Adressing Airborn Environmental Risks: Integration of Science and Policy

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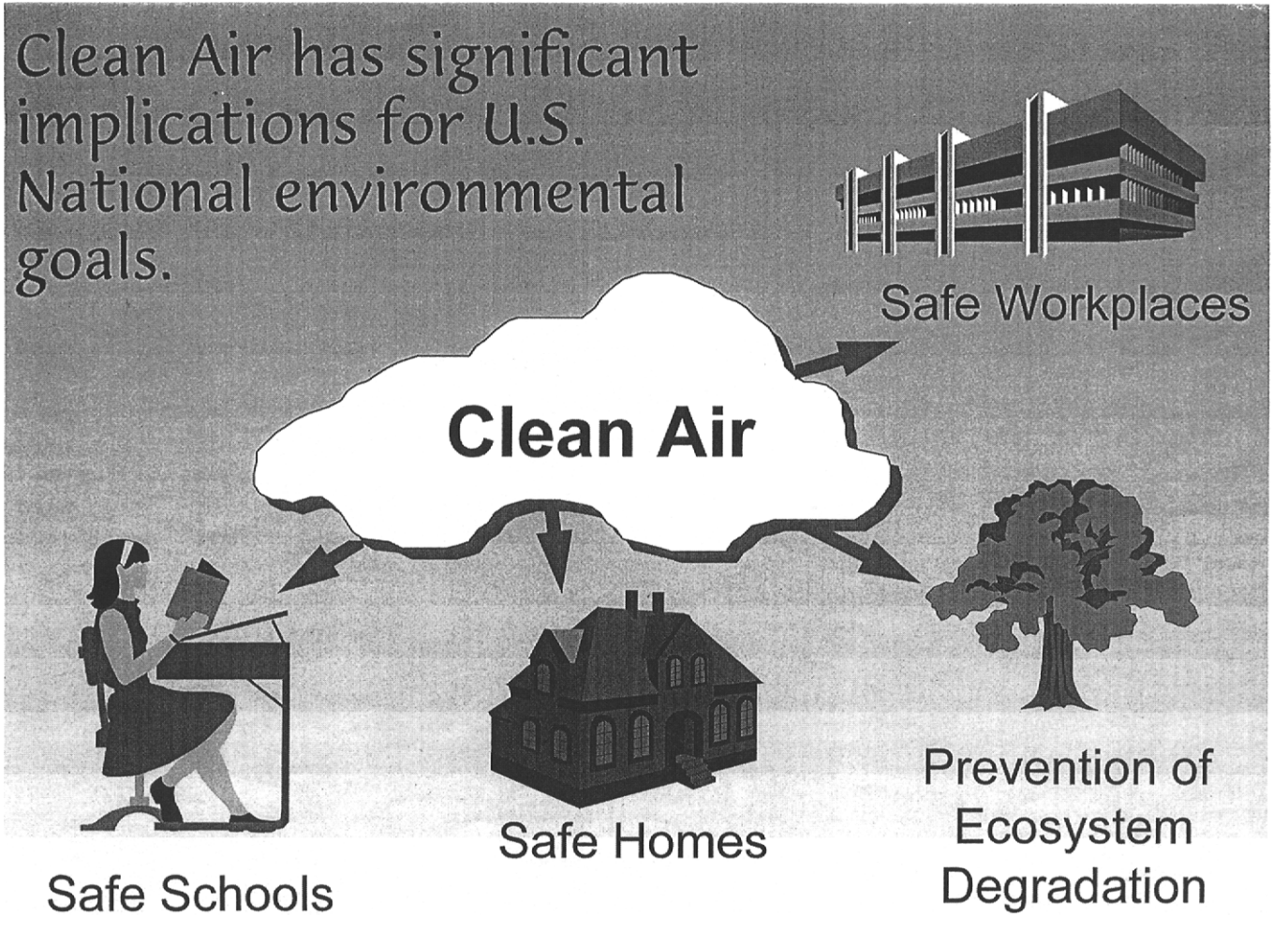

Clean Air has significant implications for U.S. National environmental goals.
Safe Workplaces
Clean Air
Safe Schools
Safe Homes
Prevention of Ecosystem Degradation

What is the nature of the Air Pollution problem?

- U.S. industrial base annually emits 2.7 million tons per year of toxic chemicals into the air.
- Mobile sources emissions are estimated to account for as much as 50% of the national volatile organic compound (VOC) emissions.
- An estimated 50 million people live within 6.5 miles of monitored sites or 1.25 miles of modeled facilities where concentration of one or more chemicals exceeded the health reference level.
- Evidence shows that children or individuals with pre-existing disease may be at particular risk due to increased sensitivity or greater exposure.
- Pollution stresses the health and sustainability o ecosystems.

Past approaches to Assessment/ Regulation have focused on single pollutant or simple classes such as:

- Air Toxics
  - → Benzene
  - → Lead
  - → PAHs
  - → Mercury
- Particulate Matter
- Tropospheric Ozone
- Indoor Air

Future Direction -- One Atmosphere Approach

Concerns to be addressed:

- Health and Ecological Effects of air pollution mixtures
- Integrated Modeling/Measurement of exposure, air quality characterization, and fate → transport → transformation
- Optimization of multi-pollutant risk management approaches

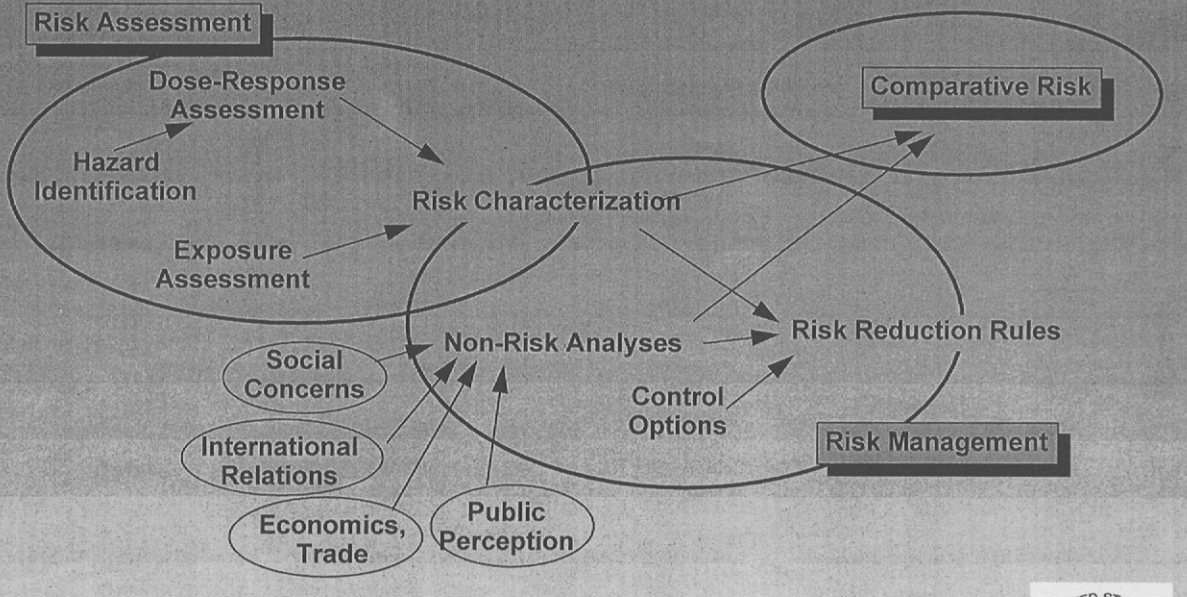
Example: Impacts of National Ambient Air Quality Standards (NAAQS) for O_3 and $PM_{2.5/10}$ and national reduction programs for acid rain and air toxics

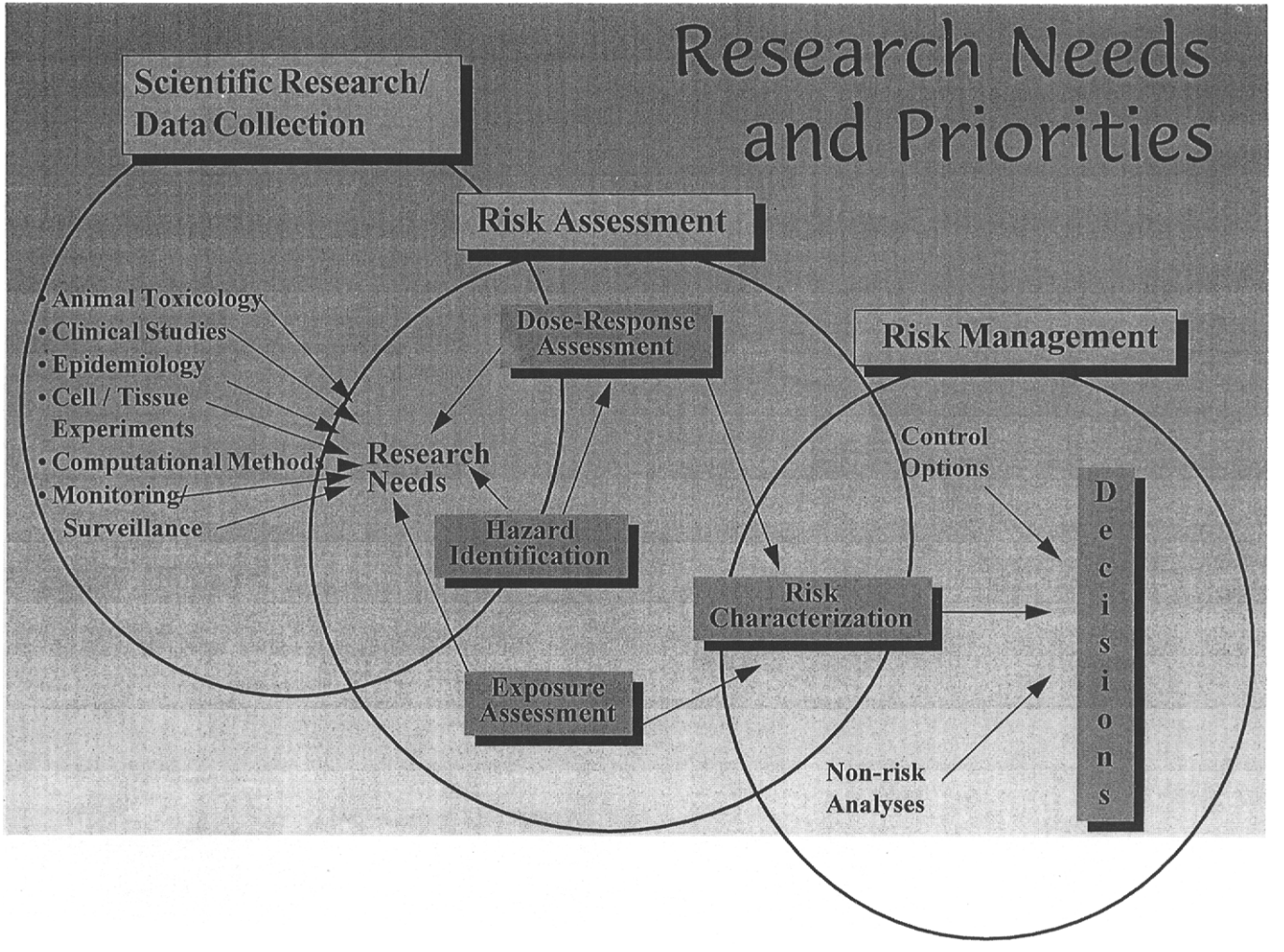
National Research Council (NRC) Perspective

"The quality of risk analysis will improve as the quality of input improves. As we learn more about biology, chemistry, physics, and demography, we can make progressively better assessments of the risks involved. Risk assessment evolves continually, with re-evaluation as new models and data become available."

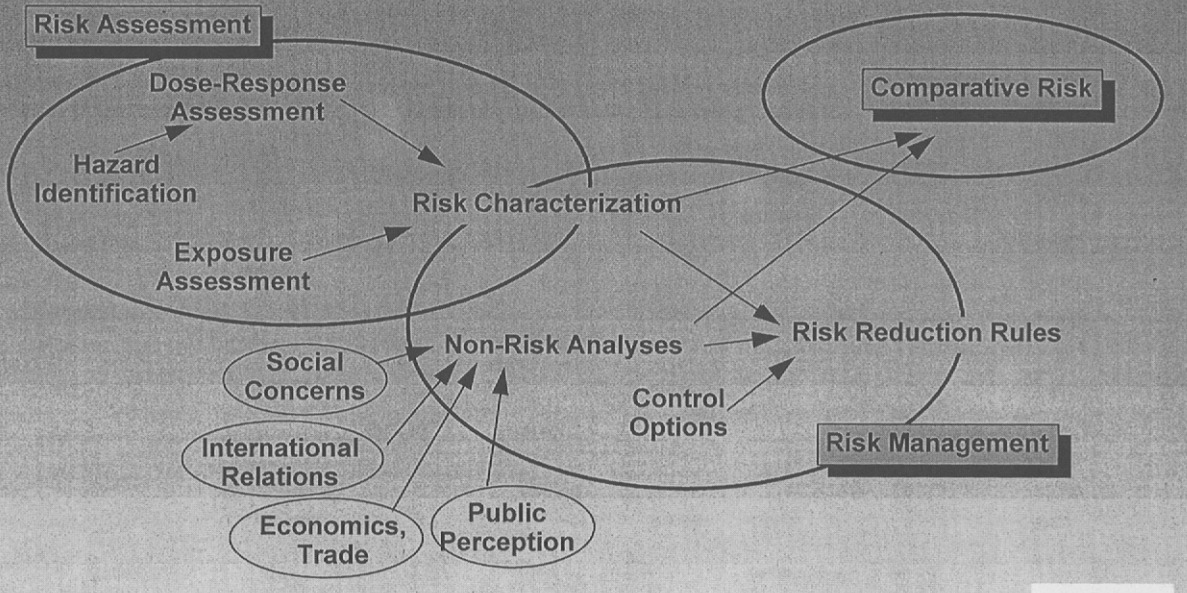
Science and Judgment in Risk Assessment (NRC, 1994)

Risk Assessment-Risk Management-Comparative Risk




Research Needs and Priorities
Scientific Research/ Data Collection
Risk Assessment
• Animal Toxicology
• Clinical Studies
• Epidemiology
• Cell / Tissue Experiments
• Computational Methods
• Monitoring/ Surveillance
Dose-Response Assessment
Risk Management
Research Needs
Hazard Identification
Control Options
Risk Characterization
Exposure Assessment
Non-risk Analyses
Decisions

Risk Assessment-Risk Management-Comparative Risk



Environmental Risk

Fields of Analysis

Risk Assessment

Nature of effects
Potency of agent
Exposure
Population at risk
- Average risk
- High-end risk
- Sensitive groups

Uncertainties of science
Uncertainties of analysis

Identify
Describe
Measure

Risk Management

Social importance of risk
De minimis or acceptable risk
Reduce/not reduce risk
Stringency of reduction
Economics
Priority of concern
Legislative mandates
Legal issues
Risk perception

Evaluate
Decide
Implement

Comparative Risk

Fields of Analysis

Science

Effects Compared

- Health to health
- Ecological to ecological
- Short-term to short-term
- Long-term to long-term
- Voluntary to voluntary
- Involuntary to involuntary

Ranking

- Actuarial *vs.* actuarial
- Forecasted *vs.* forecasted
- Quantitatively crude when estimated

Public Policy

Effects Compared

- Health to ecological
- Short- to long-term
- Voluntary to involuntary
- Global to national
- Economics & trade
- Public perception
- Public values

Ranking

- Actuarial *vs.* forecasted
- Policy based, qualitative

Summary --

- Clean Air means a healthier environment
- Research/Assessment/Management must move towards a "***One Atmosphere***" Approach
- Good communication requires clear messages regarding science, policy and its interface

Priority Research Directions in applying risk assessment to airborn environmental risks

- Variation in susceptibility
- Low dose risk estimation
- Effect of less than lifetime exposure
- Effects of multipathway/multichemical exposure
- Improved exposure assessment to reflect activity patterns, temporal variation, etc.

Uncertainties in applying risk assessment to airborn environmental risks

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