

## A Regeneration-Based Checklist for Design and Construction

There are many specific situations in which our synthetic environments are superior to nature's. But this is no adequate basis for the mechanistic conclusion that we "don't need nature anymore." On the contrary, with the complexity of modern building we need nature more than ever before. It is not a question of air-conditioning versus sea breezes, of fluorescent tube versus the sun. It is rather the necessity for integrating the two at the highest possible level. ... To intervene effectively in the situation in which we find ourselves—that is to construct a truly effective 'third environment' for individual and social life—both architect and urban designer require a much deeper understanding of the terrestrial environment than they commonly display. For the quality which most characterizes all contemporary architectural and urbanistic activity everywhere in the world today is a profound misunderstanding of ecological realities. This misunderstanding is, in turn, characterized by two sorts of errors. One is a lack of comprehension of the absolute inter-relatedness of all the component elements of the natural environment—an interdependence which makes it impossible to manipulate one factor without setting in motion a complex chain reaction that usually extends far beyond the individual designer's sphere of action. The other error is the consistent tendency of modern architects and engineers grossly to underestimate the magnitude of the natural forces of the environment; or contrariwise, grossly to overestimate the magnitude of man-made capacities at their disposal.

While we cannot expect architects and urban designers to be also meteorologists and climatologists, we might at least demand that they have a general understanding of the ecological systems which they are constantly called up to manipulate in one way or another.

—James Marston Fitch, 1975

Malcolm Wells' original *Wilderness-Based Checklist for Design and Construction* set the wilderness as the model for design. His ratings from 1969 show a wilderness to score a perfect 1500 while a suburban research lab would attain a negative score. During the summer of 1999 the Society of Building Science Educators (SBSE) studied Wells' checklist and revised it to reflect the changes in thinking that have affected sustainable design in the past thirty years. The most notable changes were to organize the checklist into site and building issues and to acknowledge John Tillman Lyle's idea that sustainable design is merely breaking even, while regenerative design renews earth resources.

Each of the following issues should be regarded as a continuum from the worst negative impact (on the left) to the best positive impact (on the right).

### THE SITE.

1. **Pollutes Air—Cleans Air.** Consider exterior air pollution via combustion (furnace, automobile, lawn mower), ventillation, and off-gassing. Consider air cleaning by native vegetation to create oxygen, absorb CO<sub>2</sub>, and remove pollutants. Exotic plants which require constant watering and fertilizing are wasteful, expensive, and inappropriate.
2. **Pollutes Water—Cleans Water.** Consider water pollution by on-site toxic wastes, pesticides, insecticides, fertilizers, and petroleum products. Consider cleaning of water that falls on or flows through the site by retention and percolation to the water table. Avoid impervious surfaces such as roofs and pavement—green roofs, earth sheltering,

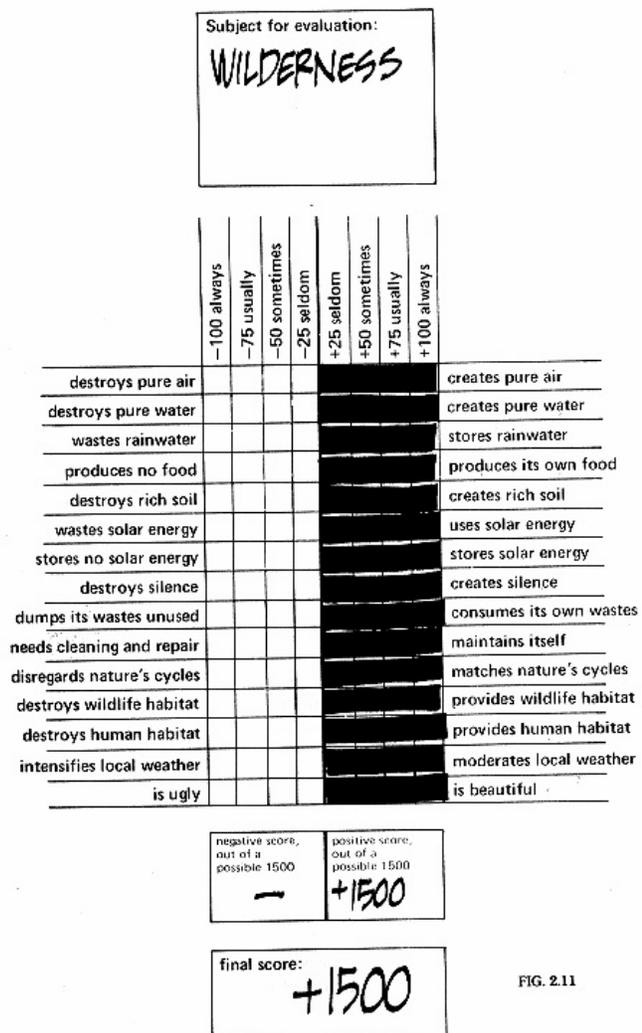


FIG. 2.11

and porous pavement are alternatives. Use retention ponds and percolation basins to control and purify run-off. Also, consider treatment of gray and black water created in the building.

3. **Wastes Rainwater—Stores Rainwater.** Consider rainwater harvesting, water recycling, and water conservation. The best place to store rainwater is in the earth, in the water table. It can also be stored in cisterns for domestic use. Gray and black water treated on-site can be reused. Conserving water used for irrigation and domestic use reduces the amount removed from ground water reserves.
4. **Consumes Food—Produces Food.** Consider food produced for humans and other species. You may not be able to feed a whole family with the food grown on a small site, but the homegrown food can't be beat—a peach plucked from a fourth-level orchard is bound to be better than one that was trucked a thousand miles.
5. **Destroys Rich Soil—Creates Rich Soil.** Consider soil destruction through hardscape creation (the roof and pavement) and pollution. Topsoil is alive; don't destroy it! Pesticides and herbicides are death to soil. Erosion strips it away. Soil-building ground covers, earthworms, composted organic wastes, and mulch will restore ailing land to healthful life.
6. **Dumps Wastes Unused—Consumes Wastes.** Consider the fate of all wastes created on-site (waste water, trash, pollutants) while the building was being constructed and during its lifetime. Organic wastes can be composted; waste water can be a nutrient for other lifeforms; construction wastes, consumer goods, and packaging can be recycled. In nature all things die and return their wastes as nutrients in compost. Our shame is ocean dumping, sanitary landfills, and sewage. Recycling, reuse, greywater systems, and constructed wetlands allow us to avoid these embarrassments.
7. **Destroys Wildlife Habitat—Provides Wildlife Habitat.** Consider the impact of the building, its site development, and its occupants on wildlife habitat. Let old families move back into the neighborhood. Whole communities of wildlife will return and set up housekeeping at our doorsteps once we get the asphalt and manicured lawns out of our blood. Wild creatures don't have to be invited twice—provide the right habitat and they'll appear.
8. **Imports Energy—Exports Energy.** Consider the energy required to heat and cool the building, to maintain the site, and to provide electricity for lights and equipment. Solar energy can be used to heat, cool, and daylight buildings. On-site wind, hydro, and photovoltaic generation of electricity is possible. Using solar energy avoids burning fossil fuels which causes air pollution, generates greenhouse gasses, and adds to the city effect. It also replaces large-scale hydroelectric power which disrupts ecosystems. Large manicured lawns usually require fuel-powered equipment for maintenance.
9. **Requires Fuel-Powered Transportation—Requires Human-Powered Transportation.** Consider the building's accessibility by automobile, transit, bicycle, and foot. Pedestrians and bicycle riders burn no fuels and cause no pollution. Mass transit reduces the per capita reliance on fuel consumption.
10. **Intensifies Local Weather—Moderates Local Weather.** Consider the microclimatic effects caused by the building and site development. Pavement, masonry walls, and waste heat intensify the city effect while green space and water retention moderate the effect.

Subject for evaluation:  
**SUBURBAN  
 RESEARCH  
 LAB**

	-100 always	-75 usually	-50 sometimes	-25 seldom	+25 seldom	+50 sometimes	+75 usually	+100 always	
destroys pure air									creates pure air
destroys pure water									creates pure water
wastes rainwater									stores rainwater
produces no food									produces its own food
destroys rich soil									creates rich soil
wastes solar energy									uses solar energy
stores no solar energy									stores solar energy
destroys silence									creates silence
dumps its wastes unused									consumes its own wastes
needs cleaning and repair									maintains itself
disregards nature's cycles									matches nature's cycles
destroys wildlife habitat									provides wildlife habitat
destroys human habitat									provides human habitat
intensifies local weather									moderates local weather
is ugly									is beautiful

negative score, out of a possible 1500 <b>-850</b>	positive score, out of a possible 1500 <b>+100</b>
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final score:  
**-750**

© Malcolm Wells 1969

FIG. 2.13

## THE BUILDING

11. **Excludes Natural Light—Uses Natural Light.** Consider the use of daylight for ambient and task lighting in the building. Electrical lighting systems can be designed to augment daylighting on an as-needed basis.
12. **Uses Mechanical Heating—Uses Passive Heating.** Consider the systems used to provide heat to the building. Conservation through intelligent building envelope design can greatly reduce or eliminate the need for mechanical heating systems. Active solar heating systems greatly reduce the use for mechanical components when compared to mechanical systems. Passive heating techniques avoid all mechanical systems, but may require mechanical back-ups.
13. **Uses Mechanical Cooling—Uses Passive Cooling.** Consider the systems used to provide shade, ventilation, humidity control, and cooling for the building. Shading can occur through site elements, exterior shading devices, and interior shades. Cooling can be provided by stack and cross ventilation schemes as well as fuel-powered fans. Evaporative cooling systems can be either passive or mechanical. Dessicants as well as air-conditioners can control humidity.
14. **Needs Cleaning and Repair—Maintains Itself.** Consider durability of the materials and systems used in the building. Sunlight, water, ice, and pollution-laden air are rough on building materials. Protect exposed surfaces in every way possible. Building with dead materials as we do, we're forced to compromise, so compromise well. Underground buildings are ideal in this regard, hiding their skins from damaging elements. The more mechanical systems that are installed in a building, the greater is the chance for failure and the requirement for maintenance. Passive systems avoid a plethora of mechanical devices.
15. **Produces Human Discomfort—Provides Human Comfort.** Consider thermal, luminous, and psychological comfort. Thermal comfort is enhanced by diverse and appropriate conditions throughout the year. Constant temperature and humidity is boring. Glare and high contrast cause luminous discomfort. Contact with outdoors conditions can provide psychological comfort.
16. **Uses Fuel-Powered Circulation—Uses Human-Powered Circulation.** Consider both horizontal and vertical circulation schemes. Even when elevators are present, human-powered circulation can be encouraged by visually accessible, prominent, and engaging stairways.
17. **Pollutes Indoor Air—Creates Pure Indoor Air.** Consider the building materials, furnishings, and maintenance requirements as sources of indoor air pollution. Materials and furnishings can off-gas volatile organic compounds (VOCs). Cleaning agents may include toxins such as chlorine. Paints, varnishes, stains, and adhesives may off-gas pollutants. Equipment and occupants can create carbon dioxide and monoxide. Choose non-VOC materials, finishes, and furnishings. Use indoor plantings to absorb CO<sub>2</sub> and create oxygen.
18. **Built of Recycled Materials—Built of Virgin Materials.** Consider materials used for paving, structure, finish, and furnishing. Use of recycled materials conserves the energy embedded and avoids the energy and resources needed for replacement materials.
19. **Cannot Be Recycled—Can Be Recycled.** Consider the materials used and the construction techniques employed as well as the suitability of the structure for new uses in the future. Some building materials are easily recycled (metals) and some have enduring value (large wood members). Some construction systems allow for easy disassembly and feature standardized components that can be reused. Some buildings are flexible in accommodating future uses, e.g. a warehouse can easily be converted into loft housing or office space.
20. **Serves as an Icon for the Apocalypse—Serves as an Icon for Regeneration.** Consider the symbolic nature of the building. A building that blatantly ignores the ecology, environment, and constraints of the earth's resources spells doom to the planet. A building with high visibility and appropriate responses to ecological issues can serve as a role model and inspire regenerative design.

Regenerative-Based Checklist for Design and Construction ©2008 by Suzanne Klee

	Regeneration			Sustainability			Regeneration		
	NO always	YES usually	NO sometimes	NO always	YES usually	NO sometimes	NO always	YES usually	NO sometimes
pollutes air									
pollutes water									
wastes fuel/energy									
consumes fossil									
consumes metal									
consumes wood									
consumes plastic									
consumes concrete									
consumes glass									
consumes steel									
consumes copper									
consumes aluminum									
consumes zinc									
consumes lead									
consumes mercury									
consumes cadmium									
consumes chromium									
consumes nickel									
consumes cobalt									
consumes manganese									
consumes selenium									
consumes tellurium									
consumes bismuth									
consumes molybdenum									
consumes vanadium									
consumes niobium									
consumes antimony									
consumes arsenic									
consumes phosphorus									
consumes sulfur									
consumes chlorine									
consumes bromine									
consumes iodine									
consumes fluorine									
consumes helium									
consumes neon									
consumes argon									
consumes krypton									
consumes xenon									
consumes radon									
consumes uranium									
consumes thorium									
consumes plutonium									
consumes americium									
consumes curium									
consumes berkelium									
consumes californium									
consumes einsteinium									
consumes fermium									
consumes mendelevium									
consumes nobelium									
consumes lawrencium									
consumes rutherfordium									
consumes dubnium									
consumes seaborgium									
consumes bohrium									
consumes hassium									
consumes meitnerium									
consumes darmstadtium									
consumes roentgenium									
consumes copernicium									
consumes nihonium									
consumes flerovium									
consumes livermorium									
consumes tennessine									
consumes oganesson									

Regeneration: 2000 possible  
Sustainability: 1000 possible  
Total score:

21. **Is a Bad Neighbor—Is a Good Neighbor.** Consider the building and site's relation to its neighbors. A bad neighbor hogs the sun in winter, sends run-off off site, intensifies neighbors' climates, and causes glare, air pollution, and noise pollution.
22. . . . and **Is Ugly—Is Beautiful.** Make an aesthetic judgement. When architecture draws its lessons from the wild, beauty will no longer have to be applied. That's an empty exercise. Organic rightness—appropriateness—will repair the broken connection between architecture and its roots.

*Æsthetic judgement constitutes the quintessential level of human consciousness. . . . To be genuinely effective, a building must conform to æsthetic as well as physiological standards of performance.*

—James Marston Fitch, 1975

Adapted freely from *Gentle Architecture*, Malcolm Wells, McGraw-Hill, 1982. I've added my mundane concerns to Malcolm's impassioned plea.