Strategies for Integrated Human and Ecological Assessment

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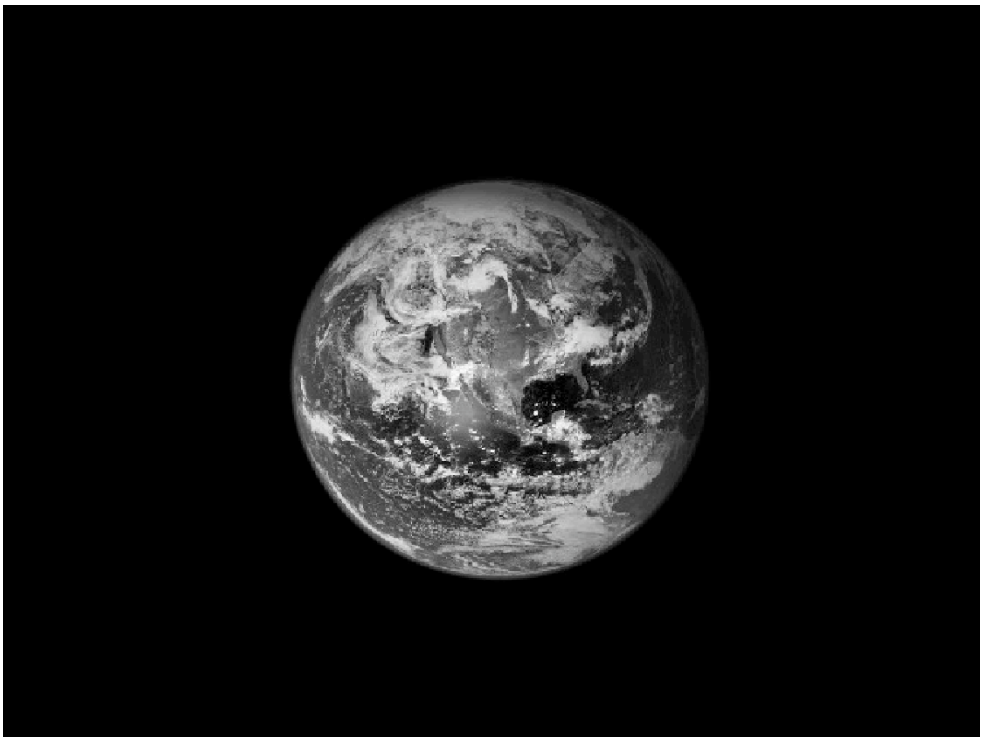
My Goals
and, I assume, yours

- Preserve and Protect the Environment
  - *Per se* and as a human habitat
- Good environmental decisions
- Good scientific input



Ground rules

Out of respect for hearing people on the phone, we'll break several times and ask for input from the team and questions from Mike and Jeff. But please no interruptions between those break points.

Integration is Imperative

- If scientists do not present a coherent and consistent assessment
- Decision makers will choose one result
  - Health or (rarely) Ecological
  - or ignore the science
- Stakeholders will be confused and will not accept the results
- Bad decisions will be made

A Tale of Three Piscivores

Other Benefits of Integration

Efficiency – less duplication of effort

Scientific Quality – the best science from ecologists and health scientists is used

Completeness – unconventional & indirect exposures and effects are revealed

Sentinels – nonhuman organisms are more exposed, can be sampled and are often more sensitive

Efficiency from shared information

- Common sources
- Common physical/chemical properties
- Common transport and fate processes
- Common exposure processes
- Common modes and mechanisms of action

It seems obvious but…

- Different approaches used to extrapolate from rats to humans and mink
- Different models used to estimate aquatic concentrations
- Separate searches for mammalian toxicity data
- Different plant concentrations in dietary models

A Tale of Two Plant Concentrations

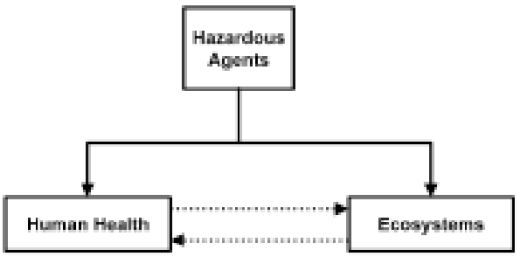
versus

$$C_{\mathrm{p}} = aC_s$$

HHRA & ERA should be Consistent

- Same or consistent scenarios
- Same or consistent assumptions
- Same or consistent spatial and temporal scales
- Comparable effects endpoints
  - Reproductive decrement in river otters and subsistence fishermen
- Same expression of probability and uncertainty

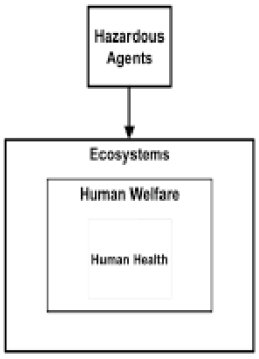
All these goals can be met by better communication and cooperation



Deeper Integration

- Requires a different view of the world
- Chemicals do not just make people sick
- The environment is not just a route of exposure
- Human welfare depends on services of nature
  - Not included in conventional risk assessments

Integrated World View



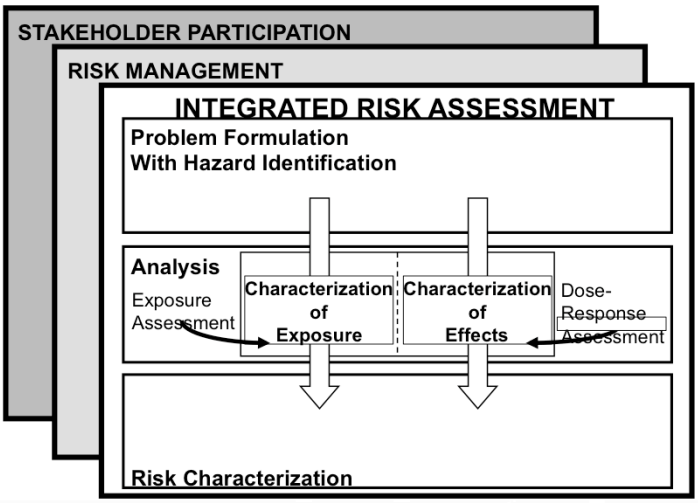
Examples

- Water, air, soil purification
- Food resources
- Aesthetic experiences
- Health benefits from experience of nature

Integrated Assessment Requires an Integrated Framework

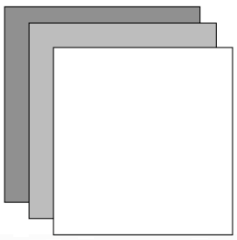
- The Integrated Risk Assessment Working Group
  - Collaboration of WHO/IPCS, OECD, EU, & U.S. EPA
- Goal: To promote integration of human and ecological risk assessment
- Developed a peer-reviewed framework
- Developed case studies

WHO Integrated Risk Assessment Framework

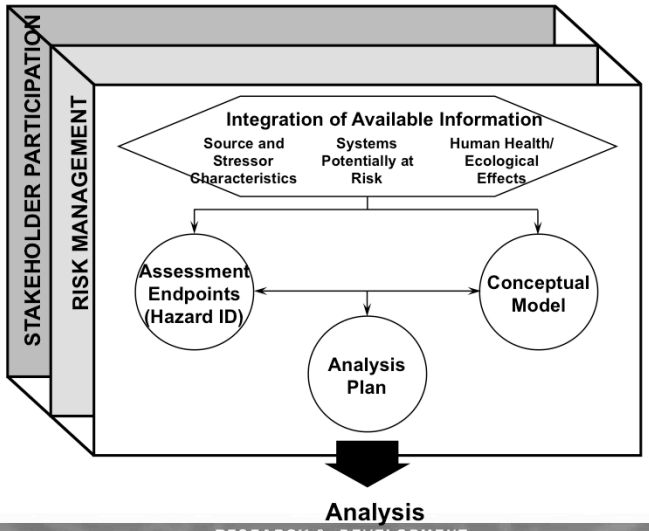


Encourages Interactions: Problem Formulation Stage

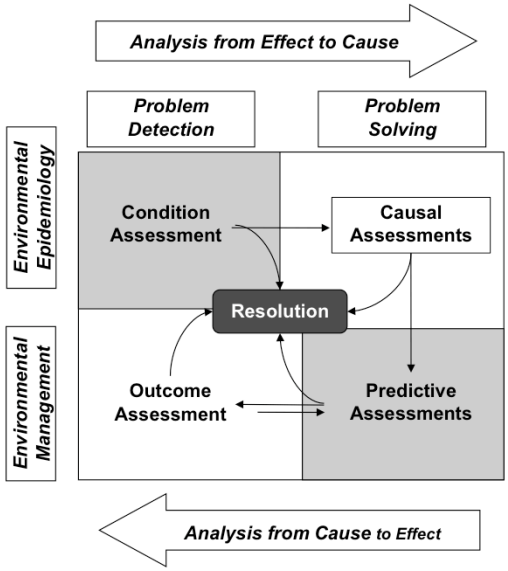
- Risk managers set goals for risk assessors
- Stakeholders raise issues and expectations
- Risk assessors clarify goals and issues



Common Problem Formulation Assures Compatible Results



A Fully Integrated EA Framework



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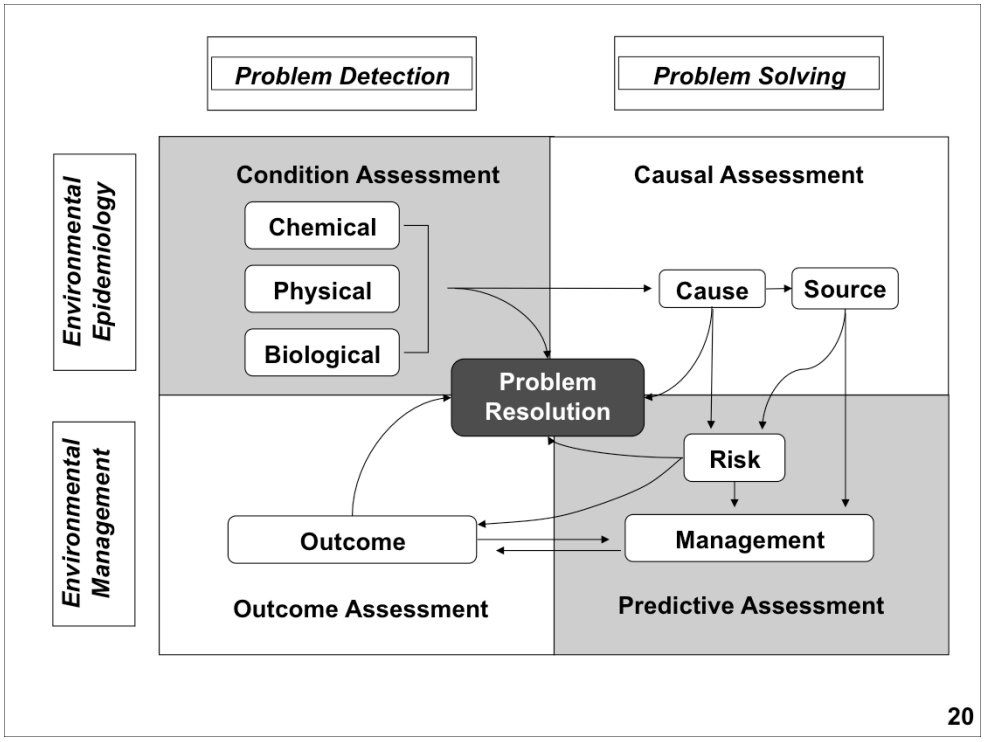
Problem Detection
Problem Solving
Environmental Epidemiology
Environmental Management
Condition Assessment
Causal Assessment
Chemical
Physical
Biological
Cause
Source
Problem Resolution
Risk
Outcome
Management
Outcome Assessment
Predictive Assessment
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Prospects

- Toxicology is becoming more mechanistic
  - Should encourage integration
  - Commonality at molecular level
- Environmental science is becoming more holistic
  - Place-based
  - Larger scales
- Both trends can promote HHRA/ERA integration and integration of types of assessment

Prospects

- U.S. EPA is moving toward integration
  - RAF's Cumulative Risk Assessment Framework
  - NERL producing integrated exposure models
  - NHEERL Wildlife Research Strategy
    - Has a human relevancy framework
  - NRMRL sustainable communities (Stella, MO)
  - Services of Nature Research Program
- But the EU is further along
  - REACH mandates integrated assessment
  - NoMiracle: research for integrated assessment
- Look forward to fully integrated environmental monitoring, assessment and decision making

Thank You

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