



Nanotechnology in Energy and Environmental Policy

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From Promise and Peril to Policy: Nanotechnology and the Environment

In the 1980s and 1990s, utopian visions of manipulating matter at the nanoscale informed expectations that nanotechnology could yield major advances in pollution prevention, environmental remediation, and medicine.

After the U.S. federal government increased its investment in nanotechnology in the 2000s, activists and scientists warned of the potential hazards of the field. Policy-makers, scientists, civil society, and the media all struggled to understand nanotechnology's impact on the future health of nature, the economy, and our bodies.

These broad swings in public understanding of nanotechnology's environmental implications spurred new avenues of research, inspired debates on the definition and meaning of nanotechnology, and led to the re-examination of policies for worker and consumer safety, as well as the health of the environment itself.



"When we develop pollution-free nanomachines to gather solar energy and resources, Earth will be able to support a civilization far larger and wealthier than any yet seen, yet suffer less harm than we inflict today."
- Dr. K. Eric Drexler,
Engines of Creation (1986)



"Dr. Richard Feynman made a speech 33 years ago in which he essentially outlined the whole field [molecular nanotechnology], and even the researchers at the cutting edge today were sort of surprised when they went back and read the speech, and found out that the basic concept has been available for a long time."
- Al Gore Jr.,
U.S. Senate hearings (1992)



"What are the societal and ethical issues for nanotechnology? ... If we fail to answer these questions early, public acceptance of nanotechnology could be in jeopardy and the entire industry derailed."
- Dr. Vicki Colvin,
Congressional testimony,
(2003)

Issues:

- 1) Can nanotechnology contribute to sustainable energy production?
Environmental remediation?
General economic growth?
- 2) Why has nanotechnology been promoted primarily by government agencies?
- 3) Will high expectations create another season of reckoning for basic science research?

Energy and the Potential of Nanotechnology

-In the 1990s, the Department of Energy chose nanotechnology from among several rubrics to label a discourse of revolutionary applied science in response to perceived political pressure for a practical dividend from basic research. The emergence of the nanotechnology idiom in this context helps show that science policy discourse occurs in a more circumscribed public space than science boundary work (in preparation for submission to *Minerva*)

-Some researchers have framed nanotechnology as a means of overcoming technical obstacles to the commercialization of advanced power sources including fuel cells and lithium ion batteries. But although power sources utilizing nanostructures often offered high performance, they posed manufacturing unknowns that slowed their movement into the market (forthcoming in *Science Progress*)

Nanotechnology and Bibliometry

Previous bibliometric research indicates that the U.S. leads the field of nanotechnology. But such analyses do not account for productivity. When integrating the number of researchers and investment, the U.S. lags behind other countries (Motoyama and Eisler, TFSC, 2011)