

**Board of County Commissioners  
Leon County, Florida**

**Workshop on Smart Energy Strategies**

**1:30 to 3:00 p.m.  
Tuesday, August 22, 2006**

**Leon County Board of County Commissioner Chambers  
Leon County Courthouse, 5<sup>th</sup> Floor**

**This document distributed: August 22, 2006**

# Board of County Commissioners

## Workshop Agenda

Date of Meeting: August 22, 2006

Date Submitted: August 16, 2006

To: Honorable Chairman and Members of the Board

From: Parwez Alam, County Administrator   
Kim Dressel, Management Services Director  
David McDevitt, Director, Growth & Environmental Management  
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Subject: Workshop on Smart Energy Strategies

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### **Statement of Issue:**

This workshop updates the Board on current energy conservation and alternative energy strategies, and seeks direction on strategies for future implementation.

### **Background:**

During the December 12, 2005 Board Retreat, the Board designated a Comprehensive Energy Policy as its third priority. The Board's discussion during the retreat highlighted the areas of solar energy, renewable energy resources, hybrid cars, biodiesel, green buildings, amending building codes, air quality, co-generation of electricity and incentives. On July 11, 2006, the Board scheduled this workshop.

### **Analysis:**

The following key concepts, regarding Peak Oil and global warming are provided to gain an understanding of the potential drivers for the Board's consideration of a comprehensive focus on energy conservation, alternative energy and related initiatives.

**Peak Oil** - "Peak oil" refers to the peak in global oil production. The rate of oil production (extraction and refining) has grown in most years over the last century. However, once we go through the halfway point of all reserves, production becomes ever more likely to "peak" and subsequently decline." Peak oil does not mean "running out of oil", but "running out of cheap oil" which will have significant economic and social consequences. Oil companies extracted the easier-to-reach, cheap oil first: oil on land, near the surface, under pressure, light and 'sweet' (meaning low sulfur content) and therefore easy to refine into gasoline. As the remaining oil (sometimes off shore, far from markets, in smaller fields, or of lesser quality) requires more money and energy to extract and refine, the rate of extraction drops. Furthermore, all oil fields eventually become economically

no longer viable. (The source for information regarding Peak Oil was Energy Bulletin - <http://www.energybulletin.net>)

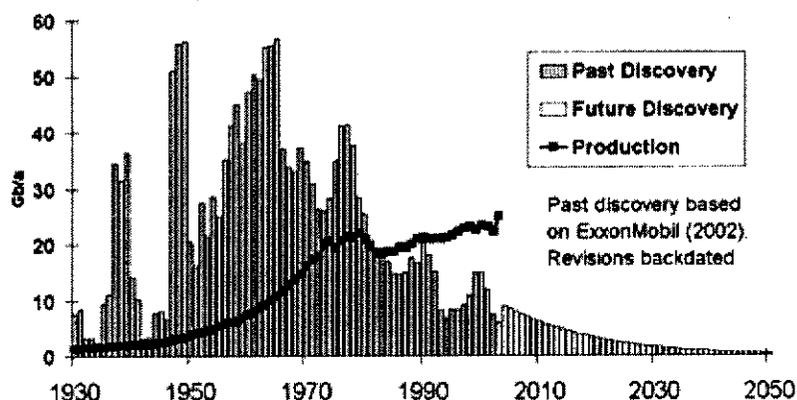
U.S. Oil Discovery and Production Has Peaked – Oil production from the continental U.S. peaked in 1970/71, contributing to 1970s energy crises and further U.S. strategic emphasis on controlling foreign sources of oil. While the U.S. has been able to import oil from elsewhere, and continue with only minimal interruption, the implications will be far greater when global oil production peaks.

Global Oil Discovery Has Peaked - Global oil discovery peaked in the late 1960s. Since the mid-1980s, oil companies have been finding less oil than the world consumes.

Giant oil fields were largely discovered in 1945-49 (mostly on land in the middle east); 1960-64 (mostly off shore in the middle east); and in 1975-79 (off shore in Mexico and the North Sea and in the Caspian Basin, as well as on-shore in Saudi Arabia

outside of the main production area). New discoveries of giant fields occur in newly explored providences. It takes 7 to 10 years from discovery of a major field to get production on line. Up to 54 of the 65 largest oil-producing countries in the world have past their peak production and are now in decline, including the U.S. and the North Sea (in 2001).

**THE GROWING GAP  
Oil Discovery and Production**



When will Global Oil Production Peak? Various projections have been made, ranging from “already peaked” to an optimistic 2035. The Association for the Study of Peak Oil and Gas (ASPO) model suggests that “regular” oil peaked in 2004. If heavy oil, deepwater, polar and natural gas liquids are considered, the oil peak is projected for around 2010. Combined oil and gas are also expected to peak around 2010. The effects of natural gas peak are more localized due to the economic and energetic expense of liquefying and transporting natural gas as liquefied natural gas. Both British and North American natural gas production have already peaked.

Impact of Peak Oil - Our industrial society was built on the assumption of continual growth with readily available cheap fossil fuels. Oil, the most convenient and multi-purposed of these fossil fuels, accounts for about 43% of the world’s total fuel consumption and 95% of the global energy used for transportation. A 2005 risk mitigation study on Peak Oil, commissioned by the U.S. Department of Energy and prepared by the Science Applications International Corporation (the Hirsch Report) warns that “as peaking is approached, liquid fuel prices and price volatility will increase dramatically, and, without timely mitigation, the economic, social, and political costs will be

*unprecedented*. Viable mitigation options exist on both the supply and demand sides, but to have substantial impact, they must be initiated *more than a decade* in advance of peaking."

Other Fossil Fuels and Alternative Energy Sources - To evaluate other energy sources it helps to understand the concept of the Energy Returned on Energy Investment (ERoEI) ratio. One of the reasons our economies have grown so abundant so quickly over the last few generations is oil's high ERoEI ratio. In the early days of oil, 100 barrels of oil were found for every barrel of oil used for exploration and drilling. More recently, oil recovery has become more difficult and the ratio has become significantly lower.

Certain alternative energy sources may actually have ERoEI ratios of less than one (when all factors are considered, you probably need to invest more energy into the process than you get back). Some alternatives (such as wind and hydro-power) may have much better ERoEI, however their potential expansion may be limited by various physical factors. Renewable sources of energy may not provide an amount of energy comparable to what the industrial society is accustomed to, and for certain tasks, such as air travel, no other energy source can readily be substituted for oil.

What can be Done? While many people are working on partial solutions at various different levels, there is probably no cluster of solutions, which do not involve some major changes in lifestyles, especially for the global affluent such as the United States.

Global Warming - Climate (the average pattern of weather) typically remains fairly constant for centuries if left undisturbed. Human activities (most importantly the burning of fossil fuels) are causing global temperatures to rise, posing a serious threat to our health, safety, and environment. "An increasing body of observations gives a collective picture of a warming world and other changes in the climate system." (Source, UN, Intergovernmental Panel on Climate Change (IPCC) 2001 Report) The national science academies of the United States, England, France, Russia, Germany, Japan, Italy, Canada, Brazil, China and India issued the following joint declaration in June 2005: "The scientific understanding of climate change is now sufficiently clear to justify nations taking prompt action." The world's leading scientists ask us to "recognize that delayed action will increase the risk of adverse environmental effects and will likely incur a greater cost." (Source: Joint Science Academies' Statement: Global Response to Climate Change) (Attachment #1)

Greenhouse Effect and Greenhouse Gases - The earth is covered by a blanket of gases, which allow light energy from the sun to pass through to the earth's surface where it is converted to heat energy. Some of this heat energy is trapped by the gases in the earth's atmosphere, keeping the earth's surface about 60°F warmer than it would be otherwise. Atmospheric concentrations of greenhouse gases are increasing, thereby increasing the amount of energy trapped in the earth's surface. Between the years 1750 and 2000, atmospheric concentrations of carbon dioxide (CO<sub>2</sub>) have increased by 31%, methane by 150%, and nitrous oxide by 17% (Table 1).

Most of the the CO<sub>2</sub> produced by human activity comes from the burning of fossil fuels. Land use changes (mainly from cutting down forests and using the land for agriculture, roads, etc.) account for approximately 10-30% of the current anthropogenic CO<sub>2</sub> emissions (those from human activities) (Source: IPCC 2001, The Scientific Basis). There was a 75% increase in per capita global emissions of CO<sub>2</sub> between 1950 and 2003. (Source: Marland, G., T. A. Boden, and R. J. Andres. 2006. Global, Regional, and National CO<sub>2</sub>, Emissions. In Trends: A Compendium of Data on Global Change, CO<sub>2</sub> Information Analysis Center, Oak Ridge National Laboratory, U. S. Department of Energy, Oak Ridge, Tenn., U.S.A.).

Approximately 60% of global methane emissions are related to human-related activities (EPA.gov/methane/sources). Cows are one of the greatest methane emitters. Their grassy diet and multiple stomachs cause them to produce methane, which the cows exhale with every breath. The sheer number of cattle makes a significant contribution to global warming. Since many methane sources are the result of human activities, increased industrialization in developing countries and stepped up global food demand could result in increased emissions in the future. (Sources: U.S. Global Change Research Information Office <http://www.gcrio.org>, and Global Climate Change, <http://www.ucar.edu>).

**Table 1 - Atmospheric Concentrations of Key Anthropogenic Greenhouse Gases, Pre-industrial Times to the Year 2000**

Gas	Period 1000-1750	Year 2000	Increase	Anthropogenic Sources (sources from Human Activities)	Global Warming Potential (GWP)
CO <sub>2</sub>	280 ppm	368 ppm	31%	Fossil-fuel combustion (oil, natural gas & coal), Land-use conversion, Cement production, Burning of wood and wood products	1
Methane	700 ppb	1,750 ppb	150%	Production & transport of fossil fuels, Decomposition of organic waste in solid waste landfills, Rice paddies, Raising of Livestock	21
Nitrous Oxide	270 ppb	316 ppb	17%	Fertilizer, Industrial processes, Combustion of fuels	310

Sources: IPCC 2001 Report and <http://www.pewclimate.org>

Global Warming Potential (GWP) – All greenhouse gases do not have the same impact on global warming, therefore the IPCC uses the concept of GWP to compare the ability of different gases to trap heat in the atmosphere. Emissions of non-CO<sub>2</sub> gases are converted to

**Table 2 - Global Warming Potential: Global Greenhouse Gas Emissions for 2000 (in million metric tons of carbon dioxide equivalents)**

Sectors	Carbon Dioxide	Methane	Nitrous Oxide	High GWP	Global Total	% of Global Total
Energy	23,408	1,646	237		25,291	61%
Agriculture	7,631	3,113	2,616		13,360	32%
Industry	829	6	155	380	1,370	3%
Waste		1,255	106		1,361	3%
Global Total	31,868	6,020	3,114	380	41,382	100%
% of Global Total						
Total	77%	15%	8%	1%	100%	

Source: EPA Global Anthropogenic Non-CO<sub>2</sub> Greenhouse Gas Emissions

a CO<sub>2</sub>-equivalent basis using the 100-year GWPs published in the IPCC's Second Assessment Report. For example, the GWP potential of methane is 21 times that of CO<sub>2</sub> and the GWP of nitrous oxide is 310 times that of CO<sub>2</sub> (Table 1). Global emissions of CO<sub>2</sub> account for approximately 70% of the greenhouse effect due to human activities since pre-industrial times, and emissions from methane, nitrous oxide and high GWP gases account for the remaining 30% (Source: United State EPA Global Anthropogenic Non-CO<sub>2</sub>, Greenhouse Gas Emissions: 1990-2020, and IPCC, 2001, Table 6-1).

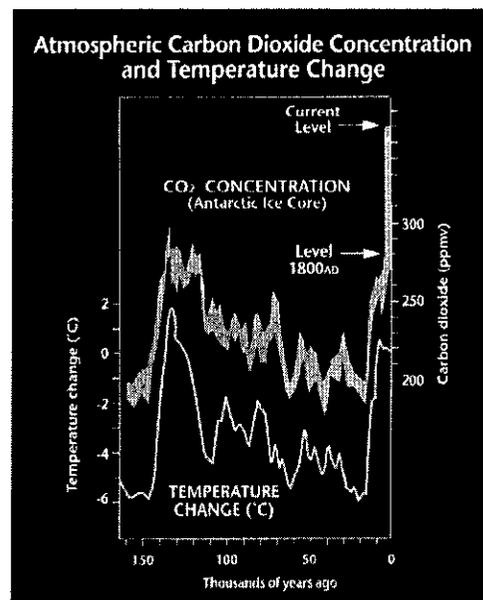
**Table 3 - 2002 U.S. Emissions of Greenhouse Gases & Global Warming Potential (GWP)**

Gas	Emissions (in Million Metric Tons)		GWP (in Million Metric Tons Carbon Dioxide Equivalent)	
	Emissions	%	GWP	%
Carbon Dioxide	5824.8	99.54%	5824.8	84.53%
Methane	26.1	0.45%	599.2	8.70%
Nitrous Oxide	1.1	0.02%	323.2	4.69%
Others			143.7	2.09%
<b>Total</b>			<b>6890.9</b>	<b>100.00%</b>

Source: Energy Information Administration / Emissions of Greenhouse Gases in the United States 2003.

By sector, energy is the largest contributor to global warming, followed by agriculture (Table 2). The U.S. emits about 25% of the world's greenhouse gases, with only 5% of the world's population (Source: University of Michigan Center for Sustainable Systems). In the U.S., Electricity Generation emits the greatest share of greenhouse gases (33% of the 2004 U.S. total), followed by Transportation (28%). When Electricity Generation is allocated to the various economic sectors, Industry is the greatest emitter of greenhouse gases (30% of the 2004 U.S. total), followed by Transportation (28%), Commercial and Residential use (17% each), and Agriculture (8%). *On-road transportation accounts for 81% of the U.S. 2003 Transportation greenhouse gas emissions. From 1990 to 2003, U.S. emissions from Passenger Cars increased by 2%; emissions from Light-Duty Trucks (which includes SUVs, minivans and pickup trucks) increased by 51%; emissions from Medium/Heavy Duty Trucks increased by 57%; and emissions from Buses increased by 11%* (Attachment #2). CO<sub>2</sub> accounts for 85% of the GWP from the U.S., and methane accounts for nearly 10% (Table 3).

Increasing Land and Ocean Temperatures - Climate data show some warming has already occurred. *The earth's average near-surface atmospheric temperature rose about 1 degree Fahrenheit in the 20th century.* The rate and duration of the 20th century warming has been much greater than in any of the previous nine centuries (i.e., over the last 1,000 years). While the record shows a great deal of variability, the upward trend is unambiguous. Annual average combined land and ocean temperatures have been rising since the late 1970s. 2005 was tied with 1998 for the hottest years on record, followed by 2002, 2003, 2004, and 2001 (Source: Union of Concerned Scientists, www.ucsusa.org).



Correlation between Global Warming and Atmospheric CO<sub>2</sub> Concentrations - Ice core samples show that there has been a very clear correlation between atmospheric CO<sub>2</sub> concentrations and the global temperature record. The current level of atmospheric CO<sub>2</sub> is already *far higher than it has been at any point during the last 420,000 years*; it is *outside* the bounds of natural variability seen in the climate record of the last 420,000 years. When viewed from a long-term perspective, the *rate of change* in CO<sub>2</sub> concentration is also unprecedented. (Source: U.S. Office of Science and Technology Policy)

Impacts of Global Warming - IPCC experts concluded with high confidence that the observed regional changes in temperature have had “*discernable impacts on many physical and biological systems*” and that “*an increasing body of observations gives a collective picture of a warming world.*” Anticipated impacts of global warming are provided in Table 4 (additional details, as well as anticipated regional and state impacts are provided in Attachment #3) (Source: Global Warming: Early Warning Signs, <http://www.climatehotmap.org/index.html>)

Ocean Warming, Sea-level Rise and Coastal Flooding	Coral Reef Bleaching
Arctic and Antarctic Warming	Glaciers Melting
Earlier Spring Arrival	Plant and Animal Range Shifts and Population Changes
Spreading Disease	Downpours, Heavy Snowfalls and Flooding
Droughts and Fires	

“The global average sea level has already risen about six inches over the past century. Based on recent trends, scientists’ mid-range projection is that sea level will rise another 15 inches by the year 2100. Along Florida’s gradually-sloped shores, this would translate into a horizontal advance of water inland by as much a 250 feet, contributing to coastal erosion, inundation and changes in wetlands and mangroves.” (Source: An Unfavorable Tide, Global Warming, Coastal Habitats and Sportfishing in Florida. June 2006. National Wildlife Federation and Florida Wildlife Federation.)

Uncertainties and Unknowns – The IPCC recently concluded that “there is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities.” While scientists estimate average global temperatures will continue to rise as a result of increased atmospheric levels of greenhouse gases, by how much and how fast remains uncertain. The IPCC projects further global warming of 2.2° to 10°F by the end of 2100. The IPCC states that even the low end of this warming projection “would probably be greater than any seen in the last 10,000 years, but the actual annual to decadal changes would include considerable natural variability.” (Source: EPA, Global Warming – Climate)

Scientists have identified that our health, agriculture, water resources, forests, wildlife and coastal areas are vulnerable to the changes that global warming may bring. But projecting what the exact impacts will be over the 21<sup>st</sup> century remains difficult, especially the impact to a local region. The current state of global warming science cannot always provide definitive answers. There is certainty

that human activities are rapidly adding greenhouse gases to the atmosphere and that these gases tend to warm the earth. The fundamental scientific uncertainties remain: How much more warming will occur? How fast will this warming occur? And what are the potential adverse and beneficial effects? Global warming poses real risks. The exact nature of these risks remains uncertain. (Source: EPA, Global Warming – Climate).

**Local Smart Energy Strategies** – Guided by the current state of science, to determine potential local responses, staff has prepared a series of strategies for the Board’s consideration. The strategies fall under the following categories: Cleaner Vehicles, Energy Efficient Buildings, Environmentally-Friendly Policies and Practices, Renewable Energy, and Community Education and Outreach.

- 1) **Cleaner Vehicles** - The technology exists today to significantly reduce global warming from cars, trucks and SUVs. Improving automobile fuel economy is the biggest single step to curbing global warming, since every gallon of gasoline burned creates 28 pounds of heat-trapping CO<sub>2</sub> pollution (Source: Oak Ridge National Laboratory: U.S. Department of Energy).

**1A - Vehicle Replacements** - The Fleet Division’s 2006-2007 Budget Request includes the replacement of three Jeep Cherokees with Ford Escape Hybrids. The Jeep averages 19 MPG while the Escape Hybrid averages 31 MPG for an increase of 12 MPG and a 61% increase in gas mileage. Selection of the Ford Escape Hybrid was made because the dealer offered basically the same capacity as the Jeep Cherokees and the advertised MPG was superior. The recharging cycle is completed automatically during idling and braking, eliminating the need to manually recharge. Staff issued a purchase order in July to Orvillee Beckford Ford for \$27,947 (this price includes a five-year 75,000 mile extended warranty). Ford Motor Company advertised overall mileage is 31 MPG. Based on annual miles of 15,000 and fuel cost of \$2.76 gallon, the annual associated cost would be \$1,335.48. The Jeep Cherokees being replaced averaged 19 MPG - the fuel cost under the same conditions would be \$2,178.94 (in this case, the savings would be \$843.46 annually). Consumer Reports annual car buyer’s guide states that the higher acquisition cost of Hybrid vehicles is not offset by the anticipated higher annual operating cost. However, they rated the Escape Hybrid the MPG leader in the small SUV class. The overall MPG is reported to be 26, utilizing the 15,000 annual miles traveled at \$2.76 per gallon the cost would be \$1,592.30. The annual savings compared to the Jeep Cherokee is \$586.64. Upon receipt of the Escape Hybrid, we intend to monitor the MPG. The Fleet Division intends to continue to request replacement of those vehicles that meet the criteria for replacement with hybrid vehicles.

In the past, the mass production of electric powered vehicles was doomed because of the travel range before a recharge, battery failure and insufficient size market to purchase the units. With gasoline prices at record levels and climbing, it merits giving them a new look. A recent article in USA Today newspaper reports that China is currently producing the Zap Xebra. The cost will be \$9,000 and it has a range of only 40 miles. Toyota recently announced that it is pursuing plug in hybrids. The article also stressed that electric cars were not a panacea but we must investigate every option that renders us less dependant on imported oil. Staff will continue to research fuel-efficient alternatives.

- **1A - Recommendation** – Fund the 2006-2007 budget request for the replacement of three Jeep Cherokees with Ford Escape Hybrids (which is included in the tentative budget).
- **1B - Hybrid Vehicle Incentives** – Local governments can encourage citizens and businesses to buy hybrid vehicles with a wide range of incentives (Attachment #4). For example, some cities provide free metered parking and access into city-owned parking lots at no charge. Nassau County in New York is proposing a tax break on the county-portion of the sales tax on hybrid vehicles along with a waiver of Nassau County's \$15 vehicle registration fee.
- **1B - Recommendation** – Direct staff to develop a policy for the Board's consideration that provides incentives for hybrid vehicle ownership (such as tax and vehicle registration fee rebates, and waiving parking fees for employees at the Courthouse and for the public at the main library).
- **1C - Incentives for Employees to Use Alternative Transportation** - For a multitude of reasons, most employees travel to and from work in single passenger vehicles and do not carpool. To promote carpooling, the Board has provided four carpool parking spaces in the Courthouse (which meets the current demand). However, such an option is not available to most of the Board's workforce, as most of its employees work elsewhere. To provide an incentive for employees to keep a car off the road, staff recommends that the Board consider implementing transportation credits. In concept, upon signing up for the program, Board employees would receive an incentive (perhaps in the form of direct payment or additional leave) for each week an employee uses alternative transportation to and from work such as walking, biking or using public transportation.
- **1C - Recommendation** – Direct staff to develop a draft policy for the Board's consideration that provides incentives for employees to use alternative transportation.
- **1D - Flextime/Staggered Work Hours and Telecommuting** - The County's Personnel Policies and Procedures provide for flextime/staggered work schedules to allow employees to work around traffic congestion, school and day care schedules, etc., when it is not in conflict with the County's operations. Some employees have flexible or staggered work hours, and some have a 4-day workweek (resulting in a 20% decrease in fuel consumption getting to and from work). Further, staggered work schedules reduce peak traffic flows. Typically, telecommuting allows employees to work part-time at an alternate site (such as home), which also eases traffic and parking congestion and reduces fossil fuel consumption. Feasibility considerations include risk management and job performance issues.
- **1D - Recommendation** - Direct staff to investigate the feasibility of implementing a telecommuting program for Board employees.

## 2) Energy Efficient Buildings -

- **2A - Green Lights and ENERGY STAR®** - The County has aggressively pursued energy efficient building improvements by participating in several relevant programs.

(1) Participating in the U.S. Environmental Protection Agency's (USEPA) "Green Lights" Program: Typical lighting systems used in commercial buildings can account for up to 28% of their total energy usage. The USEPA introduced the "Green Lights" Program in 1991, which promoted conversion to energy efficient lighting systems. Leon County became a program participant in 1994 and completed the retrofit of its building facilities in 1997, which the USEPA has determined reduced greenhouse gas emissions (at the annual rate of 3,757,570 pounds of CO<sub>2</sub>, 16,706,025 grams of sulfur dioxide; and 6,052,909 grams of nitrogen oxides) and reduced our annual electrical energy consumption by approximately 2,050,939 kWh/year. This was later confirmed through our total energy cost savings of \$3,692,211 occurring over the 10-year period from 1995-2004 (during which time the average unit costs for energy consumption in County buildings dropped from a high of \$1.94/square foot (SF) (experienced in 1994) to a low of \$1.01/SF (in 1999). For comparison, the 2005 utility cost was \$1.54/SF. The County's participation in "Green Lights" has reduced the County's total electric consumption costs by an estimated 19% sustained over time.

(2) Energy Savings Company (ESCO) Contract – On October 11, 2005, the Board selected thirteen projects to be included in an ESCO contract with Energy Systems Group (ESG), which included: installing a combined central energy plant between the Courthouse Annex and Courthouse, performing additional lighting upgrades in County building facilities, performing water conservation in certain County buildings, and further reducing the rate of electrical consumption by employing computerized energy management system controls. The total project cost of \$4,466,238 is expected to generate savings of \$6,714,535 over a period of twelve years (or to save \$954,921 after the expected debt service costs). To date, this project is 30% complete, with a majority of lighting upgrades completed and the planned water conservation improvements in process.

(3) A summary of Leon County's energy efficiency practices over time is provided (Attachment #5). To accompany this, since 1995 Leon County has: (1) reduced its greenhouse gas emissions (totaling an estimated 15,324 tons of CO<sub>2</sub>, 136,258 kilograms of sulfur dioxide and 49,369 kilograms of nitrogen oxides); and (2) saved the County at least \$3,742,237 in consumed energy costs, which corresponds to an estimated reduction in average monthly energy production of 0.41 Mega-Watt (MW) (meeting our required peak energy demand could easily require two to three times this amount, or approximately 1 MW of energy).

(4) National Association of Counties (NaCo's) ENERGY STAR® "Courthouse Campaign" – The ENERGY STAR® label, intended to identify and promote energy-efficient products to reduce greenhouse gas emissions, is now on virtually all major appliances, office equipment, lighting products, home electronics and has further been

expanded to include the labeling of office equipment and residential heating and cooling equipment. The USEPA ENERGY STAR® Program further provides an innovative building rating system, which recognizes energy efficient performance. ENERGY STAR® qualified buildings have been shown to use up to 40% less energy than typical buildings, while providing both the expected levels of user comfort and meeting the required levels of service for these facilities. The ENERGY STAR® label was extended to government-owned building facilities in 2000 and in 2004 was further extended for use in conjunction with NaCo's ENERGY STAR® "Courthouse Campaign." NaCo has since endeavored to promote the guiding principles of the USEPA's ENERGY STAR® Program, by assisting counties with their commitments to achieve energy conservation and reduction. This program basically serves as an evaluation tool for building facilities to be rated on a scale of 1 to 100, for their energy performance, and awards the ENERGY STAR® label to those facilities with a rating of 75 or higher. Leon County was awarded the ENERGY STAR® label by NaCo in March 2006, recognizing its participation in conjunction with "Green Lights." To date, 88 counties have achieved the ENERGY STAR® label in recognition for their energy efficient building practices, including seven in Florida (Alachua, Broward, Hillsborough, Lee, Leon, Manatee and Sarasota).

- **2A - Recommendation** – Direct staff to pursue additional recognition under NaCo's ENERGY STAR® "Courthouse Campaign" following completion of the ESCO project.

- **2B - Make New Buildings More Energy Efficient** – Incorporating energy efficiency requirements into County buildings increases the overall energy efficiency of new buildings.

(1) Florida Building Energy-Efficiency Ratings (BEERS) Act - The State of Florida is ahead of many other states in mandating energy efficiencies in new construction. The 1993 BEERS requires in part, under Section 553.997, that "Each public building proposed for construction, renovation, or acquisition shall be rated pursuant to the energy-efficiency rating system provided in s. 553.995 prior to contracting for construction, renovation, or acquisition. The public body proposing to contract for construction, renovation, or acquisition of a public building shall consider the energy-efficiency rating when comparing contract alternatives, notwithstanding the provisions of s. 255.254." Although the BEERS rating scale has gone to a pass/fail rating system, the calculated numerical score is still available. The County may wish to consider paying all or a portion of the permit fees for those that attain a certain rating level as determined by the Florida Building Energy-Efficiency Ratings Act.

(2) Florida Green Building Coalition, Inc.'s (FGBC's) "Green Building" Standards – The FGBC has established a local building efficiency rating and certification system that exceeds the Florida Energy Efficiency Code (in existence since 1980 and now recorded as Chapter 13 of the 2004 Florida Building Code) and the ENERGY STAR® rating system. This system requires a minimum of 200 points to achieve the distinction of being labeled as a "Green Building." Since 2001, over 500 buildings in Florida have been certified by FGBC as a Green Building, and there are currently 58 certified professionals able to review future

applications for additional certifications. The universally accepted High Efficiency Rating System (HERS) is used by the FGBC to evaluate and rate buildings for their energy and environmental performance. HERS certification by FGBC costs \$425-\$475/building on average. The FGBC program is open to homes, commercial and governmental buildings, and existing buildings and new construction are eligible for review. A comparison of this program with other available standards has been performed by FGBC (Attachment #6).

(3) U.S. Green Building Council's (USGBC's) Leadership in Energy and Environmental Design Standards (LEEDS) and Certified "Green Building" Construction Program - The USGBC has created a detailed rating system known as LEEDS leading to the construction of certified "Green Building" facilities (Attachment #7), which provides a comprehensive framework for the assessment of new building performance and the ability to meet long-term sustainability goals. LEEDS emphasizes strategies for sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality. Since its 2002 inception, the USGBC has certified nearly 550 buildings across the country. LEEDS recognizes achievements and promotes expertise in green building through a comprehensive system that offers project certification, professional accreditation, training and resources.

There are multiple levels of LEED certification based on the criteria. Staff has begun to examine the criteria and determine if the benefits to the County to use all or some of the criteria in construction of Leon County facilities, additionally many of the current State Building Code standards qualify for meeting some of the standards. The utilization of some of these Building Code standards are already in place for construction projects thus the County is already utilizing these LEED criteria countywide.

On January 17, 2006, the Secretary of Florida Department of Environmental Protection (DEP) submitted her Florida Energy Plan recommendations to the Governor, which included the recommendation that all new State government-owned buildings to meet USGBC's LEEDS with an "...added an expected 2% or less in upfront costs for supporting green building design, while imparting life cycle savings of 20% of total construction costs, or more than ten times the initial investment." This particular recommendation was not enacted by the Legislature and, as a result, is not binding upon the Florida Department of Management Services (which administers building programs for the State).

The federal government, and some 15 other states and 46 cities, require new public building construction to meet or exceed LEEDS criteria. Additionally 4 states and 17 cities offer incentives for LEEDS-rated private buildings. In 2005, Florida's Miami-Dade passed an ordinance that: (1) initiates the fast-tracking of their building permit procedures for those who commit to the use of green building standards; (2) offers a \$1,000 property tax credit per job created by industries that decide to build in the county using either USGBC or FGBC standards; and (3) offers a \$500 property tax credit per job created by industries who opt to develop including the use of available solar technology. Gainesville passed an ordinance that offers up to a 50% reduction in the building permit fees (for a maximum rebate of \$1,000) as incentives for the pursuit of green building construction. Florida Statute 553.80(7) requires, in part, that building permit fees are "... consistently applied." Therefore, any such

“reduction” in building permit fees would need to be paid by another entity (such as the County). Sarasota County pays for the training of its staff to become certified to rate and evaluate green building construction, and to further serve as advisors to the development community and public. Experience from these areas has shown that developers are finding there to be at least a 1-3% additive cost for the pursuit of green building construction, which may likely offset the added benefits and long-term energy savings.

- **2B - Recommendation** – Direct staff to pursue a pilot demonstration “Green Building,” according to one or more of the available certification programs (ENERGY STAR®, FGBC “Green Building,” or USGBC-LEEDS) as a logical first step for determining the specific costs, and available environmental and energy savings, that are associated with building “green.” Options would include the Solid Waste Division’s building, Woodville Branch Library, or other locations.

### 3) **Environmentally-Friendly Policies and Practices** -

- **3A - Land Use Planning and Associated Regulatory Considerations** – In the land use planning and associated regulatory processes there are development proposals that can be influenced through incentives to incorporate energy conservation and air quality consideration into the overall project design. In the more general overall Comprehensive Planning framework, the County’s goal of mixed-use development and compact urban growth as reflected in the establishment of the Urban Service Area and adoption of the Future Land Use Map provides the basis for the more specific project level design and regulatory considerations.

These more specific regulatory considerations include providing incentives for mixed-use development proposals, encouraging traditional neighborhood design concepts, and promoting the development of interconnected and walkable communities. Many of the concepts that can facilitate energy conservation could be promoted through the County’s Quality Development Program. These project level design considerations could potentially include enhanced incentives for mixed-use development to reduce the proposed new development’s anticipated total vehicle miles, walkable developments that integrate and provide for onsite and interconnected pedestrian and bicycle circulation, building orientation to reduce energy use and loss from heating and cooling, reuse of storm water on the project site to provide for irrigation of landscaping, and green building practices.

Apart from promoting energy conservation through the County’s Quality Development Ordinance, other regulatory and design-based provisions in the County’s Land Development Code could be revised to encourage and facilitate energy conservation and improved air quality. These would include providing incentives for increased intensity and density of development in certain land uses by allowing smaller lot sizes, flexible setback requirements, and increased building heights. Other considerations could also include the requirement for wider sidewalks located further away from roadways to encourage pedestrian utilization, and enhanced landscaping between sidewalks and adjacent roadways. Additionally, the County

could encourage the introduction of mass transit into new developments by requiring fewer parking spaces, or allowing more parking spaces when a percentage of the parking spaces are allocated to hybrid or pool vehicles.

- **3A - Recommendation** – During the upcoming review and revision process as approved by the Board based on the recommendations of the County's Blue Ribbon Focus Group, direct staff to examine and investigate changes to the County's Land Development Code as identified above to encourage new development that promotes energy conservation and improved air quality.
  
- **3B - Landfill Gas Collection and Treatment System** – The gas generated by landfills is generally 50% methane gas and the remainder mostly CO<sub>2</sub> and other non-methane organic compounds. Depending on the amount of methane gas generated in the process there are various levels of use for the gas.

The County's landfill holds previously untapped methane, which can directly or indirectly be a source of fuel. The Solid Waste Division has installed a gas burn-off system at the Landfill on Apalachee Parkway. There is a FY 2006-2007 Budget Request to install a collection system for the methane gas, which is created as a by-product, by the decomposition of the solid waste. When the volume of methane gas is determined, then the County could sell or use the methane gas that could be converted to energy. The Solid Waste Division will complete the installation of the landfill gas collection system by December 2006. This will allow the Division to determine the amount of methane gas that is created at the landfill site and determine the possible uses of the gas.
- **3B - Recommendation** – Direct staff to report to the Board the results of the amount of gas generated Landfill and possible uses.
  
- **3C - ENERGY STAR® Compliant Goods & Products and EPEAT** – While the County does not have a policy that mandates the purchase of equipment that is ENERGY STAR® compliant, MIS and Purchasing staff indicate that this certification has been recognized for many years as the standard and is assumed to be a part of the configuration of any computer equipment that is purchased. The state contracts, which are used to purchase most of the computer equipment, provide for ENERGY STAR® compliance in their bids for equipment. Additionally, the Electronic Product Environmental Assessment Tool Project (EPEAT) helps purchasers identify environmentally preferable computers and electronics. EPEAT evaluates electronic products according to three tiers of environmental performance (Bronze, Silver, and Gold). The monitors and CPU's that have recently been purchased meet or exceed the Bronze level of compliance.
- **3C - Recommendation** – Direct staff to continue the practice of purchasing ENERGY STAR® rated products when possible.
  
- **3D - Energy Savings Settings** - In FY 2003-2004 MIS began a project to replace all older CRT monitors with flat panel monitors, which consume approximately 75% less energy than

the CRT monitors. To date, 64% of all systems have flat panel monitors and the remaining replacements will be accomplished in the next three fiscal years. Additional energy savings are achieved as MIS replaces older tower systems with the Small Form Factor (Breadbox) central processing units (CPU) are, which consume 8% less energy. To date, 24% of all tower systems have been replaced and the remaining replacements will be accomplished in the next five fiscal years. MIS staff supports approximately 2,000 computers. During the configuration of the computers, energy setting on monitors and CPUs could be activated (thereby placing the CPU and monitor in "sleep state" after a discretionary number of minutes). Those settings have not been made because there is a user awareness issue with the behavior of the systems when they go into the energy savings mode (sleep state). Users think the system is locked up or down and become frustrated and concerned. Additionally, some users do not like to wait the approximate 20 seconds for the system to "wake up."

- **3D - Recommendation** - Direct staff to activate energy settings on MIS-supported monitors and CPUs and educate users as to the effects on their systems.
  
  - **3E - Consider joining the US Mayors Climate Protection Agreement** – Cities and counties are participating in reducing global warming by joining the "U.S. Mayors Climate Protection Agreement" initiated by Seattle Mayor Greg Nickels. The Sierra Club began the Cool Cities Campaign to encourage local leaders throughout the country to move forward with innovative solutions to reduce heat-trapping global warming pollution. To date, more than 200 mayors (including Mayor John Marks) representing more than 42 million Americans in 38 states have signed on, pledging to reduce global warming CO<sub>2</sub> pollution citywide to 7 percent below 1990 levels by 2012 (go to [seattle.gov/mayor/climate](http://seattle.gov/mayor/climate) for more information on the mayors' climate protection agreement). The cities have implemented easy step solutions from green and hybrid vehicle fleets, incorporating green designs into their new buildings and the retrofits of their existing builds, to renewable energy solutions. Leon County could join this campaign, support the goals, and work with the City to jointly reach the reduction of global warming pollution by 2012. Although this initiative's primary participants are cities, Mecklenburg County (Charlotte, North Carolina) has joined the Cool Cities Campaign (Attachment #8).
  - **3E - Recommendation** – Direct staff to return to the Board with additional analysis regarding joining the Cool Cities program.
- 4) **Renewable Energy** - Currently, dirty fossil fuel power plants account for over one-third of the nation's total global warming emissions (Source: Cool Cities, Solving Global Warming One City at a Time, <http://www.coolcities.us>). By using renewable energy sources, such as the sun and wind, the County will realize reduced reliance on polluting power plants.
- **4A - Incorporate Solar Energy In County Building Practices** – Available solar energy technologies utilize the sun's energy and light to provide alternative sources of light, heat, hot water supply, electricity and even cooling for homes, businesses and industry.

There are three main types of solar technology: (1) Photovoltaics (PV), in which solar cells made of semiconducting materials can convert sunlight directly into electricity; (2) Concentrating solar systems that use the sun's heat to produce electricity; and (3) Solar Thermal technology, in which the sun's energy benefits can provide for the direct heating of water for use in building facilities. There are federal and state incentives supporting solar energy solutions (Attachment #9).

According to local utilities literature, the cost of a solar thermal conversion ranges from \$1,500 to \$3,500 per application (depending on size and capacity factors of the system) with an expected energy savings of \$250 to \$640/year, which results in a simple payback of only 5 to 6 years. This is a better return than for photovoltaic systems, with costs that range between \$10,000 to \$15,000 for a 1.5 kW system, which results in expected savings of \$351/year and a simple payback period of 28 to 42 years.

Staff has concluded that the most competitive opportunity is solar thermal technology for direct water heating applications within County building facilities. Staff has further examined the building inventory and identified approximately 30 small to medium-sized buildings with electrical water heating systems and with locations that are believed amenable to such installations (facilities with good sun exposure on a sustained basis throughout the year), including branch libraries, community centers, parks and other facilities. The use of a solar thermal loop in a building to provide hot water supply does not eliminate or replace the need to provide or retain a standard hot water heater in the system (solar thermal is intended to accompany, but not replace a standard building water heater).

- **4A - Recommendation** - Direct staff to identify a location and funding for the demonstration and testing of solar thermal water heating technology.
- **4B - Biodiesel Fuel** - The Fleet Division is initiating a pilot project for the utilization of biodiesel products in three of the heavy-duty trucks. Biodiesel is a clean burning fuel, produced from domestic, renewable sources (vegetable oil, soybeans, corn and other crops). Biodiesel contains no petroleum, but it can be blended with petroleum diesel. It can be used in compression-ignition (diesel) engines at a ration of up to 80% petroleum diesel and 20% biodiesel with little or no modifications of the engine. The use of biodiesel in a conventional diesel engine results in a substantial reduction of unburned hydrocarbons, carbon monoxide and particulate matter compared to emissions from diesel fuel. Based on engine testing using protocols required by EPA for certification of fuels, the overall ozone (smog) forming potential of the hydrocarbon exhaust emissions from biodiesel is nearly 50% less than that measured for diesel fuel.

The Fleet Division is currently pilot testing fuel mixture of 80% petroleum and 20% biomass in three of the heavy-duty trucks. During the month of July, the Fleet Division purchased 500 gallons of Biodiesel at \$3.04 per gallon for a total of \$1,520. The composition of this product is 80% petroleum and 20% soybean. To accurately monitor the performance level of the product, staff selected three vehicles assigned to the Fleet Division: Unit #1575 (2001 Ford F-450), #1782 (2005 F-750) and #1830 (2005 F-350).

Currently staff has documentation that #1830 previously attained 11.63 MPG utilizing petroleum diesel. After two refueling cycles, the same vehicle produced 13.2 MPG utilizing Biodiesel. All other aspects of performance remain the same. The petroleum diesel reflects a cost of \$0.2614 as opposed to the Biodiesel at \$0.2303 cost per mile. The Fleet Division will continue to monitor the other units, as refueling is needed.

- **4B - Recommendation** – Direct staff to report the biodiesel fuel pilot test results to the Board for consideration of continuation and expansion.

#### 5) **Education and Outreach** –

- **5A – Public Information and Outreach** - Public information is an important component to further raise awareness and implications of global warming and help individuals identify differences they can make. Think back to the days before recycling became popular – when everyone threw everything out in the trash. In less than 20 years, most households have gone from recycling little to nothing to recycling newspapers, plastics, glass and metal. Many businesses recycle paper and buy recycled products and many industries practice source reduction in their packaging efforts. An entire mindset has changed in one generation!

Taking action on global warming (or climate change) and reduction in cheap, available oil is similar. In some cases, it only takes a little change in lifestyle and behavior to make some big changes in greenhouse gas reductions or reductions in oil utilization. For other types of actions, the changes are more significant. When that action is multiplied by the 270 million people in the U.S. or the 6 billion people worldwide, the savings and conservation impacts are significant.

There are numerous opportunities for the County to provide education, awareness and community outreach: internally (through resources such as staff meetings, *In the Loop* and *The Courier* employee newsletters) and more broadly (through the County's website, at the Libraries, Landfill, Community Meetings, and included in the monthly community page *Leon County Link* in the Tallahassee Democrat). Areas for increased and continued awareness could include, for example:

- Educate individuals as to what that can do to make a difference (Attachment #10).
- Educate individuals of the importance of recycling and waste reduction. Waste reduction and recycling conserves energy and natural resources and has an overall positive impact on greenhouse gas emissions. Table #5 describes energy reduction when using recyclable material compared to using virgin materials.

<b>Materials</b>	<b>% Energy Reduction</b>	<b>Equivalent Barrel Oil</b>	<b>Tons CO<sub>2</sub> Reduced</b>
Aluminum	95	37.2	13.8
Cardboard	26	2.43	0.04
Steel	61	2.71	1.52
Plastic (PET)	57	11	0.985
Newsprint	45	3.97	-0.03

Source: US Department of Energy

- Inform and educate individuals about various rebate programs (Attachment #9).
- Inform individuals how their activities impacts air quality and how we sustain good air quality. It was discussed during the December 2005 Board Retreat that Leon County may have an air quality problem. Staff has looked into the air quality issue and found that this year the American Lung Association has identified Tallahassee as one of the cleanest U.S. cities for ozone air pollution. While the County generally has good air quality, unhealthy air quality for sensitive groups has been recorded during holidays such as the Fourth of July and Memorial Day (Attachment #11).
- **5A - Recommendation** – Direct staff to implement public information initiatives within current funding capacity.
- **5B – Education** - Continued education is necessary for the County stay abreast of scientific and technological advances, in order to identify additional efforts it may seek to pursue to further reduce greenhouse gas emissions and reduce its impacts on climate change. The International Council for Local Environmental Initiatives (ICLEI) is a worldwide organization of local governments that are committed to achieve improvements in global sustainability with special focus on environmental conditions. The membership in ICLEI would provide information and a network of peers to Leon County regarding worldwide, national and regional efforts in the areas of climate protection, reduction of greenhouse gas emissions and impacts of climate change as well as other environmental issues. ICLEI is also a source to locate funding opportunities for Leon County projects. The cost of organizational membership in ICLEI is \$2,250 per year.
- **5B – Recommendation** – Direct staff to pursue County membership in ICLEI and continued learning opportunities.

**Summary:** Throughout history, major shifts in temperature occurred at a very slow rate - usually changing only a few degrees over thousands of years. According to the National Academy of Sciences, the Earth's surface temperature has risen by about 1 degree Fahrenheit in the past century. There is new and stronger evidence that most of the warming over the last 50 years is attributable to human activities. Human activities have altered the chemical composition of the atmosphere through

the buildup of greenhouse gases – primarily CO<sub>2</sub>, methane, and nitrous oxide. The heat-trapping property of these gases is undisputed although uncertainties exist about exactly how earth's climate responds to them. The snow cover in the Northern Hemisphere and floating ice in the Arctic Ocean have decreased. Globally, sea level has risen 4-8 inches over the past century. Worldwide precipitation over land has increased by about one percent. The frequency of extreme rainfall events has increased throughout much of the United States. Increasing concentrations of greenhouse gases are likely to accelerate the rate of climate change. Scientists expect that the average global surface temperature could rise 1-4.5 ° F in the next 50 years and 2.2-10 ° F in the next century, with significant regional variation. Evaporation will increase as the climate warms, which will increase average global precipitation. Soil moisture is likely to decline in many regions, and intense rainstorms are likely to become more frequent. Sea level is likely to rise two feet along most of the U.S. coast. (Source: U.S. Environmental Protection Agency, <http://yosemite.epa.gov>). Global warming is occurring in concert with global Peak Oil production, and the reduction in cheap oil. Staff has developed recommendations for smart energy solutions for the Board's consideration, aimed at helping to conserve energy and reduce greenhouse gas emissions. A visual summary of the relationship between human activities, greenhouse gas emissions, global warming and local smart energy solutions is provided as Attachment #12.

**Options:**

1. 1A - Recommendation – Fund the 2006-2007 budget request for the replacement of three Jeep Cherokees with Ford Escape Hybrids (which is included in the tentative budget).
2. 1B - Recommendation – Direct staff to develop a policy for the Board's consideration that provides incentives for hybrid vehicle ownership (such as tax and vehicle registration fee rebates, and waiving parking fees for employees at the Courthouse and for the public at the main library).
3. 1C - Recommendation – Direct staff to develop a draft policy for the Board's consideration that provides incentives for employees to use alternative transportation.
4. 1D - Recommendation – Direct staff to investigate the feasibility of implementing a telecommuting program for Board employees.
5. 2A - Recommendation – Direct staff to pursue recognition under NaCo's ENERGY STAR® "Courthouse Campaign" following a completion of the ESCO project.
6. 2B - Recommendation – Direct staff to pursue a pilot demonstration "Green Building," according to one or more of the available certification programs (ENERGY STAR®, FGBC "Green Building," or USGBC-LEEDS) as a logical first step for determining the specific costs, and available environmental and energy savings, that are associated with building "green." Options would include the Landfill's administration building, Woodville Branch Library, or other locations.
7. 3A - Recommendation – During the upcoming review and revision process as approved by the Board based on the recommendations of the County's Blue Ribbon Focus Group, direct staff to examine and investigate changes to the County's Land Development Code as identified above to encourage new development that promotes energy conservation and improved air quality.
8. 3B - Recommendation – Direct staff to report to the Board the results of the amount of gas

- generated and possible uses.
9. 3C - Recommendation – Direct staff to continue the practice of purchasing ENERGY STAR® rated products when possible.
  10. 3D - Recommendation - Direct staff to activate energy settings on MIS-supported monitors and CPUs and educate users as to the effects on their systems.
  11. 3E - Recommendation – Direct staff to return to the Board with additional analysis regarding joining the Cool Cities program.
  12. 4A Recommendation - Direct staff to identify a location and funding for the demonstration and testing of solar thermal water heating technology.
  13. 4B - Recommendation – Direct staff to report the biodiesel fuel pilot test results to the Board for consideration of continuation and expansion.
  14. 5A - Recommendation – Direct staff to implement public information initiatives within current funding capacity.
  15. 5B – Recommendation – Direct staff to pursue County membership in ICLEI and continued learning opportunities.
  16. Board Direction.

**Recommendation:**

Options #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13, #14, #15

**Attachments:**

1. Joint Science Academies' Statement: Global Response to Climate Change
2. U. S. Greenhouse Gas Emissions by Economic Sector (1990-2004) and for the Transportation Sector (1990-2003)
3. Potential Impacts of Global Warming (Global, Regional, and State of Florida)
4. Information Regarding Hybrid Vehicles and Incentives
5. Summary of Leon County's Energy Efficiency Practices
6. Comparison FGBC HERS with Other Standards
7. LEEDS "Green Building" Certification
8. Cool Cities
9. Energy Incentives
10. What Individuals Can Do to Reduce Greenhouse Emissions
11. Air Quality
12. Visual summary of the relationship between human activities, greenhouse gas emissions, global warming and smart energy solutions.



# Joint science academies' statement: Global response to climate change

## Climate change is real

There will always be uncertainty in understanding a system as complex as the world's climate. However there is now strong evidence that significant global warming is occurring<sup>1</sup>. The evidence comes from direct measurements of rising surface air temperatures and subsurface ocean temperatures and from phenomena such as increases in average global sea levels, retreating glaciers, and changes to many physical and biological systems. It is likely that most of the warming in recent decades can be attributed to human activities (IPCC 2001)<sup>2</sup>. This warming has already led to changes in the Earth's climate.

The existence of greenhouse gases in the atmosphere is vital to life on Earth – in their absence average temperatures would be about 30 centigrade degrees lower than they are today. But human activities are now causing atmospheric concentrations of greenhouse gases – including carbon dioxide, methane, tropospheric ozone, and nitrous oxide – to rise well above pre-industrial levels. Carbon dioxide levels have increased from 280 ppm in 1750 to over 375 ppm today – higher than any previous levels that can be reliably measured (i.e. in the last 420,000 years). Increasing greenhouse gases are causing temperatures to rise; the Earth's surface warmed by approximately 0.6 centigrade degrees over the twentieth century. The Intergovernmental Panel on Climate Change (IPCC) projected that the average global surface temperatures will continue to increase to between 1.4 centigrade degrees and 5.8 centigrade degrees above 1990 levels, by 2100.

## Reduce the causes of climate change

The scientific understanding of climate change is now sufficiently clear to justify nations taking prompt action. It is vital that all nations identify cost-effective steps that they can take now, to contribute to substantial and long-term reduction in net global greenhouse gas emissions.

Action taken now to reduce significantly the build-up of greenhouse gases in the atmosphere will lessen the magnitude and rate of climate change. As the United Nations Framework Convention on Climate Change (UNFCCC) recognises, a lack of full scientific certainty about some aspects of climate change is not a reason for delaying an immediate response that will, at a reasonable cost, prevent dangerous anthropogenic interference with the climate system.

As nations and economies develop over the next 25 years, world primary energy demand is estimated to increase by almost 60%. Fossil fuels, which are responsible for the majority of carbon dioxide emissions produced by human activities, provide valuable resources for many nations and are projected to provide 85% of this demand (IEA 2004)<sup>3</sup>. Minimising the amount of this carbon dioxide reaching the atmosphere presents a huge challenge. There are many

potentially cost-effective technological options that could contribute to stabilising greenhouse gas concentrations. These are at various stages of research and development. However barriers to their broad deployment still need to be overcome.

Carbon dioxide can remain in the atmosphere for many decades. Even with possible lowered emission rates we will be experiencing the impacts of climate change throughout the 21<sup>st</sup> century and beyond. Failure to implement significant reductions in net greenhouse gas emissions now, will make the job much harder in the future.

## Prepare for the consequences of climate change

Major parts of the climate system respond slowly to changes in greenhouse gas concentrations. Even if greenhouse gas emissions were stabilised instantly at today's levels, the climate would still continue to change as it adapts to the increased emission of recent decades. Further changes in climate are therefore unavoidable. Nations must prepare for them.

The projected changes in climate will have both beneficial and adverse effects at the regional level, for example on water resources, agriculture, natural ecosystems and human health. The larger and faster the changes in climate, the more likely it is that adverse effects will dominate. Increasing temperatures are likely to increase the frequency and severity of weather events such as heat waves and heavy rainfall. Increasing temperatures could lead to large-scale effects such as melting of large ice sheets (with major impacts on low-lying regions throughout the world). The IPCC estimates that the combined effects of ice melting and sea water expansion from ocean warming are projected to cause the global mean sea-level to rise by between 0.1 and 0.9 metres between 1990 and 2100. In Bangladesh alone, a 0.5 metre sea-level rise would place about 6 million people at risk from flooding.

Developing nations that lack the infrastructure or resources to respond to the impacts of climate change will be particularly affected. It is clear that many of the world's poorest people are likely to suffer the most from climate change. Long-term global efforts to create a more healthy, prosperous and sustainable world may be severely hindered by changes in the climate.

The task of devising and implementing strategies to adapt to the consequences of climate change will require worldwide collaborative inputs from a wide range of experts, including physical and natural scientists, engineers, social scientists, medical scientists, those in the humanities, business leaders and economists.

### Conclusion

We urge all nations, in the line with the UNFCCC principles<sup>4</sup>, to take prompt action to reduce the causes of climate change, adapt to its impacts and ensure that the issue is included in all relevant national and international strategies. As national science academies, we commit to working with governments to help develop and implement the national and international response to the challenge of climate change.

G8 nations have been responsible for much of the past greenhouse gas emissions. As parties to the UNFCCC, G8 nations are committed to showing leadership in addressing climate change and assisting developing nations to meet the challenges of adaptation and mitigation.

We call on world leaders, including those meeting at the Gleneagles G8 Summit in July 2005, to:

- Acknowledge that the threat of climate change is clear and increasing.

- Launch an international study to explore scientifically-informed targets for atmospheric greenhouse gas concentrations, and their associated emissions scenarios, that will enable nations to avoid impacts deemed unacceptable.
- Identify cost-effective steps that can be taken now to contribute to substantial and long-term reduction in net global greenhouse gas emissions. Recognise that delayed action will increase the risk of adverse environmental effects and will likely incur a greater cost.
- Work with developing nations to build a scientific and technological capacity best suited to their circumstances, enabling them to develop innovative solutions to mitigate and adapt to the adverse effects of climate change, while explicitly recognising their legitimate development rights.
- Show leadership in developing and deploying clean energy technologies and approaches to energy efficiency, and share this knowledge with all other nations.
- Mobilise the science and technology community to enhance research and development efforts, which can better inform climate change decisions.

### Notes and references

- 1 This statement concentrates on climate change associated with global warming. We use the UNFCCC definition of climate change, which is 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.'
- 2 IPCC (2001). Third Assessment Report. We recognise the international scientific consensus of the Intergovernmental Panel on Climate Change (IPCC).
- 3 IEA (2004). World Energy Outlook 4. Although long-term projections of future world energy demand and supply are highly uncertain, the World Energy Outlook produced by the International Energy Agency (IEA) is a useful source of information about possible future energy scenarios.
- 4 With special emphasis on the first principle of the UNFCCC, which states: 'The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof.'
- 5 Recognising and building on the IPCC's ongoing work on emission scenarios.

Academia Brasileira de Ciências  
Brazil

Royal Society of Canada,  
Canada

Chinese Academy of Sciences,  
China

Académie des Sciences,  
France

Deutsche Akademie der Naturforscher  
Leopoldina, Germany

Indian National Science Academy,  
India

Accademia Nazionale dei Lincei,  
Italy

Science Council of Japan,  
Japan

Russian Academy of Sciences,  
Russia

Royal Society,  
United Kingdom

National Academy of Sciences,  
United States of America

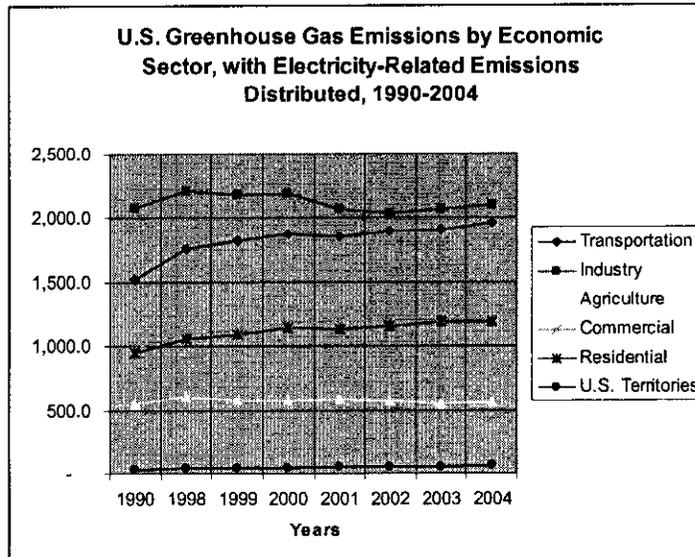
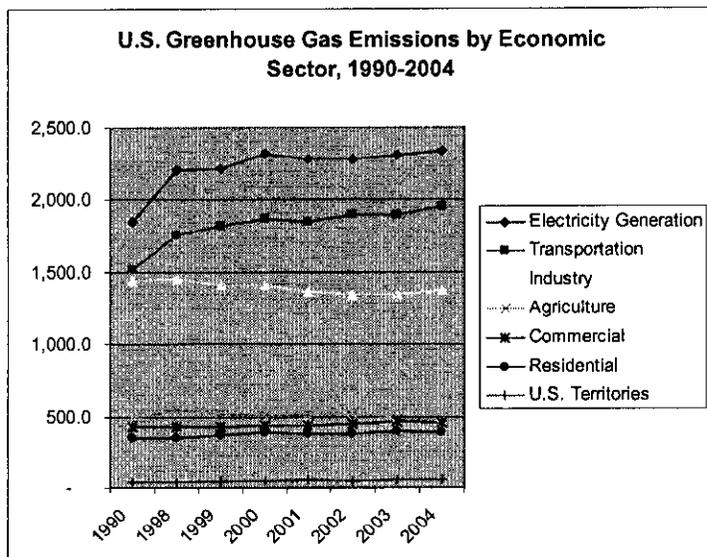
## U. S. Greenhouse Gas Emissions by Economic Sector With and Without Electricity-Related Emissions Distributed, 1990-2004

U.S. Greenhouse Gas Emissions Allocated to Economic Sectors (Tg CO <sub>2</sub> Eq.)										
Economic Sector	1990	1998	1999	2000	2001	2002	2003	2004	2004 % of Total	% Change Since 1990
Electricity Generation	1,846.4	2,202.4	2,213.3	2,315.9	2,284.4	2,280.1	2,308.5	2,337.8	33%	27%
Transportation	1,520.3	1,753.4	1,819.3	1,866.9	1,852.7	1,898.0	1,898.9	1,955.1	28%	29%
Industry	1,438.9	1,452.4	1,411.0	1,409.7	1,366.6	1,346.7	1,342.7	1,377.3	19%	-4%
Agriculture	486.3	541.6	523.9	509.5	514.4	511.0	484.2	491.3	7%	1%
Commercial	433.6	428.0	430.6	443.0	439.5	447.5	466.6	459.9	7%	6%
Residential	349.4	353.3	372.6	390.4	381.6	380.1	399.8	391.1	6%	12%
U.S. Territories	33.8	42.7	44.2	46.9	54.0	52.4	58.5	61.9	1%	83%
<b>Total</b>	<b>6,108.7</b>	<b>6,773.8</b>	<b>6,814.9</b>	<b>6,982.3</b>	<b>6,893.2</b>	<b>6,915.8</b>	<b>6,959.2</b>	<b>7,074.4</b>	<b>100%</b>	<b>16%</b>
Net CO <sub>2</sub> Flux from Land Use, Land-Use Change, and Forestry	(910.4)	(744.0)	(765.7)	(759.5)	(768.0)	(768.6)	(774.8)	(780.1)		-14%
<b>Net Emissions (Sources &amp; Sinks)</b>	<b>5,198.3</b>	<b>6,029.8</b>	<b>6,049.2</b>	<b>6,222.8</b>	<b>6,125.2</b>	<b>6,147.2</b>	<b>6,184.4</b>	<b>6,294.3</b>		<b>21%</b>

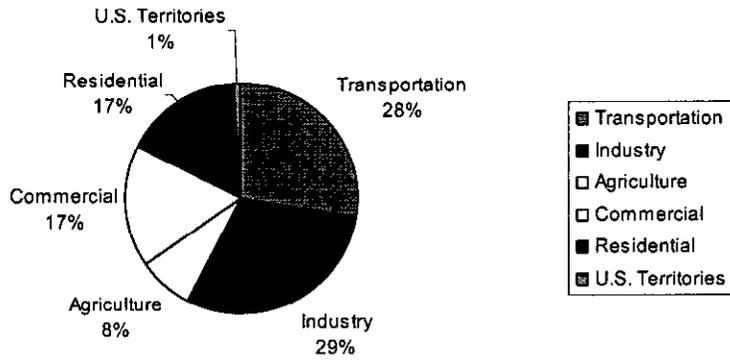
Source: EPA Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2004 (April 2006)

U.S. Greenhouse Gas Emissions by Economic Sectors with Electricity-Related Emissions Distributed (Tg CO <sub>2</sub> Eq.)										
Economic Sector	1990	1998	1999	2000	2001	2002	2003	2004	2004 % of Total	% Change Since 1990
Electricity Generation										
Transportation	1,523.4	1,756.5	1,822.5	1,870.3	1,856.2	1,901.4	1,903.2	1,959.8	28%	29%
Industry	2,074.6	2,210.3	2,174.4	2,186.1	2,073.6	2,042.0	2,066.0	2,103.0	30%	1%
Agriculture	547.2	602.4	575.0	567.2	582.6	574.5	544.3	556.9	8%	2%
Commercial	979.2	1,102.0	1,115.8	1,171.8	1,190.8	1,191.4	1,204.3	1,211.0	17%	24%
Residential	950.8	1,060.0	1,083.2	1,140.0	1,136.2	1,154.1	1,182.9	1,181.9	17%	24%
U.S. Territories	33.8	42.7	44.2	46.9	54.0	52.4	58.5	61.9	1%	83%
<b>Total</b>	<b>6,109.0</b>	<b>6,773.9</b>	<b>6,815.1</b>	<b>6,982.3</b>	<b>6,893.4</b>	<b>6,915.8</b>	<b>6,959.2</b>	<b>7,074.5</b>	<b>100%</b>	<b>16%</b>
Net CO <sub>2</sub> Flux from Land Use, Land-Use Change, and Forestry	(910.4)	(744.0)	(765.7)	(759.5)	(768.0)	(768.6)	(774.8)	(780.1)		-14%
<b>Net Emissions (Sources &amp; Sinks)</b>	<b>5,198.6</b>	<b>6,029.9</b>	<b>6,049.4</b>	<b>6,222.8</b>	<b>6,125.4</b>	<b>6,147.2</b>	<b>6,184.4</b>	<b>6,294.4</b>		<b>21%</b>

Source: EPA Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2004 (April 2006)



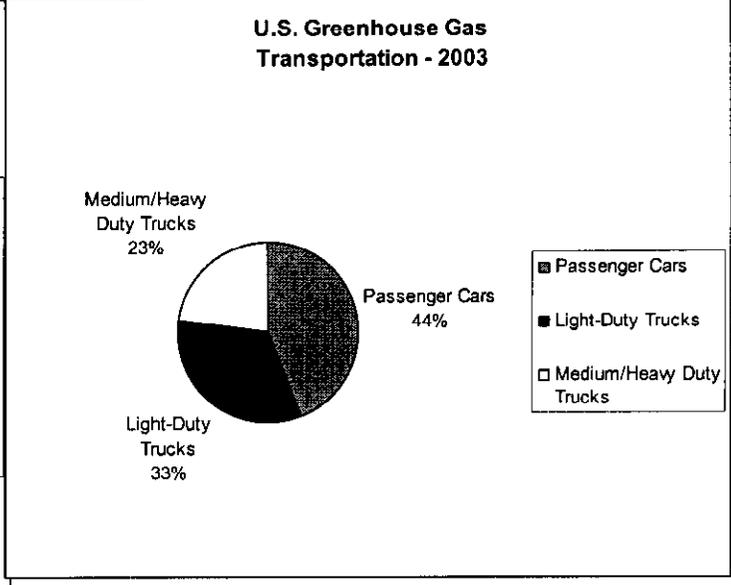
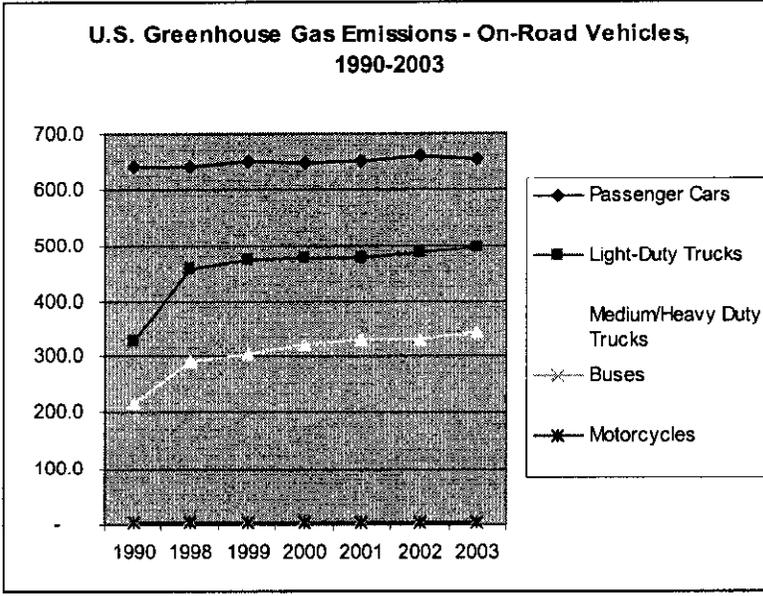
**U.S. Greenhouse Gas  
Emissions by Economic Sectors with Electricity-Related  
Emissions Distributed 2004**



Greenhouse Gas Emissions from the U.S. Transportation Section: 1990-2003

Summary of U.S. GHG Emissions for Transportation and Mobile Sources (all gases, Tg Co2 Eq.)									
Fuel/Vehicle Type	1990	1998	1999	2000	2001	2002	2003	2003 % of Total	% Change Since 1990
<b>On-Road</b>	<b>1,196.1</b>	<b>1,402.9</b>	<b>1,442.2</b>	<b>1,460.3</b>	<b>1,468.7</b>	<b>1,490.3</b>	<b>1,504.7</b>	<b>81%</b>	<b>26%</b>
Passenger Cars	640.6	642.3	650.0	649.7	650.2	662.3	654.6	35%	2%
Light-Duty Trucks	327.7	457.1	473.9	476.2	477.7	487.6	496.3	27%	51%
Medium/Heavy Duty Trucks	217.9	292.1	305.9	322.1	329.2	329.3	343.0	18%	57%
Buses	8.2	9.6	10.6	10.5	9.9	9.4	9.1	0%	11%
Motorcycles	1.7	1.8	1.8	1.8	1.7	1.7	1.7	0%	0%
<b>Aircraft</b>	<b>179.1</b>	<b>183.2</b>	<b>188.7</b>	<b>195.2</b>	<b>185.5</b>	<b>176.8</b>	<b>173.1</b>	<b>9%</b>	<b>-3%</b>
General Aviation Aircraft	9.5	10.3	12.0	11.8	11.6	11.8	11.8	1%	24%
Commercial Aircraft	118.4	127.6	137.9	142.1	134.2	123.0	124.0	7%	5%
Military Aircraft	35.1	21.7	20.8	21.2	23.1	20.6	20.8	1%	-41%
Other Aircraft	16.1	23.6	18.0	20.1	16.6	21.4	16.5	1%	2%
Boats and Ships	<b>49.6</b>	<b>32.7</b>	<b>42.7</b>	<b>63.7</b>	<b>43.2</b>	<b>57.8</b>	<b>58.0</b>	<b>3%</b>	<b>17%</b>
Locomotives	<b>36.6</b>	<b>40.9</b>	<b>42.1</b>	<b>42.2</b>	<b>43.3</b>	<b>41.5</b>	<b>43.2</b>	<b>2%</b>	<b>18%</b>
Pipelines	<b>35.9</b>	<b>34.9</b>	<b>35.3</b>	<b>35.0</b>	<b>33.4</b>	<b>36.4</b>	<b>34.8</b>	<b>2%</b>	<b>-3%</b>
Lubricants	<b>11.9</b>	<b>12.1</b>	<b>12.3</b>	<b>12.1</b>	<b>11.1</b>	<b>10.9</b>	<b>10.2</b>	<b>1%</b>	<b>-14%</b>
Mobile AC		17.4	20.8	24.0	26.7	28.8	30.3	2%	
Refrigerated Transport		7.0	8.5	9.8	10.8	11.5	12.3	1%	
<b>Total</b>	<b>1,509.2</b>	<b>1,731.1</b>	<b>1,792.6</b>	<b>1,842.3</b>	<b>1,822.7</b>	<b>1,854.0</b>	<b>1,866.6</b>	<b>100%</b>	<b>24%</b>

Source: U.S. EPA, Greenhouse Gas Emissions from the U.S. Transportation Section: 1990-2003



### **Potential Impacts of Global Warming (Global, Regional, and State of Florida)**

**Impacts of Global Warming** - IPCC experts concluded with high confidence that the observed regional changes in temperature have had "*discernable impacts on many physical and biological systems*" and that "*an increasing body of observations gives a collective picture of a warming world.*"

- Ocean warming, Sea-level Rise and Coastal Flooding - Warmer temperatures increase melting of mountain glaciers, increase ocean heat content, and cause ocean water to expand. Global sea level has risen 4 to 10 inches (10-25 cm) over the past 100 years. With additional warming, sea level is projected to rise from half a foot to 3 feet (15-92 cm) more during the next 100 years. On average, 50 to 100 feet (15-30 meters) of beach are lost for every foot (0.3 meters) of sea-level rise. Local land subsidence (sinking) and/or uplift due to geologic forces and coastal development will also affect the rate of coastal land loss.
- Glaciers Melting - Over the past 150 years, the majority of monitored mountain glaciers have been shrinking. Many glaciers at lower latitudes are now disappearing, and scientists predict that, under some plausible warming scenarios, the majority of glaciers will be gone by the year 2100. As glaciers continue to shrink, summer water flows will drop sharply, disrupting an important water source for irrigation and power in many areas that rely on mountain watersheds.
- Arctic and Antarctic Warming - Parts of Canada, Alaska, Siberia, and the Antarctic have been experiencing warming well above the global average for the past few decades. Melting permafrost is forcing the reconstruction of roads, airports, and buildings and is increasing erosion and the frequency of landslides. Reduced sea ice and ice shelves, changes in snowfall, and pest infestations have affected native plants and animals that provide food and resources to many people.
- Spreading Disease - Warmer temperatures allow mosquitoes that transmit diseases such as malaria and dengue fever to extend their ranges and increase both their biting rate and their ability to infect humans.
- Earlier Spring Arrival - Spring now arrives earlier in many parts of the world. Evidence of this comes from earlier thaw dates for rivers and lakes; earlier dates for plant blooming and leafing; and earlier animal egg-laying, spawning and migration. An earlier spring may disrupt animal migrations, alter competitive balances among species, and cause other unforeseen problems.
- Plant and Animal Range Shifts and Population Changes - Plants and animals generally react to consistently warmer temperatures by moving to higher latitudes and elevations. Recent studies reveal that some species have already started to shift their ranges, consistent with warming trends. Many populations and species may become more vulnerable to declining numbers or extinction if warming occurs faster than they can respond or if human development presents barriers to their migration.
- Coral Reef Bleaching - Reefs in 32 countries experienced dramatic bleaching in 1997-98. Bleaching results from the loss of microscopic algae that both color and nourish living corals. Water that is warmer than normal by only 2 to 3 degrees F has been linked to bleaching. Other

factors that contribute to coral reef bleaching include nutrient and sediment runoff, pollution, coastal development, dynamiting of reefs, and natural storm damage.

- Downpours, Heavy Snowfalls, and Flooding - A warmer climate will bring an increase in precipitation worldwide, especially during winter and in mid- to high latitudes, according to climate model projections. More precipitation is expected to fall in downpours and heavy snowstorms leading to increased flooding and damages.
- Droughts and Fires - Droughts are expected to become more frequent and severe in some locations, making wildfires more likely, and crops and trees more vulnerable to pest infestations and disease. Generally, local land use and land cover changes can exacerbate the climate change-driven increase in drought risk. For example, in the tropics, "slash-and-burn" land clearing practices can trigger large fires during extended droughts.

(Source: Global Warming: Early Warning Signs, <http://www.climatehotmap.org/index.html>)

**U. S. Implications and Impacts of Climate Change** – The U. S. will very likely get substantially warmer. Temperatures are projected to rise more rapidly in the next 100 years than in the last 10,000 years. It is also very likely that there will be more precipitation overall, with more of it coming in heavy downpours. Some areas are likely to get drier as increased evaporation due to higher temperatures outpaces increased precipitation. Droughts and flash floods are likely to become more frequent and intense.

- Permafrost Areas – It is very probable that rising temperatures will cause further permafrost thawing, damaging roads, buildings and forests in Alaska.
  - Forestry – Timber inventories are likely to increase over the 21<sup>st</sup> century.
  - Species Diversity – While some species will adapt to changes in the climate by shifting their ranges, human and geographic barriers, and the presence of non-native species will limit the degree of adaptation that can occur. Losses in local biodiversity are likely to accelerate towards the end of the 21<sup>st</sup> century.
  - Water Supply – Reduced summer runoff, increased winter runoff, and increased demands are likely to compound current stresses on water supplies and flood management, especially in the western U. S.
  - Islands – Sea level rise and storm surges will likely threaten public health and safety and possibly reduce the availability of fresh water.
  - Coral Reefs – Increased CO<sub>2</sub> and ocean temperatures, combined with other stresses, will possibly exacerbate coral reef bleaching and die-off.
  - Freshwater Ecosystems – Increases in water temperature and changes in seasonal patterns of runoff will likely disturb fish habitat and affect recreational uses of lakes, streams and wetlands.
- (Source - U.S. Global Change Research Information Office, <http://www.gcrio.org>)

### **U. S. Gulf Coast Region Implications and Impacts of Climate Change -**

- Rising Sea Level - Along different regions of the Gulf Coast, sea level has risen by between 8 and 40 inches (20-100 cm) over the last century, due both to thermal expansion of the global oceans and substantial local sinking of land. Around 1930, the average rate of regional sea-level rise began to increase significantly. The Gulf Coast region has a flat topography, which will move the coastline quite far inland even with only a few inches of sea-level rise.

- Extreme Rainfall Events - As in other regions of the United States, extreme rainfall events (defined as at least 2 inches per 24-hour period) have increased over the last century in the Gulf Coast region. The Gulf Coast region shows a trend for increasing winter precipitation; summer precipitation, however, is more variable with a trend towards drying in most coastal areas of the region. Changes in precipitation, evapotranspiration, and runoff are likely to be extremely important for the many ecosystems in this region that depend heavily on reliable freshwater availability.
- Changing Rainfall Patterns - Rainfall patterns in the Gulf Coast region are likely to become more erratic, with heavy downpours and longer dry periods in between. Intense rainfall events have already increased over the past century. For most of the immediate Gulf coastal zone, rainfall will likely be lower. These drier conditions will interact with other global warming impacts, such as sea-level rise, to exacerbate water conditions—for example, contributing to salt water intrusion into underground aquifers. It is not yet clear whether upland parts of the region will experience wetter or drier conditions. The Canadian model projects large decreases in precipitation and the Hadley model projects large increases; either outcome would have major impacts on upland ecosystems.
- Potential Storm Impacts - The Gulf Region experiences severe tropical and extra tropical storms. Climate change may affect both, but the mechanisms and interactions of many influential factors are still incompletely understood. Hurricane activity varies from decade to decade and is correlated with the El Niño-Southern Oscillation cycle. During El Niño events, the probability that hurricanes will make landfall in the southeastern United States goes down, while the probability increases during La Niña events. With global warming, hurricane *intensity* (maximum wind speeds, rainfall totals) is likely to increase. Note: the number of intense hurricanes (categories 3–5) is projected to increase over the next 25 years, even without climate change, based solely on past trends of climate variability. Changes in future hurricane *frequency* (which depend in part on whether global warming intensifies El Niño/La Niña conditions) are uncertain.
- Increasing Coastal Flooding and Erosion - Even if storm intensities were to remain constant, however, coastal flooding and erosion will increase as sea level rises. In other words, even coastal storms that are considered relatively minor today will exert the flooding impact of major storms in the future simply because higher sea levels will bring higher storm surges.

“The global average sea level has already risen about six inches over the past century. Based on recent trends, scientists’ mid-range projection is that sea level will rise another 15 inches by the year 2100. Along Florida’s gradually-sloped shores, this would translate into a horizontal advance of water inland by as much a 250 feet, contributing to coastal erosion, inundation and changes in wetlands and mangroves.” (Source: An Unfavorable Tide, Global Warming, Coastal Habitats and Sportfishing in Florida. June, 2006. National Wildlife Federation and Florida Wildlife Federation.)

## Hybrid Vehicles

### The Energy Policy Act of 2005

Last year Congress approved and the President signed into law a comprehensive energy bill that provides incentives for the purchase of a hybrid vehicle. The law gives states the authority to allow hybrid vehicles with less than two occupants to drive on the high occupancy vehicle (HOV) lane where applicable. The state of Florida adopted this policy allowing hybrid vehicles to be driven on HOV with the purchase of a \$5 decal from the Florida Division of motor Vehicles.

In addition, the law provides tax incentives to individuals and businesses for the purchase of qualifying hybrid vehicles. As of January 1, 2006, a hybrid vehicle purchased after 2005 is eligible for up to \$3,400 in federal income tax credit depending on the fuel economy and the weight of the vehicle and a hybrid vehicle purchased before the end of 2005 is eligible for a \$2,000 tax deduction. The credit is only available to the original purchaser of a hybrid vehicle. The full tax credit is available until a manufacturer (ex: Toyota) has 60,000 hybrid vehicle. Once the 60,000-vehicle threshold is met, a one-year phase out of the credit is enacted the following quarter in which 50% of the credit is made available for the first two quarters and 25% in the final two quarters. As of June 2006, Toyota met the 60,000-vehicle cap; the full tax credit will be available until the end of September and a 50% tax credit will be available beginning in October on the Toyota Hybrid vehicles.

### Local Government Incentives

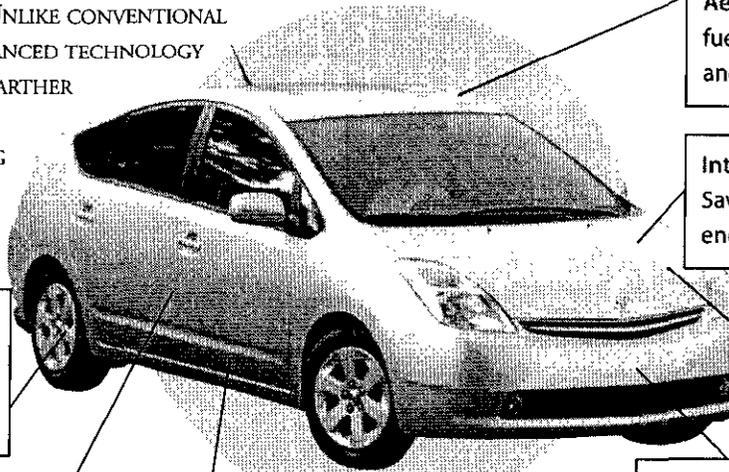
Numerous local governments provide incentives to residents and employees for the purchase and use of hybrid vehicles. A large number of cities provide free metered parking and access into city-owned parking lots at no charge. This incentive encourages those who frequently travel into high urban areas to use fuel-efficient vehicles. Nassau County in the state of New York is proposing a tax break on the county-portion sales tax on hybrid vehicles along with a waiver of Nassau County's \$15 vehicle registration fee.

Staff is recommending that the County supply public information literature to residents and businesses on tax credit incentives that are available by the federal government while also establishing a limited tax incentive/fee rebate program that provides additional savings to County residents that purchase a hybrid vehicle registered in Leon County. Staff will develop a program proposal highlighting additional requirements, hybrid fleet vehicle rebates to local businesses, and restrictions on the number of vehicles that would be eligible for the program for Board recommendation. (Sources: [www.hybridcars.com/tax-deductions-credits](http://www.hybridcars.com/tax-deductions-credits) and <http://go.ucsusa.org/hybridcenter/incentives>)

Explore, enjoy and protect the planet

# Hybrid Cars – Driving Solutions

**G**ET BEHIND THE WHEEL OF A HYBRID AND EXPERIENCE THE DIFFERENCE. UNLIKE CONVENTIONAL VEHICLES, HYBRIDS USE ADVANCED TECHNOLOGY AND SMART DESIGN TO GO FARTHER ON A GALLON OF GAS – CUTTING POLLUTION, SAVING OIL, AND SLASHING COSTS AT THE GAS PUMP.



**Aerodynamic Design** – improves fuel economy by reducing drag and wind resistance

**Integrated Starter-Generator** – Saves fuel by shutting down gas engine when idling in traffic.

**Hybrid Engine** – Combines small internal combustion engine with electric motor.

**Regenerative Braking** – Captures energy normally lost during braking to charge the electric motor

**High-Strength, Lightweight Materials** – using materials like aluminum reduces weight without compromising safety.

**Continuously Variable Transmission** – boosts fuel economy through better “gear ratios”

**Variable Valve Control Engine** – Improves engine performance by controlling the mix of air and fuel more precisely.

## Hybrid Vehicles Cut Pollution, Save Oil, and Lower Gas Costs.

Burning gasoline emits carbon dioxide – the main heat trapping gas that causes global warming. As a result, America’s cars and trucks release more global warming pollution than the entire country of Germany. By using less gasoline, hybrid vehicles release a fraction of the heat trapping emissions.

America’s dangerous dependence on oil threatens energy security and puts our environment at risk. Hybrid technology can help make all of our cars and light trucks average forty miles per gallon within the next ten years. Taking this step would save more oil than we currently import from the entire Persian Gulf or could ever take out of the Arctic National Wildlife Refuge, combined.

Hybrid vehicles also save money at the gas pump. Over the lifetime of the vehicle, hybrids can reduce

gasoline bills by thousands of dollars when compared to similarly sized cars and SUVs.

## How Do Hybrids Work?

Hybrid vehicles combine an efficient gasoline engine and an electric motor to get great fuel economy. The electric motor powers the car at low speeds, switching to the gas engine at highway speeds. To accelerate, hybrids combine the power of both the electric and gas engines. When hybrids brake, they recharge the electric motor using energy that other cars just waste. This process is known as regenerative braking. Since both the gasoline engine and the regenerative braking charge the electric motor,

hybrid vehicles never need to be plugged in! You just fill them up at the gas station like any other car – only not as often. Hybrids also use a host of other fuel-saving technologies ranging from smart transmissions to idle-off starters to aerodynamic design and better materials.

**Hybrids Don’t Just Consume Energy – They Produce It!**  
As you drive, the gasoline engine charges the batteries – which means you never plug it in!!!

# Today's Hybrids: Many Choices to Meet Your Needs

There are already several hybrids on the road today – from the two-seater Honda Insight to the 5 passenger Honda Civic Sedan and Toyota Prius Hatchback to the Ford Escape hybrid SUV – a hybrid exists to fit any need.

The next few years will see a surge of hybrid vehicles into the market, giving consumers more choices and greater opportunity to reduce our dependence on oil, slash global warming pollution, and save money at the pump. Further technological advances will improve fuel economy and lower the cost of hybrids. Hybrid technology is ready to make its appearance in the largest SUVs, vans, and pick-up trucks. America needs auto companies to put this technology to work and political leaders to make sure that we can all enjoy the benefits of hybrid vehicles.

## The Biggest Single Step.

The biggest single step to curbing global warming, cutting America's oil depen-

SAVE MONEY AND CUT POLLUTION			
Comparing Hybrids with their All-Gasoline counterparts			
Traditional Vehicles	Hybrids Vehicles	Lifetime Fuel Savings	Emissions prevented
Toyota Camry* 27 mpg	2004 Toyota Prius* 55 mpg	2,275 gallons of gas \$3,640	32 tons CO <sub>2</sub>
Honda Civic DX 33 mpg	Honda Civic Hybrid 47 mpg	1,091 gallons of gas \$1,745	15 tons CO <sub>2</sub>
Ford Escape XLT 22 mpg	Ford Escape Hybrid 37 mpg**	2285 gallons of gas \$3,656	32 tons CO <sub>2</sub>

\*The Toyota Camry is a comparable vehicle to the Prius.

\*\*estimated

dence, and saving money at the gas pump is to raise fuel economy standards. The technology exists to make all new cars, trucks, and SUVs average 40 miles per gallon within the next ten years. Taking this step would save more oil than the United States currently imports from the entire Persian Gulf, or could ever take out of the Artic National Wildlife Refuge,

combined. It would also prevent as much global warming pollution from being emitted as is released by the entire country of Mexico each year. Hybrid engines are just one of the many fuel-saving technologies that can make America's vehicles average 40 miles per gallon. Go to [www.sierraclub.org/freedom](http://www.sierraclub.org/freedom) to find out more about fuel-saving technology.

## TAKE ACTION:

### 1. Tell Bill Ford To Make More Hybrid Vehicles

It's time for Bill Ford to stop dragging his feet and commit to building more clean hybrid vehicles.

Send an email to Bill Ford at [www.sierraclub.org/takeaction](http://www.sierraclub.org/takeaction).

### 2. Make Your Next Car A Hybrid.

When you to buy a new car, why not cut the pollution and high gas costs while you're at it? Driving a hybrid will help bring the next generation of clean vehicles into the mainstream. You can even get a sizable federal tax deduction. Depending on what state you live in, you might get even more.

### 3. Organize A Community Hybrid Car Event

Help organize a hybrid car event in your neighborhood to build excitement and demand for clean vehicles. Contact the Sierra Club at [hybrid.solutions@sierraclub.org](mailto:hybrid.solutions@sierraclub.org) for help in organizing the event.



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408 C Street, NE • Washington, DC 20002 • 202-547-1141 • [www.sierraclub.org](http://www.sierraclub.org)

### Summary of Leon County's Energy Efficiency Practices

Fiscal Yr	Utility History - All BCC vs. Facilities Management Accounts (by Cost, SF, Cost-PSF & % Change)				Notes
	BCC Expend.	Sq. Ft.(sf)	Cost/sf (\$psf)	\$psf +/-	
1992					
1993					
1994					
1995	\$1,233,674	909,402	\$1.36	NA	Min. sf for FM buildings <ditto>
1996	\$1,210,298	909,402	\$1.33	-1.89%	Max. cost / sf for FM buildings 5.50%
1997	\$1,390,253	909,902	\$1.53	15.31%	USEPA "Greenlights" Program Participant <ditto>
1998	\$1,285,977	883,619	\$1.47	-4.44%	<ditto>
1999	\$1,220,514	989,485	\$1.26	-14.16%	Initial VFD Changes / EMS Enhancements <ditto>
2000	\$1,272,515	1,013,737	\$1.26	-0.29%	<ditto>
2001	\$1,460,626	1,052,725	\$1.39	10.49%	1st Year - COT Utility Services Agreement
2002	\$1,323,636	1,069,628	\$1.24	-10.77%	EMS Enhancements / Final VFD Changes
2003	\$1,691,211	1,260,371	\$1.34	8.43%	Seasonal Variations & Fluctuations <ditto>
2004	\$2,233,563	1,263,451	\$1.77	31.75%	<ditto>
2005	\$2,221,016	1,263,451	\$1.76	-0.56%	Completed EMS Enhancements
2006	\$2,601,181	1,282,880	\$2.03	15.34%	COT Rate Increases Enacted <ditto>
10-Total	\$16,709,790				Normalized to 10 Years
10-Average	\$1,670,979	1,096,525	\$1.50	4.47%	BCC Includes FM
Ratio to BCC	100%	100%	100%		Pct. of Total

\* FY06 data are estimates based on current monthly averages.

Year	Estimated Savings & Emissions Reductions from Total Scope of Energy Improvements				Avg Mo	
	Annual Savings	Cumul. Total	Annual CO2	Annual SO2		Annual NOX
0	0	0	0	0	0	0
1	\$226,376	\$226,376	1,853,934	8,242,524	2,986,422	1,011,905
2	\$458,821	\$685,197	3,757,570	16,706,025	6,052,909	2,050,939
3	\$467,929	\$1,153,126	3,832,161	17,037,654	6,173,065	2,091,652
4	\$497,100	\$1,650,226	4,071,060	18,099,793	6,557,897	2,222,047
5	\$542,631	\$2,192,857	4,443,942	19,757,611	7,158,557	2,425,571
6	\$425,116	\$2,617,973	3,481,539	15,478,800	5,608,262	1,900,277
7	\$426,355	\$3,044,328	3,491,686	15,523,913	5,624,607	1,905,815
8	\$340,224	\$3,384,552	2,786,306	12,387,817	4,488,341	1,520,808
9	\$282,597	\$3,667,149	2,314,362	10,289,574	3,728,107	1,263,214
10	\$25,062	\$3,692,211	205,248	942,527	330,626	112,028
11	\$50,026	\$3,742,237	409,694	1,821,485	659,959	223,617
<b>Total:</b>			<b>30,847,502</b>	<b>136,257,723</b>	<b>49,368,752</b>	<b>16,727,874</b>
	Avg Annual Savings	Annual CO2	Annual SO2	Annual NOX	Annual kWh	
	\$340,203	15,324	136,258	49,369		0.41

**Comparison of Energy Efficiency Ratings Programs for Building Construction**

Building Rating & Evaluation Program	Date Established	# Buildings Served	Equivalent HERS Rating	Existing Buildings?
Florida Energy Code	1980	Millions	82	Yes
ENERGY STAR®	1996	>26,000	86	Yes
FGBC "Green Building"	2001	>500	90	Yes
USGBC - LEEDS	2002	<550	>90	No

Notes: Shaded rows represent systems administered in State of Florida only, Requirements for energy efficient mortgage is HERS > 80

\*Source: Energy Efficient Building Construction in Florida, UF Energy Extension Office.



# Rating System

Version 2.0

Including the  
Project Checklist

June 2001



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# Project Checklist

## Sustainable Sites

14 Possible Points

	Prereq	1	Erosion & Sedimentation Control	Required
<input checked="" type="checkbox"/>				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1 Site Selection	1
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 2 Urban Redevelopment	1
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 3 Brownfield Redevelopment	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 4.1 Alternative Transportation, Public Transportation Access	1
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 4.2 Alternative Transportation, Bicycle Storage & Changing Rooms	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 4.3 Alternative Transportation, Alternative Fuel Refueling Stations	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 4.4 Alternative Transportation, Parking Capacity	1
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 5.1 Reduced Site Disturbance, Protect or Restore Open Space	1
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 5.2 Reduced Site Disturbance, Development Footprint	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 6.1 Stormwater Management, Rate or Quantity	1
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 6.2 Stormwater Management, Treatment	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 7.1 Landscape & Exterior Design to Reduce Heat Islands, NonRoof	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 7.2 Landscape & Exterior Design to Reduce Heat Islands, Roof	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 8 Light Pollution Reduction	1

## Water Efficiency

5 Possible Points

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.1 Water Efficient Landscaping, Reduce by 50%	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.2 Water Efficient Landscaping, No Potable Use or No Irrigation	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 2 Innovative Wastewater Technologies	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 3.1 Water Use Reduction, 20% Reduction	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 3.2 Water Use Reduction, 30% Reduction	1

## Energy & Atmosphere

17 Possible Points

<input checked="" type="checkbox"/>	Prereq	1	Fundamental Building Systems Commissioning	Required
<input checked="" type="checkbox"/>	Prereq	2	Minimum Energy Performance	Required
<input checked="" type="checkbox"/>	Prereq	3	CFC Reduction in HVAC&R Equipment	Required
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.1 Optimize Energy Performance, 20% New / 10% Existing	2
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.2 Optimize Energy Performance, 30% New / 20% Existing	2
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.3 Optimize Energy Performance, 40% New / 30% Existing	2
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.4 Optimize Energy Performance, 50% New / 40% Existing	2
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.5 Optimize Energy Performance, 60% New / 50% Existing	2
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 2.1 Renewable Energy, 5%	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 2.2 Renewable Energy, 10%	1
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 2.3 Renewable Energy, 20%	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 3 Additional Commissioning	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 4 Ozone Depletion	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 5 Measurement & Verification	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 6 Green Power	1

# Sustainable Sites

SS	WE	EA	MR	EQ	ID
<b>Prerequisite 1</b>					

## Prerequisite 1 Erosion & Sedimentation Control

---

Required

### Intent

Control erosion to reduce negative impacts on water and air quality.

### Requirement

- Prerequisite 1.0** Design to a site sediment and erosion control plan that conforms to best management practices in the EPA's Storm Water Management for Construction Activities, EPA Document No. EPA-832-R-92-005, Chapter 3, OR local Erosion and Sedimentation Control standards and codes, whichever is more stringent. The plan shall meet the following objectives:
- Prevent loss of soil during **construction** by storm water runoff and/or wind erosion, including protecting topsoil by stockpiling for reuse.
  - Prevent sedimentation of storm sewer or receiving streams and/or air pollution with dust and particulate matter.

### Technologies & Strategies

Adopt an erosion and sedimentation control plan for the project site during construction. Consider employing strategies such as temporary and permanent seeding, mulching, earth dikes, silt fencing, sediment traps, and sediment basins.

SS	WE	EA	MR	EQ	ID
<b>Credit 2</b>					

## Credit 2 **Urban Redevelopment**

---

1 Point

### Intent

Channel development to urban areas with existing infrastructures, protecting greenfields and preserving habitat and natural resources.

### Requirement

**Credit 2.0 (1 point)** Increase localized density to conform to existing or desired density goals by utilizing sites that are located within an existing minimum development density of 60,000 square feet per acre (2 story downtown development)

### Technologies & Strategies

During the site selection process, give preference to urban sites with high development densities. Quantify the development density of the project as well as the surrounding area.

SS	WE	EA	MR	EQ	ID
<b>Credit 4</b>					

## Credit 4 **Alternative Transportation**

---

1-4 Points

### Intent

Reduce pollution and land development impacts from automobile use.

### Requirements

- Credit 4.1** (1 point) Locate building within  $\frac{1}{2}$  mile of a commuter rail, light rail or subway station or  $\frac{1}{4}$  mile of 2 or more bus lines
- Credit 4.2** (1 point) Provide suitable means for securing bicycles, with convenient changing/shower facilities for use by cyclists, for 5% or more of building occupants
- Credit 4.3** (1 point) Install alternative-fuel refueling station(s) for 3% of the total vehicle parking capacity of the site. Liquid or gaseous fueling facilities must be separately ventilated or located outdoors
- Credit 4.4** (1 point) Size parking capacity not to exceed minimum local zoning requirements AND provide preferred parking for carpools or van pools capable of serving 5% of the building occupants, OR, add no new parking for rehabilitation projects AND provide preferred parking for carpools or van pools capable of serving 5% of the building occupants.

### Technologies & Strategies

Perform a transportation survey of future building occupants to identify transportation needs. Site the building near mass transit and design the building with transportation amenities such as bicycle racks and showering/changing facilities, alternative fuel refueling stations, and carpool/ van pool programs. Also consider sharing transportation facilities such as parking lots and refueling stations with neighbors.

SS	WE	EA	MR	EQ	ID
<b>Credit 6</b>					

## Credit 6 Stormwater Management

---

1-2 Points

### Intent

Limit disruption of natural water flows by minimizing stormwater runoff, increasing on-site infiltration and reducing contaminants.

### Requirements

Implement a stormwater management plan that results in:

**Credit 6.1 (1 point)** No net increase in the rate and quantity of stormwater runoff from existing to developed conditions; OR, if existing imperviousness is greater than 50%, implement a stormwater management plan that results in a 25% decrease in the rate and quantity of stormwater runoff.

**Credit 6.2 (1 point)** Treatment systems designed to remove 80% of the average annual post development total suspended solids (TSS), and 40% of the average annual post development total phosphorous (TP), by implementing Best Management Practices (BMPs) outlined in EPA's Guidance Specifying Management Measures for Sources of Non-point Pollution in Coastal Waters (EPA 840-B-92-002 1/93).

### Technologies & Strategies

Design the project site to maintain natural stormwater flows by promoting infiltration. Specify garden roofs and pervious paving to minimize impervious surfaces. Reuse stormwater volumes generated for non-potable uses such as landscape irrigation, toilet and urinal flushing, and custodial uses. Install mechanical or natural treatment systems such as constructed wetlands, vegetated filter strips, and bioswales to treat stormwater volumes leaving the site.

SS	WE	EA	MR	EQ	ID
<b>Credit 8</b>					

## Credit 8 **Light Pollution Reduction**

---

1 Point

### Intent

Eliminate light trespass from the building site, improve night sky access, and reduce development impact on nocturnal environments.

### Requirement

**Credit 8.0** (1 point) Do not exceed Illuminating Engineering Society of North America (IESNA) footcandle level requirements as stated in the Recommended Practice Manual: Lighting for Exterior Environments, AND design interior and exterior lighting such that zero direct-beam illumination leaves the building site.

### Technologies & Strategies

Adopt site lighting criteria to maintain safe light levels while avoiding off-site lighting and night sky pollution. Minimize site lighting where possible and model the site lighting using a computer model. Technologies to reduce light pollution include full cutoff luminaires, low-reflectance surfaces, and low-angle spotlights.

SS	VI	EA	MR	EQ	ID
<b>Credit 2</b>					

## Credit 2 **Innovative Wastewater Technologies**

---

1 Point

### Intent

Reduce the generation of wastewater and potable water demand, while increasing the local aquifer recharge.

### Requirement

**Credit 2.0 (1 point)** Reduce the use of municipally provided potable water for building sewage conveyance by a minimum of 50%, OR, treat 100% of wastewater on site to tertiary standards.

### Technologies & Strategies

Estimate the wastewater volumes generated in the building and specify high efficiency fixtures and dry fixtures such as composting toilets and waterless urinals to reduce these volumes. Consider reusing stormwater or graywater for sewage conveyance or on-site wastewater treatment systems (mechanical or natural).

# Energy & Atmosphere

SS	WE	<b>EA</b>	MR	EQ	ID
Prerequisite 1					

## Prerequisite 1 Fundamental Building Systems Commissioning

---

Required

### Intent

Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.

### Requirement

- Prerequisite 1.0** Implement the following fundamental best practice commissioning procedures:
- Engage a commissioning authority
  - Review design intent and basis of design documentation
  - Include commissioning requirements in the construction documents
  - Develop and utilize a commissioning plan
  - Verify installation, functional performance, training and documentation
  - Complete a commissioning report

### Technologies & Strategies

Engage a commissioning authority and adopt a commissioning plan. Include commissioning requirements in bid documents and task the commissioning agent to produce a commissioning report once commissioning activities are completed.

SS	WE	EA	MR	EQ	ID
<b>Prerequisite 3</b>					

**Prerequisite 3 CFC Reduction in HVAC&R Equipment**

---

Required

**Intent**

Reduce ozone depletion.

**Requirement**

**Prerequisite 3.0** Zero use of CFC-based refrigerants in new building HVAC&R base building systems. When reusing existing base building HVAC equipment, complete a comprehensive CFC phaseout conversion.

**Technologies & Strategies**

When reusing existing HVAC systems, conduct an inventory to identify equipment that uses CFC refrigerants and adopt a replacement schedule for these refrigerants. For new buildings, specify new HVAC equipment that uses no CFC refrigerants.

SS	WE	EA	MR	EQ	ID
<b>Credit 2</b>					

## Credit 2 **Renewable Energy**

---

1-3 Points

### Intent

Encourage and recognize increasing levels of self-supply through renewable technologies to reduce environmental impacts associated with fossil fuel energy use.

### Requirements

Supply a net fraction of the building's total energy use (as expressed as a fraction of annual energy cost) through the use of on-site renewable energy systems.

% Total Energy Load Cost in Renewables	Points
5%	1
10%	2
20%	3

- Credit 2.1 (1 points) Renewable energy, 5% contribution
- Credit 2.2 (2 points) Renewable energy, 10% contribution
- Credit 2.3 (3 points) Renewable energy, 20% contribution

### Technologies & Strategies

Assess the project for renewable energy potential including solar, wind, geothermal, biomass, hydro, and bio-gas strategies. When applying these strategies, take advantage of net metering with the local utility.

SS	WE	EA	MR	EQ	ID
<b>Credit 4</b>					

## Credit 4 **Ozone Depletion**

---

1 Point

### Intent

Reduce ozone depletion and support early compliance with the Montreal Protocol.

### Requirement

**Credit 4.0 (1 point)** Install base building level HVAC and refrigeration equipment and fire suppression systems that do not contain HCFC's or Halon.

### Technologies & Strategies

When reusing buildings, inventory existing building systems using refrigerants and fire suppression chemicals and replace those that contain HCFCs or halons. For new buildings, specify refrigeration and fire suppression systems that use no HCFCs or halons.

SS	WE	LA	MR	EQ	ID
<b>Credit 6</b>					

**Credit 6 Green Power**

---

1 Point

**Intent**

Encourage the development and use of grid-source energy technologies on a net zero pollution basis.

**Requirement**

**Credit 6.0 (1 point)** Engage in a two year contract to purchase power generated from renewable sources that meet the Center for Resource Solutions (CRS) Green-e products certification requirements.

**Technologies & Strategies**

Estimate the energy needs of the building and investigate opportunities to engage in a green power contract with the local utility. Green power is derived from solar, wind, geothermal, biomass, or low-impact hydro sources.

SS	WE	EA	MR	EQ	ID
<b>Credit 1</b>					

## Credit 1 **Building Reuse**

---

1-3 Points

### Intent

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste, and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

### Requirements

Reuse large portions of existing structures during renovation or redevelopment projects:

- Credit 1.1** (1 point) Maintain at least **75%** of existing building structure and shell (exterior skin and framing excluding window assemblies)
- Credit 1.2** (1 point) Maintain an additional **25%** (**100%** total) of existing building structure and shell (exterior skin and framing excluding window assemblies)
- Credit 1.3** (1 point) Maintain **100%** of existing building structure and shell AND **50%** non-shell (walls, floor coverings, and ceiling systems)

### Technologies & Strategies

Consider reuse of existing buildings, including structure, shell, and non-shell elements. Remove elements that pose contamination risk to building occupants and upgrade outdated components such as windows, mechanical systems, and plumbing fixtures. Quantify the extent of building reuse.

SS	WE	EA	MR	EQ	ID
<b>Credit 3</b>					

**Credit 3 Resource Reuse**

---

1-2 Points

**Intent**

Extend the life cycle of targeted building materials by reducing environmental impacts related to materials manufacturing and transport.

**Requirements**

- Credit 3.1** (1 point) Specify salvaged or refurbished materials for 5% of building materials
- Credit 3.2** (1 point) Specify salvaged or refurbished materials for 10% of building materials

**Technologies & Strategies**

Identify opportunities to incorporate salvage materials into the building design and research potential material suppliers. Consider salvage materials such as beams and posts, flooring, paneling, doors and frames, cabinetry and furniture, brick, and decorative items.

SS	WE	EA	<b>MR</b>	EQ	ID
<b>Credit 5</b>					

## Credit 5 Local/Regional Materials

---

1-2 Points

### Intent

Increase demand for building products that are manufactured locally, thereby reducing the environmental impacts resulting from their transportation and supporting the local economy.

### Requirements

**Credit 5.1 (1 point)** Specify a minimum of 20% of building materials that are manufactured\* regionally within a radius of 500 miles.

**Credit 5.2 (1 point)** Of these regionally manufactured materials, specify a minimum of 50% that are extracted, harvested, or recovered within 500 miles.

\* Manufacturing refers to the *final assembly* of components into the building product that is furnished and installed by the tradesmen. For example, if the hardware comes from Dallas, Texas, the lumber from Vancouver, British Columbia and the joist is assembled in Kent, Washington; then the location of the *final assembly* is Kent, Washington.

### Technologies & Strategies

Establish a project goal for locally sourced materials and identify materials and material suppliers that can achieve this goal. During construction, ensure that the specified local materials are installed and quantify the total percentage of local materials installed.

SS	WE	EA	<b>MR</b>	EQ	ID
<b>Credit 7</b>					

## Credit 7 Certified Wood

---

1 Point

### Intent

Encourage environmentally responsible forest management.

### Requirement

**Credit 7.0 (1 point)** Use a minimum of 50% of wood-based materials certified in accordance with the Forest Stewardship Council Guidelines for wood building components including but not limited to structural framing and general dimensional framing, flooring, finishes, furnishings, and non-rented temporary construction applications such as bracing, concrete form work and pedestrian barriers.

### Technologies & Strategies

Establish a project goal for FSC-certified wood products and identify products and suppliers that can achieve this goal. During construction, ensure that the FSC-certified wood products are installed and quantify the total percentage of FSC-certified wood products installed.

SS	WE	EA	MR	EQ	ID
<b>Prerequisite 2</b>					

**Prerequisite 2 Environmental Tobacco  
Smoke (ETS) Control**

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Required

**Intent**

Prevent exposure of building occupants and systems to Environmental Tobacco Smoke (ETS).

**Requirement**

**Prerequisite 2.0** Zero exposure of nonsmokers to ETS by prohibition of smoking in the building, OR, provide a *designated smoking room* designed to effectively contain, capture and remove ETS from the building. At a minimum, the smoking room shall be directly exhausted to the outdoors with no recirculation of ETS-containing air to the nonsmoking area of the building, *enclosed with impermeable structural deck-to-deck partitions* and operated at a negative pressure compared with the surrounding spaces of **at least 7 Pa (0.03 inches of water gauge)**.

Performance of smoking rooms shall be verified using tracer gas testing methods as described in the ASHRAE Standard 129-1997. Acceptable exposure in nonsmoking areas is defined as **less than 1%** of the tracer gas concentration in the smoking room detectable in the adjoining nonsmoking areas. Smoking room testing as described in the ASHRAE Standard 129-1997 is required in the contract documents and critical smoking facility systems testing results must be included in the building commissioning plan and report or as a separate document.

**Technologies & Strategies**

Prohibit smoking in the building or provide separate smoking rooms with isolated ventilation systems.

SS	WE	EA	MR	<b>EQ</b>	ID
<b>Credit 2</b>					

**Credit 2 Increase Ventilation Effectiveness**

---

1 Point

**Intent**

Provide for the effective delivery and mixing of fresh air to support the health, safety, and comfort of building occupants.

**Requirement**

**Credit 2.0 (1 point)** For mechanically ventilated buildings, design ventilation systems that result in an air change effectiveness (E) greater than or equal to 0.9 as determined by ASHRAE 129-1997. For naturally ventilated spaces demonstrate a distribution and laminar flow pattern that involves not less than 90% of the room or zone area in the direction of air flow for at least 95% of hours of occupancy.

**Technologies & Strategies**

Design the HVAC system and building envelope to optimize air change effectiveness. Air change effectiveness can be optimized using a variety of ventilation strategies including displacement ventilation, low-velocity ventilation, plug flow ventilation such as underfloor or near-floor delivery, and operable windows. Test the air change effectiveness of the building after construction.

SS	WE	EA	MR	EQ	ID
<b>Credit 4</b>					

## Credit 4 **Low-Emitting Materials**

---

1-4 Points

### Intent

Reduce the quantity of indoor air contaminants that are odorous or potentially irritating to provide installer and occupant health and comfort.

### Requirements

Meet or exceed VOC limits for adhesives, sealants, paints, composite wood products, and carpet systems as follows:

- Credit 4.1 (1 point)** Adhesives must meet or exceed the VOC limits of South Coast Air Quality Management District Rule #1168 by, AND all sealants used as a filler must meet or exceed Bay Area Air Quality Management District Reg. 8, Rule 51.
- Credit 4.2 (1 point)** Paints and coatings must meet or exceed the VOC and chemical component limits of Green Seal requirements.
- Credit 4.3 (1 point)** Carpet systems must meet or exceed the Carpet and Rug Institute Green Label Indoor Air Quality Test Program.
- Credit 4.4 (1 point)** Composite wood and agrifiber products must contain no added urea-formaldehyde resins.

### Technologies & Strategies

Specify low-VOC materials in construction documents. Ensure that VOC limits are clearly stated in each section where adhesives, sealants, paints, coatings, carpet systems, and composite woods are addressed.

SS	WE	EA	MR	LQ	ID
<b>Credit 6</b>					

**Credit 6 Controllability of Systems**

---

1-2 Points

**Intent**

Provide a high level of individual occupant control of thermal, ventilation, and lighting systems to support optimum health, productivity, and comfort conditions.

**Requirements**

**Credit 6.1 (1 point)** Provide a minimum of **one operable window and one lighting control zone per 200 SF** for all occupied areas **within 15 feet of the perimeter wall**.

**Credit 6.2 (1 point)** Provide controls for each individual for airflow, temperature, and lighting for **50%** of the non-perimeter, regularly occupied areas.

**Technologies & Strategies**

Design the building with occupant controls for airflow, temperature, and lighting. Strategies to consider include task lighting, operable windows, and underfloor HVAC systems with individual diffusers.

SS	WE	EA	MR	EQ	ID
<b>Credit 8</b>					

## Credit 8 Daylight & Views

---

1-2 Points

### Intent

Provide a connection between indoor spaces and outdoor environments through the introduction of sunlight and views into the occupied areas of the building.

### Requirement & Submittals

**Credit 8.1 (1 point)** Achieve a minimum Daylight Factor of 2% (excluding all direct sunlight penetration) in 75% of all space occupied for critical visual tasks, not including copy rooms, storage areas, mechanical, laundry, and other low occupancy support areas. Exceptions include those spaces where tasks would be hindered by the use of daylight or where accomplishing the specific tasks within a space would be enhanced by the direct penetration of sunlight.

**Credit 8.2 (1 point)** Direct line of sight to vision glazing from 90% of all regularly occupied spaces, not including copy rooms, storage areas, mechanical, laundry, and other low occupancy support areas.

### Technologies & Strategies

Design the building to maximize daylighting and view opportunities. Strategies to consider include building orientation, shallow floor plates, increased building perimeter, exterior and interior shading devices, high performance glazing, and photo-integrated light sensors. Model daylighting strategies with a physical or computer model to assess footcandle levels and daylight factors achieved.

SS	WE	EA	MR	EQ	ID
<b>Credit 2</b>					

**Credit 2 LEED™ Accredited Professional**

---

1 Point

**Intent**

To support and encourage the design integration required by a LEED™ Green Building project and to streamline the application and certification process.

**Requirement**

**Credit 2.0 (1 point)** At least one principal participant of the project team that has successfully completed the LEED™ Accredited Professional exam.

**Technologies & Strategies**

Attend a LEED™ Accredited Professional Training Workshop and successfully pass the LEED™ accreditation exam.



# Version 2.1 Registered Project Checklist

Project Name  
City, State

Yes ? No

## Sustainable Sites

14 Points

Prereq 1	Erosion & Sedimentation Control	Required
<input type="checkbox"/>	Credit 1 Site Selection	1
<input type="checkbox"/>	Credit 2 Development Density	1
<input type="checkbox"/>	Credit 3 Brownfield Redevelopment	1
<input type="checkbox"/>	Credit 4.1 Alternative Transportation, Public Transportation Access	1
<input type="checkbox"/>	Credit 4.2 Alternative Transportation, Bicycle Storage & Changing Rooms	1
<input type="checkbox"/>	Credit 4.3 Alternative Transportation, Alternative Fuel Vehicles	1
<input type="checkbox"/>	Credit 4.4 Alternative Transportation, Parking Capacity and Carpooling	1
<input type="checkbox"/>	Credit 5.1 Reduced Site Disturbance, Protect or Restore Open Space	1
<input type="checkbox"/>	Credit 5.2 Reduced Site Disturbance, Development Footprint	1
<input type="checkbox"/>	Credit 6.1 Stormwater Management, Rate and Quantity	1
<input type="checkbox"/>	Credit 6.2 Stormwater Management, Treatment	1
<input type="checkbox"/>	Credit 7.1 Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
<input type="checkbox"/>	Credit 7.2 Landscape & Exterior Design to Reduce Heat Islands, Roof	1
<input type="checkbox"/>	Credit 8 Light Pollution Reduction	1

Yes ? No

## Water Efficiency

5 Points

<input type="checkbox"/>	Credit 1.1 Water Efficient Landscaping, Reduce by 50%	1
<input type="checkbox"/>	Credit 1.2 Water Efficient Landscaping, No Potable Use or No Irrigation	1
<input type="checkbox"/>	Credit 2 Innovative Wastewater Technologies	1
<input type="checkbox"/>	Credit 3.1 Water Use Reduction, 20% Reduction	1
<input type="checkbox"/>	Credit 3.2 Water Use Reduction, 30% Reduction	1

Yes ? No

## Energy & Atmosphere

17 Points

<input type="checkbox"/>	Prereq 1 Fundamental Building Systems Commissioning	Required
<input type="checkbox"/>	Prereq 2 Minimum Energy Performance	Required
<input type="checkbox"/>	Prereq 3 CFC Reduction in HVAC&R Equipment	Required
<input type="checkbox"/>	Credit 1 Optimize Energy Performance	1 to 10

1  
1  
1  
1  
1  
1  
1

- Credit 2.1 Renewable Energy, 5%
- Credit 2.2 Renewable Energy, 10%
- Credit 2.3 Renewable Energy, 20%
- Credit 3 Additional Commissioning
- Credit 4 Ozone Depletion
- Credit 5 Measurement & Verification
- Credit 6 Green Power


**Materials & Resources**

Yes ? No

		13 Points
Y	Prereq 1 Storage & Collection of Recyclables	Required
	Credit 1.1 Building Reuse, Maintain 75% of Existing Shell	1
	Credit 1.2 Building Reuse, Maintain 100% of Shell	1
	Credit 1.3 Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
	Credit 2.1 Construction Waste Management, Divert 50%	1
	Credit 2.2 Construction Waste Management, Divert 75%	1
	Credit 3.1 Resource Reuse, Specify 5%	1
	Credit 3.2 Resource Reuse, Specify 10%	1
	Credit 4.1 Recycled Content, Specify 5% (post-consumer + 1/2 post-industrial)	1
	Credit 4.2 Recycled Content, Specify 10% (post-consumer + 1/2 post-industrial)	1
	Credit 5.1 Local/Regional Materials, 20% Manufactured Locally	1
	Credit 5.2 Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
	Credit 6 Rapidly Renewable Materials	1
	Credit 7 Certified Wood	1

**Indoor Environmental Quality**

Yes ? No

		15 Points
Y	Prereq 1 Minimum IAQ Performance	Required
Y	Prereq 2 Environmental Tobacco Smoke (ETS) Control	Required
	Credit 1 Carbon Dioxide (CO <sub>2</sub> ) Monitoring	1
	Credit 2 Ventilation Effectiveness	1
	Credit 3.1 Construction IAQ Management Plan, During Construction	1
	Credit 3.2 Construction IAQ Management Plan, Before Occupancy	1
	Credit 4.1 Low-Emitting Materials, Adhesives & Sealants	1
	Credit 4.2 Low-Emitting Materials, Paints	1
	Credit 4.3 Low-Emitting Materials, Carpet	1
	Credit 4.4 Low-Emitting Materials, Composite Wood & Agrifiber	1
	Credit 5 Indoor Chemical & Pollutant Source Control	1
	Credit 6.1 Controllability of Systems, Perimeter	1
	Credit 6.2 Controllability of Systems, Non-Perimeter	1
	Credit 7.1 Thermal Comfort, Comply with ASHRAE 55-1992	1
	Credit 7.2 Thermal Comfort, Permanent Monitoring System	1
	Credit 8.1 Daylight & Views, Daylight 75% of Spaces	1
	Credit 8.2 Daylight & Views, Views for 90% of Spaces	1

**Innovation & Design Process** 5 Points

Yes	?	No		
			Credit 1.1	Innovation in Design: Provide Specific Title
			Credit 1.2	Innovation in Design: Provide Specific Title
			Credit 1.3	Innovation in Design: Provide Specific Title
			Credit 1.4	Innovation in Design: Provide Specific Title
			Credit 2	LEED™ Accredited Professional

**Project Totals (pre-certification estimates)** 69 Points

Certified 26-32 points Silver 33-38 points Gold 39-51 points Platinum 52-69 points

## ENDORISING THE US MAYORS' CLIMATE PROTECTION AGREEMENT

WHEREAS, the U.S. Conference of Mayors has previously adopted strong policy resolutions calling for cities, communities and the federal government to take actions to reduce global warming pollution; and

WHEREAS, the Inter-Governmental Panel on Climate Change (IPCC), the international community's most respected assemblage of scientists, is clear that there is no longer any credible doubt that climate disruption is a reality and that human activities are largely responsible for increasing concentrations of global warming pollution; and

WHEREAS, recent, well-documented impacts of climate disruption include average global sea level increases of four to eight inches during the 20th century; a 40% decline in Arctic sea-ice thickness; and nine of the ten hottest years on record occurring in the past decade; and

WHEREAS, climate disruption of the magnitude now predicted by the scientific community will cause extremely costly disruption of human and natural systems throughout the world including: increased risk of floods or droughts; sea-level rises that interact with coastal storms to erode beaches, inundate land, and damage structures; more frequent and extreme heat waves, more frequent and greater concentrations of smog; and

WHEREAS, on February 16, 2005, the Kyoto Protocol, an international agreement to address climate disruption, entered into force in the 141 countries that have ratified it to date; 38 of those countries are now legally required to reduce greenhouse gas emissions on average 5.2 percent below 1990 levels by 2012; and

WHEREAS, the United States of America, with less than five percent of the world's population, is responsible for producing approximately 25% of the world's global warming pollutants yet is not a party to the Kyoto Protocol; and

WHEREAS, the Kyoto Protocol emissions reduction target for the U.S., had it ratified the treaty, would have been 7% below 1990 levels by 2012; and

WHEREAS, many leading US companies that have adopted greenhouse gas reduction programs to demonstrate corporate social responsibility have also publicly expressed preference for the US to adopt precise and mandatory emissions targets and timetables as a means by which to remain competitive in the international marketplace, to mitigate financial risk and to promote sound investment decisions; and

WHEREAS, state and local governments throughout the United States are adopting emission reduction targets and programs and that this leadership is bipartisan, coming from Republican and Democratic governors and mayors alike; and

WHEREAS, many cities throughout the nation, both large and small, are reducing global warming pollutants through programs that provide economic and quality of life benefits such as reduced energy bills, green space preservation, air quality improvements, reduced traffic congestion, improved transportation choices, and economic development and job creation through energy conservation and new energy technologies; and

WHEREAS, mayors from around the nation have signed the U.S. Mayors Climate Protection Agreement (list attached) which reads:

## The U.S. Mayors Climate Protection Agreement

- A. We urge the federal government and state governments to enact policies and programs to meet or beat the Kyoto Protocol target of reducing global warming pollution levels to 7% below 1990 levels by 2012, including efforts to: reduce the United States' dependence on fossil fuels and accelerate the development of clean, economical energy resources and fuel-efficient technologies such as conservation, methane recovery for energy generation, wind and solar energy, fuel cells, efficient motor vehicles, and biofuels;
- B. We urge the U.S. Congress to pass the bipartisan Climate Stewardship Act sponsored by Senators McCain and Lieberman and Representatives Gilchrist and Olver, which would create a flexible, market-based system of tradable allowances among emitting industries; and
- C. We will strive to meet or exceed Kyoto Protocol targets for reducing global warming pollution by taking actions in our own operations and communities such as:
  - 1. Inventory global warming emissions in City operations and in the community, set reduction targets and create an action plan.
  - 2. Adopt and enforce land-use policies that reduce sprawl, preserve open space, and create compact, walkable urban communities;
  - 3. Promote transportation options such as bicycle trails, commute trip reduction programs, incentives for car pooling and public transit;
  - 4. Increase the use of clean, alternative energy by, for example, investing in "green tags", advocating for the development of renewable energy resources, and recovering landfill methane for energy production;
  - 5. Make energy efficiency a priority through building code improvements, retrofitting city facilities with energy efficient lighting and urging employees to conserve energy and save money;
  - 6. Purchase only Energy Star equipment and appliances for City use;
  - 7. Practice and promote sustainable building practices using the U.S. Green Building Council's LEED program or a similar system;
  - 8. Increase the average fuel efficiency of municipal fleet vehicles; reduce the number of vehicles; launch an employee education program including anti-idling messages; convert diesel vehicles to bio-diesel;
  - 9. Evaluate opportunities to increase pump efficiency in water and wastewater systems; recover wastewater treatment methane for energy production;
  - 10. Increase recycling rates in City operations and in the community;
  - 11. Maintain healthy urban forests; promote tree planting to increase shading and to absorb CO<sub>2</sub>; and
  - 12. Help educate the public, schools, other jurisdictions, professional associations, business and industry about reducing global warming pollution.

NOW, THEREFORE, BE IT RESOLVED that the U.S. Conference of Mayors endorses the US Mayors Climate Protection Agreement and urges mayors from around the nation to join this effort.

BE IT FURTHER RESOLVED, The U.S. Conference of Mayors will establish a formal relationship with International Council for Local Environmental Initiatives (ICLEI) Cities for Climate Protection Program to track progress and implementation of the US Mayors Climate Protection Agreement.

**US Conference of Mayors Climate Protection Agreement – Signature Page**

DATE:

You have my support for the US Mayors Climate Protection Agreement.

Mayor \_\_\_\_\_ (name)  
\_\_\_\_\_ (signature)

City: \_\_\_\_\_

Address: \_\_\_\_\_

Staff contact: \_\_\_\_\_ (name, title)

Staff phone: \_\_\_\_\_

Email: \_\_\_\_\_

Please add my comments in support of the US Mayors Climate Protection Agreement. We will add these to the Website *(optional)*:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Please return completed form at your earliest convenience to: **US Mayors Climate Protection Agreement**

c/o City of Seattle  
Office of Sustainability and Environment  
PO Box 94729  
Seattle Municipal Tower  
Seattle, WA 98124-4729

**OR FAX** 206-684-3013  
email PDF file to:  
[dena.gazin@seattle.gov](mailto:dena.gazin@seattle.gov)

## Energy Incentives

**Recent Federal Government Initiatives Supporting Solar** – On August 8, 2005, President George Bush signed into law H.R.6, the Energy Policy Act of 2005. This was the first national energy plan in more than a decade, and it includes provisions to benefit green building construction and more energy efficient operations, including:

- Tax incentives for installing qualified solar technology (other than swimming pools or hot tubs), and incentives of up to 10% of the total cost (or a maximum of \$500 per building), for energy efficient upgrades to buildings made in 2006-07;
- Tax credits of up to \$2,000 in 2006-07 for buildings designed to use 50% less energy for heating and cooling (note: does not include water heating reductions);
- Requiring new Federal buildings to use 30% less energy than the minimums required under 2004 codes, while striving to meet ENERGY STAR® standards, attempting to derive 7.5% of their energy consumption from renewable sources, and pledging to reduce the 2003 levels of energy consumption by 20% by 2015;
- Reauthorization of ESCO/EPC's and improvements paid for using energy savings.

**Recent Florida State Government Initiatives Supporting Solar** - During the 2006 Florida Legislature Session, a new Florida Energy Bill was passed. The bill provides for establishment of a 9-member Florida Energy Commission, designation of Energy Efficiency Week, provision for matching grants and tax exemptions for purchase and use of renewable technologies, provision for studies to be conducted by the Florida Public Service Commission, provisions for the Department of Environmental Protection to administer a new grant program to local government, and a revision of the process for electrical power plant construction. This bill also includes several key points that are focused upon the use of solar energy. For example, funding in the amount of \$2.5 million for new commercial/consumer solar incentives, including:

- Up to \$100,000 for a place of business to install photovoltaic;
- Up to \$5,000 for a place of business to utilize solar thermal.

**City of Tallahassee** - The City of Tallahassee provides rebates and low interest loans to residents who increase the use of energy efficient appliances. The city provides rebates from \$50 to \$450 to existing homeowners for the replacement of electric or propane appliances with City natural gas appliances. The City also provides Homebuilder Rebates to offset the installation costs of gas appliances. The rebates range from \$50 to \$500 for appliances like furnaces, water heaters, ranges/ovens, fire logs, barbecue grills and pool heaters. In addition, the City provides low interest loans to finance the appliance upgrades. The terms include: 5% interest, 5-year term (60 months), \$5,000 or \$7,000 maximum amount, no down payment, no penalty for early payoff, loan payments billed on monthly utility bills, and the loan is recorded and secured with a property lien.

**Fifty Ways to Help Save the Planet**  
by: Vanity Fair 17 April 2006**What *you* can do**

**T**he problem is so vast and the urgency so great that advice which suggests you turn off the tap while brushing your teeth or switch off lights and standbys when they are not needed or go vegetarian for one day a week seems, well, ridiculous. Global warming is probably the greatest threat our species has ever faced. The sheer scale of the processes under way in the atmosphere and the oceans makes it hard not to view anything an individual does to reduce emissions as being too little too late. Not true. The astonishing fact is that each of us can have an immediate impact on the production of greenhouse gases, and if enough of us act together in these minor ways, the cumulative effect will be dramatic. That's because so much of the way we live our lives is wasteful and, to put it bluntly, thoughtless. It takes nothing to switch off a lamp, unplug the phone charger, take a shorter shower, cook without pre-heating the oven, skip the pre-wash part of the dishwasher cycle, or, often, walk or bike instead of drive. And they all save money, which is one of the rather striking things about reducing your carbon footprint—the standard way of measuring the CO<sub>2</sub> emissions each person is responsible for.

Some of the suggestions that follow may involve a little more effort—recycling, ditching plastic bags, and fixing leaky faucets and toilets; others require you to spend money—insulating your home, installing solar panels, or buying a fuel-efficient car. Even with these, however, there is almost always an eventual payback in terms of reduced bills.

The overwhelming and heartening point about the ideas here is that, if adopted by large numbers of people, they will have an immeasurable effect. When it comes down to it, the continued rise in carbon emissions is a matter of individual conscience: each of us can and should do something, however small. In 5 or 10 years' time that thought, together with everything written here, should be second nature to us. Ladies and gentlemen, this little booklet is the future—a more ingenious, more satisfying, and less wasteful future. Welcome to it. —HENRY PORTER

*Reporting for V.F.'s Green Guide by DAISY PRINCE and EMILY BUTSELAAR*

**1. LIGHTBULBS MATTER** Switch from traditional incandescent lightbulbs to compact fluorescent lightbulbs (C.F.L.). If every American household replaced one regular lightbulb with a C.F.L., the pollution reduction would be equivalent to removing one million cars from the road. A 30-watt C.F.L. produces about as much light as an ordinary 100-watt bulb. Although the initial price is higher, C.F.L.'s can last 12 times as long. C.F.L.'s are available at most home-improvement stores and at [bulbs.com](http://bulbs.com).

**2. DITCH PLASTIC BAGS** Californians Against Waste ([cawrecycles.org](http://cawrecycles.org)), a nonprofit environmental advocacy group, estimates that Americans use 84 billion plastic bags annually, a considerable contribution to the 500 billion to one trillion used worldwide.

Made from polyethylene, plastic bags are not biodegradable and are making their way into our oceans and waterways. According to recent studies, the oceans are full of tiny fragments of plastic that are beginning to work their way up the food chain. Invest in stronger, re-usable bags, and avoid plastic bags whenever possible.

**3. RINSE NO MORE** According to *Consumer Reports*, pre-rinsing dishes does not necessarily improve a dishwasher's ability to clean them. By skipping the wash before the wash, you can save up to 20 gallons of water per dishload. At one load a day, that's 7,300 gallons over the course of the year. Not to mention that you're saving time, dishwashing soap, and the energy used to heat the additional water.

**4. FORGET PRE-HEATING** Ignore cookbooks! It is usually unnecessary to pre-heat your oven before cooking, except when baking bread or pastries. Just turn on the oven at the same time you put the dish in. During cooking, rather than opening the oven door to check on your food, just look at it through the oven window. Why? Opening the oven door results in a significant loss of energy.

**5. A GLASS ACT** Recycle glass (think beer bottles, jars, juice containers) either through curbside programs or at community drop-off centers. Glass takes more than one million years to decompose; Americans generate almost 13 million tons of glass waste a year. Glass produced from recycled glass reduces related air pollution by 20 percent and related water pollution by 50 percent. Go to [earth911.org](http://earth911.org) for local recycling information.

**6. BANKING ON THE ENVIRONMENT** Want to have a more energy-efficient home or office? Save green by being green. Purchase appliances and electronics with the Energy Star certification. Begun in 1992 by the E.P.A. to rate energy-efficient computers, the Energy Star program today includes more than 40 product categories, and it also rates homes and workplaces for energy efficiency. Energy Star estimates that, with its help, Americans saved enough energy in 2004 to power 24 million homes, amounting to savings of \$10 billion. To learn more about Energy Star, visit [energystar.gov](http://energystar.gov).

**7. HANG UP YOUR DRYER** It goes without saying—clothes dryers are huge energy gluttons. Hints to reduce energy use: Clean the lint filter after each load (improves air circulation). Use the cool-down cycle (allows clothes to finish drying from the residual heat inside). Better yet, abandon your dryer and buy some drying racks, if you don't have a clothesline. Generally, clothes dry overnight.

**8. GET A GOLD LAUNDRY STAR** An Energy Star-qualified washing machine uses 50 percent less energy and could reduce your utility bills by \$110 annually. Standard machines use about 40 gallons of water per wash; most Energy Star machines use only 18 to 25 gallons, thus also saving water. Whenever possible, wash your clothes in cold water using cold-water detergents (designed to remove soils at low temperatures). And do your laundry only when you have a full load. If you must do a small load, adjust the water level accordingly.

**9. GREEN PAINT** Most paint is made from petrochemicals, and its manufacturing process can create 10 times its own weight in toxic waste. It also releases volatile organic compounds (V.O.C.'s) that threaten public health. (V.O.C.'s are solvents that rapidly evaporate, allowing paint to dry quickly.) They cause photochemical reactions in the atmosphere, leading to ground-level smog that can cause eye and skin irritation, lung and breathing problems, headaches, nausea, and nervous-system and kidney damage. The best alternative? Natural paints. Manufactured using plant oils, natural paints pose far fewer health risks, are breathable, and in some cases are 100 percent biodegradable. Remember: Never throw your paint away. Check out Earth 911's "Paint Wisc" section for re-use programs in your community; [earth911.org](http://earth911.org).

**10. BUILD GREEN** Before embarking on any home remodeling, make sure your architect has green credentials. Although there is no national organization of green architects in the U.S., that doesn't mean you can't get an architect who will build along sustainable lines. Ask where he or she sources materials, and request that energy-saving devices, such as solar paneling, be installed. Visit [directory.greenbuilder.com](http://directory.greenbuilder.com) or [environmentalhomecenter.com](http://environmentalhomecenter.com) for more green-building information.

**11. GET A GREEN ROOF** A green roof is more than simply a roof with plants growing on it. It functions like a "breathing wall," consuming carbon dioxide from the atmosphere and emitting oxygen. Green roofs generally use low-maintenance, drought-resistant plants. Vegetation is planted or laid down as pre-vegetated mats on a thin layer of soil. More intensive green-roof systems may contain trees and larger plants, but these require deeper soil and are more expensive. One of the biggest benefits of a green roof is water management: it can absorb more than 50 percent of rainwater, thereby reducing runoff, a major source of pollution in our waterways. Plus, it can help reduce air-conditioning costs during the hot summer months. The vegetation looks after itself through the seasons and creates a habitat for insects, which, in turn, provide food for birds. Green roofs can also last more than twice as long as conventional rooftops. They look better too. For more information, visit [greenroofs.com](http://greenroofs.com).

**12. PLAY IT COOL** Avoid placing your air conditioner next to a TV, lamp, or other electrical appliance that generates heat. A heat source will confuse the unit's thermostat, causing it to misread how hot the room is and make the air conditioner run longer than it should. You can also program an air conditioner to start running 30 minutes before you arrive home (as with heating). There is no need to cool a home if no one is in it.

**13. FOOD MILES MATTER** Food is traveling farther than ever. Once upon a time people ate seasonally—artichokes in the winter, cherries in June. Now you can buy most fruits and vegetables practically year-round. The average American meal contains ingredients produced in at least five other countries. The transportation of food and agricultural products constitutes more than 20 percent of total commodity transport within the U.S. To help reduce CO2 emissions (released from trucks, airplanes, and cargo ships), it's best to buy food that's in season, organic, and grown locally. Go to [ams.usda.gov/farmersmarkets](http://ams.usda.gov/farmersmarkets) to find the farmers' market nearest you.

**14. GO VEGETARIAN ONE DAY A WEEK** To produce one pound of beef requires 2,500 gallons of water—that's 40 times more water than is used to produce a pound of potatoes. Before buying beef, think about the immense cost of energy used to raise cattle and to transport meat to your supermarket shelf. Besides all this, cows consume enormous amounts of antibiotics and are a prodigious source of methane, which is the number-two greenhouse gas; livestock are responsible for almost 20 percent of the methane in the atmosphere.

**15. BUY EGGS IN CARDBOARD CARTONS** Cardboard egg cartons are normally made from recycled paper, which biodegrades relatively quickly, and are also again recyclable—Styrofoam or plastic cartons take a much longer time to biodegrade and their manufacture produces harmful by-products.

**16. DRINK SHADE-GROWN COFFEE** Shade-grown coffee is for the birds, literally. According to coffeeresearch.org, about 150 species of birds live on shade-grown-coffee farms, while only 20 to 50 inhabit full-sun farms. With increased demand for cheap coffee, many Latin American growers have moved toward full-sun plantations, clearing the habitat of numerous native birds and increasing the use of pesticides and fertilizers. By drinking shade-grown coffee, you can help bird habitats and reduce the need for farming chemicals. Shade-grown coffee beans can be purchased at many grocery stores. Starbucks offers shade-grown coffee as well.

**17. SAVE WATER INDOORS** A typical American household uses 350 gallons of water each day. About half that—175 gallons—is used indoors (toilets consume about 30 percent of the indoor total). Unnecessary water usage comes in the form of leaks. Fixing leaky faucets and toilets is a quick and easy way to conserve water. A steady faucet drip can waste 20 gallons of water a day. Leaky toilets are even worse, wasting upward of 100 gallons a day. Since toilet leaks are generally silent, check for them regularly by removing the tank cover and adding food coloring. If the toilet is leaking (and 20 percent of them usually are), color will appear in the bowl within 30 minutes.

**18. TAKE SHOWERS, NOT BATHS** The average American household consumes about 60 gallons of water a day from showers and baths. To reduce this number, take quick showers and install a low-flow showerhead that uses fewer than 2.5 gallons of water per minute, as compared to about 5 gallons with an older showerhead. Baths are relaxing, but it can take 50 gallons of water to fill a tub.

**19. STOP THE WATER** By leaving the water running while you brush your teeth, you can waste 150 gallons of water per month—that's 1,800 gallons a year! Turning the water off while you brush can save several gallons of water per minute. Also pay attention to this water-saving principle while shaving or washing your face.

**20. INSULATE YOUR HOUSE** Good insulation is one of the best ways to reduce your heating bills and cut your CO<sub>2</sub> emissions. Heating and cooling make up 50 to 70 percent of energy use in the average American home. Also, replace old windows and be sure to seal holes and cracks in your house with weather stripping or caulk. A well-insulated

house can prevent hundreds of pounds of CO<sub>2</sub> emissions per year and can cut your heating and cooling bills by up to 20 percent. For more information, visit [eere.energy.gov/consumer/tips/insulation.html](http://eere.energy.gov/consumer/tips/insulation.html).

**21. TURN YOUR THERMOSTAT DOWN ONE DEGREE** If you turn your thermostat down by one degree, your heating costs will decrease by about 3 percent. Turn it down five more degrees for four hours a day and reduce your heating bills by almost 6 percent. If you're going to be away for the weekend or out in the evening, turn your thermostat down. It's not true that reducing the temperature means it will take more heat to bring it back up to a warm level (unless you have a heat pump in your home). Also, turn the heat down if you are throwing a party—every guest will be the equivalent of a 100-watt heater.

**22. DON'T BE A BUTT TOSSER** About 4.5 trillion cigarette butts are littered worldwide each year—making them the most-littered item. The myth that cigarette filters are biodegradable is just that, a myth. Although the filters do eventually decompose, they release harmful chemicals that enter the earth's land and water during the decaying process. There is nothing earth-friendly about the breakdown. If you must smoke, carry a 35-mm. film canister to store your used butts in until you can properly discard them.

**23. DON'T JUST DUMP** Envelopes come in huge quantities for free every day. If you are careful when opening letters, you can use the envelopes again by simply putting a label over the original address. This saves money and trees, while reducing waste. Try to re-use jars and plastic containers—for example, when taking your lunch to work. (Doing so prevents waste, and making your food at home is less expensive than the alternative.) Ask your office manager to buy re-usable mesh coffee filters instead of bleached paper ones, which may contain dioxins. They are tree-free and should save your company money.

**24. AVOID DISPOSABLE GOODS** Institute a mug policy in your office. Americans throw away some 25 billion polystyrene cups every year, most of which end up in landfills. Refill your water bottles once or twice, and make your coffee in a ceramic mug. If you bring in cutlery from home, you will also cut down on those pesky plastic forks, knives, and spoons.

**25. GROW YOUR OWN GARDEN** In 1826, J. C. Loudon wrote in *An Encyclopaedia of Gardening*, "For all things produced in a garden, whether salads or fruits, a poor man that has one of his own will eat better than a rich man that has none." To start a vegetable garden costs nothing but a few packs of seeds and rudimentary garden implements, and it saves enormous amounts of money, to say nothing of the food miles and the packaging that go into supplying you with fresh fruits and vegetables. Of course, a vegetable garden is only productive for part of the year, but it is amazing how long that growing season lasts and how much you can produce from one small patch.

**26. BUY RECYCLED PRODUCTS** There has to be a market for products made with recycled goods. Support this movement by purchasing recycled goods—you will save

virgin materials, conserve energy, and reduce landfill waste. Recycled paper products include toilet paper (which is no longer scratchy, like it used to be), copy paper, paper towels, and tissues. Look for garbage bags and bin liners labeled "recycled plastic," and buy recycled toner cartridges for your fax machines and printers.

**27. PLANE BETTER** Air travel is currently responsible for 3.5 percent of the global-warming gases from all human activity and is growing fast. Cargo transport by air is increasing by about 7 percent annually and passenger air travel is up in the last few years by between 4 and 7 percent. The impact of air travel is enormous; a round-trip between New York and Los Angeles emits one ton of CO<sub>2</sub> per passenger. (To determine CO<sub>2</sub> emissions for your next flight, go to [co2.org](http://co2.org).) Try to limit the number of flights you take. If you're traveling within a country, why not take a train? (Air travel releases at least three times more carbon dioxide into the atmosphere than rail travel does.) If you're planning a business trip, consider whether a video linkup or a conference call will suffice.

**28. CARBON OFFSETTING** Air traffic is the fastest-growing source of greenhouse-gas emissions, so when you do fly, consult a carbon-offsetting organization such as Climate Care to "carbon-offset" your journey. Climate Care determines your flight's emissions and the cost to offset the CO<sub>2</sub>. For example, to offset that round-trip flight between New York and Los Angeles, you would pay about \$10 to Climate Care, which invests in forestry and energy-efficiency projects. For more information, visit [climatecare.org](http://climatecare.org).

**29. SWITCH TO GREEN POWER** The leading cause of industrial air pollution is electricity production. According to the American Lung Association, more than 50,000 Americans die each year from air-pollution-related causes. If available, get your electricity from renewable energy sources such as wind, sun, water, and biomass, all of which generate electricity with fewer environmental impacts. With utility companies in 35 states offering green-power pricing plans, around half of all electricity consumers could buy green, yet only half a million do. Does green power cost more? Yes, but barely. For example, New York's Con Edison charges an additional one-half cent per kilowatt-hour for its green-power products. To see if your energy provider offers green-power options, visit [eere.energy.gov/greenpower](http://eere.energy.gov/greenpower).

**30. STANDBY NO LONGER** Electricity "leaks" are no laughing matter. Televisions, video and DVD players, cable boxes, and other electronic equipment found in nearly every American home are wasting huge amounts of energy. When these devices are left on standby (the equivalent of "sleep" mode for computers) they use about 40 percent of their full running power. Every year, the energy wasted in this way is the equivalent of the annual output of 26 power plants. To avoid the drain of these "energy vampires," plug them into a power strip and turn it off when they are not in use.

**31. TURN OFF YOUR CHARGERS** Most cell-phone chargers continue to draw electricity even when the phone isn't plugged into it. If your cell-phone charger averages five watts per hour and is plugged in all the time, that means a total of more than 40 kilowatt-hours every year, or about 93 pounds of CO<sub>2</sub>. The same problem applies to your

other electronic equipment—your laptop, iPod, digital camera, and BlackBerry. Unplug all your chargers when they are not in use.

**32. RECYCLE YOUR BATTERIES** Although the number of electrical gadgets that use disposable batteries is on the decline, each person in the U.S. discards eight batteries per year. Overall, Americans purchase nearly three billion batteries annually, and about 179,000 tons of those end up in the garbage. Batteries have a high concentration of metals, which if not disposed of properly can seep into the ground when the casing erodes. Avoid disposable batteries by using your outlets whenever possible. If you can't do without batteries, use rechargeable and recycled ones. You should also have your batteries collected and recycled. Go to [rebat.com](http://rebat.com) for a list of companies that participate in battery reclamation.

**33. TURN OFF YOUR COMPUTER WHEN YOU LEAVE AT NIGHT** While computers do require a power surge when you first turn them on, they don't need enormous amounts of electricity to function for lengthy periods. Also, you can set your computer on "sleep" mode, which uses about three watts per hour, if you are going to be away from your desk for more than 15 minutes.

**34. GET INVOLVED** Recycling at home doesn't get you off the hook at work. If your office doesn't recycle, or recycles only paper, find out why. If you work in a small office, call your local authority to discover what recycling equipment and services are available. These may include storage containers and compacters as well as collection. If you work in a larger office, ask your building-services coordinator why there are no recycling facilities and whom you would need to speak to about starting a recycling program for paper, glass, metal, and plastic. For more information, visit [earth911.org](http://earth911.org).

**35. PRINT DOUBLE-SIDED** American businesses throw away 21 million tons of paper every year, 175 pounds per office worker. For a quick and easy way to halve this, set your printer's default option to print double-sided (duplex printing). This has the added advantage of halving the paper pile on your desk. To further cut your paper wastage, make sure you always use "print preview" mode to check that there are no overhanging lines and that you print only the pages you need. Other ways to cut down on paper before you get to the printing stage include using single or 1.5 spacing instead of double spacing, and reducing your page margins.

**36. CONSERVE WATER IN YOUR GARDEN** Attach a barrel to your downspout that will collect rain from your roof's eaves. Your plants will thank you: rainwater is better for your garden, as the chlorine in tap water can inhibit plant growth. You can also save six gallons every minute of watering simply by attaching a trigger nozzle to your hose so that you use water only when it's needed. In addition, if you grow your grass a little longer, it will stay greener and require less water than a closely mowed lawn.

**37. CREATE A LIVING FENCE** When replacing yard fences, instead of building a wooden fence, opt for a living fence. A living fence is a hedge or row of trees, which can be groomed to maintain appearance. Not only is a living fence less expensive than a

traditional fence, it also never needs to be painted. This saves you money and time and keeps harmful chemicals out of the environment. Try to use native flora and to avoid hedges comprised of only one species.

**38. RECYCLE YOUR NEWSPAPER** There are 63 million newspapers printed each day in the U.S.; 44 million, or about 69 percent, of these will be thrown away. Recycling just the Sunday papers would save more than half a million trees every week.

**39. PLANT A TREE** It's the simplest thing in the world to gather acorns, chestnuts, sweet chestnuts, and sycamore seeds in the autumn, plant them immediately, and forget them until the following spring. The success rate for acorns is not as high as for the other three, but in a good year about 40 percent germinate into oak trees. There's little that will stop the others from growing into healthy trees within the first year. Start saplings in Styrofoam coffee cups, which can be split with a knife so that the roots aren't disturbed when you plant them outdoors. Keep the saplings for four or five years, then plant them in your own garden, offer them to friends, or return them to nature. It may seem like a very small contribution, but if 5 percent of the U.S. population were to germinate one tree in one year, there would be almost 15 million extra trees absorbing carbon from the atmosphere. For more information, visit [arborday.org](http://arborday.org).

**40. AVOID PESTICIDES** Use natural methods of pest control. Form a log pile—dead wood provides a habitat for many kinds of wildlife, such as snakes and ground beetles. Both are natural predators for snails and slugs. If you create a small pond to encourage frogs and toads, they will help mop up the rest of your slug life. In the short term you can get rid of slugs using beer traps (slugs are attracted to yeast). To get rid of whiteflies, buy *Encarsia formosa*, small parasitic wasps that eat whiteflies. Grow flowers such as marigolds to attract ladybugs, hoverflies, and lacewings, all of which protect against aphids.

**41. BAT BOXES** Want to reduce the number of mosquitoes in your backyard? Then invest in a bat box. One bat can eat up to 1,000 mosquitoes a night. You will also be making a contribution to our country's temperate biodiversity: bat populations in America and around the world are declining, especially in urban areas, where they have few roosting spaces. Ideally, group two or three boxes together, place them as high as possible, and face them so the sun directly heats them for six to seven hours each day. If you are making a bat box yourself, use untreated and unpainted wood. It is essential that bats not be disturbed, so make certain your bat boxes cannot be reached by any local cats. For more information, visit [batconservation.org/content/Bathouseimportance.html](http://batconservation.org/content/Bathouseimportance.html).

**42. WALK OR BIKE** Always consider alternatives to driving, especially for journeys under two miles. It's better for the environment to walk, cycle, or even take the bus than to hop in your car. Currently, only 2 percent of employed adults walk to work in the U.S. Walking adds to life expectancy, is safe, helps with mental and physical health, and, best of all, is completely free. Cycling is another way to get around and has recently become more popular, what with more bike paths and cool new gadgets like L.E.D. lights for riding in the dark. New kinds of folding bikes have been specially developed for the

commuter. Surprisingly, recent studies have shown that bicyclists in cities are less exposed to air pollution than people in cars and taxis.

**43. BUY A HYBRID** Hybrid cars, which run on a combination of a gasoline engine and an electric motor, are all the rage these days. They get up to 50 miles per gallon, while a typical S.U.V. might travel around 15 m.p.g. Hybrids can offer substantial savings, and you may qualify for a one-time tax credit of up to \$3,400. For information on U.S hybrid-car incentives, go to [hybridcars.com/tax-deductions-credits.html](http://hybridcars.com/tax-deductions-credits.html).

**44. BIOFUELS 101, PART 1** Have you heard of biofuels? Biodiesel and bioethanol are alternative fuels derived from crops such as sugarcane, oilseed rape, and used cooking oil, which are generally blended with diesel fuel or gasoline. Biofuels are available in a range of different blends—for example, 30 percent biofuel and 70 percent gas or diesel. Biodiesel is generally appropriate for any diesel vehicle designed to run on low-sulphur diesel. Biodiesel blends are becoming more widely available in the U.S. Check [biodiesel.org/buyingbiodiesel/distributors](http://biodiesel.org/buyingbiodiesel/distributors) to find out about local availability.

**45. BIOFUELS 101, PART 2** Bioethanol is an alcohol-based fuel. A 5 percent blend of bioethanol can be included in ordinary gas and used by any car in the U.S. that runs on unleaded gas. You may already be using bioethanol-blended gas, as the 5 percent version is now being sold in the U.S. through unmarked unleaded-gas pumps. Saab and Ford both have a flex-fuel model available, which can run on bioethanol-based fuel or on straight gasoline. If you drive an older model, you can still use biofuel if you are willing to have your car converted to flex-fuel.

**46. DISCOVER YOUR CARBON FOOTPRINT** If you think you're already pretty green, determine your carbon footprint: a measurement of how your lifestyle choices affect carbon emissions. Your footprint will take into account your habits, the food you eat, your gas and electricity usage, your car and air mileage. Your score will be compared to the average figures for your county. These online tests aim to help you estimate your own carbon emissions and calculate how much of the planet's resources are required to sustain your lifestyle. They may motivate you to make changes, helping you set simple goals to reduce your negative impact on the planet. To learn about your carbon footprint, go to [carbonfootprint.com/calculator.html](http://carbonfootprint.com/calculator.html).

**47. GET AN ELECTRIC LAWN MOWER** Surrender your gas lawn mower. Gasoline lawn mowers are among the dirtiest of modern machines. A study funded by the Swedish E.P.A. found that using a four-horsepower lawn mower for an hour causes the same amount of pollution as driving a car 93 miles. The trouble with gas lawn mowers is that they not only emit a disproportionate amount of CO<sub>2</sub>, they are also responsible for releasing carcinogens such as polycyclic aromatic hydrocarbons into the air. Retire the noisy monster and buy an electric or manual model. Better still, reduce the number of times you mow per season and let some of your lawn grow wild, which has added benefits for bugs, butterflies, and birds. For more information, visit [greengrasscutters.com](http://greengrasscutters.com).

**48. GREEN GRILLING** If you have a charcoal barbecue grill, make sure your charcoal comes from a sustainable source. Enormous areas of tropical rainforest are destroyed every year to produce the 900,000 tons of charcoal burned annually in the U.S. Chimney starters are the most environmentally friendly solution to lighting charcoal. They use only a couple of pieces of newspaper, meaning you can avoid the gas-flavored meat that accompanies barbecues started with lighter fluid or fire starters. If you are replacing your grill, remember that using a gas, rather than charcoal, grill is the most environmentally friendly way to barbecue. It avoids forest destruction and doesn't add to local air pollution.

**49. RE-GIFT GIFT WRAP** Help cut down on the consumption of paper and plastic by re-using wrapping paper, ribbons, bows, and gift bags. These items should be good for at least one more wrapping. If you are feeling creative, use old calendars, pages from magazines, or even newspaper to wrap gifts.

**50. A GREEN ENDING** Green funerals don't just mean a woodland burial. Very few people actually know about the green alternatives to steel or hardwood coffins. Many private funeral homes present green alternatives to traditional coffins, including wicker caskets and shrouds. Currently, 89 percent of coffins sold are made of chipboard that is manufactured using formaldehyde. When chipboard coffins are cremated, they can release toxic gases. If buried, they disrupt local ecosystems; as the chipboard decays, the formaldehyde and glue leach into the soil and groundwater. Finally, most people opting for a green good-bye will choose a meadow or woodland burial, with only a memorial tree marking the grave. For more information, visit [fullcirclecare.org/endoflife/funeral.htm](http://fullcirclecare.org/endoflife/funeral.htm).

### Air Quality

Air quality is regulated at the federal level under Environmental Protection Agency's National Ambient Air Quality Standards (NAAQS) under the 1990 Clean Air Act. There are two types of national air quality standards. The primary standards set limits to protect public welfare, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to public welfare including protection against visibility impairment, damage to crops, vegetation, and buildings. The NAAQS measures six (6) principal pollutants to determine primary and secondary standards for air quality around the nation. These principal pollutants are ozone (O<sub>3</sub>), particle matter (PM), carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), and lead (Pb).

With the exception of lead the measurements of the principal pollutants are combined to provide the air quality of regions, states, counties, and cities through the Air Quality Index (AQI). It focuses on health effects that individuals may experience within a few hours or days after breathing polluted air. The AQI measures air quality on a range of 0 to 500. The higher the AQI value in a community the greater the level of air pollution and greater risk to public health. As illustrated below an AQI value of 0-50 indicates a good air quality with little potential to affect the health of the community. A moderate AQI value (51-100) indicates an acceptable air quality that may contain some pollutant that would concern a small number of individuals. An AQI value of 101-150 indicates an air quality that may be unhealthy for sensitive groups. These sensitive groups include those individuals that suffer from asthma, heart disease, lung disease, etc. An unhealthy AQI value (151-200) indicates that a majority of a community may begin to experience negative health effects from the poor quality of the air. A very unhealthy AQI value (201-300) will trigger a health alert as the air quality becomes more severe causing the health of most in a community to decline. The final level of health concern is the hazardous AQI value (over 300) which triggers health warnings of emergency condition for the entire population of a community. Each level is symbolized with a color: green (good), yellow (moderate), orange (unhealthy for sensitive groups), red (unhealthy), purple (very unhealthy), and maroon (hazardous). AQI provides to individuals a daily report on the air quality in their community. The AQI also provides an index report which indicates the number of good days (AQI value of 0-50), moderate days (51-100), unhealthy for sensitive groups days (101-150), and unhealthy days (151 or higher) that a county or metropolitan area experienced during a given year.

Air Quality Index (AQI Values)	Levels of Health Concern	Colors
When the AQI is in this range	air quality conditions are	as symbolized by this color
51 to 100	Moderate	Yellow
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

The AQI also indicates the number of days that each principal pollutant was present in the air. Certain pollutants are more prevalent in some regions of the country than others and for this reason may be observed more closely than others. In the state of Florida, the Department of Environmental Protection identifies ozone as the primary pollutant and is monitored daily. In 1999, the EPA required that fine particle (PM<sub>2.5</sub>) concentration be monitored at the state level even if it were not common the region. In 2003, the EPA began to require the daily monitoring of fine particle concentration in large populated areas (500,000-1 million residents). Prior to 2003 the DEP had monitored fine particles every 3<sup>rd</sup> day. In order to monitor the fine particle concentration in the north Florida region which lacks large populated areas as defined by the EPA, DEP began daily monitoring of fine particles in Leon, Escambia, and Duval. This has caused a decrease in the number of good days that Leon County has experienced and increase in moderate days. The EPA has identified ground-level ozone and airborne particles (fine particle concentration) as the pollutants that pose the greatest threat to human health in this country.

#### Ground-level Ozone

Ozone (O<sub>3</sub>) is a gas composed of three oxygen atoms. Since there is abundant O<sub>2</sub> in the atmosphere, the key to ozone formation is the availability of free oxygen atoms. At ground level, these oxygen atoms are primarily created from the breakup of nitrogen dioxide (NO<sub>2</sub>) by solar radiation. The amount of NO<sub>2</sub> available is regulated by a complex chemistry involving volatile organic compounds (VOCs) and other oxides of nitrogen (NO<sub>x</sub>) in the presence of heat and sunlight. Ozone occurs naturally in the stratosphere approximately 10 to 30 miles above the earth's surface and forms a layer that protects life on earth from the sun's harmful ultraviolet radiation.

In the lower atmosphere, where natural ozone levels are low, additional ground-level ozone is formed as a result of human emissions of VOCs and NO<sub>x</sub>. Man-made emissions of VOCs and NO<sub>x</sub> can cause additional ozone, the primary component of urban smog, to be formed. Ozone builds up near the ground through a series of complex chemical reactions involving VOCs and NO<sub>x</sub> in the presence of sunlight. VOCs are produced by natural sources, such as trees; fuel combustion in engines and industrial operations; some types of chemical manufacturing operations; evaporation of solvents in consumer and commercial products; and evaporation of volatile fuels such as gasoline. Nitrogen oxides are emitted from motor vehicles; off-road engines such as aircraft, locomotives and construction equipment; fossil-fuel burning power plants and other industrial facilities; and other sources of combustion.

Ozone concentrations can reach unhealthy levels when the weather is hot and sunny with relatively light winds. Breathing this ozone can result in damage or irritation to the lungs. Even at relatively low levels, ozone may cause inflammation and irritation of the respiratory tract, particularly during physical activity. The resulting symptoms can include breathing difficulty, coughing, and throat irritation. Breathing ozone can affect lung function and worsen asthma attacks. Ozone can also increase the susceptibility of the lungs to infections, allergens, and other air pollutants. Medical studies have shown that ozone damages lung tissue, and complete recovery may take several days after exposure has ended. In addition, longer-term exposures to moderate levels of ozone present the possibility of irreversible changes in the lung structure which could lead to premature aging of the lungs and worsen chronic respiratory illnesses. Groups that are sensitive to ozone include children and adults who are active outdoors, and

people with respiratory disease such as asthma. Sensitive people who experience effects at lower ozone concentrations are likely to experience more serious effects at higher concentrations.

### Fine Particles

Particle pollution is a mix of solids and liquids droplets in the air. It consists of a number of components including acids, organic, chemicals, metals, soil or dust particles and allergens. Fine particles are less than 2.5 micrometers in diameter. They are so small that they can only be detected with an electron microscope. Sources of the fine particles include all types of combustion including motor vehicles, power plants, residential wood burning, forest fires, agricultural burning, and some industrial processes.

People with heart or lung disease, older adults, and children considered at greater risk from particles that link particle levels to increased hospital admissions, emergency room visits, and even death from heart or lung disease. Short term exposure can aggravate lung disease, causing asthma attacks and acute bronchitis. Long term exposure can cause a reduction in lung function and the development of chronic bronchitis.

Leon County as well as the state of Florida has received numerous recognitions for their good air quality. This year the American Lung Association identified Tallahassee as one of the cleanest U.S. cities for ozone air pollution. The state of Florida is only of three states east of the Mississippi that consistently meets all the standards of the NAAQS system. Though there has been a decrease in the number of good days, the majority of all days in the County in the past five years have been good to moderate with only 11 days in which the AQI value indicated an air quality that was unhealthy for sensitive groups and no day in which the AQI value indicated an unhealthy day. The unhealthy for sensitive groups days were recorded during holidays such as the Fourth of July and Memorial Day.

Through public information campaigns the County can increase awareness of the community's air quality. Staff is recommending that the County encourage practices that lead to a larger reduction of air pollution particularly ozone and fine particles, and promote cleaner air. Throughout this agenda item, staff will touch on certain behaviors that can be adopted by residents and County employees that will sustain the good air quality the public currently experiences. (Source: <http://go.ucsusa.org/hybridcenter/incentives> and [www.dep.state.fl.us/air/](http://www.dep.state.fl.us/air/))

**Summary of the Relationship between Human Activities, Greenhouse Gas Emissions, Global Warming and Local Smart Energy Solutions**

