the problems. Many of today's problems are much less visible. The problems are less obvious but no less critical. While progress has been made in lowering the release of CFCs into the atmosphere in the industrial world, CFCs continue to be produced in the emerging nations of the world, with production accelerating. Other damaging gases continue to be released by all nations. Toxic emissions, while lowered, continue to be released into the air and water by industrial and other processes. Recycling has become an industry in many areas but is still in its infancy. In general, while we have done much to reduce the rate of environmental degradation in many areas, the general trend is that of degradation of the environment.

SEEING BUILDINGS AS DESIGN PROBLEMS: COSTS AND BENEFITS FOR USERS AND THE ENVIRONMENT

Sustainability is generally defined as an ability to meet today's needs without compromising the ability of future generations to meet their own needs. As simple as this definition may be, its application to the work of designers can be challenging. There are many unanswered questions, little understanding of most issues, and, frequently, less than ideal choices. This is particularly true in the building industry. On the other hand, there are many ways to improve the environmental performance of our building designs today within common construction budgets, time constraints and programmatic needs. The challenge is to focus on the problems and issues involved and begin to address them systematically in the design and delivery of facilities. One can start by understanding the specific impact of buildings.

The Impact of Buildings

The impact of buildings is a significant part of the overall problem of environmental degradation. Buildings use a significant portion of the earth's resources and produce an even larger proportion of the pollution released into the air, water, and soil. According to the World Resources Institute,[1] buildings use 17 percent of fresh water flows and 25 percent of harvested

wood. Buildings are responsible for 50 percent of the production of CFCs. They use 40 percent of energy flows, generate 33 percent of CO_2 emissions, and produce 40 percent of the landfill material from construction and demolition waste. The Environmental Protection Agency estimates that one-third of all buildings suffer from "sick building" syndrome.

We have these problems with the design of most buildings in part because decisions made by one party are paid for by others. Moreover, building owners simply never see the full costs of many of these decisions. Pollution created in the manufacturing of a given building material, for example, is a cost paid for not by the building owner but, generally, by the public at large, when the toxins eventually have to be cleaned up. The true cost of a building includes not only the cost of the "bricks and mortar" that go into its construction but also the cost of the people who use it. The construction costs of buildings are small compared to the costs to the people who occupy them. This is true of all building types. In the typical $\$100/ft^2$ office building, for example, the costs of its occupants may range from $200 to $500 per square foot *annually*, depending on the occupant. Clearly, it makes more economic sense to make sure that design decisions promote the health and productivity of the people using the building.

Benefits

Sustainable design is clearly important to help solve our increasingly urgent environmental concerns. It also can improve overall building performance and makes sense economically. Ironically, the extremely poor performance of a typical building today, in terms of energy efficiency, air quality, and other measures of environmental performance, often is paralleled by the building's equally poor performance as a productive place to be and work.

Buildings that make better use of energy and other resources save money. Lower operation costs lead directly to a higher building values, by raising the net operating revenue. There is increasing evidence beyond common sense telling us that healthy buildings are more productive. There is also evidence that healthy buildings lease or sell faster than ones that are less so.