

SOLID WASTE MANAGEMENT IN CEBU CITY¹

1. Introduction of Cebu City

a. City Characteristics

Geography. Located in the central part of the Philippines, the city of Cebu is an island in the south inhabited by 718,821 people. It has a total land area of 326.10 km². It is accessible from all places by air and sea transport. It only takes an hour or less by plane from Cebu to reach Manila and just a few hours more to reach most of the cities in the Asia Pacific region.

Demography. The city has a population density of 2,468 and a total number of 147,600 households. From 1995 to 2000 the city is growing at an annual average growth of 1.65 %.

Topography. The topography of the city is rugged and mountainous with elevation reaching up to 900 meters above mean sea level. Flat lands are found only on the shorelines that extend a few kilometers inland. Cebu City's flat land occupies about 23 square kilometers, representing 8% of its total land area and containing two thirds of its population.

Weather and Climate. Like the rest of the country, Cebu City is within the tropical climate zone. Its mean annual temperature is 26.5 °C with a relative humidity of 75%. The annual average rainfall is 1,636.7 millimeters. Generally rainfall decreases from February to April and then gradually increases from May to July.

Employment and Unemployment. Census data showed that 73.2% of the employed labor force of the city were found in trade and other related service activities such as banking, real estate, and insurance, community and personal services and others. Some 18.8% were employed in the industry while only 7.8% were engaged in agriculture and related services. By April 2000, the rate of unemployment in the city declined to 11.5% (as compared to 16% in April 1999) despite the increase of the country's unemployment rate of 13.7%.

Family Income and Expenditures. The average family income of the city in 1997 was P 163,196. Average family expenditure was P114, 326 in the same year. This represented a savings rate of 29.9%. Most of the families in the city still spent their income on food, accounting for 44.8% of the total.

More than half of the households received their income from salaries and wages. Only 27.7% received their income from entrepreneurial activities, mostly from non-agricultural business. The rest received their income from shares of crops, receipts from abroad, interest on deposits, dividends, gifts and others.

Economic Activity. Cebu City is the second biggest growth center next to Manila. There is a dominance of trade and service activities due to its strategic location in the Visayas region and also because of its good seaport. The service sector constitutes 73% of the economy of the city, far greater than the industry (20%) and agriculture (7%) sectors.

Direct foreign trade of the city comprised 30% of the entire Visayas figures and is equivalent to 52% of the entire foreign trade of Mindanao. The city also controlled 70% of ship calls and 90% of the passenger traffic made in the province of Cebu.

Majority of the establishments in Cebu city are still considered micro or small enterprises with an average capitalization of P1.5 million or less. 67% of these business establishments are situated in the central part of the city, which controlled about 77% of the city's economy.

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During the period 1995 to 1998, it was observed that investments in the central area of the city are getting to be capital-intensive compared to the city's average investments. This happened during the economic crisis that hit the city in 1998.

b. Main features of Cebu City

Organizational Structure. Cebu City is classified as a highly urbanized city and independent of the Cebu province. Under the new local government code, the city has the power and authority to establish an organization that shall be responsible for the efficient and effective implementation of its development plans, programs and priorities.

The structure of organization and management of the city follows what had been prescribed in the new local government code. At the head of the city is the City Mayor. Under him are all the departments and offices as required to be established under the local government code and all the other offices created by the city council to implement its plans or priority programs and projects.

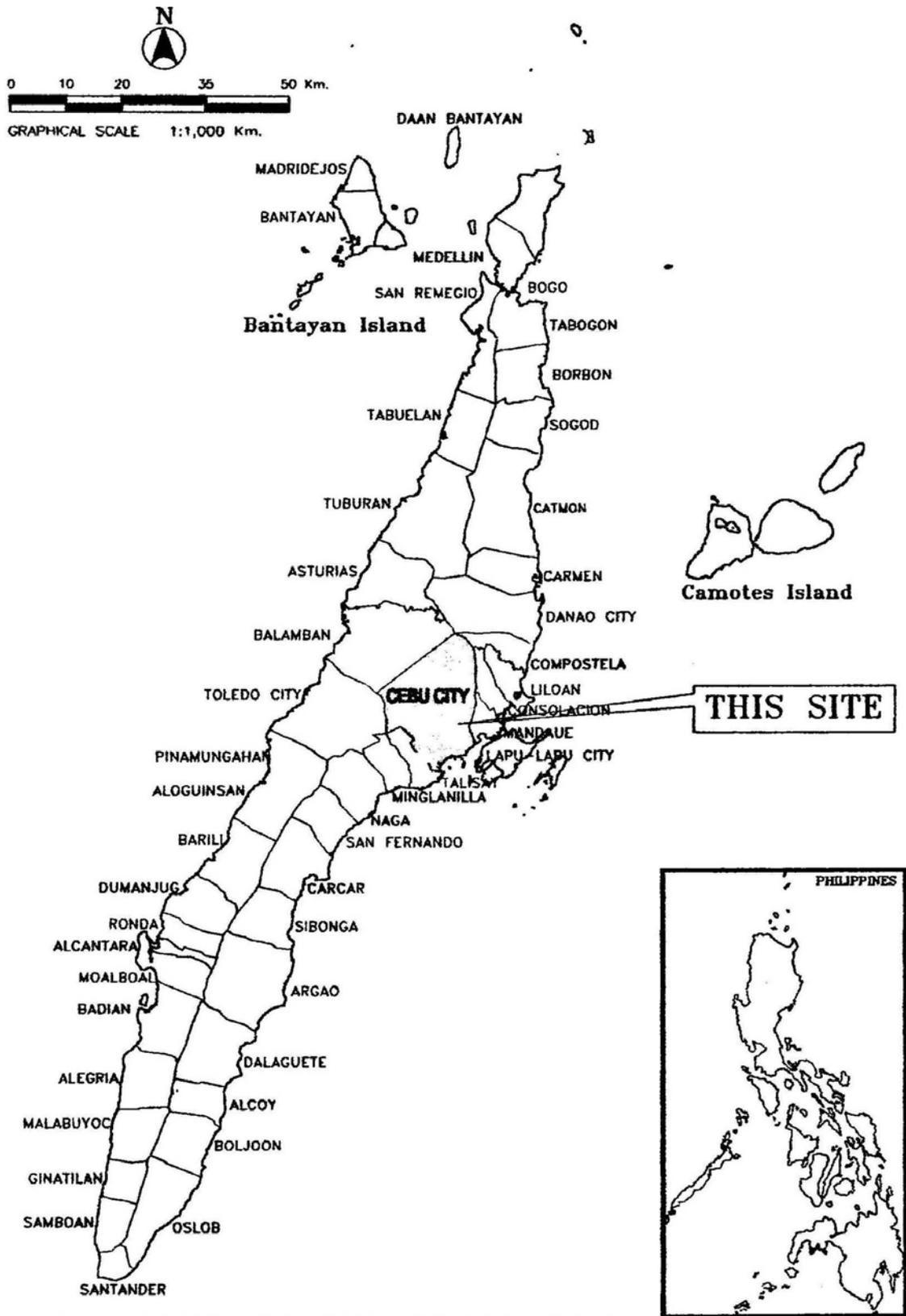


Figure 1. Map of Cebu City

The central office responsible for the cleaning and greening activities as well the management of solid wastes in Cebu City is the Department of Public Services. The DPS has the support of all the 80 barangays of the city in the conduct of its activities.

Financial Structure. The actual income of the city in 2001 was P 1,256.55 million. The 4 income generators are the following: Internal Revenue Allotment, IRA (41%), local taxes (28%), operating & miscellaneous revenue (16%), and real property taxes (14%). The IRA, the largest source of income, grows at an annual average growth rate of 3.9%.

The total expenditure of the city in 2001 increased to P1, 693.8 million. The annual average growth rate of expenditure of the city for the 1997-2001 period was 2.3%. The top 3 expenditure items for the last 5-year period are: economic services (40.7%), general public services (31.7%), and social services (19.7%).

SW Management Income and Expenditure. The total actual revenue from garbage fees in 2000 is P7.97 million. P6.69M is from garbage collection fees, P1M from market garbage fees and P.28 M from penalties. On the other hand, Cebu City spent a total of P1, 207 M in 2000, P75.7 M of which was appropriated for solid waste management. This amount is about 6.3% of the total expenditure.

c. Jurisdiction or Legislative Powers Over Regulations

The city government is empowered within its jurisdiction to ensure and support, among other things, the promotion of the people's health and safety and the enhancement of the right of its people to a balanced ecology.

The Philippines has several laws and regulations on environmental protection and management. The Cebu city council has authored several resolutions related to solid waste management and the protection of the environment of the city. Pursuant to the local government code, the city government has jurisdiction to enforce and implement environmental laws and regulations at the local and national levels.

2. Current State and Management of Solid Waste

Current Total Waste Volume. As of 2001, the waste discharge amount of the city is 511 tons per day, 57% of which is residential and the rest, non-residential wastes. The waste collection rate is 80%. The waste discharge amount is estimated at 0.7 kg/person/day.

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Waste Composition. Currently, there is no reliable data on the physical composition of wastes of Cebu City. For reference purposes, the composition of middle-income residential wastes in Manila in 1997 is shown below.

Physical Composition of Wastes Metro Manila, 1997		
Physical Composition	Organic waste	50%
	Plastics	16%
	Paper	16%
	Metal	6%
	Garden waste	5%
	Others	-
Moisture Content		-

Waste Amount Forecasts. The following table shows the projected total solid waste generation in Cebu City in the next 10 years based on an annual 2% growth rate for residential wastes and 4% growth rate for non-residential wastes. The projected growth rates are proportionate to the growth of the city residents' personal consumption, commercial and industrial activity, and social and cultural interaction.

Year	Population	Residential (ton/day)	Non-residential (ton/day)	Total SW (ton/year)
2001	756,243	392	219	186,505
2002	741,277	302	231	194,808
2003	752,767	313	244	203,498
2004	764,435	324	258	212,596
2005	776,284	336	272	222,122
2006	787,540	348	287	231,867
2007	798,959	360	303	242,062
2008	810,544	372	320	252,730
2009	822,297	385	338	263,892
2010	846,316	399	356	275,573

The non-residential wastes include all wastes other than the residential wastes, such as wastes discharged from shops, streets, parks, schools, offices, tourists, etc. Presently, there is no available information on the breakdown of non-residential wastes to commercial, industrial, school, office wastes, etc.

Waste Property Forecasts. Replacing conventional small shops with large shopping malls and supermarkets will increase packaging materials, which are required to carry goods to their homes. The economic growth will change people's lifestyles leading to an increase in demand for fast foods. This will result to an increase of packaging wastes.

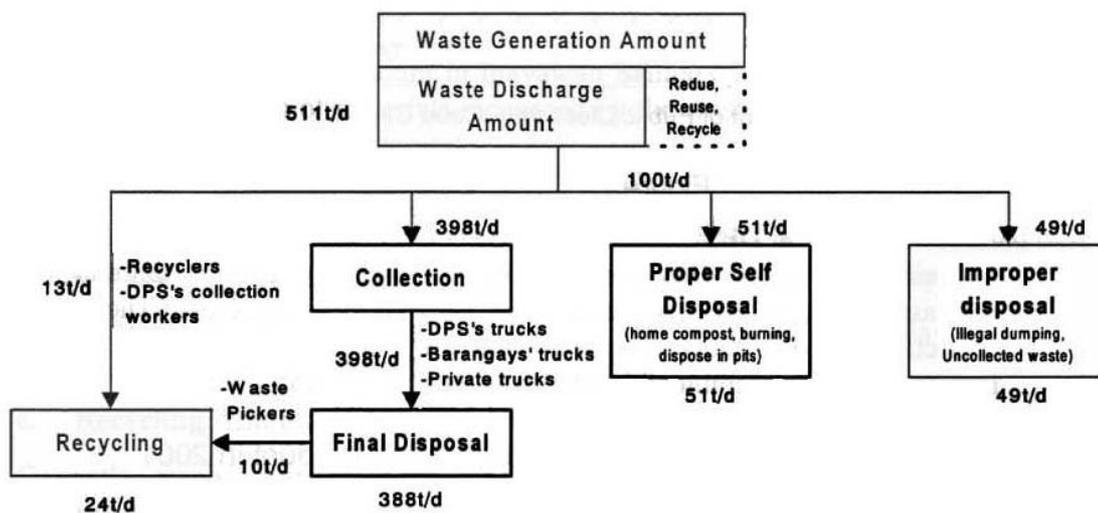


Figure 2 Current Waste Stream of Cebu City

Urbanization will decrease the green area of the city and result in the decrease of garden wastes.

With the increase in economic growth, the income of the family increases. When the income is high, the percentage of kitchen wastes to the total decreases. Thus it is expected that kitchen wastes will decline with economic growth.

Hospital Waste. Cebu City has 10 hospitals with 2,410 beds. Hospital wastes are classified into medical (hazardous) wastes and general wastes. General wastes consist of food wastes, papers, plastics, etc. while medical wastes are infectious wastes, pathological wastes, sharp objects, pharmaceutical wastes, chemical wastes, etc.

Medical waste generation rate is 0.3 kg/bed/day. In 2001, wastes generated from hospitals averaged 6.5 tons/day. Medical waste generation is 0.7 ton/day.

Hospitals use color codes for separation and storage of wastes, as shown below.

Color	Type of Wastes
Black	Non-infectious dry wastes
Green	Non-infectious wet wastes
Yellow	Infectious and pathological wastes
Yellow with black band	Chemical wastes
Orange	Radioactive wastes
Red	Sharps and pressurized containers

One government hospital employs an incinerator with 500 kg capacity for treatment of its medical wastes.

In general, hospital wastes are collected and disposed of in a separate cell of the sanitary landfill of the city without preliminary treatment. The sanitary landfill has an incinerator intended for medical waste treatment but was never used because of the Clean Air Act which prohibits the use of incinerators.

3. Success, Issues and Future Direction

Successful Activity. A very important activity that the city is currently undertaking is composting. Through the institutionalization of the compost/organic fertilizer facility at the city nursery, the city has been practicing waste segregation and organic farming.

Each day a personnel from the City Agriculture Department collects at least one ton of biodegradable garbage from the Carbon market. The garbage materials are dumped into the composting facility which makes use of the technology of trichoderma.

The P 160,000 compost facility seeks to convert biodegradable garbage into organic fertilizer. The city embarked on the said project with the goal of encouraging the practice of waste segregation as well as recycling among Cebuanos. One ton of garbage produces an output of 350 kilos of organic fertilizer which will be utilized by the demofarm located at the nursery.

Composting and recycling activities are practical and inexpensive and the technology involved is simple and easy. These activities can be replicated in developing countries especially in the Asian region because of the similarity of the waste composition and socio-economic structure of these countries.

Existing SWM Problems of the City.

Like other growing cities, the city of Cebu has problems managing its solid wastes. The major solid waste management problems of the city can be broadly categorized as follows: 1) weak institutional and organizational system for SWM; 2) problems in the upper waste stream; and 3) problems at the downstream.

Problems affecting the upper waste stream are:

1. inefficiency in garbage collection due to lack of garbage vehicles
2. no waste segregation done at the source

3. no waste recycling done at the point of generation
4. too little revenue from waste collection fees

The insufficiency of the sanitary landfill operation is the major problem at the downstream.

- a. The city has a sorting facility, which is called Materials Recovery and Storage Building, which is part of the landfill facility. Since the operation of the landfill in 1998, the sorting facility has never been used due to some design and operation problems.

Another facility in the landfill, which is not used until today, is the incinerator. The incinerator is intended for the thermal destruction of medical hazardous wastes. The incinerator is faced with a social problem. Environmental groups objected to the operation of this facility for fear that it might generate air contaminants hazardous to public health.

The Clean Air Act of the Philippines prohibits the use of incinerators. This makes the city's incinerator non-operating. In addition the city failed to obtain an Environmental Compliance Certificate, a requirement of the Department of Environment and Natural Resources, which is supposed to contain the mitigating measures that should be implemented before and during the operation of the incinerator.

The city government is faced with the problem of what to do with these facilities.

- b. Another problem is the issue with the waste pickers. Garbage pickers are free to enter the landfill area to scavenge wastes even in the operation area. They number around 200 to 300 and they work in shifts. They have organized themselves into a cooperative and had entered into a memorandum of agreement with the city government for clarity of future cooperation.

The waste pickers are supposed to work in the sorting facility for their sorting activities. What is happening is they have gone to the landfill operating area, even reaching the cell where the hospital wastes are disposed, to carry out their activities. The cell containing the medical wastes is not enclosed with a fence. Most of these people tend to violate rules and just don't like working around with regulations. So these people are not only exposed to accidents but are also in danger of contracting diseases from hospital wastes.

- c. The main problem of the city is the sanitary landfill itself. The landfill has a total design capacity of 938,400 cubic meters (compacted) and a lifetime of about 6 to 7 years. It is now 4 years in operation and is nearing its life. Added to this is the difficulty in acquiring land for a new landfill.

Other problems affecting the landfill are the lack of soil covering, improper leachate treatment, lack of landfilling plan and medical waste disposal.

Lack of soil covering. In 2000, almost no soil was purchased due to lack of budget. The lack of cover soil made the waste disposal area inaccessible to the collection trucks. Consequently, the wastes from the trucks are dumped outside of the dumping area making the landfill more unsanitary.

Improper leachate treatment. The leachate is discharged directly to the sea without treatment. The existing leachate pond only functions as a storage pond, not as a treatment facility.

Lack of landfilling plan. A landfill should have a landfilling plan consisting of landfilling order, soil procurement schedule, on-site road and drainage construction, etc. Because of the absence of the plan, the landfill has become unsanitary, its waste disposal area has become inaccessible, and the leachate has overflowed to the sea.

Medical waste disposal. Problems with disposal of medical wastes had been described above. Inasmuch as incineration is banned by virtue of CAA, the city has to find the appropriate technology for treatment and disposal of its medical wastes.

The main problem with medical waste management is the failure of the city to clarify the designated agency responsible for the collection, transportation and disposal of medical wastes. Hospitals do not acknowledge at present that it is their responsibility to properly manage their wastes.

Overcoming Problems. Considering the magnitude of the problems that the city is facing, the city has taken steps to address its problems.

1. **Capacity Building.** Aware that project sustainability depends so much on strong and improved executing body and institutional system, the city has undertaken an institutional capacity building starting from the leaders of the city's Department of Public Services. A four-man team from the office of the DPS underwent a 3-week training on Solid Waste Management last May 2002 in Hoofddorp Haarlemmermeer, Netherlands.
2. **Public Information, Education and Communication.** In its effort to educate the public on issues concerning waste management and environmental protection, the city has tapped the assistance of non-governmental institutions such as the Lihok Filipina, etc. Lihok Filipina has undertaken a community-based solid waste management project in 7 city barangays. Five mass communication students from the University of the Philippines have committed to replicate Lihok Filipina's project in 2 urban barangays by developing information, education, communication materials related to the solid waste management projects of the city.
3. **Waste Segregation at Source.** The city's DPS, in coordination with non-government organizations conducted waste segregation projects in several barangays of the city notably the barangays of Talamban, Mabolo and Guadalupe.
4. **Improvement of Waste Separation and Recycling at Disposal Area.** The city government has undertaken steps to improve the waste separation and materials recovery area at the landfill such as redesigning the Materials Recovery and Storage Building and securing the budget for its modification. Modification of the materials recovery area will have the added benefit of improving the working and health conditions of the waste pickers.
5. **Medical Waste Management.** Hospital and clinic wastes are segregated into infectious and non-infectious wastes during storage. The city is presently gathering information from all hospitals in the city, needed in establishing system of collection for infectious waste. For disposal, a separate area in the landfill has been designated and fenced as the area for medical wastes.
6. **Industrial Waste Treatment.** The common treatment facility for liquid wastes particularly electroplating wastes is situated adjacent to the city's sanitary landfill. The waste treatment facility, maintained and operated by the Cebu City Chamber of Commerce and Industry, handles liquid electroplating wastes from private industrial establishments operating not only in the city but also in the neighboring cities of Mandaue and Lapu-lapu.
7. **Composting and Recycling.** Through the institutionalization of the compost/ organic fertilizer facility at the city nursery, the city has been practicing waste segregation and organic farming. Each day a personnel from the City Agriculture Department collects at least one ton of biodegradable garbage from the Carbon market. The garbage materials are dumped into the composting facility, which makes use of the technology of trichoderma.

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segregation as well as recycling among Cebuanos. One ton of garbage produces an output of 350 kilos of organic fertilizer which will be utilized by demofarm located at the nursery.

8. Energy Conservation. The increasing demand for energy as well as the growing volume of waste disposed by the city has prompted the Cebu city government to look into the possibility of utilizing alternative sources of energy. In consonance with the present administration's serious commitment to conservation, the Committee on Energy, Transportation, Communication and Other Utilities has begun negotiations with the University of San Carlos-affiliated Non-conventional Energy Center for the construction of a 50 cubic meter biogas digester.

The biogas facility, estimated at P 335,000, is planned to be constructed near the city abattoir and the city nursery at the North Reclamation Area. The facility will make use of animal wastes from the city abattoir, which slaughters a daily average of 150-200 heads, into biogas. Resolutions appropriating the amount necessary for the construction of the biogas facility has been duly approved by the city council.

9. Efficient Garbage Collection System. The city has at present 63 vehicles to go around the city everyday to collect garbage. In addition to this, 3 large private trucks supplement the city's public collection. Moreover, the city hopes to acquire trash compactors and high pressure washers to be utilized in the sanitary landfill through the assistance of its sister city, Haarlemmermeer of the Netherlands.

4. General Conclusion

The city is focusing all its efforts in the downstream. It has invested in the construction of a sanitary landfill for disposal of all types of wastes generated in the city. However, not all of the components of the landfill are functioning. Two facilities are standing idle, the sorting facility and the incinerator.

The incinerator in particular has encountered some problems. It cannot be operated due to some legalities and social problems. Because of the Clean Air Act, the incinerator becomes a useless facility. The problem is aggravated by the fact that medical wastes of the hospitals in the city are delivered to the landfill without treatment, endangering waste pickers who are allowed to come close to the exposed infectious and hazardous medical wastes.

The hospitals, on their part, do not recognize that the responsibility of treating and disposing of their wastes including bearing the costs, fall on them. Because of the ban on incineration, the city has to find another technology for medical waste treatment.

The only possible treatment that is deemed appropriate for the city's clinical wastes is the autoclave treatment. However, investment costs for the installation of the facility is large, the city nor the hospitals may not be able to handle these costs alone. Technical knowledge on the operational processes of an autoclave treatment is also important for its success.

A good institutional framework may also be needed for the implementation of the autoclave treatment. Private sector cooperation is encouraged to help the city. A system to regulate and control medical wastes should also be established through consultations with various interest groups in the city.

The city needs to realize that it is far more important to focus all efforts in the upper waste stream. Reducing the amount of wastes generated at the source will spell a difference since this will also reduce the waste loads at the disposal area. Large waste recycling centers such as those developed in other countries may not be applicable for the city because of the city's relatively low figures in the percentage of recyclable materials in wastes, however, other waste minimization activities such as composting and small-scale recycling could be good for Cebu City. A biogas digester will have the added benefit of energy conservation.

Waste segregation is another worthy activity. This has not been widely practiced in the household level due to the insufficiency of the city's information campaign to the community. On the other hand, this activity is quite popular in the hospitals as wastes there, are segregated and properly labeled. However, the effort may be considered useless after all because the segregated wastes are collectively collected in one truck, all combining what is inside. This needs special attention requiring concerted efforts from the city, hospital management and the DENR.

These are unique experiences of the city of Cebu that other developing countries in the region can learn.

The major areas of cooperation between the city of Cebu and the city of Kitakyushu are in the conduct of waste minimization activities such as recycling and composting, and further, in the area of medical waste management and in the management of a good landfill system.