons. The estimated record ratio of food waste including humidity was 44.77%.

Because after the 2021 fiscal year Atsugi City will not put out food waste from all of 36 schools, Atsugi City Hospital and nursery schools, 1% of business related garbage, that is, 19,376 tons can be reduced. Since the reduction of garbage is quite difficult, 1% is definitely not a small number. The purpose of

the policy, the proportionality (cost-benefit) is the factor of decision making for Atsugi City to introduce TRASH.

Atsugi City will be able to pattern itself on companies and citizens. A subsidiary policy to the main policy is that Atsugi City has already the subsidy system of Trash Family to citizens. In the future, the subsidy system of Trash Buster and Trash Junior to companies will also be considered.⁸⁾

4.3 Second level of governance “Civil Society-driven”: Atsugi City Officials environmental visiting lectures to elementary schools

Two city officials from the environmental policy department visited three elementary schools and gave lectures about global warming during October and December, 2020. This is based on question time at council meetings in December, 2019.

“Easy to understand. Everyone responded well including those who did not raise their hands”. This is a comment of a class teacher.

As the result of global warming, the city official said “Sea level might raise up 1.1M” and she compared its length and height to that of a pupil. In terms of forest fires, a burned koala in Australia was used as its example. Most of pupils reacted “I know these news”.

Finally, every pupil wrote a “what I can do” list as challenge declaration. This is a practical example of active learning which is mentioned in the new educational guidelines. A more comprehensive portrait of this stage of policy is

8) Hearing from Garbage disposal site department on 24th June, 2021.

detailed as follows.

4.3.1 Inspection of prior examples and questioning time at City council

Kashiwazaki City, Niigata Prefecture has carried out environmental education since 2017. This is a city official's visiting lecture in terms of global warming. Environmental division visited every school directly and promoted the lecture. They asked Education board to check "Environmental notes" which were distributed to pupils. The actual lecture is that a city official shows images on a large screen and pupils write answers in a paper.

As an example, Q1 is "What is the reason of global warming?". The correct answer is "CO2". The final Q5 is "What can you do to stop global warming?". Pupils are given for five minutes and they can talk to other classmates. After that, several pupils show their hands and share ideas. Finally, the city official said "Please tell your parents what you wrote today".

Kashiwazaki locates this environmental education program as a Warming measure plan. They located it in March, 2013. In Kashizazaki, several elementary school 4th grade pupils visit garbage disposal sites. This is a part of the policy that is complemented by the environmental education program. In addition, since teachers lead pupils to the site, it is easy to suggest the program to every school.⁹⁾

9) H. Takada visited Kashiwazaki twice. For the first time, it was a hearing about the program on 30th October, 2019. Next, it was to see a class at Handa Elementary school on 6th February, 2020.

Based on these observations, H. Takada suggested to carry out the same kind of lecture during question time, the answer he got was “We would like to carry it out”. Following is the content from the question time on 5th December, 2019.

H. Takada: In Kashiwazaki City, Niigata Prefecture, the civil servant of garbage disposal sites gives lectures at elementary schools in terms of global warming. The educational committee assists to modify the documents for pupils. The garbage disposal sites do not ask the educational committee and approach directly to schools. Why don't you refer this case?

Chief director of environment and agriculture Masanobu Umezu: It is important to get environmental education. They will consider environment in their future. We would like to carry out at schools this hope.

In this answer the political will to carry out environmental education as it was being the case, and extend it was clearly visible. Political will is definitely important when developing a policy since is the element that can lend to debate in policy making.

4.3.2 Public policy process after “Trash” in Atsugi

The environmental policy division of Atsugi prepared the education guidelines in 2020. In order to build a sustainable society, two purposes were established. One of them is that pupils will know the effects of global warming. Another one is to educate them with the necessary actions society can do to tackle such effects. The lecture is as follows.

Sample Timetable

45 minutes lesson

durations	items	Details
10 mins	Introduction 'impact of global warming'	What is 'global warming'? Why does it matter to our lives? Explaining about global warming by using images and PowerPoint slides.
10 mins	Quiz	What causes global warming? Students answer some three-choice quizzes about global warming.
10 mins	Game	What should we do to stop global warming? Students choose 'action cards' which they think are good for environment one by one and tell others the reasons why they pick them.
10 mins	Summary	Introduce some action models to stop global warming. Introduce Atsugi City's efforts to environment.
5 mins	Declaration	Students make their own challenge cards, which are environmentally friendly, and share with classmates.

※ We will contact schools in advance to discuss about the prevention of the spread of COVID-19 at school.

※ The timetable is an example.

After the Environmental policy division receives requests from school, their preparation is as follows.¹⁰⁾

10) Interview from Environmental policy division on 22nd April, 2021.

Overall flow of the class of environmental issues (global warming).

- 1 Elementary school teachers (grade 4 to 6) initiate a phone call and send an application form by FAX to Environment Policy Division.
- 2 After arranging a schedule, instructors contact teachers at school and discuss about the details (e.g. a parking lot, number of students)
- 3 Teaching materials are sent to the school and be checked by teachers in advance.
- 4 An instructor gives a trial lesson in front of colleagues at the office. If there are indications, the materials will be revised.
- 5 Two instructors teach classes alternately, especially if there are more than three classes.
Handouts should be ready for each class.
- 6 Teachers are asked to answer questionnaire to improve the class.

5. Conclusion

Japan's current legal and policy frameworks comprise different stages of food waste along the whole food supply chain. Nevertheless, considering the intricacy of food loss/food waste issues, more supportive policies are necessary, such as including socio-economic and cultural aspects of food consumption arrangements. Policies that reflex a good degree of implementation, awareness and connectivity (with both, connectivity with other disciplines, and connectivity among food producers and food consumers), like the Atsugi "Trash" unit model adopted by the MOE, are the ones that can effectively harmonize solutions to the food loss/food waste multifaceted problem.

As developed by the authors, designing strategies that do not contribute to the fragmentation of the possible solutions to these issues is overall suggested. Not only to strengthen food waste laws/regulations, to wide their scope to cover all stages of the food supply chain but also, to further develop

local solid waste management, should all be measures that can be integrated within food education programs promoting cross-sectoral alliances in order to encourage achievement of commitments. This is why the multi-level of governance approach is important as both: as means of study and strategy of overcoming challenges more effectively with regards to policy and governance tailoring since all relevant stakeholders could then take part. Is a means of enhancing rational choice.

According to the Ministry of Environment, the number of “2050 carbon neutral expression” local governments are 414 in Japan as of 25th June, 2021. This is 87.3% of the total population of Japan. However, it is the fact that concrete measures taken now, concern future issues and also, national/international engagements. Atsugi City’s model of zero food waste from school lunch which was adopted by the Ministry of Environment is going to be one of its concrete measures for other local governments and companies.

There are a couple of suggestions in terms of food waste reduction as future progress. At first, it is to consider the Japanese commercial custom. The second, is the evident need of a Local Council for the Promotion of Environmental Education.¹¹⁾

In Japan, there is a commercial custom which is called “1/3 rule” between food makers and shops. In case goods could not deliver to shops until its 1/3

11) Refer “Act on the Promotion of Environmental Conservation Activities through Environmental Education”. In the Article 8-2 is as follows. Article 8-2 (1) The prefectural and municipal governments that intend to formulate the Action Plan may organize a council for the promotion of Environmental Education, etc. in order to discuss the formulation of the Action Plan and to coordinate the implementation of it (hereinafter referred to as the “Council”).

freshness date, there is no other place they can go.

Accordingly, the Ministry of Agriculture, Forestry and Fisheries supports to establish a “Commercial custom consideration working team for food waste measures” among food makers and shops. Although large supermarkets, convenient stores and alike establishments have begun to develop this measure, it is still in an initial stage. As an example, Osaka Prefecture has established the strategy “Food Loss reduction plan section” in its environmental council.

The second subject, namely, a Local Council for the Promotion of Environmental Education can expect to develop concrete improvement measures and information sharing. Citizen’s behavior patterns change is necessary for food loss reduction as well.

In 2019, a Food Loss Reduction Promotion Act was dispensed. The article 7 is as follows. “The State, local public entities, enterprisers, consumers, bodies performing activities for food loss reduction and other interested persons shall seek to cooperate with one another in the synthetic and effective promotion of such reduction, keeping in close contact”. However, it does not mention about the ways and means of cooperation. It is possible for local governments to create new ideas at the Council for the promotion of Environmental Education and to further include consumers in the public policy development to enhance feasibility, transparency, legitimacy and democracy.

The concrete measures of environmental policy are still being tried out. This is a fact in most local governments. There is data that supports this. The National Institute for Environmental Studies published an “Investigation

of environmental policy among local governments” in September, 2008. The result was that, the most difficult factor of policy making and its carrying out is “shortage of necessary personnel”. On the other hand, according to Ministry of Internal Affairs and Communications, total number of local civil servants as compared between 2005 and 2015, has been reduced but the total number concerning the environmental section has increased and is expected to go on the same tendency. Those contradictory investigation results show the fact of difficulty in policy making.

How can we make a rational choice with no symmetry in information? How to best deploy the tools of policy if there is no coherent data? In this regard, the hypothesis following the “TRASH” policy process making that :

“A Local Council for the Promotion of Environmental Education is a more effective way to redress policy and governance flaws by means of mutual feedback with the stakeholders involved, because it holds the advantages of a multi-level governance process”

Proves itself correct.

This is a kind of multi-level governance that needs to be considered.

Itabashi Ward and Hokkaido have taken advantage of the Council for Promotion of Environmental Education positively.

Also, Anritsu Corporation in Atsugi has introduced TRASH to restrain raw garbage. The Company’s activity will be the subject for Environmental

education and Corporate Social Responsibility. There must be other good examples among other companies as well. At this stage, people in Atsugi do not know about the activities of citizen groups, schools, or companies in Atsugi towards the environment.

The most important point is coherent information sharing among citizens, as well as among government agencies. This is where the main debate holds in this paper: a conciliation of policy making with the means of governance. While public policy consist of the set of actions, plans, laws and behaviors adopted by a government; governance draws attention to the extent to which these actions are performed now by agents of the State rather than directly by the State. The main focus of this article is the debate on the concept of local environmental governance (LEG) as a tool for empowering the local communities through the decentralization of decision making as well as the attempt to find implemented normative and institutional structures within the context of environmental education (food waste law and policy as one axe, among other environmental concerns) which can translate aspects of LEG.

Cities, towns and villages can provide consumer education programs to students and citizens. Citizens can influence to food makers, even overseas, by their daily choices. An example is the considerable quantities of food waste (notably considering the packaging) that are generated by supply chains outside of Japan. In the light of Japan's reliance on food imports and in the light of the conclusion of "Mega" regional trade agreements, these chains require their own analysis too.

However, despite the importance of the subject both domestically and

internationally, there is only a few number of local governments¹²⁾ (five) which have already established officially a Council for the promotion of Environmental Education. The way of establishment such necessary Councils remains a future subject of study.

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12) According to Ministry of Environment, Hokkaido Prefecture, Akita Prefecture, Yamagata Prefecture, Aichi Prefecture and Shiga Prefecture have established the Council for the promotion of Environmental Education. Recently, Atsugi became ready to establish it in September, 2021.

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