



*Version 1.0*



# NJ GREEN HOME REMODELING GUIDELINES



## Use of the Guidelines

*What are the guidelines and what are they not?*

The information provided in these guidelines is intended to assist homeowners, contractors, architects, interior designers, landscape architects, and other professionals who design and remodel residential structures. They draw upon best practices and provide a general overview of green remodeling strategies customized for New Jersey, with links to additional information and resources. These guidelines introduce ways a homeowner or remodeling professional can incorporate green building practices into common home remodeling projects. These are not step-by-step technical guides but rather a menu of ‘best practices’ organized by major building systems. One should become familiar with local building code and zoning requirements before undertaking a green home remodeling project.

The guidelines do not list or endorse specific green products or services but rather identify ‘greener’ options to consider when selecting materials and services for the home.

These Guidelines do not constitute an endorsement, approval, or recommendation of any kind by any persons or organizations affiliated with developing these Guidelines. The NJDEP further disclaims any and all liability for any personal injury, property damage or any other damages that are caused by or that may result from the reliance on these NJ Green Home Remodeling Guidelines.

### **New Jersey Green Home Remodeling Guidelines Version 1.0**

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The Rutgers Center for Green Building developed the guidelines with extensive input and review by an expert advisory group comprised of residential building and remodeling professionals, interior designers, landscape architects, and experts in the field of green building and energy-efficient design. The engagement of local expertise and real-life project examples were key to customizing the guidelines to New Jersey and providing insight into local opportunities, costs, and challenges.

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**RUTGERS**  
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# Contents

## **Introduction.....4**

- Use of the Guidelines
- Green Home Remodeling and Sustainability
- Green Home Remodeling in New Jersey
- Development of the Guidelines
- Role of the Expert Advisory Group
- Relation to the REGREEN Residential Remodeling Guidelines 2008

## **How to Use the Guidelines.....8**

- Organization of the Guidelines
- Getting the Most from the Strategy Write-ups

## **Green Rules of Thumb.....11**

## **Kitchen, Bath and Living Spaces.....15**

- How to Use the Guidelines
- Health and Safety
- Green Home Maintenance and Housekeeping
- Best Practice Strategies
- Resources and References
- Case Studies
- Green Products and Services
- Glossary of Terms

## **Finished Basement and Major Addition...79**

- How to Use the Guidelines
- Health and Safety
- Green Home Maintenance and Housekeeping
- Best Practice Strategies
- Resources and References
- Case Studies
- Green Products and Services
- Glossary of Terms

## **Weatherization and Energy.....149**

- How to Use the Guidelines
- Health and Safety
- Green Home Maintenance and Housekeeping
- Best Practice Strategies
- Resources and References
- Case Studies
- Green Products and Services
- Glossary of Terms

## **Outdoor Living and Landscaping.....207**

- How to Use the Guidelines
- Health and Safety
- Green Home Maintenance and Housekeeping
- Best Practice Strategies
- Resources and References
- Case Studies
- Green Products and Services
- Glossary of Terms

# Introduction

## Green Home Remodeling and Sustainability

*What is green home remodeling and why is it important?*

Residential buildings account for 22 percent of total energy and 74 percent of water consumed in the United States. When they contribute to climate change, the electricity used is generated from non-renewable and carbon-based fuels. A typical home emits almost 9,000 pounds of **carbon dioxide\*** per person per year; altogether, residences contribute 17 percent of the nation's **carbon dioxide** emissions. Moreover, Americans spend 90 percent of their time indoors, where concentrations of pollutants are often much higher than outside, making "green" in the residential sector important for both the environment and human health.

Within the menu of residential green practices, remodeling an existing home may be one of the most resource-efficient actions that a homeowner can take. Green home remodeling offers the opportunity to cost-effectively reduce home energy demand, reduce home maintenance costs, and increase occupant comfort and indoor air quality.

By taking advantage of pre-existing water, sewer, and road infrastructure, green home remodeling expands upon the inherent environmental benefits of remodeling with increased energy and water conservation, enhanced indoor air quality, reduced material waste and resource consumption, and the use of environmentally friendly products.

The basic principles of green remodeling are similar to those used in new green home construction. A major difference is that green home remodeling begins with an existing set of parameters that pose unique challenges and opportunities for employing green building strategies. Green construction of new homes can start with a blank slate of possibilities. However, it is the opportunity to green the nation's existing housing stock that offers the most promising opportunity to meet current greenhouse gas emission targets and environmental goals.

## Green Home Remodeling in New Jersey

*Why is green home remodeling important for New Jersey?*

New Jersey is the most developed state in the nation—and not by a little bit. The Garden State leads its nearest competitor in this category, Rhode Island, by about 25 percent. Although opportunities for infill and brownfield redevelopment exist, New Jersey could be the first state to reach full build-out of its remaining developable lands in just 20 to 40 years at the current pace of development and preservation. While this development trend leaves a shrinking window of opportunity to construct new green homes, it offers a growing opportunity to employ green remodeling strategies in existing homes.

An analysis done by the Rutgers Center for Green Building shows that the majority of the state's housing stock is single-family detached housing built between 1940 and 1979. Houses need to be updated and remodeled 20 to 30 years after they are built, when major systems start to require upgrading or replacement. Therefore, the average age of the housing stock in New Jersey makes it an ideal candidate for green home remodeling. As fuel prices rise, homeowners in the state will greatly benefit from renovations that include the installation of energy-efficient appliances, efficient heating and cooling systems, and a better insulated **building envelope**.

At the national level, replacement projects that boost curb appeal – siding, windows, and decks – and kitchen remodels have been found to offer the best payback for homeowners (see Top 10 Project Paybacks for 2008, to the right). Given the recent real estate market, rather than buying a new house, many New Jersey homeowners may choose to stay put and remodel their homes.

The state's environmental goals and recent commitments to cut greenhouse gas emissions, to invest in renewable energy, and to create green jobs further advances green home remodeling in the state.<sup>1</sup>

**\*Green building terms are highlighted in bold and defined in a glossary at the back of each chapter.**

### Top 10 Project Paybacks for 2008

1. Upscale fiber cement siding (**86.7%**)
2. Midrange wood deck (**81.8%**)
3. Midrange vinyl siding (**80.7%**)
4. Upscale foam-backed vinyl (**80.4%**)
5. Midrange minor kitchen remodel (**79.5%**)
6. Upscale vinyl window replacement (**79.2%**)
7. Midrange wood window replacement (**77.7%**)
8. Midrange vinyl window replacement (**77.2%**)
9. Upscale wood window replacement (**76.5%**)
10. Midrange major kitchen remodel (**76.0%**)

Source: National Association of Realtors. 2008. Cost vs. Value Report.

- A main goal of green remodeling is to reuse existing assets and limit the impact of the built environment on the natural environment. In this way, green remodeling helps to meet New Jersey's planning goal to prevent urban sprawl and preserve natural resources and open space.<sup>2</sup>
- The use of energy-efficient and renewable technologies can lower energy consumption by 30-50 percent annually, reduce utility bills and decrease demand on electrical power plants. This green strategy advances the state's goals of preserving energy resources and encouraging the development of different housing types within the limits of available infrastructure.
- Green homes consume less water than conventional homes through water-efficient appliances and by recycling water for irrigation and other uses. This helps to lower water bills and reduces costs associated with the adverse effects of stormwater runoff such as flooding and water pollution. This green strategy furthers the state's goals to preserve wetlands and prevent degradation of the environment.
- Green home construction calls for high-quality and durable materials, which reduces consumption of resources, maintenance costs, and adds value to a home. Reusing materials reduces the burden on the state's landfills, helps preserve the architectural features of historic homes, and maintains and improves the character of established neighborhoods in the state. This green strategy supports the state's goal to preserve the historical heritage of the region.<sup>3</sup>
- Green home building and remodeling reduces greenhouse gas emissions and curbs climate change. Almost all residential greenhouse gas emissions are related to energy consumption. Green home remodeling strategies that focus on energy efficiency help to reduce a home's carbon footprint. In turn, green home remodeling supports New Jersey's goal to reduce greenhouse gas emissions by 20 percent to 1990 levels by 2020, followed by further reductions of emissions to 80 percent below 2006 levels by 2050.

## Development of the Guidelines

*Why do we need the New Jersey Green Home Remodeling Guidelines?*

Nationally, many states and local governments have recognized the need for green building and created programs and guidelines focused primarily on new green building, while offering some tips and techniques for green home remodeling. Specific green remodeling guidelines and certification programs are only now emerging, and several states have programs or are developing them. With no centralized national programs to certify green home remodeling projects, the United States Green Building Council (USGBC) partnered with the American Society of Interior Designers (ASID) to develop the REGREEN Residential Remodeling Guidelines 2008. Even though there are a growing number of green remodeling guidelines, books, websites, and magazines, many builders and homeowners are overwhelmed by the amount of information available and have no idea where to start. The *New Jersey Green Home Remodeling Guidelines* simplifies the process by highlighting strategies for remodeling homes of different ages and styles located in unique bio-regions of New Jersey. They draw on local expertise and examples and take into account the availability of materials, products, and services. The Guidelines recognize the local factors that influence the cost and feasibility of recommended green strategies and technologies, providing a customized roadmap with tips and knowledge not available in other state or national guidelines.

## Role of the Expert Advisory Group

*What was the process and who was involved in the development of the guidelines?*

To gain a better understanding of the challenges and opportunities for green home remodeling in New Jersey, the RCGB conducted an analysis of the state's existing housing stock. Data gathered from the U.S. Census on housing unit type and age of structure showed the majority of the housing stock in rural and suburban counties of the State to be of single-family detached units built between 1940 and 1979. The Center also conducted a literature review to examine similarities and differences as well as applicability to New Jersey of several nationally recognized green home remodeling guidelines and programs.

The RCGB created an Expert Advisory Group in the spring of 2008 to inform the development of the guidelines. Meetings held during the course of the 16-month project and ongoing e-mail communication gathered the group's feedback and advice. Working groups matched expertise with the development of specific areas of the guidelines. Many of the case studies featured in the guidelines were either projects or

## Introduction

recommendations from members of the Expert Advisory Group. The engagement of local expertise and real-life project examples were key to customizing the guidelines to New Jersey and providing insight into local opportunities, costs, and challenges.

## Relation to the REGREEN Residential Remodeling Guidelines 2008

**REGREEN**  
ASID & USGBC

*How have the REGREEN guidelines inspired and informed the New Jersey Green Home Remodeling Guidelines?*

Concurrent with our launch of this project, the U.S. Green Building Council (USGBC) and the American Society of Interior Designers (ASID) unveiled the first draft of the REGREEN Residential Guidelines 2008 ([www.regreenprogram.org](http://www.regreenprogram.org)). This opened an opportunity for the Rutgers Center for Green Building to benefit from national-level research on green home remodeling and customize recommendations for New Jersey.

The USGBC and ASID granted the RCGB the right to use the REGREEN strategy titles and strategy identification system (ID's) to establish a formal link to the REGREEN guidelines. The *New Jersey Green Home Remodeling Guidelines (NJGHRG) Version 1.0* encompasses the REGREEN strategies deemed significant for New Jersey as well as strategies not covered by the REGREEN Guidelines. In most cases the REGREEN strategy titles were revised or combined to better reflect the purposes of the *NJGHRG*. In all cases, the strategy descriptions reflect original research conducted by the RCGB and the Expert Advisory Group. Furthermore, the *NJGHRG* draw on some of the design and organizational features of REGREEN but incorporate original photos and illustrations, use regional case study examples and present local resources and references where possible.

This collaborative partnership between the USGBC and ASID and the RCGB provides a model for how to adapt REGREEN to a regional (state) scale.

### Notes

<sup>1</sup>The Global Warming Response Act (GWRA) (P.L. 2007, c. 112) calls for reducing GHG emissions to 1990 levels by 2020, approximately a 25 percent reduction below estimated 2020 business-as-usual (BAU) emissions, followed by a further reduction of emissions to 80 percent below 2006 levels by 2050.

<sup>2</sup>New Jersey State Planning Commission 2001. New Jersey State Development and Redevelopment Plan. Adopted March 1, 2009. (Accessed August 11, 2009): [www.state.nj.us/dca/divisions/osg/plan](http://www.state.nj.us/dca/divisions/osg/plan)

<sup>3</sup>Ibid.



# How to Use the Guidelines

## Organization of the Guidelines

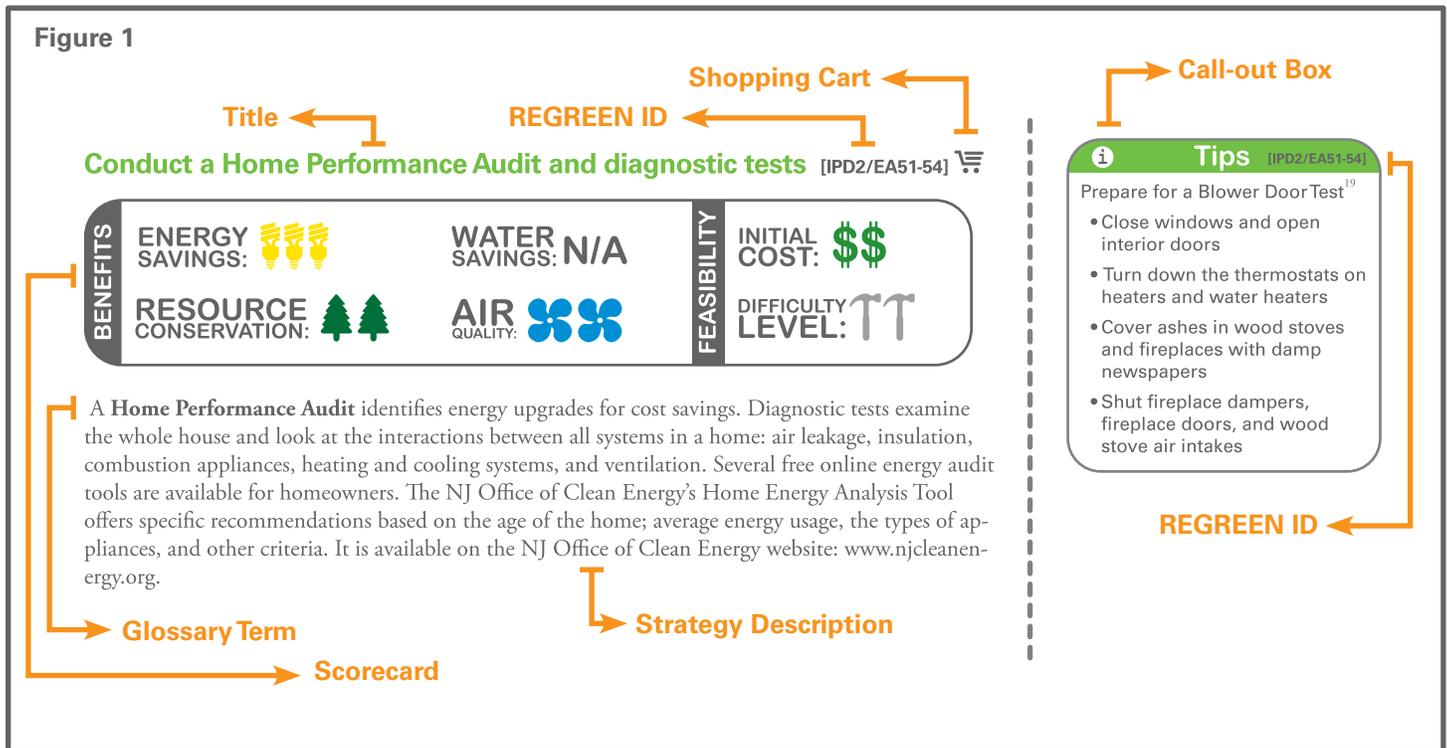
The Guidelines are organized into chapters by major project type: Kitchen, Bath and Living Spaces, Finished Basement and Major Addition, Weatherization and Energy, and Outdoor Living and Landscaping.

Each chapter includes the following:

- How to Use the Guidelines
- Health and Safety
- Green Home Maintenance and Housekeeping
- Best Practice Strategies
- Resources and References
- Case Studies
- Green Products and Services
- Glossary of Terms

## Getting the Most from the Strategy Write-ups

The Guidelines provide information on best practice strategies for each project type. These strategy write-ups are organized by building system and follow the order of the 2008 REGREEN Residential Remodeling Guidelines (i.e., IDP2), which are incorporated with permission. **Figure 1** describes the information available.



**Title and REGREEN Strategy ID** – The strategies in the REGREEN Residential Remodeling Guidelines 2008 inspired most of the strategies in these Guidelines. Where appropriate, the strategy references the related REGREEN strategy ID.



**Shopping Cart** – The cart denotes entries in the Green Product and Service Guide located in the back of each project chapter.

**Strategy Description** – This write-up provides an overview of each strategy and its environmental benefits.

**Glossary Term** – Acronyms and green building terms are highlighted in bold and defined in a glossary at the back of each chapter.

**Call-out Boxes** - The call-out boxes in **Figure 2** highlight information of special importance. These include the following types of information:

- Tips - useful hints or practical facts for accomplishing a strategy
- Incentive - sources of financial assistance
- New Jersey Bio-Region - New Jersey has 5 bio-regions, each with unique elements and environmental features to consider when remodeling
- Building Age - a home's age can inform needed repairs and call out special circumstances
- Caution - on occasion, there are hazards associated, so items are called out for safety reasons

**Hazard Symbol** - Symbols were developed to advise users of certain health and safety threats related to specific strategies. The symbols, which appear below, reference the guidance on Health and Safety located at the beginning of each section.

- HS1 – Nuisance and Toxic Dust Control 
- HS2 – Hazardous Materials - Asbestos & Lead 
- HS3 – Mold 
- HS4 – Radon 

**Web Link** - When viewing this document electronically, the websites will hyperlink, however, occasionally website links change. In most cases, the site provides a seamless link to the new address. If this is not the case, users may need to copy and paste the link into the browser address bar. At the time of publication the hyperlinks in this report were all functional.

**Scorecard** - The scorecard, **Figure 3**, provides a snapshot of the environmental benefits, initial costs, and difficulty levels associated with a particular strategy. Both qualitative and quantitative information was used to assign scores to each strategy.



It is divided into two parts: 1) Benefits and 2) Feasibility.

Graphic icons were developed for each impact category.

**BENEFIT Key**

1 icon = low benefit, 2 icons = medium benefit, 3 icons = high benefit

**FEASIBILITY Key**

 low initial cost,  medium initial cost,  high initial cost

 low difficulty level,  medium difficulty level,  high difficulty

The icons above have been developed to graphically describe the ratings that follow.

**BENEFITS**

 **Energy Savings**

To help meet its greenhouse gas reduction responsibility, in 2007 New Jersey passed **carbon dioxide (CO<sub>2</sub>)** reduction goals, i.e., achieve 1990 emission levels by 2020, followed by a further reduction of emissions to 80 percent below 2006 levels by 2050. The state has also established renewable energy and energy efficiency targets. Green remodeling strategies utilize renewable energy sources such as solar, geothermal, and wind to net a lower CO<sub>2</sub> footprint.

**Figure 2**

**i Tips** [EA49]

Use the U.S. Department of Energy's Zip-Code Insulation Program to determine how much insulation to add and where to achieve the recommended insulation levels for maximum energy efficiency  
[www.ornl.gov/~roofs/Zip/ZipHome.html](http://www.ornl.gov/~roofs/Zip/ZipHome.html)

**\$ Incentive** [EA49]

Federal tax credits may be available for added insulation to walls, ceilings, or other part of the **building envelope**. See the Tax Incentive Assistance Project: [www.energytaxincentives.org/general/legislative.php](http://www.energytaxincentives.org/general/legislative.php).

**🌍 NJ Bio-Region** [EA49]

In colder climates, adding extra insulation is more cost effective than installing a **radiant barrier**.

**🏠 Building Age** [EA49]

Insulation in older homes will have settled and at best be dusty or dirty so new attic insulation is typically installed on top of old insulation.

**⚠️ Caution** [EA49]

**Vermiculite Insulation** was used in attics until it was discovered that vermiculite ores from some sources have naturally occurring **asbestos** in trace amounts. This type of insulation is only a health concern when someone comes into contact with it; while it is contained, it is not determined to be a health risk. If a remodeling or renovation project involves removal of this type of insulation, certified professionals will be needed to safely remove or contain the material. For more information, see EPA website: [www.EPA.gov/asbestos/pubs/verm.html](http://www.EPA.gov/asbestos/pubs/verm.html)

### **Water Savings**

Water conservation reduces water use both inside and outside the home. Within the home this may include low-flow fixtures. Outside the home this may refer to using **native plants** that have lower watering requirements or rain barrels to collect rainwater for reuse on the lawn and garden. Water management includes providing proper moisture control at footings, slab perimeter, and foundation walls as well as using porous paving materials to encourage stormwater recharge for reduced runoff.

### **Air Quality**

Americans spend up to 90 percent of their time indoors where air quality can be more polluted than outdoors. Pollutants range from allergens such as mold, mildew, fungus, and dust mites to toxins, such as asbestos, and volatile organic compounds like formaldehyde and benzene found in building materials and a number of household items including pressed-wood furniture, computer ink, carpeting, and conventional household cleaners and cosmetics.

### **Resource Conservation**

Resource conservation means using materials that are durable and easy to maintain with low embodied energy (the energy used in resource extraction, manufacturing, shipping). These come from renewable sources or are produced from waste, recycled materials, or salvaged from other uses. Avoiding building materials that deplete natural resources, such as old-growth timber, and materials made from toxic or hazardous substances improves nature's ability to provide goods and services.

## FEASIBILITY

### **Initial Cost**

Cost is always a consideration for remodeling projects. Evaluating the cost of a recommended green remodeling strategy provides homeowners with a better sense of the relative costs and benefits of each recommended measure.

Costs come in two forms, so it is important to consider both in assessing feasibility. The first reflects initial costs of the strategy compared to conventional practices. A second consideration to make is the pay-back period or life-cycle cost. The pay-back costs are less obvious and are often project specific, but they can have significant environmental and economic value that factor into the overall cost. For more information on average costs, savings, and payback periods of typical energy efficiency improvements, see the Energy Efficient Rehab Advisor at ([www.rehabadvisor.pathnet.org/](http://www.rehabadvisor.pathnet.org/)). For customized results, have an energy professional conduct a thorough energy audit of your home.

 Less than \$500

 \$500-\$5,000

 Greater than \$5,000

### **Difficulty Level**

Time is money and expertise is gained over time. Some people may consider a Home Performance Audit strategy in the 'medium' category because although relatively straightforward to act on, it requires experts with custom equipment to prepare an accurate assessment. Implementing the findings from a Home Performance Audit becomes a 'high' difficulty category as space heating and cooling systems, ventilation, water heating, appliances, climate and even site factors need to be integrated to assure desired energy improvements across 'ALL loads' and to avoid negative unintended consequences. It is expected that 'high' difficulty strategies may also be dangerous for the basic homeowner to undertake.

 Easy to Do It Yourself (DIY) - little previous knowledge necessary

 Task for an Experienced DIYer or Professional - may require additional effort and higher learning curve than conventional strategy it replaces

 Task for an Expert/Certified Professional - high learning curve; new technique; requires specific green knowledge

Notes: <sup>1</sup> U.S. Environmental Protection Agency 2008. Healthy Buildings, Healthy People: A Vision for the 21st Century

# 10 Green Rules of Thumb

## 1 Start from where you are

Every home has a unique story and different starting point for going green. Greening an existing home is about more than just introducing a single green product or a collection of green technologies; it's about how systems of the whole building work together to reduce environmental impacts. First, determine what makes sense for your home and your budget. Many of the most significant opportunities for reducing the environmental impact of a residential remodeling project lie in the decisions made at the very start of the project. Start with diagnostic tests such as a **Home Performance Audit (Blower Door Test, infrared imaging, etc.)** to uncover problem areas and discover opportunities for improvements and savings.

For more information on free and reduced-rate home performance energy audits, visit the New Jersey Clean Energy Office's website, [www.njcleanenergy.com/](http://www.njcleanenergy.com/)

## 2 Expand your definition of cost

When undertaking a green remodeling project, it is important to focus on long-term savings, ease of maintenance and resource conservation. The initial cost only provides one of the true cost of a product or design; a higher price can mean a better deal in the long run. For example, resource-efficient fixtures may cost more up front but save money over time by lowering monthly utility bills. Durable materials save money by requiring less frequent replacement. A low purchase price may simply mean a good deal—or it may signify a lack of quality or durability. It may also mean that some environmental, health or social costs are not reflected on the price tag.

The cost and design of construction services might seem expensive if only the up-front costs are considered. The actual cost comes when the benefits are included, which reflects savings in operation and maintenance. The collaborative nature of the green design approach requires more up-front time (which usually translates into billable hours), but this early planning stage means tremendous benefits later: design solutions that better meet a homeowner's needs or reduce the project scope, fewer construction materials and expenses, or features that save energy, water, or maintenance.

For items that may increase your initial costs during construction, be sure to calculate the return on investment – the period of time it takes to realize the savings for items such as solar panels or added insulation. For information on Return on Investment for common green home remodeling strategies, see [www.GreenandSave.com/master\\_roi\\_table.html](http://www.GreenandSave.com/master_roi_table.html)

## 3 Reuse materials, reduce waste, and rethink space

Consider the 3-Rs: reduce, reuse, recycle. In green remodeling, the 3-Rs start at the earliest stages of design. By thinking creatively about how to reduce waste. Try to reuse as much as possible of the structure, finishes and furnishings. Keep in mind, though, that sometimes it

makes sense to replace items, such as old, inefficient refrigerators with new energy-saving models. The size of your remodel will determine the resources to build it and maintain it. Before tearing down walls, think about how to reuse existing rooms or consider opportunities to relocate space-constrained activities to outdoor spaces. If demolition is unavoidable, plan for deconstruction – or manually unbuilding and salvaging building materials – to help keep useable materials out of landfills.

Materials salvaged from deconstruction can be used on the current project, sold or donated. Develop a plan for recycling construction and demolition waste. Close the loop by choosing new materials that have a **High-Recycled Content**.

Look for salvaged materials at demolition sales and local salvage stores such as Habitat for Humanity ReStores ([www.habitat.org/env/restores.aspx](http://www.habitat.org/env/restores.aspx)) and Goodwill Retail Stores ([www.locator.goodwill.org/](http://www.locator.goodwill.org/)), or through websites like [www.Craigslist.org](http://www.Craigslist.org) and [www.Freecycle.org](http://www.Freecycle.org).

## 4 Conserve energy and use the sun

The energy used to heat, cool and power homes pollutes the atmosphere and contributes to global climate change. Additionally, inefficient homes are costly to maintain. A first step in any green remodeling project involves making homes as energy-efficient as possible and then relying on sources of clean and renewable energy for any remaining energy demands.

The sun provides free and plentiful energy in the form of daylight and heat. Although it is easier to incorporate passive solar techniques when building a brand-new home, every remodeling project should also be evaluated to identify passive solar opportunities.

- Insulate the building to a very high level and reduce **infiltration** to prevent heat loss.
- Consider the orientation of the home or addition at the start of any project. South-facing walls and windows will receive the most sunlight. Design roof overhangs for south-facing windows to let sun in during the winter and keep sun out in the summer.
- Use wall and floor materials with thermal mass to absorb heat and cold.
- Incorporate **awnings, trellises** and deciduous shade trees to limit summertime solar heat gain through south-, east- and west-facing windows.
- Design windows and operable skylights to catch prevailing breezes and provide **natural ventilation**.
- Reduce solar heat gain by using light exterior colors or paints with reflective pigments, **ENERGY STAR®** roofing materials, and/or radiant barrier roof sheathing.

For more information about passive solar design for homes, visit the U.S. Department of Energy's website, [www.eere.energy.gov/buildings/residential/solar.html](http://www.eere.energy.gov/buildings/residential/solar.html).

## 5 Conserve water and gather rain

New Jersey has abundant water resources—so why worry about saving water? Aside from periodic droughts, the simplest answer is that conserving water saves money. If household water is supplied by a well and septic system, conserving water can extend the life of the system and delay the need for repair.

If a home is serviced by a municipal water system, the less water that it uses, the smaller the bill. Conserving water can also reduce energy bills lowering water heating costs. Most people use approximately 50–75 gallons of water indoors every day, with up to 75 percent of that used in the bathroom.<sup>1</sup>

According to the **EPA**, a typical single-family suburban household uses at least 30 percent of their water outdoors for irrigation. Some experts estimate that more than 50 percent of landscape water use goes to waste from evaporation or runoff caused by overwatering. Install faucet aerators and low-flow fixtures to reduce water use indoors and consider using a rain barrel or **rain garden** to water **native plants** in the garden.

For more information on how to save water in the home, visit the U.S. **EPA** WaterSense website, [www.epa.gov/watersense/](http://www.epa.gov/watersense/).

For up-to-date information on low-flow toilet performance tests, visit the California Urban Water Conservation Council website, [www.cuwcc.org/maptesting.aspx](http://www.cuwcc.org/maptesting.aspx).

## 6 Consider the life-cycle of products and materials

*“The greenest home is the one that is already built”*

– National Trust for Historic Preservation

Everything – every material, every product – has a life cycle. A life cycle is the journey a material goes through from its raw form through processing to a finished product. All the energy to extract, process, manufacture, transport, and install a product is called its ‘embodied energy’. When a home is demolished and landfilled, the energy locked up in it is totally wasted. Demolition itself uses energy and, of course, the construction of a new home in place of the demolished one uses more energy and resources yet.

Embodied Energy of Materials and Construction per square foot of Construction <sup>2</sup>	
Residential – Single Family	700 MBTU/sq. ft.
Residential – 2 to 4 Family	630 MBTU/sq. ft.
Residential – Garden Apartment	650 MBTU/sq. ft.

To calculate the embodied energy of your home, take the Embodied Energy Survey developed by The Greenest Building Organization at [www.thegreenestbuilding.org/survey.html](http://www.thegreenestbuilding.org/survey.html).

Try to follow these guidelines:

- Design for long life and adaptability, using durable low maintenance materials.
- Ensure materials from construction and demolition wastes are reused or recycled.

- Use locally sourced materials (including materials salvaged on-site) to reduce transport.
- Select low-embodied energy materials (which may include materials with a **high-recycled content**).
- Select materials that can be reused or recycled easily at the end of their lives using existing recycling systems.
- Give preference to materials manufactured using renewable energy sources.
- Use efficient **building envelope** design and fittings to minimize materials (e.g., an energy-efficient **building envelope** can downsize or eliminate the need for a large HVAC system).

For more information on preserving a home’s embodied energy as well as its historic features, visit the National Trust for Historic Preservation’s website on sustainability:

[www.preservationnation.org/issues/sustainability/](http://www.preservationnation.org/issues/sustainability/)

## 7 Avoid Toxins

The **United States Environmental Protection Agency (USEPA)** reports that the air in homes can be 5-10 times more polluted than outdoor air. According to research published in the *New England Journal of Medicine*, 40 percent of children will develop respiratory disease in part due to the chemicals in their homes. To minimize exposure, select products and furnishings for the home that do not contain **volatile organic compounds (VOCs)**, **flame retardants**, and **formaldehyde**. The Washington Toxics Coalition (WTC) reports that using entryway mats can reduce the amount of dust on carpets by 33 percent. And homes where shoes are removed at the door, according to the WTC, have 10 times less dust than homes where shoes are worn.

Leading causes of poor indoor air quality include:

- Off-gassing of chemicals from building products and materials
- **Combustion** by-products from open-flame appliances
- Lead dust from old paint
- **Asbestos** from old insulation, floor tiles, siding or fireproofing
- Dust mites and other biological pollutants like dander and pollens
- Mold caused by excess moisture and/or poor ventilation
- **Radon** that migrates from soil into the house

For more information on ways to reduce exposure to toxics in the home, see the Health and Safety section in this guideline or visit the American Lung Association’s Health House website:

[www.healthhouse.org/](http://www.healthhouse.org/)

## 8 Connect to Nature

Disturbing or removing vegetation causes a site to lose valuable ecosystem services such as climate regulation, protection of soil health, provision of habitat for wildlife and pollinators, and filtration of pollutants from water and air. This also can restrict the capacity of

the landscape to intercept and infiltrate water which in turn manages stormwater, recharges groundwater and filters water. Furthermore, studies show that the visual effects of flowers and plants are good for people. A Chicago study links tree and grass cover to fewer property crimes, fewer violent crimes, stronger ties between neighbors, more frequent use of common neighborhood spaces and a greater sense of safety.<sup>2</sup> During construction, avoid cutting down existing trees and disturbing vegetation. Keep in mind that well-designed landscapes promote biodiversity with a mix of **native species** and ecologically appropriate non-native species.

For more information on creating sustainable sites, see the Sustainable Sites Initiative website ([www.sustainablesites.org](http://www.sustainablesites.org)) or check out the National Wildlife Foundation's Garden for Wildlife website ([www.nwf.org/gardenforwildlife](http://www.nwf.org/gardenforwildlife)).

## 9 Communicate Green Remodeling Priorities

A successful green remodeling project requires homeowners, interior designers, architects, engineers, builders, and trade contractors to coordinate their efforts as early as possible. To make sure that everyone understands and to hold them accountable for the green features of the project the following two steps are essential:

1. Incorporate green items directly into the specifications for the projects.
2. Attach a green remodeling checklist to the blueprints to make it easier for everyone involved—including the building professionals, homeowner and municipality—to see which green features are included in the remodeling project.

For tips on hiring and working with design professionals and contractors when working on green remodel projects, check out Seattle's Green Home Remodeling "Hiring a Pro" guide book: [www.seattle.gov/dpd/cms/groups/pan/@pan/@sustainablebliding/documents/web\\_informational/dpds\\_007579.pdf](http://www.seattle.gov/dpd/cms/groups/pan/@pan/@sustainablebliding/documents/web_informational/dpds_007579.pdf)

## 10 Get Paid to Green Your Home

Homeowners can receive federal and state tax credits for installing energy-efficient windows, doors, roofing and insulation as well as furnaces, air conditioners and heat pumps. Details on qualifying improvements are updated regularly on the Database of State Incentives for Renewables and Efficiency (DSIRE) website, [www.dsireusa.org/](http://www.dsireusa.org/).

New Jersey electric and gas utilities also offer rebates for **Energy Star**® appliances and energy efficiency upgrades, as well as free online energy efficiency surveys for the home. Water utilities may offer free leak-detection services, free shower and faucet aerators, landscaping and water audits, and free or rebated toilets, dishwashers and clothes washers.

For more information, check with your local utility or the New Jersey Office of Clean Energy website, [www.njcleanenergy.com/residential/home/home](http://www.njcleanenergy.com/residential/home/home).

### Notes:

<sup>1</sup>Sue Scibilia. (2003) "Hints for Household Water Conservation." Rutgers NJAES Cooperative Extension. Available at: [www.njaes.rutgers.edu/pubs/publication.asp?pid=fs862](http://www.njaes.rutgers.edu/pubs/publication.asp?pid=fs862)

<sup>2</sup>Kuo, Frances E. The role of arboriculture in a healthy social ecology. *Journal of Arboriculture* 29 no.3 (May 2003): 149-155.

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[www.cleanwaternj.org/index.htm](http://www.cleanwaternj.org/index.htm)