Green Building: Saving Money and the Environment

Opportunities for Louisiana

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People First; Developing Sustainable Communities is a cooperative effort of individuals and groups in Louisiana seeking to promote the joint goals of prosperous communities and a healthy environment. For further information, please contact Paul Templet, Project Coordinator. Phone: (504) 388-6428. FAX: (504) 388-4286. Internet: ptemple@unix1.sncc.lsu.edu.

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READERS' GUIDE

Why Was This Report Prepared?

The citizens of Louisiana face a number of important environmental challenges. The state has problems with air quality, water pollution, loss of coastal wetlands, degraded riparian areas, invasion of exotic species, diminished biodiversity, and a host of other problems.

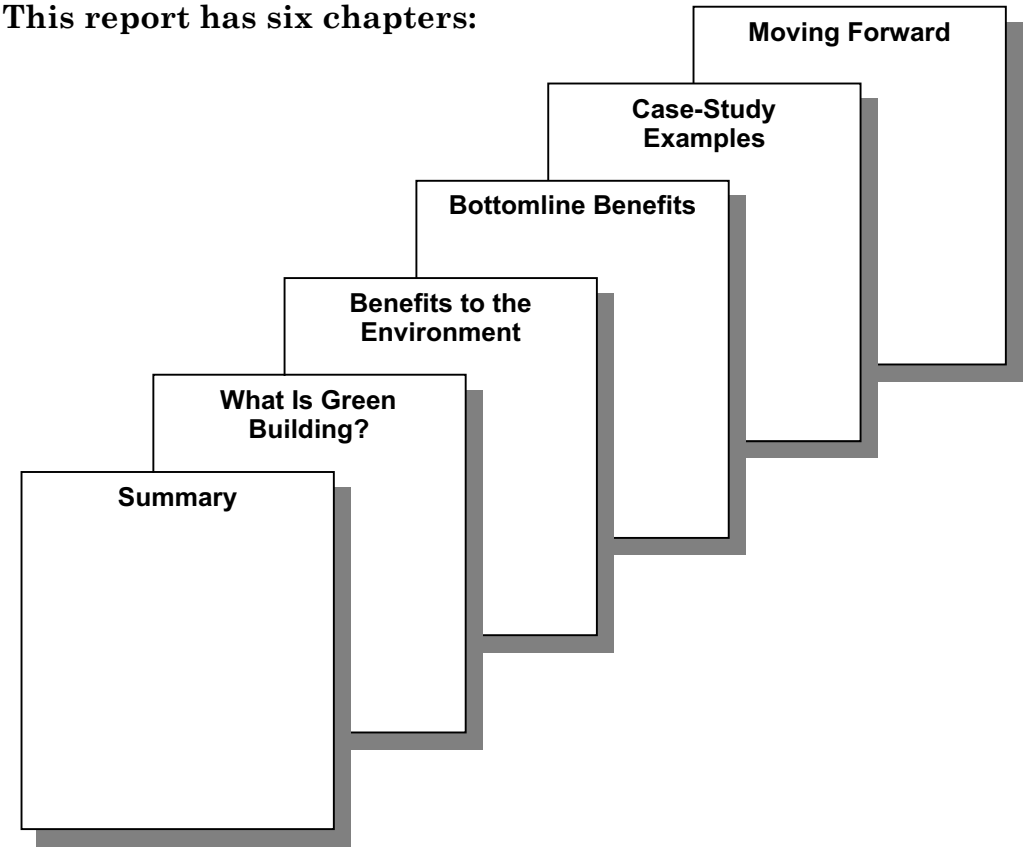
These environmental issues constrain the economy and the well-being of communities throughout Louisiana. The public and decision makers want to take appropriate steps to resolve these problems, but often hesitate because they fear the economic consequences will be too severe. But it is impossible to overlook the linkages between Louisiana's economic and environmental problems. Relative to other states, it ranks at or near the bottom of economic and environmental indicators. In a study ranking the 50 states for economic and environmental performance, Louisiana ranked 48th for economic performance and dead last for the environment. According to the U.S. Census Bureau, almost 20 percent of Louisianians live in poverty, the third highest poverty rate in the country.[1]

This study is part of a series of reports that show that environmentally sustainable business and development practices can be good for business, as well as the environment. With these reports, we aim to provide accurate, objective, and easy-to-understand information about the potential costs and benefits associated with adopting practices and policies that can resolve pressing environmental problems and lead to a more sustainable economy. This report focuses on building practices, for residential, commercial, and institutional development.

Authors and Acknowledgements

Ernie Niemi, Anne Fifield, and Jessica Knight wrote this report at ECONorthwest, an economic consulting firm in Eugene, Oregon, in conjunction with People First, Sustainable Communities, an organization committed to promoting the accomplishment of prosperous communities and a healthy environment in Louisiana. Funding support for the project was provided by the Ford Foundation. We gratefully acknowledge the insight and assistance of Paul Templet and all the individuals we interviewed.

This report has six chapters:



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Learn more about green building. Visit the U.S. Green Building Council's website: www.usgbc.org.

Visit green building's in Louisiana. Tulane University in New Orleans offers tours of its existing green buildings, and the Earthlab building at the Audubon Zoo in New Orleans is open to the public.

SUMMARY

Louisiana faces a number of growing environmental challenges. Many of its problems stem from its industrial pollution, but urban development is also part of the problem. Changing urban development can be part of the solution. Human structures can be built to minimize stormwater runoff, energy use, and toxic building materials.

Many people may associate green building techniques with California and the Pacific Northwest, where many projects have been built and the ideas are somewhat commonplace. However, the Southeast has its fair share of small projects that incorporate green building techniques, and also some extensive projects that are some of the best showcase examples of how green building can be used to minimize development's impacts on the environment and be profitable.

Some builders prove every day that conserving the environment does not have to hurt the bottom line. **They have shown that using green-building practices for design, construction, and landscaping can help conserve the environment…**

- *Directly* by reducing building-related damage to the environment and pollution.
- *Indirectly* by reducing the demand for water, hydropower, building materials, and other goods, the production of which is often harmful to the environment.

… and save money. By incorporating green-building practices, Louisianians could save millions of dollars each year in energy, water, and construction-related costs. Who benefits?

- *Builders:* Green homes and buildings are often more marketable, and, because green buildings promise lower future utility bills, buyers can spend more on the structure.
- *Homeowners:* Green homes use less electricity, water, and sewer capacity. Energy-saving improvements translate into increased home equity and preferential mortgage rates are available for energy-efficient homes.
- *Businesses:* Commercial tenants of green buildings pay up to 35 percent less for lighting, heating-cooling, water, and sewer. Their workers often are more productive because they are exposed to fewer toxic building materials and work in natural light. Louisiana's new Commercial Building Energy Conservation Code will save Louisiana building owners over $4 million in energy costs within ten years.
- *Taxpayers and ratepayers:* Energy-conservation measures at one Louisiana school district led to more than $800,000 in avoided utility costs in the first year of the program. Conserving electricity and water also lowers the need for expensive power plants and water supply

facilities. Also, preventing pollution usually is cheaper than cleaning up after the damage is done.

Wider application of green building practices makes good economic sense. Through common-sense actions, they stop wasteful uses of electricity and water that are expensive to produce; reduce the emission of pollutants that are a waste of resources and expensive to clean up; recycle building materials that are too valuable to throw away; and avoid creating compacted soils and other impervious surfaces that are expensive to manage, accelerate rainwater runoff, and increase the risk of flooding.

Green Building Practices Will Make Even More Sense in the Future

The monetary savings from using green building practices should increase in the future, as these and other forces increase the demand for green building practices:

- *Consumer preferences.* Just as shoppers increasingly prefer "organic" foods, they are likely to prefer to shop in innovative, green buildings.
- *Green building supplies.* Home Depot and other building suppliers have made commitments to supply green-certified building materials. Builders that buck the trend face market sanctions.
- *International markets.* Local manufacturers increasingly will have to occupy green factories to have access to European and other markets where green standards are high.
- *The free lunch is over.* When builders use environmentally harmful materials and practices, somebody eventually has to pick up the tab. As the tab gets larger, society will press for greater use of green building practices.

The *Case Studies* chapter shows how individual projects have saved money through green building.

In short, Green Building will help the region adopt more environmentally and economically sustainable paths. In doing so, the economy, communities and environment will all benefit.

WHAT IS GREEN BUILDING?

Green building has its roots in the energy-conservation movement of the 1970s and 1980s, and has matured to embrace a wide set of design standards and building techniques. But many green development patterns and designs have been used for centuries—such as orienting building to maximize winter sunlight, and minimize summer heat. The techniques involved in green building are diverse, and are described in a wide variety of manuals and guides. Not all green building practices deal with the structure of buildings; some deal with large interior appliances and systems that are installed when a building is initially constructed, and others deal with landscaping, site design, and other exterior issues.

Green Building Practices

Green building practices fall into seven basic categories, and directly benefit builders, businesses, homeowners, and the environment.

Energy-saving practices reduce the amount of electricity, natural gas, and oil used for space cooling and heating, water heating, and lighting of homes and offices. Techniques include furnaces equipped with clock thermostats, skylights for closets and dark hallways, office occupancy sensors, and triple-glazed windows. Additional savings are achieved through energy-efficient appliances. Basic building design can reduce electrical demands as well. Passive solar design takes advantage of winter sun, summer shade, prevailing breezes, and natural lighting, and landscaping to minimize energy use.

Water-saving practices cut down on water use both indoors and outdoors. To manage water consumption, a green building incorporates low-flow showerheads, aerating faucets, low-flow toilets, and high-efficiency washers. Outside of the home, water systems reuse household grey water to irrigate the lawn and garden. Landscaping with plants native to the region can also reduce the demand for water.

Land-saving practices avoid development on open space and other undeveloped lands. Renovating old buildings usually has less environmental impact than constructing a new building, and preserves a sense of history.

Stormwater runoff-reducing practices limit the amount of stormwater that surges into streams during rains, primarily by retaining stormwater on-site and reducing the amount of impervious surface on the property. Techniques include on-site drainage ponds, rainwater catchments and the use of pervious materials, such as gravel or crushed stone, rather than asphalt or concrete.

Materials-conserving practices are based on the three "Rs"—Reduce, Reuse, and Recycle—and these practices lower the demand for new timber and other natural resources. They include advanced framing systems that use less timber, and salvaging reused timber and other building materials.

Pollution-reducing practices limit the use of toxic building materials, such as particleboard and cabinetry made with formaldehyde glues. Cutting down on pollutants is also important outside of the home or office. Green builders substitute native plants for exotic plants in landscape designs, which decreases the need for environmentally harmful (and expensive) fertilizers and pesticides.

Green building need not incorporate practices from all seven categories. Some designers specialize in passive solar design, where the shape and orientation of the building minimize summer sun and maximize winter light. Other designers may focus on energy-efficient electronic systems. Green building is a way to think about creating or upgrading buildings so as to minimize the buildings'—and their occupants'—impact on the environment.

Landscaping

Cities produce an 'urban heat island' effect, because materials like concrete and asphalt store more heat than vegetation. Temperatures in parking lots are substantially higher than in neighboring parks featuring shade from trees. Trees can counteract the urban heat island effect, reducing the solar energy in their shade by 90 percent. Properly placed next to buildings, they can cool the structure with their shade in the summer, as well as block winds in the winter.[2]

Integrating native plants into a building's site design has many benefits. Because plants thrive in their native climate, they require less maintenance. Caretakers need less fertilizer and pesticide to cultivate healthy landscapes, so less of these chemicals make their way into waterways and aquifers. Native plants require less water from irrigation systems, rainflow can sustain them. Native plants can slow down the rate of stormwater entering streams and waterways, minimizing flood damage and the amount of urban runoff entering waterways.

Native plants are distinct to an area. By incorporating Louisiana's rich foliage into a regional landscape, they help to distinguish that region from other parts of the country. Native plants can provide habitat to native wildlife, and incorporating natives into urban and suburban landscaping can help reduce the loss of the region's biodiversity.

Work with the State's Historic Preservation Goals

Louisiana is renowned for its architecture, luring tourists from around the world to visit sites, such as New Orleans' French Quarter. The state works to preserve historic buildings, providing technical advice on renovation and restoration of historic buildings and a property tax relief program for restoration projects.[3]

Renovating and preserving older structures not only encourages the efficient use of existing infrastructure, older buildings have many passive solar design features to keep interiors cool throughout the hot and humid Louisiana summers .

Traditional architecture can provide important lessons to green builders. In the days before central air-conditioning units, buildings had features that kept the inhabitants cool. Features such as high ceilings, transoms over doorways, courtyards, and wraparound porches all help cool buildings in the hot and humid climate. Incorporating these traditional features into new buildings, and retaining and renovating them in old buildings can keep a building naturally cool, minimizing the demand for cooling systems. Buildings need not be covered with photovoltaic units and built of space-age materials to be green. A few simple design features, that have been used for centuries, can go a long way in reducing demand for energy and water.

Green Building Practitioners

The numbers of people and businesses involved in green building have grown rapidly in recent years. Louisiana enacted the Commercial Building Energy Conservation Code in 1997, mandating higher levels of energy efficiency in new construction and renovations. Architects and builders across the state are learning how to create structures that use less energy. This can be the first step in expanding green building practices in Louisiana.

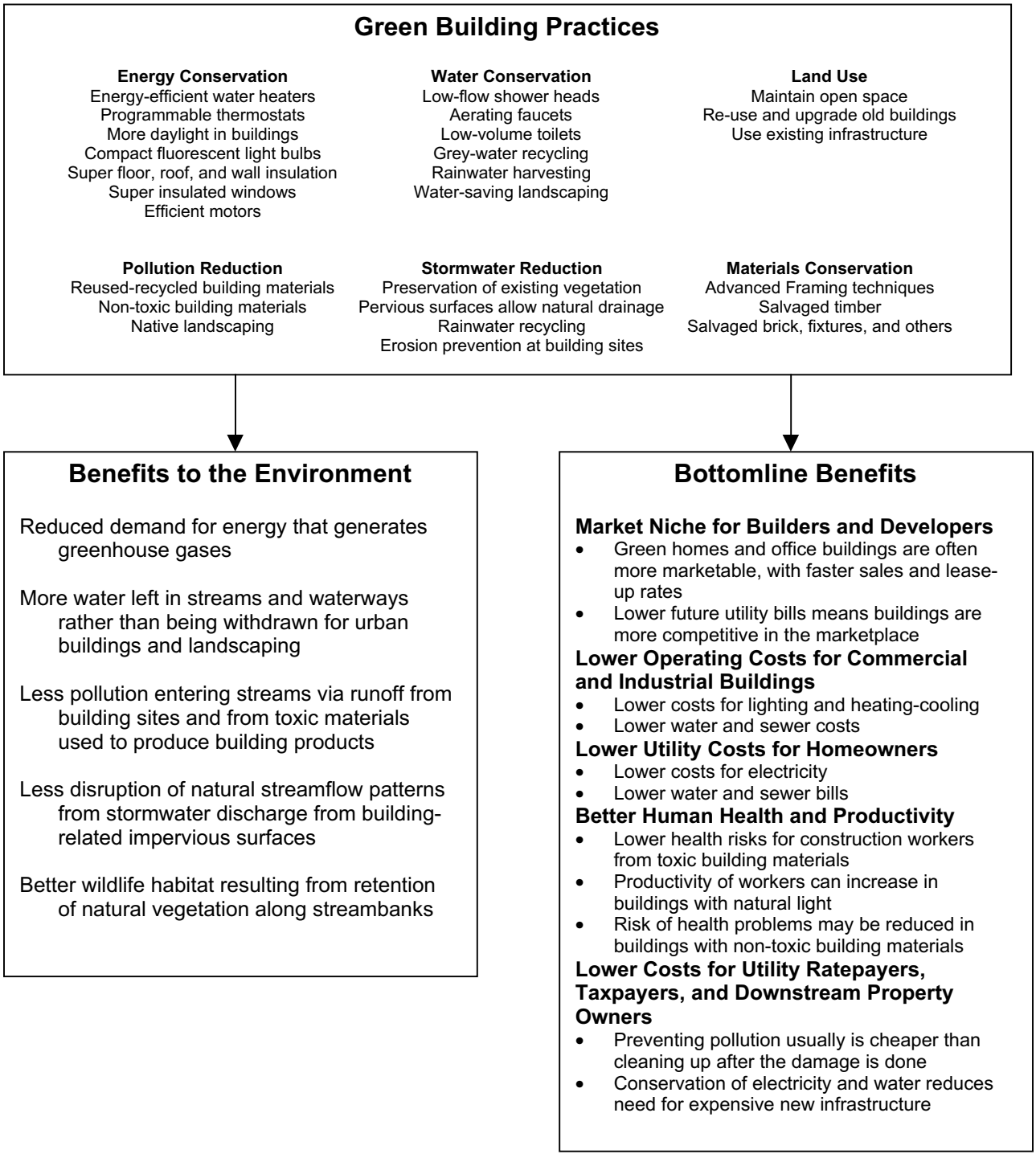
There are a number of salvage facilities for building materials in the region. Facilities such as the Green Project in New Orleans, provide a market for used building materials and paint products.[4] The Armadillo South Architectural Salvage Inc. in New Orleans specializes in architectural elements, such as Victorian fenceposts, antique doors, mantles, and a host of items typical of New Orleans architecture.[5] Crescent City Architectural also sells salvaged architectural features, specializing in elements typical of New Orleans.[6] In Baton Rouge, the Mid City Redevelopment Alliance, a private, not-for-profit organization founded in 1991, sells used doors, electrical and plumbing supplies, flooring, and other building supplies.

The U.S. Green Building Council is the nation's foremost coalition of leaders from across the building industry working to promote buildings that are environmentally responsible, profitable, and healthy places to live and work. The Council's website, www.usgbc.com lists all their registered members, and many have offices or offer services in Louisiana.

What Are the Benefits?

As Figure One on the next page shows, green building practices benefit the environment and the bottom-line. The following chapters describe these benefits in greater detail.

Figure 1: Greater Adoption of Green Building Practices Can Help Save Money and the Environment for Nearly Everyone in Louisiana



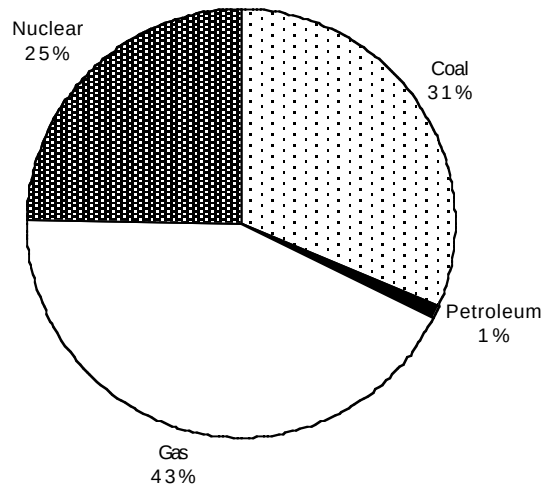
BENEFITS TO THE ENVIRONMENT

Inappropriate urban development is a key factor in degradation to the environment. Smarter urban development, incorporating proven green building practices can help turn the tide so that both existing urban areas and new developments are less harmful to the environment. Green building practices help the environment directly by reducing building-related pollution, and indirectly, by reducing the demand for goods and services that often are produced in ways that damage the environment.

Reduce Demand for Electricity

Louisiana relies on coal, petroleum, natural gas, and nuclear power plants for its electricity generation. The figure below shows the primary energy source for utilities' electricity generation, the primary electricity source for commercial and residential demands.

Utility Generation of Electricity by Primary Energy Source, 1998



Source: ECONorthwest with data from the Energy Information Administration.

Louisiana's electricity generation produces pollution that contributes to an array of problems, including acid rain and global warming. The table below shows emissions, on a per capita basis, for sulfur dioxide, nitrogen oxides, and carbon dioxide in Louisiana and the United States. Louisiana's electric power industry emits 2,300,000 tons of carbon dioxide more per resident than the industry's nationwide average. Carbon dioxide is a greenhouse gas, and a key contributor to global warming. Sulfur dioxide and nitrogen oxides contribute to acid rain and other

environmental problems, and have negative effects on human health. While Louisiana's per capita emissions of sulfur dioxide and nitrogen oxides are comparable to the nationwide average, the level of emissions per resident is growing. Sulfur dioxide emissions, per person, doubled from 1988 to 1998. Nitrogen oxides emissions grew from 30,000 tons per person in 1988 to 35,000 in 1998.

Table 1. Electric Power Industry Emission Estimates, 1,000 tons per Capita

	United States	Louisiana
Sulfur Dioxide	44	40
Nitrogen Oxides	32	35
Carbon Dioxide	9,870	12,210

Source: ECONorthwest, with data from the Energy Information Administration.

Reductions in building-related energy consumption in Louisiana directly lessen the demands on fossil fuels. One program to reduce electricity demand in Louisiana already exists. The Louisiana Department of Natural Resources offers a cash payment program to Louisiana residents to encourage improved energy efficiency in the state's housing stock. New and existing homes are eligible for the Home Energy Rebate Option (HERO) program. To qualify, new homes must be built at least 30 percent above the 1995 Model Energy Code, and existing homes must improve their level of energy efficiency by at least 30 percent. As of August, 2001, 2,550 homes have participated in the program. The program has reached its funding limit, but if the state expands it, more and more homes throughout the state will improve their energy efficiency and decrease power demands.[7] Conserving electricity could make tremendous contributions to reducing greenhouse gas emissions and improving air quality. Louisianians consumed about 26.8 billion kilowatt-hours of electricity in 1998. If all the residences reduced their electricity consumption by 30 percent, demand for electricity would decrease by about 8 billion kilowatt-hours, or enough electricity to power 541,000 homes.[8]

Reduce Water Pollution

The effects of urbanization, agriculture, and industrialization on streams and groundwater resources are a primary concern to the state. Almost three-quarters of Louisiana's waterbodies do not meet water quality standards, and 41 percent are not supporting their designated use, such as swimming, fishing, or drinking. The most common sources of impairments are industrial and municipal point sources and municipal and agricultural nonpoint sources.[9] Although industrial sources are the most notorious polluters in Louisiana, municipal run-off and inadequate septic systems contribute to water quality problems.

In a water quality assessment program of the southern half of Louisiana, the U.S. Geological Survey reports that the major water quality issues facing the area are:

- nutrient enrichment of streams, lakes, and embayments;

- bacterial contamination of surface waters in the Lake Pontchartrain Basin;
- effect of flood-control, agricultural, and land development practices on loss of riparian and submerged aquatic vegetation; and
- contamination of ground water, streams, and sediments by trace elements, pesticides and petroleum products.[10]

Many estuaries in Louisiana have eutrophic conditions, where an oversupply of nutrients stimulate algal growth. Eutrophication degrades water quality for commercial and recreational fishing and shellfishing, boating, swimming, and tourism The nutrients come from many sources, one of which is urban runoff.[11] Designing drainage systems and landscaping that can intercept the nutrients before they enter the waterway can be one step towards solving the problem.

Inadequate septic tank systems allow human fecal pathogens to enter an estuary, and high fecal coliform counts in the Barataria-Terrebonne estuary have forced state officials to close oyster beds, to reduce the risk of illness. Fecal coliform counts remain a problem in the estuary, with 14 towns in the Terrebonne Parish experiencing septic tank problems.[12] Proper land use planning can prevent inadequate septic systems, thereby reducing nutrient overload to the state's waterways.

Residential development contributes to herbicide and pesticide runoff in waterways. Pesticides used on lawns and gardens often end up in streams. In a study based Washington state, more types of pesticides were detected in urban streams than in agricultural areas.[13] Green landscaping avoids herbicides and pesticides altogether where possible, and uses limited amounts where needed.

Reduce Water Use

Green building design can reduce water and energy consumption, minimizing demand for water withdrawals from Louisiana's streams and rivers. The thermoelectric industry, which generates electricity, consumes more than half of the total water used in Louisiana. Public supply, which includes municipal water suppliers who deliver to multiple users for all types of water uses, consumes 6.5 percent of the water supply.

In Louisiana, the thermoelectric industry includes fossil fuel and nuclear energy. Most of the water withdrawn by thermoelectric plants is used for condenser and reactor cooling. Generators that rely on fossil fuel consume just over 80 percent of the water used by the industry; the nuclear reactors use the remainder.[14] The facilities return most of the water to the river it came from, but return warm water in place of cool water, diminishing water quality. Warmer waters can increase the duration and the extent of harmful algal blooms, which can damage shellfish habitat. Algal blooms can also be toxic to humans. Viral and bacterial contamination of shellfish has caused illness several times along Louisiana's coast.[15]

Table 2. Total Water Withdrawals in Louisiana by Water-Use Category[16]

	Million Gallons per Day	Percent of Total
Public Supply[a]	638	6.5%
Private Domestic	39	0.4%
Private Commercial	11	0.1%
Irrigation & Livestock	1,094	11.1%
Industrial	2,580	26.2%
Mining	1.8	0.0%
Thermoelectric	5,480	55.6%
Total	9,850	100.0%

a. Public supply includes public and private water suppliers who deliver to multiple residential, commercial and industrial users.

Source: Solley, Pierce, and Perlman (1998).

Urban Water Quality and Streamflows

Past development patterns and practices have interfered with natural streamflows and hydrological patterns by removing streamside vegetation, increasing impervious surface and stormwater runoff, and introducing pesticides and other toxins into watersheds. By limiting runoff, green building practices minimize urban development's effect on stream temperatures, streamflow patterns, and water quality.

Impervious surfaces—compacted soils, pavement, roads, roofs, and other barriers that water cannot penetrate—can dramatically alter streamflow patterns by causing rainwater to runoff quickly rather than soak into the ground. The resulting high streamflows can increase the flow of pollutants into streams. Precipitation that enters streams as surface runoff also can be warmer than that which seeps into the ground and is later released to streams. Hence, the greater the amount of impervious surfaces in a watershed, the lower the health of its streams.[17]

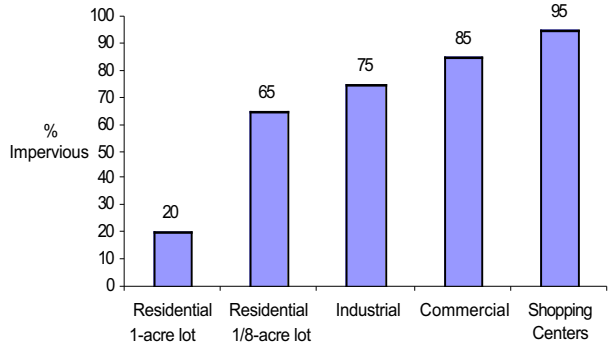
Studies near Puget Sound in Washington state show that, in natural forests, less than one percent of rainfall becomes surface runoff, 33 percent becomes groundwater, and 46 percent returns to the atmosphere via evapotranspiration. In contrast, on impervious surfaces 84 percent of the rainfall becomes surface runoff, none becomes groundwater, and 16 percent is evapotranspirated.[18] Although we know of no similar studies in Louisiana, the hydrology works in the same manner. Instead of filtering through the native sandy soil, rainwater now flows from roadways into storm drainage systems. Almost all of the pollution deposited on impervious surfaces that is not removed by street cleaning, wind, or decay will end up in surface waters.[19]

The amount of impervious surfaces varies with land use. Although low-density residential subdivisions have the lowest impervious surface per lot, their longer roads, driveways, and sidewalks generally create more overall impervious surface

than cluster-style housing.[20] High-density development, avoiding an oversupply of parking lots, and the preservation of natural vegetation can together decrease impervious surfaces to very low levels.

Land should be used as efficiently as possible and in a manner that supports healthy interactions between people and the environment. By avoiding new development on "greenfields", open space, or other undeveloped lands, new impervious surfaces can be minimized. Opportunities to develop redevelop and limit sprawl include renovating old, underutilized buildings, redesigning closed military bases, and brownfield development. When building on green spaces, site design should minimize disturbance to the natural environment. Using existing infrastructure and slowing sprawling suburban development can also reduce greenhouse gas emissions. Among all the states, Louisiana ranked 3rd highest for carbon dioxide emissions in the transportation sector, which accounts for 25 percent of carbon dioxide emissions in the state.[22] The closer people live to urban centers, the fewer miles they must drive to jobs and services.

Impervious Surface by Land Use[21]



BOTTOM-LINE BENEFITS

The environment is not the only beneficiary of green building practices. These common-sense actions also put more money in the pockets of builders, homeowners, and the owners and occupants of commercial and industrial buildings. They also save money for taxpayers and utility-rate payers.

In some cases, these financial benefits come about at little or no cost: adjusting thermostats, for example, or using comparably priced non-toxic building materials instead of toxic ones, or landscaping a yard with native plants that need little maintenance. Others require an initial cost, but then generate savings, usually spread out over the useful lifetime of a building or a landscape. The green building practices that yield the greatest savings pay for themselves in a very short amount of time. Others take longer, but are still financially worthwhile.

Below we illustrate how green building can strengthen the bottom line at home and work.

Lower utility costs and easier financing for homeowners

Homeowners (and renters) benefit by paying less for electricity, natural gas, water, and other services they pay for on a per-unit basis. Because the economic benefits of green building are not limited to the timespan of one owner, homeowners benefit not only from their cost savings, but also from the increased re-sale value of their home or building. Between 70 percent and 90 percent of many energy-saving improvements translate into increased home equity.[23] Homebuyers need not wait to enjoy these savings. A so-called Energy-Efficient Mortgage (EEM) allows a homebuyer to document energy savings while buying a house. The dollars that are liberated from the family's utility budget can be applied to the overall loan amount and make a family eligible for a larger loan. Banks in Louisiana offer EEMs, but the program is currently under-used. For more information, visit the Louisiana Department of Natural Resources Energy Section's website (http://www.dnr.state.la.us/sec/execdiv/TECHASMT/ENERGY/).

Lower operating costs and higher profits for commercial buildings

Green building practices decrease the use of electricity, natural gas, fuel oil, and other services that commercial ratepayers pay for on a per-unit basis. Take, for example, an engineering firm operating out of a 50,000 square foot building and spending $125,000 per year on energy. By making two environmentally sound investments, the company can cut its energy costs and bolster its bottom line. Replacing wasteful T-12 fluorescent lamps with energy-efficient T-8s or T-5s would cost $17,000 up front but saves the firm $4,300 each year over the next ten years.

Similarly, an inspection and tune up of the heating, cooling, and ventilation system would cost about $15,000 and generate annual energy savings of $4,200 thereafter. Taken together, these two steps cost $32,000 and yield yearly savings of $8,500. The measures pay for themselves in a little less than four years.[24]

Although in this simple example the firm's energy bill drops by 7 percent, far greater savings are obtainable. The U.S. Environmental Protection Agency estimates that, by incorporating a full complement of green building techniques, some businesses could lower their energy costs by up to one-third.[25] Louisiana's newly established Commercial Building Energy Conservation Code is estimated to save Louisiana building owners over $4 million in energy costs within ten years. The Code's new standard will reduce the state's carbon dioxide emission by 113 million pounds, and save 323 billion BTUs of energy, the equivalent of 2.5 million gallons of gasoline.[26]

Higher profits for builders and developers

Buildings designed with green-building principles and constructed with green-building techniques can be more marketable than conventional buildings and, hence, enable developers and builders to earn higher profits. These benefits come about through several, related mechanisms:

- Market segmentation. Many potential buyers or tenants will pay more for the cachet of being in a building that can readily be identified as complying with the principles of green construction.
- Capitalization of operating savings. Lower future utility bills mean buyers can spend more on the structure.
- Capitalization of higher productivity and amenities.

More and more builders and developers will have the potential to profit from green building as market demand increases. Related market forces, evidenced by Home Depot's shift towards green building materials, reinforces such actions by state and local governments.

Shorter Approval Process

Building in an environmentally responsive way can shorten the development time line, saving money in the process.[27] Builders are more likely to gain the support from a community with an environmentally sensitive project, avoiding legal delays and permitting problems.

Increased human health and productivity

Green buildings are healthier and more pleasurable places to work. Efficient lighting helps people see better, which reduces mistakes, increases work quality, and boosts production. The elimination of toxic building materials improves worker health. Optimal heating and cooling system increase worker comfort and output.

In two model sites, the U.S. Green Building Council estimates that green features increased worker productivity by between 6 percent and 16 percent. Even small productivity gains can justify an investment in green techniques. For example, consider a 10,000-square-foot office space renting for $20 per square foot including energy costs of $1.80 per square foot. If 25 workers occupy the office, and each earns an average annual salary of $50,000, the workers cost $125 per square foot—or 70 times more than energy. In this example, a 1-percent increase in worker productivity would pay for the company's entire energy bill for eight months.[28]

Lower costs for utility ratepayers, taxpayers, and downstream property owners

All ratepayers benefit from the decreased marginal costs of producing electricity, water, gas, and other natural resources. In general, it becomes more costly to extract resources as the level demanded increases, and costly new infrastructure is required. Taxpayers also benefit by preventing pollution at the outset, when the cost of clean-up is cheaper, rather than after the damage is done.

Taxpayers can also benefit through green building as public buildings that use these techniques achieve capital and operational savings that can be passed on to all taxpayers. For example, and energy management program at the East Baton Rouge Parish Public School district led to more than $800,000 in avoided utility costs in 1996, its first year.[29] Savings have grown each year, allowing more money to go towards educational programs, instead of utility bills.

Healthier housing and lower utility bills for low-income families

Low-income families are more likely to notice and appreciate the utility savings associated with green building given that utility bills comprise a larger share of their total expenses.[30] Builders of affordable housing should incorporate green building techniques into their designs. Whenever financially possible, housing for low-income families should incorporate energy-saving measures into its units, such as compact fluorescent lights, solar-hot-water systems, low-E-gas-filled windows, and passive solar design, to bring in winter sunlight and keep out summer heat. The St. Vincent de Paul based in Eugene, Oregon, which owns and operates 500 affordable-housing units in Oregon, has developed its own green-building manual.[31]

Slow Down Sprawl

Sprawling suburban development has many hidden costs. Residents must rely on their cars to get to work, shopping, and other services. Downtowns fall into decay, and undeveloped wildlands and farmland are lost. By redeveloping already developed areas, developers, taxpayers, home owners, and businesses can save in avoided infrastructure and travel costs. Avoiding greenfield development can slow the urbanization of rural lands, protecting wildlife habitat, forest lands, and agricultural lands.

Redeveloping existing building stock can be more difficult for the builder. Large pieces of construction equipment must squeeze into downtown areas. Because the surrounding area is full of buildings, storing and maneuvering machinery is awkward. But the benefits of re-using underutilized or run-down buildings are long lasting, and can revitalize old, tired urban neighborhoods.

Renovating older buildings minimizes demand for new building materials. Depending on the condition of the building, much of the original structure can be maintained. Floors, paneling, stairwells, light fixtures, and other features particular to the structure provide history and beauty. It also reduces demand for virgin timber, rock, and other building materials. Renovating old buildings can preserve historical neighborhoods, which is particularly important to a state like Louisiana, renowned for its architecture.

Homeowners that live close to their jobs spend less on transportation. Location-Efficient Mortgages (LEM) encourage home ownership in city centers. Like Energy-Efficient Mortgages discussed above, LEM allows homebuyers to borrow more money for the home, if they can show that they will be able to spend less on their own private transportation. At the time of this writing, LEMs are only available in Chicago, Los Angeles, Seattle, and the San Francisco Bay Area. But if they are successful in the test markets, the program may expand to more urban areas across the country.[32]

Adding it up: Green Building's Bottom Line

In short, Green Building practices are just plain good business. They benefit the economy and the environment. By incorporating these practices into new construction and remodeling projects, residents and businesses in Louisiana could save money. Green building is a key element in helping the region move towards more environmentally and economically sustainable paths.

CASE STUDIES: SUCCESSFUL GREEN BUILDING PROJECTS

In this chapter, we describe some of the successful building projects in Louisiana and neighboring states. The case studies include residential development, office space and public buildings. The design elements that make each project a green building vary widely.

Commercial Projects

Body Shop Headquarters, Wake Forest, North Carolina. The Body Shop retrofitted an existing building to create their U.S. headquarters. Retrofitting an existing building, instead of constructing a new one, saved the firm money in many ways. The abandoned building had adequate parking and landscaping already in place, eliminating those costs. It also saved money by reusing building materials, selling some for salvage, and donating salvaged and leftover materials to Habitat for Humanity. Not only did the company avoid tipping fees at the landfill, they received a tax benefit for the donation. Reused materials include the foundations, exterior concrete wall panels, roofing, and windows. The lobby's tile is made of recycled light bulbs, and the carpet is from recycled plastic soda bottles. Window and skylights were placed to maximize natural light inside the building, and most of windows open to the outside, so employees can get fresh air. All of the lighting and fixtures, as well as the HVAC system, are energy efficient.[33]

Peace River Presbytery, North Port, Florida. This building incorporates many different green building techniques. The first step was to use site sensitivity in the building's placement, preserving all these existing trees at the site. The designers maximized passive daylighting of the interior, by making the east-west axis three times as long as the north-south axis. Using the rainwater cistern tanks at the building corners as extra structural bracing, the designers were able to incorporate more windows into the building, as well as capture rainwater. The building uses a high efficiency HVAC system with heat pipe dehumidification of fresh air, and high efficiency lights and lighting fixtures. The builders relied on low-toxic materials. The building uses about one-third less energy and half as much water as a conventional office building. The 6,025 square-foot building cost $500,000 to build.[34]

United Parcel Service Headquarters, Atlanta, Georgia. The architectural firm worked to integrate features of the native landscape into their design of this 623,000 square-foot building, not only protecting the site's ecosystem but also enhancing the

building's aesthetic value. The forest and ravine offer attractive views from the many windows throughout the three main buildings. The design and construction techniques enabled trees to come within 15 feet of the buildings and existing trees brush right up to the building's windows. To achieve this, the construction team assembled much of the building off-site and used only a narrow staging area around the building footprint. This approach required some redesign of the roof beams to enable large cranes to be mounted on them. Avoided landscaping costs exceeded the resulting increase in construction costs. The builders placed the building to minimize destruction of the wooded site, and placed all roads, drainage, and utility lines so that they would not disturb the surrounding environment.[35]

Residential Projects

Dewees Island, off the coast near Charleston, South Carolina. The exclusive resort development at Dewees Island is a showcase example of profitable green development. The entire island has been developed to have minimal impact on the natural environment. More than 65 percent of the island has been set aside as a wildlife refuge, and the nature trails, shorelines, salt marsh estuaries are rich in wildlife. Buildings on the island are not allowed to be larger than 5,000 square-feet, they cannot be right next to the shore, and conventional lawns and nonnative landscaping are prohibited. No gasoline powered vehicles are allowed on the island; residents walk, bike, or drive electric golf carts. The roads are made of sand, allowing rainwater to naturally filtrate through the surface. The island's buildings generate little stormwater runoff, because residents harvest the rainwater for irrigation and filling ponds and spas. The island lacks a constructed drainage system, stormwater filters through the pervious sand roads, and swales and retention ponds handle runoff. The island's freshwater aquifer is regularly recharged, and soil erosion is minimized. Because the developers did not pave road surfaces, and they relied on natural systems instead of man-made infrastructure, land development and infrastructure cost 60 percent less than average developments.

Local realtors doubted that the island would be a commercial success. Many of the ecological features would be viewed as negative attributes in the traditional recreation markets. There's no golf course, no marina, no vehicles except for electric golf carts, no pavement, no conventional lawns, and no irrigation except by using collected rainwater. But sales have been healthy, lot prices increased, and net profits exceeded targets. The developer found his target market in a subgroup of the recreation market, people with strong environmental values. For this group, the environmental features became positive attributes. The developer targeted their promotional materials to that group, using selling points such as the beach, environmental preservation, proximity to Charleston, limited access, exclusive retreat, and used words such as learning, intergenerational, and legacy, to convey the community's values. The marketing emphasized that the island is a private, oceanfront retreat dedicated to environmental preservation. Evidence of their commitment to environmental preservation came with the many environmental and land stewardship awards the developers earned. The media provided positive press

coverage because of its environmentally friendly design, generating an estimated $5 million in free press.

By taking what could appear as negative attributes and presenting them as positive features to the appropriate market segment, the developer found interested buyers willing to pay a premium for a community that does not cater to golfers and boaters, but is a a small, quiet neighborhood of homes nestled within the island's natural beauty.[36]

Spring Island, off the coast of South Carolina. Similar in many respects to Dewees Island, Spring Island is an exclusive resort community, built on environmentally-conscious priniciples. Both developments provide strong evidence that green development is profitable. Understanding the consumer interested in sustainable development is key to profitability.The owners of the 3,000 acre island wanted to preserve its natural beauty, and attempted to sell it to the state to establish a state park. When the sale to the state did not succeed, they worked to build a development that minimized environmental impact. The first development plan divided the island into 5,500 home sites, but the developers decided to reduce the number of home sites to 500, and develop a 1,000-acre nature reserve. The structures on the island are subject to an architectural review board that requires environmentally conscious development. Home designs are based on local building traditions, using the indigenous 'Low Country' style architecture and relying on passive ventilation. No hard paved roads are allowed on the island, allowing rainwater to filter through the native soils.

The developer had to prove to investors that such a development would prove profitable. He convinced investors that a market existed the environmentally sensitive development. A large portion of Americans describe themselves as environmentalists, and leisure and quality of life are strong forces in decisions for many Americans. His market research revealed the Southeast draws retirees, and people over the age of 50, at the peak of their earning power, begin to seek retirement homes. And as the baby boomers grow older, the number of Americans over the age of 50 expands daily. To date, the development is highly successful financially.[37]

Private Home of Gantt Boswell, outside New Orleans, Louisiana. Mr. Boswell designed his home to be highly energy efficient. The house has many green features, including photovoltaic units that power the house's electrical needs, excluding the air-conditioner. It has reflective film on western and southwestern windows to keep out the afternoon sun in the summertime, it is oriented to maximize daylight, overhangs shade windows and glass doors during the summer months, and a radiant barrier under the roof prevents much summer heat from getting inside the house. The high ceilings and glass transoms over doors allow hot air to move above the inhabitants. The 2,500 square-foot house is built on an a concrete slab raised about 3 feet off the ground. The space under the house, the plenum, is a conditioned air space, storing cool air in the summer and warm air in the winter. It helps to maintain a consistent temperature within the house, and minimizes the need for summer air-conditioning. During the hottest summer months, the house's air-

conditioning energy costs peak at $65 per month, while many neighboring homes spend over $200 per month.[38]

Institutions

Earthlab, Audubon Zoo, New Orleans, Louisiana. Earthlab houses the Zoo's exhibits related to environmental issues, such as solid waste, recycling, species survival, and regional forestry. But the building itself, and its design, is part of the exhibit. Green design elements include recycled-content building materials and a radiant barrier vented roof system, which reflects heat so that the interior remains cool. The most notable green design element is the geothermal heat pump, which heats and cools the building. The system includes a series of underground pipes, which contain fluid that circulates between the building and below the Earth's surface. Fluid circulating in the pipes collects the Earth's natural heat in the winter and carries it to the building. A compressor concentrates the Earth's energy and releases it inside the building at a higher temperature. In the summertime, the system draws excess heat from the building and expels it into the underground pipes, to be absorbed by the Earth. According to the U.S. Environmental Protection Agency, geothermal heat pumps consume 40 percent less energy than air source heat pumps and 70 percent less than electric resistance heating with standard air-conditioning equipment.

The federally-funded Works Progress Administration (WPA) built the building during the 1930s. The architects designed the renovation so that the structure retained its original distinctive style and so that it would blend with the other WPA buildings at the Zoo.[39]

Merryl & Sam J. Israel, Jr., Environmental Sciences Building, Tulane University, New Orleans, Louisiana. The architects designed the new structure to be the focal building of the historic Front Quad at Tulane University. It is home to biology and chemistry research laboratories, and undergraduate lab space used for classes. Much of the building has access to daylight and views of the exterior, but shading devices prevent direct sunlight from shining into the building. Natural light comes through the building through large panels of low-e glass, which admits light but keeps out heat. At almost any point in the day, the lights in the building do not need to be on. Offices and conference rooms include operable windows and ceiling fans, and individual thermostats and light control.

A courtyard lies between the ESB and the existing Stern building. The courtyard is shaded most of the day, creating comfortable outdoor space. In addition to creating a pleasant outdoor space, making the space an outdoor courtyard instead of indoor atrium reduced the building's cooling load. Much of the landscaping around the building incorporates native vegetation.[40]

Center for Bioenvironmental Research, Tulane University, New Orleans, Louisiana. The historic Alcee Fortier building, originally built in 1904 as a dormitory on Tulane's Front Campus, now houses the Center for Bioenvironmental Research. The building incorporates many green features, such as daylighting and natural ventilation, and is built of natural material. Because it reuses an old

building, taking advantage of existing infrastructure, it helps to preserve open space and natural habitats, as well as reuse old materials. The Center coordinates interdisciplinary research at Tulane.[41]

East Baton Rouge Parish Public Schools. An energy management program across the school district, started in 1996, led to more than $800,000 in avoided utility costs in its first year. As the program expands, avoided costs are expected to rise. As part of the program, an energy management team regularly monitors thermostats, lights, and filters in air conditioning systems. Simple activities such as turning out lights in cafeterias and locker rooms when they are empty, which is most of the day, has had a large impact. During the Christmas break, the energy management team checks each campus to make sure that no lights or heating systems are left on.[42]

Advanced Building Demonstration, Austin, Texas. This 1,900 square-foot building demonstrates a regional approach to design. It includes a sleeping terrace, traditional dog-trot ventilation, and a portable kitchen for seasonally appropriate outside use. The building materials were regionally derived or manufactured, and the builders minimized use of Portland cement and virgin wood. The building incorporates passive solar design, renewable energy systems, on-site wastewater treatment, and rainwater harvesting with cisterns. The landscaping emphasizes native plants, minimizing outdoor water needs.[43]

Southface Energy and Environmental Resource Center, Atlanta, Georgia. The Center serves many purposes: it is a building science learning lab; a clearinghouse for sustainable technology information; and a meeting facility for organizations, government agencies, and the private sector. Completed in 1996, the 6,300 square-foot Center looks like an upscale southern home with wrap-around porches. Actually, it is a showcase of green building technologies. Winter sunlight strikes a thermal mass floor in the passive solar sun space, covered with tiles by that are composed of waste from the feldspar mining industry. The photovoltaic roofing shingles provide enough electricity to power most of the Center's lighting. About 70 percent of the Center's hot water needs are met with a rooftop solar water heater. An integrated approach to landscape water efficiency and stormwater management includes porous pavement parking lots, a rooftop water harvesting system, and a combination of water-conserving plants and stormwater infiltration basins around the building.[44]

MOVING FORWARD

Green building is not only good business; it is sound economic policy. As businesses and homeowners spend less on utilities and construction—without sacrifice in service or comfort—productivity increases, the economy grows, and the environment is not harmed. With its economic benefits, the market should be quick to embrace these commonsense practices. Yet—as with any new idea—tapping green building's full potential will require education. Below are some key steps that will expedite the education process.

Enhance the visibility of green techniques. Customers don't value what they can't see, which puts important techniques—like insulation—at a disadvantage. To get around this, builders might spend more time touring half-built homes with potential buyers when walls are exposed and crawl spaces are accessible. Demonstration homes, with exposed wall and floor space, also serve as important selling tools.

Improve information. Homebuyers may not be aware of the savings associated with green building and may perceive initial investments as simply an uncompensated cost. The Louisiana Home Energy Rebate Option (HERO) offers up to $2,000 to homebuyers who purchase a new home built to energy efficiency standards at least 30 percent above the 1995 Model Energy Code. Homeowners of existing homes are eligible for the program, if they improve the home's energy efficiency by 30 percent. Visit the Louisiana Department of Natural Resources Energy Section's website for the HERO program for more information (http://www.dnr.state.la.us/SEC/EXECDIV/TECHASMT/ENERGY/HELP.htm).

Work energy savings into financial vehicles. In this credit-card culture with households willing to pay up to 18 percent interest on their current purchases, we have ample evidence that some people simply won't value energy savings unless they are immediate. Energy-Efficient Mortgages (EEMs) are one solution to this dilemma. They have been around since the early 1980s, and the notion is simple. The less you're expected to pay for electricity, gas, or water over time; the more you have left to spend on the physical house. These lending vehicles allow you to capture those long-run energy savings in the initial mortgage effectively raising the price ceiling for a home purchase. Banks offer EEMs in Louisiana, but the program is under-used. Visit the Louisiana Department of Natural Resources Energy Section's website for more information (http://www.dnr.state.la.us/sec/execdiv/TECHASMT/ENERGY/).

Making the Case

Market surveys show that—if utility savings are well documented—buyers will pay a premium for green amenities. Green developers should start with most cost-effective features first and get them on the ground, proving to bankers and other members of the development community that these techniques make financial success.

Get green comparables into the marketplace. Most builders and developers are also not aware of the latent demand for green buildings, and the extent to which their green product could be a big moneymaker. Promoting the cost savings and financial benefits of green building will generate even further demand.

Speak to bankers in their own language. Lenders are, by the nature of their business, conservative and unwilling to lend money for projects that they see as unusual or untested. What might be mainstream in one neighborhood of residents might be seen as "risky" by financial institutions. Until lenders are presented with more information showing how green construction is a good investment, they will continue to be a barrier. Sustainability, bio-diversity, and ecology have little currency in the financial world. If green building techniques are going to thrive in the marketplace, it will be because all participants in urban development understand that they make economic sense.

Leverage the free press. Green building is innovative and newsworthy. Developers should incorporate free media coverage into their marketing strategies—for example sending press releases and inviting writers to building or home openings.

Study and quantify savings for the newest techniques. Ideas that are still in their infancy—like building commissioning—lack solid statistical data on the costs and benefits. Rigorous studies that follow a consistent format should be conducted to demonstrate the energy and non-energy benefits of the measures.

Standardize green building measures. The U.S. Green Building Council has designed a "Leadership in Energy and Environmental Design" or "LEED" system for rating green buildings, and it is proving to be an industry benchmark for green building, particularly for commercial buildings. The LEED Green Building Rating System evaluates environmental performance from a "whole building" perspective, providing a definitive standard for what constitutes a green building. The feature-oriented system rates new and existing commercial, institutional, and high-rise residential buildings.

Enact enhanced appliance standards through Congress and the US Department of Energy. For certain techniques—particularly appliances like refrigerators, freezers, water heaters, clothes washers—the most effective way to spur widespread use of the technique would be through the legislative and regulatory processes.

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