

[Abstracts](#)

**Developing Sustainable Materials:
The Need for a Shift in Practice**

Ken Geiser, Ph.D.
Associate Professor
Department of Work Environment
Co-Director
Lowell Center for Sustainable Production
University of Massachusetts Lowell
Lowell, MA 01854
T: 978-934-3275
F: 978-934-3050
E: kgeiser@TURI.org

Abstract

One key factor in moving towards a sustainable society is the nature of the industrial materials we use to make products. Some materials are more likely than others to drain the earth of its concentrated supplies of resources and to fill the lithosphere with residuals that depress natural ecologic cycles and threatened human life. We have a long history of trying to reduce human exposure and environmental concentrations of certain, well-studied, persistent toxins through government regulation and private voluntary guidelines. These efforts have been criticized as highly expensive, overly adversarial, and/or sadly inadequate. Surprisingly, we have done little to consider materials at the first stage of their life cycle: the point at which they are extracted, synthesized, or manufactured. Indeed, while today we are more attentive to materials released to the environment, there is not much attention to issues of sustainability at the point that materials are first selected for inclusion in production processing or final product design.

This is not too surprising. A review of the history of selected metals, petrochemicals and polymers demonstrates that issues of environmental and human health effects are secondary factors subordinate to factors such as performance, availability, and cost. Indeed, the professions most focused on human health and the environment have little access to the decision-making about materials development or materials use.

One result, toxicity, has received much reactive attention, as science or tragedy has taught us to be more careful with human or environmental exposure. But, there are no prospective policies that provide guidance on how to achieve a less toxic material mix in the future. An even less considered issue of material use is that of material dissipation. For nearly a century and a half we have been vigorously mining and harvesting the earth's natural resources. There have been various periods of intense concern about the depletion of the quality or quantity of these material reserves. Today, most mainstream observers believe that price and the market will continue to provide the necessary materials for the foreseeable future. There has been much less attention to the dissipation (in terms of reclaimable value) of materials during use and disposal or to the limiting

factors of ecological assimilation of large volumes of dissipated materials. Ozone depletion, atmospheric carbon build-up, and ocean hypoxia provide early warnings.

This paper will report on a year's research project examining the role that materials development and use may need to play as we become more serious about a sustainable future. It will reflect on the past experience of several materials, assess current conditions today, and offer some lessons for considering future public and private policies.