

The Seven Deadly Sins of Building Design and Construction

By David A. Bainbridge and Robert W. Bainbridge

A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it does otherwise. Aldo Leopold

Wasteful patterns are deeply entrenched in the design professions; the corporations, developers and builders who hire them; and the banks and capital sources that fund them. Architects are often blamed, but Wal-Mart, McDonalds, the Bank of America, the World Bank, and even local planning ordinances and building codes are equally culpable.

The term sin is normally applied to relationships between people, not to transactions between people and the land. One definition of a sin is to offend against a standard or principle. Most religions focus on principles that govern relationships between people. With emerging awareness of ecological principles, the concept of sin can now be extended to the land and Nature's Services that support us.

For millennia, the peoples of the world, especially cities, exploited their environment. In some cases, as in the hills above the Tigris and Euphrates River and the Sahara, they destroyed the productivity of the land. But much of the world remained unharmed, and the ability of natural systems to restore themselves endured.

In the 19th and 20th centuries, cities expanded and were linked together around the world. By 2000, over half the world's population was urban, and virtually no unexploited frontiers remained. Polluted air circled the globe, a trend visually obvious to the astronauts. People consumed resources such as oil and water that could not be restored. They shipped dangerous or awkward solid and hazardous wastes in large quantities to more and more remote sites.

Construction contributes up to 30% of the solid waste stream. Buildings consume almost a third of all energy used. Productive natural systems around the world can no longer handle the abuse.

More sustainable building patterns are well known. Excellent examples are available from historic vernacular traditions and from contemporary research. They can provide environments that are better in the present and at the same time protect the resources needed to support future generations.

Sustainable building technologies can and should be bio-diverse, resilient, locally controlled and managed. They should be based on local materials. They can be community-building, energy and material efficient, reusable or recyclable, soft, safe, pleasurable, healthful, asset building, equitable, pleasing, and empowering. Used consistently, they could improve quality of life, entail minimal negative impacts on the environment, and even help to heal damage already been done.

If better ways of building are widely known, why are they so rarely used? Three fundamental problems account for the slow adoption of sustainable approaches: the head-in-the-sand reaction, the insatiable quest for now, and simple inertia.

Despite widespread publicity about world problems, most people simply do not take the threats to the modern world seriously. Environmental damage, resource depletion, and waste usually do not directly affect them or their daily life. They feel no urgency to do things better.

The linear economy of the industrial and post-industrial eras has indirectly led to the cult of the present and the desire to maximize immediate wealth and well being, even at the expense of the future. Many traditional cultures thought long-term – “unto the seventh generation.” For most of the world’s peoples at the beginning of the twentieth century, the horizon is the next payday, the next election, or at best, the time of their own retirement. They are more like grasshoppers than ants.

Inertia always hinders new ideas. Much of what people do becomes habit, and a habit of wanton wastefulness is hard to break. It is even harder when damaging ideas such as channelizing streams and hard piping of run-off are adopted into ordinances and regulations. One of the most common answers to the question of why people do something is that “that’s the way we’ve always done it.”

And finally, the account keeping is incomplete. We balance the books with a narrow subset of costs related to construction. We neglect the true costs of environmental damage to collect and process materials, maintain them, and dispose of them. And we neglect the enormous cost of bad buildings (poor air quality, inadequate light, discomfort) at our peril. Poor account keeping is compounded by perverse incentives that encourage bad behavior. Subsidies, tax incentives, and leasing provisions discourage the use of sustainable energy sources and displace better design and construction.

These are compounded by the following list of deadly sins of building design and construction. We present it in the hopes it will help break down the barriers to a more sustainable world. These are issues we can tackle, and solve, immediately.

1. Brutal treatment of the land

Construction begins with clearing and grading land. Current practices brutally re-shape the landscape, leveling hills and filling valleys. The exposed ground is subject to erosion, contributing to the siltation of streams and severe harm to water quality. The desire to maximize profits leads to covering a high percentage of the land in impervious surfaces, including buildings, roads, and parking lots. Impervious surfaces drastically increase storm water run-off and leave little water to recharge underground aquifers. Detention ponds and silt-fences are inadequate stopgap measures. Many of the solutions, including vegetative buffers, bio-retention basins, and infiltration trenches are low cost and effective. But the fundamental solution is to treat the underlying landforms with greater respect.

2. Wasteful Heating and Cooling Systems

Before the development of energy-gobbling mechanical heating and air -conditioning systems, builders had to make use of solar heating, cooling breezes, and proper orientation of buildings. Most architects know the principles, but it is often easier to ignore them in absolute confidence that all they need to do is put in a larger system. Clients, including homebuyers, often ignore the higher costs they will face throughout the life of the building. Proper orientation of buildings costs virtually nothing, and can save on short-term and long-term costs. Subdivisions can easily be laid out for best solar orientation. Many passive solar systems also bring daylight into buildings, improving the well-being and productivity of building occupants. Since 90% of the cost of a commercial building is typically the people's labor -- a minor improvement in productivity offsets added design and building improvement costs almost immediately. In a factory like "the greenhouse," built by Herman Miller, productivity doubled, and the building pays for its improvements every few months.

3. Mishandling water

Water is a powerful force of nature and our most precious resource. From building roofs to gutters, curbs, storm drains, culverts and ditches, builders and developers habitually try to get water out of their way as fast as possible. They evidence little concern for people downstream, and less about the depletion of underground aquifers unless their own well runs dry. In city after city, sprawling development consistently aggravates downstream flooding. Over-pumping of water from the Oglalla aquifer in the upper plains causes desperate water shortages in Texas. Multi-billion dollar dam and levee projects on the Mississippi River made problems worse rather

than better. Every project can be improved by respecting natural watercourses, using grassed swales and other non-piped systems, and increasing pervious surfaces.

4. Slipshod construction and penny pinching design

In the race to build as quickly as possible, the first victim is quality. Inadequately trained and under-supervised workers make easily avoided mistakes and take unjustifiable shortcuts. Even when trees are clearly marked for preservation, grading contractors often cut them down to make work go faster. Shoddy materials may save a few dollars in the short run, but cost dearly over a building lifetime. Codes and ordinances set minimum standards, yet even these minor safeguards are often ignored. One of the few groups that benefit is lawyers. They make millions from litigation over construction defects.

Eaves are minimized or eliminated to save a few dollars. But the increased weathering, leakage and damage to wall systems and buildings costs the country millions of dollars a year. Lower cost roofing saves money up-front, but costs several times as much over a building lifetime.

5. Wasteful use of materials

Construction sites often resemble junk piles. They are littered with unsalvageable scrap lumber, masonry, packaging materials, and puddles of congealed concrete, all destined for landfills. Building demolition is even worse; often not a single item is re-used or recycled. Design and construction must adapt a cradle-to-grave philosophy. Some automobile manufacturers like BMW are showing how it can be done; their cars are designed so that up to 90% of the car can be recycled. Carpet leasing provides another interesting model. Companies now regularly install flooring for the life of the building, replacing and recycling carpet at regular intervals.

6. Using unhealthy or dangerous materials

When asbestos was first introduced, it was rightly hailed as a boon to builders and customers because of its ability to control and prevent fires. Thousands of lives were saved. Unfortunately, it was used long after the true dangers of the material were known. Creosote and other treatments for lumber lengthened the useful life of the wood, but created lingering environmental damage. Some widely used glues and bonding agents create indoor pollution. Manufacturers need to be held accountable for the safety of their products, but design professionals can help by exercising care in their own selection of materials.

7. Taking shortcuts

Developers often install inefficient heating and cooling systems to reduce project costs; higher operating costs will be someone else's problem. Many designers use "tried and true" methods even when they know better solutions, simply because they know that their engineers and contractors will know how to build it. Developers avoid innovative approaches for fear that local officials or loan officers may not approve the projects. Pioneers do make a difference, and are slowly bringing responsible change. In historic preservation, for example, in a decade or two designers, engineers, bankers, contractors, and developers all learned how to deal respectfully with historic structures. The federal tax credit program played a tremendous role in encouraging them to learn.

Overcoming the barriers to sustainable building design and construction will not be easy. Working professionals and educators can make a difference in creating a new ethos, and in developing and spreading the practical methods required to make the process work better. Programs like L.E.E.D. have raised the bar for some, but even L.E.E.D. falls well short of what is possible, and still affects only a small percentage of buildings.

Manufacturers of materials must also be more concerned about the quality, healthfulness, durability, and the ability to recycle their products. Labeling of woods from renewable forests using sustainable silviculture at least lets people know, though customers often ignore the advice.

In the short run, conscious effort must be expended to achieve more sustainable projects. With persistence and some luck, good practices can become the habits of the future and replace the sins of the present.

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