Keep materials in use

Reduce demand for new resources and the amount requiring disposal. Compare each method with its realistic alternative, including processing costs and remaining pollution.

1. START UPSTREAM: THE WASTE HIERARCHY

Supporting context: generally preferred options appear first; the best choice also depends on the material and local collection systems.

REDUCE / REUSE	Prevent waste; repair or refill products.
RECYCLE / COMPOST	Recover materials after use.
RECOVER ENERGY	Use waste or its gas as a fuel.
TREAT / DISPOSE	Manage what still remains.

2. RECYCLING: RECOVER RAW MATERIALS

Discarded materials are collected, sorted and processed into feedstock for new products. Recovered metals reduce demand for newly mined minerals. Collection, transport and processing still use energy and money; savings depend on the material and the alternative. Food contamination, poor sorting and weak demand for recovered material can undermine a program.

3. E-WASTE: REUSE FIRST, RECYCLE RESPONSIBLY

Repairing or donating usable electronics extends their working life. Recycling can recover valuable materials when a device can no longer be used. Some components contain lead or mercury; unsuitable disposal can allow hazardous substances to reach groundwater. Use appropriate collection and qualified recyclers, rather than placing electronics in mixed trash.

Waste hierarchy and prevention: US EPA, Materials and Waste Management Hierarchy.
Recycling systems: US EPA, Recycling Basics and Benefits.
Electronics recovery: US EPA, Electronics Donation and Recycling.

Scope: College Board AP Environmental Science CED, Topic 8.10, pp. 168-169.

Composting closes an organic loop

Managed aerobic decomposition converts suitable organic waste into a stable soil amendment. It recycles nutrients; it is not the same process as burning trash.

1. INPUTS + OXYGEN + MOISTURE → COMPOST

SORT INPUTS

Food scraps, leaves and suitable uncoated paper.

→

MANAGE DECAY

Microbes break down material; aeration and moisture support activity.

→

USE COMPOST

Mature compost adds organic matter and nutrients to soil.

Aerobic respiration releases carbon dioxide, water and heat. Keeping organics out of anaerobic landfill conditions can reduce methane generation.

2. BENEFITS: LESS DISPOSAL, HEALTHIER SOIL

Diverting food and yard waste reduces the amount sent to landfills or incinerators. Finished compost improves soil structure and water retention, supplies nutrients and can reduce the need for added fertilizer. Compost is a variable soil amendment, not a guaranteed one-for-one replacement for every fertilizer.

3. DRAWBACKS REQUIRE ACTIVE MANAGEMENT

Odor and rodents are potential problems, especially when food remains exposed or a pile is too wet and poorly aerated. Mix carbon-rich dry material with nitrogen-rich scraps, maintain moisture and airflow, and cover scraps. Acceptance rules differ: a home pile and an industrial facility cannot necessarily process the same materials.

Composting biology, inputs and troubleshooting: US EPA, Composting At Home.

Scope: College Board AP Environmental Science CED, Topic 8.10, pp. 168-169.

Recover value; track what remains

Reduction, diversion and landfill mitigation are different outcomes. A useful comparison explains both the benefit achieved and the impacts that still need management.

1. BURNING SOLID WASTE FOR ENERGY

Waste-to-energy combustion releases heat that can make steam and generate electricity. It reduces the volume of solid waste needing disposal, but produces ash and air emissions. Pollution controls, residue management and operating costs remain important. Recovering energy does not recover the original materials for reuse.

2. USING LANDFILL GAS AS FUEL

Anaerobic decomposition produces methane-containing gas. Wells collect it; treatment prepares it for combustion in equipment such as an engine or turbine connected to a generator. Capturing methane can reduce its release, but collection is incomplete and combustion produces carbon dioxide. Decomposition and settling reduce buried volume; burning collected gas is not burning the buried solids.

3. RECLAIMING A CLOSED LANDFILL

A closed site may be restored for habitat or park use. The waste remains below the cover: liners, gas systems, leachate controls and monitoring still need care. Reusing the land does not mean the landfill has become contamination-free.

4. CALCULATE DIVERSION WITHOUT DOUBLE COUNTING

Illustrative school audit: 240 kg/day of waste includes 60 kg recycled and 30 kg composted; these are separate streams.

Diverted = 60 + 30 = 90 kg/day
Diversion rate = (90 / 240) × 100 = 37.5%
Remaining for disposal = 240 - 90 = 150 kg/day
Use the same time period and units. Diversion is not waste prevention.

Solid-waste combustion: US EPA, Energy Recovery from Municipal Solid Waste.
Gas collection and energy use: US EPA, Basic Information about Landfill Gas.

Scope: College Board AP Environmental Science CED, Topic 8.10, pp. 168-169.