What is **Green** Building? Why It Matters.

by Al Terry, AIA

SOLOMON'S TEMPLE, described in I Kings 6, is among the earliest documented buildings in human history. Located on Jerusalem's high ground overlooking the Kidron Valley and facing east toward the Mount of Olives, it was laid out axially proceeding from the outer courtyard into the vestibule, through the sanctuary and altar, finally arriving at the innermost room reserved for the holy of holies. The Temple's description indicates a clear set of proportional relationships based on the cubit (itself a proportional measure of humans made in God's image). It was built of stone with a roof of cedar beams and planks from the forests of Lebanon. The interior lined with cedar lit from high windows must have been a dazzling sight celebrating the glory of God with a room encrusted in gold.

WAS IT "GREEN"?

Just what is "green" building? Should building green matter to churches? Is there anything to gain from building green? What is involved in building a green church?

A widely established scientific consensus today shows that the burning of fossil fuels is directly related to climate change. Churches play a small but significant role in the climate change equation because the heating, cooling, lighting, and powering of our buildings often requires burning fossil fuels. Green building, however, is about more than energy efficiency: it also includes the site, water use, materials, and the quality of the indoor environment.

Among the many reasons why churches should embrace green building, the Genesis call to be stewards of Creation is at the top. Building green is about creating human habitat in a manner consistent with this biblical call.

The advantages to building green churches include

- Protecting natural habitat and open space by minimizing site impacts
- Reducing energy use and associated church building operating costs
- Minimizing contributions by churches to climate change
- Making use of sustainable building materials and methods
- Connecting congregations to the beauty of Creation.

Green building supports the creation of better buildings. Better buildings are a result of good planning, good design, and construction methods which incorporate green solutions. A number of excellent programs and resources are available to assist with the green building process. Among those directly related to churches are the National Council of Churches Web site www.nccecojustice.org with their "Building a Firm Foundation" guide and the EPA's Web site www.energystar.gov/congregation. The USGBC LEED program and the GBI Green Globes program are two green building certification programs with many helpful resources. While these programs provide a good way to measure the "greenness" of a building project, it is the design strategies that green building has to offer that are of greatest benefit. The "good news" is that many of these methods have been around for a long time, and many of the great religious buildings of history have made use of them.

As we know, much of Jesus' ministry was lived outdoors in places like the wilderness, the Sea of Galilee, and Gethsemane. We consider these places sacred ground, but so, too, are the places where our spiritual communities worship. It is imperative to set our churches in and on the land with care and respect.

THE IMPORTANCE OF LOCATION

Choosing the right location is one of the most important decisions a church will ever make. Location can affect lot size requirements, parking, access to public transportation, proximity to community services, and impacts on natural habitat, wetlands, or farmlands. For example, the average development cost for a parking space in the U.S. is now almost ten thousand dollars, and there are other costs as well: loss of vegetation, increase in the

heat island effect, chemical, and pollutant runoff, and increased rate of storm water runoff that causes flooding. St Peters Lutheran Church in New York City was originally an overbuilt church that covered the entire block before arranging with Citicorp to share the site. Now the spot has an office tower and a beautiful church of the right size for the congregation, which takes advantage of shared parking and nearby public transportation.

A "green" roof can be another effective way to reduce environmental impacts by creating a building with a longer roof life, lower heating and cooling costs, reduced heat island effect, and slowed storm water runoff rates—all while creating oxygen and reducing carbon dioxide. Planting trees and landscaping parking lots can also provide many of the same benefits as green roofs, while creating a pleasant place to arrive, and transition into the worship experience.

Water, a necessity of life and a central feature of baptism, can be conserved by planting drought-tolerant landscapes and using efficient irrigation systems. The use of waterless or low flow urinals, dual flush toilets, and faucet strainers are appropriate ways to conserve this precious resource. The narrow water channels used to irrigate the trees in the Court of the Oranges next to the Mosque in Cordoba, Spain, are beautiful examples of how to conserve and use water in a sacred way in the garden, a microcosm of paradise.

Energy use is a concern for many congregations because it is often their largest non-salary expense. It is also worthwhile to consider some of the other costs of building energy use:

- The U.S. uses one quarter of all the energy consumed on Earth every year.
- The U.S. Energy Information Administration estimates forty- eight percent, or nearly half, of U.S. carbon dioxide emissions come from buildings.
- Seventy percent of U.S. power plant energy is used to light, power, and cool buildings. Most of that energy comes from burning coal that causes acid rain.
- Together U.S. buildings make up the single largest contribution to Climate Change in the world.
- Church buildings use approximately two percent of the energy used in buildings in the U.S. each year.

The technology is available today to build zero energy or carbon neutral buildings (buildings that need no outside energy and have no smokestack emissions), and we know how to do it. The most cost effective way to go about it is in this order:

1. Plan the appropriate size building
2. Design the building to make use of the naturally available energy opportunities
3. Build buildings that conserve energy
4. Employ the most efficient equipment to heat, cool, and light our building
5. Make use of renewable energy technologies.

GREEN IS STEWARDSHIP

Good stewardship of resources involves being clear about needs for church space. This clarity about program needs will make it possible to identify opportunities for multiuse rooms that can allow for the building of better, smaller church buildings—better because they are less expensive to operate, energize, and maintain; they leave a smaller footprint on the earth, and the financial resources can be invested in higher quality church.

Some building design strategies that dramatically reduce the need for fossil fuels or renewable energy to heat, cool, and light our buildings include earth sheltering and thermal mass to stabilize building temperatures; passive solar gain for heating; natural ventilation and shading for cool-

Summary

- Green building is about more than energy efficiency: it also includes the site, water use, materials, and the quality of the indoor environment.
- Building green is about creating human habitat in a manner consistent with this biblical call.
- Green building supports the creation of better buildings.
- Seventy percent of U.S. power plant energy is used to light, power, and cool buildings. The technology is available today to build zero energy or carbon neutral buildings (buildings that need no outside energy and have no smokestack emissions).
- Good stewardship of resources involves being clear about needs for church space. It is less expensive to incorporate energy conservation into building construction than it is to create and use that same energy efficiently in another way. Using renewable or solar energy is actually the only way to create a zero-energy building.
- At the heart of sustainable building material use is the mantra "reduce—reuse—recycle—renew."
- Using high efficiency lighting, appliances, heating, ventilating, and cooling equipment will stretch the energy used as far as possible. More than just a spiritual application, daylighting churches can reduce energy costs related to lighting and cooling by as much as a quarter.

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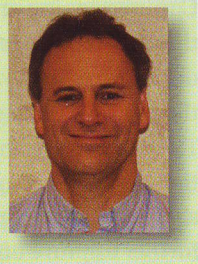

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ing; and daylight for lighting. San Xavier del Bac Mission Church outside of Tucson, Arizona, makes use of a large thermal mass in the three-foot thick adobe brick walls that minimize internal temperature swings between summer and winter and day and night to result in a cool interior in summer and a warm interior in winter.

It is less expensive to incorporate energy conservation into building construction than it is to create and use that same energy efficiently in another way. Energy loss in buildings takes place in three different ways: through walls, roof, and floors; through windows; and, through all the little cracks and holes. Compared to the cost to heat and cool during the average 40-year life of a building, insulating the walls, floor and roof is inexpensive and pays for itself quickly. Window glazing technology has come a long way and the use of low emissivity or Low "E" coatings with insulating glass has dramatically improved the thermal efficiency of windows. And all those pesky little cracks and holes that make up a third of a building's heat or cooling loss are best dealt with by air-sealing the structure prior to insulating. Investing in these measures allows for the use of smaller heating and cooling equipment and requires less energy overall.

Additionally, using high efficiency lighting, appliances, heating, ventilating, and cooling equipment will stretch the energy used as far as possible. Commissioning or tuning these systems to work at their optimum will also improve their energy efficiency. The use of programmable thermostats, occupancy sensors and energy management systems will further improve efficiency by lowering or turning off this equipment when not needed. Saving energy in these ways requires an investment up front, but this will quickly be repaid in lower operating costs.

Green building, however, is about more than energy efficiency: it also includes the site, water use, materials, and the quality of the indoor environment.

Using renewable or solar energy is actually the only way to create a zero-energy building. Turning the building into a small power plant that makes use of active solar heat collectors for hot water or heating and photovoltaic panels to generate usable power on site does this. Another viable alternative is the purchase of green tags or carbon offsets to invest in offsite renewable energy projects such as wind farms to provide a "green" energy supply for the building.

At the heart of sustainable building material use is the mantra "reduce—reuse—recycle—renew." And there is no better place to start than by reducing construction waste; forty percent of the solid waste in landfills comes from building construction and renovation. We can reduce waste by more efficiently using materials in modular sizes, or using durable materials that have a long life and low maintenance which can extend the life of a structure before it must be remodeled or built anew. Another way to reduce is by using locally available materials that reduce transportation energy costs. This in turn reduces the embodied energy of a building (energy used during construction), which can be as much as ten percent of the energy used during a building's life. The stave churches of Norway constructed of locally available wood (a renewable resource) are a wonderful example of this, and the fact that they are several hundred years old means the original embodied energy of the building is now a tiny amount.

Adaptive reuse of a building such as the Pantheon, now used as a Christian church, is a great way, but not the only way, to reuse materials. Salvaged materials such as wood timbers and flooring can sometimes be reused. Recycled steel has been used in building structures for many years now, and has been joined by recycled bricks, glass, concrete and other materials recently. The future will include other products like remanufactured carpets. Renewable material options include bamboo, straw or wheat board, and Forest Stewardship Council certified lumber. Finding ways to reduce, reuse, recycle, and renew will enable us to use the earth's resources more equitably.

Reducing indoor air pollutants by increasing ventilation and introducing fresh air will create a healthier indoor environment for congregations. Limiting the use of volatile organic compounds found in paints, composite wood products, and adhesives can also reduce pollutants. Reducing the use of carpets and changing air filters frequently also helps to control the presence of dust and other allergens.

THE POWER OF LIGHT

Natural light inspires us. It inspired the building of great cathedrals, such as Chartres, that reach for the light of heaven. More than just a spiritual application, daylighting churches can reduce energy costs related to lighting and cooling by as much as a quarter. Daylighting has been shown to increase store sales, increase workplace productivity while reducing absenteeism, and increase student test scores. Although there is no study of daylighting in churches, might the benefits include lower energy bills, better attendance, richer offerings, and a more hospitable environment for visitors?

Environmental Stewardship

Ideas for day-to-day operation

- Build or remodel using techniques and materials that are environmentally efficient.
- Conduct regular energy audits with an eye to reducing fossil fuels use.
- Re-evaluate your lighting needs.
- Use compact fluorescent light bulbs for interior lighting. Install shields on the tops and sides of exterior lights so they illuminate only the intended area and do not contribute to light pollution.
- Install labeled recycling bins throughout the grounds.
- Recycle all discarded papers.
- Choose recycled paper towels for bathroom dispensers and general use.
- Keep dumpsters where parish members can drop off large quantities of recyclable paper and cardboard.
- Buy recycled paper for parish communications. Reuse office paper when possible.
- Use non-chemical cleaning products; buy products which can be diluted and reuse the containers.
- Install efficient plumbing fixtures.

At social events and meetings

- Use as little paper and plastic as possible in food and beverage service.
- When practical, ask parishioners to bring their own ceramic cups.
- If you use paper cups, contact a company that will recycle them.
- Use only plastics recyclable in your area.
- Serve meals low on the food chain (less meat, more grains and legumes).
- Encourage walking, biking, use of public transportation, and car pooling.

On church grounds

- Landscape the grounds of churches, diocesn centers, conference centers, and camps with meditation benches and prayer walks. Just as the architecture, furnishings, and art in the interior of our churches demonstrate our understanding of the sacredness of God's creation, so should the grounds.
- Landscape with native plants to reduce water usage.
- Keep your watering fixtures well-maintained and efficient.
- Use organic fertilizer and environmentally-safe pesticides.
- Add trees to paved parking areas to reduce heat emission.
- Install, where applicable, self-guided nature walks to encourage meditation, prayer, and mindfulness of the surroundings.

Community involvement

- Exchange ideas for promoting responsible stewardship with other parishes.
- Take a stand as a parish on issues which affect the quality of life in your community.
- Join other parishes to pool purchasing power of energy resources.

Source: The Environmental Stewardship Committee of the Episcopal Diocese of West Texas
www.episcopal-dwtx.org/envirosteward

We need to incorporate the natural world into the experience of our buildings, since being in harmony with nature lowers stress and improves psychological and physical health. Thorncrown Chapel is an excellent example of incorporating nature into the church setting. Located near Eureka Springs, Arkansas, and designed by Fay Jones, the chapel is set within the woods and has windows on all sides that provide a view of the trees. Norman L. Koonce, executive vice president and CEO of the AIA had this to say about it:

> "How do the thousands of visitors who annually make what is, in effect, a pilgrimage value this vision? Inside the chapel there stands a handsome donation box, also designed by Jones. Each year, more money is voluntarily dropped in that box than it cost to build the chapel. The box has no lock, yet in all the years Thorncrown Chapel has been open to the public, it appears that not a cent has ever been taken. What an affirmation of the power of architecture to elevate and enrich our human experience!"

SO, WAS SOLOMON'S TEMPLE "GREEN"?

Like most pre-industrial buildings, there were no fossil fuels used to build, heat, cool, or light the temple. It made use of windows for light and ventilation, and relied on the stone's thermal mass to temper summer's heat and winter's cold. The building materials came from nearby, albeit on the backs of a conscripted labor force. And while the cedar used in its construction is a renewable resource, the Cedars of Lebanon forest was likely not managed in a sustainable way. And though we think of the Temple as the building itself, it was actually of modest size, set in a larger complex where the congregation gathered outside in the courtyard surrounded by the beauty of God's Creation. In its way, it has stood the test of time. The Western Wall still serves as an open-air synagogue and a place for all to pray. On the whole, it was and is a green building and a worthy example of what we can strive for in the churches we design and build today.

Resources **to Learn and Do More** about Climate Care

The following list of resources and organizations is compiled to help you find information and groups that can assist you in learning and responding to the growing awareness of creation care. Inclusion on the list does not constitute an endorsement or agreement on the part of NACBA. If you are aware of other resources that should be included, please send information to editor@nacba.net. For an online listing with active hyperlinks see: www.nacba.net/green

AIA 2030 The American Institute of Architect's AIA 2030 sets as a goal that all new buildings and major renovations in the U.S. will be designed to be zero energy or carbon neutral buildings by the year 2030. www.aia.org

The American Scientific Affiliation (ASA) is a fellowship of men and women in science and disciplines that relate to science who share a common fidelity to the Word of God and a commitment to integrity in the practice of science. In matters of science and Christian faith, we offer Christian scholarship, education, fellowship and service to ASA members, churches, and educational institutions, the scientific community, and society. http://www.asa3.org/

Au Sable Institute of Environmental Studies provides university-level courses with transferable credits to over 50 colleges and universities, the framework and services for sustainable community-building, environmental education and restoration for school children and adults, facilities for community and environmental organizations, community and regional conferences and retreats, and outreach services. http://www.ausable.org

Build Carbon Neutral is a Web-based calculator that calculates the approximate embodied energy in a building. Embodied energy is the energy needed to manufacture, transport and install building material in a building. http://www.buildcarbonneutral.org

Catholic Conservation Center: Promoting ecology, environmental justice, and the stewardship of Creation in light of sacred scripture and living tradition of the Roman Catholic Church. http://conservation.catholic.org/

Churches Go Green is a Web site dedicated to helping churches reduce their energy usage, save money and reduce their carbon footprint sponsored by the United Church of Christ. www.churchesgogreen.org

Cooperative Baptist Fellowship The Fellowship Portal focuses on going green. http://cbfportal.wordpress.com/2008/02/27/going-green/

The Cornwall Alliance is a coalition of clergy, theologians, religious leaders, scientists, academics, and policy experts committed to bringing a proper and balanced Biblical view of stewardship to the critical issues of environment and development. http://www.cornwallalliance.org/

Database of State Incentives for Renewables and Efficiency (DSIRE) is a comprehensive source of information on state, local, utility, and Federal incentives that promote renewable energy and energy efficiency. Choose one or both databases to search http://www.dsireusa.org/

Earth Ministry and Energy Conservation Founded in 1992, Earth Ministry's mission is to inspire and mobilize the Christian community to play a leadership role in building a just and sustainable future. They work in partnership with congregations and individuals to respond practically to this great moral challenge through education, individual and congregational lifestyle choices, and organizing for social change through environmental advocacy http://www.earthministry.org/Congregations/energy_conservation.htm

ELCA Resources and Audit Workbook The Environmental Education and Advocacy program of the ELCA is committed to caring for our Lord's creation. This involves the responsible stewardship of all God's creation: soil, air, water, and all of God's living creatures. It recognizes that God is the giver of all life.http://www.elca.org/advocacy/environment/

Energy Education, Inc., provides advice to large churches on how to save energy; worked with mega church in Texas and helped them save over $1.3 million in energy costs in the first year. http://www.energyeducation.com/MarketsWeServe/LargeChurches/tabid/84/Default.aspx

Energy Star The EPA's Energy Star program is a rating and labeling system for energy efficiency of a number of different consumer items including computers, appliances, water heaters and furnaces, and even whole houses. There is also an excellent Web site that includes a great section on ways that churches can reduce their energy usage. www.energystar.gov

The Environmental Stewardship Committee of the Episcopal Diocese of West Texas http://www.episcopal-dwtx.org/envirosteward

The Evangelical Environmental Network (EEN) is a nonprofit organization that seeks to educate, inspire, and mobilize Christians in their effort to care for God's creation, to be faithful stewards of God's provision, and to advocate for actions and policies that honor God and protect the environment. http://creationcare.org

Floresta, a Christian nonprofit organization, reverses deforestation and poverty in the world, by transforming the lives of the rural poor. http://www.floresta.org

Forest Stewardship Council (FSC) is a third party accreditation organization for sustainable lumber and forest products (such as paper). They facilitate one of the most rigorous verification systems in the industry that includes a chain of custody tracking system that follows a piece of lumber from the time it is cut as a tree in a sustainably managed forest till it arrives on a building site and is used in construction. Their verification system also includes a stringent third party accreditation process for recognition of sustainably managed forests. www.fsc.org

The Orthodox Churches and the Environment Conference reached conclusions concerning the fundamental principles emerging from a consideration of the Orthodox position with regard to the ecological problem http://www.goarch.org/en/ourfaith/environment/

Green Building Initiative (GBI) is an organization whose mission is to accelerate the adoption of sustainable design and building practices. They also offer a sustainable building certification system known as Green Globes. The strength of the Green Globes system is its Web-based tracking system that makes extensive use of life cycle cost analysis to evaluate sustainable options in the design of buildings; it is also fairly affordable to administer. Its weakness is that it has a relatively lax verification process; consequently, it is more vulnerable to poor follow through during construction. www.thegbi.org

Green Seal certifies a variety of products, including some building materials as well as many building maintenance products such as cleaners. www.greenseal.org

History of Climate Science This Web site created by Spencer Weart supplements his much shorter book, which tells the history of climate change research as a single story. On this Web site you will find a more complete history in dozens of essays on separate topics, updated annually. http://www.aip.org/history/climate/index.html

Interfaith Power and Light An interfaith ministry devoted to deepening the connection between ecology and faith. Their goal is to help people of faith recognize and fulfill their responsibility for the stewardship of creation. www.theregenerationproject.org

Interfaith Works—Sanctuary Exchange Purchasing renewable power is a tangible way that religious organizations can undertake environmental stewardship. Renewable power is electricity generated from renewable sources such as solar and wind. These sources most often have lower environmental impacts than other sources of electricity production, such as coal, oil, and natural gas. http://www.interfaithworks.org/program-renewable.html

Interstate Renewable Energy Council (IREC) emphasizes education and outreach, stakeholder coordination, technical assistance, workforce development, the adoption and implementation of uniform guidelines and standards, consumer protection, and building networks to share experiences and information. http://www.irecusa.org/

Mennonite Creation Care Network A network for Mennonite people and agencies actively engaged in the care and restoration of God's Creation as part of the missional commitment of Mennonite Church USA and Mennonite Church Canada. http://www.mennocreationcare.org/

National Association of Evangelicals is a first-of-its-kind collaboration, evangelical and scientific leaders estbalished a joint effort to protect the environment. http://www.nae.net

National Council of Churches (NCC) has a Web site promoting a variety of ecological justice programs. They have also published a guide for building green churches entitled "Building a Firm Foundation." www.nccecojustice.org

National Religious Partnership for the Environment (NRPE) Association of independent faith groups across a broad spectrum: the U.S. Confer-

ence of Catholic Bishops, the National Council of Churches U.S.A., the Coalition on the Environment and Jewish Life, and the Evangelical Environmental Network. http://www.nrpe.org

Pew Center on Global Climate Change This site provides facts about the scientific evidence for human impacts on the climate system, specifically global warming. They also include updated data for U.S. emissions. http://www.pewclimate.org/global-warming-basics/facts_and_figures

RENEWAL Project has been designed to make the documentary and its inspiring stories available to people and organizations who want to be a part of this growing movement to protect life on our planet and reverse the damage that humans have done to the environment. Learn how you can get involved today! Across the nation, people of faith are standing up for the environment.

Evangelical Christians are fighting mountaintop removal, a coal mining process that is decimating Appalachia. Muslims are supporting sustainable farming. Jews are helping children experience the bond between nature and spirituality. Interfaith Power and Light is mobilizing people of all faiths in a religious response to global warming. http://renewalproject.net/

Resources for Christian Education Curricula, Action Committees, and Prayer Groups The Environmental Stewardship Committee of the Episcopal Diocese of West Texas http://www.episcopal-dwtx.org/envirosteward2/enviroaids.htm

Southern Baptist Environment & Climate Initiative This ministry began as a simple conviction that Southern Baptists should be actively involved in creation care, but it has now become a promising vision for Southern Baptist stewardship http://www.baptistcreationcare.org/

U.S. Green Building Council (USGBC) is the industry leader in certifying and promoting sustainable or green building. Their Leadership in Environment and Energy in Design (LEED) certification system is based on 69 points that a building project may earn toward several levels of sustainability—silver, gold and platinum levels. They also have a program to accredit sustainable design and building practitioners known as Accredited Professionals or LEED AP. The strength of the LEED certification system is its rigorous certification process that requires third party verification of every point earned. The weakness of their program is that it is relatively expensive to administer and consequently most of the certified buildings are relatively large, where the certification cost represents a small portion of the total cost, or they are projects where the label or USGBC brand has public relations appeal and certification costs can be viewed as a cost of marketing. The 69-point checklist is a useful guide in the design of sustainable buildings even if an organization is not interested in actual certification of their building. www.usgbc.org

Web of Creation Web site has several resources for congregations interested in green building. Check out the "building and grounds" section, it includes a guide for green church building. www.webofcreation.org

For an online listing with active hyperlinks see: www.nacba.net/green