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Sustainable Architecture and Engineering

Encyclopedia of Environmental Ethics and Philosophy , 2009 

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Sustainable Architecture and Engineering

In the late twentieth century many citizens in Western societies began to recognize that if other societies consumed resources at the same rate that they did, the ecosystem soon would be exhausted and unable to reproduce itself. That recognition motivated the United Nations to charter the World Council on Environment and Development (WCED) to investigate ways in which the apparent conflict between economic development and environmental degradation might be reconciled. Under the auspices of the Brundtland Commission, the WCED published its findings as Our Common Future in 1987. That document, long considered the seminal text on sustainable development, defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Council on Environment and Development 1987,p. 8). In the conflict between economic development and environmental protection unsustainable development usually is associated with the industrial and transportation sectors. Although industrial wastes and automobile emissions contribute substantially to degraded environmental



and social conditions, they are not the largest source of the problem.

RESPONSES TO THE CHALLENGE

According to the U.S. Department of Energy (DOE), the production and operation of the built environment accounts for almost half of all greenhouse gas (GHG) emissions and more than half of annual energy consumption in North America. These general statistics were put in a critical context by a Brookings Institution study that projected that in 2030 about half of the buildings in which Americans live, work, study, and shop will have been built after 2000 (Nelson 2004). If these projections are accurate, the construction and operation of buildings could become the single largest threat to public health, safety, and welfare as well as the major cause of environmental degradation and threats to other species. These statistics present a serious ethical challenge to architects, engineers, and those who commission their services.

As the public conversation about sustainable development has matured, three responses to this challenge have developed: resignation, denial, and hope. If one takes these statistics as inevitable, as do neo-Malthusians such as Paul Ehrlich (1971), one tends toward resignation. If one considers them overblown or unreliable, as do those with an interest in maintaining the status quo, one tends to deny the mounting evidence that shows that people's habits are unsustainable. However, if one takes these statistics seriously but rejects historical determinism, one tends to be hopeful that environmental collapse can be avoided. This is the story line of sustainable development, a modern narrative in which people create hope for the future by taking collective actions that may alter the path of history.

MODERN ARCHITECTURE

The popular thesis among many environmentalists, that ancient architecture is the best model for sustainable development in the future, generally is accompanied by the corollary that modern architecture has been relentlessly antinature. Although many modern buildings consume vast amounts of energy because they ignore the natural energy flows of their locations, there also are buildings that look stylistically modern but act in harmony with the ecologies and cultures for which they were designed. It is inaccurate to imagine that modern and sustainable architectures embody singular and opposed sets of values; reality is far more complex.

A good example of midcentury modern architecture that works with natural forces is the Tremaine House in Santa Barbara, California (1947–1948), designed by the Austrian-American architect Richard Neutra (1892–1970). The deep overhangs of the roof shield the large expanses of glass from unwanted solar heat gain, and the operable transom panels above the sliding glass doors allow for natural cross-ventilation even when the doors are closed. Neutra (1948) referred to this system as CSSA/LS, or continuous sub-soffit airchange over a lowered spandrel. What makes Neutra's work a particularly good example of protosustainability (the initial ideas required for sustainability to emerge in the form articulated by the Bruntland Report) is the fact that he employed energy-saving technologies not only in houses for people of substantial means such as the Tremaines but also for people of modest means. This is demonstrated by his 1948 proposal that Brazilian schools be equipped with his CSSA/LS system along with technologies designed to harvest rainwater and produce electricity on site. Neutra's work demonstrates a balanced sensitivity to the competing interests of economic development, environmental preservation, and social equity— commonly referred to as the three Es—long before the Brundtland Commission declared them to be the core values of sustainable development.

Neutra was not alone in the search for environmentally and socially responsible architecture. Among his peers were the theorists Patrick Geddes (1854–1932), Lewis Mumford (1895–1990), and Frederick Keisler (1890–1965), as well as a diverse group of practitioners that included Frank Lloyd Wright (1867–1959), Alvar Aalto (1898–1976), Harwell Hamilton Harris (1903– 1990), and the many practitioners of regionalism in the Bay Area of California, Texas, and Mexico, among other

places. In his collection of regionalist texts Vincent Canizaro (2007) demonstrated that some modern architects have championed the values that are associated with sustainability. In the world of engineering the appropriate technology movement that emerged in the 1960s demonstrates similar values.

After the appearance of Our Common Future in 1987 pressure from outside the building professions to build sustainably increased slowly; after the turn of the millennium the subject of sustainable design became a dominant discourse in both architecture and engineering. This does not imply that the legacy of Neutra and his peers dominated the theorizing and designing of sustainable environments. The sociologist Simon Guy and the architect Graham Farmer (2001) found six distinct traditions within architectural discourse, each based on differing and sometimes conflicting assumptions yet all claiming to define what sustainable design must be. Guy and Farmer's categories would include buildings as diverse as the low-tech back-to-the-land earth ships built in New Mexico by Mike Reynolds (1970), the technocratic and energy-efficient Commerzbank Tower designed for Frankfurt by Sir Norman Foster and Associates (1995–1998), and the communal solar kitchen developed for Jiutepec, Mexico, by the BaSiC Initiative (2004). Although some technocrats would prefer to standardize sustainable technologies as lists of best practices or universal technical codes, the practice of sustainable design has continued to diversify.

DISCIPLINARY APPROACHES

Another popular conception involves the division of work between architects and engineers in the planning of sustainable built environments. People are predisposed to associate architects with space planning and the superficial embellishment of building facades and engineers with technical problem solving. Although there is some truth in this categorization, reality is far more complex. Although these two modern professions emerged from a common European origin, over the last five centuries they have developed distinct cultures. Where architects tend to be expansive in their approach to problem solving—as in the arts—engineers tend to be reductive—as in the sciences. Where architects tend to emphasize the visual or communicative qualities of the environments they design, engineers tend to emphasize economic efficiency. However, the tendency to essentialize the values of the disciplines is as erroneous as it would be to characterize the visual characteristics of modern architecture as inherently antinature. The building professions are far more pluralistic than many critics suppose.

Among the diverse design practices developed in the early twenty-first century were those which derived from the critique of modern technology offered by science and technology studies (STS). Rather than focus on the expressive possibilities of building form, economic efficiency, or the artifacts themselves, STS scholars study the relationship of particular material technologies to the societies that develop, maintain, and operate them. The empirical study of the built environment as a socio-technical system is a promising area of analysis that may influence not only the teaching of design but also the consequences of design practice.

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