

Energy-Efficient Homes—An Environmental Quick Fix

A great number of today's citizens are aware of ecological and environmental problems caused by pollution, such as smog and global warming. However, though we know about the effects of pollution and have taken steps to minimize this hazard, there is one important area often overlooked when trying to find cheap, simple pollution solutions. This area is the American home. While what we put into our homes and what we do in them contribute greatly to the annual U.S. household energy usage, the design of our homes plays a very important factor, since a poorly-constructed home will use more energy for maintenance, heating, and cooling than a home with an energy-efficient design. If we could reduce the amount of energy used by our homes, we can make a significant contribution to reducing pollution generated from excess energy use. This, as will be shown later, is not a difficult thing to do; there are many ways that we can make our homes more energy-efficient, and most of us naturally like to make improvements to our homes. One of these improvements could be on the design of our homes, since much of our country's energy and funds go toward supplying heat and electricity to homes that could be made more energy-efficient. From this, we see that the design and energy-efficiency of a home are two things that need a second look if we wish to improve environmental health and lead more comfortable, happier lives.

To get a better sense of how we should begin solving our pollution problems, we must first understand the reasons why we tend to produce them in the first place. There appears to be an

underlying reason for why humans are naturally energy-inefficient, according to Allaby and Bunyard--perhaps we just happened to evolve that way. The two both claim that we have an innate sense to exploit and consume environmental resources. In prehistoric times, early humans abandoned tree life in search of less competition and more resources on the ground, and we have been doing the same thing ever since, moving into ecosystems and “making the best of whatever [we] found in them” (11). Allaby and Bunyard define this action as opportunism. There is nothing wrong with being opportunistic, as long as this behavior does not harm our well-being. Opportunism has proven to be beneficial to survival; organisms with the most successful adaptations and population numbers such as weeds, bacteria, insects, and many small mammals are opportunistic. As opportunists, humans have been successful in conquering every landmass on earth except for Antarctica, have been able to survive in inhospitable frigid and arid regions, and have even spent months in the lethal conditions of space. However, this same kind of behavior, when unchecked, can prove detrimental to both the social/economic and physical/environmental elements of human well-being (Cloke and Park 35).

For the purpose of improving the quality of our lives, we have relied on using increasingly larger amounts of energy, often without much thought to the amount of pollution produced to generate the energy. The fact that “more electricity is consumed in the United States through the use of air conditioners than more than 800 million Chinese use for everything” demonstrates vividly the scale of energy use in America (Allaby and Bunyard 170). This agrees well with Allaby and Bunyard’s opportunism theory; we often tend to use something if it will benefit us now, without much regard for long-term effects of its use. However, doing so is as hazardous to personal well-being as is “happily writ[ing] ever larger checks without considering what’s happening to the balance of the account” (Ehrlich and Ehrlich 68). Whenever any energy source

is used, there are always waste products associated with the liberation of the energy; burning wood creates ash and noxious smoke, and burning oil to produce electricity produces a variety of air pollutants. Many of the gases released through the combustion of fuel materials play a large part in one of this century's most publicized environmental problems, global warming.

Global warming is a gradual process of climate change, caused when certain gases rise into the atmosphere and prevent the escape of solar heat back into space. This action is called the "greenhouse effect," and the primary "greenhouse gases" involved are water vapor and carbon dioxide. Because of the greenhouse effect, the earth begins to warm over time, eventually leading to changes in climate over all portions of the world. The recent surge of hurricanes, floods, and other El-Nino-related weather problems within and outside our country are all manifestations of global warming. There are many people who might argue that global warming does not exist, or might even try to disprove its validity. They might recall that three decades ago, scientists believed that rising pollution levels would cause "global cooling" and launch the earth into an ice age (Rasool and Schneider qtd. in McCarthy 138). However, almost 30 years later, scientific technology has advanced to a level adequate enough to measure and depict a tiny but gradual rise in annual world temperatures. Thus, we know that global warming due to pollution is a real-time phenomenon that will not go away and cannot be ignored.

Although harnessing increasingly larger amounts of energy has led not only to many improvements in lifestyle, such as electric lighting and heating/air-conditioning systems, the pollution produced from energy production has had negative consequences for both people and the environment. Whenever converting a fuel material into useful energy, waste products are inevitably emitted. Therefore, no matter what source of energy we choose to use, there will always be some form of waste produced. More than often, this waste pollutes the environment.

However, society would be drastically different if we were to stop producing energy using our current methods. We cannot completely eliminate pollution from organic fuels; it is a natural by-product of combustion. Even with nuclear fission, dangerous radioactive waste is produced. Nuclear fusion, which is still in its experimental stage, promises to be a clean source of energy; its only waste products are water and a few neutrons easily absorbed by water. However, because researching and developing a new energy source often takes a while, we should try to focus more on things we can do to limit our energy use *now*. After all, pollution problems such as global warming will only continue to mount unless a solution can be found. One such solution comes almost readily to mind: if we use less energy, less energy will have to be produced by power plants, which in turn will reduce the amount of pollution produced. This is the basic idea behind energy-efficiency.

For energy-efficiency to be a good pollution solution, it must be simple, economically feasible, and accessible to everybody. It should be more of a hobby than a chore, or else, people will not feel enthusiastic in participating. Also, energy-efficiency should be practiced in the most comfortable environment possible, so that those of us being newly introduced to the ideas behind energy-efficiency will gain a better impression and appreciation of it. Since most Americans live enjoyably in their homes where more than half of the nation's energy is being used, the home is the best starting point for us to put energy-efficiency to practice.

The home is a safe, open environment where we can make necessary decisions about becoming more energy-efficient. There is no pressure to do so, as there might be in the workplace. Also, the home is a better place to practice energy-efficiency because one can relax and think more openly and freely about new ideas there than elsewhere. A reason for this is the greater sense of security and comfort felt when at home, which helps us to think more clearly and

rationally. Some people might argue that such a lax environment compared to the workplace might be a reason most homeowners aren't practicing energy-efficiency, since they are not pressured or required to do so at home. However, the home does offer the freedom to make the choice of being more energy-efficient, and this freedom of choice is something most of this nation's citizens will likely respect having. Making a transition toward energy-efficient living is something most of us may not have thought much about before, and the home provides a safe, non-demanding environment for us to make the necessary decisions and lifestyle changes.

Practicing energy-efficiency at home is a simple, economical, and practical solution to the problem because anyone can do it—from kids to adults, individuals and extended families, practically anyone who lives in a home. Simple forms of energy-efficient lifestyle changes, such as remembering to turn off lights when not in use or taking shorter showers, do not require much monetary investment. Instead, these changes will help family members save money in both the short and long run. Kids can hang clothes out to dry instead of using a dryer just as well as adults can, demonstrating that family members of all ages can participate in making a home more energy-efficient. Therefore, the project of making energy-efficient lifestyle changes becomes more family-oriented at home, a unique feature not found elsewhere, such as at school or in the workplace.

Middle-class families are not the only group who can benefit from energy-efficient home living. Single homeowners can practice energy-efficiency with no more difficulty than a large family can, and will enjoy the same energy savings that come from making energy-efficient lifestyle changes. Also, a person's level of education and socioeconomic background also do not limit his or her decision to be more energy-efficient. This is because identifying sources of energy usage in the home is very simple to do. Wherever electricity, heat, or air-conditioning are

used, energy is being used, and if the home is not well-insulated, most of that energy is wasted. About “50 to 70% of the energy used in the average American home” is used for heating and cooling alone, according to the US Department of Energy, so it would be beneficial to homeowners to minimize the amount of energy lost by their homes. Fortunately, all that is really required to do this is an energy-efficient home design, coupled with eco-conscious individuals or families. Following this lead, even a very poor person can decide not to own a relatively expensive, traditional home and instead, opt to build his or her own earth-sheltered home for half a traditional home’s cost. These homes are not only more cost-effective and energy-efficient than traditional homes; they are also often stylishly built, so that neighbors may never notice the person is poor¹. Finally, a wealthy person living alone can choose to buy a smaller home, so that heating, cooling, and electricity costs for the home will not be the same as those for a home large enough for a middle-class. These are but a few examples of simple, money-saving lifestyle changes that will not only benefit individuals and families, but also the health of our environment.

Practicing energy-efficiency at home is certainly an economic solution to our environmental problems, contrary to popular belief that it will cost more to implement. Opponents of the transition to an energy-efficient lifestyle claim that it will cost more and will stifle business. However, energy-efficiency will create new jobs in technology research and development. When developing energy-efficient electric motors to be used at home, for example, simply improving the motor’s efficiency by only 2 percent, coupled with an average electric cost of 6 cents/kwh, an average electric cost of 6 cents per kwh, is enough to produce annual savings of more than \$1 billion (Qayoumi 1). Energy-efficiency will also create new jobs in the

¹ See Appendix 1 for the various stylish designs of today’s earth-sheltered homes. Note the striking modern architecture of these homes. They can be custom-built to almost any specification.

manufacturing of energy-efficient products, and remodeling and constructing more energy-efficient homes. This includes items like passive solar heating, by which a home's heat comes from the sun, and thick insulation, as exemplified by earth-sheltered homes, to reduce or virtually eliminate energy wastage due to heat or cooling loss. When working to design energy-efficient electric motors, if "the efficiency of every [electric] motor were improved by only 2 percent, and with an average electric cost of 6 cents per kwh, it would translate into annual savings of more than \$1 billion" (Qayoumi 1). It is true that sometimes, being more energy-efficient might cost more initially, but the cost is very little in comparison to the benefits and energy savings people will receive in the long run.

Earth-sheltered homes are very energy-efficient houses partially or completely recessed in the ground, but not completely covered by earth. It has windows, doors, and all the standard utilities found in other homes. Earth-sheltered homes may cost a little more than a traditional home to build. However, such a home can easily pay back its construction cost within a decade in terms of energy savings. Also, because of their passive solar design, earth-sheltered homes eliminate heating/cooling costs and energy use devoted to these ends. The earth-sheltered homeowner thereby helps to conserve resources such as firewood, natural gas, and fossil fuels used to make electricity for heaters and air-conditioners, while also helping to reduce pollution emissions produced from the use of these energy sources.

An architect of earth-sheltered homes tells us, "A properly built underground house...would probably cost 10 percent more. But the energy savings should be more than 50 percent--possibly 75 percent. The extra construction costs would be paid back very quickly" (Campbell 7). Earth-sheltered homes are great ways for individuals to live a more energy-efficient lifestyle. An owner of one writes, "I think all the world's people and critters should attempt to live together in a synergistic partnership in which everyone and everything co-exists in harmony with nature and

the environment. I think earth sheltered houses and their lack of heating and cooling costs, both monetary and environmental, are one, very important way to accommodate this process" (Clair qtd. in Eco-Home Network 7).

Because an earth-sheltered home's physical design allows it to use energy more efficiently throughout its lifetime than any other residential structure, its owners save substantially on maintenance and utility costs. This home is an ideal, economical way for new homeowners to adopt a cleaner, more energy efficient lifestyle. However, earth-sheltered homes also have an advantage over traditional homes in the area of aesthetic design. Looking at the color photographs of various earth-sheltered home designs in Appendix 1,² the reader might notice that most of these homes are made with concrete exterior walls. There are good reasons for why this building material outperforms wood, besides the fact that it is environmentally better since it eliminates our need to cut trees.

1. Untreated lumber will last less than 5 years.
 2. Treated lumber has not been used long enough to actually tell how long it lasts.
 3. Treated wood is treated with arsenic. In case of a fire one would die from the fumes rather than smoke inhalation or fire.
 4. So many companies are starting to treat lumber that the quality is suffering.
 5. Concrete does not reach its optimum strength until it ages for about 100 years.
 6. There are many claims about treated lumber that are unfounded. Only time will tell.
- (Earth Sheltered Technology FAQ 1)

The concrete exterior can then be overlaid by either stucco, brick, stone, cedar, split logs, or any other type of wood or material, even vinyl siding if one wishes. The design flexibility, along with a superior level of energy-efficiency, gives earth-sheltered homes both an environmental and aesthetic advantage over traditional homes. There is also another incentive to own an earth-sheltered home.

² See the Appendices at the very end of this paper.

Perhaps you read just recently that fuel prices took an enormous jump over last year's prices. Natural gas went up 23%, propane (LP) 67% and fuel oil 34%. With energy costs going up at that rate, it will not be long until earth sheltered will be the only type of home that people will build. (Earth Sheltered Technology 1)

With energy costs increasing steadily each year, "it will someday be impossible to sell a conventional home because of the energy and maintenance costs" (Earth Sheltered Technology 3).

There are those who may argue that "Project financing involves many risks—commercial risks, market risks and governance risks. Responsibility for each must be assigned to the party best able to control and manage them—developers, lenders and/or the government" (Chaturvedi 15). This is not the viewpoint toward energy-efficiency projects that we should maintain. Any individual can choose to become more energy-efficient. There is no party better able to "control and manage" an energy-efficient lifestyle than the individual. Just as it is more efficient for homeowners to sort their recyclables before recycling than to have a group of people sort everyone's recyclables, "self-sufficiency in energy is more likely to be possible if it is attempted at the individual and community level" (Allaby and Bunyard 169). It is definitely more efficient for each household to conserve energy than for large, expensive programs funded by city, state, or federal governments to have to regulate energy use for the population.

While it may be true that many risks are associated with embarking on a new project, these risks are minimized when a large body of individuals shares them instead of having all the risks fall on a single controlling body, such as a development agency or the government. Sharing the risks of making energy-efficient lifestyle changes means that less monetary and personal risk will be taken per person. When a person feels that he or she is not under heavy risks, that person feels more security and confidence in completing the project. This sense of security is something most people would like to feel when confronted with the need to make energy-efficient lifestyle

changes; since there is little risk per individual, people feel that energy-efficient changes in personal living are easier to make. ‘Easier to make’ translates into “more likely to succeed,” and this is the primary goal when trying to achieve energy-efficiency in the home.

Two more energy-saving features that will help a home to be more energy-efficient are passive and active solar heating systems. Passive solar heating and active solar heating are the two most widely-used features to ensure substantial reduction or elimination of heating/cooling costs. Yes, it is true that these energy-efficient homes incorporating passive or active solar heating might have a greater initial cost. However, the cost is very little in comparison to the heating and cooling expense savings that homeowners will receive in the long run.

In passive solar heating, sunlight is absorbed by a home to raise its temperature. When the sun shines from the sky onto the skin, warmth can be felt. Passive solar heating can best be described in two main parts. First, windows let the sunlight shine through, and second, “thermal mass” in the form of concrete or some other heat-absorptive material absorbs the sun’s heat. In the daytime heat is absorbed; at night, concrete walls re-radiate heat back into the house. This keeps the interior of a house at a nearly constant temperature, and for heavily-insulated homes, alleviates the need to use heaters and air-conditioners. A passive solar heating system installed in a house will either drastically reduce or potentially eliminate heating and cooling bills.

Active solar energy is harvested wherever solar cells are seen. An active solar heating system uses electricity generated by solar cells to heat water, which correspondingly heats a home like a radiator or helps to heat hot water. It is much more expensive than a passive solar heating system, but active solar energy has many other uses. Since it involves the conversion of sunlight

into electricity, solar cells arranged in sheets or panels can serve as power sources for small equipment, thereby greatly reducing one's electric bill.

Both passive and active solar heating systems can be added onto a home to improve its energy-efficiency, but the greatest amount of improvement can be made when buying a new home, especially when buying a well-insulated earth-sheltered home or an above-ground rammed-earth tire home. Though both types of homes emphasize a heavily insulated design, rammed-earth tire homes are a bit different. While an earth-sheltered home is built mostly from newly harvested or mined materials such as concrete, steel, and wood, a rammed-earth tire home is made from used materials. Used tires stuffed with earth, combined with aluminum cans, form the backbone of this above-ground home. The insulative properties of these materials rival those of the concrete and earth used in earth-sheltered homes, but unlike earth-sheltered homes, with construction costs hovering around 10% higher than traditional homes, rammed-earth tire homes generally cost up to 50% less than an equally-sized traditional home (Yellow Mountain Institute 1). The basic building materials are easy to come by and transport, and the home's design is simple enough that a single person alone could build it. This kind of home, unlike most others, gives individuals the same amount of freedom that large families often enjoy when making energy-efficient living choices.

We need to make the move toward energy-efficient living now, and the good news is that it will not be a difficult process to start. *Anyone* can do it. There are many ways to make our homes more energy-efficient, such as using energy-efficient products like fluorescent light bulbs, buying earth-sheltered homes instead of traditional, non-insulated above-ground homes, and using forms of energy alternative to coal, oil, and nuclear power, such as passive and active solar energy for heating, and geothermal, hydropower, and wind energy to supply electricity for other

household functions. There is little need to wait before deciding to adopt an energy-efficient lifestyle at home, especially in light of its benefits to society and the environment. In this startling example of lifestyle changes made by the British in response to a threatening situation, Allaby and Bunyard provide us with the notion that rapid change can occur, “provided the incentive to make them is large enough” (192).

In 1939, for example, every building in Britain was equipped with efficient black-out materials, every person was issued with a gas mask, identity card, and ration book, thousands of children were evacuated from cities into rural areas, and air-raid shelters were built or improvised to accommodate urban populations, all in a matter of weeks. (Allaby and Bunyard 192).

All of this was done in preparation of an anticipated attack during World War II, and demonstrates exactly how much one country can do on *very* short notice when the welfare of its inhabitants was threatened. Because of the pollution and damage that energy wastage has inflicted on the environment, the welfare of all humankind is at stake. Energy-efficiency is our best defense against our environmental problems. We know what to do; now, let us just do it.

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