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Green Building
INTRODUCTION

Green building (also called sustainable building, or high performance design, or healthy building practices) seeks to reduce negative environmental and health impacts of buildings through better design, siting, construction, operation, maintenance, and removal practices—without compromising aesthetic appeal or budget criteria. There is a focus on increasing the efficiency of energy, water use, and materials resources, as well as on reducing negative human health impacts throughout a building's life cycle. Green building is often called sustainable building because its practices make use of ecosystems and their resources in a way that meets the current needs of people and communities without compromising the needs and options of future generations.

Across the country, the trend of incorporating green principles in houses and communities is growing. The U. S. Green Building Council,[1] a national trade association established in 1993, held its first national convention in 2002 with just a few hundred people in attendance. In the fall of 2008, there were nearly 30,000 in attendance from all over the world. In the opening plenary, Bishop Desmond Tutu told attendees that we “are a remarkable people” and can do what we need to do if we set our minds and hearts to it; and the final plenary included a statement from E. O. Wilson, eminent biologist: “We will either settle down, achieve sustainability and do it right, or completely wreck the planet.” This conference reflected a growing movement to create more healthy living environments through building greener homes, buildings, and communities.

As the movement has matured, the earlier perception that "greening" is about *sacrifice* has evolved into an awareness that it is really about *excellence* and *appropriateness*. This evolution reflects a greater understanding that *all* elements of our living environment have an impact on the health and well-being of people and their surroundings. At all levels of society—national, state, and local—many aspects and issues have emerged to compel this movement to "build green"—for example, the responsibilities associated with environmental stewardship; the impact of the environment on health and productivity; the future status of non-renewable energy resources; the economic potential of green building, including new products and local jobs for services, manufacturing, and renewable energy production; and the willingness to redefine growth beyond conventional definitions.

Following are examples of real-world situations that are driving the global development of green building expertise as a means of sustaining the health and well-being of both the planet and its residents.

Planetary Health: There are many aspects of the living environment that can be positively influenced by a more respectful, sustainable use of our planet and its resources; for example:

- *Water*— The Earth's supply of potable water is limited. According to the U. S. Department of the Interior,[2] only three per cent of the Earth's total water is non-saline freshwater (two per cent locked up in glaciers and icecaps and one per cent available as surface and ground water). Practices that use potable water for throw-away systems (such as toilet flushing) are a questionable use of a critically limited resource. According to the Water Research Foundation, daily indoor per-person water use in the United States is 69.3 gallons,[3] about twice the per-person use in Europe.

- *Air*— Every place on the planet is interconnected, and harmful substances emitted in any one country will come to the others, affecting people and regions well beyond the point of origin. Reducing or avoiding those emissions benefits *all* people; in addition, innovative development can strive to identify a healthful use for those "waste" products.

- *Soil*— Various actions can have significant unintended impacts on the sustainable quality of the earth's soil, and these impacts are often not recognized or not taken into account. For example, removing older-growth trees and brush that replenish the soil with their leavings, destroys soil. Or, when outmoded farming methods or climate changes deplete the soil's nutrients, it becomes harder or impossible to obtain healthful food from the earth. Other actions, such as building roads, dumping waste, logging, re-routing waterways, and aerial spraying affect the quality of the soil on a long-term basis.

- *Diversity of species*— Many species of plants and animals have become extinct and others are endangered—due to several reasons, including the increasing sprawl of humans, a general unawareness of or indifference to these plants and animals, and a lack of knowledge of the critical role that *variety* in plants and animals plays in sustaining the environment and the critical balance of nature. In many ways, true (closed) cycles (which encourage creation of diversity in some species to balance a loss in others) are declining because of activities and behaviors; for example, farming systems in the United States encourage huge farms of single crops, together with engineering to make one crop variation dominant.

Health and Performance of People:
Environment-related decisions—both unintended and calculated—have direct, often long-lasting impacts on health and well-being; for example:

- People spend an average of 90 per cent of their days and nights in their homes and public buildings; but the materials used for construction and for furnishings are often toxic, sometimes intentionally planned to achieve a laudable purpose. For example, electronics and clothing are produced with fire retardants to

protect users from fire, but with the knowledge that those substances can increase the risk of cancer or endocrine disruption.

- Coal miners and workers in other hazardous jobs are exposed to health hazards that are unsupportable.

- While tens of thousands of chemicals have been created, basic toxicity information is publicly available for only 43 per cent of HPV[4] chemicals and full information on toxicity is publicly available for only seven per cent.[5]

Increasing incidence of many health conditions have been associated, to one degree or another, with environmental toxicity, including lung disorders, contact illnesses, bioaccumulation of toxins, and poor performance; for example:

- According to the American Academy of Allergy Asthma and Immunology,[6] an estimated 300 million people worldwide suffer from asthma; 250,000 annual deaths are attributed to the disease; workplace conditions, such as exposure to fumes, gases, or dust, are responsible for 11 per cent of asthma cases worldwide; and about 70 per cent of asthmatics also have allergies. The prevalence of asthma increased 75 per cent between 1980 and 1994, and asthma rates in children under the age of five increased more than 160 per cent during that time period.

- Eczema, various skin disorders, and other allergy-related sensitivities have increased.[7]

- Nearly 16 per cent of women of childbearing age have mercury levels above what is considered safe.[8]

- Buildings with little or no natural daylight have resulted in eye strain, depression, and decreased productivity. Children in schools that were well-lit with natural light were found to do better academically.[9] Poor air quality can cause migraine headaches, dizziness, lack of focus on tasks at hand, and can even potentially cause heart strain. Nationwide, the number of children in special education programs with learning disabilities increased 191 per cent between 1977 and 1994.[10]

Economics: Green buildings, even those that use the LEED[11] rating system, do not need to cost more than “conventional” buildings to construct; for example:

- The use of passive solar gain, controlled day-lighting, and cross-ventilating breezes are natural systems that have their basis in things that are free, giving a building an economic leg-up on operational costs.

- Builders can choose to work with the landscape in which the building is situated. Common green areas with indigenous plantings can reduce chemical-use, as well as the energy and money spent on lawn care.

When green-building adds to initial construction costs, this can be viewed within the overall costs of operating and maintaining the building over the long term. Green buildings are typically built better, with more durable materials and more efficient products; thus, they last longer, perform significantly better in monthly operating costs, and recoup any initial additional costs in a reasonable period of time. However, decisions can be difficult to make when considering only the initial construction-cost feasibility. For example, if a project is green (no toxins, much recycled content, materials made locally)—in response to the homeowner's heightened sensitivities to chemicals or to a mission directive to support local businesses—but costs 20 per cent more, tough choices have to be made to accommodate the additional project cost within the established budget.

The three topics above illustrate *Triple Bottom Line* (TBL) thinking, where each decision is weighed against the benefit or cost to the people affected, to the planet we all inhabit, and to the bottom line of the organization, individual, or community. Employing TBL considerations in each decision can result in a stable and reasonable understanding of the long-term success of a project.

The general movement in green design and planning relates to the TBL approach and employs Integrative Design—pulling the concerned parties into the mix early and working very hard to understand the needs, prioritize the goals, and design with long-term benefits in mind—while balancing the budget, schedule, and program. While such an approach sounds complex, it quickly becomes a less linear, more comprehensive approach to design and planning, resulting in projects that involve fewer changes in construction because more questions are asked and answered early on . . . all opportunities for discussion and benefits are brought up earlier . . . and more, creative alternatives are considered. Two examples can illustrate this:

- No longer is the engineer brought in once a building's “architecture” is set and the engineer then plugs in standard one-size, one-type systems to heat and cool the building. Instead, there is greater understanding that such systems affect the design, and the design should support the parameters and potential of the systems used by the engineer.

- If a building is disturbing the portion of the site that is near the road, consideration can be given to adding sidewalks for the community and water-retention to keep local streams cleaner. Keeping other pieces of the TBL equation in mind, how could the cost of this alternative solution be addressed? Perhaps the city will reduce taxes on the project because the sponsor is engaging the town and supporting its infrastructure beyond the code requirements, and that tax break will make the sidewalk an affordable project cost. Or, an alternative suggestion might be to use permeable concrete for the sidewalks, reducing or eliminating the need for a water-retention system. Or, perhaps a trade can be made with a neighbor—the project includes the sidewalk, but the neighbor agrees to maintain it. Following an Integrative Design approach, discussions such as these allow the project an opportunity to become a positive choice for the people, the community, and the planet.

While an Integrative Design process is often not easy, national organizations are moving forward to support its adoption. The National Charrette Institute[12] specializes in training people to manage the large-scale and long-term planning sessions that must be employed for community projects; the American Institute of Architects[13] promotes this approach and is educating its professionals in this communication skill; and the United States Green Building Council (USGBC)[14] is striving to create rating systems to measure successful application of the process and case studies to inspire users. These three organizations are leaders in understanding sustainability in design and construction and are excellent resources for community planning, green building design, and the tools and processes to achieve green building and sustainability goals.

Inclusive, integrative planning and design, and using a TBL approach, is applicable to any project, be it a neighborhood feasibility study, retirement housing, adaptations to local zoning, a community center project, changes to town infrastructure, or a new kiosk in the town center. For any project, the end result is a more universally accepted, understood, and supported project throughout its design, construction, and implementation. Initial construction and long-term maintenance and operation costs are understood; more people are on board and will work to ensure the success of the project; more people feel that their concerns are addressed and understood; success is more certain; the triple bottom line is clearly understood; and the project works to sustain the health, comfort, and safety of the people and the wider community.

References:

[1] United States Green Building Council (USGBC), 2101 L Street, NW, Washington, DC—a nonprofit trade organization comprising 78 local affiliates, over 20,000 member companies and organizations, and over 100,000 LEED-accredited professionals. Its mission is to work toward creating a sustainable future (environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life) through its LEED green building certification program; educational materials, resources, and activities; networking opportunities; an annual international conference and expo; advocacy in support of public policies that encourage and enable green buildings and communities; and support of the Green Building Certification Institute's LEED Professional Credential Program.
National USGBC: http://www.usgbc.org/Default.aspx.
USGB—New York Chapter: http://www.urbangreencouncil.org/Home.
USGB—New York Upstate Chapter: http://www.greenupstateny.org/.

[2] U. S. Geological Survey, U. S. Department of the Interior, Washington, DC, *Where Is Earth's Water Located*:
http://ga.water.usgs.gov/edu/earthwherewater.html.

[3] Water Research Foundation, Denver, Colorado:
http://www.waterrf.org/Pages/WaterRFHome.aspx.

[4] HPV (High Production Volume): According to the U. S. Environmental Protection Agency, HPV chemicals are "classified as those produced or imported in the United States in quantities of one million pounds or more per year." http://www.epa.gov/HPV/.

[5] Janelle Sorenson (July 28, 2009), "80,000 Chemicals in Everyday Products, but Who's Counting (No one)," *MomsRising.org:* http://www.momsrising.org/blog/80000-chemicals-in-everyday-products-but-whos-counting/.

[6] American Academy of Allergy Asthma and Immunology (AAAAI), *Asthma Statistics.* Milwaukee, WI: AAAAI http://www.aaaai.org/about-the-aaaai/newsroom/asthma-statistics.aspx.

[7] Science Daily (January 8, 2008), "Eczema Still On the Increase Across the Globe," *Science News*. http://www.sciencedaily.com/releases/2008/01/080107112729.htm.

[8, 10] State Environmental Leadership Program and The Institute for Agriculture & Trade Policy (nd), *Mercury and Developmental Disabilities in Minnesota's Children,* Briefing Paper. Minneapolis, MN: The Institute for Agriculture & Trade Policy. http://www.healthobservatory.org/library.cfm?refID=37024.

[9] Karen Stephenson (August 13, 2009), "Student Success Includes Natural Lighting," *Suite 101.com*. http://suite101.com/article/student-success-includes-natural-lighting-a138865.

[11] LEED (Leadership in Energy and Environmental Design), an internationally recognized green building rating and certification system established by the U. S. Green Building Council, which provides third-party verification that a building or community has been designed and built using strategies that improve performance in energy savings, water efficiency, CO_2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts: http://www.usgbc.org/DisplayPage.aspx?CategoryID=19.

[12] National Charrette Institute, Portland, Oregon: http://www.charretteinstitute.org/.

[13] American Institute of Architects, Washington, DC: http://www.aia.org/.

[14] United States Green Building Council (USGBC), Washington, DC: http://www.usgbc.org.