

# Ecologically-Sustainable Design for Cohousing

## Making Smart Choices for Green Projects

by Mary Kraus

### INTRODUCTION

What is sustainable design, anyway? For many people, the idea of ecological design brings up the image of a remote, rural, straw-bale home with solar electric panels, solar hot water, a composting toilet, and a generous organic garden. But understanding sustainable design often requires deeper reflection. A project that at first glance appears "conventional" may turn out to be more environmentally-friendly. An old apartment building in an urban neighborhood, for example, may be more sustainable than the "greenest" new project in the suburbs. Why? The apartment dwellers can walk or take public transportation rather than drive to work and to the grocery store, and their attached dwellings conserve heat by sharing walls and floors.

Sustainable design involves siting, design, and construction decisions which can minimize ecological impact and maximize healthfulness of the built environment. The key is thinking it through. What I've observed in my twelve years of working with cohousing groups as both an architect and a facilitator is that the most successful groups are realistic about costs, and are willing to balance their sustainability goals with their other multiple preferences. The earlier they understand the trade-offs involved, the more likely they are to succeed.

So how does a group "go green?" Some of the best sustainability opportunities are inherent to cohousing, while others are related to site and building choices that any good housing developer would make. Each of the choices you make will impact the "greenness" of your built community. How you think about them at the beginning can make all the difference.

### THINKING UP-FRONT

#### Know Your Values

The very first step is to be clear about your goals and priorities. If you understand how sustainability stacks up relative to your other goals, you are on the way to making sound decisions that reflect your group and your vision. Once you set your goals, it is paramount to regularly evaluate your design decisions based on these priorities.

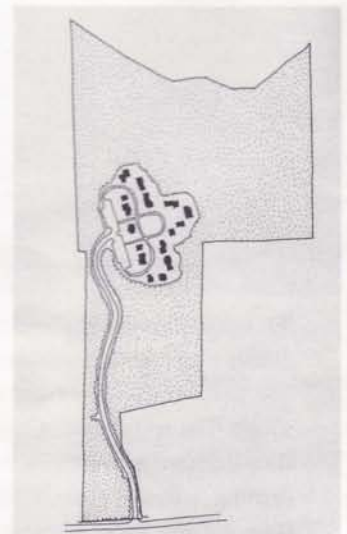
I know of a group that went far down the road of design before they called in an energy consultant. Their homes were fairly large and quite complex in shape. When the consultant recommended some energy-saving choices with associated costs, the group said: "Gee, it's too bad we can't afford the ecological features. We really wanted to include them, but they're just too expensive." What they didn't realize was that the size and shape of their homes contributed to this high cost, and that they were making unconscious choices between size and energy-efficiency, and esthetics and ecological performance. You want to be clear about your trade-offs and make sure that the completed project represents your actual values—whatever they may be.

#### Pick Your Site Wisely

From an environmental point of view, the site you choose can have the greatest impact related to your project. You can reduce your auto dependence by choosing a site close to public transportation and within easy walking or biking distance to key services and workplaces. Communities that have made this kind of "smart growth" decision have found that the number of cars associated with their project dwindles. For example, at Winslow Cohousing on Bainbridge Island, WA, located within walking distance of the commuter ferry, 35 cars serve 30 households.

Redeveloping a "damaged" industrial urban infill site (rather than that pristine site with the sparkling brook running through it) is a great way to conserve land.

On the other hand, clustering a cohousing neighborhood on an old farm site in the country might save it from sprawl development that would destroy it entirely.



**Pathways Cohousing**  
Site Plan: Kraus-Fitch Architects





**Doyle Street Cohousing**  
Photo: Kathryn McCamant

## Consider Renovation

Renovation is a good way to make use of structures that already exist, rather than expending the energy and materials to build new ones. Doyle Street Cohousing in Emeryville, CA, is a successful example of renovating an industrial building into apartments and a common house. An old farmhouse on a rural site can be used as a common house or adapted for individual homes. Just one caution: be sure to evaluate, with the help of your architects, whether the existing structures can accommodate the new functions well, particularly in the case of a common house.

## TAKE ADVANTAGE OF COHOUSING'S INHERENT SUSTAINABILITY

Many aspects of cohousing are inherently sustainable—the clustering of homes, smaller units, and sharing of resources. You can build on these strengths by embracing further opportunities to make your project more environmental.

## Cluster to Save Land and Resources

Whether you build on rural land or in the suburbs, a village cluster of buildings means shorter distances for roads, paths, and utilities between homes. By leaving a good portion of the site unbuilt, you also leave room for wildlife habitat, gardens, and orchards. You can save even more resources by joining walls and attaching units. Shared walls will conserve heat and “coolth,” and your project will use less siding and other building materials. Units arranged in an apartment building save roofing as well. (Of course, there are sometimes added requirements such as sprinklers, and be aware that in some climates, access to breezes may be more important than attaching units.) In Cambridge Cohousing in Cambridge, MA, many of the units are apartments in a four-story building that includes the common house. These apartments have an added advantage of allowing weather-protected, ready access to the common house.

*Taking advantage of the smaller model of housing that cohousing suggests is a fundamental environmental strategy for groups.*

## Build Small

The smaller you build, the fewer materials you use, and the less energy you need to heat or cool your home—not to mention the reduced requirements for maintenance and repair. Taking advantage of the smaller model of housing that cohousing suggests is a fundamental environmental strategy for groups. The guest rooms you decide not to include in your individual homes will reduce the impact of your project overall.

## Centralize HVAC

When twenty or thirty homes are clustered or attached as they are in cohousing, centralized heating and cooling makes sense. You save money by not replicating individual heating units, and can use your savings to invest in a premium high efficiency system—or an unconventional energy source such as wood chips from a local lumber yard or a centralized ground source heat pump system. Clustering also permits the sharing of solar hot water, and makes shared photovoltaics and wind turbines more economical.



**Cobb Hill Cohousing**  
Photo: Judith Bush

Cobb Hill Cohousing in Hartland, VT, will be using a central wood-burning boiler to heat the community. As a matter of fact, they have just fired it up for the first time at this writing. In the interim, they had used three propane boilers shared by about five to eight houses each.

## Take Advantage of Scale

Cohousing groups with the buying power of fifteen to forty households can gain access to technologies and alternative materials that might not be available to individual home buyers. In working with the Second Neighborhood of EcoVillage at Ithaca, in Ithaca, NY, I remember searching for sustainably harvested wood sources. A consultant who specialized in alternative sourcing was available to serve us because of our multiple households, but would not have taken on a single home. The basic economy of scale associated with larger projects brings down the cost of most items, whether that's lumber, composting toilets or energy-efficient appliances.





On the other hand, a large project can make some unconventional approaches more difficult. Assuming straw bale is an appropriate green choice for your area, it's one thing to convince a building official that it's a viable alternative for a single family home, but they're not so likely to approve this unfamiliar technique for a common house and a block of townhouses.

### Connect Work and Life

Consider including some office space or alternative work space in your project. At Pioneer Valley Cohousing in Amherst, MA, we have a separate "home office" building across the green from the common house. Several of us co-own this building, which includes offices, a conference room, a fax machine, a copier, a computer and an internet server. The facilities are also available to the community-at-large, saving our neighbors many car trips to the copy shop, and allowing some residents access to a computer, without having to own one. The First Neighborhood in EcoVillage at Ithaca also has home offices, which they have built as a wing to the common house.



**Nyland Cohousing**  
Photo: Kathryn Lorenz

development—they are available to any builder who cares about the environment. They are available to cohousing groups because they control the project.

### Develop Your Site Sensitively

As I mentioned earlier, site location will have a great effect on the environmental impact of your community. Whatever site you choose, however, make it a point to understand its assets and weaknesses. Build on areas that are already damaged, and try to leave sensitive ecosystems and fertile farmland untouched. A good landscape architect can help analyze your site and assist with making environmentally sound choices.

*In designing a whole neighborhood at once, you have the option to place buildings and plantings strategically to take advantage of solar gain.*

### MAKE SMART GREEN CHOICES

Some environmental choices don't depend on the cohousing model of

Good landscaping and planting choices will minimize your ecological impact over time. Traditional lawns are some of the most unsustainable landscapes possible, whether they're in dry arid regions where water is scarce, or cool humid areas of the Northeast. Gas lawn mowers create a lot of pollution and use up fossil fuels. Not to mention the noise! If you have smaller lawn areas, mow them with hand mowers. In arid climates in Colorado and New Mexico, groups use "xeriscaping," incorporating plants adapted to dry climates.

Native plants provide great benefits, especially ones that are sources of food or safe habitat for birds and other wildlife. At Pioneer Valley, we used "corridors" of native plantings to give animals a safe entry from the adjacent woods. You can also use edible landscaping to provide tasty organic snacks for the community.

### Take Advantage of Solar Orientation

In designing a whole neighborhood at once, you have the option to place buildings and plantings strategically to take advantage of solar gain, cooling breezes, and shading. For example, a row of low, one-story buildings south of the pedestrian way will let sunlight onto the path and into taller two-story structures on the northern side. Planting trees on the west side of buildings will help reduce summer overheating from the afternoon rays. You can also create comfortable outdoor micro-climates, like a warm sitting area exposed to the sun and sheltered from wind, or a cool summer dining spot under the shade of a large trellis, exposed to breezes.

### Design Energy-Efficient Buildings

Insulation is your friend when it comes to energy efficiency. A good building "envelope" with well-insulated walls, roof, and basements will keep heat and "coolth"

where you want them. Choose high-performance windows that insulate well and let in the right amount of solar gain. And you want to build tightly to eliminate drafts and heat loss through air leakage. Well-designed natural lighting is also a good energy-saving strategy while creating pleasant cheerful interiors. This involves attentive window placement to bring in the sun's light without glare or overheating. With light from the sun, you won't feel the need to switch on the electric lights.



**Pioneer Valley Cohousing**  
Photo: Mary Kraus



## Select Environmentally-Sound Materials

The less material you use, the lower your ecological impact. In addition to plain old building small, there are other ways to minimize materials use. For example, walls can be framed more efficiently, using fewer studs. Roof trusses, made primarily from two-by-four's, do not require the large trees necessary for solid two-by-twelve rafters.

And what about the actual materials themselves—the flooring, siding, and kitchen cabinetry? Questions to ask in evaluating a particular material for sustainability include: What are the land use and pollution impacts caused by the extraction and/or manufacture of the material? How much energy did it take to manufacture and transport the material? What is its recycled content? Is it a salvaged material?

Is it durable (to minimize energy spent maintaining and replacing it)? Is it locally or regionally produced (to minimize energy used to transport it to the site)? Is it healthful for the occupants?

At Pioneer Valley, we balanced concerns for sustainable materials with the need to meet our affordability goals. Flooring is an example. We wanted to avoid the toxicity of carpets but found hardwood too expensive. So we used locally-harvested white pine, milled a mile from our site. Pine is fairly soft, and therefore gets “dings” over time, but the group felt this was a worthwhile compromise, and some of us even think of it fondly as the “patina” of aging.

We used a similar approach to kitchen cabinetry. To avoid particleboard, which outgasses formaldehyde, we used regionally-produced solid pine cabinets. In order to afford the more expensive quality ones, we decided to use fewer of them, eliminating upper cabinets to leave flexible space at the top. Many residents wanted open shelves anyway, and different households have built uppers in different ways, so that our kitchens all look unique. This is a strategy that can allow personalization after move-in without having to customize beforehand.

At Pathways Cohousing in Northampton, MA, residents developed an array of flooring options, including natural linoleum in their bathrooms to avoid vinyl (the manufacture of vinyl has significant ecological impacts). Non-VOC (volatile organic compound) paints were a standard option.

## Choose Appropriate Systems and Equipment

Whether you design a central system or several dispersed ones, seek to select the most efficient equipment. For health concerns, choose “sealed-combustion” fuel-burning boilers or furnaces. This keeps combustion gases out of the building. Electric heat is generally considered a poor ecological choice because of very poor overall efficiency, and in many areas, its energy source is nuclear fuel. But there is one electrically-based system that is so efficient that some people argue it is ecologically advantageous. This is the ground-source heat pump, which uses electricity to draw heat from the earth for heating (and cooling) buildings. As to whether these are better than an efficient gas system, I think the jury is still out and it probably depends on your particular location and fuel costs.

*At Pioneer Valley, we balanced concerns for sustainable materials with the need to meet our affordability goals.*

The choice of ventilation systems will also be important for health and energy-efficiency. You can include a simple system that uses bathroom fans or range hoods to exhaust air from your home, or you can use a “heat recovery ventilator,” which brings in clean air while recovering some of the heat (or “coolth”) from the dirty air being exhausted.

## Use Efficient Appliances and Fixtures

When it comes to lighting, consider efficient lights such as compact fluorescents, and choose controls that reduce electricity consumption, such as occupancy sensors to turn off lights in some common house areas. Controls can be useful for site lighting as well; for instance, you may want to light your parking areas only when a car pulls in or a person enters the lot.

Appliances are another area to explore for energy savings. Residential refrigerators account for a large chunk of a household's energy use. The U.S. government's Energy Star ([www.energystar.gov](http://www.energystar.gov)) program provides a rating for most major home appliances, indicating efficient products. “Energy Star” appliances use at least 30% less energy than unrated products. You can also find appliances that exceed these standards.



Pathways Cohousing  
Photo: Mary Kraus



## Conserve Water

To live sustainably, you will do well to limit your community's water usage, especially if you're in an arid climate. Low-flow plumbing fixtures include toilets, dishwashers, clothes washers, faucet aerators that reduce flow, and water-efficient shower heads. As you conserve hot water, you are saving on the fuel required to heat it.

Of course, if you really want to save on water, composting toilets can help dramatically. They will also recover some valuable fertilizer (not for direct application to your garden), although in many states you may not be allowed to use it.



Photo: courtesy Island Cohousing

Then there is the issue of "gray water"—the soapy stuff that goes down the drain. In theory, you can use it to flush toilets or water some plants. While it may not be permitted yet in your locale, you might build your plumbing to allow easy separation later on—if and when it becomes legal.

## Optimize the Construction Process

It's one thing to look at the product you're building. But how about the process of getting it built? There are a number of issues to consider during construction. For one, you want to protect trees and sensitive areas, because the compaction caused by vehicles and machinery can damage root systems and eventually kill trees. The management of construction waste is another important concern. You can set up waste separation on-site for ease of recycling. When we built Pioneer Valley, we collected wood scraps in one place and accumulated a ready source of fuel for our common house masonry heater. Collection points for various reusable or recyclable materials, including cardboard packaging, can also help. A way to reduce wood waste in the first place is to have your contractors do all their cutting in one centralized location. This way, they are likely to find that three-foot piece they need, rather than cutting down a new full-length two-by-four.

## BEING CLEVER ABOUT GREEN DESIGN

Green design isn't just a collection of strategies to be randomly applied. You'll be most likely to succeed when you apply your environmental knowledge and strategies in a way that responds both practically and imaginatively to the unique qualities of your project.

## Choose Opportunities Appropriate to Your Community

*Island Cohousing realized that one of the most profound issues they could address was protection of the sole-source aquifer.*

Recently, my design partner Laura and I were working simultaneously with a group in rural Vermont and an urban group in Boston. Both wanted to be environmentally sustainable. It's interesting to note how each elected to do this. Champlain

Valley Cohousing, the rural group, has dedicated part of its site to organic community supported agriculture (CSA). Jamaica Plain Cohousing, the urban group, selected a site on the subway line to minimize their need for cars. Champlain Valley's vast site allowed the placement of buildings to take full advantage of solar gain, for heat in the buildings as well as for solar collectors on the roofs. While Jamaica Plain's site does not offer that kind of flexibility, the group opted to cluster their homes in a three-story apartment building, saving on heating requirements by sharing walls, floors and ceilings.

Island Cohousing in Martha's Vineyard, MA, offers another interesting example. The group realized that one of the most profound issues they could address was protection of the Island's sole-source aquifer. They chose to dramatically reduce their household water usage by incorporating composting toilets in all of the project's buildings. They also installed water-saving fixtures throughout, and of course, planned their landscaping to minimize watering requirements.

## Don't Overlook the Mundane

In working with cohousers over the years, I've found that group members are often excited about some ecological "bells and whistles"—photovoltaic cells, living roofs, gray water systems. These are great ideas to consider. But sometimes, the group's ecological budget is best spent on more "mundane" innovations. Tighter construction, a well-insulated building envelope and efficient appliances don't make a green building look any different, but they can be very effective strategies for making your project more ecologically sound.



## Get Good Bang for Your Buck

Believe it or not, some ecological choices don't cost you anything, and may even save you money. The smaller your buildings are, the less ecological impact you'll have—and the lower your costs will be.

Small is green, and small is cheap. Similarly, attaching units in townhouses or apartments will generally save you money, in both building-construction and site-infrastructure costs.

It generally doesn't cost anything to orient buildings to take advantage of solar heating, shading, and cooling breezes. It just takes good planning. (Well, okay, I guess you have to pay your architects, but we're pretty cheap compared to bricks and mortar.) Given a set number of windows, there's no added cost to placing more of them on the south and fewer on the north, but it will help the energy performance of your building. Energy-efficient appliances and lighting don't necessarily cost more, and many utilities give rebates for installing these items.

Incorporate all the no-cost strategies available to you in the context of your overall project goals. It only makes sense.

## Be Realistic

Yes, I know, that did sound too good to be true, didn't it? The truth is, not all ecological choices are free. It costs more to insulate well, to build tightly and detail carefully, and to use high-performance windows. Many alternative materials cost more; wood flooring costs more than carpet, natural linoleum costs more than vinyl, alternative foundation materials can be costly, as can recycled-content roofing shingles. Solar hot water and photovoltaic panels will add thousands to your bill. Composting toilets will generally do the same. To offset these higher costs, some cohousing communities have opted to simplify other aspects of their project—building a bit smaller, keeping the building shapes simpler, and reducing the sizes of their kitchens, for example.



**Pioneer Valley Cohousing**  
Photo: Pioneer Valley Cohousing

*Some ecological choices don't cost you anything, and may even save you money.*

## Do Now What You Can't Do Later

Most groups cannot afford to build-in all of the green features they ideally want, and will choose to defer some opportunities "for later." But some environmental opportunities are really hard to come back to. For example, detailing your foundation for radon mitigation involves placing a layer of stone under the floor slab—not something you can easily change. Similarly, highly insulated exterior walls should be done at the outset, because adding insulation later will mean removing and re-installing siding. Although windows can be changed after the fact, that's a mighty expensive proposition. If you can afford the better windows early on, do it. Composting toilets, if they are allowed in your locale, are a good candidate for the "do it now" list. Island Cohousing recognized that it made sense to integrate this technology up front. Designing a septic system to accommodate flush toilets, and then installing composting ones later would have been expensive and wasteful.

## Prepare for the Future

While you build now what is impractical to change later, you can leave the door open for other green features in the future if you plan ahead. For example, generous expanses of south-facing roof can accommodate future photovoltaics or solar hot water. We did this at Pioneer Valley, and my husband and I now have a solar hot water system on the south roof of our duplex.

## Save the Bells & Whistles for the Common House

It certainly is fun to demonstrate a cool new technology. It's a great conversation-opener and may get people asking about some of your more invisible strategies. Why not try it on your common house? This is the perfect place to "show" your commitment to environmental living, and you can enjoy it at a fraction of the cost. ■

This is a part one of a two-part article by Mary Kraus. In the Fall 2002 issue of CoHousing, she will explore environmental lifestyle choices.

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