

Setting Environmental Management Priorities

Rethinking Risk Analysis

Christina Chociolko Simon Fraser & Queen's Universities

W.G.B. (Bill) Smith University of British Columbia

MANAGEMENT PROBLEM

- Need to allocate time, money and effort to resolving a broad range of environmental issues on an ongoing basis

Controversy About the Best Way To Set Environmental Priorities

- Hazard Screening Methods
 - Pollutant at a time
 - Site by site
- Comparative Risk Projects
 - Address a broader range of issues
(including chemicals)
- Cost- Benefit Analysis
 - Net present value of options

Why Attempts To Set Priorities Have Not Been Defensible

- Science is used to justify decisions taken for other reasons
- Jurisdictional and budgetary constraints are more important
- The participants have a stake in the status quo
- Methods used cannot be replicated
- The rationale for decisions cannot be communicated
- Priorities are set by experts
 - Laypersons view risk differently
 - Experts disagree about facts and their interpretation

Features of the Proposed Approach

- Goal Driven
- Process for reaching consensus
- Comprehensive - Deals with health concerns, ecological effects & socio-economic impacts
- Risk Based - Targets worst risks first
- Links Economic & Environmental Decisions
- Identifies action sensitive risks

Overview of the Priority Setting Process

STEPS

- **Goal Setting**
- **Scan & Scope for Issues**
- **Screen & Characterise**
- **Score & Rank**
- **Priority Setting**

ACTIONS

- Public input
- Aided by expert advisors
- Stakeholders select issues & appoint expert panels
- Peer-reviewed panel report
- Challenged by stakeholders

GOAL SETTING - the principles underlying the process

- Goals must be expressed in terms of social values
- fishable, drinkable, swimmable water
- Maintaining ecosystem integrity is the key to a sustainable future
- The boundaries of natural systems must be used to define issues
- A time frame of several generations must be used for decision making

STEP 1: SCAN & SCOPE FOR ISSUES

FRAMEWORK: Stress>Exposure>Response

First Sort: Emerging Concerns

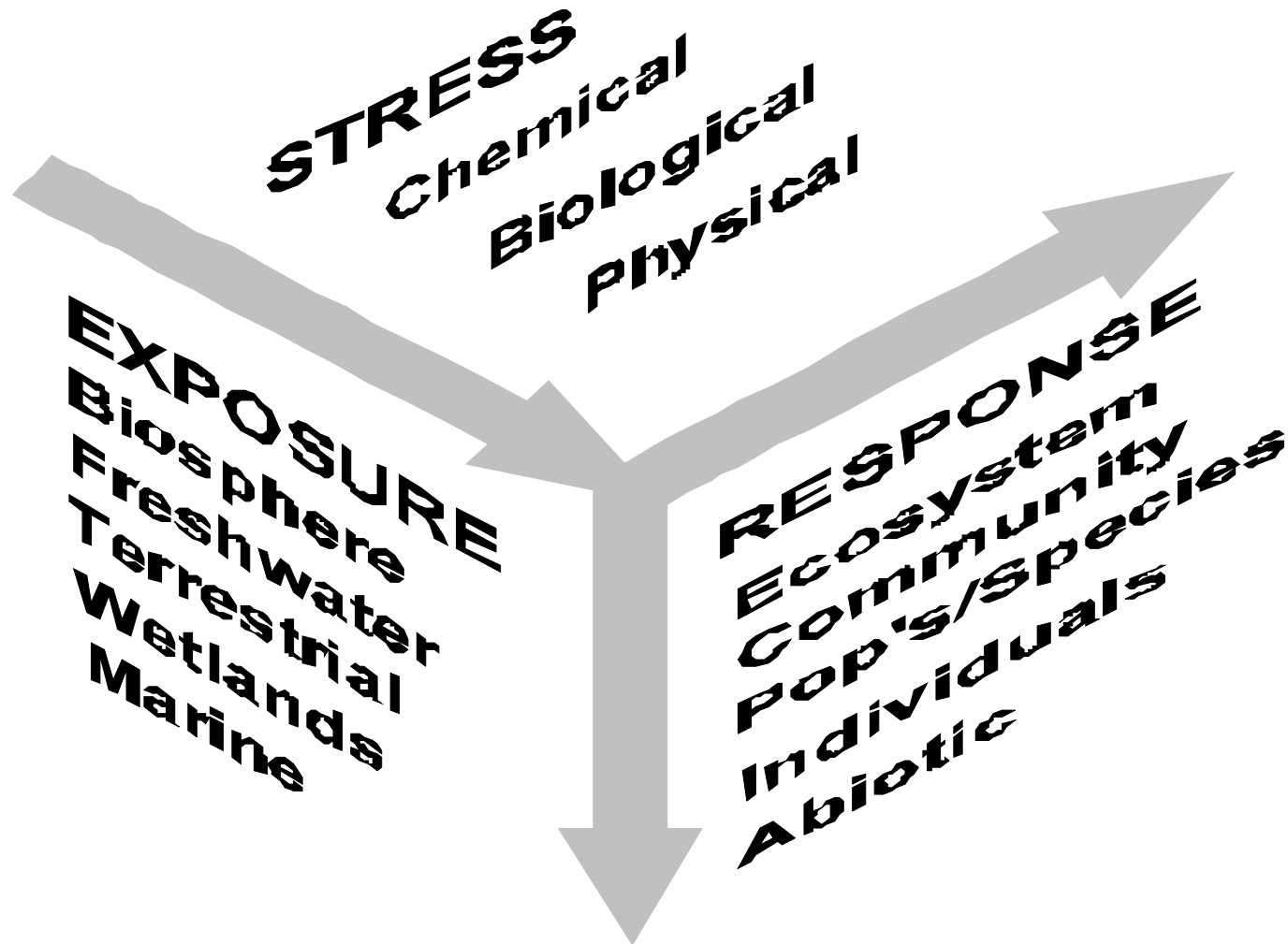
SCAN - Define Issues

- Define S-E-R relationships
- Test for potential threats

SCOPE - Bundles Issues for Decision Makers

- Compare and group
- Use matrix to identify linkages

A Framework for Environmental Issue Definition



Concerns originate with the

Public

- I want my children to be able to...!

Scientists

- There are excess levels of ... in ...!

Industry/Resource Managers

- Will our products/activities be viewed as harmful to ... ?

Concerns become Environmental Issues when they can be expressed as an

S-E-R relationship

- Stress
- Exposure
- Response

ISSUE

Clear-cut logging of forested areas is eliminating the habitat for many wildlife species

Test for potential threats to ecosystem integrity

- Definition of a threat
 - An **ACTIVITY** imposing
 - socioeconomic activities creating stress are increasing
 - a **STRESS** that results in
 - intensity and extent of stress will increase
 - a **RESPONSE** reducing ecosystem integrity
 - structural and functional changes will result

Issue Definition Matrix is Used to Examine Linkages Between Issues

Human Activity/ Natural Processes	Stressors	Exposure “Ecosystem”	Response(s) “Consequences”	Adaptation “Policy Responses”
<ul style="list-style-type: none">• Inputs• Processes• Point Sources• Products• Sinks	<ul style="list-style-type: none">• Chemical• Biological• Physical	<ul style="list-style-type: none">• Aquatic• Terrestrial• Marine• Urban	<ul style="list-style-type: none">• Human Health• Ecological• Socio-economic	<ul style="list-style-type: none">• Advisories• Standards• Technology• Regulations• Incentives

Step 2: SCREEN & CHARACTERISE

PROFILE - Activity-S-E-R-Adaptation Matrix

Second Sort: Issues

SCREEN- Develop Checklist of Significance

- Health, Ecological & Socioeconomic
- Public concern, Welfare of future generations

SELECT LIST OF ISSUES for decision making

CHARACTERIZE - Describe Issues

- Panel Selected to Compare Relative Risks

STEP 3: SCORING & WEIGHTING

- Third Sort - Risks.

SCORING - Use Comparable Descriptive Criteria for

- SEVERITY (S)
- MAGNITUDE (E)
- TREND (T)

Develop Weight of Evidence Scale to Rate

Current State of Knowledge $\Sigma (S \times E) \times T$

Severity

EFFECTS	SCORE	DEFINITION
Critical	8	Threaten Survival or Viability
Serious	4	Major Dysfunction
Adverse	2	Functional Change
Minor	1	Uncertain or Mild Effects

Examples of Comparative Risks

CRITERIA	Health	Ecological	Socio-Economic
Critical	Death	Habitat loss	Loss of natural capital
Serious	Disability	Biodiversity	Loss of income
Adverse	Illness	Food webs Env.media quality	Decline in productivity
Minimal	Discomfort	Sinks - buffering capacity	Activity levels decline

Magnitude of Effects

National/ Widespread	4	6	8
Regional/ Common	2	4	6
Local/ Rare	1	2	4
	Weeks/ Months	Years	Decades

Trend

TREND	SCORE	DEFINITION
Increasing	2.0	Substantial Increase
Evolving	1.5	Gradually Increasing
Static	1.0	Constant Rate of Change
Declining	.5	Dissipating

STEP 4: CLUSTER & RANK

- Fourth Sort: Priorities

RANK - issues will increase, remain the same or decrease in severity and magnitude through time

- OPTIONS

- Use raw scores (0-N)
- Normalize scores (0-100%)
- Determine breakpoints (Lo-Md-Hi)
- Select ordered combinations (1-9)

- FLAG ISSUES - draw concerns to decision takers attention - Ownership, Ability to Manage, Uncertainty

Allocate Resources to Portfolio of Response Strategies

- Manage
 - Consensus about the level of urgency, sequence and timing of action
 - Know where to focus efforts
 - Relative risk reduction
 - Cost-effective action
- Assess - Monitor & Review
- Research - Reduce Uncertainties

Merits of the Approach

- Recognizes the legitimate role of expert judgement
- It makes explicit the value judgements behind the facts
- Provides a framework within which experts can speculate about the facts
- Frames and gauges the relative importance of issues in terms that policy makers and the public can understand

Reasons for Resistance

- Would reallocate resources
- Some issues may be dropped
- Limits managerial and scientific discretion
- Requires stakeholders to take responsibility for the risks they produce
- Moves the debate beyond the facts
- Open to public challenge

Challenges for Risk Analysts

- Risk analysts are more comfortable coming up with quantified estimates of what we already know and understand well
- In policy making the real problem is how to deal with a complex set of demands, many of which are not well known or understood
- Let's develop the ways and means of providing proactive advice