

This document was prepared as part of the U.S. Department of Energy's Better Buildings / Better Plants Waste Reduction Pilot.

Introduction

A common starting point in a new waste reduction initiative is to identify all the waste streams in a facility or organization. Broadly speaking, a waste is any material that leaves a facility for which there is no customer or revenue but instead a cost. So, a waste stream is the source of such materials. Examples include production processes, offices, kitchens, and incoming raw material receiving areas.



The next step is to group wastes by type. It is common for more than one source to create the same kind of waste(s). For example, packaging wastes are often created in all parts of an organization. Categorizing wastes will aid collection and handling and ultimately provide a framework for managing and minimizing wastes.

There are several approaches to categorizing wastes. Many classification schemes are legally motivated such as those used by the U.S. Environmental Protection Agency (EPA), while others are shaped by a process or set of goals such as our pilot. In our pilot, we anticipate that each participant will use a system for grouping wastes into different categories that is reflective of its processes and helps it achieve its waste reduction goals. This taxonomy of wastes is intended to provide guidance for grouping waste streams and suggestions for waste categories. Pilot participants are not required to align their categories with this taxonomy.

Regulatory Categories

A key regulatory distinction that you may want to include in your waste management system is between hazardous and non-hazardous wastes. As depicted in Figure 1 below, EPA considers all hazardous wastes to be solid wastes regardless of whether they are solid, liquid or a mixture of the two. EPA defines Solid waste to be garbage, refuse, sludges, and other discarded solid materials, including solid waste materials resulting from industrial, commercial, and agricultural operations, and from community activities, but does not include solid or dissolved materials in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial wastewater effluents, dissolved materials in irrigation return flows or other common water pollutants. Unless specifically noted otherwise, the term "solid waste" as used in these guidelines shall not include mining, agricultural, and industrial solid wastes; hazardous wastes; sludges; construction and demolition wastes; and infectious wastesⁱ.

Not included in Figure 1 are wastes that are not considered to be solid wastes. **Wastes which are not Solid Wastes** include domestic sewage, point source discharge, irrigation return flow, radioactive waste in-situ mining, pulping liquors, spent sulfuric acid, reclamation in enclosed tanks, spent wood preservatives, coke by-product wastes, splash condenser dross residue, hazardous secondary material from the petroleum refining industry, excluded scrap metal, shredded circuit boards, pulping condensate derived from Kraft mill steam strippers, spent materials from primary mineral processing, petrochemical recovery oil, spent caustic solutions, hazardous secondary materials used to make zinc fertilizers, zinc fertilizers, CRTs, and solvent contaminated wipesⁱⁱ.

Hazardous Wastes are wastes with properties that make it dangerous or capable of having a harmful effect on human health or the environment. Hazardous wastes are generated from many sources, ranging from industrial manufacturing process wastes to batteries and may come in many forms, including liquids, solids gases, and sludgesⁱⁱⁱ. EPA defines **Hazardous waste** as waste or

TAXONOMY OF WASTES

combination of wastes of a solid, liquid, contained gaseous, or semisolid form which may cause, or contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness, taking into account the toxicity of such waste, its persistence and degradability in nature, its potential for accumulation or concentration in tissue, and other factors that may otherwise cause or contribute to adverse acute or chronic effects on the health of persons or other organisms^{iv}. The definitions of these wastes and their treatments are described in CFR 40 Chapter 1, Subchapter 1, Part 261^v (6).

There are some wastes that that have been excluded from the Hazardous Waste rules because they are addressed in other regulations. Solid wastes that are not considered to be Hazardous Wastes by EPA include household wastes, agricultural wastes, mining overburden, fossil fuel combustion waste, trivalent chromium wastes, cement kiln dust, arsenical-treated wood, injected groundwater, spent chlorofluorocarbon refrigerants, used oil filters, used oil distillation bottoms, and landfill leachate^{vi}.

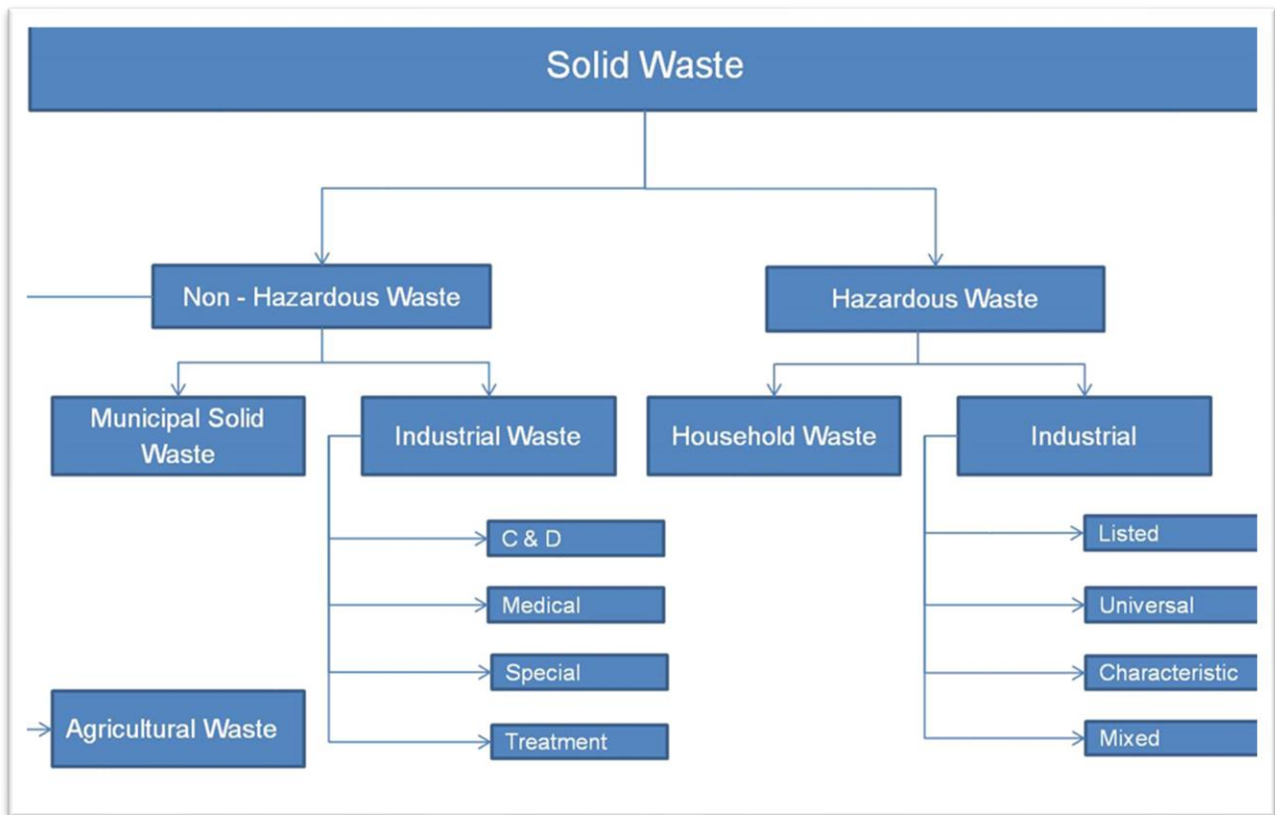


Figure 1. The Hazardous Waste Identification Process^{vii}

The EPA has developed alternative management standards, exclusions and exemptions for academic laboratory wastes (subpart K), Cathode Ray Tubes (CRTs), household hazardous waste (exempted), mixed radiological wastes (“Mixed Wastes” are regulated by NRC), pharmaceutical hazardous wastes, solvent-contaminated wipes, universal waste (batteries, pesticides, mercury-containing equipment, lamps), and used oil^{viii}.

Solid Wastes Definitions

We anticipate that most participants in the Waste Reduction Pilot will focus on wastes currently going to landfills. The definitions of these wastes and their treatments are described in CFR 40 Chapter 1, Subchapter 1, Part 243. The definitions can be found in 243.101 and are copied below^{ix}.

- ▶ **Agricultural solid waste** means the solid waste that is generated by the rearing of animals, and the producing and harvesting of crops or trees.
- ▶ **Bulky waste** means large items of solid waste such as household appliances, furniture, large auto parts, trees, branches, stumps, and other oversize wastes whose large size precludes or complicates their handling by normal solid wastes collection, processing, or disposal methods
- ▶ **Commercial solid waste** means all types of solid wastes generated by stores, offices, restaurants, warehouses, and other non-manufacturing activities, excluding residential and industrial wastes.
- ▶ **Food waste** means the organic residues generated by the handling, storage, sale, preparation, cooking, and serving of foods, commonly called garbage
- ▶ **Industrial solid waste** means the solid waste generated by industrial processes and manufacturing.
- ▶ **Infectious waste means:** (1) Equipment, instruments, utensils, and fomites of a disposable nature from the rooms of patients who are suspected to have or have been diagnosed as having a communicable disease and must, therefore, be isolated as required by public health agencies; (2) laboratory wastes, such as pathological specimens (e.g., all tissues, specimens of blood elements, excreta, and secretions obtained from patients or laboratory animals) and disposable fomites (any substance that may harbor or transmit pathogenic organisms) attendant thereto; (3) surgical operating room pathologic specimens and disposable fomites attendant thereto, and similar disposable materials from outpatient areas and emergency rooms.
- ▶ **Institutional solid waste** means solid wastes generated by educational, health care, correctional, and other institutional facilities.
- ▶ **Mining wastes** means residues which result from the extraction of raw materials from the earth.
- ▶ **Residential solid waste** means the wastes generated by the normal activities of households, including, but not limited to, food wastes, rubbish, ashes, and bulky wastes.
- ▶ **Sludge** means the accumulated semiliquid suspension of settled solids deposited from wastewaters or other fluids in tanks or basins. It does not include solids or dissolved material in domestic sewage or other significant pollutants in water resources, such as silt, dissolved materials in irrigation return flows or other common water pollutants.
- ▶ **Construction & Demolition Waste** means waste that is generated as a result of new construction, site expansion, or site renovation activities. The definition includes waste associated with site remediation and hazardous materials abatement

Categories for Solid Waste Management

Each of the regulatory categories is broad and therefore not well suited to waste management. The EPA WasteWise program^x identified over four dozen categories for grouping common commercial, institutional, industrial, and residential wastes. We have consolidated that list into a more manageable number of categories and subcategories for pilot participants' consideration.

Categories for Solid Waste Management
Appliances, computers, furniture
Batteries
Ceramics
Construction and demolition debris
Chemicals
Electronics
Food and compostables
Glass
Light bulbs and fluorescent lights
Metals
▶ Aluminum
▶ Copper
▶ Ferrous
▶ Other/Mixed
Paper
▶ Office
▶ Paperboard and cardboard
▶ Glossy and Other
Plastics
▶ Plastic code #1, PET
▶ Plastic Code #2, HDPE
▶ Plastic Code #3, PVC/Vinyl
▶ Plastic code #4, LDPE
▶ Plastic code #5, Poly propylene
▶ Plastic code #6, Polystyrene
▶ Mixed
Rubber and tires
Sand, soil, dirt, rocks
Textiles
Wood
▶ Lumber
▶ Yard trimmings

Solid Waste Solutions

We anticipate that there will be methods for recycling or reusing the waste streams that most participants in the Waste Reduction Pilot are trying to reduce. There are several other solutions participant may want to consider. Below are some of the more common solutions.

- ▶ **Energy Recovery:** The use of waste, based on its calorific or BTU value, as an energy source in a fuel combustion process, supplementing or completely replacing a primary fuel source.
- ▶ **Fuel Blending:** A process or method designed to mix various wastes and commercial fuels in order to meet the calorific or BTU specifications required by an incinerator, a cement kiln, or an industrial furnace.
- ▶ **Incineration:** The thermal destruction of waste, without recovery of its energy content, typically to eliminate hazardous characteristics.

- ▶ **Prevention:** Designing a product, process or activity to avoid generating waste. This is the ideal and most sustainable approach to Landfill Free status and should always be evaluated first during product design, process development, and project activity planning.
- ▶ **Reuse:** The use of a material more than once for its intended purpose or beneficial use of waste without reclamation in a different process to replace a new or virgin material.
- ▶ **Recycling:** The use of waste as manufacturing feedstock or as a virgin material replacement to create a new product. Typically, some degree of reclamation or conditioning is required before the waste can be utilized.
- ▶ **Source Reduction:** The modification of a product, process, activity, or material in order to reduce the quantity of a specific waste at the source of generation.
- ▶ **Treatment:** A process designed to change the physical, chemical, or biological characteristics of a waste in order to minimize its environment impact. This is an intermediate step to modify a waste, and does not by itself meet the definition of Landfill Free.

Mapping out waste streams and identifying each type of waste are key first steps in waste management. An organization may want to group wastes by source such as production, in-coming packaging, or cafeteria. Since there may be several types of wastes coming from a source (such as production), grouping by source is most valuable as a first level category. Each source category can be further divided into groups identified above. For example, production wastes might include metals, chemicals, and plastics. There is seldom a perfect way to group wastes. Almost by definition, wastes are messy and heterogeneous combinations of undesirable materials. But grouping first by source and then by type may be a useful way to initiate one's waste reduction efforts.



Figure 2: Connecting waste streams to solutions.

Figure 2 features several common sources of wastes and suggests possible solutions. Many of these sources are likely to have more than one category of wastes. For example, offices generate lots of paper, plastic and incoming packaging wastes. They may also have electronics and appliances to recycle. Figure 2 captures the reality that more than one solution may be required to deal with all of the wastes coming from a single waste stream.

Summary

This Taxonomy is intended to provide a starting point for your efforts to define and group the waste streams at your facilities. Identifying waste streams and categorizing wastes are two key steps an organization must take to establish a sustainable waste management program. It may be useful to add to or amend these lists to fit the needs of your organization.

Once an organization has identified all of its key wastes, it should prioritize which ones it will address first. Then it should explore methods for reducing those waste streams. While this document touched on connecting wastes to solutions, this topic will be covered in greater detail in other program documents.

End Notes

ⁱ Federal Register, Part III, Environmental Protection Agency, 40 CFR Part 243: Guidelines for the storage and collection of residential, commercial, and institutional solid waste. March 21, 2011. www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=7fba7e4beedf30ab76ca6358a9028781&mc=true&n=pt40.27.243&r=PART&ty=HTML

ⁱⁱ U.S. Environmental Protection Agency. 2019. "Criteria for the Definition of Solid Waste and Solid and Hazardous Waste Exclusions." Accessed September. Washington, DC: US EPA. www.epa.gov/hw/criteria-definition-solid-waste-and-solid-and-hazardous-waste-exclusions

ⁱⁱⁱ U.S. Environmental Protection Agency. 2019. "Learn the basics of hazardous waste." Accessed September. Washington, DC: US EPA. www.epa.gov/hw/learn-basics-hazardous-waste.

^{iv} Federal Register, Part III, Environmental Protection Agency, 40 CFR Part 243.101: Guidelines for the storage and collection of residential, commercial, and institutional solid waste. Subpart A – General Provisions. Definitions." March 21, 2011. www.ecfr.gov/cgi-bin/text-idx?SID=7fba7e4beedf30ab76ca6358a9028781&mc=true&node=se40.27.243_1101&rqn=div8

^v Federal Register, Part III, Environmental Protection Agency, 40 CFR 261: Identification and Listing of Hazardous Waste," May 19, 1980. www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=7fba7e4beedf30ab76ca6358a9028781&mc=true&n=pt40.28.261&r=PART&ty=HTML

^{vi} U.S. Environmental Protection Agency. 2019. "Criteria for the Definition of Solid Waste and Solid and Hazardous Waste Exclusions." Accessed September. Washington, DC: US EPA. www.epa.gov/hw/criteria-definition-solid-waste-and-solid-and-hazardous-waste-exclusions

^{vii} U.S. Environmental Protection Agency. 2019. "Learn the basics of hazardous waste." Accessed September. Washington, DC: US EPA. www.epa.gov/hw/learn-basics-hazardous-waste.

^{viii} U.S. Environmental Protection Agency. 2019. "Learn the basics of hazardous waste." Accessed September. Washington, DC: US EPA. www.epa.gov/hw/learn-basics-hazardous-waste.

^{ix} Federal Register, Part III, Environmental Protection Agency, 40 CFR Part 243.101: Guidelines for the storage and collection of residential, commercial, and institutional solid waste. Subpart A – General Provisions. Definitions." March 21, 2011. www.ecfr.gov/cgi-bin/text-idx?SID=7fba7e4beedf30ab76ca6358a9028781&mc=true&node=se40.27.243_1101&rqn=div8

^x U.S. Environmental Protection Agency. 2019. "WasteWise." Accessed September. Washington, DC: US EPA. www.epa.gov/smm/wastewise.