

CENTER FOR INDUSTRIAL ECOLOGY

The Center for Industrial Ecology (CIE) is dedicated to the development and promotion of research, teaching, and outreach in industrial ecology. Through the study of consumption and production systems, industrial ecology helps companies and policy makers to understand how resources are converted to products and how pollution comes about as a byproduct of that process, and to identify options to reduce resource use and pollution. Industrial ecology addresses the environmental footprints of products and technologies through mass and energy balances, thus also helping consumers make environmentally conscious decisions. Among the programs and goals of the center are the following:

- Conducting pathbreaking research in industrial ecology
- Master's, doctoral, and postdoctoral study and research in industrial ecology
- Hosting of visiting domestic and international scholars in industrial ecology

Major foci include (1) the Clean Energy Choices project, which assesses different options to mitigate greenhouse gas emissions from our energy system in terms of their feasibility, resource requirements, and environmental impacts; (2) development of a generalizable system dynamics modeling framework to assess the profitability and net energy, CO₂ emissions, and resource-saving benefits of U.S. fiber-recycling systems under different economic, technological, and scrap market assumptions; and leadership of the systems node of REMADE Institute, which seeks to reduce energy use and greenhouse gas emissions of materials production through recycling and remanufacturing; CIE's role addresses understanding the stocks and flows of materials, developing scenarios, and analyzing benefits; (3) the Industrial Symbiosis Project, in which multiyear research has been conducted, including examination of the environmental and economic rationale for intra-industry exchange of materials, water, and energy; (4) a project for the U.S. Critical Materials Institute providing material flow and scenario analyses for several critical materials, as well as forward-looking criticality assessments and underlying economic analyses; (5) the Program on Industrial Ecology in Developing Countries, which adapts industrial ecology theory and practice to issues related to energy access, water quality and quantity, waste and material management, and global warming in industrializing countries with a current focus on a study of low-carbon and sustainable cities in China, India, and the United States; and (6) Extended Producer Responsibility (EPR) research, which analyzes the conceptual, policy, and legal foundations of EPR, including the investigation of the governance of EPR and the conditions necessary for the implementation of individual producer responsibility as well as development of a reference database of studies and documents.

JOURNAL OF INDUSTRIAL ECOLOGY

CIE is home to a highly regarded international journal. Published by Wiley and owned by Yale University, the *Journal of Industrial Ecology* is a peer-reviewed, online, multidisciplinary bimonthly on industry and the environment that is aimed at both researchers and practitioners in academe, industry, government, and advocacy organizations. It is edited in partnership with Tsinghua University in Beijing, China, and the Norwegian University of Science and Technology in Trondheim, Norway. The *Journal of Industrial Ecology* is indexed in Science Citation Index Expanded (ISI), and it is the official journal of the International Society for Industrial Ecology. See www.wileyonlinelibrary.com/journal/jie.

INDUSTRIAL ENVIRONMENTAL MANAGEMENT PROGRAM

The Industrial Environmental Management (IEM) program at Yale aims to equip students with an integrated set of skills with which to tackle the complex, multifaceted environmental problems facing industrial and corporate managers. The core intellectual framework for IEM is the systems science of industrial ecology, which examines materials, water, and energy in a common framework. Students can pursue specialization and certification through the M.E.M. program in Industrial Ecology and Green Chemistry.

An active Industrial Environmental Management and Energy Student Interest Group sponsors field trips to industrial sites, on-campus talks by visiting managers, and symposia on current topics of interest.

PROGRAM ON SOLID WASTE POLICY

The program has two principal goals: (1) to inform contemporary policy discussions about solid waste and materials management and the circular economy by applying the methods and findings of social and environmental science and industrial ecology; and (2) to develop workable policy solutions that address the impediments to safe, cost-effective solid waste management and the complexities of comprehensive materials and life-cycle management. Current research focuses on high-resolution mapping of nonhazardous industrial waste to improve the potential for reuse.