



**Prairie
Stewardship
Network**

*Engaging people and communities in
climate change solutions*

Sustainable Buildings and Their Relationship to Climate Stewardship

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Introduction

- The impact of buildings on the environment and climate change is significant.
- Buildings in the U.S. annually account for:
 - More than 30 percent of the total energy and more than 60 percent of the electricity used in the U.S.;
 - 39 percent of the country's CO₂ emissions;
 - 30 percent of raw material use;
 - 30 percent of waste output/136 million tons annually; and
 - 12 percent of potable water consumption.
- A typical commercial construction project in the U.S. produces 2.5 lbs of solid waste per square foot.
- Reckless, uncontrolled, poorly planned or unplanned development consumes massive amounts of land in the U.S., causing people to drive farther and farther to get to jobs and basic services. Typical development shifts land usage away from natural, biologically diverse habitats to hardscape that is impervious and devoid of the biodiversity needed to sustain the climate.
- Green building practices can substantially reduce or eliminate negative environmental impacts and improve existing unsustainable design, construction and operational practices.
- Studies show that:
 - Average LEED (Leadership in Energy and Environmental Design) certified buildings consume 20 to 50 percent less energy than standard buildings and give off 40 percent less CO₂.
 - Students in day-lit schools score higher in standardized tests.
 - Workers in green buildings reported productivity gains of 16 percent.
- Green buildings also reduce long-term operating expenses (pay me now or pay me later) and reduce potential liability resulting from indoor air quality problems.
- Utility costs will be more than the cost of construction over the life of a LEED building, so why not design a building that reduces the operational costs while also preserving our environment and climate?
- Green design has environmental, economic and social elements that benefit everyone who occupies or owns a green building.

Utilizing Green Building Construction Technology

Leadership in Energy and Environmental Design (LEED) Certification is a green building rating system sponsored by the U.S. Green Building Council (USGBC). Features include:

- Creating or Choosing Sustainable Sites
 - Prevent storm water pollution during construction.
 - Select sites that are previously developed Brownfield or preserve original site conditions of undeveloped sites with native vegetation.
 - Consider site location and community connectivity: select sites close to community amenities.
 - Promote alternate transportation: public transport, bikes, low emitting vehicles.
 - Control storm water runoff.
 - Reduce heat island effect with material selection. Heat island is the effect of dark urban surfaces causing a rise in air temperature.
 - Reduce light pollution from site lighting.

- Increasing Water Efficiency
 - Landscape: use native or adapted plants.
 - Irrigation: use efficient irrigation systems, reuse storm water for irrigation.
 - Wastewater technologies: recycle grey water on site for toilet flushing, irrigation.
 - Water use reduction: select low flow toilet fixtures, waterless urinals, composting toilets.

- Energy Efficiency and Atmosphere
 - Maximize energy performance of mechanical and electrical systems.
 - Orient building for passive solar heating.
 - Utilize day lighting (by using natural light to illuminate rooms).
 - Allow for natural ventilation.
 - Create an efficient building envelope through good wall and roof insulation, high efficiency windows, vapor barriers, caulking at joints.
 - Reduce or eliminate greenhouse gases and ozone depleting gases in equipment, eliminate chlorofluorocarbons (CFCs).
 - Include on-site renewable energy options; for example, wind, photovoltaic, solar hot water heating, biomass, mini-hydro, and green power (through renewable energy certificates).

- Material Selection and Resources
 - Promote recycling in the finished building and during construction. Add recycling stations and rooms.
 - Reuse old buildings and materials.
 - Use material with recycled content – Fly-Ash, carpet, ceiling tiles, etc..
 - Select regional materials, rapidly renewable materials, and FSC (Forest Stewardship Council) certified wood. Buy locally produced materials (within 500 miles) and use materials that are rapidly renewable (bamboo, waste agricultural products, i.e. strawboard panel, straw bales).

- Indoor Environmental Quality
 - Increase outdoor air delivery and promote natural ventilation.
 - Select non-toxic and low-emitting materials – adhesives, paints, carpets, composite wood products – taking into account the impact to humans, the environment and climate.
 - Utilize occupant controllable systems: thermal and lighting.
 - Allow for day lighting and views to the exterior from all occupied spaces.

Have a Holistic Design Approach to Building:

- Create a collaborative effort between building owners, occupants, and design professionals to promote a green building process that will create a healthy and efficient building.
- Model design concepts holistically to gain greater efficiency.
 - For example: Window openings with sun shades. Orient windows to allow direct sunlight to enter during winter (this reduces heating required). Shade windows during the summer (this reduces cooling required). Sun shades also act as light shelves to daylight spaces and, with the use of automatic light controls during daylight, sun shades also reduce the electrical load. Reduced artificial lights mean less heat gain from fixtures, which results in reduced cooling loads, etc..
- Bio-mimicry – using how nature holistically works as a model for the design of buildings. There is no waste or pollution in natural systems. Everything is reused.

The Cost of a Certified Green Building

LEED certified projects average only 3 percent more than standard construction, while some LEED certified projects have *no* increase in costs over standard construction. Additional construction costs of LEED certified buildings are repaid in operational savings usually within a few years.

Conclusion

The built environment has a profound impact on the natural environment and climate. It can affect health and productivity. We are called to be stewards of the earth, and we have the knowledge in building science, technology and operations to create buildings that can make a positive contribution to the world we are living in. Let us use this knowledge to create the future.

Websites of interest

www.usgbc.org – US Green Building Council

www.rmi.org – Rocky Mountain Institute

www.aia.org – American Institute of Architects (click on sustainability)

www.nccecojustice.org/grbuilding.htm – National Council of Churches of Christ (Green building and Faith Resources)

<http://www.fscus.org/> – Forest Stewardship Council, United States