





Prepared by

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Lecture Strategy

Please



lecture time



1-Smile



3- Make your mobile Silent

- 1. What is meant by waste management?
- 2. Waste Categories.
- 3. Waste quantities and composition
- 4. Municipal Solid Waste MSW
- 5. Waste policy and regulation
- 6. Waste reduction and reuse



From Bad Health

What is the SWM?

Waste Magagement

Storage

Recycling

- Collection
- Disposal and monitoring of waste materials.
 Transport and handling
 Unit of the second sec

TRANSPORTATION

Storage:

- Galvanized steel dust bin
- Paper sack
- Public bins



ANAEROBIC DIGESTER

COLLECTION



PROCESSING

COMPOST

INCINERATION

SANITARY LANDFILL

DISPOSAL

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RECOVERY

#### Collection

- House-to-house collection
- Collection from the public bins
- Door to door





### **MSW Characterization**

Waste





Usually when the characteristics of the area are uniform, separation into subregions is not required.

## 2. Sampling procedure

#### Sampling can be classified as:

#### a. Sampling at source.

is used when a complete integrated solid waste management project is in question. Furthermore, this type of sampling is required when a study related to recycling is going to be performed

### **b. Sampling at the disposal site**.

is required when it is not planned to make any change in the collection and transfer of the wastes, and when all improvements considered are "end-of-the pipe"



## MSW Characterization at Source vs. MSW at Disposal Site





- Samples are taken directly from the source of solid wastes, namely from houses and shops. The procedure followed is given below step by step:
- **1. Decide whether the area will be separated in sub-regions or not**

#### 2. Number of samples

Usually, the number of samples giving a confidence level above 90% is required. **3. Points of sampling sites** The random sampling technique should be used to determine the points of

sampling

One of the most common systematic errors is to select the first-floor apartments in a building as the sampling source, instead of top floors which are more difficult to reach.

### 4. Sampling:

#### a) Sampling from residential areas

Two points which should be emphasized are:

i) only wastes generated within that apartment during the defined period should

be placed in the bags;

ii) before placing ashes in the bag, it should be made sure that no burning coal or other sources of fire exist.

When collecting the bags, a questionnaire, including questions such as the number of people living in the apartment, their income and education levels, their

ages.

### 4. Sampling:

#### **b. Sampling from commercial areas**:

The amount and characteristics of wastes from commercial areas depend on the type of the commercial activity and its size.

Sampling from such areas is more complicated than that from residential districts.

- 5. Sampling time
- <u>Sundays</u> should be avoided because solid wastes collected during these days may include wastes accumulated during the weekend.
- 6. Activities to be done after collecting the samples
- The collected bags should be weighed one by one (kg/capita)

## 2.21. Sampling at the disposal Site

If the amount of waste is relatively small, all the wastes coming from different regions are stored separately. > After the collection of wastes is completed, the procedure for obtaining the necessary size of a sample should start.  $\succ$  This is achieved by separating the collected wastes into four groups, choosing one of these parts and repeating the same procedure again and again until a sample of 50 to 100 kg is obtained.

#### Waste characterization steps



#### 1. Generation Rate at Source (Kg/capita/day)

1.05 1.00 0.95 0.90 0.90 0.85 0.80 0.75 High-Income Level Medium-Income Level Low-Income Level Families

Generation Rate (7-Day Average)

| Income Level        | Average Generation Rate (kg/Capita/day) |
|---------------------|-----------------------------------------|
| High-Income Level   | 0.86                                    |
| Middle-Income Level | 0.99                                    |
| Low Income Level    | 0.89                                    |
| Total Average       | 0.91                                    |

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For each income categoty, 30 househols were visited

#### 2. Bulk Density (Kg/cu m)



The bulk density results are aligned with similar studies in developing countries [1]

| Income Level        | Bulk Density (kg/m³) |  |  |
|---------------------|----------------------|--|--|
| High-Income Level   | 146                  |  |  |
| Middle-Income Level | 168                  |  |  |
| Low Income Level    | 148                  |  |  |
| Total Average       | 154                  |  |  |

[1] Integrated Solid Waste Management (ISWM) Project of Republic of Azerbaijan, 2017, financed by the WORLD BANK

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#### 3. Size Characterization



| Income Level        | > 8 cm (%) | 6 – 8 cm (%) | < 6 cm (%) |  |
|---------------------|------------|--------------|------------|--|
| High-Income Level   | 30.7       | 7.2          | 62.0       |  |
| Middle-Income Level | 29.4       | 8.6          | 61.9       |  |
| Low Income Level    | 28.9       | 9.3          | 61.7       |  |
| Total Average       | 29.7       | 8.4          | 61.9       |  |

4. Waste composition



| Significant Contents | High-Income (%) | Mid-Income (%) | Low-Income (%) | Average (%) |
|----------------------|-----------------|----------------|----------------|-------------|
| Organic fraction     | 70.54           | 65.61          | 75.29          | 70.48       |
| LDPE Plastic         | 12.54           | 13.56          | 12.08          | 12.73       |
| Diapers              | 6.04            | 11.01          | 5.06           | 7.37        |
| Paper                | 4.03            | 4.55           | 3.27           | 3.95        |





## MSW at Source vs. MSW at Disposal



#### Note:

- Egyptian code was used to characterize mixed waste obtained at the source of generation
- The ASTM standard was applied to characterize mixed waste at disposal sites

| Overall Contents      | Zone 1 | Zone 3 | Average | Zone 2 | Zone 4 | Average |
|-----------------------|--------|--------|---------|--------|--------|---------|
| Paper & Cardboard     | 3.95%  | 3.15%  | 3.55%   | 2.12%  | 2.48%  | 2.30%   |
| Plastic (Mixed)       | 14.52% | 24.12% | 19.32%  | 17.22% | 10.84% | 14.03%  |
| Textiles              | 1.20%  | 4.17%  | 2.69%   | 9.17%  | 3.90%  | 6.53%   |
| Other Recyclables     | 2.04%  | 3.64%  | 2.84%   | 2.34%  | 2.07%  | 2.21%   |
| Other Non-Recyclables | 0.44%  | 0.01%  | 0.23%   | 0.01%  | 0.48%  | 0.25%   |
| Diapers               | 7.37%  | 6.82%  | 7.09%   | 10.37% | 8.24%  | 9.31%   |
| Organic               | 70.48% | 58.09% | 64.28%  | 58.77% | 71.99% | 65.38%  |

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### Comparison with other findings (at disposal site)



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