

# ***2004 National Environmental Public Health Tracking Conference***

***A Systems Approach to Environmental Public Health  
Tracking***

Presented by  
Harold Zenick, Ph.D. and William Sonntag,  
U.S. Environmental Protection Agency  
March 24, 2004

# *A Common Agenda*

## EPA Report on the Environment

It is also important that we hold ourselves **accountable to the American public** and report to them our **progress in reaching the goals** we have set for ourselves ....to describe the **condition of critical environmental areas and human health concerns”**

Governor Whitman, 2001

## CDC National Environmental Public Health Tracking

By **linking environmental and health data on a national level**, we will be better equipped to identify problems and effective solutions, thereby reducing the burden of environment-related diseases on the American people."

Dr. Gerberding, Director, CDC 2002



# *U.S. EPA Report on the Environment*

- **Describes what EPA knows - and doesn't know**
- **Identifies measures/indicators** to report on the status of national environmental conditions/trends and, where possible, their impacts on human health and the environment; and
- **Discusses the challenges** that the nation faces in improving these measures.
- The draft "Report" also includes a comprehensive draft "**Report on the Environment Technical Document**".
- Beginning to plan the **RoE 2006 Report**

(<http://www.epa.gov/indicators/roe/index.htm>)



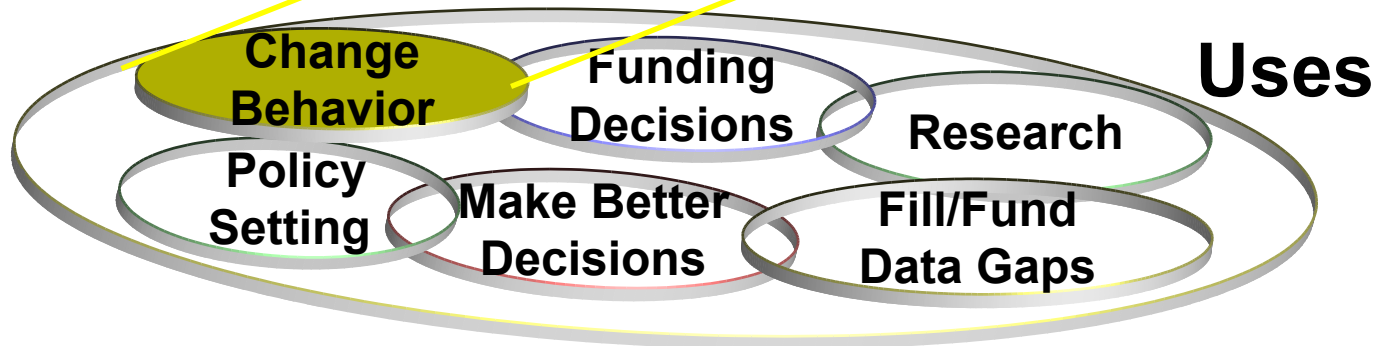
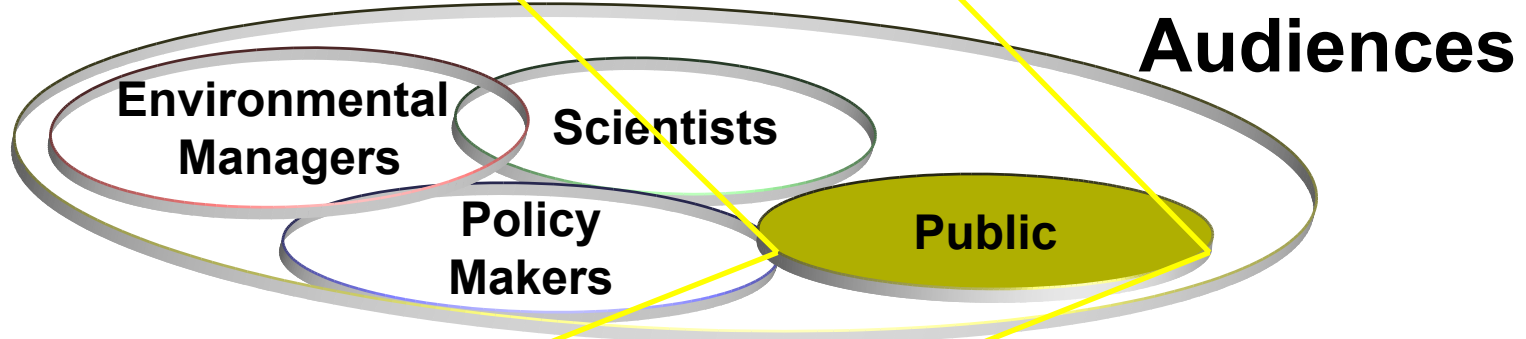
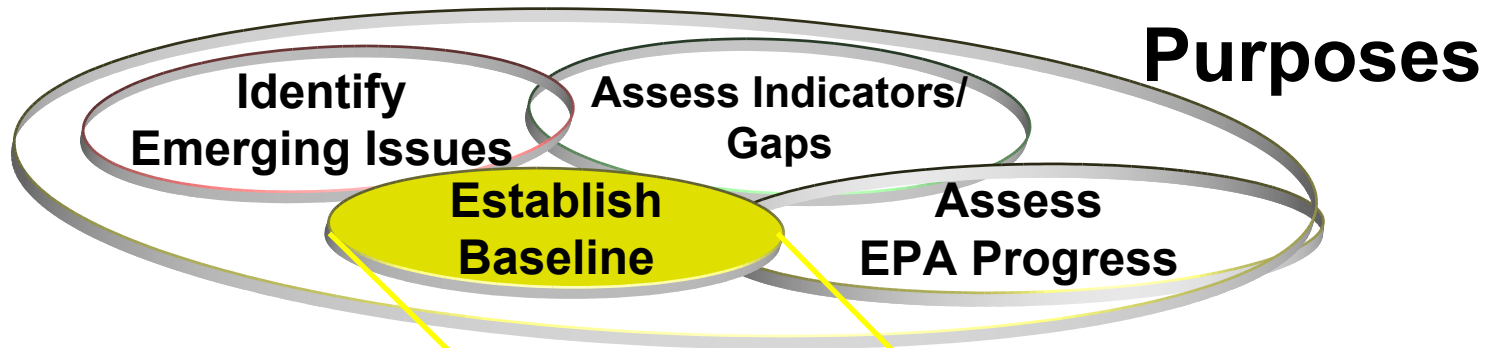
# ***RoE Challenge: Being All Things to All People***

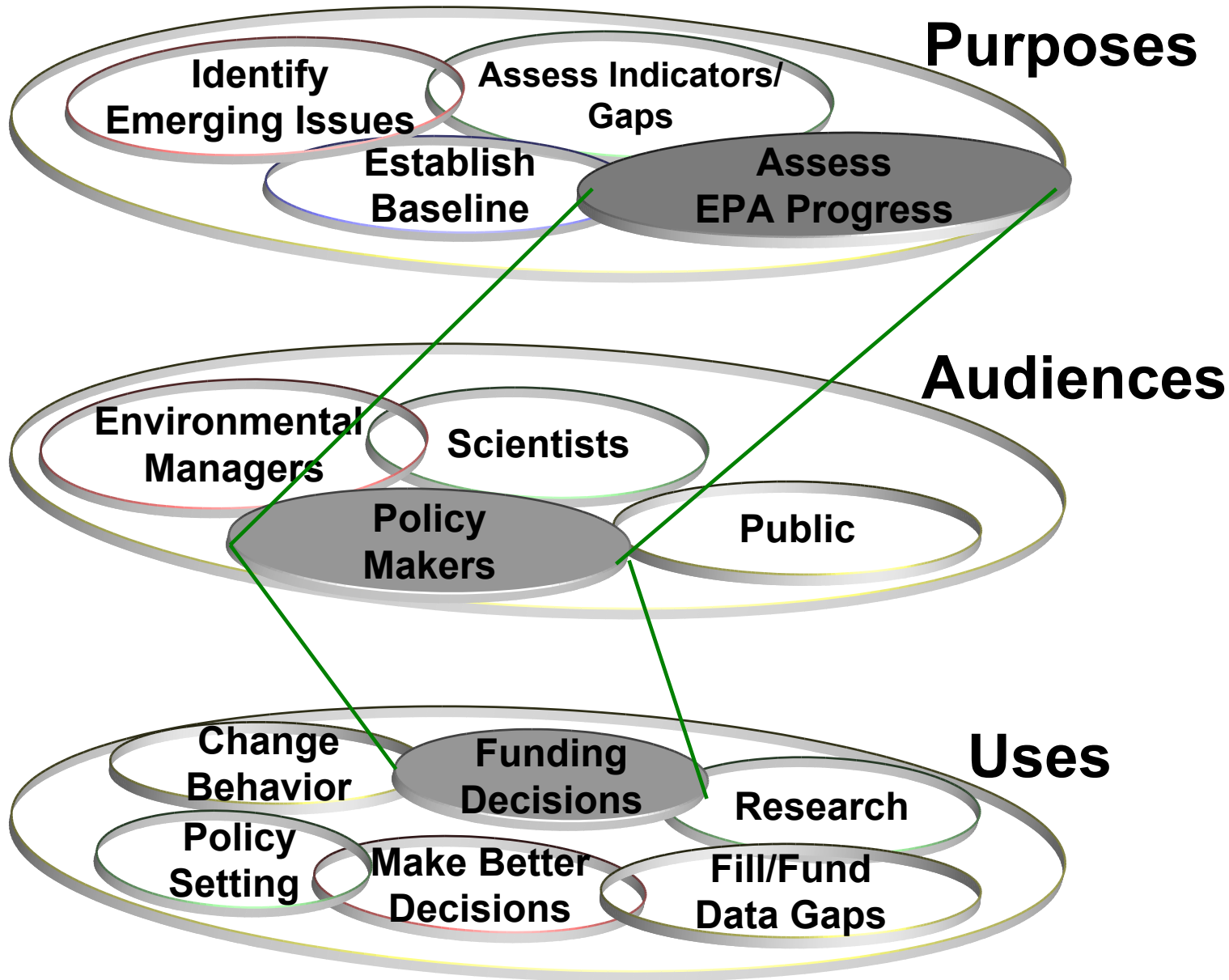
Experience demonstrates need to better clarify:

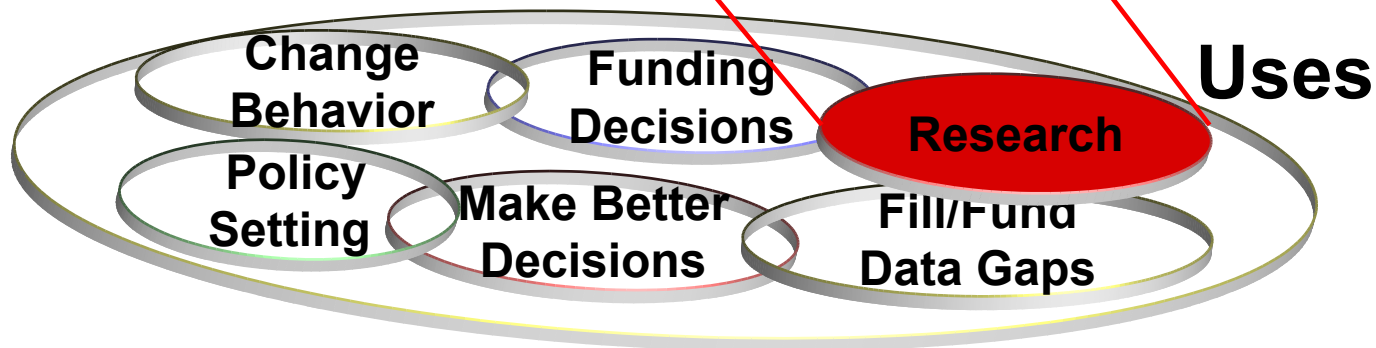
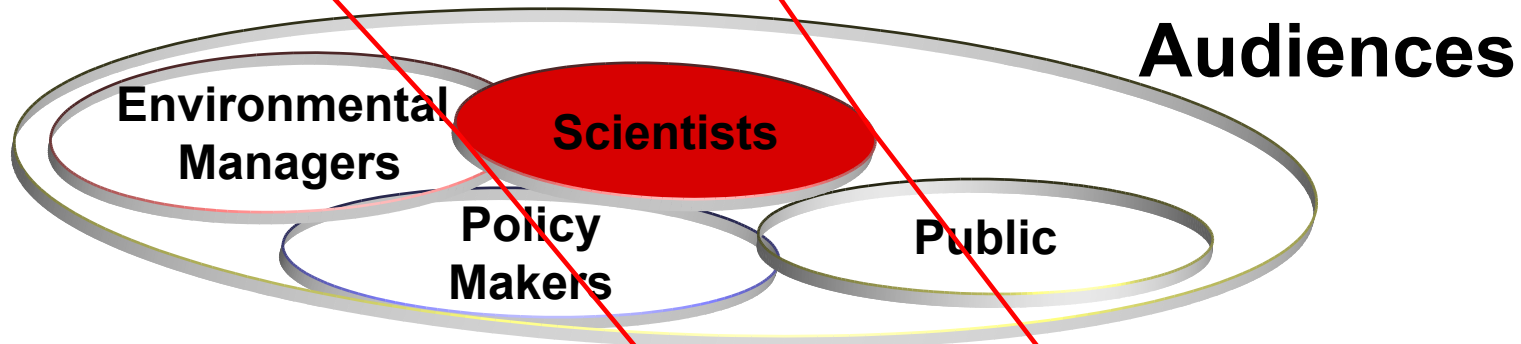
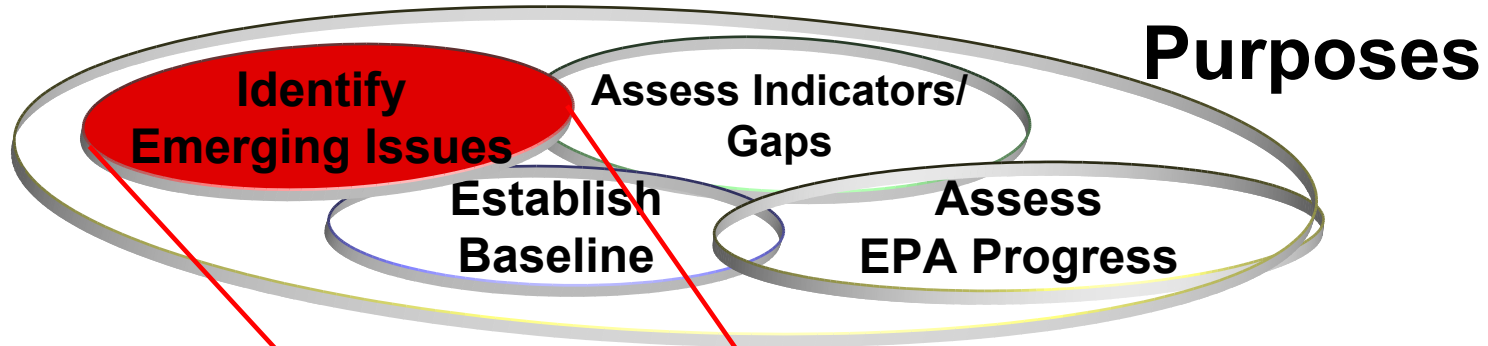
- Primary intent
- Primary audience

Clarification has substantial implications for research priorities

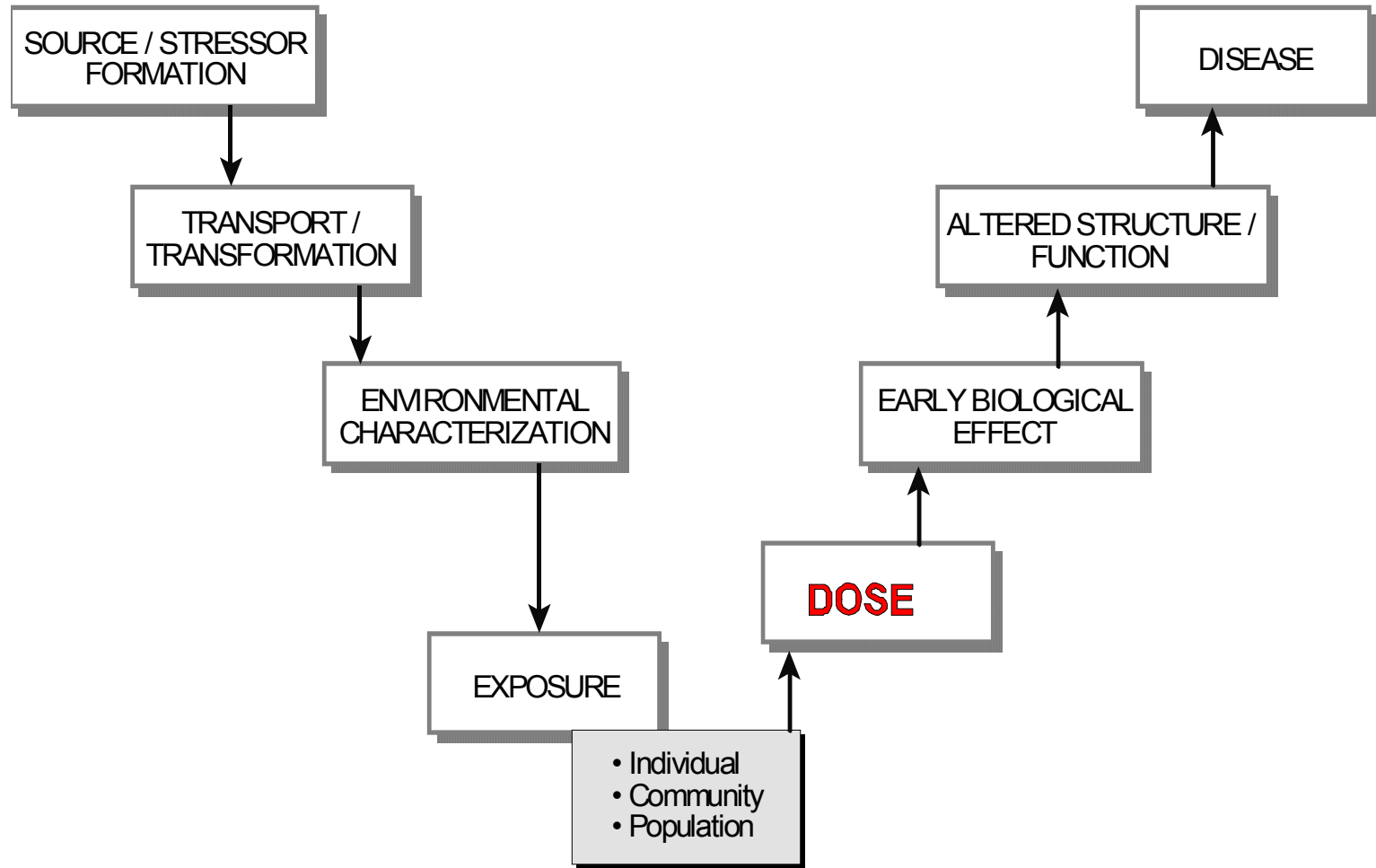






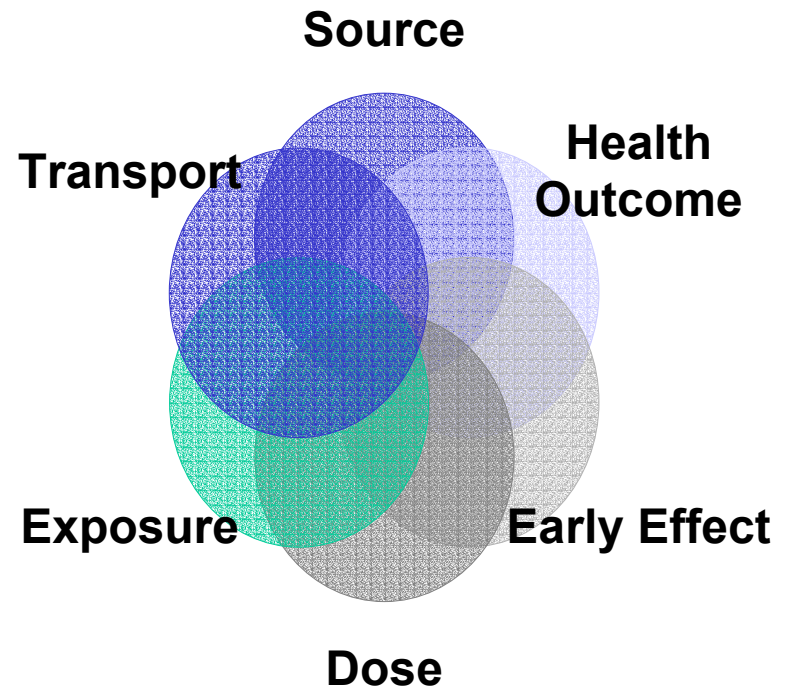
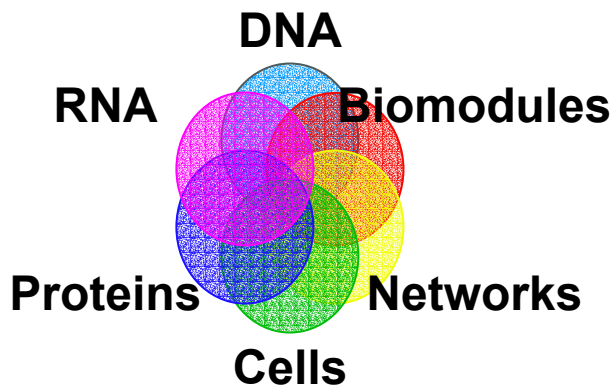
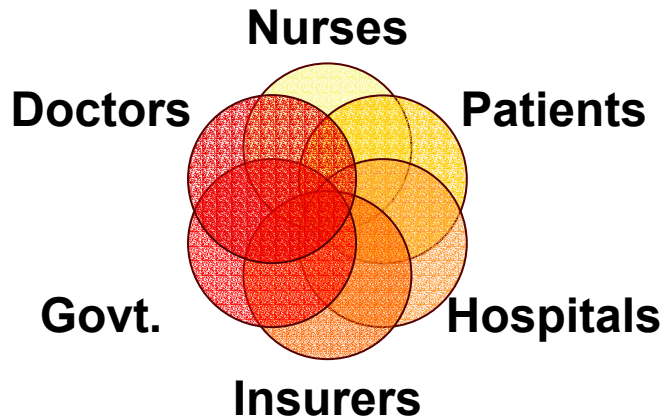


# Environmental Public Health Continuum





# Systems Approach to EPH



# ***Systems Approach to EPH***

## **What does it take to carry out a System Approach\***

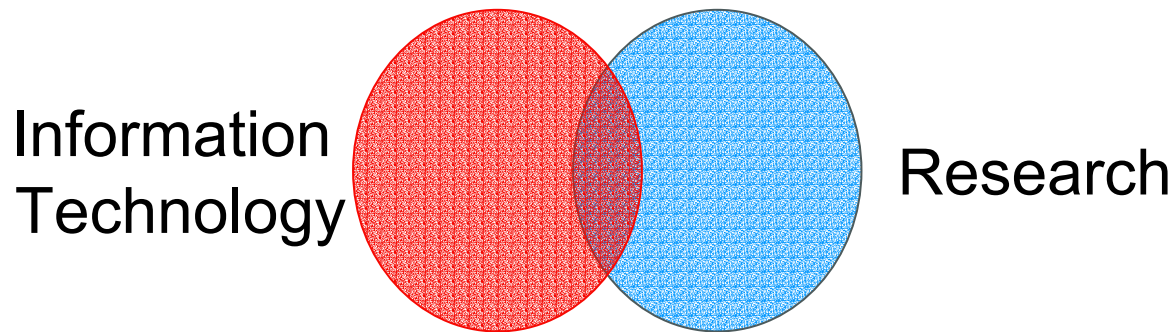
- **Integration of discovery science with hypothesis-driven**
- **Cross-disciplinary team to facilitate**
- **The development of new approaches/technologies integrated with data acquisition, storage, integration, and analysis tools**

**A major challenge is to give the technologists a deep understanding of public health and so forth**

\*Modified text from Institute of Systems Biology website ([www.systemsbiology.org](http://www.systemsbiology.org))



# *Building Blocks to the System*



# ***Beginning a Systems EPH : MOU Between HHS and EPA***

- **Advance efforts** to achieve mutual environmental public health goals
- **Strengthen bridge** between environmental and public health communities
- **Achieve better understanding** between environmental hazards, ensuing exposures and health effects
- **Cornerstone** is cross institutional initiatives to link environmental and health information sources, namely:
  - **EPA's National Environmental Information Exchange Network**
  - **CDC's National Environmental Public Health Tracking Network**



# National Environmental Information Exchange Network

Office of Environmental  
Information

[www.exchangenetwork.net](http://www.exchangenetwork.net)



RESEARCH & DEVELOPMENT

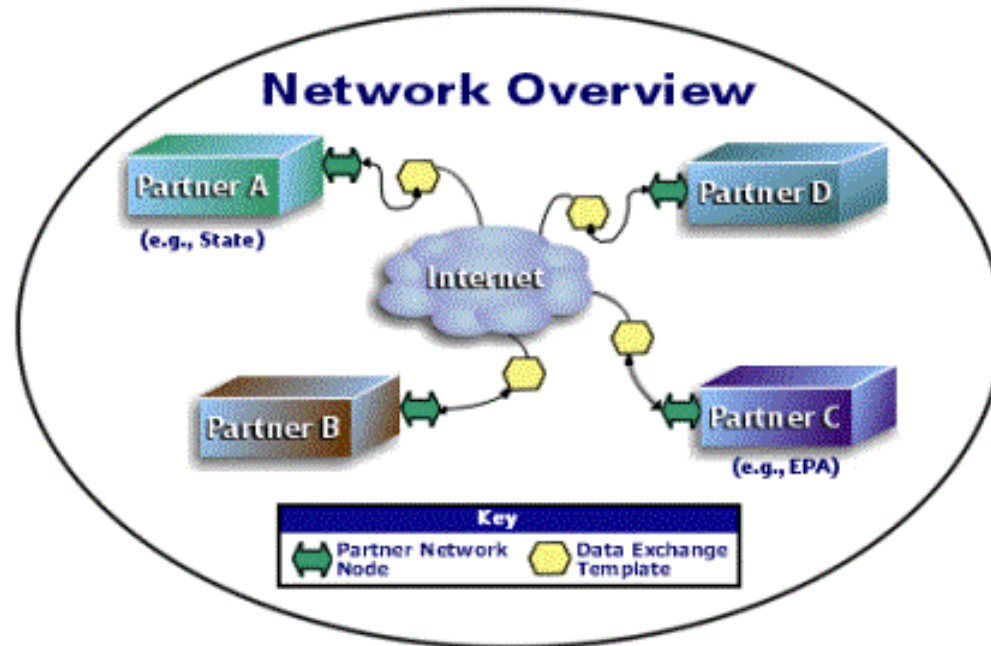
*Building a scientific foundation for sound environmental decisions*

# ***NEIEN Vision***

- States and EPA are committed to a **partnership**
- Build **locally and nationally accessible**, cohesive and coherent **environmental information systems**
- Ensure that both the public and regulators have **access to the information**.
- Sets the stage for the **broader exchange** of information between and amongst other State and/or federal agencies



# What is the Exchange Network?

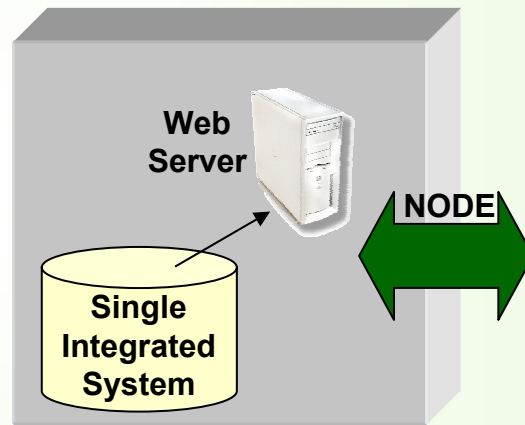
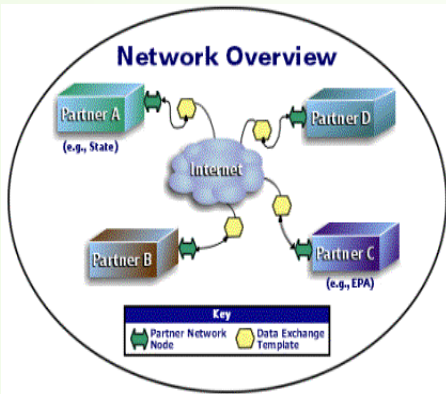


*An Internet and standards-based method for exchanging environmental information between partners.*



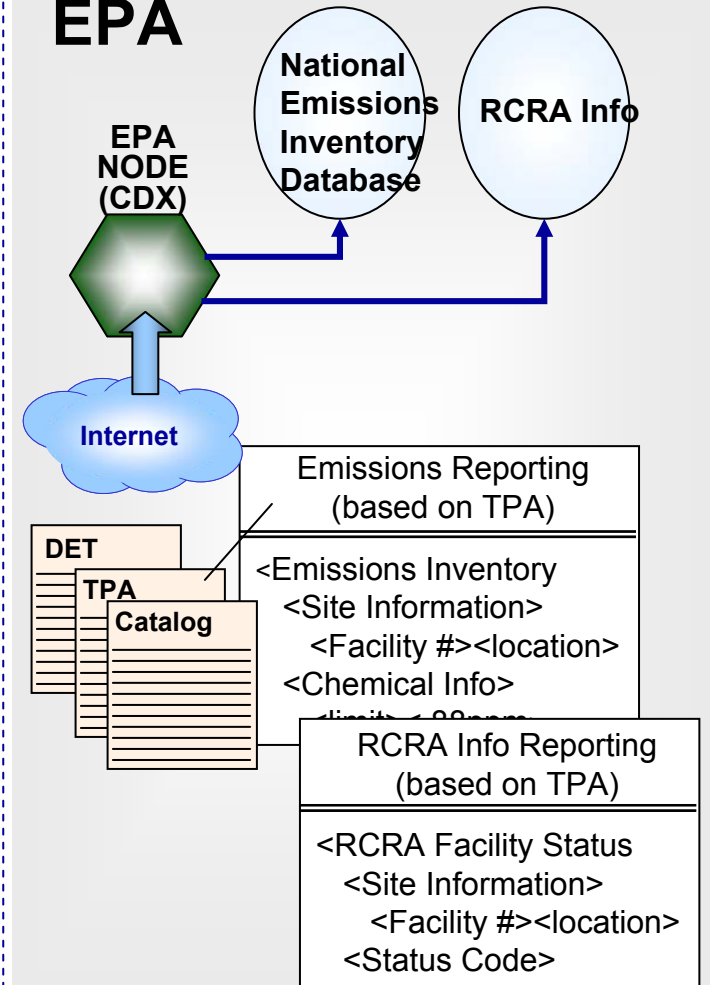
# How the Pieces Fit Together

## State Environmental Department



State systems may or may not be integrated.

## EPA





# ***CDC National Environmental Public Health Tracking Network***

## Mission Statement:

“....better prepared to develop and evaluate effective public health actions to prevent or control chronic and acute diseases **that can be linked** to hazards in the environment.”



# ***CDC National Environmental Public Health Tracking Network***

CDC's goal is to develop a national network that will:

- be standards-based;
- allow direct electronic data reporting and linkage within and across health effect, exposure, and hazard data; and
- interoperate with other public health systems



## ***Current EPA-CDC Dialogue***

- Ongoing Assessments of Environment and Data Health Needs
- Discussion of Potential Pilot Projects to Examine Specific Data Sets
- Information Exchange on Data Standards Technology and Architecture Structures
- Consideration of Pilot Applications Development



# Systems EPH: Potential Research Directions

Use of existing data bases

Linkage research

Multistressors attribution

The application of emerging science



# ***Use of Existing Data Sets***

- Desire spatial and temporal compatibility, yet systems were designed originally for different purposes
- Current systems may meet mandates but not public need
- Monitoring designs should be influenced by the health outcomes and populations that should benefit from the regulatory and public health actions
- Explore allowing greater state flexibility in monitoring?
- Tap new partners



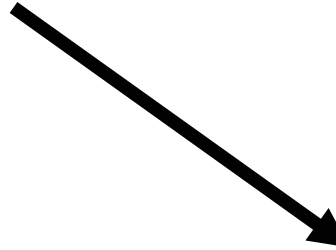
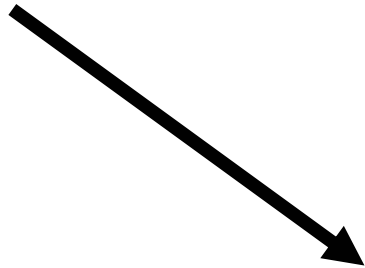
# Air Monitoring Requirements x Type of Epi Study

(Provided by Lucas Neas, Ph.D., ORD, U.S. EPA)

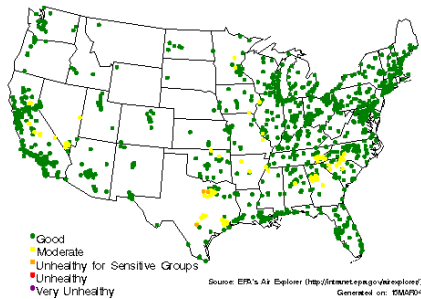
	<b>Unencumbered Open-Cohorts</b>	<b>Closed- Cohorts</b> (w/ repeated measures)	<b>Closed Cohorts</b> (analyzed for event timing)	<b>Closed Cohort</b> (analyzed for cum. Incidence)
<b>Frequency</b>	Daily	Hourly	Hourly	Monthly
<b>Duration</b>	Years → Decades	Weeks→Years	Years	Decades
<b>Geo. Scope</b>	Urban Centers	Limited	Urban Centers	U.S. Pop.
<b>Geospatial Detail</b>	County	Study Site	County	Regions



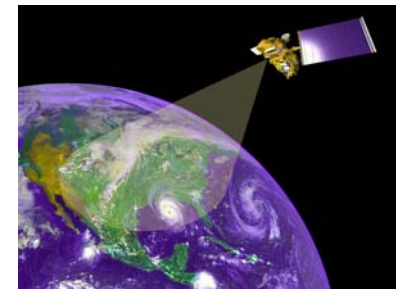
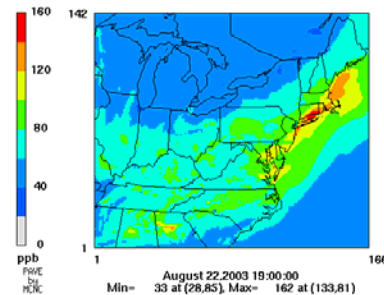
# Use of Existing Data Sets: New Partnerships in Characterizing Air Quality



Ozone AQI Values by site on 06/20/2003



Predicted Surface Ozone Concentrations (ppb)



Monitoring



Modeling



Satellite



RESEARCH & DEVELOPMENT

*Building a scientific foundation for sound environmental decisions*

# Systems EHP: Potential Research Directions

Use of existing data bases

## **Linkage Research**

The reality of multistressors

The application of emerging science



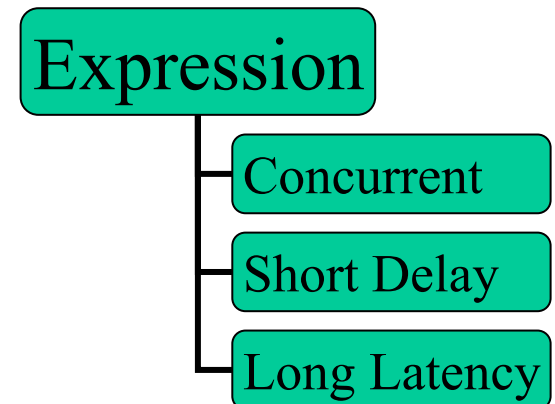
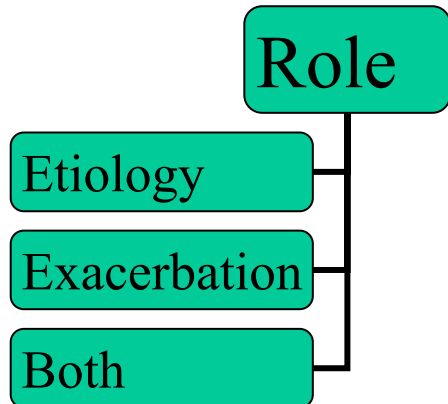
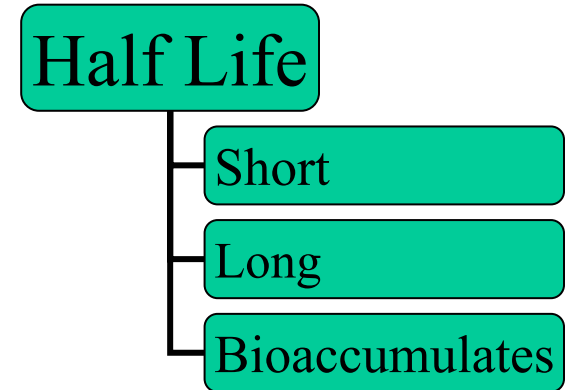
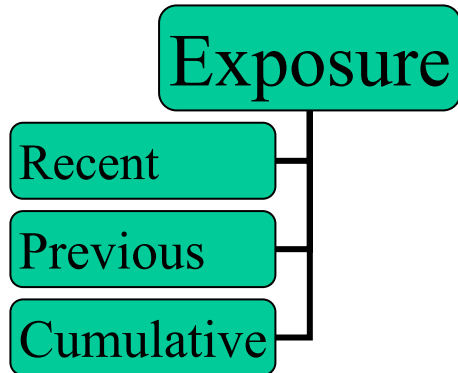


# ***CDC National Human Exposure Report***

- Spring, 2003 report presents levels on 127 chemicals
- Anticipates biannual report
- Over time, report will provide stable picture including exposure in certain subpopulations
- Challenge in translation of the data



# Complex Dynamics



	<b>TEMPORAL DIMENSION OF EXPOSURE</b>			
<b>Exposure Measure</b>	<b>Concurrent</b>	<b>Recent</b>	<b>Historic</b>	<b>Cumulative</b>
<b>Distance from source, e.g., agr field</b>	X	X	X	X
<b>Environmental sample, e.g., soil</b>	X	X		X
<b>Biological sample, e.g., urine</b>	X	X		X



# Systems EHP: Potential Research Directions

Use of existing data bases

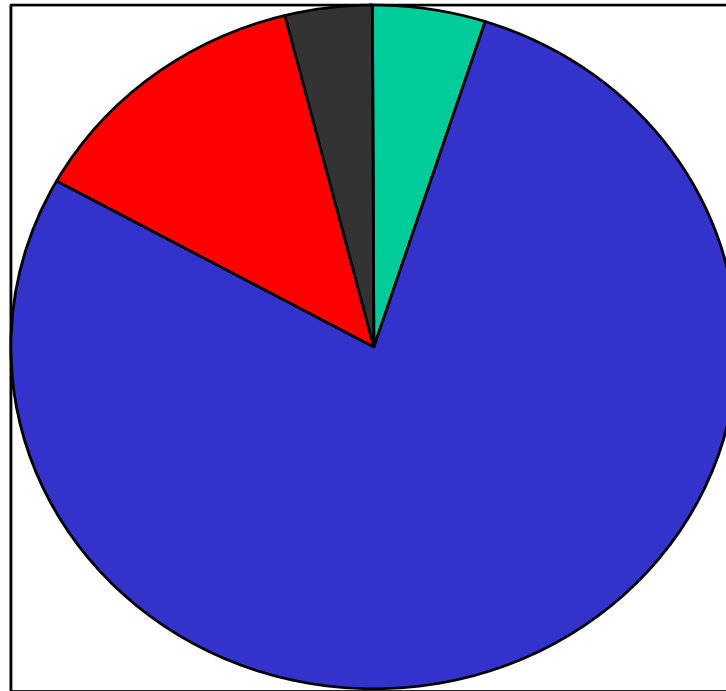
Linkage research

**The reality of multistressors**

The application of emerging science



# Multistressors for Pulmonary Disease



**■ Air Pollution ■ Smoking ■ Occupation ■ Genetics**



# Systems EHP: Potential Research Directions

Use of existing data bases

Translational research

The reality of multistressors

**The application of emerging technologies**



# *The Application of Emerging Science*

- Omics Revolution
  - Susceptibility
  - Partition multistressor contributions
  - Exposure fingerprints
- Information Technology
- Integrative Models



## ***Systems Approach to EPH***

This is the ambitious goal for Systems EHP, the quantitative study of processes as **integrated systems** rather than as isolated parts. In Systems EHP, traditionally separated scientific disciplines must be unified by quantitative models.\*

Systems EHP will under grid the emerging efforts to bridge the 30-year chasm between the environment and public health communities

\*Modified from the 3<sup>rd</sup> International Conference on Systems Biology  
<http://www.ki.se/icsb2002/about.htm>

