

APPENDIX C. PERFORMANCE INDICATORS FOR SOLID WASTE SERVICES

A. Generation

A1. DEMOGRAPHIC information

- administrative or political area (area bounded by the administrative boundaries of the municipality in km²)
- service area (area requiring solid waste management services in km²)
- total population in the administrative area
- population in the service area
- number of households, commercial establishments, and institutions (e.g., schools, public libraries, religious buildings, hospitals) in the service area
- number of parks and other public places in the service area
- number of markets in the service area
- number of factories in the service area
- length of roads and streets requiring sweeping (km)
- length of drains requiring cleaning (km)

A2. QUANTITIES of waste generated

- household
- commercial/business
- institutional
- park/public
- market
- street sweeping
- drain cleaning
- industrial
- total waste

Generally, waste generation (by source) is expressed in terms of daily wt/unit. Therefore, the indicators presented in the previous paragraph can be expressed as:

- household waste (kg/cap/day)
- commercial waste (kg/x/day, where x can be m² of floor area of commercial establishment, unit volume or dollar value in sales, number of employees, etc.)

- institutional waste (kg/x/day, where x can be number of students, m² of the area of park or public place, number of visitors, etc.)
- market waste (kg/x/day, where x can be the number of market spaces, m² of floor area, dollar in sales, etc.)
- industrial waste (kg/x/day, where x can be unit volume or dollar of production output, m² of floor area, number of employees, etc.)
- street sweeping waste (kg/km/day)
- drain cleaning waste (kg/km/day)
- total waste (kg/cap/day)

B. Waste characterisation

B1. PHYSICAL composition (% wet or dry wt basis)

- putrescible matter
- bones
- paper
- plastics
- yard/garden
- wood
- glass
- metals
- rubber and leather
- miscellaneous inert material

B2. CHARACTERISTICS

- moisture content (%)
- bulk density (kg/m³)
- higher and lower calorific values (kcal/kg)
- chemical composition (N, C, P, Ca, K, etc.)

C. Storage

C1. INDIVIDUAL containers

- type (e.g., bin, bag, basket)
- size or capacity (L)
- material (e.g., plastic, metal, bamboo)
- maintenance condition

- number and location of storage units (on a map)
- cover or lid
- use of standardised containers (%)

C2. COMMUNAL receptacles

- type (e.g., bin, bag, basket)
- size or capacity (L or m³)
- material (e.g., plastic, metal, wood, bamboo)
- number and location (on a map)
- maintenance condition
- cover or lid
- maximum distance from house (m)
- average lifespan of container

C3. COST

- purchase cost of individual container (cost/ container)
- purchase cost of communal container (cost/ container)
- repair cost of communal container (cost/ container/yr)

D. Collection and transport

D1. SERVICE performance indicators

D1.1. Coverage

Indicators are shown in the following list for household waste only. Similar indicators could apply to the other categories of waste.

- household waste collected (area in km² or % of the service area; population or % of the population; number of houses or % of the number of houses; quantity or % of household waste generated in the service area)
- commercial/business waste collected
- institutional waste collected
- park/public place waste collected
- market waste collected
- street sweeping waste collected
- drain cleaning waste collected
- total waste collected

In localities where solid waste is collected and transported by contractors and/or by private individuals or institutions, the following indicators can be used:

- number of contractors
- population or number of houses or establishments served by contractors or by private haulers for each category of waste
- percentage of population or number of houses or establishments served by contractors or by private haulers for each category of waste
- the quantity of waste collected by contractors or private haulers for each category of waste

D1.2. Frequency

Collection frequency varies from more than once a day to once a week, or even less frequently. Indicators relating to collection frequency can be actual collection frequency or the percentage of the actual to the required collection frequency. This information can be arranged according to generators of solid waste as well as types of on-site storage.

D1.3. Complaints

Type and number of complaints made to the solid waste management authority are good indicators of the quality of the service. Some of the types of complaints that can be used are: uncollected waste, odour, flies and insects, spillage during transportation, or complaints about the attitudes of collection workers. The number and type of complaints should be recorded by collection zone.

D2. RESOURCE input indicators

D2.1. Human resources

For each category of staff, the number of workers; the average and total wages (daily, monthly, and annually); and the fringe benefits (e.g., health insurance, pension, paid leave), if any, are the resource input indicators.

- supervisors
- drivers
- collection workers
- street sweepers
- vehicle maintenance workers
- others (e.g., drain cleaners)

D2.2. Physical resources

Examples of the types of equipment are as follows:

- compactor trucks
- dump trucks
- fixed-bed trucks

- tractors
- trailers
- others (e.g., tilt frame vehicles, mechanical sweepers)
- pushcarts
- collection bins/baskets
- brooms

The following information should be collected for each category of equipment:

- number
- type or make
- capacity
- year of purchase
- purchase cost
- amount and cost of fuel consumed
- cost of regular service/maintenance
- cost of repair and spare parts
- average downtime

In situations where private contractors are employed for the collection service, the contractor's human and physical resource inputs and the contractual fees must be recorded.

D3. EFFICIENCY indicators

- weight or volume of solid waste collected daily per dollar of collection cost
- weight or volume of solid waste collected directly by the municipal authority daily per dollar of collection
- weight or volume of solid waste collected daily by contractors per dollar of contractual fees
- population served per collection worker
- population served per vehicle
- households served per collection worker
- length of street swept per sweeper

E. Processing and resource recovery

E1. SERVICE performance indicators

Processing plants can be categorised as follows:

- size reduction
- compaction

- transfer station
- composting
- materials recovery
- incineration

It is suggested that the following indicators be recorded for each facility:

- design capacity (Mg/day)
- amount of waste processed (Mg/day)
- amount of product generated (Mg/day)
- amount of residue generated (Mg/day)
- revenue from sales of products (cost/yr)
- savings due to reduced disposal cost (cost/yr)
- number of complaints by type (e.g., odour, flies and insects, unsightliness)

E2. RESOURCE input indicators

E2.1. Human resources

- plant manager
- engineers
- technicians
- labourers

For each category of human resource, the following indicators should be recorded:

- number
- average and total salaries
- fringe benefits (e.g., health insurance, pension, paid leave)

E2.2. Physical resources

- land
- facilities and equipment
- utilities consumed (electricity, gas, water, etc.)
- spare parts and other materials

Capital, as well as operation and maintenance, costs of these resources should also be recorded as resource input indicators.

In situations where contractors are employed, the contractor's human and physical resources and the contractual fees should be recorded as resource input indicators.

E3. EFFICIENCY indicators

There are a number of efficiency indicators that can be calculated based on the data collected; the following list provides some of the most common ones.

- annual revenue from sales of products per annual total cost
- annual revenue from sales of products, plus annual savings due to reduced disposal cost per annual total cost
- quantity of waste processed per total cost
- quantity of materials recovered per sorter

F. Final disposal

F1. SERVICE performance indicators

The following list provides representative service performance indicators for final disposal facilities:

- total capacity (m³)
- amount of waste disposed (Mg or m³/day or /yr)
- remaining capacity (m³)
- number of complaints by type (e.g., odour, flies, etc.)

F2. RESOURCE input indicators

Human resource inputs can be categorised as:

- plant managers
- engineers
- technicians
- labourers

For each category of human resource, the following indicators should be recorded:

- number
- average and total salaries
- fringe benefits

Physical resources include:

- land
- support facilities (e.g., office, fencing, weigh bridge, garage, surface water diversion system, liners, leachate collection and treatment facilities, landfill gas extraction system, groundwater monitoring wells)
- equipment (e.g., bulldozers, backhoes, compactors)

- electrical power and water supplies

Capital, as well as operation and maintenance, costs for the human and physical resources are also resource input indicators.

In the event that private contractors are employed, their human and physical resources and the contractual fees should be recorded.

F3. EFFICIENCY indicators

The most useful and commonly used efficiency indicator is the unit cost of waste disposed (cost/Mg).

F4. ADMINISTRATIVE indicators

Some of the most common administrative indicators include:

- number of violations (e.g., littering, illegal dumping, requirement for provision of storage containers)
- number of organised public communication activities (e.g., mass-media campaign, exhibitions, community cleanup contests, community meetings, recycling bazaars)
- number of public education activities
- number of participants in each of these activities