Converting Waste Plastics into Fuel:
A Proposed SWM Project in the City of Cebu, Philippines

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Outline of the Presentation

- Environmental Management in Cebu City
- Waste Characterization at the Inayawan Landfill, Cebu City
- Project Brief
- Opportunities for Financial and Economic Benefits

Environmental Management in Cebu City

Facts and Figures

- Located in the central part of the Philippines
- Land area of 326.10 square kilometers
- Population of 718,821 (the figure increases during day time due to workers coming from the neighboring cities and municipalities which are employed in the city)

Environmental Management in Cebu City

Garbage Profile

- 500 grams- average waste generated by one person daily
- 450- 500 tons - average daily disposal of Cebu City
- Cebu City has 14-15 operational trucks complemented by 42 barangay owned trucks

Collection is done 24 hours and in three shifts.

Environmental Management in Cebu City

Expenses and Garbage Fees

Waste collection and disposal is highly subsidized

- City only earns P7 million annually from garbage fees
- it spends **P50 million-P70 million** to operate the Dept. of Public Services (DPS)

The DPS is the office tasked to collect garbage from the barangays. Its annual operation costs the City P50 to P70 million not including the expenses incurred by barangays who assist in the collection..

Waste Characterization at the Landfill

Overview of Waste Sectors/Description

Commercial waste - Waste disposed by businesses and industries that is collected and transported by private and government haulers.

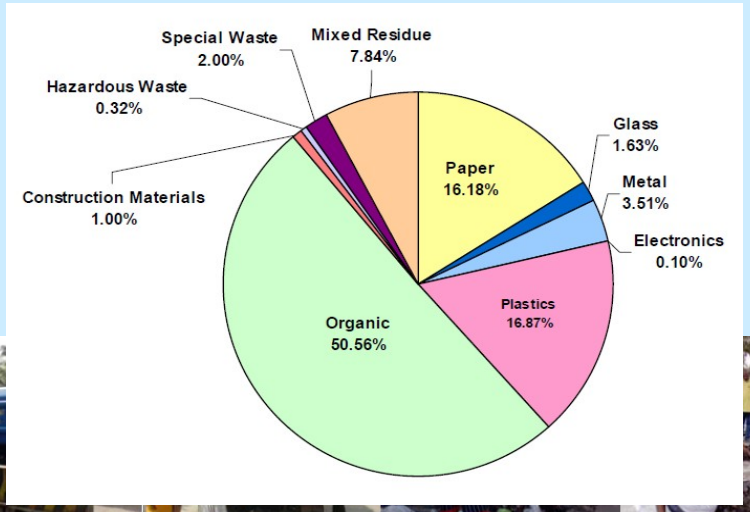
Residential waste - Waste disposed by households that is collected and transported by private and government haulers.

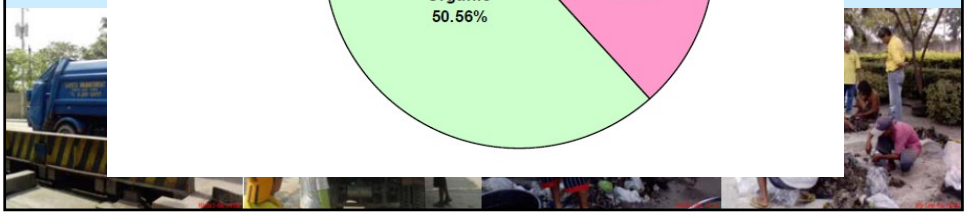
Markets Waste - generated from known public markets collected and transported by government haulers.

Institutions Waste - disposed by government agencies, schools and hospitals collected and transported by private and government haulers.

Waste Characterization at the Landfill

Composition of Cebu City's Overall Waste Stream

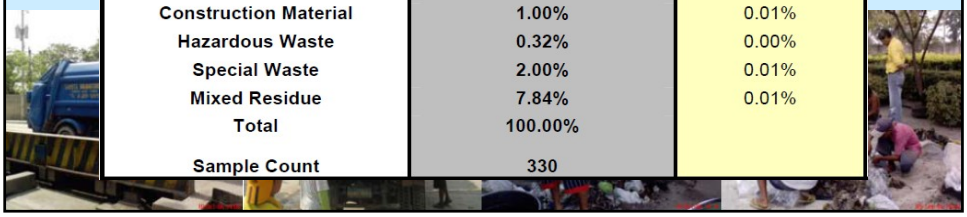




Waste Characterization at the Landfill

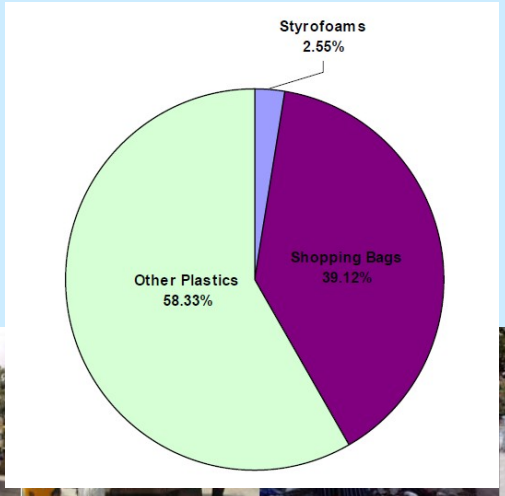
Composition of Cebu City's Overall Waste Stream

Waste Types	Estimated Percentage	+ / -
Paper	16.18%	0.02%
Glass	1.63%	0.00%
Metal	3.51%	0.01%
Electronics	0.10%	0.00%
Plastic	16.87%	0.02%
a. Styrofoam	0.43%	0.00%
b. Shopping Bags	6.60%	0.00%
c. Other Plastics	9.84%	0.01%
Organic	50.56%	0.03%
Construction Material	1.00%	0.01%
Hazardous Waste	0.32%	0.00%
Special Waste	2.00%	0.01%
Mixed Residue	7.84%	0.01%
Total	100.00%	
Sample Count	330	



Waste Characterization at the Landfill

Overview of the Composition of Plastics



Waste Characterization at the Landfill

Categorization of Plastics

A. Styrofoams

a) **Nonfood Expanded Polystyrene:** Nonfood packaging and finished products made of expanded polystyrene. Includes Styrofoam products such as packaging peanuts and blocks.

B. Shopping Bags

a) **Clean Shopping/Dry Cleaner Bags**: Includes grocery and other checkout bags. This category includes bags intended to contain produce, bread, merchandise, dry-cleaned clothing, and newspapers, but it does not include bags that were not contaminated with food, liquid, or grit during use.

Waste Characterization at the Landfill

Categorization of Plastics

B. Shopping Bags

b)Other Clean Polyethylene Film: Polyethylene film, plastic sheeting, and bags, other than those identified above, which were not contaminated with food, liquid, or grit during use.

c)Other Film: Film packaging other than checkout bags, and not defined above, or: was contaminated with food, liquid, or grit during use; is woven together (e.g., grain bags); contains multiple layers of film or other materials that have been fused together (e.g., potato chip bags). This category also includes photographic negatives, shower curtains, and used garbage bags. This category also includes supermarket and shopping bags that were contaminated with food, liquid, or grit during use.

Waste Characterization at the Landfill

Categorization of Plastics

C. Other Plastics

a)PET Bottles: Polyethylene terephthalate (No. 1) translucent bottles.

b)HDPE Natural Bottles: High-density translucent polyethylene (No. 2) milk, juice, beverage, oil, vinegar, and distilled water bottles with necks.

c)HDPE Colored Bottles: High-density colored polyethylene (No. 2) bottles. Liquid detergent bottles and some hair care bottles with necks.

d)Other Plastic Bottles: Plastic bottles not classified in the above-defined PET or HDPE categories; includes No. 3 through No. 7, unknown bottles, and other bottles with necks.

Waste Characterization at the Landfill

Categorization of Plastics

C. Other Plastics

e)No. 2, 4, and 5 Tubs, Cups, and Lids: No. 2, 4, and 5 wide mouth cups and tubs,without a neck, and lids, such as for yogurt, cottage cheese, and margarine containers.

f)No. 1, 3, 6, and 7 Tubs, Cups, and Lids: No. 1, 3, 6, and 7 wide-mouth cups and tubs, without a neck, and lids, such as polystyrene (expanded and clear) drink cups, and food, cosmetic, cleaning, auto, and other products and packaging.

g)Other Food Service Plastics: Includes plastic food-related packaging and finished products not classified elsewhere that are made of polystyrene and other plastics. Includes items such as plates, bowls, clamshells, salad trays, microwave trays, cookie tray inserts, utensils, straws, stirrers, and condiment packaging.

Waste Characterization at the Landfill

Categorization of Plastics

C. Other Plastics

h)Other Rigid Packaging: No. 1 through No. 7 and unmarked rigid plastic packaging and containers (excluding expanded polystyrene and food service plastics). Includes plastic toothpaste tubes and spools.

i)Plastic Products: Other finished plastic products made entirely of plastic such as toys, toothbrushes, vinyl hose, and lawn furniture. Includes fiberglass resin products and materials.

j)Composite/Other Plastic: Items that are predominantly plastic with other materials attached such as disposable razors, pens, lighters, toys, and binders.

Project Brief:
Converting Waste Plastics into Fuel

The United Nations Environmental Programme (UNEP) through the International Environmental Technology Centre (IETC), Division of Technology, Industry and Economics (DTIE) is implementing Integrated Solid Waste Management (ISWM) based on 3R (reduce, reuse and re-cycle). This also includes new waste streams such as waste plastics.

To build the local capacity and to support transfer technology, under Bali Strategic Plan, IETC has developed a project on "Converting Waste Plastics into a Resource" to build the local capacity on assessment of waste plastics and development of demonstration projects based on environmentally sound technologies and supportive policy framework.

Project Brief:
Converting Waste Plastics into Fuel

Overall Objectives:

1. To facilitate and support identification, assessment, and adaptation of technologies to convert waste plastics into diesel fuel thus leading to eventual transfer of technologies from developed to developing countries.
2. To raise awareness in developing countries on plastic waste and its possible reuse for conversion into diesel fuel and other applications.

Project Brief:
Converting Waste Plastics into Fuel

Overall Objectives:

3. To identify and assess technologies for other uses of waste plastic such as making roof tiles for low cost housing, making more weather resistant and long lasting roads etc.
4. Promote reuse of waste plastic thus providing alternative solutions to waste plastic disposal and simultaneous reduction in GHG emissions.

Project Brief:
Converting Waste Plastics into Fuel

To support the above objectives, IETC is currently developing:

1. Guidelines for assessment of waste plastics to develop baseline on characterization and quantification with future projections on waste plastics, and assessment of current waste plastics management system and practices
2. Compendium of technologies to convert waste plastics into fuel

Project Brief:
Converting Waste Plastics into Fuel

Project Activities:

1. **Select 1 or 2 cities for baseline data collection and local capacity development and demonstration project**
   Time Frame: 1 week
2. **Preparation of baseline report on waste plastics characterization and quantification with projection for future generation in the selected cities**
   Time Frame: 4 weeks
3. **Training on waste assessment methodology**
   Time Frame: 3 weeks

Opportunities for Financial and Economic Benefits

- Implementation of Communal and Household Composting using the Takakura-method transferred from Kitakyushu City, Japan
- Segregation of Plastics at Source and at the Landfill to be used as Fuel for Cementa Plants
- Solution to Drainage Maintenance Costs


Thank you very much!