

Limited Research

Making the case to managers and practitioners to build green requires hard data, statistics, and case studies. But identifying the best ways for the Federal government to improve the environmental performance of its buildings, and ensuring that the means employed to do so are effective, requires continued research on buildings' environmental effects and interactions and on technologies and techniques to reduce these impacts. The energy aspects of environmental design and construction have been more thoroughly researched than other aspects, such as water conservation and reuse, recharging of groundwater, construction runoff control, the use of green building products, and indoor environmental quality (e.g., daylighting, ventilation, low emitting materials, and indoor chemical and pollutant source control). In addition, information is required on the business case for green building, including its effect on cost savings, worker productivity, and worker health.

The Federal government does not endorse specific products, but construction and purchasing professionals ultimately need to find reliable sources of green building materials. Therefore, another critical research need is comparable information on the environmental impacts of building products—namely, life cycle assessment (LCA) and building product life cycle inventories (LCI) tools and protocols. LCA is a systematic approach to estimating the multiple environmental, energy, and resource impacts associated with a product or process from “the cradle to the grave.” An LCI is the database of information on which LCA is based (e.g., information on how much energy and resources are used to make a product; emissions to land, sea, and air during production and transportation; product performance during its useful life; and its end-of-life impacts). This type of information is necessary to systematically determine which building products and strategies are environmentally preferable in comparison to competing products.

A variety of Federal agencies are working to fill these important research gaps. For example, DOE's Office of Energy Efficiency and Renewable Energy funded the development of technical information on building envelope performance, lighting, and thermodynamics for years. In addition, FEMP has developed life cycle cost analysis tools that help with justifying the energy conservation components of environmental design.⁵⁴ These tools can be readily adapted to other components if the cost savings of those components are known. Using these tools, and other methods for documenting business value, FEMP set out to develop *The Business Case for Sustainable Design in Federal Facilities*. The Report, now available in draft, provides an overview of research and case studies that document the economic, environmental, and social costs and benefits of sustainable design choices.⁵⁵

⁵⁴For example, see FEMP's website on Analytical Software Tools at <<http://www.eere.energy.gov/femp/techassist/softwaretools/softwaretools.html>>.

⁵⁵*The Business Case for Sustainable Design in Federal Facilities*. DOE/FEMP. August 2003. Available in draft at: <<http://www.eere.energy.gov/femp/techassist/sustainability.html#business>>.

A primary focus of the Commerce Department's National Institute of Standards and Technology's Building and Fire Research Laboratory (NIST/BFRL) is its *Healthy and Sustainable Buildings Program*.⁵⁶ NIST/BFRL's Building for Environmental and Economic Sustainability (BEES) tool currently evaluates the life cycle environmental and economic performance of 200 building products.⁵⁷ Hopefully, in the future, many more product categories will be added to the tool in order to cover the wide range of products that may be specified in Federal building design. BEES currently has shortcomings. First, there is a lack of more detailed data on the environmental impacts of material production and use and, especially, the impacts on life cycle energy consumption. There is also a need to enhance the indoor air quality analysis incorporated in BEES to reflect better current knowledge and practices such as those adopted and being used by the State of California.⁵⁸ Continued research in all of these areas is needed in order to create a complete picture of the costs and benefits of green building.

What is missing in the government's research program is the coordination of these various efforts under common goals and protocols, regular communication among these programs, and the use of government buildings as laboratories to demonstrate and apply new technologies and approaches. Although DOE has taken steps to coordinate research through its various "technology roadmap" efforts, much more work is needed in this area.⁵⁹ And, results from completed research needs to be translated into tools and/or guidance that can be easily used by building professionals.

⁵⁶See the NIST/BFRL website at <<http://www.bfrl.nist.gov>>.

⁵⁷See the NIST/BFRL BEES 3.0 website at <<http://www.bfrl.nist.gov/oae/software/bees.html>>.

⁵⁸See the California Integrated Waste Management Board website at <<http://www.ciwmb.ca.gov/greenbuilding>>.

⁵⁹See DOE Building Technology Roadmaps website at <<http://www.eere.energy.gov/buildings/research/roadmaps.cfm>>.