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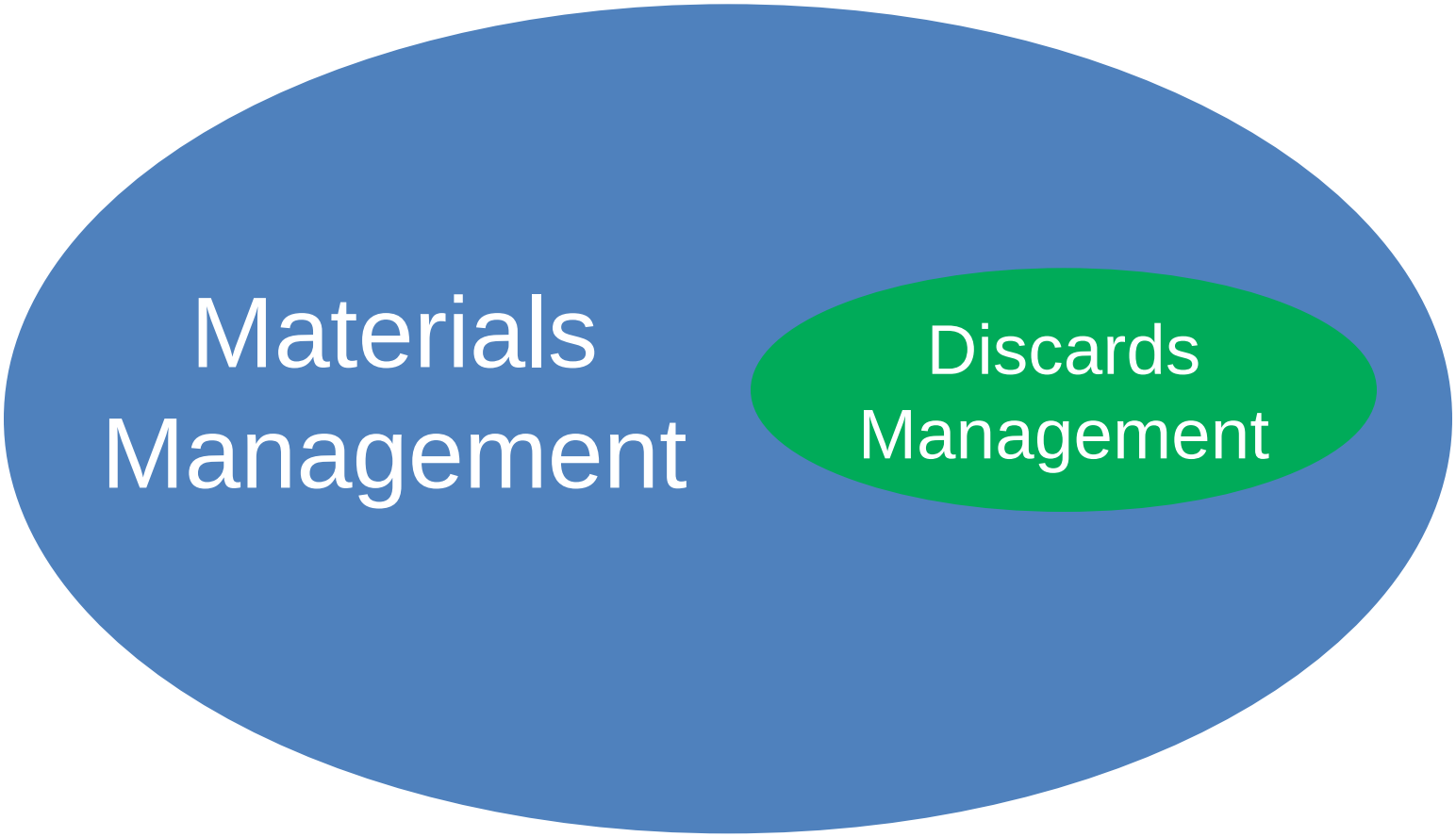
Reducing Greenhouse Gas Emissions through Recycling and Composting

John Davis, Administrator, Mojave Desert and Mountain Recycling Authority

West Coast Climate and Materials Management Forum

West Coast local, state, and tribal governments working with US EPA to integrate and share lifecycle materials management policies and practices to drive climate action.

Sustainable Materials Management



Sustainable Materials Management

An approach to using & reusing resources most productively and sustainably throughout their life cycles:

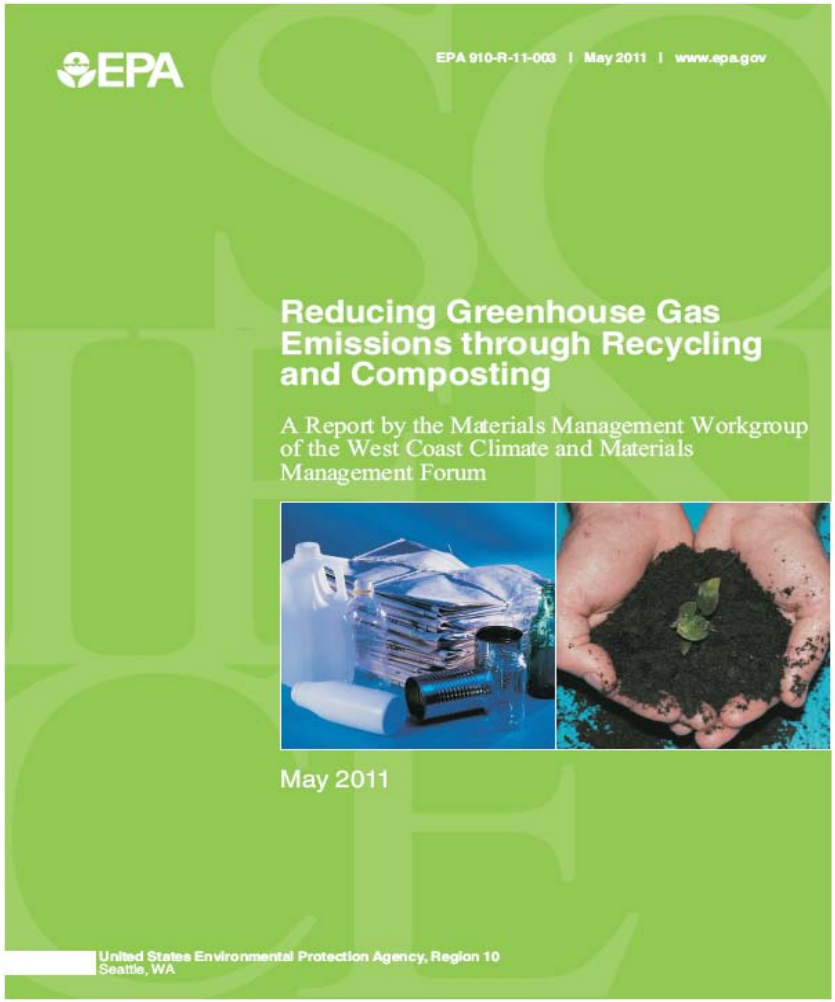
- minimizing the amount of materials involved,
- minimizing associated environmental impacts.

Can result in significant GHG savings at all stages.

Report Overview

- Identifies top 10 materials with greatest GHG emissions reduction potential in waste streams of CA, OR, and WA.

- Highlights existing practices and opportunities for improving recycling and composting of priority materials to achieve state and local policy goals.



Research Methodology

- Use EPA's Waste Reduction Model (WARM) to estimate the GHG emissions attributable to materials in the waste streams of California, Oregon, and Washington under baseline and alternative end-of-life management scenarios.

- WARM calculator and model documentation is available online:

http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html

- Data from 2008/2009 state waste characterization studies.

Findings: Priority Materials

Four priority material types, based on findings:

- **Carpet**
- **Core Recyclables**
  - Aluminum cans
  - Cardboard
  - Magazines
  - Newspaper
  - Office paper
  - PET/HDPE
  - Steel cans
- **Dimensional Lumber**
- **Food Scraps**

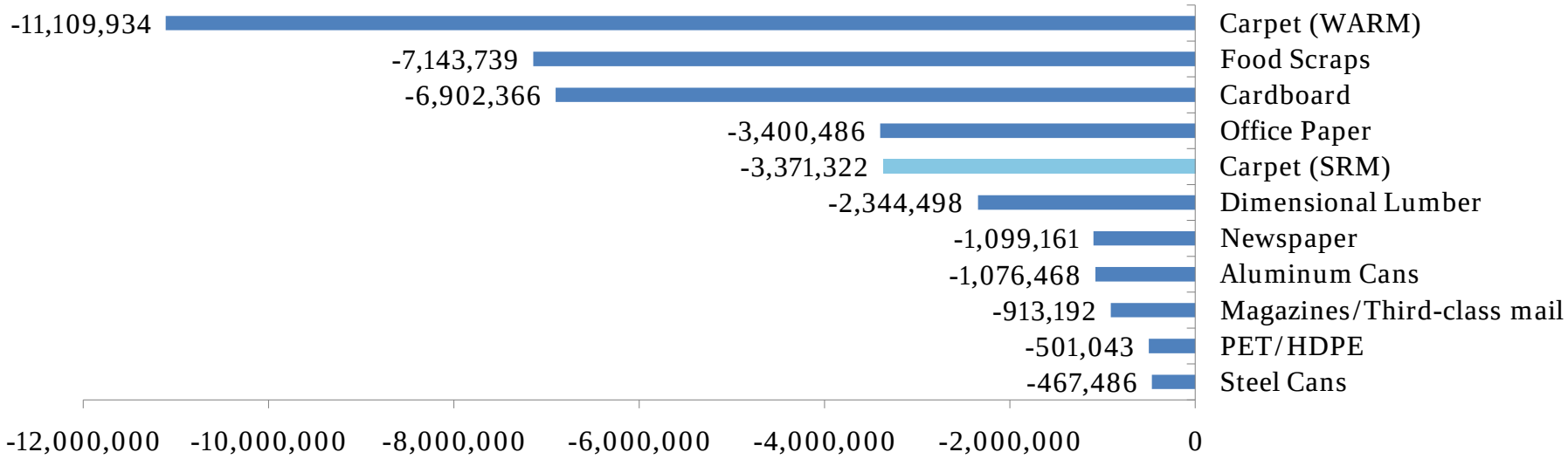
Priority Materials GHG Reduction Potential

CALIFORNIA 2008		OREGON 2009		WASHINGTON 2009	
Material Type	**$MTCO_2e$**	**Material Type**	**$MTCO_2e$**	**Material Type**	**$MTCO_2e$**
Core Recyclables	-12,217,565	Core Recyclables	-526,229	Core Recyclables	-1,616,408
Carpet (WARM)	-9,324,722	Carpet (WARM)	-490,438	Carpet (WARM)	-1,294,774
Food Scraps	-5,837,189	Food Scraps	-433,855	Food Scraps	-872,695
Carpet (SRM)	-2,892,314	Carpet (SRM)	-152,123	Carpet (SRM)	-326,885
Dimensional Lumber	-2,123,138	Dimensional Lumber	-128,271	Dimensional Lumber	-93,089
TOTAL =-23,070,206 to -29,502,614		TOTAL = -1,240,478 to -1,578,793		TOTAL =-2,909,077 to -3,876,966	

If all of these materials currently being sent to the landfill were instead recycled and composted, the resulting emissions reduction could be equivalent to taking more than **6.3 million cars** off the road for a year.

Priority Materials GHG Reduction Potential

West Coast $MTCO_2e$ Reduction Potential



Meeting State GHG Reduction Goals

Programs that focus on recycling/composting these materials can deliver emissions reductions and contribute to climate action goals.

	California	Oregon	Washington
Lifetime emissions reduction potentials of materials wasted in one year			
Carpet, **core recyclables**, and **lumber**	**4-6%** of 2050 annual emissions reduction	**1-2%** of 2050 annual emissions reduction	**4-6%** of 2050 annual emissions reduction
Food scraps	**1.5%** of 2050 annual emissions reduction	**0.8%** of 2050 annual emissions reduction	**1.8%** of 2050 annual emissions reduction
State 2050 annual emissions goal	*80% below 1990 levels*	*75% below 1990 levels*	*50% below 1990 levels*

Additional Benefits: Economic Growth and Jobs

If just half of all available core recyclables and food scraps were recycled and composted, West Coast states could create more than

$3 billion

in new economic activity

Economic Activity Potential from Recycling and Composting

California Total	**$2,570,897,467**
Salaries and Wages	$508,142,161
Goods and Services	$1,383,55,388
Sales	$679,199,918
Oregon Total	**$163,154,381**
Salaries and Wages	$32,247,735
Goods and Services	$87,803,238
Sales	$43,103,408
Washington Total	**$361,790,555**
Salaries and Wages	$71,508,505
Goods and Services	$194,701,375
Sales	$95,580,675

Existing Practices and Opportunities for Recycling and Composting

- **Carpet**
  - In 2010, only 5% of carpet was recycled
  - Last year, CA passed first state product stewardship bill for carpet, other states are likely to follow
  - Collection/processing infrastructure needed
  - Market development – new products, new processes

Promising Practices and Opportunities to Improve

- **Core Recyclables**
  - PAYT is a proven strategy for increasing recycling, but it doesn't go far enough – recyclables still end up in landfills
  - Largest GHG emissions associated with corrugated cardboard – disproportionately from commercial sector
  - CA instituting mandatory commercial recycling as part of its climate action strategy
  - Paper and Plastics are going overseas

Focus on Core Recyclables, Jobs and Businesses

Proposed Domestic Materials Market Development through the State of California's Commercial Recycling Mandate

Background

In 2005, Executive Order S-03-05 was issued and set in place the Climate Action Team and established targets to reduce greenhouse gas emissions to 1990 levels. The Legislature subsequently passed Assembly Bill (AB) 32 - the California Global Warming Solutions Act of 2006 (Chapter 488, Statutes of 2006). AB 32 directs the Air Resources Board (ARB) to work with all agencies to reduce statewide greenhouse gas (GHG) emissions to 1990 levels by the year 2020. The solid waste sector has been identified as a significant source of GHG emissions. For the solid waste sector, potential strategies to achieve GHG emission reductions include landfill methane capture, **mandatory commercial recycling (MCR)**, organic waste diversion alternatives, and product stewardship. The mandatory commercial recycling measure in particular is designed to achieve a reduction in greenhouse gas emissions of 5 million metric tons of carbon dioxide (CO2) equivalents (5MMTCO2E).[1]

The Mandatory Commercial Recycling Measure focuses on increased commercial waste diversion as a method to reduce greenhouse gas emissions. To achieve the measure's objective, an additional 2 to 3 million tons of materials annually will need to be recycled from the commercial sector by the year 2020 and beyond.[2]

Currently, approximately 5-20% of the recyclable materials collected in California remain in the State for remanufacturing; the majority of the recycled materials are shipped to other parts of the United States or to global markets. [3] In other words, 80-95% of our recyclable materials are leaving California, specifically to overseas markets. So too, are our jobs, tax revenue and commerce. Achieving the 5MMTCO2E emission reductions is dependent on ensuring that the recyclable materials are recycled into new products, which offers an enormous opportunity to existing and new businesses in California. The State energy grid is cleaner than Pacific Rim countries and than most States receiving California's recovered materials. So in-State

Promising Practices and Opportunities to Improve

- **Dimensional Lumber**
  - Mostly biomass or mulched now
  - Green building codes will increase supply
  - LEED resource-efficient standards create demand
  - Can be used for engineered wood, laminates, parquet, countertops, shelving, pallets
  - Processing opportunities
  - Non-structural and product reuse

Dimension Lumber

- **California Air Resources Board emission reduction factor is not closed loop**
  - Recycling Emission Reduction Factor is -0.21 MTCO2E/Ton
  - Chipped and used for biomass combustion
  - Alleviates fossil fuel use
  - Biogenic source

Dimension Lumber

- **WARM assumes dimension lumber recycled into wood products (e.g. MDF)**
  - Applies forest carbon sequestration
  - Emission reduction of -2.46 MTCO2E/Ton

Promising Practices and Opportunities to Improve

- **Food**
  - Major portion of waste stream
  - Collection and processing infrastructure needed
  - Regulatory hurdles
  - Covered aerated static pile composting
  - Anaerobic digestion
  - Product use and application
  - Water-efficient agriculture and landscape

WARM Composting Ex. 1: Components of the Food Composting Emission Factor	
Emission Type	Emission (MTCO2E/Ton of Feedstock)
Transportation Emissions	0.04
Soil Carbon Storage	-0.24
Net Emissions	-0.20

ARB Table 4 Summary Emissions Factors	
Emission Type	Emission (MTCO2E/Ton of Feedstock)
Transportation Emissions	0.008
Process Emissions	0.008
Fugitive CH4 Emissions	0.078
Fugitive N2O Emissions	0.025
Total	0.119

ARB Table 7 Summary Emission Reductions			
Emission Reduction Type	Emission Reduction MTCO2E/Ton of Compost	Conversion Factor	Final Emission Reduction MTCO2E/Ton of Feedstock
Increased Carbon Storage	N/A	N/A	0.26
Decreased Water Use	0.4	0.5	0.2
Decreased Soil Erosion	0.25	0.5	0.13
Decreased Fertilizer Use	0.26	0.5	0.13
Decreased Herbicide Use	0.0	0.5	0
		Total	0.54

Promising Practices and Opportunities to Improve

- **Upstream Changes**
  - Transportation modes
  - Manufacturing practices
  - Distribution infrastructure
  - Energy sources
  - Product design

Role for Product Stewardship

- **How can Product Stewardship address the upstream impacts of products?**
  - Concern over whether end-of-life costs are large enough to drive upstream design changes
  - More research needed in this area

Join the Workgroup

- Materials Management and Products Stewardship Workgroup needs product stewardship, market development perspectives
- New projects include research on how product stewardship policies can reduce GHG emissions
- Open to state and local governments
- Not on the West Coast? Sustainable materials management work is being done in EPA Regions 1/2. Email Jeri Weiss for details: weiss.jeri@epa.gov

More Contact Information

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