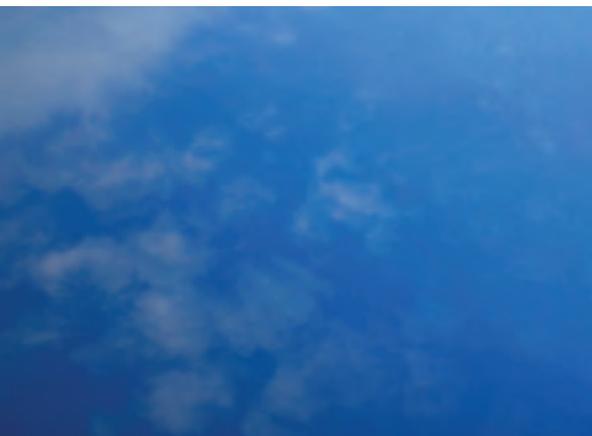




# Building Greener, Building Better

The National Association of Home Builders confronts the challenges of global climate change



It starts out as a simple science lesson. }



## THE SUN'S ENERGY HEATS THE EARTH'S SURFACE.

Some of this energy is absorbed into the earth and heats the land and the oceans; some of it is radiated back out to space. The earth's atmospheric gases trap some of this outgoing energy, causing the earth to retain the heat, much like a greenhouse.

Since the beginning of the Industrial Revolution, the growing use of fossil fuels – first coal, now oil and gas – means that more carbon dioxide, methane and nitrous oxide – greenhouse gases – are released into the air. This combination of gases has increased the heat-trapping capacity of the atmosphere.

Now, the National Academy of Science reports that the earth's temperature has risen 1°F over the last century, with the most accelerated increase in temperature occurring just in the past two decades. It suggests that this increase in global temperature is attributable to human activities and the use of fossil fuels that have led to more greenhouse gas emissions, which in turn have altered the composition of the atmosphere.

These increasing concentrations of greenhouse gases are likely to accelerate the rate of climate change. As a result, more water will evaporate, so more rain may fall. Sea levels may rise and storms, such as hurricanes, may increase in intensity.

According to the U.S. Environmental Protection Agency, fossil fuels that power trucks and cars, heat homes and offices and run factories are responsible for 98 percent of the country's carbon dioxide emissions, 24 percent of methane emissions and 18 percent of nitrous oxide emissions. The agency has found that about 6.6 tons of greenhouse gases are emitted per person per year, and 82 percent of those gases come from burning fossil fuels.

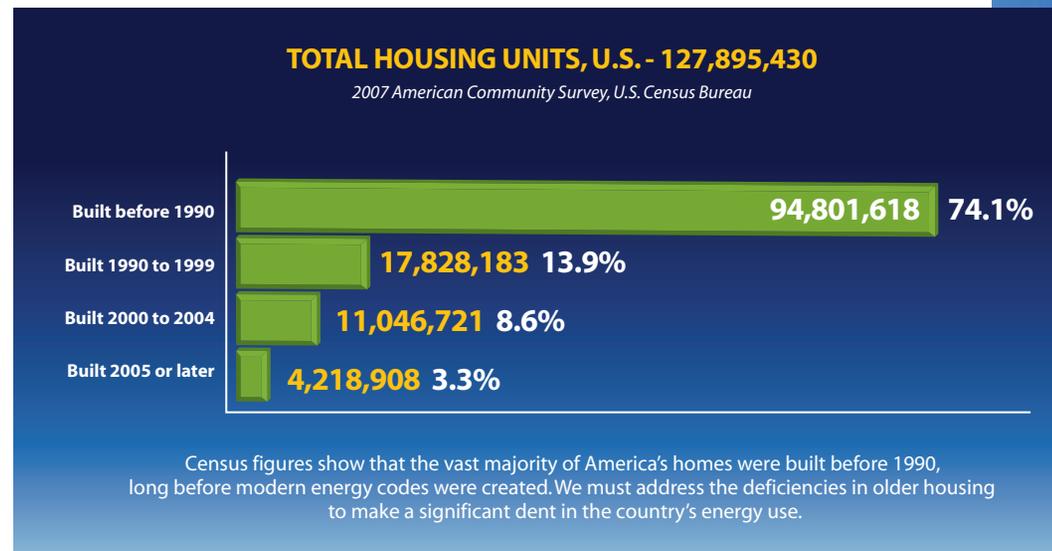
Housing contributes about 21 percent of the overall greenhouse gas emissions. This quantity is primarily a function of how much energy is consumed, which in turn is the result of many factors, including how the home is constructed and how its occupants use electrical power and other fuels.

New homes only account for a small share of the total housing inventory and a even smaller share of annual energy consumption, because the homes built today are significantly more energy efficient than those built in the past.

The EPA estimates that just by altering personal choices, people can reduce their impact by as much as 32 percent. We need to reduce our energy use – get out of our cars, consume less electricity, recycle and reuse already existing products.

But being prepared for and responding to climate change is not just about improving energy efficiency. It's also about taking an integrated approach to address both the causes and the potential impacts of climate change and treading a little lighter on the earth.

It's important to note that no industry group has led the way on environmental stewardship like the members of the National Association of Home Builders. It's the right thing to do – and frankly, it's good business.





# Home builders are out in front.

## THE FEDERAL DEPARTMENT OF ENERGY

estimated that in 2005, about 21 percent of the energy we used was consumed by homes – for heating, cooling and electric appliances. NAHB has long recognized that energy efficiency is key to our nation’s continued security and to our economy. Additionally, builders know that building with energy conservation in mind is practical...and it’s profitable.

Even before activists called for carbon trading and alternative energy investments, home builders were devising ways to construct a more efficient building envelope for a tighter house and a lower utility bill. Our suppliers and manufacturers were creating more efficient insulation products and appliances.

Homes today are significantly more resource efficient, as reflected in today’s engineered-wood products, low-emissivity windows, panelized construction techniques and other technological advancements.

Meanwhile, we also are rediscovering the practices of the past and redefining them for the future. Our ancestors sited their homes to protect them from winter winds. Our grandparents put canvas awnings over sunny windows to protect them from summer heat. Now, we have fancier names for these practices, like passive solar design. But just because it’s low-tech doesn’t mean

it’s not highly effective.

At the same time, land developers were designing communities with walkable neighborhoods and shared open space. Environmental engineers were discovering innovative methods to direct storm water runoff and reduce pollution in rivers and streams. Professionals throughout the home building industry have stepped up to help mitigate the effects of global warming.

It’s just that for years, we didn’t call it that. We called it responding to market demand. And it’s working.

Voluntary and market-driven approaches have been demonstrated to be the most cost-effective method of achieving meaningful greenhouse gas reductions, to date. These programs have also been effective in promoting emerging technologies and facilitating the use of those technologies that have a true economic and environmental benefit. In these voluntary programs, builders learn and then put into practice construction methods and materials that can provide energy efficiency, improve water efficiency, make better use of supplies and components, promote indoor environmental quality and lessen the developmental impact in both new construction and residential renovation.

**Home builders are rediscovering the practices of the past and redefining them for the future.**

## ENERGY CONSUMPTION IN 2005

*in trillions of Btu*

	AMOUNT	PERCENT
Total	100,506	100.00%
Residential Sector	21,717	21.61%
All Housing Units Built before 2000	19,690	19.59%
All Housing Units Built 2000-2005	2,028	2.02%

Sources: 2007 Annual Energy Review by the Energy Information Administration; the 2005 Residential Energy Consumption Survey, Energy Information Administration.



## Safer, stronger, more efficient.

Rising crude oil prices in the 1970s brought about a change in America's gas-guzzling habits, and the era of 25-cent-per-gallon fuel came to an end. Home buyers now wanted lower energy bills, and builders stepped up to the challenge. The home building industry worked hand in hand with building code officials and engineers to develop model codes to ensure uniform results throughout the country while preserving regional differences in style and design, as well as local geography and temperature. Innovations like low-emissivity windows, technically advanced heating and air-conditioning units and even concrete that "eats" smog were introduced by industry suppliers.

Per square foot, new homes today consume less than two-thirds the energy of older homes for heating and air conditioning. The problem lies with older homes with outdated electrical systems and appliances, drafty windows and insufficient insulation.

## Smart Growth: It started here.

Like improving energy efficiency, using land wisely is a central tenet to positively responding to climate change. Builders and developers continue to work on creative solutions, planning communities that can accommodate the

increased need for housing in "smarter" ways by planning for and building more compactly at higher densities, mixing uses and housing types, redeveloping older neighborhoods, preserving meaningful open space, and protecting environmentally sensitive areas.

Many developers welcome the opportunity to meet housing demand with a project that offers a mix of uses, encourages walking and preserves significant open space. From the Carolinas to Seattle, innovative land use has become a hallmark of the development industry. Examples include clustered housing that puts buildings more compactly on one part of the site to preserve more useable open space in another; new communities that mix housing types and land uses; careful efforts so the site is designed to address storm water management; preservation of trees; solar orientation of homes to maximize energy efficiency; and sidewalks and hike-and-bike trails that enable residents to reach community amenities without using a car.

However, the greatest barriers to environmentally sensitive development are existing zoning codes – and neighbors who oppose moderate- to high-density housing. It is not uncommon for a proposed Smart Growth or green development to be reshaped into a low-density, automobile-dependent community because existing development regulations don't allow a mix of uses or because nearby residents don't want higher density housing anywhere near their neighborhood.



### Energy Experts, Home Builders Reward Great Design

Since 1996, a program awarding innovation in energy-efficient building has helped move once-experimental practices into the mainstream.

The NAHB Energy Subcommittee founded the EnergyValue Housing Award (EVHA) program to help educate the home building industry and the public about successful approaches to energy-efficient construction. Now, EVHA is the nation's pre-eminent energy-efficiency award, honoring builders who voluntarily incorporate energy-saving practices into all aspects of new home construction.

Some practices that once were considered innovative or only for niche markets include installing air ducts in conditioned space, specifying Low-e windows, including only Energy Star-rated appliances throughout a home, and conducting blower door tests, which measure the amount of air seepage in a home. These technologies and practices are now commonplace among energy-

efficient home builders, and some have even begun to filter over to the mainstream as well.

The caliber of applications has advanced each year since the EVHA program began, with builders now focused on well-integrated systems design. Features that were once relatively obscure in energy-efficient homes are now becoming differentiating factors for EVHA winners, such as energy-efficient lighting and independent energy testing.

Each year, winners exceed the benchmarks that have been set the previous year, setting themselves apart in ways that add value to their businesses, their customers, and the environment.

The EVHA is coordinated annually by the NAHB Research Center in partnership with the U.S. Department of Energy through the National Renewable Energy Laboratory, and the National Association of Home Builders (NAHB). Awarded each year at the International Builders' Show, the program is funded primarily through the U.S. Department of Energy Building America program with additional support from private-sector sponsors.



Designing with nature

**THESE DAYS, DEVELOPERS AND LAND PLANNERS** recognize the value of the natural landscape and the importance of letting that landscape dictate community design. Developers can often take advantage of a site's natural floodways, ponds, and swales to improve storm water management and water quality. In many cases developers are increasing the amount of pervious surface to diminish the amount of rain water that flows in storm drainage systems and increase the amount of water that can filter down through the ground and recharge the groundwater supply.

Builders and developers are also leaders in repairing natural habitats that may have been damaged from previous uses such as farming, ranching or older commercial or residential development. This work includes streambed repair and restoration of wetlands.

Much has been learned over the last three decades from the environmental sciences about the types of vegetation that can be used to remove pollutants and sediment, protect stream beds from erosion, and provide habitat for birds and other wildlife.

## Green moves to the mainstream.

Since 1998, when NAHB members gathered to begin planning the first-ever National Green Building Conference, home builders have moved green building practices from the niche market into the mainstream. It's been a gradual process in response to market demand, availability of materials, and education. But in every step of the process, NAHB has led the way.

Builders increasingly incorporate more energy efficiency, water and resource conservation, sustainable or recycled products, and attention to indoor air quality into the everyday process of home building. A recent NAHB-McGraw Hill Construction survey anticipates that between 12 percent and 20 percent of new homes will be green by 2012.

More and more local home building associations are starting green building certification programs for their members. There are nearly 200 state and local green building programs across the country working with local builder



association members. Many are affiliated with NAHBGreen, the NAHB National Green Building Program, which accelerates regionally appropriate and voluntary, market-driven green building with extensive educational and training resources and a third-party home verification program administered by the NAHB Research Center.

By December 2008, more than 1,600 builders, remodelers and suppliers to the home building industry had achieved the Certified Green Professional educational designation, an NAHBGreen program that was launched just 10 months earlier. The explosive growth of this designation is another indication of this green leadership.

In 2007, NAHB announced a historic partnership with the International Code Council to write the nation's first residential green building standard. When approved by the American National Standards Institute, the standard will provide a model for rigorous voluntary programs that are certifiably green – and enable the certification of all new and remodeled homes and for entire residential developments, including apartments and condominium units.

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## The Panel is IN

A generation ago, almost all single-family homes were framed and built stick by stick on the building lot. While the home building industry continues to rely on wood as an environmentally responsible construction material, builders increasingly rely on systems building or panelization as a way to use resources more efficiently – and also to cut home buyers' utility bills.

Systems building means that a lot of the construction takes place not at the home site, but in a factory. Individual components – wall panels, roof trusses and floor trusses, to name a few – are designed, engineered, cut to specification and then assembled using repeatable processes.

Today, most builders use factory-made floor and roof trusses, the most commonly known form of panelization. Factory-built components take some of the weather-related risk out of building. The ability to avoid weather conditions in a factory and lean manufacturing techniques translates to more accurate dimensions, tight seals, and improved structural stability.

There's less waste: Wood not needed for one truss can be used for the next one rather than brought to a landfill. Leftover materials that can't be used are ground up to be made into oriented strand board (OSB) and other building materials.

Increasingly, many builders are also using structural insulated panels – known as SIPs – another form of panelized construction. SIPs are made of polystyrene or foam insulation sandwiched between two pieces of OSB. A SIP "sandwich" is extremely energy efficient and requires a minimal amount of additional framing, using fewer resources.

A recent NAHB study found that construction of a 2,600 square-foot home with trusses and panels used 26 percent less lumber, generated 76 percent less waste, and was built in just 37 percent of the labor hours of a similar, stick-built home.

All of the above and more are key components to green building practices – and more efficient use of resources. More information is available on the NAHB Building Systems Councils page at [www.buildingsystems.org](http://www.buildingsystems.org).





## Energy Star: A Voluntary Success Story

NAHB supports Energy Star, the U.S. Environmental Protection Agency and Department of Energy voluntary energy-efficiency program for new homes.

About 120,000 homes earned the Energy Star in 2007 bringing the total number of qualified homes to 840,000. In 2007 alone, these homes eliminated the equivalent emissions of 60,000 vehicles and 355,680,000 pounds of coal – and offered benefits equivalent to planting 97,000 acres of trees, according to federal government calculations. They also saved their owners about \$54 million on their energy bills.

Energy Star homes are least 15 percent more energy efficient than homes built to the 2004 International Residential Code, and include additional energy-saving features that typically make them 20 to 30 percent more efficient than standard homes, the EPA says.

The Energy Star program certifies commercial buildings as well, including the National Housing Center, the NAHB headquarters building in downtown Washington, D.C. The building earned its

fourth Energy Star designation in 2008 in recognition of its efficient heating and cooling systems and maintenance program that conserves natural resources while providing a comfortable and healthy environment for employees and visitors.

NAHB replaced a number of traditional incandescent light bulbs with compact fluorescent light bulbs, which use two-thirds of the energy and last 10 times longer. All water faucets have been retrofitted with water-saving aerators. The association also installed motion detectors in the restrooms and conference rooms rather than leave the lights on when they aren't in use and frequency drives on the cooling tower fans to coordinate the speed of the fans with the building's air conditioning needs, rather than cycling on and off at 100 percent power.

The Housing Center's continued Energy Star designations save money and energy while they also send a strong signal of the housing industry's support for voluntary energy guidelines.

## EVEN AS BUILDERS AND DEVELOPERS

are taking concrete steps to build green and use land more efficiently, some policymakers are rushing to put forward regulatory or legislative responses to the climate change problem without any data to predict the potential success of these proposals or any sense of the economic impacts.

Nowhere is this rush to “solve” climate change greater than in the question of vehicle miles traveled – or VMT.

Unfortunately, in their zeal to mandate immediate emissions reductions, most policymakers have paid little attention to the sources of the emissions, the viability of reduction strategies, or how to accurately and consistently quantify greenhouse gas emissions and other climate change issues associated with any specific source, industry, or user. Likewise, most have failed to fully consider the long-term implications of certain policies.

The outcome of these failings is likely to be programs that neither target appropriate sources nor deliver the intended results. Regardless, in the absence of valid scientific evidence, states and localities may adopt or enforce ill-conceived climate change initiatives that do little to address the issue even as these measures crimp the economy and drive up the cost of housing.

To fill the void, NAHB is working to analyze what is known about the relationship between various land use patterns and transportation behavior, identify knowledge gaps, and recommend what data is needed to help solve the problem. The goal is to develop a methodology for quantifying the effect of travel behavior, including establishing a “baseline” level of effects from existing development that can be compared to expected emissions from new development.

Preliminary studies indicate that increasing density can help cut VMT, but it does not result in significant reductions when the underlying density is already high. More work needs to be done to quantify the intended results of policy changes based on anticipated effects of climate change, and NAHB is at the cutting edge of this research.

As concern over climate change grows, and as lawmakers work to demonstrate that they are responding to those concerns, it is important that new policies be based on sound evidence. NAHB believes it is important that all who seek to address the climate change issue do so in a thoughtful, transparent way that encourages cooperation, collaboration and a shared desire to develop policies that make a difference.

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## Renewables on the Rise

Is America paying closer attention to its energy consumption? Data from the U.S. Department of Energy would indicate that it's true: the country's total energy consumption declined by 1 percent in 2006, mainly due to a drop in the use of fossil fuels.

That corresponds with a recent report from the Environmental Protection Agency, which found that public awareness of the Energy Star label, used for energy-efficient products and services, is up to 76 percent in major markets where the voluntary program gets more promotion from utilities and home builders.

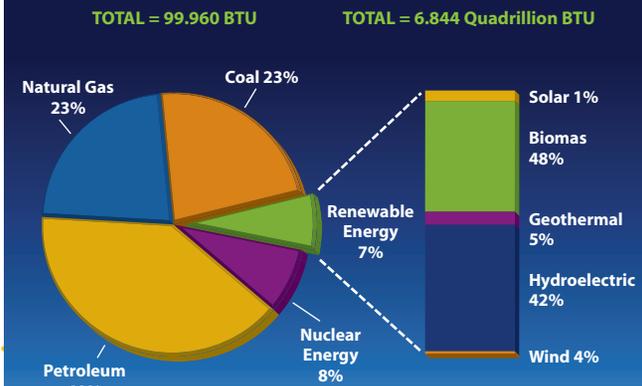
Meanwhile, the use of renewable energy in the United States is on the rise, with a 7 percent increase in 2006, according to the federal Energy Information Administration.

Biofuel consumption increased by 28 percent and wind power by 45 percent, according to EIA. But these two energy sources represent a smaller portion of the renewable energy pie: The biggest overall increase was in hydropower, which represents more than 40 percent of renewable consumption. Americans consumed 186 trillion Btu, or 7 percent more than they did in 2005.

Texas overtook California as a producer of wind energy, adding 943 megawatts of capacity for a total of 2,698. In 2007, according to the report, the American Wind Energy Association projected the installation of more than 3,000 additional megawatts.

Key to the growth of renewable energy: the Federal Renewable Production Tax Credit, the report says. And higher costs for fuels like natural gas improve the competitive position of wind power, fueling more investment and eventually driving down costs.

## RENEWABLE ENERGY



## { The Advantage of Compact Development

Recent NAHB research on household vehicle trips has found that gasoline consumption and the associated CO<sub>2</sub> emissions are lower for residential developments that are relatively more compact.

The research is based on data from the most recent (2001) National Household Travel Survey conducted by the Federal Highway Administration. This research also analyzed other factors related to gasoline consumption including Vehicle Miles Traveled (VMT), the efficiency of the vehicles owned, and the efficiency of the speed at which those vehicles are driven.

The results show a clear “congestion” effect: as the compactness of a subdivision increases, vehicles tend to be driven at less efficient speeds. However, this congestion effect is not strong enough to totally offset the impact of compactness on VMT, so gasoline consumption and the associated CO<sub>2</sub> emissions still tend to be lower in more compact developments.

The research warns us that the straight line measure of subdivision compactness cannot tell us how the complex nature of compact development and many other land use characteristics affect gasoline consumption and CO<sub>2</sub> emissions. The presence of concentrated employment centers and their proximity to where people live, for example, obviously could affect gasoline consumption.

Likewise, the presence of bike trails, how well interconnected local roads are, and the very design of the development could all have an effect. Unfortunately, information on these characteristics is not available in the NHTS data and is difficult to quantify.

An important fact that must be kept in mind, researchers say, is that building a home does not create the people who live in it. If the new home were not built, the household would be living somewhere else, cooking, driving, and consuming energy somewhere else. What is equally important, but often neglected in existing literature, is research regarding these baseline emissions. The baseline emissions are the CO<sub>2</sub> emissions that households would generate if the new homes were *not* built and the households had to live somewhere else.

To demonstrate the findings of the research, NAHB assumed a hypothetical residential project that consists of owner-occupied, single-family homes. Relative to the baseline emissions, the CO<sub>2</sub> emissions would be 2.25 percent higher for those households that live in the new hypothetical residential project because the new subdivision would be less dense than the existing, surrounding housing stock. If the new development were denser than the surrounding area, there would likely be a reduction in emissions.

The full report, Vehicle CO<sub>2</sub> Emissions and the Compactness of Residential Development, is available at [housingeconomics.com](http://housingeconomics.com)

# Our next steps are important.

**THE HOME BUILDING** industry continues to keep environmental stewardship at the top of the agenda. But at the same time, home builders realize that the evolving dialogue on climate change introduces more questions than answers, and that building more efficient homes is not in itself a panacea for global warming.

The hard truth is this: Government data shows that homes built between 1991 and 2001 account for only 2.52 percent of total energy consumption. And even if each of the new homes built over the 1991-2001 period consumed no energy, total consumption would be only 2.52 percent less than at present. The same result could be achieved by improving the average efficiency of the pre-1991 homes by 14.7 percent. That's a tall order.

Here's another way to put it: A 2008 study for the California Homebuilding Foundation revealed that spending \$10,000 to retrofit a typical home built in the 1960s could eliminate about 8.5 tons of emissions, whereas increasing the energy efficiency of a new home by 35 percent would cost about \$5,000, but only cut emissions by 1.1 tons. In other words, retrofitting existing homes with energy-efficient features is four to eight times more carbon- and cost-efficient than adding further energy-efficiency requirements to new housing.

The Energy Policy Research Institute say that by

2030 30 percent of residential power use will be “plug-connected”. Homeowner behavior makes a difference. Only a home's residents can control the use of light bulbs, computers, washing machines and other appliances that consume energy: a fact that points to the overriding importance of better consumer education. As Americans, we need to understand that electricity isn't cheap, even when we can afford the monthly bill.

At the same time, our nation's leaders need to carefully consider how they'll legislate energy policy. When more stringent requirements for new homes are enacted ahead of market demand, education and product availability, consumers pay the price – literally – because they can be priced out of the new, more energy-efficient home – and continue to live in a less efficient one.

As new technologies are developed and new materials tested, home builders can – and will – do more, because that makes good business sense.

Builders will continue to innovate and to lead. But it will take the combined efforts of all Americans to make a significant dent in the amount of energy we use. The efforts of one group – the residential building sector – won't be enough. We invite conservation groups, energy advocates and Congress to join us.



Making green building a priority. }

Thanks to the following  
award-winning builders  
whose projects  
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BRIGHTON CONSTRUCTION  
*Omaha, Nebraska*

FERRIER CUSTOM HOMES  
*Fort Worth, Texas*

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