



# Materials Management and the Climate Connection


Reuse Matters ... *Because Materials Matter*

**ReuseConex**  
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# Unsustainable Trajectory

- ▶ Materials management is associated with 42% of U.S. GHG emissions
  - ▶ In past 50 yrs, humans consumed more resources than in all past history
  - ▶ In 2000, U.S. consumed 57% more materials than in 1975; global consumption increase was even greater
  - ▶ U.S. has < 5% of world's population but is responsible for about 1 / 3 of world's total materials consumption in 1970–1995
  - ▶ Our reliance on minerals as fundamental ingredients in manufactured products used in U.S. (e.g., cell phones, paint, toothpaste) requires extraction of >25,000 lbs of new nonfuel minerals per capita each year
  - ▶ 1992 Earth Summit world leaders declared that “a principal cause of the continued deterioration of the global environment is the steady increase in materials production, consumption and disposal”
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# A Different Future is Needed

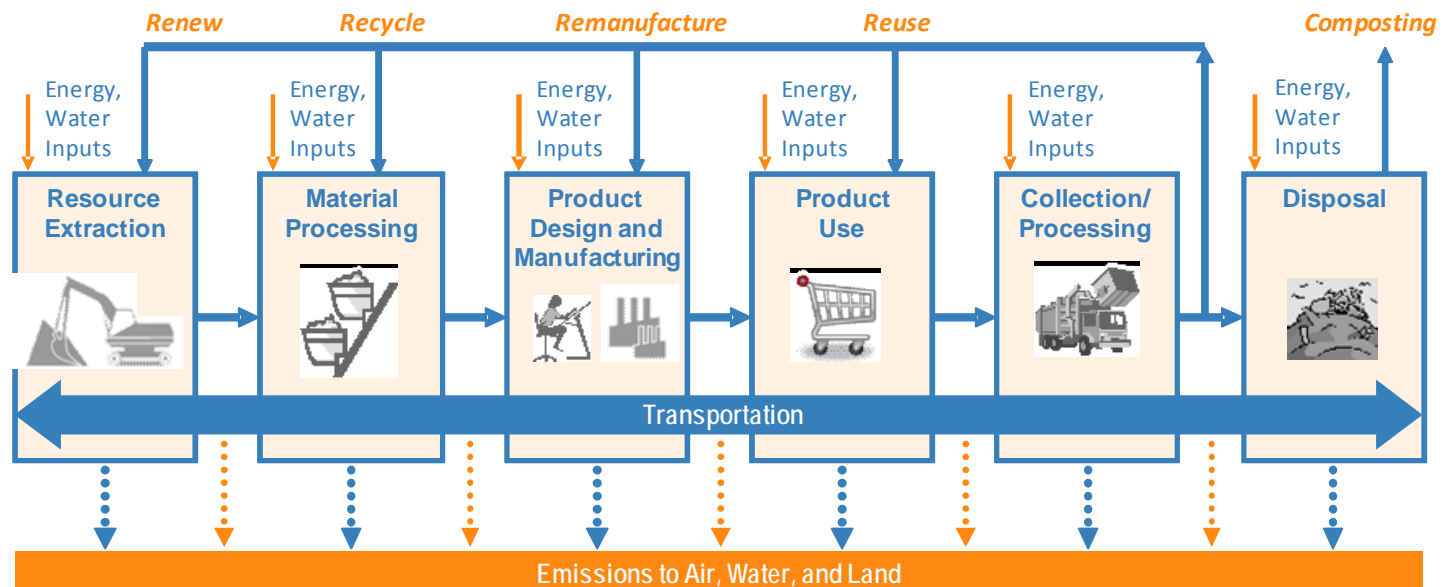
- ▶ Independently, EPA's "*Sustainable Materials Management: The Road Ahead*" report and the WBCSD's "*Vision 2050*" report concluded:
  - "Business as usual" cannot continue
  - A systems approach is needed
  - We must start now to achieve the necessary changes to minimize negative environmental impacts or unintended consequences of actions
- ▶ "Materials management" means targeting and coordinating interventions throughout the life cycle of materials, products and services.
  - Which materials to use
  - How to use less (materials, energy, water)
  - Reduce hazardous inputs
  - Design for longer life, reuse, refurbishability, recyclability

To achieve EPA's 2020 Vision, more powerful upstream efforts to reduce and change material use throughout the life cycle is needed.

# What is Sustainable Materials Management?

What we currently call “waste” is really a stream of valuable materials, with environmental investments and impacts at all stages of the lifecycle:

Raw material extraction, through transportation, processing, manufacturing, reuse, recycling and disposal.



# Within the Life Cycle of Materials...

- ▶ The significant impacts of materials, products, and services can:
  - Be concentrated in a single stage of the life cycle (e.g., VOCs released in use phase, or metal emissions from blast furnaces)
  - Occur across multiple stages of the life cycle (e.g., chemicals in various processing steps)
  - Be the sum total of lots of small upstream impacts
  - Arise in the life cycle of the “support systems” (e.g., transportation, energy)
- ▶ To reduce impacts we must address these “support systems” as well as specific impacts of making particular products

# How is EPA making the shift to Sustainable Materials Management?

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- ▶ Resource Conservation Challenge 2010 Training Workshop
  - The beginning of a national dialogue
  - [www.sustainablematerials2020.com](http://www.sustainablematerials2020.com)
- ▶ Materials Management Demonstration Projects
  - Residential one-unit construction/deconstruction
  - Packaging
- ▶ Life-cycle Analysis Disclosure Standard Guidance
- ▶ Green Products

# Materials and the Climate Change Connection

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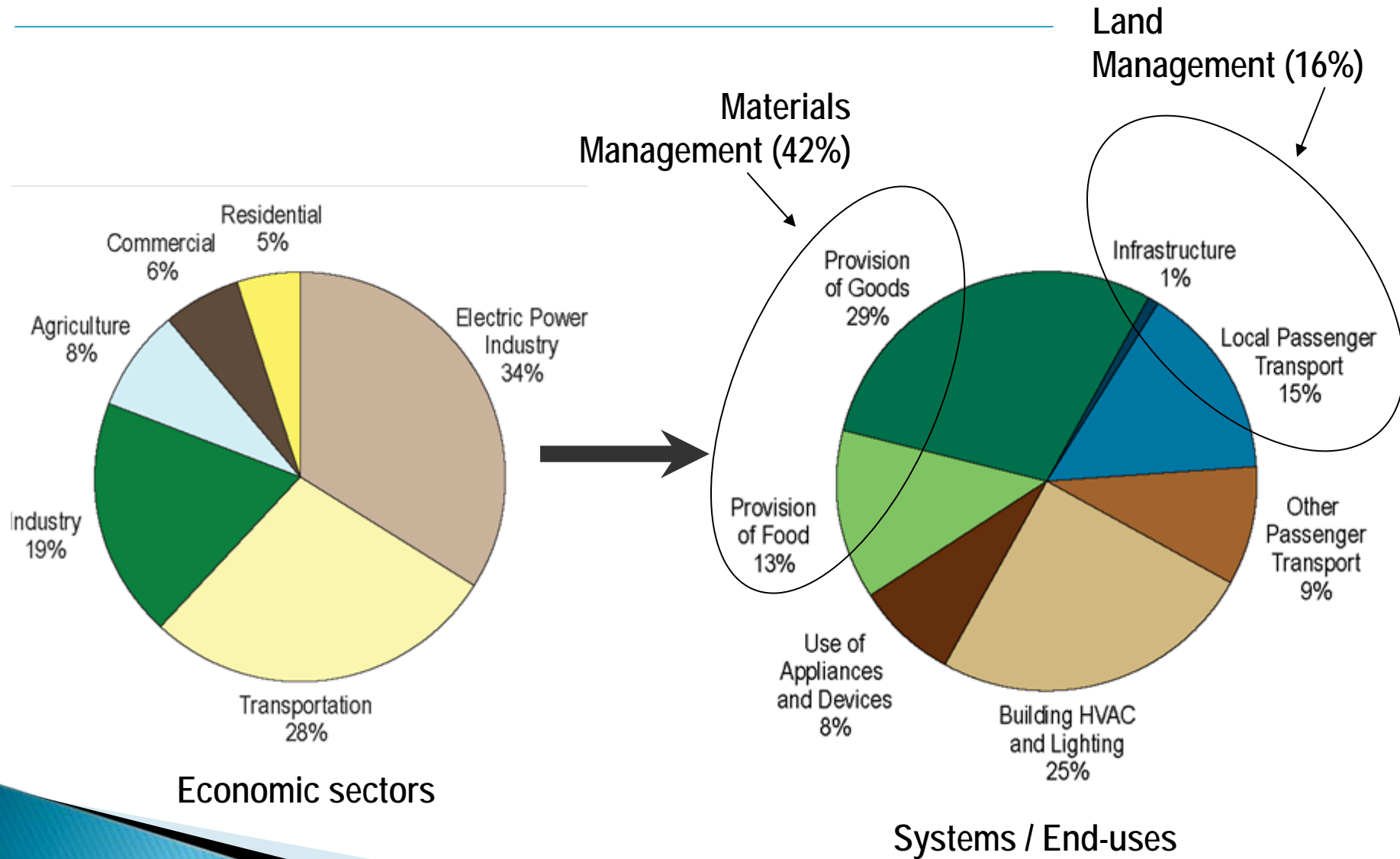
- ▶ Climate Change is one of the EPA Administrator's seven priorities.
  - OSWER's materials (and land) management efforts contribute to green house gas reductions.
- ▶ EPA has tools and studies linking Materials Management and Green House Gas emissions

# Studies and Reports

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- ▶ September 2009: OSWER issued “*Opportunities to Reduce Greenhouse Gas Emissions through Materials Management and Land Management Practices.*”  
([www.epa.gov/oswer/docs/ghg\\_land\\_and\\_materials\\_management.pdf](http://www.epa.gov/oswer/docs/ghg_land_and_materials_management.pdf))
- ▶ Substantiates the link between GHG emissions and materials and land mgmt:
  - Estimates the portion of US GHG emissions associated with materials and land management practices
  - Describes materials and land management scenarios as a first step to identifying opportunities for reducing GHG emissions through materials and land management.

# Materials and Land Management GHGs



# Technical Potential Reductions from Materials Management

Source Reduction		Estimated GHG Emission Benefit*	
Reduce packaging use by:	50%	40—105	MMTCO <sub>2</sub> E/yr
	25%	20—50	MMTCO <sub>2</sub> E/yr
Reduce use of non-packaging paper products by:	50%	20—70	MMTCO <sub>2</sub> E/yr
	25%	10—35	MMTCO <sub>2</sub> E/yr
Extend the life of personal computers by:	50%	25	MMTCO <sub>2</sub> E/yr
	25%	15	MMTCO <sub>2</sub> E/yr
<b>Reuse/Recycling</b>			
Increase recycling of construction and demolition debris to:	100%	150	MMTCO <sub>2</sub> E/yr
	50%	75	MMTCO <sub>2</sub> E/yr
	25%	40	MMTCO <sub>2</sub> E/yr
Increase national MSW recycling and composting rate from 2006 rate (32.5%) to:	100%	300	MMTCO <sub>2</sub> E/yr
	50%	70—80	MMTCO <sub>2</sub> E/yr
Increase composting of food scraps from 2006 rate (2%) to:	100%	20	MMTCO <sub>2</sub> E/yr
	50%	10	MMTCO <sub>2</sub> E/yr
	25%	5	MMTCO <sub>2</sub> E/yr

# Technical Potential Reductions from Materials Management (cont'd)

Energy Recovery / Disposal		Estimated GHG Emission Benefit	
Combust percentage of currently landfilled MSW:	100%	70—120	MMTCO <sub>2</sub> E/yr
	50%	35—60	MMTCO <sub>2</sub> E/yr
	25%	20—30	MMTCO <sub>2</sub> E/yr
Combust MSW remaining if national recycling rate is increased to 50%:		65—110	MMTCO <sub>2</sub> E/yr
Capture percentage of currently emitted methane at U.S. landfills for electricity generation:	100%	150	MMTCO <sub>2</sub> E/yr
	50%	70	MMTCO <sub>2</sub> E/yr
	25%	35	MMTCO <sub>2</sub> E/yr

# Technical Potential Reductions from Land Management

Land Revitalization <sup>[1]</sup>		Estimated GHG Emission Benefit	
Shift 60% of expected new development to compact development patterns:		<b>79</b>	MMTCO <sub>2</sub> E/yr
Reuse percentage of qualifying EPA-tracked contaminated land for utility-scale solar:	100%	<b>2,200</b>	MMTCO <sub>2</sub> E/yr
	50%	<b>1,100</b>	MMTCO <sub>2</sub> E/yr
	25%	<b>540</b>	MMTCO <sub>2</sub> E/yr
Reuse percentage of qualifying EPA-tracked contaminated land for community and utility-scale wind:	100%	<b>40</b>	MMTCO <sub>2</sub> E/yr
	50%	<b>20</b>	MMTCO <sub>2</sub> E/yr
	25%	<b>10</b>	MMTCO <sub>2</sub> E/yr
Reduce electricity use for the most energy-intensive treatment technologies at National Priorities List sites by:	100%	<b>0.4</b>	MMTCO <sub>2</sub> E/yr
	50%	<b>0.2</b>	MMTCO <sub>2</sub> E/yr
	25%	<b>0.1</b>	MMTCO <sub>2</sub> E/yr
Reforest percentage of qualifying former mine lands for carbon sequestration: <sup>[5]</sup>	100%	<b>4</b>	MMTCO <sub>2</sub> E/yr
	50%	<b>2</b>	MMTCO <sub>2</sub> E/yr
	25%	<b>1</b>	MMTCO <sub>2</sub> E/yr

# Additional Studies and Reports

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- ▶ U.S. Department of State 5<sup>th</sup> Climate Action Report to United Nations (2010) – sites EPA’s WasteWise program and states how recycling has a significant GHG impact (<http://www.state.gov/g/oes/rls/rpts/car5/index.htm>)
- ▶ UN paper on climate change and waste (July 2010) ([http://www.unep.or.jp/ietc/Publications/spc/WasteManagement&ClimateChange%20\\_Draft.pdf](http://www.unep.or.jp/ietc/Publications/spc/WasteManagement&ClimateChange%20_Draft.pdf))
- ▶ Waste Management Chapter of the Intergovernmental Panel on Climate Change (IPCC) 4th Assessment report (<http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-chapter10.pdf>)
- ▶ Executive Order 13514 – requires a target for federal government to increase recycling by 50% to reduce GHG and save energy

# EPA's Waste Reduction Model (WARM)

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- ▶ Planning tool to compare a current waste management practice with an alternative.
  - Source reduction, recycling, combustion, composting, and landfilling.
  - 38 materials
- ▶ Calculates GHG emissions reductions and energy savings.
- ▶ Helps solid waste planners and organizations track and voluntarily report these benefits.

[www.epa.gov/warm](http://www.epa.gov/warm)

# WARM = Quantitative Climate Change Measurement for Materials Management

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- ▶ The US recycled 83 million tons of material in 2008.
- ▶ As a result, Americans
  - avoided 182 million metric tons of carbon dioxide equivalent (MTCO<sub>2</sub>E), comparable to the annual GHG emissions from more than 33 millions passenger vehicles, and
  - saved 1.3 quadrillion Btu of energy, the equivalent of 10.2 billion gallons of gas.



# EPA Promotes Waste Reduction

EPA has various Voluntary programs that support waste reduction, in turn helping decrease climate impacts.



# WasteWise

- ▶ Partner w/companies to decrease waste through waste reduction (RRR) and to save money throughout their manufacturing processes.
- ▶ Provides Partners with data on their GHG emissions reductions (based on waste reduction)



# PAYT is SMART at Reducing



**SMART** – Saves Money and Reduces Trash...ultimately reducing GHG emissions and saving energy.

Residents are charged for waste services – based on amount they throw away.

**This creates a direct economic incentive to Reduce, Reuse and Recycle.**



# All “Waste” begins as a Natural Resource



*Materials Matter*