1. Introduction

General

The City of Kitakyushu has developed as a major industrial city since 1901. Today, the population is 1.02 million and area is 470km^2. Because it has dramatically overcome severe environmental pollution from industrial activities, Kitakyushu is now known as an "Environmental City."

Jurisdiction & Organization

The City of Kitakyushu is a designated city and has authorities over most environmental management policies such as air, water, and solid waste, etc. The Mayor of Kitakyushu and the city councilors are directly elected by general election. Solid waste management including the monitoring of industrial waste management is the responsibility of local government in Japan. This decentralization has been promoted as well as financial support from national government for constructing solid waste management facilities.
The Environment Bureau is in charge of solid waste management and is comprised of about 600 people. Waste collection services are implemented by city government staff and private contractors

Finance

The City's general budget (revenue) comprises 29.4 %: city tax, 29.7 %: subsidies from the national and prefecture governments, 11.7 %: city debt, and etc.
The budget of Environment Bureau (17.6 billion yen) is about 3.3 % of the general account.
Half of the budget for solid waste management comes from general revenue. Users' fees and subsidies from prefectural and national governments form 18 % of the budget

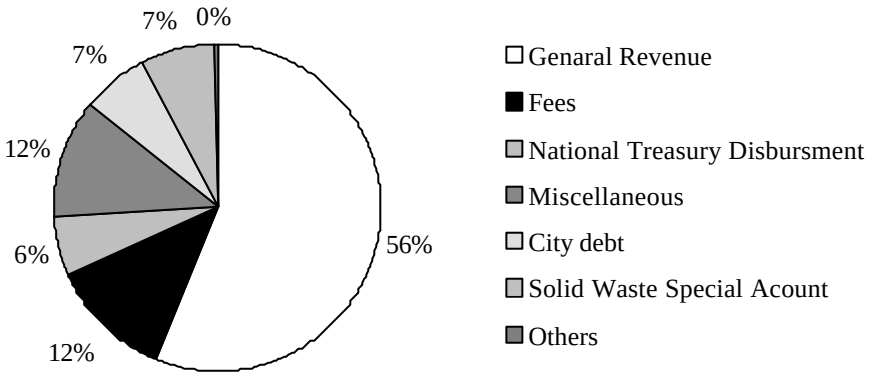

Figure. 1 Income for Solid Waste Management in 2001

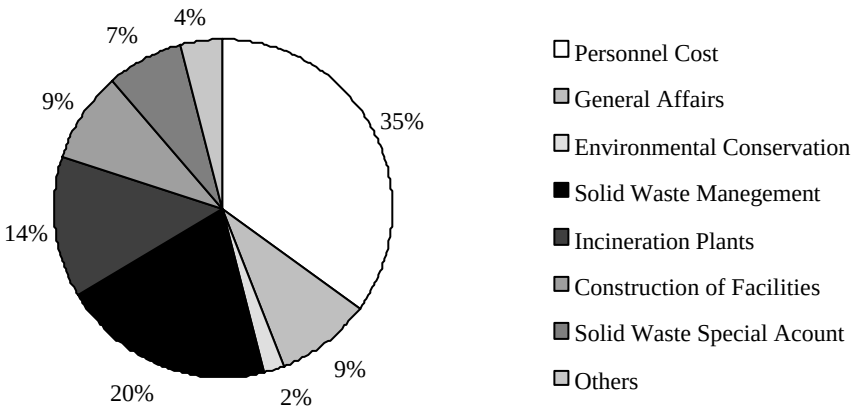

Figure.2 Expenditure for Solid Waste Management in 2001

The City of Kitakyushu has electric generation facilities at 3 solid incineration plants and gets the benefit from selling electricity amounting to 7 % of revenue. One third of the expenditure covers personnel and another third covers collection services and facilities.

2. Current State and Management

Generation & Collection

The amount of solid waste generated per year has increased to 3 times what it was in the early 1960s. At present, the amount of solid waste per capita per day is 1,400g, almost equal to the average of major cities in Japan. However the recent trend in solid waste generation per capita among major cities for the past couple of years has been flat.

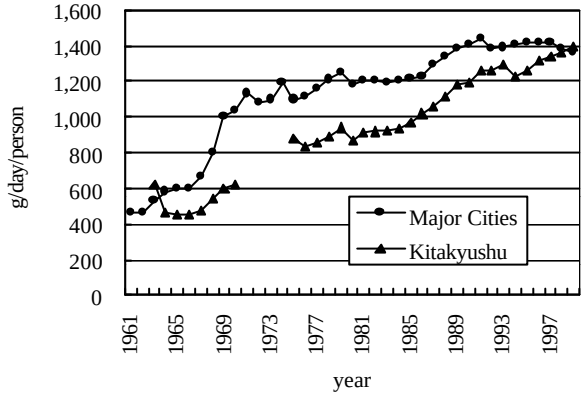

Figure.3 Solid Waste Amount per Capita

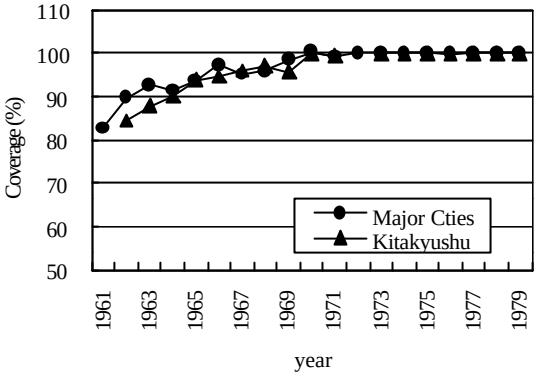

Figure.4 Coverage of Solid Waste Collection Service

In Japan, municipal governments are collecting domestic wastes. The coverage of collection services has been increased and achieved 100 % in early 1970s.

Composition & Disposal

Knowing the nature of solid waste generation, such as its amount and characteristics / composition, including caloric value, is a fundamental management activity. The City of Kitakyushu conducts quarterly analysis of domestic waste composition. The results of analysis are indicated in Figure.5 and Figure.6. As shown, paper has the largest portion equal to 40% followed by plastic (20%). Total of both wastes is almost 60% of domestic waste.

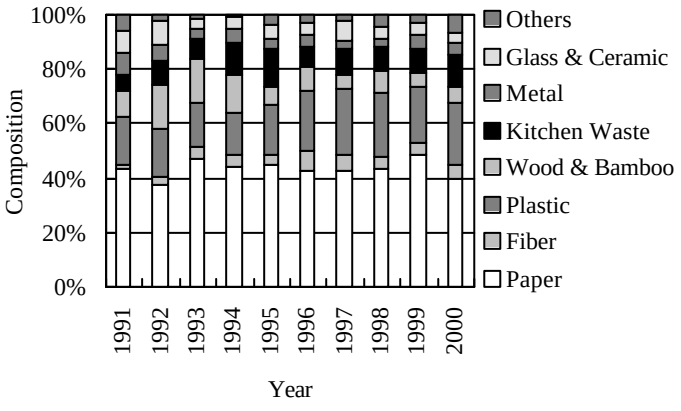

Figure. 5 Composition of Solid Waste (Domestic)

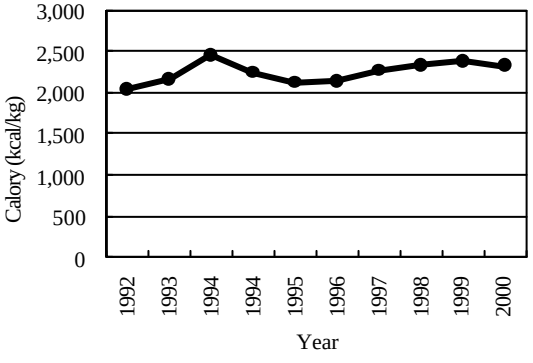

Figure.6 Calories of Domestic Waste

The City of Kitakyushu has conducted a field study of solid waste composition in a certain Asian city. The majority of solid waste in that city was kitchen waste. The characteristic in compare with Kitakyushu's composition is that kitchen waste is 5%. This difference in solid waste composition results from differences in lifestyle and other circumstances. In that city, kitchen waste portion in domestic solid waste was 70 % in 1990. This tendency of change in solid waste composition goes hand in hand with urbanization. Due to the high volume of paper and plastics, the calorific value of domestic waste in Kitakyushu is more than 2,000 kcal/kg. This means that combustion with no extra fuel can be done and energy recovery is very important and useful as a part of solid waste management.

Solid waste management flow is indicated in Table 1. The solid waste generated by households, after picking up some such as paper and cloth by citizens themselves, is separated into types for better resource utilization and collected by city governmental services. Some part of those waste are recycled. The others are disposed of at landfill sites after incineration.

Table 1 Solid waste management in Kitakyushu (Example)

House	Category	Collection	Intermediate Treatment	Final State
Paper (*)	Recycling, Selling	Community Private Enterprise	Recycling	Selling recycled paper
Cloth	Recycling, Selling	Individual / Community Private Enterprise	Recycling Export	Selling new cloth
		Flea Market	Reuse	Reuse
Can	Recycling	City (separate collection)	Selling for private enterprises	Private enterprises sell it as raw material
Bottle (Glass)	Recycling	City (separate collection)	Selling for private enterprises	Private enterprises sell it as raw material
	Returnable	Individual or private enterprise	Private enterprises treat it for reuse	Reuse
Bottle (Plastic)	Recycling	City (separate collection)	Private enterprises' processing	Private enterprises sell product one as raw material
Plastic Tray & Milk carton (paper)	Recycling	Individual: home to shop/market City: after shop/market	Private enterprises: processing	Private enterprises sell processed one as raw material
Home Appliances	Recycling	Individual or private enterprise: home to shop Official contractor: after shop	Private enterprise / Kitakyushu Eco-town: processing	Separated material: sell as raw material
Fluorescent lamp	Recycling	Individual or private enterprise: home to shop Private enterprises: after shop	Private enterprise / Kitakyushu Eco-town: processing	Private enterprises sell processed one as raw material Using
Kitchen Waste (**)	Disposal	Same as others	Same as others	Same as others
	Recycling	Composing at home	Composing at home	Use as fertilizer
Bulky Waste	Disposal	City on demands Private enterprise & Individual	Crash & same as others	Same as others
	Reuse		Repair	Selling at Recycle Plaza
Others(***)	Disposal, Thermal-Recycle	Individual: home to station City: station to plant City service: twice a week In plastic bag (pay bag)	Incineration with Thermal recovery as electricity	Final Disposal at Controlled Sanitary Landfill Recovered electricity: sale!

(*) Recycling/selling depends on the market price.
(**) A small portion of waste is recycled by individual activities..
(***) Some types of solid waste (domestic waste) are managed by different systems. They are not listed In this table.

Collection services are being provided 2 times a week at community collection. Citizens are requested to bring their waste to the sites. For solid waste recycling, collection service is once a week. Waste accumulate at collection sites are collected by Kitakyushu City within that day and transferred to the appropriate plant such as one of 2 recycling plants or 3 incineration plants. The collection service coverage has reached 100 %.

The City of Kitakyushu has 4 "Environment Centers" to find out citizens' needs and promote dialogue between the city and its citizens for better solid waste management. These Environment Centers also manage solid waste collection services including collection vehicles maintenance and collection schedules arrangement. Environment Centers have each responsible area.

Citizens' Activities

In Kitakyushu City, citizens purchase plastic collection bags called "Designated Bag" or "Sitei-bukuro" in Japanese at 15 yen a bag and use these bags, exclusively, for solid waste collection. The Designated Bag system has been introduced since 1998, and 98 % of citizens follow this. Income from the sale of Designated Bags is also used in assisting and promoting environmental activities in communities. The City of Kitakyushu does not collect other forms of solid waste management fees from its citizens.

Citizens, through participation in community activities, recycle paper product such as newspapers, journals, packages, and etc. Cans, glass, and plastic bottles are separated by citizens, collected, and utilized as raw materials after pre-processing. Some glass bottles are reused on deposit-refund systems.

Kitchen waste management, which is a major issue in almost all Asian countries, is a subject addressed in the recycling programmes of Kitakyushu City. To this end, the city government established a subsidy programme for promoting composting activities among citizens. At present, 26,526 households have compost equipment. Composting is a good approach to solid waste management and the Farmers Association has been extremely successful in composting livestock excrement. However, most composting activities are not economic perspective but instead environmental management. A composting market is not yet well established because of a lack of quantitative and qualitative stabilities and major consumers.

Intermediate Treatment / Incineration

Incinerations of solid waste are being discussed in many countries including Japan because of the potential of environmental pollution. In Kitakyushu, there are 3 incineration plants. Why is incineration the method of domestic waste management adopted in Japan? There are 3 reasons. Japan's domestic waste management, which has also been a sanitation/hygiene issue, has 3 objectives:

To disinfect solid waste;
To reduce its volume in order to accommodate limited landfill space in Japan; and
To stabilize reclaimed area by avoiding decomposition of organic waste

In addition to these, energy recovery can be done due to the high-energy potential of solid waste. Incineration plants have electric generation equipments and generate 27 million kw / year. This recovered electricity is used for facilities in and near the plants and the remainder is sold to electric company. The economic benefit is 2.4 billion yen per year and net economic benefit after using electricity in factories and related facilities is 1.5 billion yen. The economic benefits are not so big in comparison with maintenance costs, but energy utilization is still the reason why Kitakyushu uses generation systems.

The emissions of Dioxin generated from public incineration plants in Kitakyushu follow the national standard. As already known, Dioxin is easily generated by low temperature and/or imperfect combustions. So, the City of Kitakyushu is operating incineration plants at 900°C. Dioxin generated is adsorbed on micro-particulates and those are collected by bag filters.

Appropriated System

Which system is most appropriate or effective for a given municipality depends upon that city's situation. While a certain way is that its whole system should be considered to be effective while individual measures are often mentioned and allocate so much resources. For instance, citizen participation in Surabaya City, Indonesia, is much more active than in Kitakyushu City. The collection system in Kampungs or communities are operated by citizens themselves or the "Yellow Force", which are contractors contracted

by the citizenry. This is a typical case where a traditional system of mutual aid called "Gotong-Royong" is still at work.

3. Success, issues, and future direction

The City of Kitakyushu has had some success as well as some lingering issues. In particular, the relationship between the citizen and the local government needs to be improved.

1) Designated Bag

Consensus & Implementation:

The fundamental process of solid waste management is consensus or agreement among local community such as residents and local autonomy. Kitakyushu City adopted the Designated Bag system, with bags purchased at shops at 15 yen per bag, for domestic waste collection. Although this price is not enough to cover the cost of solid waste management, it is helpful in enhancing citizens' awareness in keeping anything with care and reducing waste. In this case, citizens have to buy it at present while they did not pay before 1998. Why dose it work? Analysis of factors will be done behind this.

At the time that Kitakyushu adopted the Designated Bag programme, some cities near Kitakyushu had already adopted it. 60 % of municipalities all over Japan, totally 2001, have implemented this system. The price in Kitakyushu is cheaper than other cities by as much as one fifth. Therefore, Kitakyushu citizens did not have any economic disadvantage. Citizens' awareness was also a very important factor; according to citizens' evaluation of city policies, solid waste management and reduction ranked first. This means that the priorities of citizens and the city were identical, a fact indicated by the results of questionnaires given to citizens.

Table 2 Citizens' Evaluation of City's Policies

Ranking	1996	1997	1998	1999	2000
1	Solid Waste Management and Reduction	Solid Waste Management and Reduction	Solid Waste Management and Reduction	Solid Waste Management and Reduction	Solid Waste Management and Reduction
2	Park and Greenery	Park and Greenery	Park and Greenery	River Purification	River Purification
3	River Purification	River Purification	River Purification	Park and Greenery	Park and Greenery
4	Landscape	Road Construction	Sight-seeing	Sight-seeing	Road Construction
5	Road Construction	Sight-seeing	Landscape	Road Construction	Sight-seeing

Source: Questionnaire for citizen, City of Kitakyushu (2000)

One of the factors in the success of Kitakyushu City's action was in its approach. That was not "One-way Compulsion" but through a "Dialogue" with citizen for realizing the citizens' needs, which are sometimes silent majority, in City's policy. There are many "Chounaikai" or communities in Kitakyushu and most citizens belong to a Chounaikai. It is similar to "Kampung" in Indonesia and "Barangay" in the Philippines. The City had many dialogues with citizens during the planning phase of the process of establishing the Designated Bag system. Dialogue meetings were held 733 times and 29,909 citizens participated in them. In dialogue meetings, exchange of opinions and information regarding propriety and objectives of pay-bag system, citizen's benefits and additional responsibilities of new system are frankly discussed. For instance, citizens pointed out some issues such as physical weakness of present free-bag and pollution caused by broken bag at collection sites in communities. Most of those needs were addressed in the new system and consensus between citizens and the City was accomplished. Official agreement was amended by the Kitakyushu City Local Ordinance of Solid Waste Management.

Implementation / Enforcement

Adopting new system is not difficult but implementation is another matter. At first, city government officers and volunteers provided their human resources to advice to and assist citizens' activities in the new

system. Every morning they visited any collection points, which number 32,000 throughout the city. City officers worked not as officers but as volunteers. During 6 months on a trial basis, Designated Bags were provided free of charge by the city government. 2,100 of volunteer officers worked with 10,150 of citizen volunteers. This approach of by the city government also drew a good impression from the citizenry. Eventually, the rate of Designated Bag or use cooperation with the new system reached more than 98 %.

2) Solid Waste Management Plan

Effective and Efficient Management

In order to successfully implement new policies on solid waste management based on a local community's consensus and common goals effectively and efficiently, planned actions such as knowing the state of solid waste generation, estimation of future need, identification of issues and problems, measure to solve those problems and issues, evaluation of the capabilities and roles of local stakeholders, and the securing all of necessary resources, are required.

The City of Kitakyushu is carrying out its solid waste management based on the "Kitakyushu City Fundamental Plan for Domestic Waste Management." Scientific and statistical analyses indicate that keeping present management policy would make for a 20 % increasing in domestic waste by 2010. Increasing waste means increasing necessary resources for solid waste management services such as collection, transportation, intermediate treatment, and final disposal as well as impact on the environment. Therefore, the Kitakyushu City Fundamental Plan for Domestic Waste Management calls for local stakeholders (citizenry) to understand city policy and cooperate to reduce waste. This will be done by disseminating information on solid waste management policy and by providing concrete alternatives for the reduction of solid waste by citizens.

To avoid wasteful investment and implement effective management, such a solid waste management plan will be indispensable.

4. Conclusion

Asia has a variety of societies. That requires a variety of responses to solid waste management issues. However collection and final disposal are urgent problems, adequate management systems including measures for solid waste generation for fundamental solution of issues.

The issue of solid waste needs much more understanding, participation, cooperation / partnership of a society's members than any other environmental issue. Great potential for such partnerships exist in traditional and indigenous local social systems. To draw out this potential, the sharing of many experiences of success and failure, and their contributing factors, among local societies across borders would be very beneficial.

To this end, the City of Kitakyushu will cooperate with the Kitakyushu Initiative Network.
The Kitakyushu Initiative for a Clean Environment has been included in the "Plan of Implementation of the World Summit on Sustainable Development" in the Johannesburg Summit.

5. Contact

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