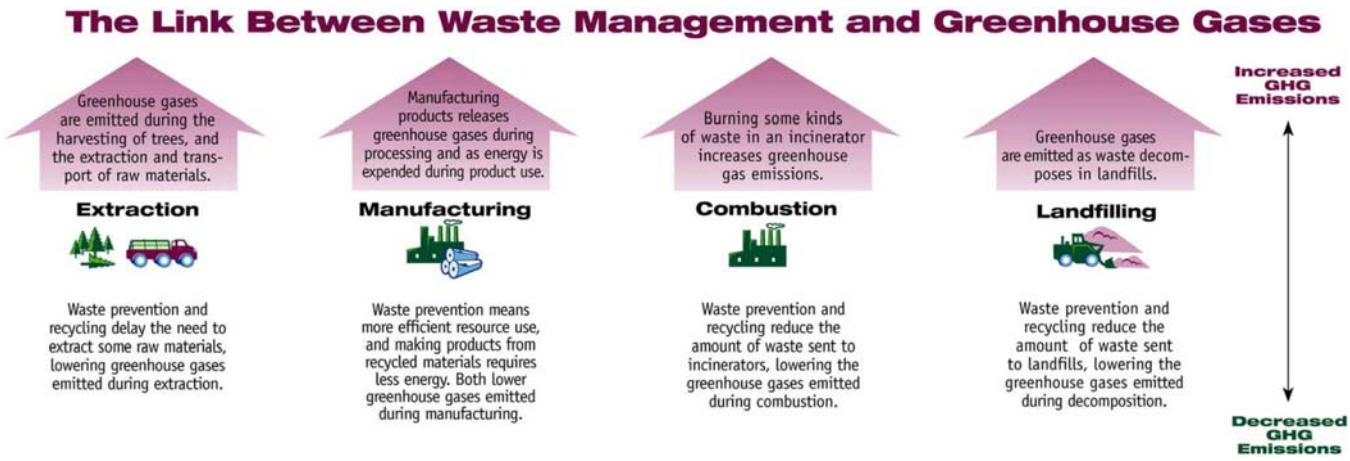
Recycling and Climate Change: Reducing GHG Emissions, Pollution, and Energy Consumption Using Materials Management Strategies

In the past, it was thought that the waste management sector only contributed a small portion to greenhouse gases through methane emissions from landfills. However, that view is no longer supported by fact, as we examine the problem more thoroughly from a materials management perspective that takes into account upstream impacts as well as those downstream.

"Waste" isn't only about what you throw away. It is also about how you manage strategic materials throughout their entire lifetime. When we extract minerals from the earth, drill for oil, mine coal, harvest forests to obtain wood for housing and packaging, we use immense amounts of energy. We pollute air, water and soil; we emit large quantities of greenhouse gases (GHGs); and, we use valuable water. To get those materials to a processor and process them for use as raw feedstock, we continue to use large amounts of energy, pollute resources, emit GHGs and unnecessarily use our limited supply of water.

A new school of thought, Sustainable Materials Management, has concluded that the upstream impacts of consumerism have a much greater effect on climate change than previously considered. Sustainable Materials Management tracks the flow of materials throughout their entire lifecycle, from extraction to end-of-life. If, instead of using 'virgin' materials that have to be extracted, transported and processed before they can be used in manufacturing, we recycled the materials currently in the loop back into the manufacturing streams, we could reduce our GHG emissions by 33%[1] or as much as 44% if we include the impacts from products produced abroad that are consumed in the U.S.[2] We would also see additional savings in energy usage, depending on the type of material being recycled. Recycling aluminum in manufacturing new products saves 95% of energy typically consumed during virgin extraction and processing.



This figure, created by USEPA, visually depicts the various stages of the life cycle of strategic materials and what impacts they have at those stages.

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[1] *SOLID WASTE MANAGEMENT AND GREENHOUSE GASES: A Life-Cycle Assessment of Emissions and Sinks 3rd Edition, USEPA 2006*

[2] *Products, Packaging and US Greenhouse Gas Emissions by Joshuah Stolaroff – PhD for the Product Policy Institute September 2009*

By thoughtful materials management and especially recycling, we can substantially reduce the resource extraction and material transportation and processing steps. This results in major reductions in GHG emissions and can reduce end-of-life methane emissions from landfills. For example, in Oregon, recycling 100 tons of 'average' curbside recyclables and using them to replace virgin feedstocks, showed a net savings of approximately 235 Metric Ton Carbon Dioxide Equivalent (MTCO2E). Added benefits are found in the carbon sequestration in our forests when paper and wood are source reduced and recycled, and in carbon storage in the soil when organics are composted and added to the soil.

According to studies by Skumatz Economic Research Associates (SERA), recycling and materials management options are considerably less expensive per MTCO2E than the standard laundry list of energy efficiency measures or even renewable energy programs. Pay-As-You-Throw (PAYT), a strategy that links an increase in discards to an increase in cost to dispose of them, reduces GHG emissions at a cost one-ninth that of residential weatherization programs, and one twentieth that of wind, for example. Curbside recycling also shows significant savings over energy efficiency and renewable (wind, solar) options. SERA's data indicates that PAYT and other recycling programs can be fully implemented city-wide in 3 – 9 months, while residential weatherization programs often take 1 – 3 years to get started and much longer to implement city-wide.[3]

Dr. Jeffery Morris of Sound Resource Management, based in the State of Washington, has also done economic research comparing the costs of typical waste management versus sustainable materials management. Morris attaches a monetary value to each pollutant / emission, based on either the estimated real financial costs to society in terms of environmental degradation and human health impact, or the actual market value of the pollutant's emissions.[4]

In fact, in reviewing another study by Dr. Morris, the conclusion of the Evaluation and Cost-Benefit News is: "Recycling of newspaper, cardboard, mixed paper, glass bottles and jars, aluminum cans, tin-plated steel cans, plastic bottles, and other conventionally recoverable materials found in household and business municipal solid wastes consumes less energy and imposes lower environmental burdens than disposal of solid waste materials via landfilling or incineration, even after accounting for energy that may be recovered from waste materials at either type disposal facility. This result holds for a variety of environmental impacts, including global warming, acidification, eutrophication, disability adjusted life year (DALY) losses from emission of criteria air pollutants, human toxicity and ecological toxicity. The basic reason for this conclusion is that energy conservation and pollution prevention engendered by using recycled rather than virgin materials as feedstocks for manufacturing new products tends to be an order of magnitude greater than the additional energy and environmental burdens imposed by curbside collection trucks, recycled material processing facilities, and transportation of processed recyclables to end-use markets."[5]

By making Sustainable Materials Management, in the form of recycling a policy priority, Colorado and the United States could be well on our way to a 30% - 40% decrease in GHG emissions. The Colorado Association for Recycling would like to work with the state to help such policies become a reality through incentives to manufacturers to use more recycled feedstock, support for recyclables collection programs and education of the public to encourage increased diversion throughout all sectors.

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[3] Skumatz, Lisa A., Ph.D., "*RECYCLING AND CLIMATE CHANGE: Getting GHG Reductions Fast & Cheap – Why PAYT Should be One of the First Programs for "Sustainable Cities"", Skumatz Economic Research Associates, Inc. (SERA), April 2007, and Skumatz, Lisa A. Ph.D. "Reducing GHG: How do Energy Efficiency Programs Stack Up?", Proceedings of the National Association for Energy Service Professionals Conference, January 2009*

[4] Morawski, Clarissa, The New "Eco-Currency": New model monetizes environmental benefits and reveals new cost savings in waste diversion, Solid Waste & Recycling, December/January 2008.

[5] Morris, Jeffrey (2005). Comparative LCAs for curbside recycling versus either landfilling or incineration with energy recovery, *International Journal of Life Cycle Assessment* 10(4) 273-284