



Great big green monster mansions

Environmentally correct housing has never been more popular. But even the most eco-friendly home may do more harm than good when it is super-sized.

By **LINDA BAKER**

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En route to a Vancouver, B.C., conference on recycled products a couple of years ago, green-building consultant Kathleen O'Brien struck up a conversation with her Bangladeshi cab driver, who wanted to know what kind of green features to incorporate into his house. "He asked, 'Should it be wood, should it be steel?'" said



Green building is one of the fastest-growing sectors in the exploding market for environmentally friendly materials and technologies. According to the National Association of Homebuilders (NAHB), in 2002, programs such as Built Green certified more than 13,000 homes in the United States. Next year, the U.S. Green Building Council will pilot its Leadership in Energy and Environmental Design (LEED) Homes program, certifying state-of-the-art green residences. States and municipalities also continue to strengthen residential codes for energy efficiency, indoor air quality and water use.

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But there's an elephant in the living room of most of these green homes. Call it square footage -- lots and lots of it. Fifty years ago, the average house size was 1,100 square feet, and the average household size was 4.2 people. Today, the average house size has increased to 2,150 square feet, while the average household size has declined to 2.3 people.



"That's a killer combination," said Mike O'Brien, a program manager in the Portland, Ore., Office of Sustainable Development. "In the space of 50 years, we've reversed the equation completely."

Here's what the green residential landscape looks like in the 21st century. In the United States, advances in green-building technologies have to compete with the proliferation of 3,000-square-foot-plus homes -- simultaneous trends that underscore one of the key paradoxes of sustainable development in the United States.

"In spite of everything we've done to make the building envelope more efficient," O'Brien said, "we're still using more energy in our homes." Nadav Malin, the editor of the monthly newsletter Environmental Building News, agrees. Most of the green features people are incorporating into their homes represent ecological improvements in the 10 to 50 percent range, he said via e-mail. But even a 50 percent reduction in the ecological footprint, Malin noted, "would be totally offset by a doubling of the house size."

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The American proclivity for living large does more than raise questions about whether a 4,000-square-foot single family home should ever qualify as a "green" residence. It also calls into



products and technologies will save us from environmental apocalypse. If we all go solar, if we install rainwater catchment systems and use sustainably harvested lumber, so the logic goes, then there's no need to deprive ourselves of the luxuries that space -- and the furniture and accessories to fill it -- affords. But the issue of consumption, not to mention overconsumption, is curiously absent from the sustainability discourse. And in an era characterized by unprecedented consumer wealth, this could be the movement's fatal flaw.

Within the green home market, there does exist a niche for small houses, fueled largely by the runaway success of "[The Not So Big House](#)" book series by Minnesota architect Sarah Susanka and, to a lesser extent, an emerging trend toward sleek, efficient -- and affordable -- modular housing. But for the most part, the green housing market mirrors the megahouse trends in the conventional homebuilding market.

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"My clients want to build green, but they want to build bigger," says George Ostrow, principal of Velocipede Architects, a leading sustainable design firm in Seattle. Ostrow links big green houses to fuel-efficient SUVs and other green-living oxymorons. "It's a contradiction of our culture," he said.

Whether it's a McMansion or an architect-designed estate, big green homes offer a recognizably American take on eco-friendly trends sweeping the country.



There's the 4,200-square-foot solar-powered home **featured in Salon** last month -- a house "so spacious it includes an entire guest wing the couple never uses." Rob Harrison, another Seattle architect who specializes in sustainable design, cites a 4,100-square-foot home -- including garage and attached greenhouse -- he recently designed for a single family household in Redmond, Wash. Among other features, the house will incorporate advanced framing, Forest Stewardship Council-certified lumber, hardwood floors and plywood, as well as sustainably harvested cork floors. The main roof slopes south for future photovoltaic panels, and there is **porous paving** on the driveway.

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"We had many green features," Harrison said. "But ultimately, because of the size, we are still using more resources." The client's personal requirements, including room for a regulation-size pool table and a music performance atrium for 30 people, made it impossible to reduce the footprint of the house, Harrison said.

"House size," he says, "is probably the most important criterion and often the most difficult one for us to meet."

Not all green designers and builders hew to the notion that less is more. Take William McDonough, the visionary **green architect** who likes to invoke the cherry tree -- in which thousands of blossoms provide fruit so that one pit might take root and grow -- as a model for



"No one would ever look at the ground littered with cherry blossoms and say 'how inefficient how wasteful,'" writes McDonough in his book, "Cradle to Cradle." Instead, he observes, the blossoms decompose and provide nutrients for soil, plants and other organisms. Nature, in his view, is both abundant and productive -- qualities that "eco-effective" design (a McDonough alternative to "eco-efficient" design) can and should emulate.

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Allison Ewing, a residential architect at McDonough's Charlottesville, Va., firm, applies this theory to the 4,000-square-foot-plus green homes she designs. "Our belief is that if it's solar powered, you can have all the hot water you want," she said. "As long as you have cradle-to-cradle design, we say, celebrate abundance." Responding to a question about house size and ecological footprint, Ewing reiterates another favorite McDonough saying: "We're not in the business of telling people to be less bad," she said. "We're about 100 percent more good." Ewing cites a recently designed 4,500-square-foot residence that incorporates geothermal energy sources, radiant floor heating and sustainably harvested wood -- a house that apparently catalyzed a local market for sustainably harvested lumber. A smaller residence, she said, would not have had the same impact on the local green economy.

As a metaphor, design principle and incubator for sustainable markets, the idea of productive abundance is compelling. It's much less compelling when viewed in context of American



metaphors, the natural world is, conveniently, a free market. And as Ostrow and Harrison point out, the trend toward large green houses is driven in large part by the lack of awareness surrounding square footage and ecological footprint, not because of any lofty ideas about nature's fecundity.

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A reflection of American priorities and lifestyles, the march toward bigger homes also gets a push from complex zoning regulations and real estate and banking practices. Mortgage banks lock in large house sizes by requiring the value of the home to be three times the value of the land, said Art Castle, executive vice president of the Home Builders Association of Kitsap County, Wash. "If you put a house outside of these perimeters, you create a market aberration," he said. "A lot of lenders are unwilling to support smaller houses."

The bias toward large homes has even penetrated green-building rating programs, according to an analysis performed last year by the Pittsburgh-based Integrated Building and Construction Solutions (IBACOS). The study found that the Home Energy Rating System, a federal program that rates energy efficiency performance for new and existing homes, requires smaller houses to incorporate more advanced energy features than larger houses, assuming a given occupancy. "The whole motivation for doing the analysis was that house size is not being taken as seriously as it should be," said Eric Newhouse, an IBACOS

~~systems integration designer and the co-author of the report "Analysis of Energy~~



Consumption, Rating Score and House Size." The paper was presented at the U.S. Green Building Conference last year.

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In 1998, Environmental Building News published an article comparing energy and materials use in large and small houses. Using data compiled by the NAHB and Energy Balance, the article showed that a 1,500-square-foot home with low energy performance standards will use less energy for heating and cooling than a 3,000-square-foot house with high energy performance standards. Because big houses tend to have more design features, the NAHB also estimated that large homes consume proportionately more materials. Thus a 5,000-square-foot house will consume three times as many resources as a 2,085-square-foot house, even though its square footage is only 2.4 times greater.

Six years later, experts say the correlation between square footage and resource and energy use is still valid. Size matters even if a residence incorporates solar power, rainwater catchment and other "off the grid" technologies, says Newhouse. "Bigger houses use more materials," he said. "and there's no perfectly environmentally friendly material."

Acknowledging the issue, some green-building rating programs have started to incorporate a matrix for house size. Like many green residential programs, PGE's Earth Advantage certification in Portland, Ore., is based on a combination of required measures and additional



four advanced levels of certification, two of which incorporate a matrix for house size. For example, under the new Earth Advantage Gold Environmental and Water Efficiency package, a 2,500-square-foot home needs to earn 50 more environmental responsibility or resource efficiency points than a 1,999-square-foot home in order to earn the same ranking.

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The Vermont Built Green (VBG) program, which piloted last year and is recognized as the most comprehensive program in the country, takes this idea one step further. To earn VGB certification, a home must meet 54 requirements and earn at least 100 points. Under this system, the easiest way to earn certification is to meet the minimum requirements and build a very small house. For example, a two-bedroom house earns 100 points if it's 1,000 square feet; 25 points at 1,500 square feet. By contrast, a four-bedroom house at 5,200 square feet loses 100 points, meaning that the house will have to earn 200 points -- twice as many -- for VBG certification.

"House size is the centerpiece," said Richard Faesy, project manager of the Vermont Energy Investment Corp., which administers the VGB. "We hope to spur education and discussion to get people to acknowledge size is a significant factor in green homes."

Building small isn't nearly as sexy as installing photovoltaic panels for solar power. But there is a niche for small green homes, especially among young families in search of affordable



Portland, Ore., with her husband and two young children, is one such convert. Boasting a rainwater catchment system, solar and radiant heating, reclaimed lumber from a dismantled granary, bamboo flooring, and reclaimed sinks, toilets and marble, the house won the 2003 National Green Custom Project award from the NHBA Research Center. "We had 18 people here for Thanksgiving," said Bacon-Brenes. "Everyone was so surprised at how good it felt."

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To create a feeling of spaciousness, Bacon-Brenes and Portland architect Andre DeBar said they incorporated principles from Susanka's "Not So Big" books: an open floor plan with modular spaces, definition between the entryways and rooms, and diagonal lines of sight.

A surprisingly chi-chi source of small green homes can be found in contemporary modular housing -- a 21st century incarnation of modernist, mass-production architecture that bears little relation to the fake Tudors or trailer parks most people associate with prefabricated construction. One example is the "Q series" of modular homes, designed by Kohn Shnier architects and manufactured by Royal Homes in Toronto. A sleek, wedge-shaped structure with floor-to-ceiling windows and simple plywood interiors, the Q comes in variable sizes up to 850 square feet, with a price tag around \$150,000. Lloyd Alter, managing director of the Toronto Site for Royal Homes, calls the Q the "anti-monster home." With good design, you don't need a lot of space, says Alter, who advocates for what he calls the housing equivalent

~~of IKEA furniture: "good, affordable design that can get off the rack."~~



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Other players in the modernist prefab movement include 33-year-old Missouri architect Rocio Romero, whose stylish, light-filled 1,150-square-foot "LV House" comes in panels of corrugated aluminum. The basic LV kit costs \$29,000 plus shipping, around \$3,000 -- but doesn't include electrical or plumbing systems.

Whether or not modular housing evolves into the next big thing, prefabrication reduces construction-related waste and square footage, and tends to privilege flexible spaces and plenty of light. And the efficiencies inherent in modular construction are intriguing. Alter cites a Danish design called "flip spaces," in which bedrooms span two units in a condo or apartment building. When the kids in one family move out, the bedroom "flips" to the other unit. "There are a lot of flexible design ideas that can be done if the house isn't sitting alone on a lot," Alter said.

In the meantime, families who are content with smaller-than-average houses are still the exception. As for big green houses, well, they evoke the parable about boys who will turn any toy -- blocks, balls, stuffed animals -- into a war game. Give Americans sustainable technology, and we'll super-size it beyond recognition.

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"If we wanted to sell our home, who would we sell it to?" asked Kathleen O'Brien, who lives in a 1,650-square-foot, two-bedroom Built Green house on Bainbridge Island, Wash. "Maybe another couple or family with one child, with our same philosophy." Other than that, O'Brien said, the possibilities are limited. "Resale value is another market constraint on small homes."

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