



Research Approaches to Assessing Public Health Impacts of Risk Management Decisions

22-23 January 2008

Research Triangle Park, NC

Short- and Long-term Interacting Trends in Environmental Awareness, Policy and R&D.

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Gaining a Perspective





Environmental Timeline

“Anthropocene Epoch”

1825

1900

2000

←~1760 – Start of Industrial Revolution

1820 - World population reached 1 B

1849 - Establish U.S. Department of Interior

1854 - Thoreau publishes Walden

1866 - Haeckel coined term Oekologie (Ecology)

1872 - Yellowstone 1st US National Park

1879 - U.S. Geological Survey formed

1892 - John Muir founded Sierra Club

1905 - Des Voeux coined term Smog

1930 - World population reached 2 B

1945 - Hiroshima & Nagasaki bombing

1951 - The Nature Conservancy in US

1956 - Minamata disease

1960 - World population reached 3 B

1962 - Silent Spring

1969 - Last Cuyahoga River fire

1969 – NEPA

<http://www.worldwatch.org/node/3944>

<http://www.ecotopia.org/ehof/timeline.html>

http://en.wikipedia.org/wiki/Timeline_of_environmental_events



Environmental Timeline

“Anthropocene Epoch”

1970

1980

1990

2000

2010

1970 - EPA founded

1970 - Clean Air Act

1971 - Keep America Beautiful "Crying Indian" TV ad

1972 - Federal Water Pollution Control Amendments

1972 - Stockholm Conference on the Human Environment

1972 - United Nations Environment Programme

1972 - Apollo 17 "Blue Marble photograph

1972 - Coastal Zone Management Act

1972 - Federal Insecticide, Fungicide, and Rodenticide Act

1973 - OPEC US oil embargo

1974 - Molina & Roland stratospheric ozone CFC publication

1975 - Energy Policy and Conservation Act

1976 - Resource Conservation and Recovery Act

1977 - Clean Water Act

1977 - Surface Mining Control and Reclamation Act.

1979 - EPA response to Love Canal

1979 – Three Mile Island



Environmental Timeline

“Anthropocene Epoch”

1980

1990

2000

2010

1980 - CERCLA

1984 - Bhopal disaster

1986 - Chernobyl

1986 - Emergency Wetlands Resources Act

1987 - World population reached 5 B

1987 - Brundtland report on sustainable development

1987 - Water Quality Act

1988 - Ocean Dumping Ban Act.

1988 - Establish Intergovernmental Panel on Climate Change (IPCC)

1989 - Exxon Valdez

1989 - Montreal Protocol on ozone depletion

1990 - European Environment Agency established

1990 - First IPCC report

1990 - Clean Air Act major amendment

1992 - Rio de Janeiro Earth Summit

1992 - Ecological footprint is coined by William Rees.

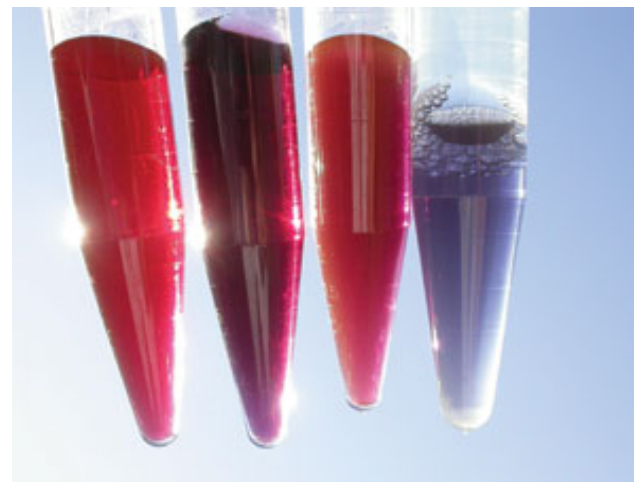
1997 – Kyoto Protocol negotiated

1999 - World population reached 6 B

Some Trends

- **Increasing breadth and depth of public's environmental knowledge**
- **Success in remedying more tractable problems**
 - **Point Source, single contaminant, single jurisdiction**
 - **574 new HPV (>1 M lbs/yr) chemicals**
http://www.americanchemistry.com/s_acc/sec_policyissues.asp?CID=432&DID=1493
 - **Nanoparticles**
- **Increasing international regulatory authorities**
- **Geographic extent of impacts**
 - **Mississippi R. Basin – Gulf hypoxia**
- **Increasing population**
- **Increasing urbanization**

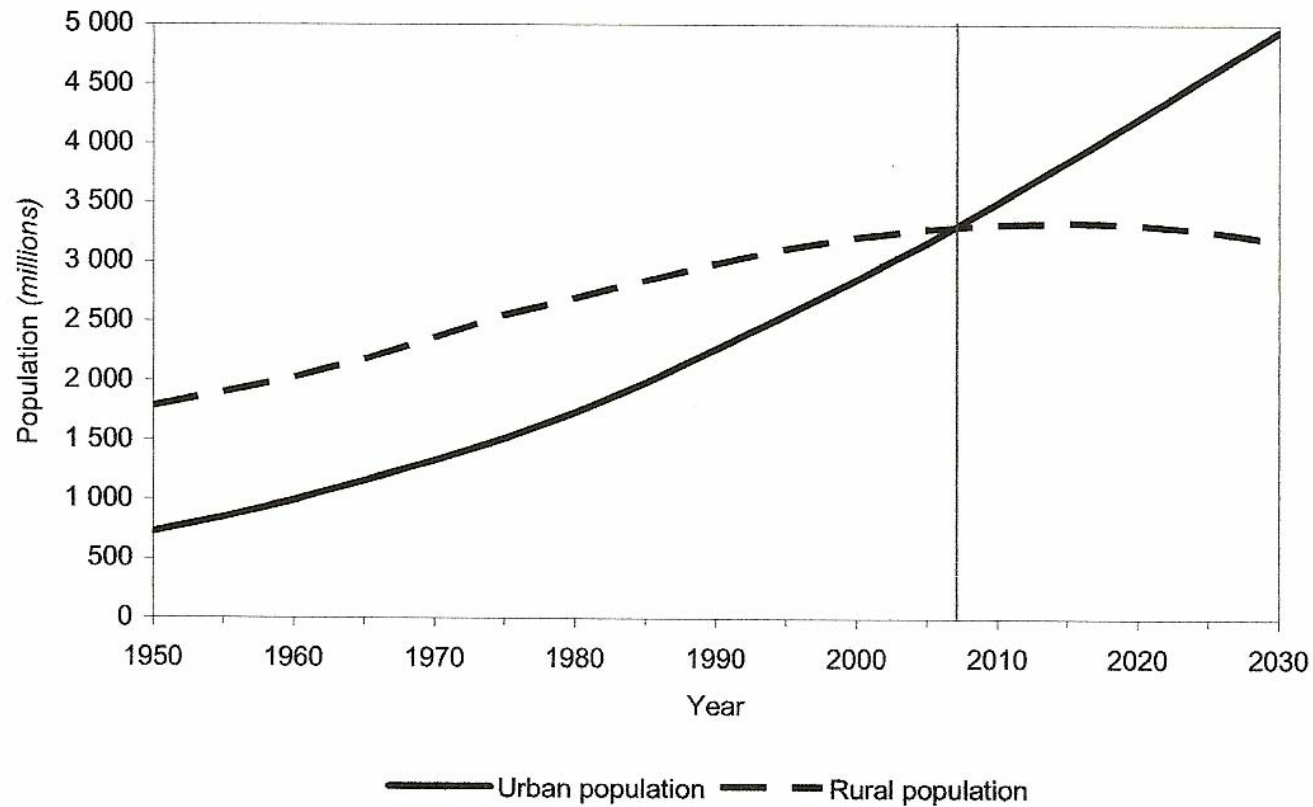
Nanogold particles



Properties & reactivities

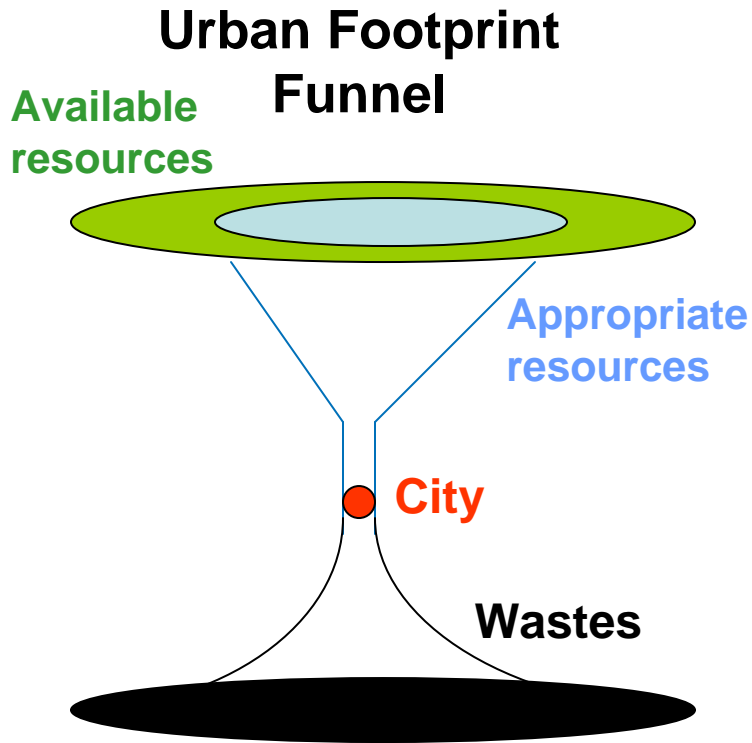
Urbanization

Figure I.1. Urban and rural populations of the world: 1950-2030



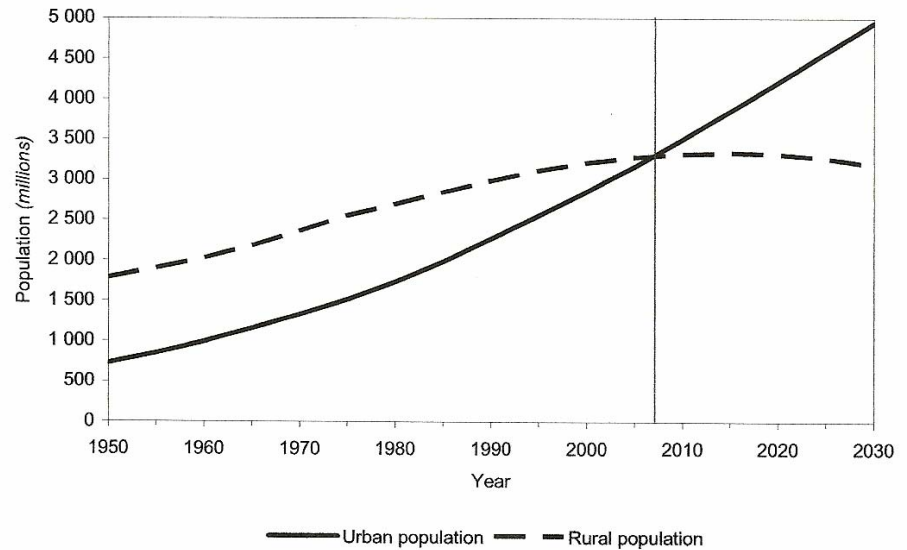
2004 UN Report on World Urbanization Prospects

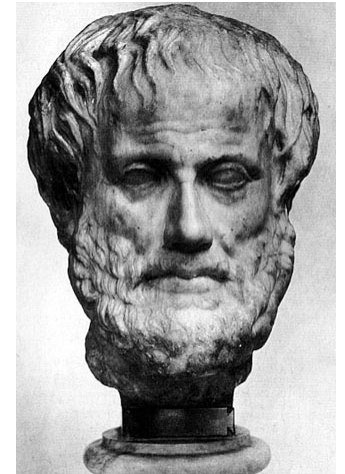
Urbanization



Luck et al., 2001

Figure I.1. Urban and rural populations of the world: 1950-2030





“I can't shake the feeling that we're medieval monks teaching kids Aristotle while around us the Enlightenment is already in full bloom.”

Brad Allenby, professor of civil and environmental engineering at Arizona State University, comment on environmental sustainability education.



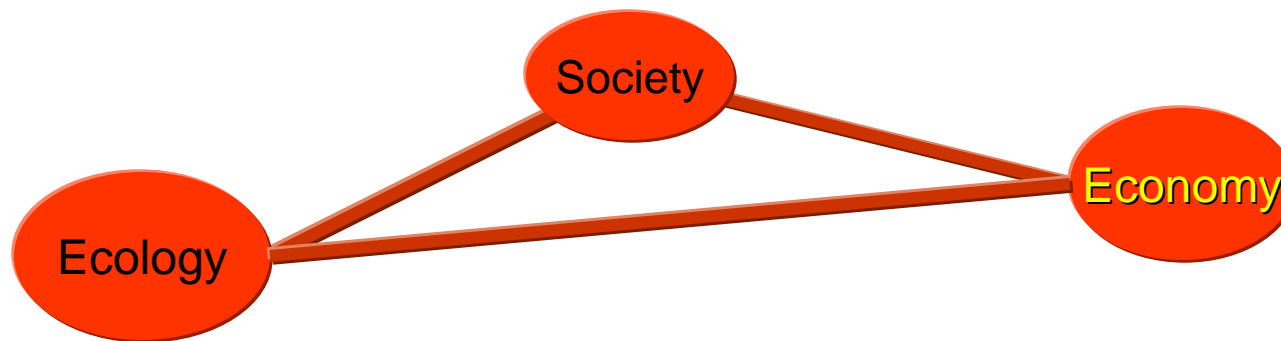
EPA's Mission - "To Protect Human Health and the Environment"



National Risk Management Research Laboratory's (NRMRL) Mission

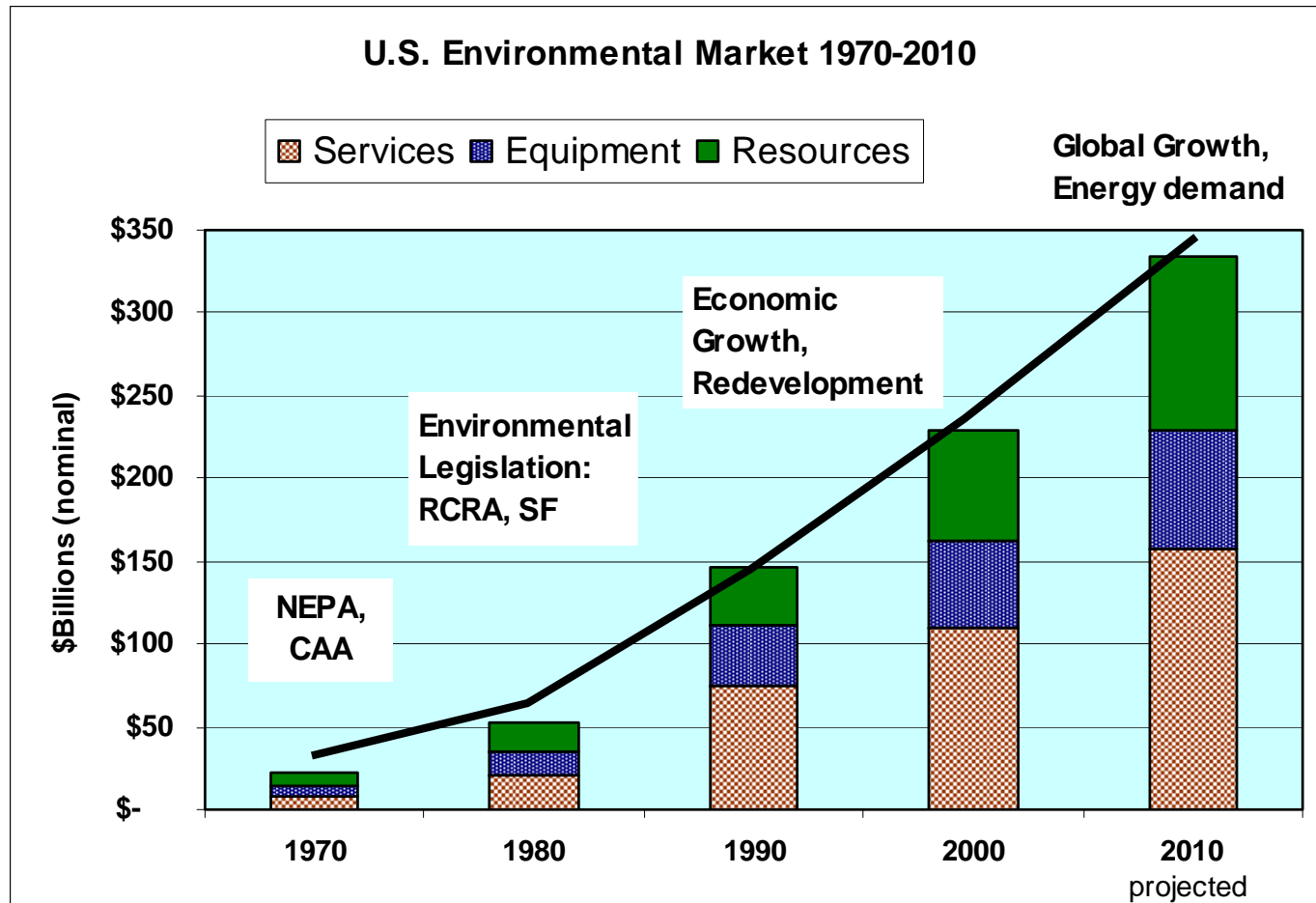
Advance scientific and engineering solutions that enable EPA and others to effectively manage current and future environmental risks.

Sustainable Environmental Systems Paradigm



- **Complex, dynamic, coupled systems are continuously evolving**
- **Growth is a “natural” behavior**

Using U.S. Entrepreneurism and Market Forces “To Protect Human Health and the Environment”





“To Protect Human Health and the Environment”

Economy and Environment

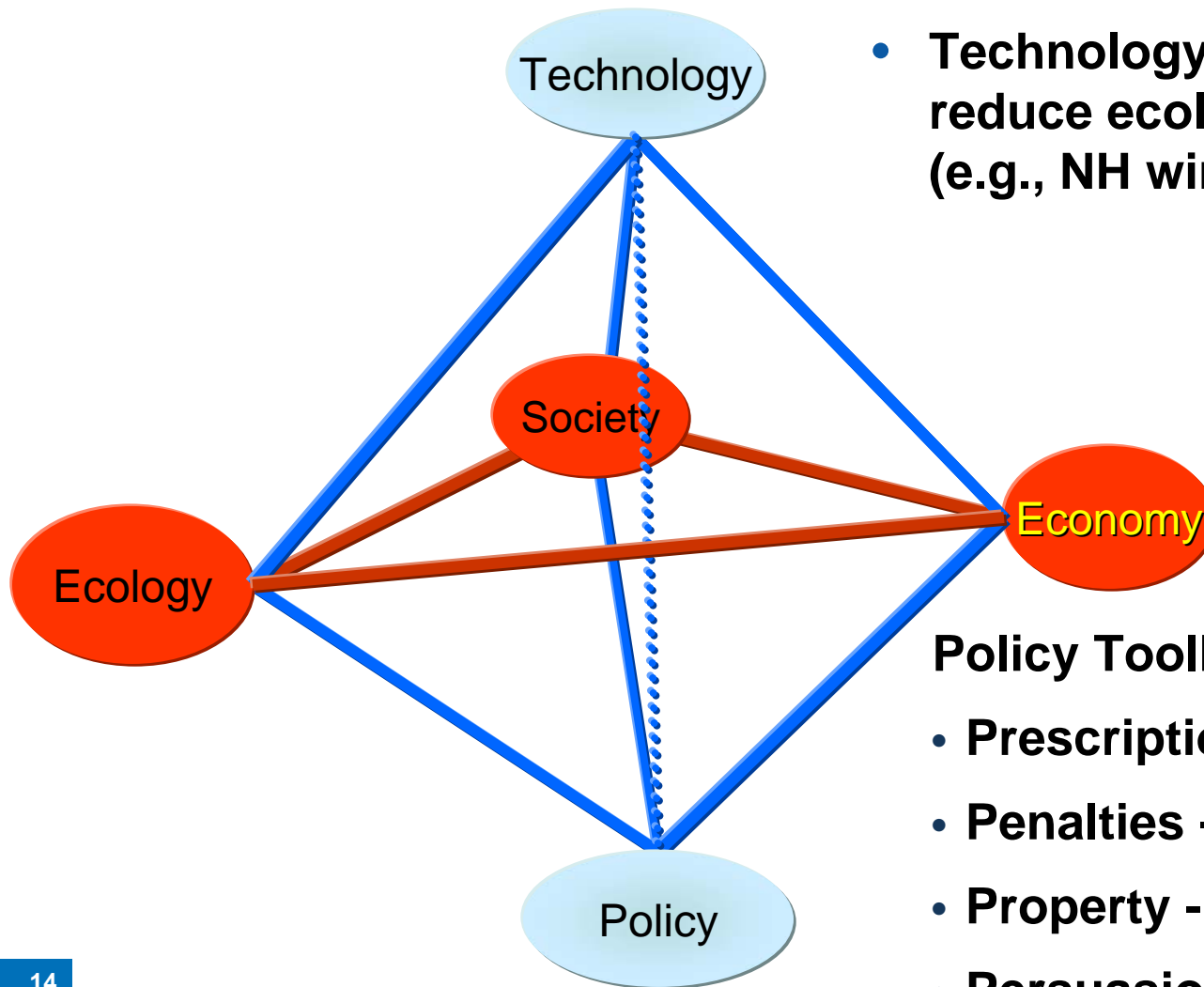
Former paradigm 1970s - mid 1990s

- **Regulatory driven market**
- **Compliance-based purchasing**
- **“End-of-pipe” tech, e.g. scrubbers on smoke stacks**
- **Chemical science**
- **Traditional engineering**
- **Slow growth markets, e.g. waste management**
- **“Save the world” mentality**
- **Low use of IT**

Emerging paradigm Late 1990s – Today

- **Economic market drivers**
- **Productivity-based purchasing**
- **“Front-of-pipe” tech, e.g. zero emission plants**
- **Biological & materials science**
- **Systems design & engineering**
- **Rapid growth markets, e.g. solar energy**
- **“Entrepreneurial” mentality**
- **High use of IT**

EPA has a major role in environmental technology and policy development



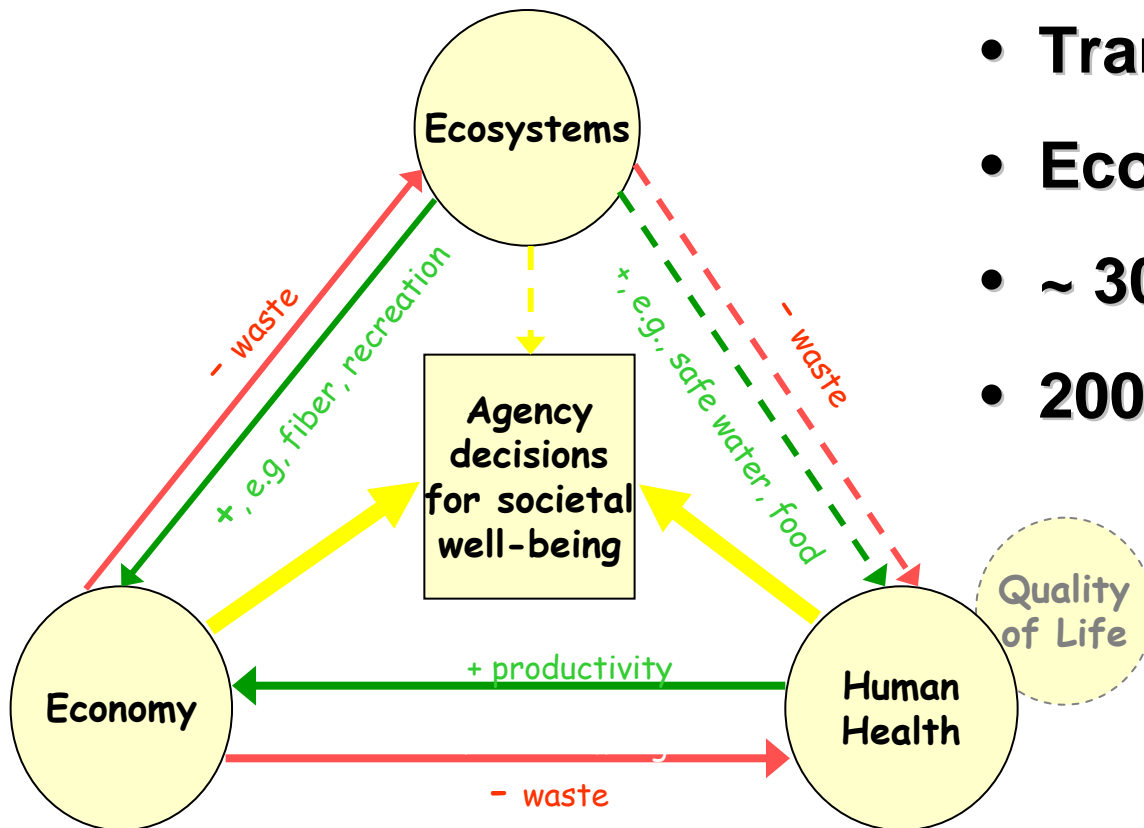
- **Technology alone may not reduce ecological footprint (e.g., NH wind power, SUVs)**

Policy Toolbox – Jim Salzman

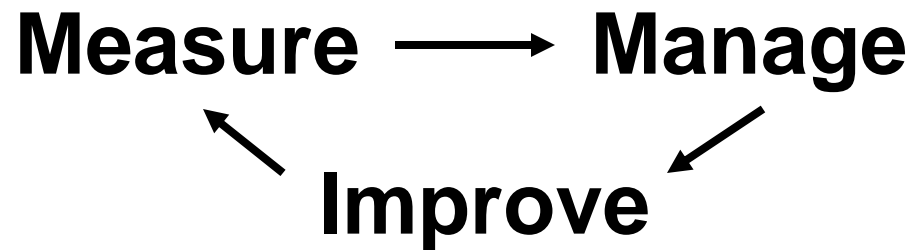
- **Prescription - regulations**
- **Penalties - fines**
- **Property - trade in markets**
- **Persuasion**

Ecosystem Research Program

- **Systems research**
- **Transdisciplinary**
- **Ecological sustainability**
- **~ 300 FTEs**
- **2007 through 2014**



EPA's R&D Challenges



1. Metrics are needed

- **Science-based**
- **Legally defensible**
- **Support market trading**

2. Non-traditional ORD science

- **Economics - valuation**
- **Decision science**
- **Outreach**
- **Sociology**
- **Quality of life**



Importance of the Social Dimension

“Human needs and desires drive political, social, and economic processes. Engineers provide technological solutions. It is important for the engineering community to educate society about their choices and allow them to make informed decisions regarding political choices and commerce”.

DANIEL KAHNEMAN won the 2002 Nobel Prize in Economics for having integrated insights from psychological research into economic science, especially concerning human judgment and decision-making under uncertainty.



EPA Science Forum

2008 Innovative Technologies

Advancing Environmental and Economic Progress

*Ronald Reagan Building
and International Trade
Center, Washington, DC
May 20-22, 2008*

Technology Track will include sessions on environmental monitoring, nanotechnology, arsenic treatment technologies, and more.

Energy, Climate, and the Environment Track will focus on Agency activities in the areas of energy, climate change and the environment...all priority focus areas of the EPA Administrator.

Water Systems Infrastructure and Security Track will introduce technical solutions to improve the Nation's aging water and wastewater infrastructures and advancements in water protection and security.



TECHNOLOGY



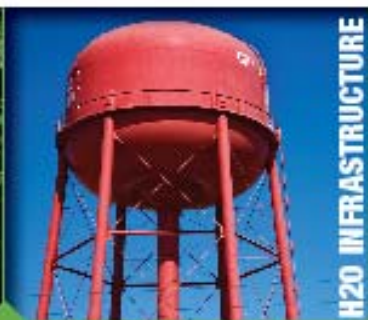
ENERGY



CLIMATE



ENVIRONMENT



H2O INFRASTRUCTURE

www.epa.gov/scienceforum

Unique research opportunities in New Orleans



They bury the dead above ground in New Orleans.

Unique research opportunities in New Orleans



This makes it easier for them to get out and vote.

Unique research opportunities in New Orleans



Opportunity for EPA exit surveys that can be used as metrics of outcomes in the OMB PART evaluations.