

CLIMATE CHANGE AFFECTS BUILDING AND FACILITY DESIGNS

While the debate over the severity of global warming and subsequent climate change rages on in scientific and political circles, many in our field might be wondering about the potential impact on their public works and public buildings. When people think of global warming, perhaps they picture automobiles and buses spewing noxious exhaust gases, or factories and industrial centers emitting plumes of thick black smoke. While these sources of greenhouse gases are significant, it may come as a surprise that their environmental impact pales in comparison to the impact of the built environment. In fact, buildings and the energy they consume are among the largest contributors to annual greenhouse gas emissions, accounting for almost half of carbon dioxide emissions in the United States, which is more than either the industrial or transportation sectors.¹

AIA Goals

The American Institute of Architects (AIA) understands the relationship between architectural design and greenhouse gas emissions, so it has called on architectural and engineering firms to make a voluntary commitment to promote carbon-neutral building design for

all new and renovated structures by the year 2030.² The commitment calls for a 60 percent reduction in greenhouse gas emissions by 2010, and an additional 10 percent reduction every five years until the 100 percent target is reached.

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Carbon-Neutrality

In the context of global warming, "carbon-neutrality" refers to the balancing of carbon dioxide (CO₂) emissions with an equivalent amount of carbon offsets resulting in net zero emissions of carbon dioxide into the atmosphere - in other words, a zero "carbon footprint". One can also account for other greenhouse gases such as methane (CH₄) and nitrous oxide (N₂O) in terms of their CO₂ equivalence. Over a 100-year period, CH₄ and N₂O are approximately 21 and 310 times more potent than CO₂, respectively.³ For



instance, this means that the release of a single pound of methane is equivalent to the release of about 21 pounds of carbon dioxide in terms of each gas's radiative effect in the atmosphere over 100 years.

According to the Intergovernmental Panel on Climate Change, worldwide atmospheric concentrations of the greenhouse gases carbon dioxide, methane, and nitrous oxide have increased 35 percent, 148 percent, and 18 percent, respectively, from pre-industrial baseline levels (pre-1750) to the year 2005.⁴ On the basis of CO₂ equivalents, the increase over the same period equates to over 50 percent more atmospheric CO₂. Consequently, discussions about anthropogenic greenhouse gas emissions, primarily the burning of fossil fuels, have consistently garnered the attention of environmental professionals and policy makers in recent years, making such phrases as "carbon neutrality," "carbon footprint" and "green design" colloquial not only in technical circles but also in the mainstream media.

¹ United States Environmental Protection Agency (2009). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007.

² American Institute of Architects (2009). AIA Introduces 2030 Commitment Program for Architecture Firms to Develop Action Plans to Reach Goal of Carbon Neutrality by 2030. Press Release: April 30, 2009.

³ Solomon, S.; D. Qin; M. Manning et al. (2007). Technical Summary. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

⁴ Intergovernmental Panel on Climate Change (2007). Climate Change 2007: Synthesis Report.

Legislative Support

The National Governor's Association (NGA) recently passed a resolution in support of the AIA's 2030 goal, making it the largest and arguably most influential legislative body to espouse the idea of carbon-neutral buildings.⁵ Other legislative groups, including the U.S. Conference of Mayors⁶ and the National Association of Counties⁷ have already passed similar resolutions supporting this green initiative.

The endorsement by the NGA is significant in that it may stimulate adoption of the new green building code currently under development by the International Code Council (ICC). The ICC's new building code, which should be available for implementation by cities and states by 2012, is not only consistent with the AIA's goal for carbon-neutral building design by 2030, but it also includes improvements in areas such as water delivery, energy efficiency, air quality, and safety.⁵

Green Building Design

To reach the goal of 100 percent carbon neutrality by 2030, architects and engineers need to generally cultivate building designs and renovations that minimize the use of non-renewable natural resources and

maximize the use of renewable energy sources. For instance, in certain cases it may make sense both environmentally and financially to renovate existing structures rather than tear them down and build new ones. Efficiencies need to be addressed for the entirety of a structure's anticipated life cycle, including construction, operation, and decommissioning.



Many people understandably question the up-front cost versus long-term financial benefit of green building designs. Aside from the health and environmental benefits, numerous studies suggest that over their lifetime green buildings cost less than conventional ones. In a 2003 report to California's Sustainable Building Task Force, it was reported that for a two percent green design and construction premium, the average green building would result in life cycle cost savings of approximately twenty percent of the construction cost.⁸

⁸ Kats, G.; L. Alevantis; A. Berman et al. (2003). The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force.

⁵ New York Times (2009). Governors Call for Carbon-Neutral Buildings by 2030. July 20, 2009.

⁶ American Institute of Architects (2006). Mayors Adopt AIA Position on Sustainability: Call for Reduction in Fossil Fuel Use In Buildings. Press Release: June 8, 2006.

⁷ American Institute of Architects (2008). National Association of Counties Adopts AIA Challenge of Carbon Neutral Public Buildings by 2030. Press Release: July 30, 2008.

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Preparing for Change

Whether or not one fully embraces global warming and climate change, it is difficult to dispute that green initiatives such as the AIA 2030 commitment are becoming more prevalent and continue to build momentum. Now is the ideal time for potentially affected parties to educate themselves and prepare for anticipated changes, before proposals such as the carbon-neutral building code become law. Consultants can offer assistance by assessing the condition of existing structures, and mapping out a plan for the renovation, replacement, or decommissioning of each building at the end of its useful service life. No building is too small or insignificant for consideration, so it is imperative that affected parties evaluate the entirety of their building infrastructure and begin to make plans for the future.

For More Information

American Institute of Architects:
www.aia.org

International Green Construction Code: www.iccsafe.org/cs/IGCC

U.S. Green Building Council:
www.usgbc.org/Default.aspx

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