



Environmental Implications of Construction and Infrastructure

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Introduction:

The construction industry has paid particular attention to the ecological impacts of new facilities, energy use of buildings, asbestos contamination and removal, indoor air quality, and several other important environmental issues. Yet many impacts relative to constructed facilities' life cycle (planning, design, construction, occupancy/operation, and demolition) have not been systematically and comprehensively studied. Engineers and architects, as well as owners, planners, operators and other construction professionals should understand the environmental and energy implications of construction materials, processes and alternative facility designs because their everyday decisions carry substantial social implications. We also seek reductions in the environmental burdens of construction and the infrastructure.

Objectives of research:

To provide information, metrics and analysis tools related to the environmental implications of construction materials, machines and processes, alternative design choices, and other construction products.

Approach:

Life cycle assessment based on economic input-output analysis and publicly available environmental data (EIO-LCA) is used to quantify the environmental implications of construction alternatives and infrastructure. Life cycle assessment traces out environmental implications throughout a product's life, from supply chain effects through use and disposal.

Environmental effects quantified:

Resource inputs: electricity, fuels, ores, fertilizers

Environmental outputs: toxic chemical releases, toxicity-weighted chemical emissions (CMU-ET), ozone depletion potential, conventional air pollutant emissions, global warming potential, RCRA Subtitle C hazardous waste generation and management.

Where possible, the social costs of these outputs are also quantified.

Case studies:

- Asphalt vs. reinforced concrete pavements
- Steel vs. reinforced concrete bridges
- Wood vs. steel residential framing
- Insulation materials
- Infrastructure for alternative fuels

Representative publications:

"A Comparison of the Environmental Implications of Asphalt and Steel-Reinforced Concrete Pavements," Arpad Horvath and Chris T. Hendrickson, Transportation Research Board Conference, Washington, DC, January 1998, and Transportation Research Record, 1998.

"Steel vs. Steel-Reinforced Concrete Bridges: An Environmental Assessment," Arpad Horvath and Chris T. Hendrickson, *ASCE J. of Infrastructure Systems*, September 1998.

"Use of Economic Input-Output Models for Environmental Life Cycle Assessment," Chris T. Hendrickson, Arpad Horvath, Satish Joshi and Lester B. Lave, *Environmental Science & Technology*, April 1998.

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