Climate Change and Greenhouse Gas Reduction

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Introduction

Global warming is being accepted as a fact of life in most quarters. Tangible evidence seems to be accumulating on an almost daily basis—shorter winters, melting polar ice caps, rising sea levels, and deeper droughts. Greenhouse gasses are increasingly linked to global warming and are seen as a primary culprit.

Greenhouse gases are made up of carbon dioxide, methane, and nitrous oxides. They contribute to global warming by trapping radiation from the sun. The bulk of greenhouse gases emitted in the United States is associated with transportation (e.g., cars) and energy generation and usage.

Implications of Not Addressing the Issue

If current low-density, "sprawl" development patterns in many communities continue and expand, the ability to reduce VMTs in the future will be seriously hamstrung. Once development patterns are set, it is exceedingly difficult to affect travel patterns and preferences. Low-density development makes cost-effective mass transit nearly impossible.

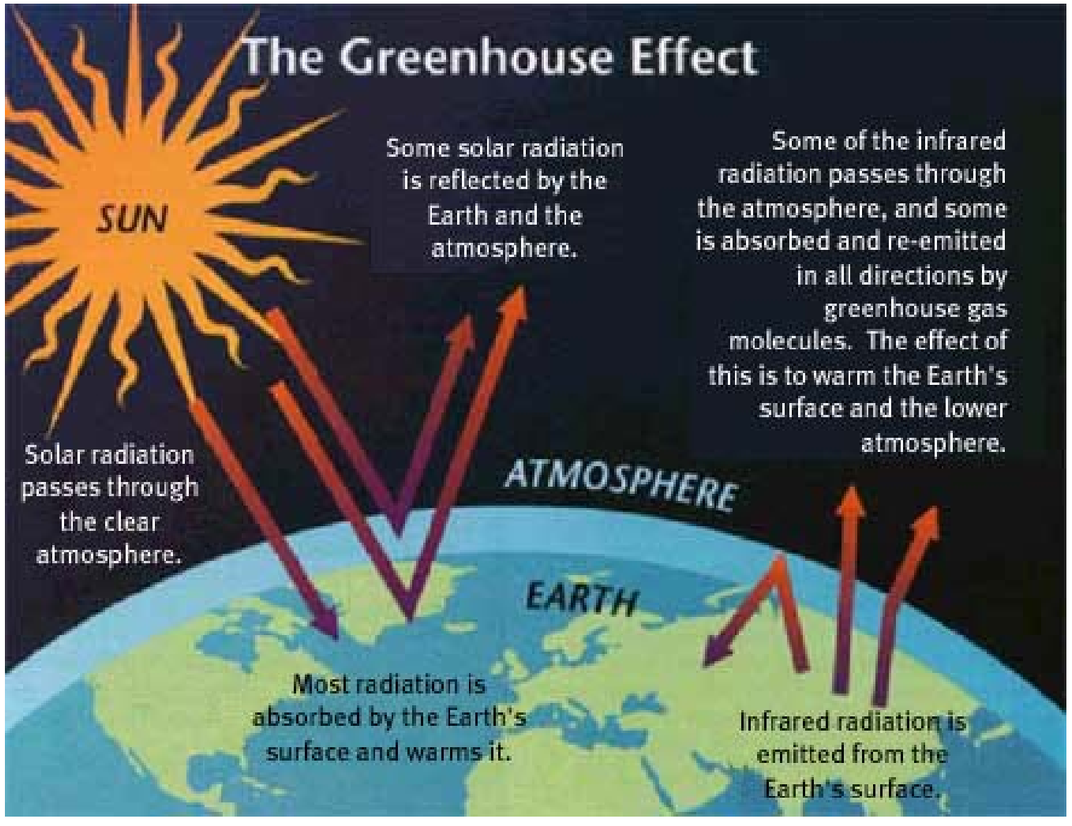
The same is true with preservation of mature trees that absorb huge quantities of greenhouse gases and sequester them for many years. If mature trees are needlessly cut to accommodate new development rather than new development being shaped to preserve these trees whenever possible, their destruction will actually release stored greenhouse gases (through burning or rotting), and it will take decades to replace them with smaller trees that absorb much less carbon dioxide in their early years.

Additionally, if communities do not take steps to accommodate and encourage alternative energy sources such as wind and solar, development patterns may be set that prohibit retrofitting in the future.

The Role of Land Use Regulations In Controlling Greenhouse Gas Generation

Land-use and zoning regulations can thus play an important role in helping to reduce greenhouse gas emissions through:

- Encouraging development patterns that allow less reliance on autos for mobility and result in reduction in vehicle miles traveled and corresponding greenhouse gas emissions
- Preserving existing trees that can sequester carbon dioxide and require the planting of new trees
- Promoting alternative energy generation such as solar and wind power that do not generate greenhouse gases as do oil, gas, and coal-fired power plants



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KEY STATISTICS AND FACTS:

- Greenhouse gases include carbon dioxide, methane, and nitrous oxides.
- The United States, with 4% of the world's population, emits almost 25% of global carbon dioxide each year—second only to China. Carbon emissions in the U.S. have increased about 20% since 1990
- In the U.S., each person's direct emissions amount to 40% of this total—mostly from household energy and transportation. Total per person carbon emissions are about 16.5 metric tons (11.0 home; 5.00 auto; .5 air travel). 60% of transportation emissions come from fueling and driving autos.
- The average mid-size car emits 9.500 pounds of carbon dioxide annually
- In the U.S., development is becoming more spread out--land consumed for development has increased at a rate of twice that of population growth between 1982 and 2002. During that period, per capita vehicle miles traveled (VMT) increased three times population growth
- According to a study of 83 metro areas by Reid Ewing, residents in compact regions (Boston, Portland) drove about 25% less than those in sprawling regions (Atlanta, Raleigh)
- Residents in the most walkable neighborhoods drive 26 fewer miles per day than those in the most sprawling areas according to a report conducted in King County, Washington, by Larry Frank. A study for the City of Sacramento, CA, reported that a compact growth scenario would result in a 25% reduction in VMT per house per day
- According to a study by Ewing, a doubling of development density can reduce VMTs by 5%. Other studies report a 5-15% reduction in VMT associated with mixed-use projects
- According to the Dept. of Energy, a 30-year old hardwood tree can sequester the equivalent of 136 pounds of carbon dioxide annually. About 70 such trees would offset the carbon dioxide emissions from one medium-size car
- Planting a hectare of riparian forest can over the next 100 years offset the carbon emissions caused by 54,000 gallons of gasoline
- Net carbon sequestration by forests, urban trees, and agriculture can offset 15% of total U.S. carbon dioxide emissions annually

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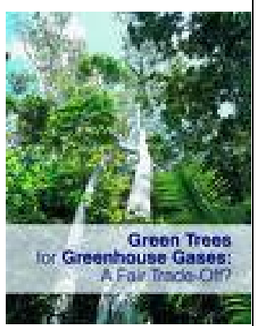
		Achievement Levels (Note: higher levels generally incorporate or exceed actions of lower levels)				
		Bronze (Good)	Silver (Better)	Gold (Best)	References/Commentary	Code Examples/Citations
0 	Remove Obstacles	▪ Allow mixed-use development by right in selected zone districts ▪ Permit solar and small wind turbines by right in selected zone districts (See Renewable Energy Section (solar access and wind power) of Code framework for citations) ▪ Allow accessory units and live/work units by right in residential zone districts ▪ Allow live-work units in commercial and mixed-use districts Permit small-scale recycling facilities in residential zone districts	▪ Allow larger recycling facilities in appropriate industrial and commercial zone districts ▪ Reduce parking requirements for mixed-use developments/in mixed-use districts ▪ Tailor development standards (e.g., landscaping, open space, parking) to encourage infill and mixed-use development (e.g., alternative open space such as plazas, community gardens, green roofs; reduced landscaped buffers with enhanced ornamental fencing) ▪ Reduce overly restrictive height/setback requirements for small-scale wind turbines	▪ Require all single-family developments to include minimum % of accessory units ▪ Prohibit single-use developments/buildings in commercial zone districts (e.g., downtown) ▪ Prohibit urban level development (e.g., more than 1 residential unit/acre) outside defined urban service areas	▪ See itreetools.org for tools for protecting trees and urban forests ▪ T. Litman, Parking Management Best Practices, American Planning Association. 2006 ▪ See Smart Code mixed-use (transect) districts at http://www.smartcodecentral.org/ ▪ US Department of Energy methodology for calculating carbon sequestration by trees: ftp://ftp.eia.doe.gov/pub/oiaf/1605/cdrom/pdf/sequester.pdf	▪ Colorado Springs Mixed-Use Development Manual, http://www.springsgov.com/units/planning/Currentproj/CompPlan/MixedUseDev/I.pdf ▪ Santa Cruz, CA – accessory dwelling unit program http://www.ci.santa-cruz.ca.us/pl/hcd/ADU/adu.html. See Housing Affordability Section of Model Code for additional citations regarding accessory dwelling units ▪ State of Oregon urban growth boundary regulations http://www.oregon.gov/LCD/ruraldev.shtml

DRAFT Sustainable Community Development Code Framework						
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		Achievement Levels (Note: higher levels generally incorporate or exceed actions of lower levels)				
		Bronze (Good)	Silver (Better)	Gold (Best)	References/Commentary	Code Examples/Citations
 Tree protection during construction	Create Incentives	▪ Offer density/height bonuses for green roofs ▪ Give bonus points for green/cool roofs in commercial design standard point systems ▪ Allow and encourage shared parking arrangements ▪ Give priority parking for vans, hybrid vehicles, and bicycles in parking standards ▪ Give increased landscaping credit for preserving existing trees	▪ Reduce transportation impact fees for mixed-use and infill projects to reflect lower traffic generation ▪ Create density bonus and expedited processing incentives for infill and mixed-use developments ▪ Allow green roofs to qualify for open space credits ▪ Offer height increases, density bonuses, and flexibility regarding non-conforming use regulations for projects that remove impermeable surfaces from existing developments or reduce during redevelopment or use permeable pavement	▪ Encourage low-energy maintenance landscaping by giving additional landscaping credit	▪ Chesapeake Bay Program urban tree canopy program http://www.dnr.state.md.us/forests/programs/urban/urbantreecanopygoals.asp ▪ For general information on permeable pavement, see http://www.epa.gov/owow/nps/pavements.pdf and http://www.en.wikipedia.org/wiki/permeable_paving	▪ Portland, OR, FAR bonuses for ecoroofs (City zoning code 33.510: http://www.epa.gov/hiri/resources/pdf/EcoroofsandGreenCityStrategies.pdf ▪ ▪ Landscaping credit for preserving existing trees: http://www.colleyville.com/files/Ch.%2004%20Landscaping%20and%20Buffering.pdf http://www.ewqateway.org/pdffiles/library/wrc/TB-LandscapingRegs.pdf ▪ Austin, Texas, Development Code: Subchapter E: Design Standards and Mixed-Use, available online at http://www.ci.austin.tx.us/development/downloads/final.pdf ▪
	Enact Standards	▪ Require sidewalks in all developments and connections with adjacent sites ▪ Adopt historic preservation standards to protect existing structures (and energy they represent) ▪ Limit coniferous trees on southern sides of buildings in northern climates to preserve solar access ▪ Require planting of deciduous trees ▪ Adopt regulations to protect larger trees ▪ Require provision of bicycle racks in all multifamily and commercial developments	▪ Require replacement of all trees removed during development on an inch/inch diameter basis or contribution to offsite tree fund ▪ Enact minimum density/intensity standards to encourage compact development ▪ Adopt pedestrian connectivity standards to reduce vehicle use ▪ Enact solar access ordinance (See Renewable Energy/solar access section.) ▪ Require bicycle fleets for all hotels, resorts ▪ Limit number of garages allowed on each residential lot (1-2 vs. 3-4) ▪ Limit impermeable surface areas and require use of permeable pavement in appropriate areas	▪ Require green roofs on all commercial and multifamily developments. ▪ Require low-energy landscaping. ▪ Enact limitations on house size ▪ Adopt minimum reforestation requirements for sites without vegetation. ▪ Establish mandatory carbon budgets/limits for new developments (emissions from added traffic, energy used in construction materials, future energy requirements) and offsets/impact fees ▪ Require minimum % of homes in subdivisions to be oriented for passive solar access (on an east/west axis) (See Renewable Energy/solar	▪ University of Florida, *A Guide To Selecting Existing Vegetation For A Low Energy Landscapes.* Available online. ▪ American Planning Assn. PAS Report 446, Tree Conservation Ordinances. Zoning Practice July 2006, *Tree Preservation.* ▪ For a good discussion of a carbon offset measurement methodology, see Forest Guardians Carbon Offfset Program Description: http://www.fguardians.org/support_docs/document_carbon-calculation-methodology_2-07.pdf ▪ US EPA Personal Emissions Calculator: http://www.epa.gov/climatechange/emissions/ind_calculator.html	▪ Aspen/Pitkin County Renewable Energy Mitigation Program. http://www.aspencore.org/sitepages/pid31.php; http://www.greenpowergovs.org/Solar4aspencode.html ▪ Boulder, Colorado, Solar Access Regulations, available online at http://www.bouldercolorado.gov/files/PDS/codes/solrshad.pdf ▪ Maryland Forest Conservation Act/Regulations: http://www.dnr.state.md.us/forests/programapps/newFCA.asp ▪ Franklin, TN, connectivity 5.10.4) and tree protection regulations (5.3): http://www.franklin-gov.com/pdf/Franklin%20Zoning%20Ordinance-%20Effective%201-1-08.pdf ▪ Bicycle Level of Service Standards:

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				access section.) ▪ Require outdoor signage to be turned off when business is closed ▪ Require new developments to be carbon neutral	▪ U.S. Green Building Council, LEED for Neighborhood Rating System (See Green Construction and Technology chapter.), available online at http://www.usgbc.org/DisplayPage.aspx?CMSPageID=222	http://sf-now.com/sf-bike/SFBC_LOS_Research.pdf; Florida DOT: http://www.dot.state.fl.us/planning/systems/sm/los/pdfs/blos-art.pdf ▪ Fort Collins, CO, minimum density requirements in medium-density mixed-use zone district: http://www.ci.fort-collins.co.us/cityclerk/codes.php
CLIMATE CHANGE ADAPTATION—FUTURE SECTION						▪