**Waste management** *Modified**From Wikipedia, the free encyclopedia*

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**Waste management** involves the collection, [transport](http://en.wikipedia.org/wiki/Transport), and [processing](http://en.wikipedia.org/wiki/Waste_treatment) ([recycling](http://en.wikipedia.org/wiki/Recycling) or disposal) of [waste](http://en.wikipedia.org/wiki/Waste) materials produced by human activity. It is generally undertaken to reduce the effect of these materials on [health](http://en.wikipedia.org/wiki/Health) and [the](http://en.wikipedia.org/wiki/Amenity) environment, and to recover [resources](http://en.wikipedia.org/wiki/Natural_resource) from the waste material.

Waste management can involve [solid](http://en.wikipedia.org/wiki/Solid), [liquid](http://en.wikipedia.org/wiki/Liquid) or [gaseous](http://en.wikipedia.org/wiki/Gas) waste, with different methods used for each type of waste.

Management for non-[hazardous](http://en.wikipedia.org/wiki/Hazardous) residential and institutional waste in metropolitan areas is usually the responsibility of [local government](http://en.wikipedia.org/wiki/Local_government) authorities, while management for non-hazardous commercial and industrial waste is usually the responsibility of the generator.

**Waste management methods**

Waste management methods differ for:

* [developed](http://en.wikipedia.org/wiki/Developed_nation) and [developing nations](http://en.wikipedia.org/wiki/Developing_nation),
* [urban](http://en.wikipedia.org/wiki/Urban_area) and [rural areas](http://en.wikipedia.org/wiki/Rural_area), and for
* [residential](http://en.wikipedia.org/wiki/Residential_area) and [industrial](http://en.wikipedia.org/wiki/Industry) producers.

The methods differ for many reasons, including:

* type of waste material – solid/liquid/gas / hazardous/non-hazardous
* nearby land uses, and
* how much and what kind of area is available for waste processing.

Disposal of solid waste includes the following methods:

* landfills,
* incineration,
* recycling - physical processing, and biological processing

**Landfill**

Disposing of waste in a landfill involves burying waste to dispose of it, and this remains a common practice in most countries. Historically, landfills were often established in old [quarries](http://en.wikipedia.org/wiki/Quarry) or [borrow pits](http://en.wikipedia.org/wiki/Borrow_pit), or in less desirable land such as wetlands.

A properly-designed and well-managed landfill can be a hygienic and relatively inexpensive method of disposing of waste materials. Older, poorly-designed or poorly-managed landfills can create a number of adverse environmental impacts such as wind-blown [litter](http://en.wikipedia.org/wiki/Litter), attraction of [vermin](http://en.wikipedia.org/wiki/Vermin), and generation of liquid [leachate](http://en.wikipedia.org/wiki/Leachate) and gases (mostly composed of [methane](http://en.wikipedia.org/wiki/Methane) and [carbon dioxide](http://en.wikipedia.org/wiki/Carbon_dioxide)), produced as organic waste breaks down [anaerobically](http://en.wikipedia.org/wiki/Anaerobic_digestion). This gas can create odor problems, kill surface vegetation, and is a [greenhouse gas](http://en.wikipedia.org/wiki/Greenhouse_gas), while the leachate can contaminate groundwater supplies.



*A landfill compaction vehicle in action.*

Modern landfill designs include clay or plastic lining material to contain leachate. Once the liner is put into place, the waste is compacted and then covered to prevent attracting [vermin](http://en.wikipedia.org/wiki/Vermin) (such as [mice](http://en.wikipedia.org/wiki/Mice) or [rats](http://en.wikipedia.org/wiki/Rats)). Many landfills also have landfill gas extraction systems installed to extract the [landfill gas](http://en.wikipedia.org/wiki/Landfill_gas). Gas is pumped out of the landfill using perforated pipes and flared off or burnt in a [gas engine](http://en.wikipedia.org/wiki/Gas_engine) to generate [electricity](http://en.wikipedia.org/wiki/Electricity).

In rural areas, it is often more difficult to establish new landfills due to opposition from owners of adjacent land. As a result, solid waste disposal in these areas must be transported further for disposal or managed by other methods.

This fact, as well as growing concern about the environmental impacts of excessive materials consumption, has given rise to efforts to minimize the amount of waste sent to landfill in many areas. These efforts include taxing or levying waste sent to landfill, recycling waste products, converting waste to energy, and designing products that use less material.

**Incineration**



*A waste-to-energy plant in* [*Saugus, Massachusetts*](http://en.wikipedia.org/wiki/Saugus%2C_Massachusetts)*, the first plant in the* [*United States*](http://en.wikipedia.org/wiki/United_States)*.*

Incineration is a disposal method that involves [combustion](http://en.wikipedia.org/wiki/Combustion) of waste material. Incinerators convert waste materials into [heat](http://en.wikipedia.org/wiki/Heat), [gas](http://en.wikipedia.org/wiki/Gas), [steam](http://en.wikipedia.org/wiki/Steam), and [ash](http://en.wikipedia.org/wiki/Incineration#Solid_Outputs).

Incineration is carried out both on a small scale by individuals, and on a large scale by industry. It is used to dispose of solid, liquid and gaseous waste. It is recognized as a practical method of disposing of certain [hazardous waste](http://en.wikipedia.org/wiki/Hazardous_waste) materials (such as biological [medical waste](http://en.wikipedia.org/wiki/Medical_waste)), but is also sometimes viewed as controversial due to issues such as emission of gaseous [pollutants](http://en.wikipedia.org/wiki/Pollutants).

Incineration is common in countries such as [Japan](http://en.wikipedia.org/wiki/Japan) where land is more scarce, as these facilities generally do not require as much area as landfills.

Waste-to-energy (WtE) facilities use modern combustion technologies to burn waste in a furnace or boiler to generate heat, steam and/or electricity. Special combustors allow problem wastes to be used as fuels for the generation of [electricity](http://en.wikipedia.org/wiki/Electricity). These wastes include: [municipal](http://en.wikipedia.org/wiki/Municipal_solid_waste) solid waste, [sewage](http://en.wikipedia.org/wiki/Sewage), [sludge](http://en.wikipedia.org/wiki/Sludge), "[dirty coals](http://en.wikipedia.org/wiki/Lignite)", and coal [byproducts](http://en.wikipedia.org/wiki/Byproduct). The [fly ash](http://en.wikipedia.org/wiki/Fly_ash) byproduct is inert, and can be mixed with [compost](http://en.wikipedia.org/wiki/Compost).

**Recycling**

The process of extracting resources or value from waste is generally referred to as recycling, meaning to recover or reuse the material. There are a number of different methods by which waste material is recycled: the raw materials may be extracted and reprocessed, or the calorific content of the waste may be converted to electricity. New methods of recycling are being developed continuously, and are described briefly below.

**Physical Reprocessing**



*Steel scrap, sorted and baled for recycling*

The popular meaning of ‘recycling’ in most developed countries refers to the widespread collection and reuse of everyday waste materials such as empty beverage containers. These are collected and sorted into common types so that the raw materials from which the items are made can be reprocessed into new products. Material for recycling may be collected separately from general waste using dedicated bins and collection vehicles, or sorted directly from mixed waste streams.

The most common consumer products recycled include [aluminum](http://en.wikipedia.org/wiki/Aluminum) beverage cans, [steel](http://en.wikipedia.org/wiki/Steel) food and aerosol cans, [HDPE](http://en.wikipedia.org/wiki/HDPE) and [PET](http://en.wikipedia.org/wiki/Recycling_of_PET_Bottles) bottles, [glass](http://en.wikipedia.org/wiki/Glass) bottles and jars, paperboard cartons, [newspapers](http://en.wikipedia.org/wiki/Newspapers), magazines, and [cardboard](http://en.wikipedia.org/wiki/Cardboard). Other types of plastic ([PVC](http://en.wikipedia.org/wiki/Polyvinyl_chloride), [LDPE](http://en.wikipedia.org/wiki/LDPE), [PP](http://en.wikipedia.org/wiki/Polypropylene), and [PS](http://en.wikipedia.org/wiki/Polystyrene): see [resin identification code](http://en.wikipedia.org/wiki/Resin_identification_code)) are also recyclable, although these are not as commonly collected. These items are usually composed of a single type of material, making them relatively easy to recycle into new products. The recycling of complex products (such as computers and electronic equipment) is more difficult, due to the additional dismantling and separation required.

**Biological processing**



*An active* [*compost*](http://en.wikipedia.org/wiki/Compost) *heap*

Waste materials that are organic in nature, such as plant material, food scraps, and paper products, can be recycled using biological composting and digestion processes to [decompose](http://en.wikipedia.org/wiki/Decompose) the organic matter. The resulting organic material is then recycled as [mulch](http://en.wikipedia.org/wiki/Mulch) or [compost](http://en.wikipedia.org/wiki/Compost) for agricultural or landscaping purposes. In addition, waste gas from the process (such as methane) can be captured and used for generating electricity. The intention of biological processing in waste management is to control and accelerate the natural process of decomposition of organic matter.

**Avoidance and Reduction**

Another important method of waste management is the prevention of waste material being created. Methods of avoidance include reuse of second-hand products, repairing broken items instead of buying new, designing products to be refillable or reusable (such as shopping bags made from corn starch instead of plastic), encouraging consumers to avoid using disposable products (such as disposable plate, cups and [cutlery](http://en.wikipedia.org/wiki/Cutlery)), and designing products that use less material to achieve the same purpose.

**Waste collection**



*A typical front loading Garbage Truck in* [*North America*](http://en.wikipedia.org/wiki/North_America)

Waste collection methods vary widely between different countries and regions. Domestic waste collection services are often provided by local government authorities, or by private industry. Some areas, especially those in less developed countries, do not have a formal waste-collection system.

Most urban domestic households in developed nations have a bin or bins that are emptied weekly from the curb, and recyclables and/or organics that are picked up on a scheduled basis. In Europe and a few other places around the world, a few communities use a collection system known as Envac, which conveys refuse via underground conduits using a vacuum system. In rural areas people often dispose of their waste by hauling it to a transfer station. Waste collected is then transported to a regional [landfill](http://en.wikipedia.org/wiki/Landfill).

**[Waste hierarchy](http://en.wikipedia.org/wiki/Waste_hierarchy" \o "Waste hierarchy)**



*The waste hierarchy*

The waste hierarchy refers to the "3 Rs" [reduce](http://en.wikipedia.org/wiki/Reduce_%28waste%29), [reuse](http://en.wikipedia.org/wiki/Reuse) and [recycle](http://en.wikipedia.org/wiki/Recycling), which classify waste management strategies according to their desirability in terms of [waste minimization](http://en.wikipedia.org/wiki/Waste_minimization). The aim of the waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste.

**[Extended producer responsibility](http://en.wikipedia.org/wiki/Extended_producer_responsibility" \o "Extended producer responsibility)**

Extended Producer Responsibility (EPR) is a strategy designed to promote the integration of all costs associated with products throughout their life cycle (including end-of-life disposal costs) into the market price of the product. This means that firms which manufacture, import and/or sell products are required to be responsible for the products after their useful life as well as during manufacture.

**[Polluter pays principle](http://en.wikipedia.org/wiki/Polluter_pays_principle" \o "Polluter pays principle)**

The Polluter Pays Principle is a principle where the polluting party pays for the impact caused to the natural environment. With respect to waste management, this generally refers to the requirement for a waste generator to pay for appropriate disposal of the waste.