

U.S. PRIORITY SETTING ANALYSIS FOR SUSTAINABLE MATERIALS MANAGEMENT

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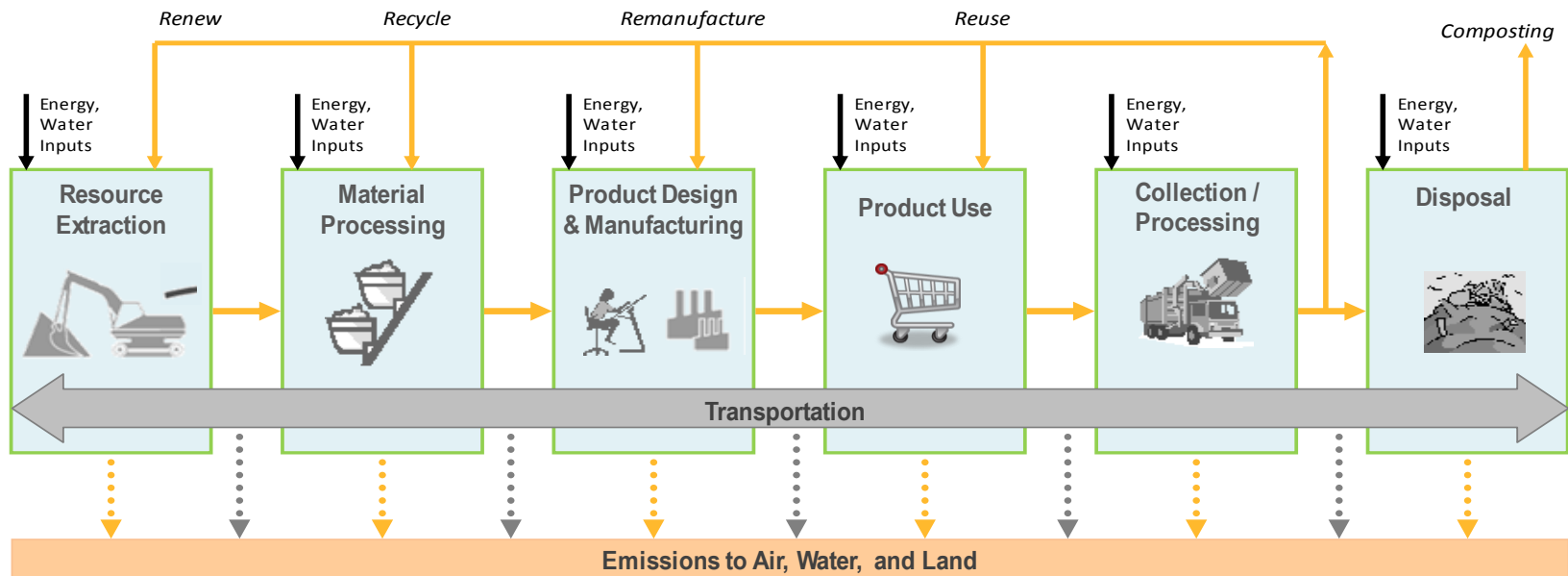
United Nations Environment Programme (UNEP) &
Organisation for Economic Cooperation and Development (OECD)
Workshop on “Sustainable Resource and Materials Management –
Linking National and International Initiatives on Methodology and
Assessment”

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CONTEXT OF ANALYSIS

- Analysis done for EPA-State task force. Report completed in June 2009: *Sustainable Materials Management: The Road Ahead*.
- Key messages in report:
 - Material use (and corresponding energy and water use) is rising rapidly, driven by population and economic growth.
 - The Earth's systems – air, water and land – struggle to withstand the many resulting environmental problems.
 - Task force recommends measures to EPA and states:
 - (1) promote efforts to manage materials and products on a life-cycle basis, using present legal authorities,
 - (2) build our capacity to manage materials in the future, and
 - (3) accelerate the public dialogue necessary to start a generation-long shift in how we manage materials and create a green, resilient and competitive economy.(+ See Appendix 1 for more details.)
- Analysis and recommendations draw on US and international experience.

SYSTEMS VIEW OF MATERIALS



Source: U.S. Environmental Protection Agency

FINDING A STARTING POINT

- A few hundred materials are taken from the planet and transformed into thousands of products through a highly complex and intertwined system. Unrealistic to move to life-cycle materials management for all simultaneously.
- Need a way to identify the highest priorities.
- Report recommends choosing several pilots to demonstrate the value of the materials management approach and gain greater insights on integrating policies and programs around materials management.
- Analytical challenge: take into account a variety of environmental and resource impacts along the entire life cycle for each material/product.
- Earlier example for analysis: Environmental Impacts of Products (EIPRO) study for EU. Present analysis added some new aspects.

WHAT THE ANALYSIS DID

- Ranked 480 materials, products and services consumed in the U.S. economy,
 - Across five important environmental aspects:
 - Environmental Impacts (*Human toxicity, Ozone layer depletion, Freshwater aquatic and sediment ecotoxicity, Marine aquatic and sediment ecotoxicity, Terrestrial ecotoxicity, Land use, Resource depletion, Global warming Photochemical oxidation, Acidification, and Eutrophication.*)
 - Energy Use
 - Water Use
 - Material Use
 - Material Waste
 - Through three perspectives (all throughout the life cycle):
 - Direct impact/resource use/waste (direct impacts)
 - Intermediate consumption (direct plus embedded impacts)
 - Final consumption (embedded impacts)
- Analysis produced a relative ranking, NOT an assessment of risk or absolute assessment of impacts.

ANALYTICAL APPROACH

- Linked the U.S. Bureau of Economic Analysis' list of 480 materials, products and services identified in its detailed Input-Output tables to environmental release/emission data, material use data, energy use data, water use data, and waste disposal data.
- Used existing databases, including
 - Comprehensive Environmental Data Archives 3.0 (CEDA)
 - World Resources Institute's Material Flow Database
 - USGS water use data and other Federal data.
- Data issues – uncertainties and limitations
 - Crosswalked data systems not designed to work together.
 - Range of data quality among commodities, criteria.
 - Based on transaction info that serves as basis of I/O tables.
 - Commodities have different levels of aggregation.
- Peer Review: Approach is a reasonable starting point for setting priorities.

RESULTS OF ANALYSIS

- Looking at all impacts together (weighted equally), 38 highest-ranking commodities can be grouped in 7 broad categories (not in ranked order; see Appendix 2 for full list):
 - construction and development
 - food products & services
 - forestry
 - metals
 - nonrenewable organics
 - textiles
 - miscellaneous
- Results track with other studies.
- Analysis provides a rough sense of what impacts are occurring, where they are occurring, and what demands are behind them through its rather complete set of criteria and perspectives.

FURTHER OBSERVATIONS (1)

- Analysis highlights importance of looking at multiple criteria/perspectives.
- Examining all criteria can matter. Example:
 - Meat packing plants and air transportation create similar GHG impacts.
 - Meat packing also creates land use, freshwater aquatic ecotoxicity, photochemical oxidation, terrestrial ecotoxicity and eutrophication impacts.
 - Air transportation creates energy use impacts.
- All criteria influenced rankings, although water use was rarely a significant driver.
- Future opportunity: weight criteria differently and observe results.

FURTHER OBSERVATIONS (2)

- Examining from 3 perspectives matters.
 - Each perspective highlights potential issues that the others miss.
 - Different materials/products/services rank high depending on which perspective is used – generally fall within different life cycle stages.
 - Raw materials and intermediate products tend to rank high under direct impact/resource use/waste perspective.
 - A mix of raw materials and products tend to rank high under Intermediate consumption perspective.
 - Finished goods and services tend to rank high under the final consumption perspective.
- In general, assessing a range of environmental aspects and multiple system perspectives enables strategic targeting of policies to promote more efficient use of materials and reduce environmental impacts across all stages of the material system.

FOR MORE INFORMATION

- Report and technical appendix:
<http://www.epa.gov/waste/inforesources/pubs/vision.htm>
- *Journal of Industrial Ecology*, “Using Material Flow Analysis for Sustainable Materials Management : Part of the Equation for Priority Setting,” 13(5), Nov. 2009 (forthcoming on line)
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APPENDIX 1

SUSTAINABLE MATERIALS MANAGEMENT: REPORT RECOMMENDATIONS

- 1. Promote efforts to manage materials and products on a life-cycle basis.**
 - Select a few materials/products for an integrated life-cycle approach, and launch demonstration projects.
 - Expand the focus of existing environmental programs to encompass life-cycle materials management more fully.
 - Promote specific materials management approaches that can help address climate change.
 - Promote greener products, product stewardship, and product-to-service transformations.
 - Strengthen market signals to reduce waste and other adverse environmental impacts throughout the life cycle of materials.
- 2. Build capacity and integrate materials management approaches in existing government programs.**
 - Establish and improve databases to promote materials management.
 - Improve decision tools to support life-cycle materials management.
 - Expand research and innovations support programs to promote materials management.
 - Emphasize materials management in EPA and state processes and procedures.
 - Support and reward federal, state, tribal, and local champions for materials management and encourage collaboration.
- 3. Accelerate the broad, ongoing public dialogue on life-cycle materials management.**
 - Stimulate a national conversation about materials management, engaging multiple networks.
 - Open a dialogue on economic instruments to encourage better materials management.
 - Create ways to share knowledge on materials management.

APPENDIX 2

38 TOP RANKED MATERIALS, PRODUCTS & SERVICES (17 impacts weighted equally; not in rank order)

Food Products & Services

Dairy farm products (19, -, -)
Poultry and eggs (20, -, -)
Meat animals (6, 6, -)
Food grains (13, -, -)
Feed grains (9, 15, -)
Miscellaneous crops (16, -, -)
Meat packing plants (-, 11, 7)
Poultry slaughtering and processing (-, -, 17)
Eating and drinking places (-, 16, 5)
Food preparation, n.e.c. (-, -, 19)
Fluid milk (-, -, 20)

Textiles

Cotton (2, 2, -)
Apparel made from purchased materials (-, 13, 2)
Broadwoven fabric mills and fabric finishing plants (-, 10, -)

Nonrenewable Organics

Coal (5, 9, -)
Crude petroleum and natural gas (4, 4, -)
Industrial inorganic and organic chemicals (3, 3, -)
Petroleum refining (8, 5, 3)
Electric services (utilities) (1, 1, 1)
Natural gas distribution (15, 14, 12)

Metals

Blast furnaces and steel mills(-, 17, -)
Primary aluminum (18, 20, -)
Motor vehicles and passenger car bodies (-, 12, 4)

Construction & Demolition

Dimension, crushed and broken stone (14, -, -)
Sand and gravel (17, -, -)
New residential 1 unit structures, nonfarm (10, 8, 8)
Other new construction (-, -, 13)
Owner-occupied dwellings (-, -, 11)
New highways, bridges & other horizontal construction (-, -, 10)
New office, industrial, commercial buildings construction (-, -, 16)

Forestry

Pulp mills (11, -, -)
Paper and paperboard mills 7, 7, -)

Other Products and Services

Computer and data processing services (ranks high w/newer data)
Photographic equipment and supplies (12, -, 14 – w/older data)
Wholesale trade (-, 19, 15)
Retail trade, except eating and drinking (-, -, 6)
Hospitals (-, -, 9)
Real estate agents, managers, operators and lessors (-, 18, 18)

*(Key: relative ranking among top 20 from each of 3 perspectives:
direct impacts, intermediate consumption, final consumption)*