

WASTE MANGEMENT

1. Materials Management Overview

How society uses materials fundamentally affects our economic and environmental future. Inefficient and wasteful use of materials now challenges the capacity of the Earth – air, water and land. We can fulfill our needs and prosper while using less material, reducing toxics, and recovering more of the material we consume. By acting less wastefully and considering system-wide impacts in the design, marketing, reuse, recycling, and disposal of products, life-cycle materials assessment represents an important change in how we think about waste and chemicals management. Actions are being taken by EPA to: (1) manage materials and products on a life-cycle basis; (2) build the nation’s capacity to manage materials, and (3) accelerate the public dialogue necessary to create a green, resilient, competitive, and sustainable economy in the future. The President’s [Executive Order 13514](#), Federal Leadership in Environmental, Energy, and Economic Performance, emphasizes the importance of sustainability and requires U.S. Federal agencies to meet a number of energy, water, and waste reduction targets, including 50% recycling and waste diversion by 2015.

1.a EPA Materials Management Responsibilities

EPA’s Strategic Plan <http://www.epa.gov/finance/plan/plan.htm> identifies priority approaches to protect the land, including reducing waste at its source, recycling waste for materials or energy values, managing waste effectively by preventing spills and releases of toxic materials, and cleaning up contaminated properties. EPA’s waste management office, the Office of Resource Conservation and Recovery, <http://www.epa.gov/epawaste/index.htm> is primarily responsible for overseeing implementation of certain provisions of the nation’s Resource Conservation and Recovery Act (RCRA). RCRA’s central goals are to:

- Protection from the hazards of waste disposal
- Reduce or eliminate waste
- Conserve energy and natural resources by recycling and recovery
- Reduce or eliminate waste
- Clean up waste, which may have spilled, leaked, or been improperly disposed.

EPA works in close partnership with the States, Tribes, industry, environmental groups, and the public to achieve these goals. Hazardous waste <http://www.epa.gov/epawaste/basic-hazard.htm> regulated under RCRA is waste with properties that make it dangerous or potentially harmful to human health or the environment, if mismanaged. Non-hazardous waste <http://www.epa.gov/epawaste/basic-solid.htm> may include household garbage, industrial waste, and commercial waste. Under RCRA, much of the responsibility for regulating these wastes is delegated to the States.

The Agency increasingly emphasizes opportunities for source reduction, recycling, and reuse. In 2002, the Agency issued “*Beyond RCRA: Waste and Materials Management in the Year 2020*”. This report describes the need to shift from a waste management approach to materials management: a “cradle-to-cradle” approach aimed at reducing environmental impacts throughout the life cycle of products, materials, and activities. In 2009, a roadmap describing how to move towards a materials management approach was prepared: *Sustainable Materials Management: The Road Ahead*” <http://www.epa.gov/epawaste/inforesources/pubs/vision.htm>. The report suggests a path to move towards materials management and is focused on 1) knowing and reducing the life cycle impacts across the supply chain; 2) using less material inputs (reduce, reuse, recycle); 3) using less toxic and more renewable materials; and 4) considering whether services can be substituted for products.

EPA’s Resource Conservation Challenge <http://www.epa.gov/epawaste/rcc/index.htm> (RCC) is an important national effort developed by EPA to conserve natural resources. The RCC builds on the strengths of many EPA programs and partners to help prevent pollution, reduce the use of toxic chemicals, promote recycling and reuse of materials, and conserve energy. The current focus of the RCC is fourfold: (1) achieving a national 35% recycling rate for municipal solid waste; (2) fostering beneficial reuse of secondary materials; (3) reducing priority and toxic chemicals; and (4) promoting green initiatives, with an initial focus on electronics.

Green remediation <http://www.epa.gov/superfund/greenremediation/> embraces the idea that all aspects of environmental protection should be considered when cleaning up contaminated properties. Using green remediation principles, EPA is taking actions to encourage the sustainable reuse of these properties. In addition to clean up, these actions can result in lower energy demand, reduced greenhouse gas emissions, less water use, and other health and environmental benefits that contribute to economic and environmental sustainability. For example, EPA’s Brownfields Sustainability Pilots http://www.epa.gov/brownfields/sustain_plts/ fund actions that further long-term environmental stewardship.

2. Domestically-Focused Agencies and Programs

EPA largely has focused on developing hazardous and municipal solid waste programs in the United States and fostering a strong societal commitment to recycling and pollution prevention. Since the enactment of RCRA, EPA has built a comprehensive cradle-to-grave regulatory program for hazardous waste management; set national baseline standards for municipal solid waste landfills; identified priority pollutants on which to focus hazardous waste reduction efforts; worked in successful partnerships to reduce waste, promote recycling, and build markets for recycled-content products; and provided education and technical assistance to further in these efforts. While safe waste management and cleanup remain a critical foundation

necessary to protect human health and the environment, EPA increasingly is emphasizing the importance of work in resource conservation, sustainability, and safe materials management.

2.a Reducing Environmental Impacts of Products

Product stewardship <http://www.epa.gov/waste/partnerships/stewardship/basic.htm> calls on all parties in the product life cycle - material feedstock suppliers, manufacturers, retailers, and consumers—to share responsibility for reducing the environmental impacts of products. Beginning with design, products can be made and used in ways that conserve materials and foster reuse to save energy, reduce waste, preserve resources, and protect the environment. Life cycle assessment <http://www.epa.gov/nrmrl/lcaccess/> (LCA) is an important technique used to help achieve this goal. LCA allows users to make more informed decisions through a better understanding of the human health and environmental impacts of products, processes, and activities. EPA has created the WASTE Reduction Model http://www.epa.gov/climatechange/wydc/waste/calculators/Warm_home.html to help solid waste planners and organizations calculate, track, and voluntarily report reductions in these emissions from alternative materials management practices such as source reduction (e.g., using less packaging material <http://www.epa.gov/retailindustry/products/sustainability.html#packaging>), recycling, and composting that reduce waste quantities and toxicity. EPA created the Recycled Content (ReCon) tool to help companies and individuals estimate life-cycle greenhouse gas (GHG) emissions and energy impacts from purchasing and/or manufacturing material with varying degrees of post-consumer recycled content. http://www.epa.gov/climatechange/wydc/waste/calculators/Recon_home.html

2.a.a Product Design and Development

Pollution prevention <http://www.epa.gov/p2/pubs/p2policy/framework.htm> means changing the culture from one that tolerates pollution to a sustainable approach that increasingly eliminates pollution at the source and prevents the creation of waste in the first place. Important opportunities for applying pollution prevention principles exist in product design and development:

- Process Improvement and Waste Minimization. Design for the Environment <http://www.epa.gov/dfe/> is an EPA program that promotes cleaner technologies and safer chemical alternatives by assisting manufacturers to select safer chemicals in processes and product design. The Green Suppliers Network <http://www.epa.gov/greensuppliers/> works with large manufacturers to engage their small and medium-sized suppliers in low-cost technical reviews that focus on process improvement and waste minimization through lean manufacturing techniques. The Suppliers Partnership for the Environment <http://www.epa.gov/oppt/suppliers/> provides a forum in which automotive and vehicle suppliers can share environmental best practices and common-sense approaches that benefit smaller companies in the

industry through increased energy efficiency, waste elimination, and technology optimization.

- Energy Star http://www.energystar.gov/index.cfm?c=about.ab_index. The Energy Star Program uses energy-efficiency-labeling and tax credits to conserve energy and reduces waste by promoting the use of energy-efficient products and practices. Products in more than sixty categories are eligible for the Energy Star.
- Green Building <http://www.epa.gov/greenbuilding/>. Green, or sustainable, building is the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life cycle - from siting to design, construction, operation, maintenance, renovation, and deconstruction. The use of green building approaches is important to EPA's Brownfields Program <http://epa.gov/brownfields/>, which supports the sustainable reuse of properties complicated by the presence or potential presence of hazardous substances, pollutants, or contaminants.

2.a.b Product Marketing and Sales

EPA encourages the marketing and sale of products that reduce waste and are better for the environment:

- The Comprehensive Procurement Guideline (CPG) Program <http://www.epa.gov/waste/consERVE/tools/cpg/index.htm>. The CPG Program is part of EPA's continuing effort to promote the use of recovered materials. Buying recycled-content products ensures that the materials collected in municipal recycling programs will be used again in the manufacture of new products. Under RCRA and Executive Order 13101, EPA is required to designate products that are or can be made with recovered materials, and to recommend practices for buying these products. Once a product is designated, procuring agencies are required to purchase it with the highest recovered material content level practicable.
- Environmentally-Preferable Purchasing <http://www.epa.gov/epp/index.htm> (EPP). US Federal agencies are directed by federal laws, regulations, and Executive Order 13423 to purchase environmentally preferable products and services. EPA's EPP Program helps these agencies comply with green purchasing requirements by providing Green Purchasing Guides for topics such as cleaning products and carpeting. EPP resources for electronics <http://www.epa.gov/epp/pubs/products/electronic.htm>, for example, encourage federal government facilities and agencies to purchase greener electronic products, reduce their environmental impacts during use, and manage obsolete electronics in an environmentally safe way. The Federal Electronics Challenge <http://www.federalelectronicschallenge.net/> is a government partnership program to support these goals.
- Recycling Markets Development. Materials and waste exchanges <http://www.epa.gov/epawaste/consERVE/tools/exchange.htm> are markets for buying

and selling reusable and recyclable commodities. EPA provides resources, including information on international and national markets <http://www.epa.gov/epawaste/consERVE/tools/exchnat.htm>, for buying and selling reusable and recyclable commodities in order to support the development of markets <http://www.epa.gov/epawaste/consERVE/rrr/rmd/index.htm> for recycled products.

2.b Reducing Chemical Risks

Priority and toxic chemicals reduction <http://www.epa.gov/epawaste/rcc/resources/action-plan/appndx-b.htm> is an important objective of the RCC. To achieve this goal, EPA promotes the use of advanced production and management tools, including green chemistry <http://www.epa.gov/greenchemistry/index.html>, green engineering, <http://www.epa.gov/oppt/greenengineering/>, environmental management systems <http://www.epa.gov/EMS/>, lean manufacturing <http://www.epa.gov/lean/>, chemical management services <http://www.epa.gov/waste/hazard/wastemin/minimize/cms.htm>, and waste-to-energy technologies <http://www.epa.gov/RDEE/energy-and-you/affect/municipal-sw.html>. Examples of EPA programs that focus on the reduction of wastes from chemicals of concern include:

- **Reducing Priority Chemicals.** Misuse of products containing toxic metals such as mercury, cadmium, and lead is a serious concern. Through the National Partnership for Environmental Priorities <http://www.epa.gov/epawaste/partnerships/npep/> (NPEP), EPA partners with industry, business, municipalities, federal facilities, and Tribes to reduce the use of potentially hazardous chemicals in products and processes through improved chemicals management. The National Lead Free Wheel Weight Initiative <http://www.epa.gov/waste/hazard/wastemin/nlfwwi.htm>, for example, is a broad public-private NPEP partnership that encourages a transition from the use of lead for wheel weights to lead-free alternatives. EPA also encourages consumers and businesses to use non-mercury alternatives to mercury-containing products <http://www.epa.gov/mercury/consumer.htm>, and to recycle mercury-containing products when possible. Some batteries contain mercury and cadmium, and electronic products may contain these toxic constituents. EPA's National Vehicle Mercury Switch Recovery Program <http://www.epa.gov/mercury/switch.htm> (NVMSRP) is an example of a national effort to recover all available mercury switches from scrap automobiles.
- **Schools Chemical Clean-Out Campaign** <http://www.epa.gov/epawaste/partnerships/sc3/index.htm>. The Schools Chemical Cleanout Campaign is an EPA initiative aimed at ensuring that all U.S. schools are free from hazards associated with mismanaged chemicals. The Campaign provides schools with information and tools to manage chemicals responsibly by removing inappropriate, outdated, unknown, and unnecessary chemicals, raising awareness of chemical issues, and promoting sustainable solutions. Tools include: training, curriculum change, and long-term management solutions. Using these techniques, schools, parents, and local

organizations can partner to create a chemical management program that meets the unique needs of their schools

- Rulemakings. EPA's Universal Waste Rule <http://www.epa.gov/epawaste/hazard/wastetypes/universal/> encourages recycling and proper disposal of certain consumer products that contain toxic materials, such as batteries, thermostats, and florescent lamps. Cathode ray tubes (CRTs) are video display components of televisions and computer monitors. The glass in CRTs typically contains enough lead to require its management as hazardous waste under certain circumstances. EPA's CRT Rule <http://www.epa.gov/osw/hazard/recycling/electron/crt-fs06.htm> streamlines the federal hazardous waste management requirements for CRTs and CRT glass destined for recycling in order save energy, conserve resources, and allow for the recovery and reuse of lead and glass.

2.c Reuse and Recycling

EPA promotes the many benefits, including resource conservation and cost savings, of reuse and recycling, which converts materials that otherwise would be considered waste into valuable resources. WasteWise <http://www.epa.gov/epawaste/partnerships/wastewise/index.htm>, for example, is an EPA partnership program that seeks to reduce and recycle municipal sold waste and selected industrial waste streams. Working with businesses, schools, hospitals, local communities, and government agencies, WasteWise saves energy and prevents the release of greenhouse gases.

2.c.a Municipal Materials Management

EPA has established an action plan to achieve a National Recycling Rate of 35% for municipal solid waste <http://www.epa.gov/epawaste/rcc/resources/action-plan/act-p1.htm>, including household and office waste. The action plan lays out a framework or road map and targets actions for particular waste streams (e.g., paper and paperboard, organic waste, and packaging/containers) to achieve this goal. EPA initiatives to foster the recycling of household and office materials include:

- Organic Materials <http://www.epa.gov/waste/consERVE/materials/organics/index.htm>. Many opportunities exist to reduce, reuse, and recycle organic materials. Excess food can be donated to feed hungry people. Greenscapes <http://www.epa.gov/epawaste/consERVE/rrr/greenscapes/index.htm>, for example, encourages companies, government agencies, and homeowners to make more cost-efficient and environmentally-friendly landscaping decisions. GreenScapes' on-line calculators promote sustainable landscaping decisions by allowing readers to compare costs between environmentally-preferable methods and the use of virgin materials. Through composting

- <http://www.epa.gov/epawaste/consERVE/rrr/composting/index.htm>, yard trimmings, food waste, and wood waste can prevent soil erosion and provide valuable nutrients.
- **Electronics** <http://www.epa.gov/waste/consERVE/materials/ecycling/index.htm>. EPA is working to educate consumers and others about the importance of reusing and recycling electronics. Plug in to ECycling <http://www.epa.gov/epawaste/partnerships/plugin/index.htm> is a partnership program between EPA and leading consumer electronics manufacturers, retailers, and mobile service providers of televisions and computers to foster and promote shared responsibility for safe recycling of electronics,. Responsible Recycling (R2) Practices <http://www.epa.gov/waste/consERVE/materials/ecycling/r2practices.htm> are a set of guidelines for accredited certification programs to assess electronics recyclers' environmental, worker health and safety, and security practices.
 - **Mercury-Containing Lamps** <http://www.epa.gov/epawaste/hazard/wastetypes/universal/lamps/index.htm>. EPA is working with manufacturers and major U.S. retailers to develop, implement and expand recycling options for all mercury-containing light bulbs, including compact fluorescent light bulbs.
 - **Landfill Methane Outreach Program** <http://epa.gov/lmop/> (LMOP). LMOP is a voluntary EPA assistance program to help reduce methane emissions from landfills by encouraging the recovery and use of landfill gas as an energy resource. LMOP forms partnerships with communities, landfill owners, utilities, power marketers, States, project developers, Tribes, and non-profit organizations to help assess project feasibility, find financing, and market the benefits of project development.
 - **Recycle on the Go** <http://www.epa.gov/epawaste/consERVE/rrr/rogo/index.htm>. EPA's Recycle on the Go Program promotes recycling opportunities in public locations like parks, convention centers, sports stadiums, and shopping centers. Recycle on the Go helps communities develop the infrastructure necessary to achieve recycling in these public places.
 - **Pay-As-You-Throw** <http://www.epa.gov/waste/consERVE/tools/payt/index.htm>. In communities with pay-as-you-throw programs (also known as unit pricing or variable-rate pricing), residents are charged for the collection of household trash based on the amount they throw away. This strategy creates a direct economic incentive to recycle more and to generate less waste. EPA promotes Pay-As-You-Throw through national workshops, informational guides, videos, and web-based resources.

2.c.b Industrial and Building Materials Management

Nearly every industrial process, from manufacturing consumer goods to generating energy, produces different types of usable materials. Hundreds of millions of tons of nonhazardous industrial materials are often wasted. Industrial materials recycling <http://www.epa.gov/epawaste/consERVE/rrr/imr/index.htm>, also referred to as beneficial use, involves reusing or recycling byproduct materials generated from industrial processes. These

materials can be used as substitutions for raw materials in the manufacture of consumer products, roads, bridges, buildings, and other construction projects. Similarly, construction and demolition (C&D) materials recycling

<http://www.epa.gov/waste/consERVE/rrr/imr/cdm/index.htm> involves the use of heavy materials, such as concrete, wood, metals, glass, and salvaged building components debris generated during the construction, renovation, and demolition of buildings, roads, and bridges. EPA initiatives to promote the reuse and recycling of industrial and building materials include:

- **Coal Combustion Products Partnership**
<http://www.epa.gov/epawaste/partnerships/c2p2/index.htm>. Coal combustion products are generated from burning coal in coal-fired power plants and include fly ash, bottom ash, boiler slag, and flue gas desulfurization gypsum. Recycling coal combustion byproducts saves money and natural resources and reduces energy consumption. The Coal Combustion Partnership promotes the beneficial use of these materials in cement and other products.
- **Foundry Sands Recycling**
<http://www.epa.gov/waste/consERVE/rrr/imr/foundry/index.htm>. Spent foundry sands are generated by the metal casting industry. Together with industry, EPA has set national goals for the safe reuse of nonhazardous foundry sands. The recycling of nonhazardous, spent foundry sand in asphalt, concrete, and mortar mixes can save energy, reduce the need to mine virgin materials, and reduce costs for both producers and end users.
- **Recycling C&D Debris** <http://www.epa.gov/waste/consERVE/rrr/imr/cdm/programs.htm>. EPA has established partnerships and programs to reduce and utilize C&D debris. Careful consideration of how C&D materials are generated and managed is a critical element of green buildings
<http://www.epa.gov/waste/consERVE/rrr/imr/cdm/greenbld.htm> that provide healthier and more resource-efficient models for construction, operation, maintenance, and renovation. EPA's Construction Initiative
<http://www.epa.gov/waste/consERVE/rrr/imr/initiative.htm> complements EPA's initiatives to promote green buildings. The Initiative is a collaborative, public-private sector effort to increase the recycling and reuse of industrial materials, including coal combustion products, spent foundry sand, construction and demolition materials, iron and steel slag, scrap tires, and pulp/paper mill residuals, in building and transportation construction projects across the nation.

2.c.c Hazardous Materials Management

EPA has established hazardous waste recycling <http://www.epa.gov/waste/hazard/recycling/index.htm> regulations to promote the reuse and reclamation of useful materials in a manner that is safe and protective of human health and the environment. Hazardous waste recycling opportunities includes used oil, precious metals, and

scrap metal. Appropriate reuse and recycling of hazardous household products <http://www.epa.gov/waste/consERVE/materials/hhw.htm#options> also can save money and reduce the need for generating hazardous substances.

3. Internationally-Focused Agencies and Programs

Relevant EPA international responsibilities include agreements, regulations, and initiatives <http://www.epa.gov/waste/hazard/international/index.htm>. The U.S. has established important agreements that affect the handling of wastes shipped across international borders, and U.S. regulations govern the import and export of hazardous waste. International initiatives involve the Organization for Economic Cooperation and Development (OECD), the U.S.-Mexico and U.S.-Canada borders, the Commission for Environmental Cooperation (CEC), and methane gas capture.

3.a Transboundary Movement of Hazardous Waste

3.a.a U.S. Import/Export Requirements <http://www.epa.gov/waste/hazard/international/imp-exp.htm>. The United State is a party to various international agreements which provide for prior notification of shipment of wastes (i.e., both importing and exporting of waste). EPA processes notifications documenting individual shipment of waste and receives annual export reports for the regulated community. Importers and exporters of hazardous wastes must comply with applicable US domestic laws and regulations, which include regulations under the Resource Conservation and Recovery Act (RCRA). The [Import-Export Program \(IEP\)](#) in EPA's Office of Enforcement and Compliance Assurance is responsible for overseeing international trade in hazardous waste involving the United States.

3.a.b International Agreements <http://www.epa.gov/waste/hazard/international/agree.htm>

The United States is party to agreements with Canada, Mexico, Costa Rica, Malaysia, the Philippines, and the OECD concerning the transboundary movement of waste. In addition, the U.S. is a signatory to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.

- [Canada](#). The original 1986 agreement between Canada and the U.S. on the transboundary shipment of hazardous waste between the two countries seeks to provide the U.S. and Canada with safe, low cost options for managing waste for which there is a lack either of domestic capacity or the technology to manage this waste appropriately. This agreement was amended in 1992
- [Mexico](#). A 1986 agreement between Mexico and the U.S. controls the transboundary shipment of hazardous wastes between the two countries.
- [OECD](#). A 2001 OECD Decision on the control of transboundary movements of hazardous wastes destined for recovery operations establishes hazardous waste shipment requirements between OECD countries, including the U.S.

- Basel Convention on the Control of Transboundary Hazardous Wastes and their Disposal. The Basel Convention regulates the import and export of hazardous waste among party nations and establishes legal obligations to ensure that such wastes are managed in an environmentally-sound manner. As a non-party to the Convention, the U.S. participates in Convention meetings and initiatives, including the Basel Mobile Phone Partnership Initiative <http://www.basel.int/industry/mppi.html> (MPPI). MPPI was established as a sustainable partnership on the environmentally-sound management of used and end-of-life mobile telephones.
- Costa Rica, Malaysia, and the Philippines. The Agreement Between the Government of America and the Government of Malaysia Concerning the Transboundary Movement of Hazardous Wastes from Malaysia to the United States (1995), the Agreement on the Transboundary Movement of Hazardous Waste from Costa Rica to the United States (1997), and the Agreement Between the Government of the United States of America and the Government of the Republic of the Philippines Concerning the Transboundary Movement of Hazardous Wastes from the Philippines to the United States (2001) are bilateral agreements that govern the export of hazardous wastes from these countries into the U.S. .

3.b International Initiatives.

EPA international work involves the OECD, Border Plan 2012, the Commission for Environmental Cooperation (CEC), and methane capture:

- OECD. The U.S. actively participates in and supports the OECD Working Group on Waste Prevention and Recycling (WGWPR), whose work includes: [Sustainable Materials Management \(SMM\)](#); [Environmentally Sound management of Waste \(ESM\)](#); Transboundary Movements of Waste http://www.oecd.org/document/54/0,3343,en_2649_34395_37987446_1_1_1_1,00.html, and [Waste Prevention and Minimisation](#) .
- U.S. Border Programs. The U.S.-Mexico Environmental Program <http://www.epa.gov/usmexicoborder/index.html> (Border 2012) is a bi-lateral collaboration between the United States and Mexico to improve the environment and protect the health of the nearly twelve million people living along the border. The U.S. has been active in addressing materials management priorities identified by the Border 2012 Waste Policy Forum <http://www.epa.gov/usmexicoborder/fora/waste-forum/index.html>, including waste management infrastructure, international electronic exchange of export/import data, scrap tire clean up and prevention, and clean up and restoration of contaminated sites. EPA also administers border environmental programs <http://www.epa.gov/oem/content/border.htm> jointly with Canada and Mexico to prepare for and prevent chemical and other hazardous substance emergencies along the northern and southern borders of the U.S.

- Commission for Environmental Cooperation
<http://www.epa.gov/oia/regions/na/nacec/index.html> (CEC) Waste Program. The CEC fosters collaboration among the North American Free Trade Agreement (NAFTA) parties to implement NAFTA's environmental side agreements. Under the CEC Hazardous Waste Task Force, the U.S. has worked to improve the tracking of transboundary movements of hazardous waste and increase the environmentally-sound management of materials in North America.

Methane Capture <http://www.epa.gov/outreach/international.html>. The Methane to Markets Partnership is an international initiative that advances cost-effective, near-term methane gas recovery and use as a clean energy source. The goal of the Partnership is to reduce global methane emissions in order to enhance economic growth, strengthen energy security, improve air quality, improve industrial safety, and reduce emissions of greenhouse gases. EPA is involved in a number of international activities to better understand and quantify global methane emissions, assess the costs and benefits of emission reduction options, and facilitate cost-effective emission reduction opportunities.