

Professional Project Final

Building Better in Eastern Nebraska:
Insights for a Green Building Program

By Kristina M. Wamstad-Evans

For the degree:
Master of Community and Regional Planning
Department of Community and Regional Planning
University of Nebraska-Lincoln

Professional Project Advisory Committee:
Dr. John K. Hulvershorn, Chair
Professor Gordon P. Scholz
W. Cecil Steward, FAIA, Joslyn Castle Institute

November 18, 2004

Table of Contents

Overview of Project	1
Part I: Framework for Sustainability.....	3
Part II: Identifying Elements of Green Building Programs	8
Guiding Principles of Green Building	9
Critical Environmental Areas	13
Whole-Building Design	15
Life Cycle Assessment.....	16
Envisioning a Green Building Program.....	18
Fundamental Program Questions.....	19
• Who is the target audience?	19
• Who manages the program?.....	20
• What are the partnerships?.....	22
• What building types are considered?	22
• Is the program required?	23
• What incentives are offered?	24
• What is the rating system and how is it applied?.....	25
• How are ratings evaluated?.....	26
• How is quality verified?.....	28
• How are programs funded?.....	29
Part III: Green Building in Nebraska.....	31
Nebraska’s Golden (and Green) Building Legacy.....	31
Nebraska Building Green Today	31
Smaller Steps toward Sustainability Practice	33
Part IV: Recommendations & Strategies	36
Program Design Assumptions.....	36
Five Factors of Community	37
Program Development Recommendations & Strategies.....	38
Bibliography	43
Appendix.....	45
US Green Building Council.....	46
National Association of Home Builders	47
Earth Advantage.....	48
California Green Builder Program (HBA).....	49
Built Green Colorado.....	50
Nebraska Green Built Home.....	51
Florida Green Building Coalition	52
New Jersey Green Affordable Green Program	53
Austin, Texas	54

Boulder, Colorado Green Points	55
Portland, Oregon G/Rated.....	56
Seattle, Washington Sustainable Building.....	57
Scottsdale, Arizona Green Building Program.....	58
Kansas City, Missouri Build Green	59
Atlanta, Georgia EarthCraft House.....	60
Santa Monica, California	61
Built Green of King & Snohomish Counties (Washington).....	62
Frisco, Texas Green Building	63

Tables and Figures

Table 1: Community factors	4
Figure 1: Factors and interconnections in community development.....	5
Figure 2: Sustainability Program Model.....	6
Figure 3: Sustainable Communities	7
Figure 4: Whole-Building Energy Design	15

Overview of Project

Pioneers arriving to the Nebraskan territory embarked on a great transformation of the fledgling state from Great Plains prairie to agriculturally productive land. Upon this economic foundation, residents built a reputation for a strong work ethic and close-knit neighborhoods often associated with agrarian communities. While the qualities linked to Nebraska has expanded to include football fanaticism, corn fields, and long drives in the middle of the night, the base factors of what makes Nebraskans ‘Nebraskan’ persists: hard work and a strong sense of community.

Communities are based on interdependence of people living in a defined space with the basic goal of improving the overall quality of life through cooperative health, safety, and welfare. Yet, no community can exist as a closed system. Regional, national, and international relationships influence community-based processes. Addressing these complex interconnections and relationships in the context of developing a strong quality of life for residents is a challenge. It needs more than a “sense” of community; it requires a strategy for the future.

Sustainable development provides a broad framework for meeting this challenge. The underlying mission for sustainable development is best articulated in the UN Brundtland Commission report, *Our Common Future*: “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (UNCED, 1987)

Sustainable communities are the products of education, visioning, and participation. By learning about the world around us and our options for maximizing quality in our lives, we can make informed decisions about how we want the future to look. The future will never fully be what we expect. It is yet to be defined. However, change is inevitable, thus behavioral changes must be flexible and guided by existing and growing knowledge of complex relationships to reduce the probability of negative consequences.

Green building is one of many strategies for achieving the goal of sustainable communities. A program in Scottsdale, Arizona, provides the clearest definition for this strategy. It describes green building as “a whole systems approach utilizing design and building techniques to minimize environmental impact and reduce the energy consumption of a building while contributing to the health of its occupants.”

Over the last decade, green building ideas have inspired multiple efforts with national, regional, state, and local focal points. As programs developed, ideas about green building were founded based on technical insights and applicability to unique situations. Although the proliferation of the concept is a good thing, the dense and incompatible nature of the programs requires significant sifting for the establishment of second-generation programs.

Applying green building principles requires a contextual model for considering integration of sustainability factors associated with community. These basic factors include environment, economics, socio-cultural elements, public policy, and technology. Simplified, each basic factor represents an ideologically different way people relate within a defined area, called the community. But, as all who live in them have experienced, it is the complexity and integration of these factors that create the sense of place. For long-term success, implementing a green building program will require attention to each factor and the interdependent complexities inherent in the community. A systematic approach with emphasis on facilitating education, visioning, and participation is the best way to build sustainable communities. The first part of this paper, *A Framework for Sustainability*, presents a graphical way of addressing this task.

Furthermore, in order to develop an efficient process for implementing a green building program, it is important to understand the guiding principles behind green building, the processes by which other programs have developed, and the common elements associated with each. From this, an evaluation of strengths and weaknesses will provide decision makers with the insights for their own programs. The second part of this paper, *Identifying Elements of Green Building Programs*, addresses these topics.

The ultimate purpose of this project is to suggest strategies to progress green building in the State of Nebraska. It would be remiss to not acknowledge past and present efforts. The strongest allies for implementation are the people most familiar with the issues. Part three, *Green Building in Nebraska*, investigates the history, key players, and some of the challenges faced by green building advocates.

This leads into the final part: *Recommendations & Strategies*. Based on the information and analysis from the previous parts, it outlines the author's advice for advancing green building starting at the local level in the Omaha/Lincoln region.

Part I: Framework for Sustainability

In 1987, the United Nations Commission on Environment and Development met to address the increasing levels of environmental deterioration internationally due to imbalances between natural resource use and economic development practices. The meeting produced a document, called *Our Common Future*, also was known as the Brundtland Report, in honor of the commission's chair, Mrs. Gro Harlem Brundtland, Prime Minister of Norway. The most significant thing to come out of the meeting was the concept of sustainable development, defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (UNCED, 1987)

Over a quarter of a century later, this concept is being actively applied to communities throughout the world. In 1992, the United Nations held a Conference on Environment and Development, known as The Earth Summit, in Rio de Janeiro. At the Earth Summit, nations of the world agreed on an action plan for the next century, called Agenda 21. Agenda 21 set forth the following key principles:

- Humans depend on the Earth to sustain life;
- There are linkages between human activity and environmental issues;
- Global concerns require local actions; and
- People have to be involved in planning developments for their own communities if such developments are to be sustainable. (Sitarz, 1994)

Both the Brundtland Commission and Rio's Earth Summit recognized that the pathways to development throughout the 19th and 20th century created a problem: the unhealthy imbalance of factors upon which communities are based. While strengthening ourselves in the short term by unconsciously utilizing natural resources to encourage economic growth thus promoting a higher quality of life, we do so at the expense of resources for the future. The world we are leaving to the next generations may contain obstacles too large for human existence to surmount. Given it is in humanity's interest to perpetuate the species, this trend toward self-destruction must be addressed before sliding down that slippery slope. So, today's question becomes: What can be done to reverse this trend so future generations are not overly burdened with the short-sighted vision of such poor development strategy?

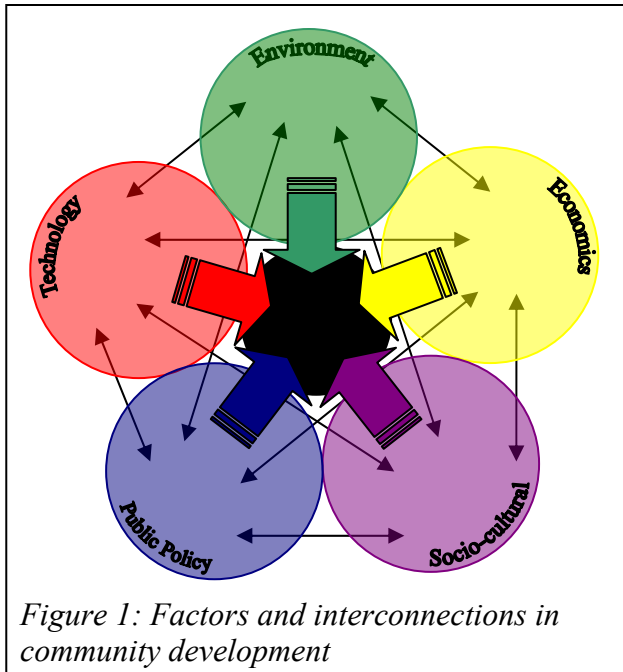
Solutions to this question and others are being flushed out through new ideas for social mechanisms and tools for conservation practice. The basis for all of these notions is that

communities can be theoretically reduced to environment, economics, socio-cultural, public policy, and technology factors. (JCI, 2004) These factors and elements in which they are commonly associated are described in Table 1. Cognitively, the distinctions between these factors are inherently recognized in most modern developed societies.

In community development, reductionism provides order by simplifying complex human and environmental systems to component parts. Reductionism is a view that asserts that entities of a given kind are collections or combinations of entities of a simpler or more basic kind. Expressions denoting such entities are definable in terms of expressions denoting the more basic entities. For instance, the ideas that physical bodies are collections of atoms or that thoughts are combinations of sense impressions are forms of reductionism.

<i>Factor</i>	Environment	Economics	Socio-cultural	Public Policy	Technology
<i>Definition</i>	The complex interaction between biotic and abiotic components influencing the external conditions of an organism or community.	The system of production, distribution, and consumption in a country, region, or community that manages and influences domestic affairs and resources.	The beliefs, customs, arts and institutions relating to a member group who are mutually dependent upon one another for existence.	A body of laws, rules, guidelines and court decisions by which an open society organizes and conducts its affairs.	The application of knowledge to develop tools, materials, techniques, and systems to help people meet and fulfill their needs and extend their capabilities.
<i>Commonly associated with...</i>	<ul style="list-style-type: none"> ● Biodiversity ● Ecosystems ● Climate Change ● Water Quality ● Air Quality ● Natural Resources ● Forests ● Grasslands ● Pristine wilderness ● Toxic wastelands ● Agriculture & Food Production 	<ul style="list-style-type: none"> ● Supply & Demand ● Labor & Employment ● Productivity ● Availability of goods & services ● Trade ● Continuation of existing businesses ● Generation of new business ● Financial structures ● Incentives ● Resource Use 	<ul style="list-style-type: none"> ● Education ● Housing ● Neighborhood ● Equality ● Morals ● Values ● Charity ● Health care ● Symbolism ● Families ● Demographics ● Arts ● History ● Crime & consequence ● Religion 	<ul style="list-style-type: none"> ● Comprehensive Plan ● Design Standards ● Building codes ● Urban Development ● Zoning ordinance ● Executive Orders ● Government structures ● Taxes ● Procurement ● Legislation ● Enforcement ● Justice 	<ul style="list-style-type: none"> ● Transportation: Biped, Vehicle, Rail, & Airplanes ● Communication: Letters & wires, Telephone, Facsimile, Internet, Wireless ● Engineering: Roadways, Bridges & Dams, Energy Generation, Water & Sewage Treatment ● Way of Life: Appliances, Entertainment, Electric Lighting, HVAC, Medical Innovation ● Weapons

Table 1: Community Factors



Reductionism represents the primary ideology upon which many communities are analyzed. An analytical method can provide useful background information, but is a poor tool for developing new programs encouraging sustainability. The realms of each factor can be independently documented or described. However, the reality is that all are dynamic and interdependent causing complexity that must be addressed via a systems approach.

Systems theory was originally proposed in the 1940's by the biologist Ludwig von Bertalanffy. Von Bertalanffy emphasized that

real systems are open to, and interact with, their environments, and that they can acquire qualitatively new properties through emergence, resulting in continual evolution. (Von Bertalanffy, 1976) "Taking a systems perspective necessarily forces one to consider all of the essential elements that interact and make up the behavior of the system under consideration." (Chiras, 2001) Figure 1 presents a graphical model of how the systems theory relates to community development.

Systems theory considers the whole system, addressing its totality, complexity, and dynamics. There are two main approaches to systems theory: hard and soft systems. A hard systems approach defines the problem solving sequence. Hard system decision-making includes problem definition, choice of objectives, identifying various alternative strategies, choosing the best alternative, developing to a prototype stage, and monitoring and modifying the end product.

Another version looks at the costs and benefits of alternative programs, thus creating procedures for optimization of limited resources. In hard systems, objectives, problem specification, and organizational needs are generally taken as a given. (Clayton, Clayton and Radcliffe, 1996) Typically, engineering, architecture, and many physical science disciplines use this approach.

Processes in human-based systems are not always so clearly defined, often containing disagreements regarding goals, objectives, and solutions. In soft system methodology, a more

open ended approach is required where the outcome is not seen as being an optimal solution but rather a continuous learning process. In effect, it strives to answer the question: Given this complex problem situation, how can we improve it? (Bawden, 1991)

A soft systems approach includes reviewing an unstructured problem; clarifying and expressing the problem situation; defining the relevant systems and subsystems (formally or informally); building conceptual models, scenarios, and analogies; comparing these models with the expressed situation; effecting such changes as are currently both feasible and desirable; and taking action to improve the problem situation. (Clayton, Clayton and Radcliffe, 1996)

So, with this understanding of systems theory, emergence, and hard and soft approaches, how do we begin building a coherent strategy for putting sustainable development principles into practice? Successful implementation requires a combination of hard and soft system approaches. For modeling program development, a systematic approach can be considered in three stages: comprehensive education of components and interconnections; visioning of best practices and possible emergences as they relate to objectives, constraints, and resources; and implementation

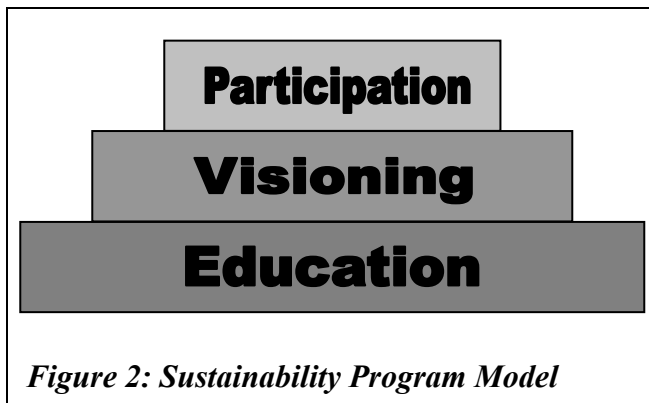


Figure 2: Sustainability Program Model

through participation that explicitly recognizes the risks, costs, and benefits. (JCI, 2004) Figure 2, the Sustainability Program Model, graphically depicts these stages in a hierarchical form.

Although represented in stages, education, visioning, and participation are actually dynamic for the individual participating and the overall program.

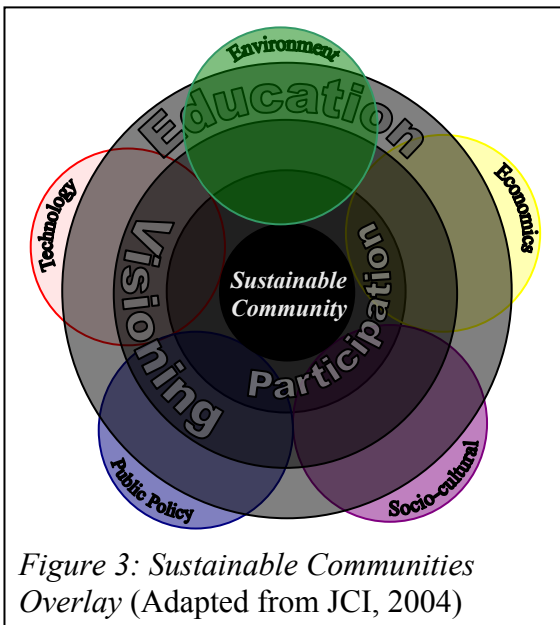
Sustainable development is multi-disciplinary and complex. Information incorporated must be assimilated and adapted to create change in underlying values and behavior. Comprehension by the individual or the group will be biased toward the existing pool of knowledge. Thus, it is vital to involve a diversity of viewpoints and facilitate open communication in the early stages of program development. The key to success is for the individual and the program to develop a balanced approach and further comprehensive understanding of multi-disciplinary issues.

If the education is multi-faceted and balanced, then the effect of the visioning stage will be more profound and empowering. In the visioning stage, the individual or group tackles the question of “how” the program will look:

- Primarily:
 - What are the qualitative goals of the program?
 - Will it be voluntary or mandatory?
 - Who is the target audience?
- Secondly:
 - What does “participation” look like?
 - How will oversight of objectives be managed?
 - What support elements and tools are necessary for implementation?

In the final stage, a clear action strategy is developed based on education and visioning. Some are inherently drawn to “changing the rules” of government or creating a new “structure” to achieve the vision. However, in complex systems, change is inevitable, whether it be in ecology, economics, society, politics, or technology. The program being developed must be flexible enough to account for changes; otherwise, it may lose momentum or deter sincere involvement. Remember that this is a community-building process, not a program defining one.

By overlaying the factors of community with this model of sustainable systems, a graphic is formed that can be used as a tool for participants (see Figure 3). It serves as a reminder that balance is necessary for the process to excel. It can also be used to identify areas of deficiency, generate new ideas, and examine program elements.



This framework is suggested as an underlying philosophy for building sustainable communities. The purpose is to create a foundation to facilitate successful program development. It presents assumptions about mechanisms, fluidity, and emergence that are understood emotionally and mentally, but are difficult to apply without some frame of reference. Fortunately, the depth and breadth of sustainable development strategies today provides a vast resource. The strategy focused on in this research project is green building.

Part II: Identifying Elements of Green Building Programs

Human survival in diverse habitats can be minimally described by the need for sustenance, such as food and water, and micro-climate regulating devices, such as clothing and shelter. In primitive cultures, the method of acquiring the tools for survival included the intensive choice of settlement (staying in one location and gathering materials locally) or the extensive choice of questing (movement to find needed resources, as with nomadic cultures). Humans were required to live according to the limits of their environment.

The cultural evolution of division of labor and trade led to an increase in the types of knowledge and materials available for survival. Transportation meant domiciles no longer needed to be constructed of only locally available materials. Also, protection from environmental factors, such as climate extremes and wild animal attacks, was no longer the sole purpose of a shelter. Buildings were designed to increase personal comfort, to distinguish and designate areas for compatible tasks (such as preparing food or sleeping), and to provide space for commercial ventures. The next step was to increase potential productivity and unify communities by maximizing technological advancements in water, power, and wastewater infrastructures.

This evolution provided the theoretical blocks upon which contemporary buildings are designed and constructed. Today, conventional building practice is designed by an architect based on engineering principles utilizing community infrastructure for the purpose of achieving social expectations of design, cost, and productivity. In the United States and many developed countries, a series of required guidelines, called building codes, dictate how a building should be structurally designed for safety. Internal mechanisms for heating and cooling buildings provide maximum comfort for occupants. Ventilation systems ensure regular movement of air and decreased incidents of mold-related illnesses from trapped water vapor. The advent of steel, concrete, and plastics meant floors of commercial and residential uses could be stacked upon one another to increase density and utilize vertical space as well as horizontal, especially in heavily populated areas. Also, less work would be required to maintain the building against the natural deterioration of materials used in construction. The invention of the elevator assisted high rise occupation above the traditional five stories that were acceptable for stair climbing.

Humans finally escaped the environmental restrictions placed upon their advancement. Or, had they? In the late 1970's, the US experienced an awakening that the energy supply, as it was being derived, was finite and the supply was not under their control. Additionally, claims of

adverse effects from pollution of water and air from manufacturing, transportation, and human settlements made a decade earlier were being validated by environmental degradation. Over the next 20 years, researchers focused on techniques to clean up environmental waste, scientists monitored environmental quality, sociologists documented health concerns of both city and rural habitants, and legislators passed regulation after regulation to control the impacts humans have on their environment.

The theme of interdependency became prevalent in defining the human relationship to the natural world. In order to benefit one way, a choice of sacrifice would need to be made in the other. This still holds true today. For humans, the sacrifice is typically economic. For the natural world, it is degradation. But, must the choice be one or the other?

Advocates of green building say ‘no’. The practice of green building provides a solution to sacrifice based on the scientific idea of mutualism. In biology, mutualism is defined as a relationship between two or more species where the actions of one serve to provide a resource for the other, and vice-versa. However, humans will always benefit at the expense of the environment. The relationship green building hopes to achieve could better be described as parasitic moderation, or decrease the level of impact humans have on the environment while increasing the economic incentive, or benefits. In general terms, building green means seeking out solar or other renewable power sources, utilizing smart architectural design to maximize natural sunlight and ventilation, and selecting recycled and nontoxic construction materials.

(Pierce, N)

Issues of energy dependence, environmental public health, and local economic development are at the forefront of the population’s political and personal concerns in the United States. According to the most recent building industry statistics, the United States has an estimated 5 million commercial structures and 108.3 million residential buildings. (Wilson and Yost, 2001) In 2000, commercial and residential buildings accounted for 36.4% of the total US primary energy consumption. Industry used 36.5% and transportation was 27%. (US DOE, 2001) Given the role transportation plays in construction and maintenance, the actual energy consumption of buildings is much higher. Buildings are a key source of energy consumption, either directly through utilities or indirectly through transportation and land development. In the last 20 years, the US has taken great strides to address energy efficiency by setting standards in appliances and lighting.

The modern definition of green building practice and the strategies to achieve “green” status are not as universally clear. Green building can be categorized in two ways. It is the design practice, construction materials, and innovation applied to an individual building. But, also, it is the program elements developed to support the wider implementation of individual green building practice through availability of mechanisms for technical knowledge and incentives to generate commitments. This project will focus on the later with hope of developing community context for green building practice on a regional and local scale.

This part of the project is split into two sections: The Guiding Principles of Green Building and Envisioning a Green Building Program. These sections are intentionally related to the “Education” and “Vision” elements of the Sustainability Program Model described in *Part I: A Framework for Sustainability*.

Guiding Principles of Green Building

“Humans are profoundly impacted by the buildings we create. Few other influences in our lives can match those represented by the physical surroundings, spiritual association and sense of identity we derive from the places in which we live and work. In turn, it is in buildings that our role as designers and occupants can effect major savings in new and embodied energy, resources, and materials. In buildings we celebrate and reinforce the intangibles of culture, customs, and human habit.” – from “Guidelines for Sustainable Development” (Gerace et al)

The Office of the Federal Environmental Executive defines green building as “the practice of 1) increasing the efficiency with which buildings and their sites use energy, water, and materials, and 2) reducing building impacts on human health and the environment, through better siting, design, construction, operation, maintenance, and removal – the complete building life cycle.” (OFEE, 2003) As mentioned in the introduction, green building has a long and varied history throughout the world as humans sought to construct the best quality shelters from limited resources. Early modern construction methods focused on creating ambience for occupants by stabilizing indoor temperatures and reducing glare from the sun with deep-set windows and awnings. In the US, the urban landscape was transformed in the 1930’s with the rise of air conditioning, low-wattage fluorescent lighting, structural steel, and reflective glass. These technologies and the availability of cheap fossil fuel made it possible to construct enclosed glass-and-steel structures that could be heated and cooled with massive HVAC systems. (Cassidy et al, 2003) The “glass box” building became a design icon of American cities.

In the 1970s, connections between human habitation and environmental quality by profound writers, such as Rachel Carson and Edward Abbey, and the OPEC oil embargo led to a new transformation toward energy efficiency and environmental conservation. The Federal government, through the newly established Department of Energy, actively pursued methods of reducing energy consumption and of changing energy sources away from fossil fuel. This sparked the initial stages of modern green building in the United States. The 1987 UN World Commission on Environment and Development defined the context for these efforts with the term “sustainable development”. Agenda 21, the product of the 1992 Earth Summit, set a blueprint for achieving sustainability throughout the world.

The newly elected President of the United States, Bill Clinton, saw many possibilities in the momentum from the Earth Summit. On Earth Day 1993, he announced plans to make the remodeling of the Presidential mansion and the Old Executive Office Building an example of sustainability with a project called “Greening the White House”. Additionally, President Clinton established the President’s Council on Sustainable Development that produced a report recommending 140 actions to improve the nation’s environment, many through building practice.

The “Greening the White House” project was a success with nearly \$300,000 in annual energy and water savings, landscaping expenses, and solid waste costs over three years. The measurable amount of atmospheric emissions was reduced by 845 tons of carbon per year. Encouraged, several other Federal facilities followed suit. (Cassidy et al, 2003)

During his tenure, President Clinton issued three “greening” executive orders:

- E.O. 13101, September 14, 1998: Improve use of recycled and “environmentally preferred” products;
- E.O. 12123, June 3, 1999: Improve energy management and reduce emissions through better design, construction and operation of Federal buildings; and,
- E.O. 13148, April 21, 2000: Integration of environmental accountability into day-to-day decision making and long-term planning.

The Federal Government was not alone. Their designs and progress in “Greening the White House” was guided by experienced practitioners and organizations, including the American Institute of Architects (AIA). Members of the AIA Environmental Committee recognized the connection between sustainability and the building process. Redefining the “architects” role in this context led to a concerted effort to develop guidelines and programs for the industry.

Inspired by their active participation at the Earth Summit, sustainability was selected as the theme for the June 1993 UIA/AIA World Congress of Architects, named “Architecture at the Crossroads”. Six thousand architects from around the world attended; the convention is recognized as “a turning point in the history of the green building movement.” (Cassidy et al, 2003)

Also in 1993, the US Green Building Council was incorporated with the goal of creating a sustainability rating system that would provide a tool for assessing commercial high-performance building construction. The founders researched several international efforts directed at reducing carbon monoxide and a local program by the City of Austin, Texas. The Austin program is recognized as the first municipal green building program in the US. However, the USGBC did not want to create a national infrastructure for certified assessors or building code officials. Additionally, the rating system needed to address the most environmentally critical aspects of building construction, site development, energy efficiency, water efficiency, indoor environmental quality, and materials use, in a comprehensive and performance-based manner.

The tool developed is known as the Leadership in Energy and Environmental Design (LEED) green rating system. Version 1.0 of LEED was released in late 1998. The pilot indicated several major revisions were necessary before it could be applied universally. LEED version 2.0 was approved in March 2000. Minor refinement led to the current version 2.1 in early 2003. LEED did two things to the building industry: it presented a simple, exciting way to improve building construction by providing a scaled award system and a thorough set of guidelines, and it challenged the assumptions typically made in conventional building practice.

With over 4,000 members, the US Green Building Council is the largest organization dedicated to green building in the US. LEED established a widely-accepted standard upon which all newly constructed commercial green building projects are judged. The USGBC continues to revise LEED for new construction, but they are also expanding the applications of LEED. At their November 2004 annual conference in Portland, Oregon, LEED-Existing Buildings was approved by the membership. Other LEED drafts in various stages of development include commercial interiors, core and shell construction, neighborhood development, and residential homes.

While LEED has captured the commercial building sector, the application of green building standards in the residential sector is less defined. The USGBC is developing guidelines for

residential homes, but early indications suggest the primary focus will be specific to modular housing. Many municipalities and states have worked diligently to develop strategies and standards representative of their local political, economic and environmental conditions. Most programs target the owner of the property, either through voluntary or mandatory participation.

Built Green Colorado was the first Home Builder Association-sponsored program. They emphasized the marketing benefits of green home construction to the builder, its target audience for the program. The program was successful in providing builders with detailed, prescriptive guidelines on how to build for this generally higher-value niche market. Several other HBAs adopted similar programs and, eventually, the National Association of Home Builders (NAHB) took a lead in encouraging all HBAs to create programs in their communities. In September 2004, the NAHB released a pilot version of their green building guidelines with the intention of builders or municipalities adopting or adapting the strategies outlined. If successful, this will propagate niche markets for builders throughout the US.

Although the definition of green building is currently contested, most programs generally recognize three guiding principles: Five critical environmental areas, whole-building design, and life cycle assessment.

Critical Environmental Areas

Most programs employ a rating system to quantify adherence to their green building strategies. Although the divisions within the actual rating systems vary, all involve five critical environmental areas: site development; energy efficiency; water quality and efficiency; indoor environmental quality; and materials and resources. Since this project's purpose is to address programs, not specific strategies, the following paragraphs provide only brief overviews of these areas and their relationship with buildings.

Site design is a process involving the integration of circulation, structure, and utilities within the natural environment. The interaction of a site's climate, resources, and attributes create patterns and processes of the living world to which humans are inextricably linked. Basic tenants may include: promote biodiversity; evaluate site resources; locate buildings to minimize environmental impact; landscape for energy conservation; plan for growing food and returning energy and nutrients to the soil and water cycle; and reuse already disturbed areas.

Energy efficiency primarily means reduction in fossil fuel or other nonrenewable energy sources that have heavy environmental impacts. Although the term ‘energy’ could be applied to each of the other areas, the distinction is that this category typically involves the actual heating (or cooling) of air and water by gas and electricity supplied to the property. Energy efficiency can be achieved directly through the use of renewable energy sources, such as wind turbines, solar collection, and fuel cells, or indirectly through passive solar design, insulation, or other technologies. Energy efficiency is the one critical area with an extensive knowledge-base and many tools available for measuring impact based on performance.

Water efficiency means minimal potable water use from the municipal system. Water efficiency provides a dual cost savings by reducing the volume of water used and sewage treated. Broad strategies include: water efficient landscaping; reuse of catchment or greywater; mechanisms for delivering low water ratios; minimization of hazardous waste leakage to groundwater; and innovative wastewater technologies.

Indoor Environmental Quality involves the air, thermal comfort, light, views, and acoustics in a building. These qualities are enhanced by increased ventilation, avoidance of pollutants, monitoring, individual controls, daylighting, and access to outdoor views. The average time Americans spend indoors is greater than 90%. A building’s indoor environmental quality has a significant impact on the health and productivity of its occupants and on related potential liabilities for its owner.

Green building materials and resources are ideally produced or found locally, have low embodied energy content, and do not offend human senses. Embodied energy content refers to the amount of energy required to harvest, refine, manufacture, and transport a final product. Natural materials are preferred over heavily synthesized or synthetic choices that subject the employees of the manufacturer or the building contractor to toxic or otherwise dangerous working conditions. Products that are not heavily packaged reduce waste and minimize construction site and landfill disposal problems. Choosing water-based paints, adhesives, sealants, and finishes reduces the use of petrochemicals, simplifies cleanup and keeps residual unused chemicals out of landfills, and subsequently, groundwater supplies. Special attention is given to using recycled products as substitutes for raw materials. Adaptive reuse of existing structures is a form of recycling that can save large quantities of building materials, the energy inherent in them and the historic, cultural, and educational value they represent.

Whole-Building Design

Whole-building design is a process that considers all building components, structure and systems, during the design phase to assess how these systems work best together to save energy and reduce environmental impact. Because the systems must be integrated, the building design team must work together from the beginning. The design team may include architects, engineers, building occupants and owners, and specialists.

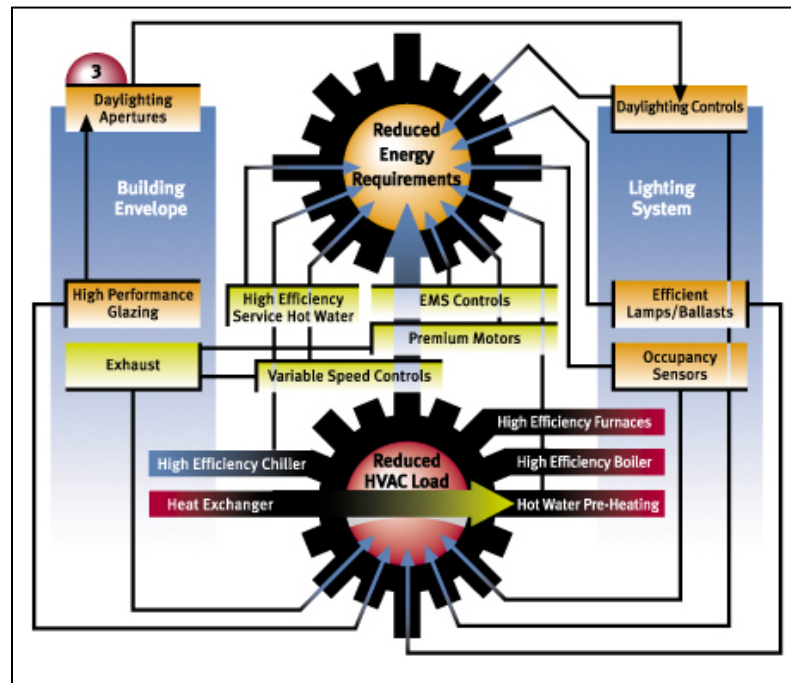


Figure 4: Whole-Building Energy Design (from *Savings by Design*, 2004)

The whole-building philosophy takes into account energy, materials, indoor air quality, acoustics, natural resources, and their interrelations. It is most frequently used in the construction of commercial high performance buildings, but it could theoretically be applied to any building type. Commercial buildings typically have larger budgets and greater flexibility in materials and space design than residential ones. Using economies of scale, model home construction in subdivisions could provide a cost-effective catalyst for applying this EMS concept to more residential buildings.

Figure 4 illustrates the energy optimization that can be achieved when a building's systems are properly integrated. For instance, the level of cooling required in a building is directly affected by window size and placement, glazing characteristics, and configuration of lighting. Use of natural daylight and appropriate lighting controls reduces need for electric illumination, further reducing needed cooling capacity. Major energy savings can result throughout the life of the building with attention to these types of details and awareness of the interaction of a building's components.

The cost of construction and materials for high performance buildings is on average 10% higher than convention buildings of similar size. However, the operations and maintenance costs

are significantly reduced over the life of the building. As practitioners become better acquainted with the process, the initial costs will certainly decrease. The benefits of include: reduce energy use by 50% or more; reduced maintenance and capital costs; reduced environmental impact; increased occupant comfort and health; and increased employee productivity. (US DOE, 2003)

The Whole-Building Design process does not end with the design and construction phases. Operations and maintenance are a vital component of assuring the optimal efficiencies are achieved for the system. The operations and maintenance phase spans the greatest amount of time and is vital to ensuring occupants and owners receive the greatest benefit. It includes the commissioning, or testing, of the building and the choice of products used in day to day operations. Overall impacts from hazardous waste and virgin material use can be significantly lessened through informed choices for environmentally preferable products. Many organizations, including the EPA, provide lists of environmentally preferable products for procurement.

Life Cycle Assessment

Life-Cycle Assessment (LCA) takes a systems approach to evaluating the environmental consequences of a particular product, process, or activity from the “cradle to grave”. (Svoboda, 1995). LCA includes three separate but interrelated components:

- Life Cycle Inventory is an objective, data-based process of quantifying energy and raw materials, air emissions, waterborne effluents, solid wastes, and other environmental releases incurred throughout the life cycle of a product, process, or activity;
- Life Cycle Impact Assessment is an evaluative process of assessing the effects of the environmental findings identified in the inventory component. It addresses both ecological and human impacts, as well as social, cultural, and economic ones; and
- Life Cycle Improvement Analysis is an analysis of opportunities to reduce or mitigate the environmental impact throughout the whole life cycle of a product, process, or activity.

Completing an inventory of all components, materials, systems, and processes, associated with a building’s life span is both complex and time intensive. As LCA is not a required tool, most conventional building techniques do not account for the external effects to environmental quality, public health, or finite resources over time. Without inventory, prediction of the future using impact assessments and imposing improvements are subject to moral and value judgments that are highly controversial.

In green building, tools have been developed to account for some of the costs associated with the whole life of a building. Most notably in the US, BEES (Building for Environmental and Economic Sustainability) was developed by the National Institute of Standards and Technology (NIST) as a technique for selecting cost-effective, environmentally-preferable building products. BEES, a freely downloadable software program, measures the environmental performance of building products by using an approach specified in ISO 14000 standards. All stages in the life of a product are analyzed: raw material acquisition, manufacture, transportation, installation, use, and recycling and waste management. Economic performance covers the costs of initial investment, replacement, operation, maintenance and repair, and disposal. A combination of these two performance elements presents an overall measure upon which decision can be made.

LCA can be a practical tool, but it can also be a philosophical notion. True calculations of life cycle impacts and costs of green building are evolving, but generally not practiced. Whereas LCA considers the pre-, present, and post- stages of components and processes, a related assessment is the measure of cost and benefits over the lifespan of a building, called life-cycle costing (LCC). LCC is often used to compare (and justify) green building practice to conventional methods. Because most economic decision-making systems are based on first-cost rather than externalities and eventual costs, the higher upfront cost (2-10%) of green building places it at a competitive disadvantage. This is the case despite the fact that high performance buildings have been estimated to save owners 20- 30% over a 40-year life span (Kats, 2003; Cole and Sterner, 2000).

Recently, there has been an increase in studies documenting the health value associated with the indoor environmental quality of green buildings. This relates to owner's employee costs for healthcare, sick days, and other leaves of absence. If the absentee rate falls, then logically, more employees are working resulting in higher profit and less expense. Productivity increases, due to cleaner air, increased daylight, and work space more conducive to integration, is yet another benefit. Benefits for health and productivity accounted for 70% of estimated monetary savings of green buildings versus conventional buildings. (Kats, 2003)

A 2000 study on life cycle costing found that all three phases of the building process (design, construction, and operations/maintenance) combined account for only 8% of the total expenses associated with buildings. (Cole and Sterner, 2000) For office buildings, 92% of the cost is linked to the employees and the social (payroll, healthcare, etc) and technical (electronics,

communication devices, etc) systems needed for a business to function. Similarly, of household income, mortgage or rent is typically less than 25% of overall monthly expenses. Utilities, including gas, water, and electric, will account for 8%.

However, this comprehensive view of costs may not be useful to an owner in making direct decisions about building construction, which can be reduced to design, construction, and operation and maintenance. Isolating operations and maintenance can account for 55% of this total cost over a 40-year period. (Flanegan and Norman, 1987) Given an economic strength of green building is its ability to save money in the long term, this percent of realized savings is convincing.

Envisioning a Green Building Program

For this project, the author evaluated eighteen established green building programs to synthesize the fundamental programmatic elements. These elements are the foundation upon which the community green building agendas are designed. Generally, the programs can be distinguished in one of two ways: external or internal. External programs focus on community-wide implementation. Internal programs look at an institution, such as a city, as an owner and regard how they apply green building standards to themselves through self-imposed regulations. Programs included in this study are:

- US Green Building Council
- National Association of Home Builders
- Earth Advantage
- California Green Builder Program (HBA)
- Built Green Colorado
- Nebraska Green Built Home
- Florida Green Building Coalition
- New Jersey Green Affordable Green Program
- Austin, Texas
- Boulder, Colorado Green Points
- Portland, Oregon G/Rated
- Seattle, Washington Sustainable Building
- Scottsdale, Arizona Green Building Program
- Kansas City, Missouri Build Green
- Atlanta, Georgia EarthCraft House
- Santa Monica, California
- Built Green of King & Snohomish Counties (Washington)
- Frisco, Texas Green Building

Appendix A contains an overview of each program and describes perceived strengths and weaknesses. The programs selected represent a broad spectrum of approaches based on their applicability to regional or local implementation. To understand the fundamentals of each program, the following questions were asked:

- Who is the target audience?
- Who manages the program?
- What are the partnerships?
- What building types are considered?
- Is the program required?
- What incentives are offered?
- What is the rating system and how is it applied?
- How are ratings evaluated?
- How is quality verified?
- How are programs funded?

The following section addresses these questions as synthesized from the reviewed programs.

Fundamental program questions

- *Who is the target audience?*

In the review of programs, three groups can be defined based on how the program is being applied: owner, practitioner, and institutional. Owners are direct consumers of the building. They are responsible not only for defining their wants and needs, but also for the operation and maintenance of the buildings after constructed. They are concerned with the quality of construction, design, and long-term maintenance costs. Often, owners make decisions based on emotional attachment, modern functionalism, and design elements, leading to consumer demand for products and services.

Practitioners are the builders, architects, designers, engineers, and other technical providers. Contracted by the owners to provide a service, they focus on the design and construction costs as they relate to end profits. If a project is not profitable or requires too much time (remember, time equals money), it is difficult to justify the effort. They advise owners based on a variety of variables, including cost, design, materials, technologies, and methods. Ultimately, they provide the supply-side of the market. Practitioners can be owners in the cases of model homes, subdivisions, and multi-retail, such as malls, or multi-company office buildings.

Institutional refers generally to government-managed properties, including city office buildings, fire halls, public schools, and other public facilities. Through property management, the institution owns the building, but they differ from other forms of ownership. As publicly accountable entities, they are required to provide multiple services related to the health, safety, and welfare of the community. This is a complex one owner-to-many buildings relationship entitled to special considerations, particularly for procurement, operations, and maintenance.

- *Who manages the program?*

Management refers to the type of organization directing the program. The management of the reviewed green building programs fell into five categories: Cities, States, companies, independent non-profit, and Home Builder Associations, a unique class of non-profits among the green building programs.

City-managed programs provide a regulatory structure that facilitates compliance with local zoning and building codes. A city has the power to mandate a program community-wide or in specific sectors of concern. A city represents its residents, but can also lead-by-example. Many cities have taken this approach by requiring green building standards for city-funded new construction over a set square footage. Additionally, cities can encourage residential and commercial green building by offering incentives, revising building codes, and participating in coalitions developing green building program designs.

State government involvement is typically the product of a corresponding state-wide program, such as energy conservation or affordable housing. The end goal of most state-managed programs is to refine the program, transfer implementation tools to the local level, and encourage its progress through incentives, grants, and legislation. A hierarchical system establishes consistent data across communities and allows the state to measure the effects on its ulterior goals. The drawbacks to State-based programs are that they can either be too complex, by attempting to account for multiple factors, or too simple, by generalizing the strategies applied. An alternative role for States is to establish standards and/or incentives based on targeted goals for energy conservation, water and air quality, and solid waste. Further, the same could be developed in the areas of economics, transportation, and health, as they apply to green building. This would set a bar that cities or other programs could use as a baseline for performance elements, a preferable, but difficult measure of environmental and social quality.

There is only one company in the green building arena today. Earth Advantage, a consulting business with close ties to Portland Energy, serves the Northwest region in residential, commercial, and institutional building planning. Their rating system is a recognized brand of quality construction. They also provide LEED certification and documentation services for commercial construction for those companies seeking a more universal rating program. However, the major benefit of Earth Advantage is their support services. The choice of materials and green building strategies can be overwhelming. Now, imagine two overwhelmed parties attempting to negotiate a project. The tension can be great; the means of achieving the end goal can be excruciating. Trained staff guides the building process, ensuring the quality expected is received and that the proper documentation is gathered. Time is money for most building projects. Earth Advantage cuts the time-associated cost by reducing the learning curve of green building and serving as a translator and intermediary between builder and customer. However, as a for-profit business, accessibility to information is proprietary and their services can be expensive. This limits the degree to which all in the community are educated and able to participate.

The reverse tends to be true with independent non-profits. Community education and accessibility are key elements in furthering the mission and goals of the organization. Non-profits can operate at any scale: nationally, state-wide, or city-wide. They function independently of constraints placed on municipal and company-based programs. Thus, they serve as catalysts of an agenda based on values and ideals rather than politics and economics. True believers on boards, committees, and in the membership donate countless hours to achieve the vision. A prime example of this is the US Green Building Council, a non-profit coalition. They must start with the steps of establishing themselves according to the IRS 501(c) 3 status, which can limit their funding options, create new organizational and staffing structures, and require a long time for relationships and credibility to establish.

Home Builder's Associations (HBAs) are established non-profits that advocate and support the home building industry. HBAs exist at 3 different geographic scales: national, state, and city. By joining an HBA at the city level, membership is automatic at state and national levels. Thus, they are locally-based, but interconnected. The Colorado HBA was the first HBA to implement a residential green building program, called Built Green. With a strong reputation and network, transfer of knowledge occurs quickly amongst HBAs. However, HBAs possess inherent bias in

favor of the building industry. In the quest for new market, the potential for unethical “green washing”, or overstatement of green building features to sell product, is a concern for consumers. Additionally, the HBA does not target general education of the public, but rather filters the education through their participating builders.

- *What are the partnerships?*

In current society, accomplishment of program goals relies on one of two things: mandatory regulation or partnerships. Few program managers attempt to go-it-alone. The exceptions to this are cities or states with the regulatory power to impose the program on the populace. This is acceptable when the political nature of the community strongly advocates the position or in cases at an extreme where inaction will have immediate, devastating effects.

Partnerships add diversity of opinion to program development, building consensus and orchestrating an outcome better aligned with reality. With early involvement, partnerships can draw to light potential conflicts that will need to be resolved for the program to succeed. Networking between partners builds interconnectivity that strengthens the overall process. Through partnerships, program managers can educate the community, build interest, and disseminate information on implementation procedures.

“Non-traditional” partnerships are associations between groups that may share an interest in the benefits of green building, but come at it from different angles. A classic example is a partnership between an environmentalist and a developer. Typically, members of these two groups are in opposition to the other over how development should occur. Some environmentalists lean strongly toward natural preservation while most developers are keenly aware of the economic potential in construction of buildings.

For successful and meaningful partnerships to be founded, the program manager must provide strong facilitation centered on the program goals that encourages open dialogue and consideration for diverse viewpoints. Preferably, the focus of the partners should be placed on how to implement guidelines, not on what the guidelines should contain.

- *What building types are considered?*

The use of a building is determined by the occupant’s expectation as a residence, place of school/work, market/retail, and/or other uses. Because of these diverse space functions, the types

of design, technology, operations, and maintenance required differ. These differences are also reflected in appropriate services and products. The distinct building types identified in these programs include: single residential, multi-family residential, commercial, industrial/warehouse, schools & universities, and government. A truly comprehensive program must include all building types. Most green building programs specialize in one or just a few.

Nearly all of these building types are self-explanatory. However, some require brief description. Multi-family includes duplexes and smaller apartment complexes. Larger apartment complexes often share similar design and construction requirements with commercial buildings. USGBC recognizes apartment buildings with more than four stories as applicants for LEED standards. Commercial includes office, retail, and special uses, such as car washes, churches, hospitals, or assembly halls. Although many government buildings are offices, this category includes special use facilities, such as fire halls, museums, etc.

Subdivision developments are a special category of building type, as they are more than one building and also include the land, water, air, and materials of the supporting infrastructure: streets, lighting, sewer, etc.

- *Is the program required?*

As mentioned previously, cities and states have the capacity to mandate community behavior through regulations. Some owner-based green building programs, such as Boulder (CO) Green Points and the City of Frisco, have used this approach to implement and facilitate broad scale changes to comprehensive plans, building codes and ordinances. Success is often politically determined. The residents of both Boulder and Frisco are inclined toward concerns with local, regional, and global environmental and social impacts. This tends to be an exception rather than a norm. In cases of extreme, community-wide environmental or social stress, mandatory requirement of green building programs offer solutions. No programs of this type exist presently.

More typical mandatory programs are institutionally-based. In other words, the city chooses to lead by example in the area of green building. Many cities have adopted LEED standards for city-funded new construction or remodeling over a set square footage. By mandating this, the City also provides an incentive for builders to learn green building techniques, in turn offering this service to others in the community.

Voluntary programs provide the owner or practitioner a choice to be involved. Usually, voluntary programs rely on incentives, education, and market-driven approaches. Voluntary programs with rating systems are not strictly voluntary. The initial participation is by choice, but minimum standards must be met to qualify for certification.

- *What incentives are offered?*

An incentive is an inducement or reward to stimulate or spur-on a desirable course of action.

Common incentives offered include:

- brand identification: a form of quality assurance for customers;
- awards or recognition;
- marketing products and PR assistance;
- directory listing or other advertising: direct accessibility to target audience;
- tax rebates from federal, state or city government;
- reduced filing fees;
- expedient site plan review;
- conferences, training, and workshops;
- compliance – in the case of mandatory programs;
- green mortgages – mortgages tailored to unconventional building techniques;
- non-cost certification or verification; and
- free technical support – through direct consultation, guidelines, or website resources

Three items are particularly enticing options on this list: tax rebates, expedient site plan review, and green mortgages. The State of Oregon offers a variety of tax rebates for purchases ranging from energy efficient appliances to alternatively fueled cars to solar panel installation. The tax rebate offsets or significantly reduces the initial cost while encouraging the long-term savings. Expedient site plan review relates to the “time is money” motto for construction. Through time reduction, construction can begin earlier reducing the timeframe from production to the market.

Green mortgages are big incentives for green home buyers. Many lending institutions will not offer conventional mortgages because of the nuance of green building practices. Current green mortgages, such as ones provided by Fannie Mae and Sun Trust Corporation, are based on energy efficiency and require certification. Other programs include transportation-based green mortgages, where home owner can take into account the reduced cost of public transportation if they do not commute to work by car.

The type of incentives available is not limited to this list. Incentives are a carrot-on-a-stick. What works for one community may not be successful in another. Residential density bonuses, mitigation, and other topics should be explored thoroughly in a community.

- *What is the rating system and how is it applied?*

A rating system is a tool for evaluating compliance with program guidelines. The guidelines dictate design strategies, material specifications, and implementation procedures. There are three main considerations for a rating system that define the fundamental program design: type of measures, proxies, and ease of use.

The rating system is typically organized into multiple categories representing clusters of similar objectives, or measures, for achieving a desired goal. Generally, green building goals are environmental improvements in the areas of site development, water quality, energy efficiency, indoor environmental quality, and resource use. There are two types of measures: prescriptive and performance. Prescriptive measures are strategies based on or stipulating a norm or standard as the means for meeting a goal. It is laid down as a step-by-step guide, direction, or rule of action that is followed without question. Examples of prescriptive measures are strategies specifying a certain type of flooring to address material use or the use of a certain appliance for energy efficiency.

Performance measures are strategies that stipulate an outcome for meeting a goal, but allow a greater degree of flexibility for the materials, technologies, and methods applied by practitioners. The proposed design elements are evaluated for their effectiveness in meeting the intent of the measure. Performance measures in the reviewed programs are most often associated with energy efficiency based on a certain percentage above a State's mandatory requirement. Energy performance software provides a tool for comprehensive evaluation of the proposed energy efficiency measures, but other strategies are more difficult to evaluate. Programs should be designed with this in mind and revised as new measuring techniques become available. In the interim, a combination of meaningful prescriptive and performance measures will yield the greatest results.

The technique to represent prescriptive measures in a rating system is by proxy. A proxy is any score-keeping, award, or credit that is not a direct measure of impacts on the environment, the economy, the community, or people. In general, green building prescriptive proxies are either

point-systems or a menu of choices. In point-system proxies, strategies are represented by a number of points. In order to achieve the goal, a certain minimum number of points must be acquired. This reflects that an appropriate number of strategies were selected to meet the goal. There are different ways of calculating points. First, points may be added comprehensively, to meet an overall point minimum. Or, points may be required within each category to satisfy the specific environmental improvement goals. Second, points may be weighted to reflect environmental benefits, ease of implementation, or economic costs. Or, the minimum number of points per category may be more in one category and less in another. In a menu of choices, the categories are divided into a variety of strategy choices. The user must select a pre-determined number of strategies from within each category to qualify. To put it simply, at the top of the category would read: "Choose any (number) of the following options."

Ease of use is the level of detail in the program, especially the descriptions and checklists. The user can be an architect, designer, engineer, builder, or a "hands-on" owner. Complex and technical descriptions are difficult for multiple users to read and interpret. Cross-referencing simple descriptions with more detailed explanations provides better organization and cleaner appearance. Lengthy checklists with a multitude of choices and weighting factors are overwhelming. The State of New Jersey provides its green building contractors with an MS Excel spreadsheet called the Green Matrix. Although the incentives are calculated through spreadsheet equations, the level of detail required is astounding. Checklists are more difficult to mentally absorb for programs with heavily prescriptive measures and those with multiple and sometimes repetitive categories. Many HBA programs design their checklists with the job sequencing process in mind. While this may be useful to the builder, it can also lead to repetition of strategies which dilutes the overall intent of whole building analysis. It is a better strategy to cross-reference environmentally-based criteria with job sequencing information for builders.

- *How are ratings evaluated?*

Question: What do restaurants, movies, college classes and green building programs all have in common? *Answer:* Evaluation of excellence based on a qualitative scoring system. The evaluation process is represented in two basic forms: single and scaled. In the single form, two choices are presented. A restaurant may be good or bad. A movie should or should not be seen. A college student passes or fails their class. Green building program goals, represented by the

rating system, are met or they are not. Put simply, ‘yes’ or ‘no’. The process is straightforward and easy to evaluate. The single rating evaluation is based on achieving minimum standards. Strategies above-and-beyond this do not receive formal recognition, although the effort may be acknowledged in other ways, such as marketing or “above minimum standard” statements (i.e. “This building excelled by including 20% more strategies than required.”) This type includes mandatory programs, such as the City of Boulder’s Green Points or the City of Frisco’s Green Building Program.

A scaled scoring system officially recognizes above-and-beyond efforts and encourages achievement through greater fulfillment of the program goals. Minimum standards represent the lowest level of achievement. The number of levels applied above this varies by program. The following list contains a sample of programs and their qualitative scales (from lowest to highest attainment):

- US Green Building: LEED – Certified, Silver, Gold, Platinum
- National Association of Home Builders: Bronze, Silver, Gold
- Earth Advantage: Home program – Certified, Gold: Healthier Indoor Air, Gold: Energy Efficiency, Gold: Environmental & Water Efficiency, Platinum
- Earth Advantage: Commercial program – Green, Gold, Platinum
- Built Green Colorado: Tier I, Tier II, Tier III
- Austin, Texas: Home program – 1-, 2-, 3-, 4-, or 5- stars
- Scottsdale, Arizona: Home program – entry, advanced; others – single rating

Scaled scoring introduces an interesting twist to the market of green building: making a game of it. In conventional construction, owners must focus on the initial costs of a building rather than the long term costs associated with operations and maintenance. Practitioners must be successful at meeting the owner’s budget to build their reputation and referrals. The end result is negotiation of building design and materials based on what the owner can afford. Gaming tweaks the rules to this negotiation process. It redefines the owner’s costs according to life-cycle analysis and provides incentives to practitioners and owners to stretch further toward more comprehensive “green” goals. Since the beginning, the biggest incentive is the “bragging rights” through marketing and comparisons with competition. Whereas the benefits over time are always greater, the first costs of the building may or may not be higher depending on material selection, design strategies, and level of experience with green building on the design team. Additionally, many cities participating in the USGBC’s LEED program mandate contracts for municipal construction meet a level of Silver or higher, stepping a level above the minimum requirement.

- *How is quality verified?*

Quality assurance is an important part of any green building program. Without it, there is uncertainty as to whether or not the strategies are applied as directed. Lack of verification puts a program's reputation for effectiveness at risk and increases the liabilities of the program to the owners and practitioners. The programs reviewed have approached the issue of verification in two ways: self-certification and third party certification. With self-certification, the practitioner submits documentation to a review committee to justify compliance with strategies.

Documentation may include site plans, bill of sale for materials, or narratives explaining the work performed. Frequently, the checklist or guidelines describe appropriate methods of self-certification per strategy listed. Other forms of self-certification membership and mandatory attendance at approved workshops or trainings. Self-certification is more often applied to prescriptive measures that do not affect the structural quality of construction (i.e. appliances, cabinet trim, temperature system control mechanisms, etc).

Third party certifications are conducted by unbiased, trained inspectors according to a prescribed set of rules for certification. Structural elements and performance measures, such as energy efficiency, are usually reviewed by third party certifiers. The process typically includes testing of systems and careful inspection for compliance. Local building code officials and energy raters are the most common types of inspectors. Sometimes, professional engineers must be contracted to review more unconventional methods of construction, such as structural straw bale walls. Third party certification specific to the program checklists are usually conducted by staff inspections or specially trained individuals. Certain programs require inspections for every project while others opt for "surprise" inspections of certain percentage of participating projects. Most programs employ a combination of self-certification and third party certification methods.

Self-certification is by far less expensive than third party certification. The most significant cost in self-certification is the time it takes to organize the documentation or attend trainings. Third party certifiers charge a premium for green building in places where there is not a strong market. The Kansas City HBA program requires their checklist be supplied to customer by the builder, but does not oversee this certification process for liability reasons. Many other HBA programs include legal statements to reduce their liability.

- *How are programs funded?*

Programs cannot be implemented without a continual source of funding for staffing, maintenance, and development. The reviewed green building programs approach this dilemma by incorporating a diversity of funding sources. Exceptions to this are the mandatory programs and state-based pilot projects are institutionally funded as programs of the government. Diverse funding sources include the following: membership dues, application or certification fees, sponsorships, grants, in-kind support, and fees for trainings, workshops, and conferences.

Generally, practitioners are the primary members for most programs. Sliding scale dues are dependent on the type and size of the organization. Benefits of membership include access to programmatic and technical support, marketing inclusion, and discounted educational opportunities. It also represents the qualification for implementing the guidelines. Owners interested in the program must choose amongst participating contractors, creating a niche market for those members. Participation in HBA green building programs requires an annual HBA membership in the local organization. State and national membership is included when a practitioner joins at the local level. EarthCraft House in Atlanta, Georgia, charges an additional fee for participation in their program. Florida's Green Building Coalition (FGBC) uses a representative membership that is open to everyone, including home owners, students, and local organizations. Representatives in the FGBC's Board of Directors are elected by the membership.

While membership dues offer a continued source of funding, they also limit community wide access and participation by the building industry. Certification or application fees may be charged on a per project basis. Typically, these fees cover the staff's time for application review or advising and materials, such as placards, copies of checklists and guidelines, etc. Many programs offer discounts for registering multiple projects, as with subdivision developments.

The Cities of Austin and Scottsdale do not have membership or certification dues. They reason that membership dues place too great of restriction on participation and that certification can be provided through the city's existing procedures. This type of in-kind service is common amongst city- and state-sponsored programs. Development of guidelines and program administration fees are incorporated into the existing bureaucracies, such as Planning Departments, Building and Codes, State Energy offices, and Housing programs.

Corporate sponsors are attracted to programs where they can access niche market consumers. Advertising and special recognition is offered in return for significant funding contributions.

Although this can be a win-win situation for the program and the sponsor, there is a risk of diluting the meaningfulness of the program through the attempt of some corporations to acquire a “green” image despite non-environmentally friendly practices.

Less typical sources of funding include accreditation fees, third party certification training, contracted services, facility rental, and sale of publications or other materials.

Part III: Green Building in Nebraska

Nebraska's Golden (and Green) Building Legacy

Nebraskans have long been recognized as the innovators of straw bale construction, a green building practice. Over a hundred years ago, Nebraskan pioneers needing good houses quickly lacked access to lumber. They conceived an alternative form of housing from a locally abundant by-product of cereal grain, “waste” straw fiber. They staked bales of straw, then let them settle, rendered them on the outside with sand-lime stucco and on the inside with that or gypsum plaster, to form load bearing exterior walls. In addition to serving a housing need and using a waste product, straw bale construction provided an added benefit of incredible insulation properties. Many examples of “Nebraskan-style” straw bale houses still stand today.

However, in modern housing construction, Nebraska-style straw bale is no longer a widely accepted construction practice. Much of the construction process is slow and marred by redundancy and waste. A settling period of 4 to 8 weeks is deemed necessary, with roof in place, to compress bales for the next stages to begin. The modern practice of “shotcreting” is difficult to apply and hand-stuccoing is extremely laborious. Further, the final structural properties rely on the strength and stiffness of the outer materials, or the skins. The final structural properties rely on the straw’s ability to transfer shear forces and to stabilize the skins against buckling under load. Finally, the technique can only produce the exterior walls of a building, a fraction of the vertical surfaces expected in modern housing. (Fugler, 1996) Although studies are being conducted to address these issues, conventional post-and-beam construction that uses straw bales as insulating barriers is a more common practice in contemporary “straw-built” construction.

Nebraska Building Green Today

Because of its population size, availability of land and water resources, and easy access to building materials, Nebraska does not have some of the fundamental driving factors found in states with established green building programs, such as California, Oregon, and New Mexico. But, development issues are big topics in the eastern portion of the state, as Lincoln and Omaha grapple with the ebb-and-flow of promoting and maintaining increasing growth. The reverse is true in many western communities where growth is stagnant or decreasing and long-term economic viability is a questionable.

This does not mean, however, that Nebraskans would not gain from green building strategies. Studies regarding the economic and health benefits are sufficient to warrant wide-spread adoption of green building practices. The rising cost of energy supply, decrease in overall community health, and degradation of land, air, and water, is anxieties for many residents. These concerns are universal throughout the United States. Businesses and governments, including the Federal government, are responding with efforts to “green” new construction and remodeling efforts. This trend is taking root in the eastern portion of Nebraska.

In 2004, five new construction projects announced intentions for seeking LEED certification. The projects include: the US Homeland Security Department (Omaha); the National Park Service Headquarters (Omaha); the Lewis & Clark Visitor Center (Nebraska City); the Nebraska Heart Institute Medical Office Building (Lincoln); and the USDA Forest Service Nursery Office (Halsey). In September, members of all Omaha’s architectural firms and a few contractors earned chapter status with the US Green Building Council, forming the Flatwater Organizing Group. This group will be active in promoting primarily commercial green building techniques for projects throughout Nebraska, but especially in the Greater Omaha area.

Other efforts have been directed more toward residential construction. In the mid-1990s, the City of Lincoln worked with area builders, architects, utilities, state agencies, and others interested in “green” strategies to identify the challenges for green building in the city and the region. As the number of interested people grew, so did the issues associated with implementing a program. The main challenges identified were local code conformance, lack of product specifications for recycled or non-traditional building materials, economic viability of green built residential construction versus conventional, and impacts on current city practices involving water, energy and solid waste disposal. These were large issues to overcome, but a concerted effort was being made to create pathways for green building. Unfortunately, competing interests over resource use and economic profitability diluted the end goals and created disillusionment for regulatory implementation. The most enduring legacy was a loosely-based network of participants.

The Nebraska State Home Builders Association teamed with the State of Nebraska’s Energy Office (NEO) in 2003 to form the Nebraska Green Built Home, one of the eighteen programs reviewed for this project. The guidelines and implementation method were created over two years with input from building professionals throughout the state. It focuses primarily on energy

efficiency, with all homes required to meet a five-star energy rating verified by the NEO, while also encouraging the use of recycled-content materials, minimization of construction waste, and reductions in water use. The target audience is home builders, who are required to be certified by the program. For its pilot project, the NEO developed a one-million dollar revolving loan for the construction of three demonstration homes in the Lincoln area. Although the homes met energy performance and exceeded the guideline requirements, there is some skepticism about the vested interests, affordability, and meaningfulness related to the prescriptive sustainability goals and strategies set through by this state-based program.

The Lincoln Green Building Group (LGBG) is a non-profit coalition of architects, builders, and others interested in promoting a principled approach to green building in the city. Their mission is to promote concepts, practices, projects, and policies of sustainable living through education, assistance, and advocacy. Their grassroots style emphasizes building partnerships between local industries and involvement of the general public in program development. In fact, the public is invited to join and actively participate in meetings and events. They advocate a voluntary green building program that focuses on the owner rather than just the builder and includes a comprehensive approach to sustainability issues. For the past two years, the LGBG sponsored tours of homes they felt represented the intent of green building practice. Forty-five people participated in the 2004 event, a day-long bus tour called the “Workshop on Wheels”. The homes featured solar designs, energy-efficient heating and air-conditioning, straw-bale insulation, and natural, sustainable building materials.

Smaller Steps toward Sustainability Practice

While the above paragraphs describe efforts to address green building as a whole, some organizations are also taking steps to infuse infrastructural aspects of green building. In 2001, Jen Carlson and Josh Shear formed a natural building supply business called Straw, Sticks, and Bricks. Their goal is two-fold: educate the diverse audience of architects, builders, engineers, community leaders, and home owners, interested in sustainable living, and provide access to a market of building materials not commonly found in the region. Initially, the business was solely web-based, but in April 2004, they opened a display-oriented store and warehouse in Lincoln where customers are invited to acquire information and explore their options.

Since energy conservation is a primary motivator, energy-efficiency measures and alternative energy technologies are prevalent amongst utility companies. The Nebraska Energy Code will become 2003 International Energy Conservation Code effective July 1, 2005. The State Energy Office is providing trainings on converting communities to the new code. This will lead to significant changes for all new construction in the area of energy efficiency, especially renewable energies.

Lincoln Electrical System (LES), the locally-owned supplier of electricity in Lincoln, is exploring wind energy options through construction of wind turbines. They also work in partnership with local institutions to explore energy options. In 1995, LES worked in cooperation with Lincoln Public Schools to install geothermal heat pump systems in four elementary schools. The estimated heating and cooling savings will reach about \$3.8 million over 20 years. The Hyde Memorial Observatory, a Lincoln Parks and Recreation program, installed photovoltaic cells to harness sun energy and power their facility.

Keep Nebraska Beautiful (KNB) operates a Material Exchange Program open to businesses and residents with excess or unwanted materials. KNB links the generators of waste with potential users, continuing the life of the product rather than disposing of it in municipal or private landfills. But, some of these materials are quite valuable and better suited for resale. Architectural supply stores furnish antique or reusable building materials salvaged from older residences throughout the community. In these stores, materials tend to be unique with associated architectural or historical value and acquired through the owner or prior to home demolition. Also, a newly developing venture, the Nebraska Center for Sustainable Construction (NCSC), will offer an alternative to demolition and disposal of buildings as waste. The organization aims to establish deconstruction teams and salvaged materials sales centers in locations throughout Nebraska. The NCSC project is being facilitated by the Joslyn Castle Institute.

The Joslyn Castle Institute is an Omaha-based non-profit organization founded in 1996 by the University of Nebraska's College of Architecture. JCI projects focus on the promotion of sustainable design in the built environment through education and facilitation of an integrated approach to community development. Put simply, they strive for "human systems in balance with the natural environment." The stated purpose of their endeavors is "to inform professionals and concerned citizens of how sustainable design and development concepts are being

implemented and to look at local issues that need to be addressed.” (JCI, website reference) JCI is also the sponsor of this professional project.

Although a state-wide initiative for green building implementation would be useful, narrowing the scope to communities in the eastern portion of Nebraska is more productive for this project, its sponsor, and the immediate future. The following section outlines recommendations and strategies for advancing green building in the Greater Omaha/Lincoln area.

Part IV: Recommendations & Strategies

Promotion of green building strategies is a logical match to the mission and projects of JCI. In particular, the 60 Mile Radius project provides an excellent vehicle for implementing green building philosophies. Recognizing that development in Omaha's rapidly growing metropolitan area is increasing stress on the fragile regional ecosystem, the 60 Mile Radius project "is a commitment by [JCI] and area stakeholders to stimulate communication, establish a repository for pertinent planning documents, and develop a sustainability indicators system to help guide future growth." As the project name implies, the region covered includes all areas within a sixty mile radius of Omaha. This represents a population of over 1 million people in 157 communities, including Omaha, Lincoln, and Council Bluffs, Iowa.

The options for developing and implementing second-generation green building programs are numerous based on the review of established local green building programs. Although some are related, no two are exactly alike. This reflects not only municipal considerations, but also the interests, and bias, of the program managers. The challenge for second-generation green programs is to analyze the established programs, synthesize the applicability to local conditions, and seek alternatives not yet considered. However, developing a holistic strategy is not a simple piecemeal process.

To achieve this, programs must be designed with the following assumptions:

- *Information, technical and programmatic, should be clearly written, organized, and accessible to the general public.*
- *Measures should strive to be performance based: explicit and measurable, open to a range of solutions.*
- *Education, rating systems and guidelines should reflect the interests of the owner and be cross-referenced with the construction process for the builder.*
- *Promote wide-spread, voluntary participation, but set minimum requirements for achievement.*
- *Distinctions should be made by building type (residential or commercial) with special considerations for government implementation.*
- *Strategies and rating systems reflect comprehensive, integrated, and balanced approach.*

- *Reward ambition and innovation through metric rankings.*
- *Program design team should be diverse, but directed; cooperative, not competitive.*
- *Power of implementation must be decentralized with a focus on creating the tool and supporting documentation.*

It is said that the only constant thing is change. If a system is to sustain itself through time, it must be able to adapt to changes in its external environment. There exists a rigid and often resistant attitude toward change in human and social systems. Resistant statements such as ‘We have always done it this way’ and ‘that will never work here’ need to be transformed to reflect the flexibility necessary for sustainability. Such transformations will not be immediate, especially within bureaucracies. Green building is a tool for mainstreaming this paradigm shift in society.

Communities are built on five factors outlined in the first section of this paper: environment, economics, socio-cultural, technology, and public policy. It is logical to reflect these factors in the recommendation and strategies. The first part of this section outlines recommendations and strategies accordingly. However, as indicated previously, these factors are interconnected over space and time. Green building program development must be guided by principles that reinforce the concept of sustainable communities through education, visioning, and participation. Similarly, integrated building design suggests three phases in building development: planning and design, construction, and operations and maintenance. These same phases are applied to program development in the second part of this section.

Five Factors of Community

Environment

- Demonstrate the latent impact on the micro and macro environments related to past, present and future building permits.
- Investigate impacts on local landfill and solid waste management, especially C&D waste.
- Encourage connectivity of habitats through greenways and limit fragmentation of natural areas and prime farmland.
- Minimize site disturbance, especially for subdivision development, by promoting pre-construction McHargian analysis, appropriate housing densities, and mitigation strategies.

Economics

- Investigate the potential long-term impacts on public financing of urban infrastructure and land uses. Research green mortgage and incentive opportunities at the national level and work with state and cities to develop incentives.
- Assess potential impact of strengthening local economic systems through local commerce and labor. As the green building market grows, Nebraska's agricultural resources could be developed into a new market for materials. This presents an economic development opportunity, reduces transportation costs for materials locally, and creates access to a local market.
- Develop supportive and clear reasoning for life cycle assessment for owners (ie. first costs vs. long term benefits, embodied energy). Work with city officials to incorporate life cycle assessment in contracting and procurement of building services, including design, construction, and operations/maintenance.

Socio-Cultural

- Emphasize indoor air quality as a leading factor for health and productivity, especially in schools, hospitals, and the workplace. Health departments and community health organizations are natural allies for promoting cleaner indoor environments.
- Promote healthy life styles and the benefits of choice of housing.
- Green building provides a unique educational opportunity for youth and adults because they are related to a variety of natural, social, and political systems. In learning about how materials are acquired and buildings constructed, people learn about their connections to the environment and the community at local, regional, national, and international levels.
- "Non-traditional" partnerships facilitate positive community relationships through a systems approach. Explore the potential for broad partnerships and the community benefits of groups working toward a common future of sustainability.

Technology

- Focus on new and emerging technologies in energy, materials, and construction systems. These systems are continuously updated and the dispersal of education to practitioners and the general public creates new opportunities for improved green building strategies.
- Investigate the impact of digital and communications technologies on building and systems performance.
- Connect green building with smart growth and new urbanism strategies that minimize new for vehicular transportation and encourage other forms of transit, like bikes, buses, and walking, for commuting and other daily activities.

- Research green infrastructure possibilities that expand sustainability practice beyond the building process.

Public Policy

- Identify contacts in public programs directly linked to green building, such as public works, planning, recycling, solid waste, health, and building and codes.
- Examine existing public policies, such as building codes and zoning, to evaluate public and private barriers and draft possible revisions.
- Examine existing public policies, such as impact fees and density bonuses, to evaluate opportunities for incentives.
- Assist in development of new policies that support adoption of a municipal green building program and encourage private owner participation. The city should be addressed as an owner of its public buildings.

Program Development Recommendations & Strategies

Planning & Design

- *Be the green champion for a green building program.* Commitment from the beginning and vigilance throughout are keys to success. Focus on the broad context, not the details. Similarly, focus on the broad region, not a specific city. By setting the broad context for green building, JCI can better facilitate communication between interested parties, remain flexible to new technologies and design strategies, and keep the larger objective in mind. It is particularly important to identify allied champions and supporters among city government leadership.
- *Develop draft Sustainable Guidelines and point-based rating systems that can be generally adopted by any city.* This should be done in-house by JCI staff, not by coalition of diverse interests. While giving JCI the power to define, there is also incredible responsibility and accountability. This will include program goal setting, research, and anticipation of conflicts. To remain flexible and fair, measures should be performance based. Distinctions between residential and commercial buildings must be made. LEED sets performance standards for commercial construction, including municipal. However, many cities have adjusted LEED to suit their local conditions by developing a city-based LEED supplemental. To simplify JCI's workload, commercial construction guidelines can focus on creating a supplemental, rather than the base document. Residential, and development, guidelines will take a bit more effort to construct. But, by focusing on performance based measures rather than prescriptive, the detail will be limited to justifying the measure rather than the method. Do not focus on program implementation at this stage.

- *Form a Program Design Team with participants from a wide variety of interests* in a green building program, such as builders, utility companies, governmental departments, architects, environmentalists, and “green” businesses. The Program Design Team should project clear commitment to green goals, rather than prior green building experience and personal benefit. Disagreements about specific strategies and power struggles that lead to inertia in designing a program must be avoided through strong facilitation. All Program Design Team members should be given resources on green building for independent research prior to their participation in defining the program.
- *Facilitate a Program Design Charrette.* Invite the Program Design Team to review drafts of the performance based Sustainable Guidelines and/or supplements. Guide the charrette by defining the context (model of sustainable communities, principles of green building, and list of assumptions on page 28). Participants are asked to identify the strengths and weaknesses of the Guidelines based on their applicability to the building industry and municipal regulations. Ask, ‘What type of incentives could be offered to encourage participation?’ Further, participants are asked to identify conflict resolutions with modifications to either the guidelines or to the industry. For instance, if local building code will be a conflict, the resolution is development of a mechanism to provide assurances (such as 3rd party certification) or modification of building code.
- *Revise Sustainability Guidelines based on Charrette information.* This is an opportunity to resolve conflicts prior to implementation. Research suggestions and evaluate potentials for implementation. For the LEED supplement, JCI will need to work directly with the USGBC. Although the measures are performance based, encourage HBA to develop a prescriptive advice tool for builders to simplify the decision making process in residential construction.
- *Develop the rest of Program Implementation Components and Produce Documents.* The rest of the program implementation components may include internal elements: Guideline review process, application fee structure, metric system, branding, and verification; or external elements: incentives, life cycle costing tools, third party certification process (and training), public education efforts (workshops, annual conferences, etc), partnerships, maintenance manuals and technical support services. In developing these external elements, JCI should not assume that they will implement them. For instance, support services could be offered to home builders through the HBA. Public education could be a coalition effort between utilities and a non-profit. A third party certification could be provided as a new service from engineering companies.
- *Develop creative, locally-based incentives that encourage practitioner and public involvement.* Many of the programs reviewed suggest expedited site review as a key incentive. In Omaha and Lincoln, this may not be the strongest enticement for developers given the existing review process. However, density bonuses and rebates on impact fees may provide developers with greater reason to build green. Additionally, streamlining the federal and state incentives with city-based programs facilitates achievement of rewards and lessens frustration in self-coordinating this process.

- *Start building partnerships.* Although JCI's initial Program Design Team is a logical choice for inclusion in the oversight of the program, more partners can be identified based on the external components identified in the previous step. Use the partnerships to decentralize the power, thus disseminating the program ownership widely.

Construction (or Implementation)

- *Begin implementation with the Lincoln and Omaha city governments.* Present finalized program to Planning Departments, Public Works Department, building and codes officials, community leaders, and other decision makers. The aim of approaching governments is to 1) encourage adoption of LEED with supplemental for all new city-funded construction, 2) modify Comprehensive Plans to reflect sustainability goals, and 3) garner support for the program either actively, through regulation modifications and incentives, or passively, through recognition. Contract with the city to provide these services.
- *Encourage Commissioning and Decommissioning of buildings.* Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent. Decommissioning is the act of determining when buildings no longer have a useful life and green strategies, such as reuse and recycling, can be taken with the various materials that make up the building.
- *Establish new Green Building Program as administratively separate JCI.* The goal is to make the program a standard managed to maintain an independent brand. This also releases JCI from the vested interests associated with managing and promoting the program. Thus, JCI can start providing services to cities, companies, and developers.
- *Promote and implement LEED supplement to businesses as owners or architects and engineers as advisors.* Special services could include LEED application review and documentation services. Also, JCI could provide workshops to architecture and engineering firms interested in green building. Provide a locator service for clients interested in green building, but naïve to the process.
- *Promote and implement residential program.* In addition to reviewing applications, JCI could provide on-site services and advising for larger subdivision projects. Incentives that could be particularly enticing in Lincoln are density bonuses and appliance rebates.
- *Encourage supportive activities by partners.* Continue to build relationships and decentralize the power associated with the program. Encourage the economic multiplier effect through new business or new services.

Operations & Maintenance (Program Follow-through)

- *Maintain a database of projects, case studies, and program evaluation comments.*
- *Development benchmarking methods*

- *Continue to revise program as needed.*
- *Network with other green building programs.*
- *Once established, continue building out program to communities in other parts of the state.*

BIBLIOGRAPHY

Bawden, RJ. "System thinking and practice in agriculture." *Journal of Dairy Science* 74 (1991): 2362-2373

Cassidy, Robert (Editor). "White Paper on Sustainability." *Building Design & Construction Supplement* (November 2003). Available from:
<http://www.bdcmag.com/newstrends/BDCWhitePaperR2.pdf>

Chiras, DD. *Environmental Science: A systems approach to sustainable development*. Belmont, CA: Wadsworth, 2001.

Clayton, T, AMH Clayton, and NJ Radcliffe. *Sustainability – A systems approach*. Boulder, CO: Island Press, 1996.

Cole, RJ and E Sterner. "Reconciling theory and practice of life-cycle costing." *Building Research and Information* 28, no. 5/6 (September 2000): 368-375.

US DOE, Energy Information Administration. *Monthly Energy Review* (March 2001)

Flanagan, R and G Norman. *Life Cycle Costing: Theory and Practice*. London: Surveyors Publications Ltd, 1987.

Fugler, D et al. "Developing and proof-testing the 'Prestressed Nebraska' method for improved production of baled fibre housing." Canada: Fibrehouse Limited, 1996. Available from:
<http://mha-net.org/docs/chapman.PDF>

Heylighen, F and C Joslyn. "What is Systems Theory?" in F. Heylighen, C. Joslyn, and V. Turchin (editors): *Principia Cybernetica Web*. Brussels: Principia Cybernetica, 1992. Available from: <http://pespmc1.vub.ac.be/SYSTHEOR.html>

Jones Gerace, A, R Flora, R Kobet, C Leininger, and J Whetzel "Guidelines for Sustainable Development." Pennsylvania. Available from: <http://www.ccicenter.org/publications/gsd4>

Joslyn Castle Institute. Available from <http://www.ecospheres.org>

Kats, G et al. "The Costs and Financial Benefits of Green Buildings." California: Sustainable Building Task Force, October 2003. Available from:
http://www.usgbc.org/Docs/Resources/CA_report_GBbenefits.pdf

Lafferty, B. "Making a financial case for building green". *Waste News* 10, no 7 (August 2004)

Lee, A, G Syphers, T Rasmussen, and A Scott. "Green City Buildings: Applying the LEED™ Rating." Portland, Oregon: Portland Energy Office, June 2000. Available from:
<http://www.sustainableportland.org/CityLEED.pdf>

Lewis, M. "Integrated Design for Sustainable Buildings." *ASHRAE Journal* 146, no 9 (September 2004)

NAHB Research Center. "NAHB Model Green Home Building Guidelines; Pilot Version." Upper Marlboro, Maryland: NAHB, September 2004. Available from: <http://www.nahbrc.org>

NAHB Research Center. "Summary of Green Building Programs." Upper Marlboro, Maryland: NAHB, July 2002. Available from: <http://www.nahbrc.org>

Office of the Federal Environmental Executive (OFEE). "The Federal Commitment to Green Building: Experiences and Expectations." 18 September 2003.

Pierce, N. "States and Cities taking 'Green' Energy Lead." *Nation's Cities Weekly* 27, no 33 (16 August 2004)

Savings by Design. "Whole Building Approach." California: Savings by Design, 2004. Available from: <http://www.savingsbydesign.com/aboutus.htm>

Sitarz, D. *Agenda 21: The Earth Summit Strategy to Save Our Planet*. Boulder, Colorado: Earth Press, 1993.

United Nations Commission on Environment and Development (UNCED). *Our Common Future*. London: Oxford University Press, 1987.

US Department of Energy (DOE). "High Performance Buildings: Design Approach." USA: DOE Office of Energy Efficiency and Renewable Energy, December 2003. Available from: http://www.eere.energy.gov/buildings/highperformance/design_approach.html

Von Bertalanffy, L. *General Systems Theory: Foundations, Development, Applications*. New York: George Braziller, 1976.

Wilson, A and P Yost. "Buildings and the Environment: The Numbers." *Environmental Building News* 10, no 5 (May 2001)

Appendix

<i>Green Building Programs Reviewed:</i>	<i>Page</i>
➤ <i>US Green Building Council</i>	<i>46</i>
➤ <i>National Association of Home Builders</i>	<i>47</i>
➤ <i>Earth Advantage</i>	<i>48</i>
➤ <i>California Green Builder Program (HBA)</i>	<i>49</i>
➤ <i>Built Green Colorado</i>	<i>50</i>
➤ <i>Nebraska Green Built Home</i>	<i>51</i>
➤ <i>Florida Green Building Coalition</i>	<i>52</i>
➤ <i>New Jersey Green Affordable Green Program</i>	<i>53</i>
➤ <i>Austin, Texas</i>	<i>54</i>
➤ <i>Boulder, Colorado Green Points</i>	<i>55</i>
➤ <i>Portland, Oregon G/Rated</i>	<i>56</i>
➤ <i>Seattle, Washington Sustainable Building</i>	<i>57</i>
➤ <i>Scottsdale, Arizona Green Building Program</i>	<i>58</i>
➤ <i>Kansas City, Missouri Build Green</i>	<i>59</i>
➤ <i>Atlanta, Georgia EarthCraft House</i>	<i>60</i>
➤ <i>Santa Monica, California</i>	<i>61</i>
➤ <i>Built Green of King & Snohomish Counties (Washington)</i>	<i>62</i>
➤ <i>Frisco, Texas Green Building</i>	<i>63</i>



US Green Building Council

Program:	USGBC's LEED
Year of Inception	1993
Managed by...	Non-profit coalition
Staffing	7 - Executive level
Partnerships	Consensus-based boards & committees
Membership	4000+ groups: manufacturers, architects, building owners, government agencies, engineers, real estate agents, colleges, and environmental organizations
Geographic area	National/Universal
Target Audience	Governments, owners, and practitioners
Requirements	Voluntary
Building Type	LEED-NC (new construction); under development: Existing Building, Commercial Interiors, Core/Shell, Homes, & Neighborhood Development
Incentives	Highly regarded national branding; training/workshops; project advertising; annual conference; professional accreditation; recognition; rigorous site review
Program Design	
Measures	Prescriptive & Performance
Primary Proxy	Point-System, Credit Checklist
Ease of Use	Simple: 5 categories plus innovation, Points required in each category; prereq's
Rating	
Scaled	Certified, Silver, Gold, Platinum
Certification	
Self-Certification	Letter Template & detailed submittals, narrative, Checklist, drawings & photos
3 rd Party	Committee Review, pending status, audit
Funding Sources	
Membership	Based on member type & profit. Annual Dues: \$250 to \$10,000
Application or certification fees	Based on bldg sqft & membership; Registration: from \$750 to \$3,750; Certification: from \$1,500 to \$7,500
Sponsorships	Website sponsorship
Grants	
Other	Training, workshops, & conferences; publications; Accreditation Exam
Website	www.usgbc.org

Overview:

USGBC mission is to promote the design and construction of buildings that are environmentally responsible, profitable, and healthy places to live and work, through consensus-based process. It is the goal of USGBC to integrate building industry sectors; lead market transformation; and educate owners & practitioners.

The first tool created to implement the mission was LEED-NC (Leadership in Energy & Environmental Design – New Construction). Version 2.1 is the most current adaptation. LEED defines “green building” by establishing a common standard of measurement; promotes integrated, whole-building design practices; recognizes environmental leadership in the building industry; stimulates green competition; raises consumer awareness of green building benefits; and transforms the building market.

LEED-NC provides a framework for commercial and institutional building performance in sustainable site development, water efficiency, energy & atmosphere, materials & resources, and indoor environmental quality. A wildcard category for innovation and design process to account for strategies not specified in the other groups.

Categories include multiple strategies (called credits) and/or prerequisites. Each credit is worth 1 point, with exception of the “optimize energy performance” credit which ranges from 1 to 10 points. The checklist is simple and user-friendly. A supplementary checklist indicates the types of documentation needed for the application and certification. A guidebook provides the technical details on how to achieve each credit. Scaled rating is as follows: Certified: 26-32 points; Silver: 33-38 points; Gold: 39-51 points; and Platinum: 52-69 points.

Programs in development include LEED-Existing building, LEED-Commercial interiors, LEED-Core and shell, LEED-Homes, and LEED-Neighborhood Development.

The USGBC works with several municipalities, including Seattle and Portland, to modify the LEED checklist to local concerns and code requirements. Chapters are established by interested parties to further the mission, education, and local efforts.

Strengths:

The USGBC and LEED are the most recognized universal “symbols” of green building in the marketplace today. LEED creates a gaming system that challenges and encourages practitioners and consumers to raise the bar in green development. The measures are a combination of prescriptive and performance, which establishes accountability for hard-to-measure elements while allowing design creativity and flexibility. USGBC has made a concerted effort to work with municipalities.

Drawbacks:

Membership in USGBC is open only to organizations (not individuals) and annual dues can be costly. Currently, LEED-NC is the only program; however, the others are scheduled for release within the next year. The standards are generalized and do not fully represent localized conditions. Documentation process is technically heavy. Practitioners must have significant technical competence for compliance. While not required, the easiest credit is use of a LEED accredited professional. Contracting LEED accredited practitioners may be difficult and add to expenses.



National Association of Home Builders

Overview:

The National Association of Home Builders created Green Building guidelines as a service to their member organizations and local municipalities seeking to implement a green building program. The Guidelines apply to new construction of residential homes or subdivision. They were designed with the “mainstream home builder” in mind. A draft version was released in September 2004.

While recognizing that many in the building industry already incorporate green building ethics, the guide addresses holistic integration of guiding principles: Lot design, preparation, and development; Resource efficiency; Energy efficiency; Water efficiency; Indoor environmental quality; Operation, Maintenance, and Homeowner education; and Global impact. For subdivisions, there is a supplemental section on site planning and land development.

The program emphasizes voluntary, market-driven approaches, with implementation on the local level. NAHB stresses that the guidelines are offered as recommendations, not a structured program. An appendix offers municipalities a step-by-step resource guide on creating local programs based on the experiences of various established programs and builder suggestions.

The checklist is organized in guiding principle sections with subcategories. Each subcategory contains one or more line items, or strategies, with points assigned. Another column references ways to verify each line item.

Within the guiding principles, prescriptive strategies are described and weighted based on environmental impact, building science & best building practices, and ease of implementation. They note the gray areas in identifying and quantifying environmental impacts. Energy efficiency tends to provide the most concrete numbers. Thus, some of the energy strategies are performance based.

Strengths:

NAHB provides a tool that is flexible enough for builders or local municipalities to adopt in their communities. This is especially useful in areas where no program currently exists. They also provide a large amount of technical information to builders through their associated website, ToolBase.

For developing the Green Building Guidelines, NAHB consulted 64 green building experts and incorporated the experiences of 28 existing programs. The goal was to provide a comprehensive and practical set of voluntary guidelines for the entire home building industry to apply to individual, regionally distinct green home building efforts.

The method of weighting is based on a combination of positive environmental impact, building science and best building practices, and ease of implementation. This is the first set of defined criteria for point weighting. For every scaled rating, points must be acquired

Drawbacks:

While setting overall guidelines, the program does not do a good job of offering distinctions. Through the weighting system, more points are given for ease of implementation than positive environmental impacts. The justification for this is that a positive environmental impact would only be achieved if it was implemented.

The guidelines reduce the complex decision making to components. For integrated design and holistic strategies, this creates a complicated interpretation process. A builder may give up the integration process out of the exhaustion from deliberating each line item.

Program:	National Association of Home Builders
Year of Inception	1964-NAHB; 2004-Green Building Guidelines
Managed by...	Non-Profit HBA
Staffing	10 Key Staff
Partnerships	Stakeholder groups: large & small home builders, manufacturers, architects, environmentalists, government agencies, and others, local HBAs
Membership	20,000+ members
Geographic area	National/Universal
Target Audience	Builders, developers, local municipalities
Requirements	Voluntary; program suggested
Building Type	Residential homes & subdivisions
Incentives	Nat'l Green Building Awards, EnergyValue Housing Award
Program Design	
Measures	Mostly Prescriptive, Energy Performance
Primary Proxy	Weighted points with menu of choice within sub-categories (program pending)
Ease of Use	Complex: 6 Primary groups, but many sub-categories. Minimum # required per category plus 100 general
Rating	
Scaled	Bronze, Silver, Gold
Certification	
Self-Certification	Installer-certified or builder-certified
3 rd Party	recommended
Funding Sources	
Membership	HBA local annual dues
Application or certification fees	none
Sponsorships	Industry sponsors
Grants	HUD for ToolBase website
Other	Books and resources
Website	www.nahbrc.org



Earth Advantage

Program:	Earth Advantage
Year of Inception	1999
Managed by...	Private company
Staffing	50 Building professionals
Partnerships	Portland Electric
Membership	Sponsors, builders, remodelers
Geographic area	Pacific NW region
Target Audience	Government and institutions (as bldg owners), commercial owners, residential owners, support practitioners.
Requirements	Voluntary
Building Type	Single residential (new and 60% remodels), Commercial Buildings (wide variety)
Incentives	Branding, advertising for building professionals, website ads, referrals, PR support, access to incentives information; green mortgages
Program Design	
Measures	Primarily performance with some prescriptive elements
Primary Proxy	Menu of Services
Ease of Use	Clear application process; customized services provided; LEED program & documentation services available
Rating	
Scaled	Home program: Certified, EA Gold (3 choices) and EA Platinum; Commercial program: Green, Gold, & Platinum
Certification	
3 rd Party	By Earth Advantage: Planning oversight, On-site inspections, and blower test
Funding Sources	
Membership	Annual Dues for businesses: Green - \$2,500; Silver - \$5,000; Gold - \$10,000; Platinum - \$15,000; Dues include perks, like trainings and use of meeting space
Application or certification fees	Contract-based
Sponsorships	Private donations
Other	Facility rental, classes
Website	www.earthadvantage.com

Overview:

Earth advantage is a green building consulting arm of a Portland-based energy company. The program covers the Pacific Northwest as a region. Their team of consultants provides guidance through the design, construction, and operations to owners and practitioners to maximize building performance. The program is divided into two branches based on building type and customer: residential and commercial.

The residential program provides home owners with many tools and resources for achieving new construction or remodeling of their “green dream” home. The certification process serves as a step-by-step guide, augmented by individual support of the staff. It includes assistance in selecting a builder, plan review, determining materials & methods, consultation during construction, walk-through verification, performance testing, and certification process. Additionally, Earth Advantage green mortgages and information on state incentives are offered. Ratings have expanded in the last few years from one to five, allowing the customer to select a basic (Certified), primary (Gold – Healthier Indoor Air, Energy Efficiency, or Environmental & Water Efficiency) or comprehensive emphasis (Platinum).

The commercial program includes a wide variety of building types, including governmental, office, retail, schools and universities, lodging, recreation, health care, and food service. The scaled rating is based on a menu of services with categories in energy efficiency, quality indoor environment, environmental responsibility, and resource efficiency. Each category contains strategies with level determined by a minimum number of strategies in each. Services also include LEED project management and documentation.

The Earth Advantage National Center provides a museum-style look to practitioners of cutting-edge energy efficiency and sustainable design resources.

Strengths:

As a private business, Earth Advantage has greater flexibility that government and non-profits in implementing their programs. The connection with the utility company benefits both: the utility company is encouraging energy-saving measures that reduce their cost of purchasing on the regional or national network; Earth Advantage has access to the wealth of industry knowledge, including incentive mechanisms and appropriate technologies.

By developing a comprehensive strategy with defined mission and goals, Earth Advantage maximizes its audience and builds credibility for its product and services. One-on-one consulting allows flexibility in trying to mold standards to many different building and owner types.

Drawbacks:

Conflicts of interest between Earth Advantage’s recommendations and the utility company’s bottom line should be a concern for customers.

As a consulting company, they also serve as a broker between green building practitioners and buyers. In order to be involved, a business must become an annual member. Thus, it restricts the market to those willing and able to pay. But, that’s business.

California Green Builder Program

Program:	California Green Builder Program
Year of Inception	2001
Managed by...	Trade organization: California Building Industry Association: Building Industry Institute
Staffing	4 Executive Staff
Partnerships	Local Governments and businesses
Membership	6000+ construction related firms; produce 80% of all new homes in California
Geographic area	Statewide
Target Audience	Primarily Builders; work with Institutions on codes & incentives
Requirements	Voluntary, but under CA's strict guidelines for environmental quality
Building Type	Single residential & subdivisions
Incentives	Recognition, coordinate expedited plan review & field check and financial help with local gov't, reduced business banes (call backs, litigation, homeowner dissatisfaction)
Program Design	
Measures	Minimum standards are performance based
Primary Proxy	none
Ease of Use	Good technical document support; Many codes established by state already
Rating	
Single	Home program
Certification	
Self-Certification	Plans & certifications submitted prior to construction
3 rd Party	CHEERS 3 rd party inspection, Random inspection process
Funding Sources	
Membership	Through trade organization
Application or certification fees	\$150 certification fee
Sponsorships	Private donations
Grants	Federal and state
Other	Subdivision participation fees
Website	www.thebii.org

Overview:

The Building Industry Institute (BII) was founded in 1993 by the California Building Industry Association to develop, implement, and administer research and educational programs for homebuilders, developers, and the general public. Recognizing home construction accounted for significant resource waste and energy consumption, they set about defining a new role for builders in California. BII worked with its members, local jurisdictions, state and federal organizations, environmental groups, and local building organizations to address this challenge. Green Building guidelines set goals for significant improvements in energy efficiency, reduction in air emissions, on-site waste recycling and reduction in water use. Working to that goal, the BII developed the following minimum performance standards for their program:

- Participate in Community Energy Efficiency Program (CEEP) – requires 15% over Title 24 (California's State Energy Code)
- Build to Energy Star Home's air emission level
- 50% diversion from landfill job site waste
- 25% decrease in water use compared to 1980's home.

The California Green Builder Program is implemented on a statewide basis with particular emphasis on subdivision development (rather than single homes). Many local jurisdictions have adopted this program by offering incentives to developers ranging from expedited site review to cash benefits.

Strengths:

BII succeeds in effectively using existing programs, such as the California Home Energy Efficiency Rating System (CHEERS) and Energy Star, to package its product and verify its results. This reduces administration costs and staff time.

The BII knows its audience well. Reduction of business banes are one of the many incentives. These banes include call backs, litigation, and homeowner dissatisfaction. By mentioning this element, the California Green Builder program directly identifies with its target audience.

Drawbacks:

BII states that they are defining green building for the industry. And, they do just that... but, that's where it stops. The minimum standards are overly focused in the construction phase without regard for the design and implementation stages. There is no mention of recycled material use, indoor air quality, or site development, all of which are common to other programs.

While the measures are performance based, the options for the home buyer in negotiating their wants is limited. The California Green Builder marketing effort dilutes local voluntary initiatives by adding one more brand to the mix. This can create confusion for homebuyers as to what program or programs they want to participate. The cost of participating in more than one is determined by the builder rather than the owner.



Built Green Colorado

Program:	Built Green Colorado
Year of Inception	1995
Managed by...	Non-profit HBA
Staffing	4
Partnerships	Governor's Office, Xcel Energy, & E-Star Colorado
Membership	Builders, industry leaders
Geographic area	Statewide
Target Audience	Primarily the building professional; owners are customers to the primary
Requirements	Voluntary
Building Type	Single family residential, developments, & mixed use.
Incentives	Advertising, Energy Efficient Mortgages, process
Program Design	
Measures	Prescriptive
Primary Proxy	Menu of services and Point system
Ease of Use	Complex: 23 categories, 208 choices with varying points. 600 points total; minimum requirement: 70 points for residential. Points can come from anywhere on the list. Weighing based on level of cost
Rating	
Simple	Developments & Mixed use
Scaled	Residential Tier I - 70 points Tier II - 86 points plus specific requirements; Tier III - 88 points plus specific requirements.
Certification	
Self-Certification	Comprehensive checklist, builder narrative
3 rd Party	5% of all residential homes are inspected on random basis
Funding Sources	
Membership	Annual: HBA: \$150; not member: \$625
Application or certification fees	\$35 w/o yard sign; \$85 with yard sign
Sponsorships	45 sponsors; 8 "big" industry leaders
Grants	Initial setup grants from state
Other	Subdivision participation fees
Website	www.builtgreen.org

Overview:

Self-described as the largest green building program in the nation, Built Green Colorado is a voluntary program with the purpose of encouraging homebuilders to use technologies, products and practices that provide greater energy efficiency and reduce pollution; provide healthier indoor air; reduce water usage; preserve natural resources; and improve durability and reduce maintenance. They recognize the scrutiny under which home builders and developers are perceived in the public; green building provides an opportunity to present the industry in a positive light while not sacrificing bottom-line costs. They are calling for a preemption of future codes and regulation that will restrict and require the industry to make sustainable choices.

Builders are not required to build every home to meet the program's criteria; but every home registered must. The criteria are represented by the Built Green Checklist, which includes an energy efficiency requirement and a menu of options addressing a range of "green" items of which a minimum number must be selected. Points provide weight to the items based on environmental benefit and building cost. The categories are complex, although a Guide to the Checklist provides programmatic and technical detail needed to understand it all. There are a wide variety of strategies to choose from and the minimum requirement is 70 points for Tier I; 86 points plus specific requirements for Tier II; and 88 points plus specific requirements for Tier III.

Strengths:

Built Green Colorado is flexible enough that they were able to change their rating system from a single to scaled levels in response to consumer demand. Over 20,000 homes have been certified in Colorado since its inception in 1995. The combination of point system and menu of services provides a structured approach to achieving their goals. They are successful in appealing to sponsors and industry leaders for funding and other support. They are the first green building program to be privately funded.

Drawbacks:

The subdivision of topic areas (ie Land, Energy, Water, Resources) into multiple main categories and availability of cumulative points (instead of per category) dilutes the intent for whole building design. There are 208 strategies to choose from and, for certification, homes are only required to acquire 70 points out of a possible 600. It solely focuses on residential and development construction. The Checklist and Guide to the Checklist are lengthy and too detailed to allow for flexibility in design and construction process. Verification is mainly based on self-certification, with only 5% of all homes inspected on a random basis. This indicates little or no attention to the quality standards of the branding. As a market-driven program, informing and educating the home-buying public is considered one of the primary undertakings; however, it targets practitioners as decision-makers rather than home buyers. This creates an imbalance with the supply-side controlling choice and the demand-side submitting to that choice. When the LEED Home standards are released, this program will have a difficult time developing compatibility to that program.



Nebraska Green Built Home

Program:	Nebraska Green Built Homes
Year of Inception	2003 (pilot program)
Managed by...	State of Nebraska Energy Office
Staffing	2
Partnerships	Nebraska HBA; Nebraska Green Building Council
Membership	Builder certification listing
Geographic area	Statewide (pilot in Lincoln)
Target Audience	Builders, developers, energy businesses; Gov't coordinates
Requirements	Voluntary
Building Type	Single family residential
Incentives	Listing of certified builders, recognition, site review, linkages to energy incentive programs
Program Design	
Measures	Primarily prescriptive; Energy Efficiency Performance
Primary Proxy	Menu of choices
Ease of Use	19 categories with a set number of required and choice features. No weighting of standards.
Rating	
Single	Nebraska Green Built Home
Certification	
Self-Certification	Home plans & specs, including manufacturer & product literature; builders must be certified through training program
3 rd Party	On-site visual inspection by NEO rep or NE Home Energy Rater
Funding Sources	
Membership	None listed
Application or certification fees	None listed
Sponsorships	None listed
Grants	Nebraska DEQ, State of NE
Other	None listed
Website	www.nol.org/home/NEO/home_const/greenbuilt homes.htm

Overview:

In April 2003, the State of Nebraska Energy Office and the Nebraska Home Builders Association launched the Nebraska Green Building program. Two years of program development went in to developing the criteria, specifications, and standards appropriate for Nebraska.

The voluntary program is based around a ratings worksheet. The worksheet includes the following categories: lot and siting, waste reduction and recycling, foundation, building envelope design, exterior walls, insulation, roof materials & construction, indoor air quality, doors, windows, structural frame, mechanical equipment & design, water heating equipment & design, water, finishes & adhesives, appliances, lighting, cabinetry & trim, and finish floor. Some categories include required strategies in addition to the menu of choices.

The pilot project was to build prototype homes that demonstrated cost-comparison with conventionally built homes in the area. Using tax-funds, the Nebraska Energy Office created a revolving loan program worth \$1 million dollars to fund the pilot project and subsequent projects. The loan was to be repaid with the sale of the homes. To participate, builders are required to attend training to become a certified Nebraska Green Builder. In the first year of the pilot project, three high income model homes were built. Their construction process was a working classroom for builders, students, and other professionals. Future plans will include exploring a similar process with more affordable housing.

The Nebraska Department of Environmental Quality (DEQ) provided a grant for website development and a special listing of recycled content products. Other programs associated with the Nebraska Energy Office include Energy Star, Home Energy Rating, Renewable Resources, and Design/Build Issues.

Strengths:

The State should be commended for dedicating such a large sum of money to catalyze green building methods. The energy efficiency categories are comprehensive and attentive to detail. Builders are connected to the process through certification, training, and participation with the Green Building Council.

The worksheet is organized to reflect components of the construction process.

Drawbacks:

The website provides very little information or tools to residents. The website itself is not very sophisticated and is poorly organized.

The organization of the categories and the strategies suggested are too complex with little technical support to inspire builders or owners. Many of the strategies are not stringent enough to justify the goals of green building. Often it is the scale of the strategies that is questionable. The number of strategies listed and choices per category are not weighted to reflect environment, social, or economic benefit.

The design and operations/maintenance stages of implementation are poorly represented. Home owner interests are not actively represented through this program. Lincoln is the only community included so far in this state-based program.



Florida Green Building Coalition

Program:	Florida Green Building Coalition
Year of Inception	2000
Managed by...	Non-profit
Staffing	Executive Director, Elected Board of Directors & Corporate Officers
Partnerships	Florida Solar Energy Center
Membership	Categories: student, individual, non-profit, government agencies, & business
Geographic area	Statewide
Target Audience	Municipal Green designation Building owners, developers, professionals
Requirements	Voluntary
Building Type	New & Existing homes, developments, small green commercial buildings
Incentives	Brand, success case studies, builder profiles, mortgage assistance, overlay with Florida Building code
Program Design	
Measures	Primarily prescriptive, Energy Performance element
Primary Proxy	Point-system, weighted on environmental benefit
Ease of Use	Min and Max for each category; Complex categorization, but checklist descriptions kept simple, reference guide provides greater detail; Checklists for Home, Development, & Commercial
Rating	
Simple	4 programs: Home, Development, Commercial Building, & Municipality
Certification	
Self-Certification	Proof of implementation with document submittal
3 rd Party	Certain criteria require 3 rd party certification by certifying agents or project evaluators
Funding Sources	
Membership	Annual Dues: \$25 to \$475
Application or certification fees	Processing: Home: \$50 - \$75; Developments: \$1000 + (\$1 x total acres); Commercial: \$3000 - \$6000
Sponsorships	Florida Solar Energy Center, seeking others
Website	www.FloridaGreenBuilding.org

Overview:

FGBC was conceived and founded in the belief that green building programs will be most successful if there are clear and meaningful principles on which “green” qualification and marketing are based. FGBC is a membership-based organization governed by a Board of Directors and Corporate Officers who are elected by vote of the general membership. There are five standing committees with specific responsibilities:

► **Education:** Maintain FGBC continuing education and accreditation files; develop educational materials and programs that can be promoted to members, industry and the public; maintain a schedule of education and training events and linkages to appropriate non-FGBC events; and provide web site education and training content.

► **Nominating:** Ensure electoral honesty and fairness; establish the nominees for elections of the Board of Directors and its Officers; process nominations and referenda from the membership; and provide web content for elections.

► **Research & Technical:** Provide technical guidance to the Board of Directors; maintain web-based credits list for standards adopted by the Board; process requests from private entities wanting their latest widget to qualify for credit under one of the standards; and respond to questions of a technical nature asked by visitors to the web site.

► **Program & Promotion:** Manage program operations (e.g., provide certificates, etc.); market FGBC programs; maintain FGBC web site; prepare, coordinate and circulate news releases for FGBC; and coordinate FGBC fund raising efforts (grants and partnerships).

► **Standards:** Oversee the development of Standards, Guidelines and Procedures; uphold the requirements for consensus in the revision and public comment on standards; and provide Standards content in easy-to-use, web-based format. – FGBC website

The group also has four working committees: Green Homes, Green Commercial Buildings, Green Developments, and Green Municipalities. Articles of Incorporation and By-laws are available on their website.

Strengths:

The FGBC provides significant programmatic and technical support through certifying agents or project evaluators and a standard reference guide that includes cost/benefit ratios, environmental implications, utility savings, and a list of statewide suppliers. Trainings and workshops are held each year. Private consultation services are also available. The program is accessible to a wide variety of interested parties and the information provided is both detailed and clearly stated for the novice and professional alike. They oppose “green-washing” practices that dilute the value in the meaning of green building.

Drawbacks:

Newly formed non-profits rely significantly on the energy and abilities of their volunteer boards and working groups. The program risks burnout and stagnancy because it is not tied to an established entity. If they emerge from the first five years still strong, they will continue to persevere. If not, then the status of the brand and credibility associated with the program is in jeopardy.



NJ Green Affordable Green Program

Program:	NJ Green Affordable Green Program
Year of Inception	1998 (pilot program)
Managed by...	State of New Jersey's Department of Community Affairs (DCA)
Staffing	2 state employees (Green & Balanced Housing Programs)
Partnerships	PSE&G, developing contacts with building professionals
Membership	Request for Qualifications for High Performance/Green Design Professional
Geographic area	Statewide
Target Audience	Government buildings in pilot project; Building professionals are primary target; owners as consumers for creating demand
Requirements	Mandatory for DCA pilots; evolve to voluntary
Building Type	Affordable multi-family housing projects
Incentives	Energy Star, subsidies per unit, marketing campaign, awards & recognition, builder's association, state rebates for green technologies; future plans: Mortgage programs, trainings, energy raters alliance, project specific technical assistance.
Program Design	
Measures	Primarily prescriptive, energy performance; Goals & objectives are performance
Primary Proxy	Green Matrix; menu of choices
Ease of Use	Connected with the Balanced Housing application;
Rating	
Single	DCA NJ Affordable Green
Certification	
Self-Certification	Developer must sign a Memorandum of Agreement based on the Green Matrix; Tracking worksheet and various documentation
3 rd Party	NJGHO final inspection
Funding Sources	
Other	Currently all state funded
Website	www.nj.gov/dca/dhcr/hsg_prog/njgreenhomes.shtml

Overview:

The mission of the office is to fundamentally improve the environmental performance, energy efficiency, quality, and affordability of housing in New Jersey. Through advocacy, education, and technical assistance we aim to accelerate the use of innovative green design and building technologies, raise building standards and create a consumer demand for efficient and environmentally responsible - high performance homes.

The Green Homes office is an outcome of the successful Sustainable Development Affordable Housing Pilot Program initiated by DCA in partnership with PSE&G in 1998. The Pilot is composed of seven major, new and rehab, construction projects presently in various design and construction stages. In total 367, low to moderate income units will be built Energy Star certified, resource efficient, and environmentally healthy. The Green Homes office will build on the momentum achieved by the developers of affordable housing through the pilot program.

Goals and objectives are divided into five categories: Siting and Land Use; Building Design; Energy; Resource Efficiency; and Operations and Maintenance. The Green Matrix was designed on an MS Excel spreadsheet. Builders fill out the form and preset calculation estimate cost and energy incentives. Developers are required to submit a narrative describing how their project will meet the performance measures set in the goals.

Strengths:

The State of New Jersey, through this pilot initiative, is addressing a common concern regarding green building: the cost. By targeting affordable housing projects, the program establishes a baseline for providing benefits to low to moderate income residents. Combining the efforts of the Balanced Housing Program with Green Building is a unique approach compared to other green building programs. With support from state funds and an established review process for developers, incorporating the Green Matrix is not as great of a challenge.

The goals and objectives clearly describe a vision for success in the program. They provide the underlying context to reform the assumptions of the developer toward construction. While not divided in similar categories to other programs, the Matrix considers a spacio-temporal approach, from design to construction to operations and maintenance.

Drawbacks:

This program takes a very hierarchical approach to implementing a green building program. The guiding documents and technical support for satisfying program requirements are generated by the State. The Green Matrix is a very structured and prescriptive document. While providing the State with the information needed, it requires builders to dedicate a great deal of time documenting specifics.

The program targets the developers who, in turn, make decisions for the eventual owners. There is a give and take with the developers participating, and knowledge of successful green building techniques is passed through them to other professionals and customers. This separates the owner from ownership in the process. It also limits the accessibility of the program to all professionals.

Other sources of funding will be needed to sustain the New Jersey program. While a pilot project may set the groundwork, implementation of similar strategies with non-State funded buildings may be difficult.



Austin, Texas

Overview:

Concerns regarding energy supply began in Austin in the early 1980s. The City Council devised energy conservation programs to delay the construction of a new power plant. Successful programs developed with marketing assistance to builders for exceeding minimum requirements of the new City Energy Code. From this starting point, the City began to consider other efforts conserve environmental resources. In 1991, they initiated the first comprehensive program to encourage sustainable building techniques in residential, multifamily, commercial, and municipal construction.

The residential, multifamily, and commercial programs are voluntary. Homes are rated in six areas: energy efficiency; testing; water efficiency; materials efficiency; health and safety; and community. Workshops and a resource library are provided to help owners make sustainable decisions. Also, a publication called “Green by Design” mentally walks a novice through the process from building a team to verifying completion of work. Practitioner must be a member of the Green Building Program.

Direct, free technical assistance is provided for commercial builders. The program is incorporated in the early stages for effective sustainability planning. A Checklist and Commercial Rating Tool is designed specifically for commercial interests. Sustainability Bonuses, cash incentives, and assistance in coordinating rebates are offered.

The municipal program is encouraged, but not required, for newly constructed and remodeled City buildings and facilities. A three-volume set, called the Municipal Guidelines, includes the guidelines, a specifying guide, and a commissioning, operations, and maintenance manual.

Strengths:

They present a balanced mix of required strategies and a point-system checklist. The combination ensures certain issues are always addressed while allowing some controlled decision-making in other areas. The Health & Safety category targets molds, mites, and fibers and chemical outgassing, two major concerns with indoor air quality.

With almost 15 years of program development and a large staff, the Austin program has figure out how to be success in implementing green building practice. The community is engaged with the work, with over 130 companies participating in the program. A grassroots non-profit organization, called the Sustainable Building Coalition, provides a tangential educational and spiritual component not often associated with municipal programs.

The Austin Green Building Program has been so successful that a significant portion of their non-government funding comes from consulting other cities and some national programs, such as the US Green Building Council.

Drawbacks:

It was the right time in the right place. Austin’s energy concerns and the resident’s interest in environmental conservation provided a fertile ground for green building. This is not the case in all communities. The checklist, while balanced, is very prescriptive and leaves little room for design flexibility. The requirement that builders be members of the green program, although free, creates a bottleneck of knowledge and practice in the market. The self-certification method does not provide enough oversight to ensure the quality expected is being achieved. The checklists are inaccessible for review, perhaps for proprietary reasons.

Program:	Austin, TX
Year of Inception	1990
Managed by...	City
Staffing	12 specifically for program
Partnerships	14 local organizations including non-profits, colleges, city programs, and practitioners
Membership	130 practitioners who completed workshop
Geographic area	Citywide
Target Audience	Residential, Multi-family, Commercial, and Institutional
Requirements	Voluntary
Building Type	Homes, apartments, commercial office, government office
Incentives	Rebate programs for Residential, Commercial, and Multifamily
Program Design	
Measures	Prescriptive
Primary Proxy	Comprehensive, weighted checklist, mandatory elements and point-system
Ease of Use	Owners and practitioners need the program staff to direct them in the actual implementation (the checklists are not available online), but there are numerous resources available for product and design research.
Rating	
Scaled	Stars, scale 1 to 5
Certification	
Self-Certification	Architect, designer, or builder must be Green Building Members
3 rd Party	Rating and Final inspection for commercial buildings
Funding Sources	
Membership	No dues
Grants	Urban Consortium Energy Task Force for program development
Other	Books, CDs, workshops, “Manage it Green” program consulting to other cities
Website	www.ci.austin.tx.us/greenbuilder



Boulder, CO Green Points

Program:	Boulder, CO Green Points
Year of Inception	1997
Managed by...	City's Office of Environmental Affairs
Staffing	Not specified
Partnerships	Not specified
Membership	All builders are required to participate; certification workshops provided
Geographic area	Citywide
Target Audience	Home owners
Requirements	Mandatory
Building Type	All newly constructed residential buildings (including single and multi-family housing); interior remodels over 500 sq ft; and additions over 500 sq ft
Incentives	Building permit
Program Design	
Measures	Prescriptive with optional energy performance measure
Primary Proxy	Weighted point-system; number of points required increases as square footage increases. Energy Code Worksheet can be performance or prescriptive.
Ease of Use	Checklist and Energy Code Worksheet information available on-line. Clear, concise language allows owners to negotiate their interests with builders. Category divisions are based on typical construction practice, making it easier to implement in stages. Points are cumulative (no requirements per category); Energy Code worksheet is required
Rating	
Simple	Mandatory
Certification	
Self-Certification	Some measures through documentation (City reserves the right to inspection)
3 rd Party	Other measures verified by city inspector during rough inspection and final inspection.
Funding Sources	
Other	Not specified
Website	www.ci.boulder.co.us/environmentalaffairs/green_points/index.htm

Overview:

The Office of Environmental Affairs sponsors the Green Points Building Program to encourage the use of cost-effective and sustainable remodeling and building methods that conserve fossil fuels, water and other natural resources. It is one of only a few completely mandatory residential programs in the country. The purpose of the program is to: help homeowners find the products and designs for building "green"; encourage Boulder homeowners to include cost-effective and sustainable remodeling and building methods that conserve fossil fuels, water and other natural resources; promote the recycling of construction materials and reduce solid waste; and promote better indoor air quality.

Green Points divides its program into 10 categories, with 71 strategies. The application form provides a checklist describing the necessary strategy and related certification method. The points per option are weighted, giving more points to measure that have a larger impact. Other resources include a Residential Construction and Demolition Waste Checklist and Construction Job-Site Recycling Guide.

Strengths:

Residents of the City of Boulder, nestled in the foothills of the Rocky Mountains, have a long-standing reputation for environmentally- and socially-conscious behaviors. Building practitioners and suppliers are ahead of the curve on green building techniques and technologies.

The mandatory requirement redefines the industry and establishes an "even playing field". In other words, the cost of green building is assumed by all builders and owners, thus the comparison factor of conventional versus green-built is non-existent. This will intentionally slow the rapid growth rate of the housing market in Boulder.

Also, this program inherently encourages growth of new industry and expansion of existing businesses. Surrounding cities, including Denver, have greater access to new products and services.

Looking to the future, they will be able to maximize the benefits of green building by taking into account the whole community, rather than individual efforts. Planning for future utility and resource programs is more predictable with non-market based criteria.

Drawbacks:

The political environment of Boulder encourages decisions based on world-view and regional arguments. This atmosphere does not exist in most cities and states of the US. It is unlikely that enough public support would be offered to allow a mandatory requirement like this unless the communities were under extreme environmental duress.

Boulder creates a new bureaucracy that must be managed and imposes an unconventional ideology on the populace. These questions are raised: Was there low confidence amongst the City that people would participate in a voluntary program? What does that imply about the government's relationship with the people they serve?

Housing prices in Boulder are high in comparison with the rest of Colorado and the US, in general. This program adds to the initial cost of housing, further stratifying affordability in the market. Workers in Boulder who seek or require affordable housing must move outside the city & commute. This practice consumes valuable farmland, increases costs for low & moderate income workers, and increases fossil-fuel use.



Portland, OR G/Rated

Overview:

In 2001, the City adopted a Green Building Policy requiring all new construction and major renovations to meet the certified level of LEED. Additionally, recognizing that there were local issues associated with green building practice that needed to be addressed, the City negotiated a Portland supplement that can be applied through LEED's application process. This became known as Portland-LEED.

The Portland-LEED by "localizing" LEED standards (ie erosion control, stormwater management, energy regulations); creates pre-approved innovation credits reflecting Portland's goals for mixed use development, construction waste management, alternative transportation, and stormwater management; and gathers local building and zoning code regulations into a centralized resource guide. The fundamental goals of G/Rated are 1) to expand market demand by educating building industry professionals and the public and 2) make green building practice easier to implement by reducing regulatory and financial barriers while developing technical services and resources.

G/Rated primarily targets government and commercial building owners and practitioners. Financial incentives, case studies, and information on tenant improvements are available in the commercial building program. ReThink is a comprehensive green building training series for commercial and residential building design and construction professionals.

The residential building portion of G/Rated focuses on owner education and encourages modification of behaviors. Although incentives to home owners are not offered, state and national sources are identified. The Build It Green! home tour and information fair is a self-guided tour that provides an opportunity for homeowners to share their knowledge and learn about best strategies.

The Resource Center provides a wealth of on-line knowledge to commercial and residential owners alike. Research, practices & strategies, tools & software, technologies, and G/Rated publications are provided. Additionally, a green directory links owners to practitioners and suppliers in the Northwest region.

Strengths:

Through Portland-LEED, G/Rated is able to provide a conduit to a highly regarded standard without draining resources or creating a burdensome new bureaucracy. By supplementing the established LEED standards, Portland is able to address issues that are more local or regional in scope. While the residential portion seems lacking, the availability of regional programs, such as Earth Advantage, can fill the need for a home ratings or certification process. With a strong environmental ethic amongst the population already, the onus and responsibility is placed upon the owner with support from G/Rated.

Drawbacks:

By connecting with the USGBC's LEED program, the City of Portland is dependent on that organization's reputation and its effect on their programs. Projects must register, apply, and be certified through the LEED process, which can be expensive. LEED does not address some key issues, such as operations and maintenance post-construction and weighting credits based on levels of environmental or social impact. Also, G/Rated does not significantly include home builders, a major part of the building industry.

Program:	Portland, OR G/Rated
Year of Inception	2001
Managed by...	City's Office of Sustainable Development
Staffing	5 program specific
Partnerships	With city offices
Membership	N/A
Geographic area	City of Portland
Target Audience	Governments, Owners, and Practitioners
Requirements	Voluntary (Gov't Mandatory)
Building Type	Institution, Commercial, Residential (informational & case studies)
Incentives	Awards for businesses, recognition, support for accessing grants, rebates, loans, and tax credits, information on green mortgages, in past: grants for residential case studies
Program Design	
Measures	Uses Portland LEED-NC
Primary Proxy	Uses Portland LEED-NC
Ease of Use	For projects already seeking LEED certification, the process is clear and simple. This program expands the local benefits of implementing LEED.
Rating	
Scaled	Certified, Silver, Gold, Platinum
Certification	
Self-Certification	Uses LEED-NC
3 rd Party	Uses LEED-NC
Funding Sources	
Membership	Commercial & Gov't must join USGBC to use LEED
Application or certification fees	
Sponsorships	Sponsorships and tuition pay for additional programs and events
Grants	Grants and contracts
Other	Residential and commercial solid waste fees
Website	www.green-rated.org



Seattle, WA Sustainable Building

Program:	Seattle, WA
Year of Inception	1998
Managed by...	City
Staffing	Green Building Team: 11 from City Departments
Partnerships	Utilities, Built Green of King and Snohomish Counties, USGBC
Membership	N/A
Geographic area	Citywide
Target Audience	City projects (and residential or businesses through city and state incentives programs; multi-family Built Green incentive; business LEED incentive)
Requirements	Mandatory for all City-funding building greater than 5000 sq ft
Building Type	Government/Institution
Incentives	Required for city contracts over 5000 sq ft.; city incentives are available for residential and commercial projects.
Program Design	
Measures	Seattle LEED v2.0
Primary Proxy	Seattle LEED v2.0
Ease of Use	A detailed set of tools are provided, including LEED Seattle supplement, project manager task list, recycled content product guide, design for occupant recycling, and sustainable resource guide
Rating	
Scaled	Minimum LEED-Silver (v2.0), Gold or Platinum are optional
Certification	
Self-Certification	LEED Silver application and certification process
3 rd Party	Review by USGBC (includes the Seattle supplement)
Funding Sources	
Other	City funded
Website	www.cityofseattle.net/sustainablebuilding

Overview:

The City of Seattle's program is mandatory for city-funded buildings greater than 5000 square feet. They chose to co-opt LEED's standards to help increase the environmental performance of city buildings. All required buildings must meet LEED Silver standards and the Seattle supplement. The Seattle supplements take into account the unique regional environmental and social aspects, the goals of the City, and local codes and ordinances.

Guidelines were created for City facilities in the form of a Facility Standards for Design, Construction, and Operations (FSDCO) manual, a performance guideline. The management and administration of this mandatory program is overseen by a team of 11 state employees, called the Green Building Team. Members are recruited from the following departments: Office of Sustainability and Environment; Seattle Public Utilities; Seattle City Light; Fleets and Facilities Department; Office of Housing; Department of Planning and Development; Seattle Parks and Recreation; and the Seattle Center.

Seattle's Sustainable Building Library provides up-to-date information on sustainable building techniques and materials to designers, builders, project managers and do-it-yourselfers. This includes design strategies, industry standards, best management practices, information on building materials, and other topics. An on-line tool, called Implement, allows the public to query best management practices on a variety of topics.

A diverse slate of state and city based incentive programs are available for residential and commercial projects. This includes links to Built Green incentives for multifamily projects and LEED incentives for businesses.

Strengths:

Using a national standard such as LEEDTM helps establish minimum performance levels, creates a common dialogue for discussion, and allows Seattle to measure its building performance relative to other jurisdictions using the same system. In addition, technical rulings, training, networking and marketing support are provided by the USGBC.

Seattle has great accessibility to information on sustainable building practice. In implementing standards for their own buildings, they are working to lead by example for their residents. They take this suggestion a step further by providing the tools to accomplish this: information and incentives.

Ratings systems for residential and commercial buildings are provided by Built Green of King and Snohomish Counties and USGBC's LEED, respectively.

Drawbacks:

At the time of its inception, the LEED rating system was in version 2.0. They continue under this version today, despite the upgrades of LEED to version 2.1. This is an example of the need for built-in flexibility that must be addressed by cities co-opting LEED standards.

Implement was released in 2004 as a tool for the general public.

Unfortunately, the tool is incomplete. Offices, tenant buildings, and fire stations are the only buildings listed. It does not yet include strategies for much desired residential buildings. The tool needs a good amount of work before it will be useful to the general public.



Scottsdale, AZ Green Building Program

Program:	Scottsdale, AZ
Year of Inception	1998
Managed by...	City
Staffing	1 Program Coordinator assisted by interns & inspection staff
Partnerships	Green Building Advisory Committee
Membership	Practitioners are expected to attend 2 workshops/year
Geographic area	Citywide
Target Audience	Consumer-driven, owners, practitioners
Requirements	Voluntary
Building Type	Residential, Multifamily, Commercial & Tenant Improvements, Residential remodels, and City facilities (LEED-Silver required in future?)
Incentives	Expedited plan review, public education (Tours, expos, workshops), special inspections and certification, homeowner's manual (in layman's terms), Directory of participating designers and builders, builder/developer promotional package, and job site signs.
Program Design	
Measures	Prescriptive & Energy Performance
Primary Proxy	Point-based with 26 requirements for residential; LEED for others
Ease of Use	Pre-application, qualification meeting is required for all projects so potential plan review issues can be resolved. If okay, the project is expedited (2-3 wks)
Rating	
Scaled	Residential: 2 levels-Entry & Advanced; Others: Single level
Certification	
Self-Certification	Checklist;
3 rd Party	Qualification meeting; Building Permit Inspection
Funding Sources	
Application or certification fees	Same as regular building inspection process
Other	in-kind from City, State, and Utility; City budget; Green Building Expo revenues;
Website	www.scottsdaleaz.gov/greenbuilding

Overview:

The Scottsdale Program describes green building as “a whole systems approach utilizing design and building techniques to minimize environmental impact and reduce the energy consumption of a building while contributing to the health of its occupants.” The program’s goals are: to reduce the environmental impact of building; achieve both short and long-term savings in energy, water, and other natural resources; encourage a healthier indoor environment; and to educate the public and the development community in sustainable building practices.

Scottsdale is situated in the environmentally-sensitive Sonoran desert. The high rate of housing construction led to the first programs focusing on residential building. From the beginning, they determined that the program would be strictly-voluntary and non-regulatory, free of charge, and not require membership. Furthermore, keep it simple, flexible, and meaningful.

The residential rating system is a checklist divided into 14 categories that represent the following six environmental impact areas: site use, energy, indoor air quality, building materials, solid waste, and water. Each strategy is supported by an argument for its environmental or economic benefit.

Initially, the program was housed in the City’s Inspection Services Division. In 2003, the City committed to fully integrate it into their building regulatory process. The program moved to the Building Plan Review division of the Planning & Development Services Department.

Strengths:

Scottsdale’s integration of this voluntary program through the Plan Review speaks volumes on the City’s earnest commitment to green building strategies. It also takes advantage of the existing structure of plan review rather than creating complexity and disjointedness. This leads to improved customer service and better utilization of existing staff in Building, Plan Review, and Inspection Services. The checklist is designed based on the builder’s construction process.

Incentives are offered for non-residential projects pursuing the USGBC’s LEED rating. This keeps their overhead low, provides benefits to commercial builders, and allows the City’s primary attention to be on providing services to the general public.

In a recent progress report, they note a key strength is the “ability to both collaborate and lead in the efforts to promote sustainable building practices.” A very active Green Building Advisory Committee helped create the program and formed internal sub-committees involved in residential criteria, commercial criteria, remodeling guidelines, deconstruction/waste reduction, promotion, education, and events.

Drawbacks:

A 2003 thesis by a UMASS-Amherst graduate cited the following weaknesses in the program: Stronger incentives for developers and better tracking/estimating of mitigating environmental impacts of “green” projects. Additionally, greater inclusion of performance measures will support greater design flexibility. More efforts need to be applied to the custom design and operations/maintenance phases.



Kansas City, MO Build Green

Overview:

"Build Green" is a voluntary program developed by the Home Builders Association of Greater Kansas City. It encourages a comprehensive approach to home building, utilizing design and building techniques that minimize impact on the environment, reduce energy consumption and result in homes that are healthier for both the homeowner and the environment.

There are an infinite number of ways to build an environmentally friendly home, and the Build Green program is constantly evolving to incorporate new products and methods. The five categories into which these products and methods are organized are: Site Conservation; Energy Use; Material Selection; Air Quality; and Recycling.

Four levels of program participation - Platinum, Gold, Silver and Bronze - make the various choices in each category easier to understand and give the builder and home buyer benchmarks at which to aim. Each level is intended to result in a healthier and more efficient home, which everyone can enjoy and benefit from.

The worksheet provides a tool for builders to dialogue with their customers regarding environmental features of the home. Copies of the completed worksheet must be given to the customer and retained by the builder, but do not need to be submitted to the Home Builders Association.

Members are required to remain in good standing by completing eight classroom hours per year. Classes are sponsored and/or approved by the Build Green Council and posted to the website.

Kansas City is also the home of the Heart of America Green Builder Program. They provide access to incentives, awards, and education to developers, builders, homeowners, and design professionals to improve the quality, durability, resource, and energy efficiency of buildings and developments. (www.kcgreen.org)

Strengths:

Kansas City Build Green reduces their program's liability by including disclaimers on the quality, accuracy, warranty, nor representation of the builders or the homes. Legally, this protects the Home Builders Association from suits and reduces the overhead associated with administering the program. There are four checklists, one per rating. This division of checklists provides clear guidelines for builders and their customers to negotiate features and expected costs. The class requirement ensures that the builders continue to be educated on current trends and technologies.

Drawbacks:

While reducing their liability and administrative costs, the disclaimer also reduces the assurance of a quality standard consistently applied by all builders. Builders are required to sign a form stating that they will build to the expectations of the program, but the repercussions appear minor. Thus, it is the owner's responsibility to verify the work of the builder. As green building techniques and technologies are complex, this is a large task to assign to an often ill-informed customer. Also, by dividing the mechanism into four checklists, it is more difficult to compare strategy upgrades or downgrades. The checklist strategies are too prescriptive and not weighted to address environmental, social, or economic benefits and costs. The dues and enrollment fee seems high for the level of services offered. More incentive programs need to be included.

Kansas City, MO Build Green	
Program:	Kansas City, MO Build Green
Year of Inception	2002
Managed by...	HBA of Greater KC
Staffing	HBA
Partnerships	Home builders throughout Kansas City
Membership	Seven businesses
Geographic area	Greater Citywide
Target Audience	Practitioners: Home Builders
Requirements	Voluntary
Building Type	Single residential and some housing developments
Incentives	Niche marketing, directory listing on website
Program Design	
Measures	Prescriptive
Primary Proxy	Menu of Choices per rating; Checklist of completion
Ease of Use	Levels set as a guide, but no requirements. Checklists clearly state specific actions and strategies.
Rating	
Scaled	Bronze, Silver, Gold, & Platinum
Certification	
Self-Certification	No paperwork is required; checklist is a tool, but the actual agreement is left for verification between the builder and the owner.
3 rd Party	Independent Home energy rater is required to achieve Silver, Gold, or Platinum status.
Funding Sources	
Membership	Build Green Council \$125 Annual dues
Application or certification fees	Home enrollment fee: \$50/home
Sponsorships	Local sponsors fund administration of program
Grants	
Other	
Website	www.buildgreenc.com



Atlanta, GA EarthCraft House

Overview:

EarthCraft House is a voluntary green building program of the Greater Atlanta Home Builders Association that serves as a blueprint for healthy, comfortable homes that reduce utility bills and protect the environment. The aim of the program is to help Atlanta's home builders be leaders in smart growth management and environmental stewardship.

Any size or style of new home can be certified under the program by meeting the EarthCraft House guidelines. These guidelines are flexible to allow for a variety of approaches to environmental construction.

An EarthCraft House certification requires that a house score at least 150 points and pass a final inspection by an EarthCraft House inspector. There are twelve categories on the worksheet that cover site planning, energy efficiency, resource efficiency, waste management, indoor air quality, water conservation, home buyer education, and builder operations. All projects must exceed the Georgia Energy Code. Additionally, a minimum of 75 points must come from the energy measures category.

The four biggest advantages to becoming an EarthCraft House builder, according to the website, are reducing callbacks, differentiating your homes, increasing profits and accessing special mortgage products.

Strengths:

Significant corporate sponsorship and concerted effort for administration by the Greater Atlanta HBA has created a very strong green home building program in the South.

EarthCraft House knows its audience well. They name their four biggest advantages as reduced callbacks, quality differentiation, increased profits, and mortgage program access. The familiarity will lead to an efficient and effective program for member home builders.

By including home owner education, they take a step toward directing the operation and maintenance of the home after it leaves the builder's hands. This is one way of assuring the results that are being sought and changing consumer behavior.

Drawbacks:

The pool of available EarthCraft builders is dependent on membership in the HBA. If a builder chooses not to join the HBA, then they can not construct a EarthCraft house. There are no other branding mechanisms that offer this type of certification and assurance to home owners.

The heavy national and regional sponsorship of the program raises concerns about local market development for green building businesses. What are those companies receiving in return? A comprehensive program should encourage economic development for sustainability. Whereas some materials may be less expensive, environmental accounting of transportation and production of those materials is typically higher.

Program:	Atlanta, GA EarthCraft House
Year of Inception	1999
Managed by...	HBA
Staffing	HBA: 28; 1 point reference
Partnerships	Southface Energy Institute, government, & industry leaders
Membership	Must join HBA and EarthCraft House. 105 currently listed
Geographic area	Greater Citywide: 9 counties
Target Audience	Practitioners: Home Builders
Requirements	Voluntary
Building Type	New homes, home renovations, & multifamily: affordable housing and developments
Incentives	Branding and access to national financial incentive programs
Program Design	
Measures	Prescriptive, but must exceed GA Energy Code
Primary Proxy	Point-system; 150 minimum
Ease of Use	12 Categories
Rating	
Single	Certified
Certification	
Self-Certification	Builder must be a member and participate in variety of activities for certification status; documentation and scoring worksheet required
3 rd Party	Final inspection by 1 or more program inspectors
Funding Sources	
Membership	HBA annual dues: \$590 EarthCraft House dues: \$150
Application or certification fees	\$75; Multi-residential must pay for services
Sponsorships	Heavy national, regional, and local sponsorship.
Grants	
Other	1 st inspection is free; if home fails re-inspection costs \$75 to \$200. Cancellation fees
Website	www.earthcrafthouse.org



Santa Monica, CA

Overview:

In September 1994 Santa Monica's City Council adopted the Santa Monica Sustainable City Program. This program was developed by the city's Task Force on the Environment to create the basis for a more sustainable way of life -- one that safeguards and enhances local resources, prevents harm to the natural environment and human health, and strengthens the community and local economy -- for the sake of current and future generations.

Conventional design and construction methods produce buildings that can negatively impact the environment as well as occupant health and productivity. These buildings are expensive to operate and contribute to excessive resource consumption, waste generation, and pollution. To help reduce these impacts and meet the goals of the Sustainable City Program, the Task Force recommended that the City adopt a set of guidelines to facilitate the development of "green" buildings in Santa Monica without forcing excessive costs or other burdens upon developers, building owners or occupants.

The Green Building Design and Construction Guidelines were developed over a three-year period by City staff and Sheltair Scientific Ltd., a sustainable design consultant team, with extensive input from the local design, construction and development community. The Guidelines include required and recommended practices that are intended to reduce life-cycle environmental impacts associated with the construction and operation of both commercial and municipal developments and major remodel projects. They provide specific "green" design and construction strategies in the following topic areas: Building Site and Form, Landscaping, Transportation, Building Envelope and Space Planning, Building Materials, Water Systems, Electrical Systems, HVAC Systems, Control Systems, Construction Management, and Commissioning.

Strengths:

Santa Monica created one of the most comprehensive and easily accessible guidelines of all the green building programs. Although the number of categories involved is complex, the guidebook and design advisor provide clear organization for implementation. The design advisor conveys the required and recommended strategies clearly for a diverse set of building types. They provide options of performance or prescriptive energy requirements; this allows for design flexibility while accounting for certain immeasurable environmental and social costs. The Green Building Resource Center is a museum-style location open to the public for exploring relevant information. The recent inclusion of a voluntary affordable housing checklist opens the program to residential and low-income builders.

Drawbacks:

The systematic involvement of multiple departments is time intensive and expensive to setup and coordinate. The City Council mandate allows for this, but modifies and complicates the existing bureaucracy.

Santa Monica does not do enough to address the needs of the residential building community. Given the variety of builders and projects involved with residential, this type of mandatory program may be difficult to implement. A voluntary program may better engage home owners, home builders and remodelers.

Program:	Santa Monica, CA
Year of Inception	1994
Managed by...	City
Staffing	Program Advisor and various City departments
Partnerships	Guidelines: Sheltair Scientific Ltd, Resource Center: Global Green USA
Geographic area	Citywide
Target Audience	Practitioners: builders & designers
Requirements	Mandatory and "Recommended"
Building Type	Residential (Housing Dept provides a prescriptive checklist, but not a part of the City's defined program), high rise or low rise multifamily (including hotels & motels), non-high rise commercial office or retail, light industrial, educational institutions, and government offices
Incentives	Required for site review; financial incentives for LEED-NC achievement (20K – 35K) and innovative technologies (5K); access to state programs
Program Design	
Measures	Prescriptive; Performance or Prescriptive for energy requirement
Primary Proxy	Menu of choices: Required, highly recommended, recommended, for consideration, and not recommended strategies per building type.
Ease of Use	Complex, but very detailed and organized guidebook and supporting information. Requirements and recommendations can be queried by building type. Technologies & strategies info available on-line.
Rating	
Single	Required
Certification	
Self-Certification	Required elements must be presented in site review.
3 rd Party	Department of Environmental Management and Public Works
Funding Sources	
Fees	Building Permit fees
Other	Government funded
Website	http://greenbuildings.santa-monica.org



Built Green of King & Snohomish Counties

Built Green of King & Snohomish Counties	
Program:	Built Green of King & Snohomish Counties
Year of Inception	2001
Managed by...	Master Builders Association
Staffing	1 dedicated staff; 33 MBA support staff
Partnerships	County and State agencies
Membership	79 Builders & associates: 26 architects, 85 vendors, 7 realtors/lenders, 18 professional, 2 utilities, 7 government, 2 other
Geographic area	2 counties; Seattle area
Target Audience	Consumers (Owners), Builders, and other interested sponsoring parties
Requirements	Voluntary
Building Type	Homes, Remodel, Multifamily, Communities
Incentives	Marketing, branding, promotional materials, advertising, mortgages
Program Design	
Measures	Primarily prescriptive
Primary Proxy	Point-system, weighted
Ease of Use	Four checklists based on building type. Star requirements outlined in the beginning of checklist. Cumulative Star levels (ie Meet previous star and additional requirements)
Rating	
Scaled	1-, 2-, or 3-stars (MBA determines); Homes may also achieve 4- or 5-
Certification	
Self-Certification	Builder qualification; copy of checklist sent to MBA
3 rd Party	Review of application & submitted documents; 3 rd party verification (reference) required for 4- or 5-star
Funding Sources	
Membership	Annual fee: \$100 for MBA & \$250 for non-MBA; Attend program orientation
Application or certification fees	Fees based on MBA membership & categories: Home Builder, Developers, Remodelers, and Multifamily
Sponsorships	Levels: Industry Allies-\$40K/3 years; Building Partner- \$10K/2 years; Community Partners-\$2.5K to \$10K/year; Friends-up to \$5K/year
Grants	Government, Utilities
Other	MBA for basic budget & staff

Overview:

Website	www.builtgreen.net
---------	--------------------

The Built Green program is designed to provide builders with a unique opportunity to meet the growing demand for environmentally friendly home building. They recognized that homeowners are sensitive to issues of salmon recovery, water conservation, energy efficiency, and indoor air quality. The Built Green program gives builders the tools they need to meet this growing demand.

Their mission is to work in partnership to improve and protect the valuable natural features and environmental resources within King and Snohomish Counties to promote safer, healthier building.

The program was designed for builders and developers by builders and developers. It focuses on actions that can make a significant impact on housing, health, and the environment and are readily “doable” in King and Snohomish counties.

Features of the checklists include: Green codes, site & water protection, energy efficiency, health and air quality, materials efficiency, and environmentally responsible home ownership.

Third-party certification is required for 4- and 5- star levels. It is optional for the others. A verification checklist is provided on-line to track the required documentation. Inspectors are accredited by the program based on a well-defined Code of Ethics.

Strengths:

Built Green of King & Snohomish Counties provides a comprehensive program for residential housing. They have successfully created membership and sponsorship funding sources to strengthen their marketing, education, and administration. By partnering with local governments, they develop conduits to communicate concerns over building codes, zoning, and other issues that potentially limit green building activities. As a Home Builder Association, they have credibility within the building industry. Yet, their ultimate audience, as stated on their website, is consumers. This represents true attention to the market-driven economy of their area. Also, they achieved a balance between quality workmanship and program assurance by instituting required 3rd party verification for homes with 4- or 5- stars. This is optional for 1-, 2-, and 3-star qualification. Given the prescriptive measures are less complicated at the lower levels, documentation, checklist review, and customer feedback should be enough to ensure a builder’s integrity.

Drawbacks:

Although the checklists have a legend, they are difficult to follow for a first time user. The reliance on prescriptive-based measures means that each category has a very long list of options from which to choose. This could be viewed as a benefit by expanding choices, but actually it limits builders to a predefined set of standards without allowing design and construction flexibility.

Although the target audience is the consumer, little or no attention is placed on educating the home owner on their options and rights.



Frisco, TX Green Building

Overview:

In 2001, the City of Frisco became the first municipality to institute by city ordinance a mandatory green building program using the EPA's Energy Star program. The ordinance regulates energy efficiency, conservation of water, indoor air quality, and recycling of waste for all residential buildings.

Frisco's program was developed as a quality measure to protect the housing stock of a rapidly developing community. The City Council felt that a program mandating high-performance housing was a good way of keeping real estate and community values high as the more or less uniform housing stock matured.

The Green Building Program focuses on several areas including: waste reduction, pollution reduction, water conservation, energy conservation, and sustainable development. The performance-based minimum standards are divided into four categories: energy efficiency, water conservation, indoor air quality, and waste recycling.

Strengths:

The City of Frisco details the "green" philosophy in its comprehensive plan. This serves as a basis for implementing green building through the city's planning process which is a strong criterion for future success.

By integrating the Green Building Program with the Planning Department, Frisco efficiently addresses consistency for applying the program. As a mandatory program, all contractors and builders are required to self-inform to receive building permits or favorable site reviews. This creates an environmental and economic baseline for residential green building projects regardless of builder.

By making the standards of this program mandatory, they hope to give future generations the legacy of environmental sensitivity, functionally efficient homes, and a commitment to conservation.

The minimum standards are performance based, which allows for some design creativity and flexibility.

Drawbacks:

The program does not provide incentives nor support to builders or owners for meeting or exceeding the minimum standards. In fact, it appears aggressively bureaucratic in comparison with all other programs, mandatory or voluntary. It presents a completely regulatory process that would receive a great deal of political backlash in many other parts of the country.

Although the minimum standards are performance based, the reasoning behind the choices is not clear. Strategies are based on conventional techniques which does not encourage earnest growth of commonly accepted green building practice. It presents a bare-bones approach. Only two links, EPA's energy star and one on native plantings, were listed on the website. In the midst of incredible growth in green building ideas throughout the country, this seems to limit accessibility to education. Perhaps, supporting organizations exist within Frisco that address these issues.

Program: Frisco, TX	
Year of Inception	2001
Managed by...	City
Staffing	Through planning department: 5 staff
Partnerships	None
Membership	Required
Geographic area	Citywide
Target Audience	Builders, contractors
Requirements	Mandatory
Building Type	Residential, Subdivision
Incentives	Building Permit
Program Design	
Measures	Performance; Energy performance according to EPA Energy Star
Primary Proxy	Set minimum standards
Ease of Use	Minimum standards in 4 categories; strategies clearly defined (but not described); no checklists, no technical support, no additional information beyond minimum standards
Rating	
Single	Mandatory
Certification	
Self-Certification	
3 rd Party	Site plan review; Third Party Rater Verification required
Funding Sources	
Membership	Contractor registration: \$50
Application or certification fees	Development fees
Other	City funded within planning department
Website	www.ci.frisco.tx.us/planning/greenbuilding_index.htm