

## 2 Global Waste Management Practices

### At a Glance:

- ▶ In solid waste management there is no throwing 'away'.
- ▶ The organic fraction of waste, collection vehicles, and waste disposal methods contribute to GHG emissions.
- ▶ The last two decades have brought a new challenge for waste management: the growing vagaries of global secondary materials markets.

In solid waste management there is no 'away'. When 'throwing away' waste, system complexities and the integrated nature of materials and pollution are quickly apparent. For example, waste incineration is expensive and poses challenges of air pollution and ash disposal. Incineration requires waste placed outside for collection to be

containerized to stay dry, and much of the waste stream is not combustible. Landfills require land availability, and siting is often opposed by potential neighboring residents. Solving one problem often introduces a new one, and if not well executed, the new problem is often of greater cost and complexity.

## BOX 2

### Definitions of Municipal Solid Waste

**By OECD:** Municipal waste is collected and treated by, or for municipalities. It covers waste from households, including bulky waste, similar waste from commerce and trade, office buildings, institutions and small businesses, yard and garden, street sweepings, contents of litter containers, and market cleansing. Waste from municipal sewage networks and treatment, as well as municipal construction and demolition is excluded.

**By PAHO:** Solid or semi-solid waste generated in population centers including domestic and, commercial wastes, as well as those originated by the small-scale industries and institutions (including hospital and clinics); market street sweeping, and from public cleansing.

**By IPCC:** The IPCC includes the following in MSW: food waste; garden (yard) and park waste; paper and cardboard; wood; textiles; nappies (disposable diapers); rubber and leather; plastics; metal; glass (and pottery and china); and other (e.g., ash, dirt, dust, soil, electronic waste).

ITC landfill and recycling center, Ankara, Turkey ▶



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**TABLE 1**  
**Comparison of Solid Waste Management Practices by Income Level (adapted from *What a Waste 1999*)**

Activity	Low Income	Middle Income	High Income
Source Reduction	No organized programs, but reuse and low per capita waste generation rates are common.	Some discussion of source reduction, but rarely incorporated into an organized program.	Organized education programs emphasize the three 'R's' – reduce, reuse, and recycle. More producer responsibility & focus on product design.
Collection	Sporadic and inefficient. Service is limited to high visibility areas, the wealthy, and businesses willing to pay. High fraction of inerts and compostables impact collection—overall collection below 50%.	Improved service and increased collection from residential areas. Larger vehicle fleet and more mechanization. Collection rate varies between 50 to 80%. Transfer stations are slowly incorporated into the SWM system.	Collection rate greater than 90%. Compactor trucks and highly mechanized vehicles and transfer stations are common. Waste volume a key consideration. Aging collection workers often a consideration in system design.
Recycling	Although most recycling is through the informal sector and waste picking, recycling rates tend to be high both for local markets and for international markets and imports of materials for recycling, including hazardous goods such as e-waste and ship-breaking. Recycling markets are unregulated and include a number of 'middlemen'. Large price fluctuations.	Informal sector still involved; some high technology sorting and processing facilities. Recycling rates are still relatively high. Materials are often imported for recycling. Recycling markets are somewhat more regulated. Material prices fluctuate considerably.	Recyclable material collection services and high technology sorting and processing facilities are common and regulated. Increasing attention towards long-term markets.  Overall recycling rates higher than low and middle income. Informal recycling still exists (e.g. aluminum can collection.) Extended product responsibility common.
Composting	Rarely undertaken formally even though the waste stream has a high percentage of organic material. Markets for, and awareness of, compost lacking.	Large composting plants are often unsuccessful due to contamination and operating costs (little waste separation); some small-scale composting projects at the community/ neighborhood level are more sustainable. Composting eligible for CDM projects but is not widespread. Increasing use of anaerobic digestion.	Becoming more popular at both backyard and large-scale facilities. Waste stream has a smaller portion of compostables than low- and middle-income countries. More source segregation makes composting easier. Anaerobic digestion increasing in popularity. Odor control critical.
Incineration	Not common, and generally not successful because of high capital, technical, and operation costs, high moisture content in the waste, and high percentage of inerts.	Some incinerators are used, but experiencing financial and operational difficulties. Air pollution control equipment is not advanced and often by-passed. Little or no stack emissions monitoring. Governments include incineration as a possible waste disposal option but costs prohibitive. Facilities often driven by subsidies from OECD countries on behalf of equipment suppliers.	Prevalent in areas with high land costs and low availability of land (e.g., islands). Most incinerators have some form of environmental controls and some type of energy recovery system. Governments regulate and monitor emissions. About three (or more) times the cost of landfilling per tonne.
Landfilling/ Dumping	Low-technology sites usually open dumping of wastes. High polluting to nearby aquifers, water bodies, settlements. Often receive medical waste. Waste regularly burned. Significant health impacts on local residents and workers.	Some controlled and sanitary landfills with some environmental controls. Open dumping is still common. CDM projects for landfill gas are more common.	Sanitary landfills with a combination of liners, leak detection, leachate collection systems, and gas collection and treatment systems. Often problematic to open new landfills due to concerns of neighboring residents. Post closure use of sites increasingly important, e.g. golf courses and parks.
Costs (see Annex E)	Collection costs represent 80 to 90% of the municipal solid waste management budget. Waste fees are regulated by some local governments, but the fee collection system is inefficient. Only a small proportion of budget is allocated toward disposal.	Collection costs represent 50% to 80% of the municipal solid waste management budget. Waste fees are regulated by some local and national governments, more innovation in fee collection, e.g. included in electricity or water bills. Expenditures on more mechanized collection fleets and disposal are higher than in low-income countries.	Collection costs can represent less than 10% of the budget. Large budget allocations to intermediate waste treatment facilities. Up front community participation reduces costs and increases options available to waste planners (e.g., recycling and composting).

Locally, waste collection vehicles are large sources of emissions and both incineration and landfilling contribute GHG emissions. Uncollected waste can provide breeding areas and food to potentially disease carrying vectors such as insects and rodents, with their associated health and nuisance issues. Waste management cannot be effectively managed without due consideration for issues such as the city's overall GHG emissions, labor market, land use planning, and myriad related concerns.

Despite progress in solid waste management practices in the decade since the original *What a Waste* Report was published, fundamental institutional, financial, social, and environmental problems still exist. Although each country and city has their own site-specific situations, general observations can be made across low-, middle-, and high-income countries, as delineated in Table 1.

The average city's municipal waste stream is made up of millions of separate waste items. For a compilation of the different definitions for Municipal Solid Waste, please refer to Box 2. In many cases, items in a city's waste stream originated from other countries that have countless factories and independent producers. Some of the larger waste fractions, such as organics (food and horticultural waste) and paper are easier to manage, but wastes such as multi-laminates, hazardous (e.g. syringes), and e-waste, pose disproportionately large problems. Industry programs, such as voluntary plastic-type labeling, are largely ineffective (no facilities exist to differentiate containers by numbers, either mechanically or by waste-worker) and deposit-return systems often meet industry and consumer resistance. Hybrid, ad hoc, and voluntary take-back programs are emerging, however they are generally inefficient

and municipalities are often forced to subsidize the disposal costs of these items.

In the last ten to twenty years an additional challenge has emerged for the waste manager: the growing global vagaries of secondary materials markets. Many municipal recycling programs in Europe and North America were started with the recycling markets relatively close to source. More recently, marketing of secondary-materials has emerged as a global business. The price paid per tonne of waste paper in New York City is often based on what the purchase price is in China. The majority of waste recycled in Buenos Aires, for example, is shipped to China. The volatility of secondary materials prices has increased, making planning more difficult. The price is often predictive of economic trends, dropping significantly during economic downturns (when a city is least able to afford price drops). There are some hedging opportunities for materials pricing, however secondary materials marketing does not have the same degree of sophistication as other commodities (largely due to issues of reliability, quality, externalities, and the sheer number of interested parties).

In the years that have passed since the original *What a Waste* report was released, two comprehensive World Bank studies on India and China have been prepared (Hanrahan et al 2006 and Hoornweg et al 2005). Additionally, OECD and PAHO have released MSW data for Latin America and the Caribbean. This version of *What a Waste* includes the data presented by these reports.

MSW, as defined in this report, encompasses residential, industrial, commercial, institutional, municipal, and construction and demolition (C&D) waste. Table 2 gives sources and types of waste generated.

Source	Typical Waste Generators	Types of Solid Wastes
Residential	Single and multifamily dwellings	Food wastes, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, metals, ashes, special wastes (e.g., bulky items, consumer electronics, white goods, batteries, oil, tires), and household hazardous wastes (e.g., paints, aerosols, gas tanks, waste containing mercury, motor oil, cleaning agents), e-wastes (e.g., computers, phones, TVs)
Industrial	Light and heavy manufacturing, fabrication, construction sites, power and chemical plants (excluding specific process wastes if the municipality does not oversee their collection)	Housekeeping wastes, packaging, food wastes, construction and demolition materials, hazardous wastes, ashes, special wastes
Commercial	Stores, hotels, restaurants, markets, office buildings	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes, e-wastes
Institutional	Schools, hospitals (non-medical waste), prisons, government buildings, airports	Same as commercial
Construction and Demolition	New construction sites, road repair, renovation sites, demolition of buildings	Wood, steel, concrete, dirt, bricks, tiles
Municipal Services	Street cleaning, landscaping, parks, beaches, other recreational areas, water and wastewater treatment plants	Street sweepings; landscape and tree trimmings; general wastes from parks, beaches, and other recreational areas, sludge
All of the above should be included as municipal solid waste. Industrial, commercial, and institutional (ICI) wastes are often grouped together and usually represent more than 50% of MSW. C&D waste is often treated separately: if well managed it can be disposed separately. The items below are usually considered MSW if the municipality oversees their collection and disposal.		
Process	Heavy and light manufacturing, refineries, chemical plants, power plants, mineral extraction and processing	Industrial process wastes, scrap materials, off-specification products, slag, tailings
Medical waste	Hospitals, nursing homes, clinics	Infectious wastes (bandages, gloves, cultures, swabs, blood and body fluids), hazardous wastes (sharps, instruments, chemicals), radioactive waste from cancer therapies, pharmaceutical waste
Agricultural	Crops, orchards, vineyards, dairies, feedlots, farms	Spoiled food wastes, agricultural wastes (e.g., rice husks, cotton stalks, coconut shells, coffee waste), hazardous wastes (e.g., pesticides)

**TABLE 2**  
Generators and  
Types of Solid Waste  
(adapted from  
*What a Waste 1999*)