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Green Building A to Z,

Understanding the Language of Green Building

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Green Buildings Today

Green Buildings in a Global Context

Green buildings are part of a global response to increasing awareness of the role of human activity in causing global climate change.

Buildings account for more than 40% of all global carbon dioxide emissions, one of the main culprits implicated in the phenomenon of global warming.

While the US and Western Europe, Canada and Japan contribute the majority of greenhouse gas emissions at the present time, this situation is going to change dramatically in the near future.

Green Buildings Today

The projected rapid growth of carbon dioxide emissions from China, India, the rest of Asia, Brazil and Russia make it imperative that the entire world participate in reducing the "carbon footprint" (the impact on the environment in terms of the amount of greenhouse gases produced, measured in units of carbon dioxide) of urban civilization over the next 30 years.

Global temperature increases are inevitable, with significant consequences for all of us.

Many observers predict that half the new building over the next three decades will occur in China alone, some 20 billion square meters of new space for residential, commercial and industrial uses.

Without a focus on energy-efficient and green buildings, we have no chance for tackling global climate change.

The US and other developed countries need to set a leadership example in tackling their own contributions to carbon dioxide emissions.

There is every reason to believe that this is not only the socially responsible thing to do, but that it will be good business as well, for the entire world soon will be buying all manner of "carbon reduction" technologies.

There are other practical reasons for innovating with green buildings.

New water conservation, wastewater treatment and water reuse technologies promise to cut building water use in half, perhaps leading to a 5% to 10% reduction in total water use.

Learning how to cut energy use in buildings will also cut water use from thermal power plants (coal and nuclear), estimated to use half the water supply, directly or indirectly.

In fact, most of the 40 largest cities in the world are not in the currently developed world; they are places such as:
Rio de Janeiro and Sao Paulo, Brazil; Mumbai, Chennai, Pune, Bangalore, Delhi and Kolkata, India; Karachi and Lahore, Pakistan; Hong Kong, Beijing, Chongqing, Wuhan, Tianjin, Shenyang, Guangzhou and Shanghai, China.
Of the top 40 cities by population, there are only two in the US: New York and Los Angeles.
In Japan, only one: Tokyo; in Russia, only two: St. Petersburg and Moscow; in Western Europe, only London; in developed East Asia, only Seoul and Singapore.

Clearly, we must introduce green buildings on a massive worldwide scale to halt the growth of carbon dioxide emissions and avoid the potential for major climate changes and severe economic and health disruptions over the next30 to 50 years.

Green buildings also present a way to attack the inequity of global resource distribution by providing affordable housing for the poor that is healthier, more resource efficient and cheaper to own and operate.
Renewable energy systems using the solar and wind energy (which found everywhere) of the planet are powering many poor villages in the developing world, helping to provide education and healthcare in resource-poor environments.

Finally, green buildings are good for the environment. Features such as green roofs emphasize sensitivity to urban habitat preservation.

Innovative onsite stormwater management and the use of sustainably harvested wood and recycled-content materials help reduce the environmental and infrastructure effects of our current building methods.

The essence of good design is having one action carry multiple benefits.

In the year 2035, three-quarters of the built environment in the US will be either new or renovated [representing more than 28 billion square meters of construction].

What was Germany's environmental policy in 2020?

Greenhouse gas (GHG) emissions were cut by 40% by 2020 and would be cut by at least 80% by 2050.

In the field of energy efficiency, Germany reduced primary energy consumption by 20% by 2020 and intends to 50% by 2050.

Green Building History

Created in 1993, the US Green Building Council (USGBC) aims to transform the building industry into a more environmentally responsible activity.

Beginning in the mid-1990s, the USGBC undertook, with financial assistance from the US Department of Energy, the development of a rating and evaluation system to define what a green building represented.

The first system, dubbed Leadership in Energy and Environmental Design or LEED, for new construction and major renovations, was piloted or beta-tested in 1998 and 1999 on about 50 projects in the US.

Understanding Green Buildings:

What do we mean when we speak of green buildings or high-performance buildings?

According to the USGBC, these buildings incorporate design and construction practices that significantly reduce or eliminate the negative impact of buildings on the environment and occupants in five broad areas:

- **Sustainable site planning.**
- **Safeguarding water and water efficiency.**
- **Energy efficiency and renewable energy.**
- **Conservation of materials and resources.**
- **Indoor environmental quality.**

LEED helps buildings to focus on efficiency and leadership to deliver the triple bottom line returns of people, planet and profit.

Today's version of LEED, LEED v5, raises the bar on building standards to address energy efficiency, water conservation, site selection, material selection, day lighting and waste reduction.

The first quarter of 2024 marks the official launch of LEED v5 D&C (Design & Construction), aimed at new construction buildings.

LEED is the world's leading green building project and performance management system, delivering a comprehensive framework for green building design, construction, operations and performance:

LEED (Leadership in Energy and Environmental Design) is an internationally recognized green building certification system, providing third-party verification that a building or community was designed and built using strategies aimed at improving performance across all the metrics that matter most: energy savings, water ...

Typically, green buildings are measured against code buildings - structures that qualify for a building permit but do not exceed the minimum requirements of the building code for health and safety.

In addition, green buildings are often measured according to a system such as the LEED rating system (usgbc.org), the Collaborative for High-Performance Schools (CHPS) ratings (chps.net), the Advanced Building™ guidelines (power yourdesign.com), Green Guide for Healthcare (GGHC)6 or, in some cases, local utility or city guidelines (a number of utilities have rating systems for residential buildings).

Such buildings must score a minimum number of points above “standard building” performance thresholds to qualify for a certification, or a rating as “green” or high-performance.

What Is a Green Building?

We've been talking about green buildings in general.

Now let's get a little more specific about what we actually mean by the term "green building."

A green building is one that is built considering the following five factors.

However, most green buildings do not incorporate all of these measures, but rather the project team picks and chooses those that are appropriate for a project's budget and goals.

1. Promote Selection of Appropriate Sites and Environmentally Sustainable Site Development

• Locate projects on sites away from wetlands, above the 100-year flood level, away from prime agricultural land and away from endangered or threatened species habitat.
• Locate projects on sites where there is already urban infrastructure to serve them.
• Locate projects on brownfield sites that have been remediated of contamination; these usually have infrastructure already in place.
• Provide opportunities and building infrastructure for people to commute to work using public transit and bicycles.
• Minimize parking to discourage excessive auto use.
• Provide low-emission vehicles and car-sharing arrangements to reduce gasoline use.
• Protect open space in site development and restore open space on already impacted sites.
• Manage storm water to reduce the rate and quantity of storm water runoff, and use best practices to clean storm water before it leaves the site.

1. Promote Selection of Appropriate Sites and Environmentally Sustainable Site Development

• Manage landscaping and parking lots to reduce excessive areas of open pavement that cause heating of the area around a building in summer, leading to more air-conditioning use.

• Control interior and exterior light from leaving the site, helping to make skies darker at night.

2. Promote Efficient Use of Water Resources

• Control irrigation water use for landscaping, using as little as possible. Select native landscaping which demands little or no added water.

• Look for alternative ways to reduce sewage flows from the project, possibly even treating the wastewater onsite.

• Use water-conserving fixtures inside the building, to reduce overall water demand.

3. Conserve Energy, Use Renewable Energy and Protect Atmospheric Resources

• Reduce the energy use (and environmental impact) of buildings 20% or more below the level of a standard building.
• Use onsite renewable energy to supply a portion of the building's electrical and gas (thermal energy) needs, using solar photovoltaic (PV) panels or solar water heating.
• Commission the building by verifying the functional performance of all energy-using systems after they are installed but before the building is occupied.
• Reduce the use of ozone-harming and global-warming chemicals in building refrigeration and air-conditioning systems.
• Provide a means to troubleshoot the building's energy use on a continuing basis by installing measuring and monitoring devices.
• Supply 35% or more of the building's electrical supply with purchased green power from offsite installations, typically from wind farms.

4. Conserve Building Materials, Reduce Construction Waste and Sensibly Use Natural Resources

• Install permanent locations for recycling bins to encourage the practice in building operations.

• Reuse existing buildings, including interior and exterior materials, to reduce the energy use and environmental impacts associated with producing new building materials.

• Reduce construction waste disposal by 50% or more to cut costs and reduce landfill use.

• Use salvaged and reclaimed building materials such as decorative brick and wood timbers that are still structurally sound.

• Use recycled-content building materials that are made from “down cycled” materials such as recycled concrete, dry wall, fly ash from coal fired plants and newspapers.

Use materials that are harvested and processed in the region, to cut the transportation impacts associated with bringing them from farther away.

Use rapidly renewable materials that have a ten-year regeneration time or less.

5. Protect and Enhance Indoor Environmental Quality

• Provide non-smoking buildings, or separate ventilation systems where smoking is allowed (such as in high-rise housing).

• Monitor delivery of outside air ventilation so that it responds to demand by using sensors for carbon dioxide levels to adjust air flow.

• Provide for 30% increased ventilation above code levels, or natural ventilation of indoor work areas, to increase the amount of healthy air in the building.

• Conduct construction activities so that there is clean air at the startup of systems and no dust or moisture in materials such as ductwork and sheet rock. The idea is to get rid of “new-building smell” and its associated toxicity.

5. Protect and Enhance Indoor Environmental Quality

• Use low-emitting materials in the building to reduce sources of future pollution, including off-gassing from paints and coatings, adhesives and sealants, carpets and backing and composite (or engineered) wood.
• Make sure that areas where chemicals are mixed or used (such as in house printing plants or large copy rooms) are separately ventilated, and install walk-off mats or grilles at building entrances to capture pollutions before they enter the building.
• Provide for individual thermal comfort of building occupants, with respect to temperature and humidity.
• Provide for occupant control of building lighting and ventilation systems.
• Provide for adequate day lighting of interior work spaces, using both vision glazing and overhead light sources such as skylights and roof monitors (vertical glazing).
• Provide for views of the outdoors from at least 90% of all workspaces so that people can connect with the environment.

Becoming a Green Building Advocate.

In Your Office or Workplace.

There are many things you can do where you work to promote green buildings and sustainable design.

Reducing Your Carbon Footprint

In Your Home or Apartment.

The most powerful agent of change is your own personal experience.

Think of what you can do to promote green buildings and green operations where you live.

Your College or University

Your Town, City or State: The Power of Local Initiatives

Green Building Terms

In this lecture, we present a brief explanation of the most important terms used in green building discussions.

These terms are typically used by architects, engineers, builders, developers, local officials and building managers to describe the green building attributes of a specific development.

Our intention here is not to present a complete description of each topic, but to give you a brief, technically accurate introduction, so that you'll have a better understanding of what people are talking about when the subject of green buildings comes up.

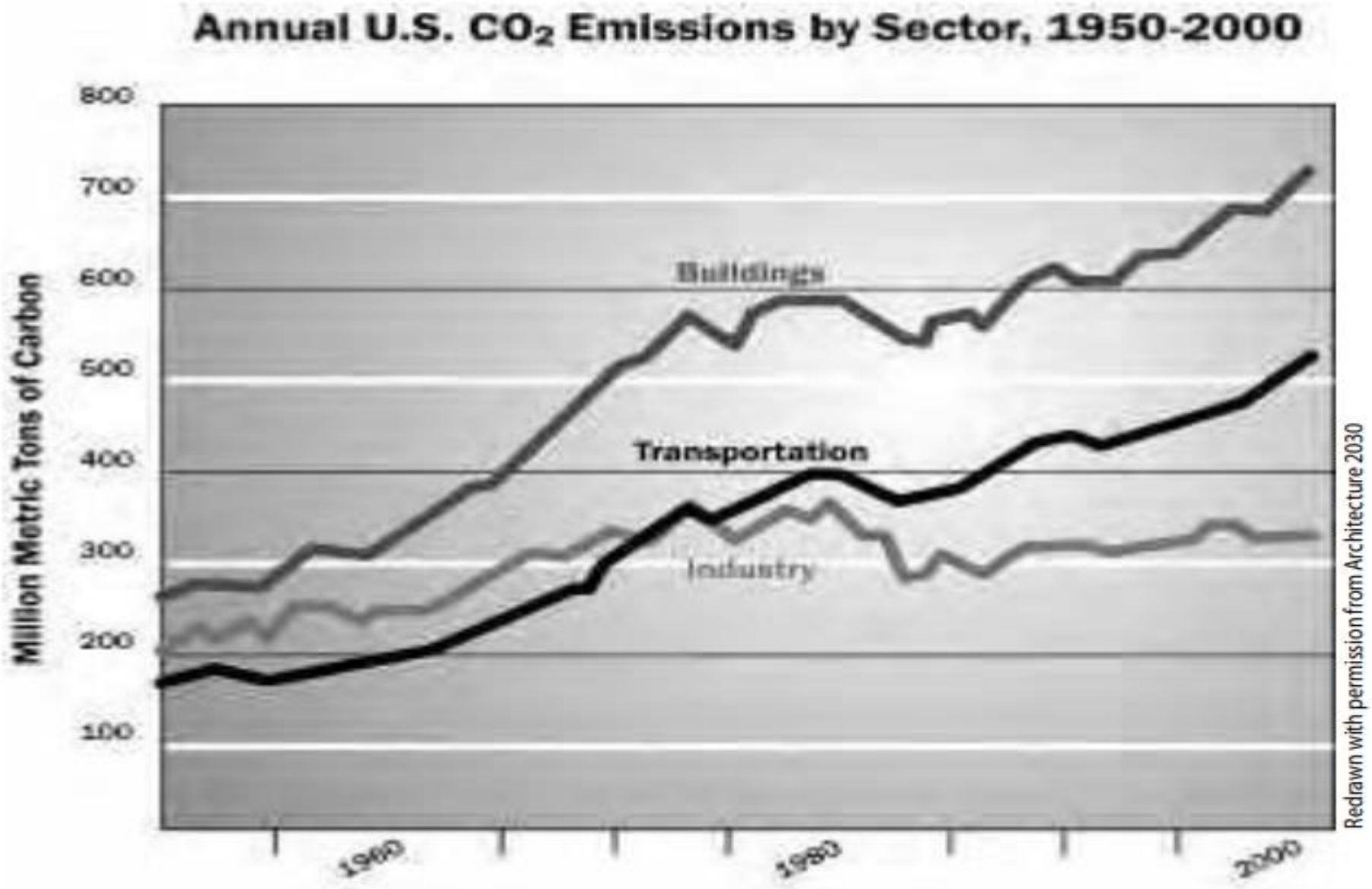
At the end of the book, there is a resource section with access to further information, so that you can investigate each topic as much as you please.

Green Building Terms

Architects and engineers often lapse into techno-speak, using acronyms and terms that even the intelligent and well-informed non-professional can’t understand.

Most green building concepts are understandable to anyone who paid attention in high-school physics and chemistry classes or has ever worked around their own home.

Certain terms have been appropriated from general use and have acquired their own specialized meanings, such as “building envelope,” a term used to denote the exterior of a building, including the type and amount of glazing (glass) and insulation used.



Residential and commercial sector carbon dioxide emissions, 1950–2000. Without changes in present practices, emissions would increase 37% by 2030.

Costs of Green Buildings

As we showed earlier, a main barrier to implementing green buildings has been the perceived cost increases for green measures.

It is true that many of the earlier green projects in the 2000 to 2005 period were more costly.

This is largely because the transition to new methods of design and construction involves a lot of social learning that is accompanied by construction mistakes, poor designs, unproven new products and a myriad of reasons leading to extra costs.

By 2005 and especially in 2006, however, many design and construction teams had done enough green projects to start lowering costs to more conventional levels.

What determines the cost of a green building?

First and foremost, it depends on what the design team and owner are trying to achieve. If it's a LEED Platinum building, they most likely will use green roofs and photovoltaic, two expensive additions to a project that may not be included in a LEED Silver or possibly even a LEED Gold project.

Second, it depends how early in the process the project decides to pursue sustainable design and construction. It's best if that decision is made as early as possible, even during the site selection process, so that a building can be properly oriented, with a rectangular shape that allows for good day lighting and efficient passive solar design measures.

Third, it depends still on the experience of the design and construction team with green buildings; the more experience, the less the cost premium based on both fear of the unknown and lack of knowledge about sourcing green products, for example. Less-experienced teams often use green building consultants to help them out with their first project, to accelerate the learning curve.

Integrated design often leads to creative solutions that allow teams to “tunnel through the cost barrier” and design a more energy-efficient building at a lower initial cost.

Typically, this is done by having the architecture do some of the work of cutting energy use, as well as heating and cooling a building with day lighting, shading devices, highly efficient windows, orientation and heavy mass construction.

Green buildings can also cut other project costs by saving on infrastructure investments and connection charges for storm drainage and sewage connections through total water system management.

Often, by thinking strategically in the first 30 days of a project, you can influence 65% of total costs by assessing a broader range of options, making choices among key cost drivers and having a clear vision of results.

One of the most widely cited studies of the costs of green buildings was done by the international cost-consulting firm Davis Langdon in 2004 and updated early in 2007.

Using their own proprietary database of actual building costs, and comparing 45 LEED projects with 93 other non-LEED projects.

Davis Langdon discovered that green building costs (for three types of common projects — libraries, academic classrooms and laboratories) were statistically no different than conventional building costs when normalized for year of completion (taking cost inflation out of the analysis) and location (reflecting the variation of building costs by locality).

THANKS

QUESTIONS ?