

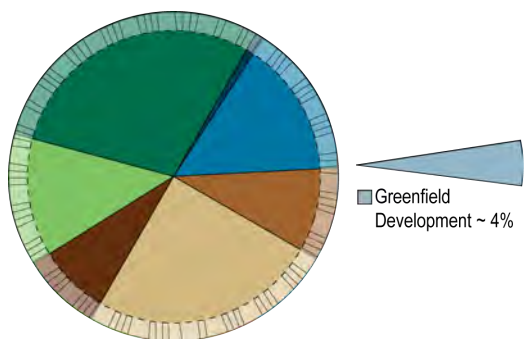
# Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices



In 2009, EPA announced the finding that greenhouse gases (GHGs) in the atmosphere endanger public health and welfare by contributing to global climate change. Understanding sources of GHG emissions is necessary to formulating creative and effective means for reducing GHG emissions associated with human activities. In a September 2009 report, *Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices*, EPA showed that land and materials management has a significant impact on U.S. GHG emissions and sinks. [www.epa.gov/oswer/docs/ghg\\_land\\_and\\_materials\\_management.pdf](http://www.epa.gov/oswer/docs/ghg_land_and_materials_management.pdf)

Usually GHG emissions are categorized in inventories according to the sectors producing them. The EPA report quantifies U.S. GHG emissions based on economic systems supporting goods and land use. An economic system represents the parts of the economy that work together to meet a particular need. For example, emissions associated with the provision of goods combines the emissions from electrical power, industry and transportation that are associated with providing goods to people. The figure below shows that 42% of 2006 U.S. GHG emissions were associated with materials management, and 16-20% were related to land management activities.

**U.S. GHG EMISSIONS 2006**  
Reported in *The Inventory of U.S. Greenhouse Gas Emissions and Sinks*  
Re-Categorized to Show How Land and Materials Management May Influence Emissions



▨ Land Sink - absorbed 13% of total GHGs

#### Land Management Policies (16-20%)

- Infrastructure - 1%
- Local Passenger Transit - 15%

#### Other Drivers (42%)

- Other Passenger Transport - 9%
- Building HVAC and Lighting - 25%
- Use of Appliances and Devices - 8%

#### Materials Management Policies (42%)

- Provision of Food - 13%
- Provision of Goods - 29%

#### MATERIALS MANAGEMENT = 42% of U.S. 2006 GHG EMISSIONS

This refers to how we manage materials as they flow through the economy, from extraction or harvest in the course of mining, forestry, farming and ranching, to production, assembly, storage and transport, provision of services, and finally reuse of materials and their disposal. At each stage in the material flow, GHGs may be emitted. For example, some goods rely on materials that are GHG intensive to extract. Other goods are GHG intensive to produce or transport. Still others are not easily disassembled or recycled, affecting their method of disposal. In total, the goods we create, transport, and dispose of and the food we produce, process, transport, and dispose of are estimated to account for approximately 42% of U.S. GHG emissions.

#### LAND MANAGEMENT = 16-20% of U.S. 2006 GHG EMISSIONS

This refers to how we manage and use land to provide open space and habitat, food, natural resources, and places for people to live, work, and recreate. While a variety of policies affect land management, local land use decisions such as zoning, have a direct impact on the GHG emissions related to how our land is used. For example, the emissions associated with local transportation are directly related to urban sprawl. Reliance on automobiles increases with sprawl, since the distances of daily trips often become too far to walk or bike. Land use decisions impact the extent of sprawl as well as the quality of public infrastructure, the shape of settlements, and their construction and maintenance.

Land use decisions also determine the fate of greenfields – agricultural or undeveloped lands, such as grasslands or forests. These lands serve as a carbon sink, shrinking total emissions. In the figure this is represented by the hatched ring offsetting 13% of emissions from all wedges in the pie chart. As greenfields are developed, GHGs are emitted from the soil and the surface area that can absorb carbon is reduced. Emissions from new development are not separately identified in the Inventory of U.S. GHG Emissions and Sinks, so they are presented in the figure as a wedge outside the pie chart.

## We Have Opportunities to Reduce Greenhouse Gas Emissions through Materials Management.

There are significant opportunities to reduce or avoid GHG emissions by improving both materials themselves and our materials management practices. Strategies include reducing the amount of materials used to make products or perform services, influencing product design so less materials are needed to make it, enhancing recycling and capabilities for reusing materials to minimize raw material input, extending the life span of products, maximizing the ease of product maintenance and eventual recycling or transformation into parts that have further productive use.

In addition, our existing reuse and recycling programs can be upgraded. Approaches to recycling such as Pay-As-You-Throw programs help raise recycling rates. Increasing the national municipal recycling and composting rate to half of its maximum potential could avoid 70 million metric tons of carbon dioxide equivalent (MMT $\text{CO}_2\text{e}$ ) in emissions per year. Adding composting facilities to local recycling programs reduces the need for fossil fuel based fertilizer use and increases carbon sequestered in the land on which compost is applied. EPA promotes this type of sustainable approach to materials management. An important goal of these materials management strategies is to avoid GHG emissions by reducing the extraction, processing, and disposal associated with new materials.

## We Have Opportunities to Reduce GHG Emissions through Land Management.

Rethinking some of our local land use decisions can reduce or avoid GHG emissions, especially those associated with local passenger transportation. Through the reuse of vacant buildings and infill development, we take advantage of infrastructure that is in place and increase density in areas that have already been developed, creating mixed-use, walkable communities. Incentivizing more compact construction, considering parking demand management options, and effectively linking land use planning with transportation planning can also change transportation patterns so that GHG emissions are avoided. Smart growth principles and regional land use and transportation planning can be effective tools for shaping development patterns across jurisdictional lines.

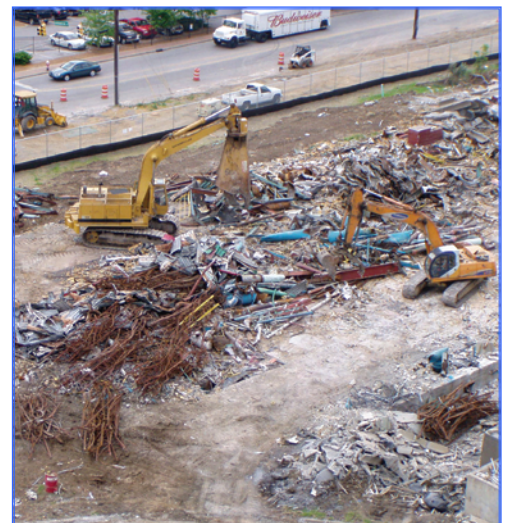
In addition, we can preserve open space, improve the quality of open lands, plant trees, and develop urban gardening programs to protect and increase the carbon sink provided by land.

## How we manage our materials and land has a significant impact on U.S. GHG emissions and sinks.

Numerous scenarios illustrating the significant potential impact of material and land management policies are presented in the full EPA report. Materials and land management approaches can be useful tools for local, state and federal efforts towards reducing GHG emissions.



Shifting 60% of expected new development to compact designs could potentially save 79 MMT $\text{CO}_2\text{e/yr}$



Increasing the current recycling rate for construction and demolition to just 50% could result in an emissions benefit of 75 MMT $\text{CO}_2\text{e/yr}$



A 50% reduction across all categories of materials used for packaging could potentially avoid 40 – 105 MMT $\text{CO}_2\text{e/yr}$