

SUSTAINABILITY

Bernard D. Goldstein, MD
University of Pittsburgh



Overview of presentation

- National Research Council Report on Sustainability at EPA
- Relation of Sustainability to “Closure for the Seventh Generation”
- Interface between Sustainability, Resilience and Human Health

Three Overlapping Phases in the Past, Present and Future of Environmental Management

- 1) Command and Control
- 2) Risk Assessment / Risk Management
- 3) Sustainability and Resilience



Definitions of Health and Sustainability

- “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.”
 - World Health Organization
- “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”
 - Brundtland Commission of the United Nations, 1987

Resilience

- Resilient human communities anticipate risk, limit impacts, recover quickly and successfully adapt when faced with adverse events and change

SUSTAINABILITY VS RESILIENCY

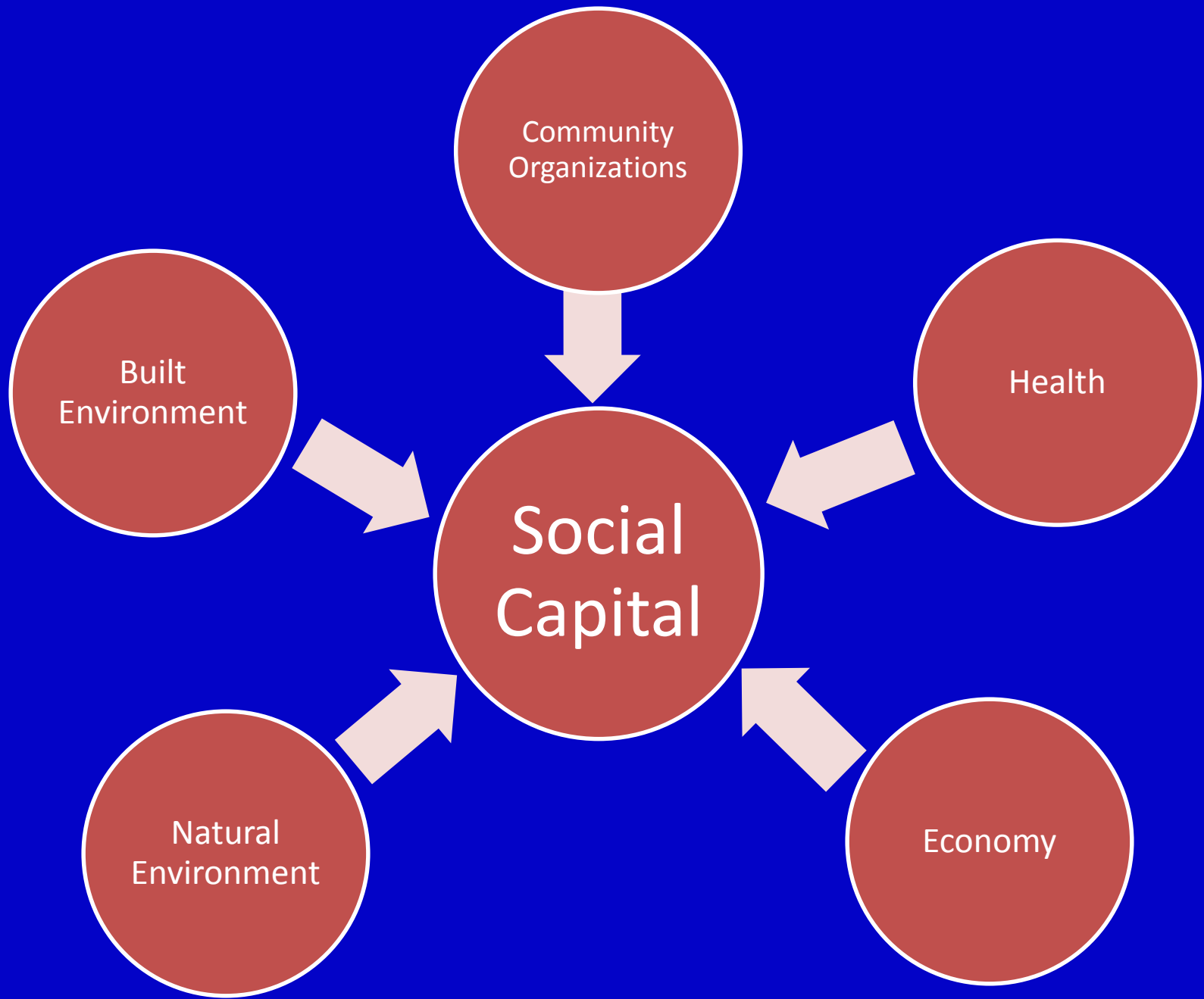
Is the glass half full or half empty?

FOR SUSTAINABILITY: The glass is twice as large as it needs to be

FOR RESILIENCY: The glass needs to be larger than half size

BUT HOW MUCH LARGER?

Sustainability Targets	Key Determinants	Trajectory
Adult Humans	Aging	Downhill (Death Inevitable)
Terrestrial Biomes	Human Activities	Downhill, but Potentially Reversible
Communities	Social Capital	Multi-Directional



- Some sources of variability/change for which increasing resilience can mitigate adverse effects are not controllable at the source by humans (e.g., sunspots, hurricanes, earthquakes).

But others are (e.g., oil spills)

- In public health speak: an incident is not an accident





Gulf State Health Indicator Rankings

	Poor or fair health	Low birthweight	Adult smoking	Adult obesity	Uninsured
Alabama	47	48	43	49	29
Florida	31	36	27	18	49
Louisiana	46	49	40	49	41
Mississippi	50	50	47	50	44

COREXIT 9500 MSDS: NALCO

(edited)

2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous:

<u>Hazardous Substance(s)</u>	<u>(w/w)</u>
- Distillates, petroleum, hydrotreated light	10.0 - 30.0%
- Propylene Glycol	1.0 - 5.0%
- Organic sulfonic acid salt (Proprietary)	10.0 - 30.0%

Top 6 stressors in PA residents who believe their health has been affected by shale gas activities.

Stressor	Session 1 (n=33)
Denied or provided false information	79%
Corruption	61%
Concerns/complaints ignored	58%
Being taken advantage of	52%
Financial damages	45%
Noise pollution	45%

Ferrar, K. J., Kriesky, J. K., Christen, C. L., Marshall, L. P., Malone, S. L., Sharma, R. K., Michanowicz, D. R., Goldstein, B. D., (2013). Assessment and longitudinal analysis of health impacts and stressors perceived to result from unconventional shale gas development in the Marcellus Shale region. *International Journal of Occupational and Environmental Health*.

Social Amplification of Risk

- Major Determinants
 - Familiarity
 - Trust

Risk Assessment

- Hazard Identification
- Dose response evaluation
- Exposure assessment
- Risk characterization

Cumulative Risk Assessment

- Cumulative risk assessment was originally intended to integrate across all of the chemical risk factors to which an individual is exposed and through all of the pathways of exposure
- As such, it was seen as particularly relevant to environmental justice issues
- More recently, a large body of evidence has shown that lifestyle, social and behavioral factors moderate an individual's response to chemical exposures

Olden Hypothesis

- The epigenome can be used as a biosensor to monitor cumulative effects of exposure to multiple chemical and non-chemical stressors over the life course.

Both Chemical and Non-Chemical Stressors can Induce Epigenetic Changes in DNA and Chromatin

Non-Chemical

- Psychosocial Stress
- Famine
- Poverty
- Maternal grooming
- Exercise
- Noise
- Health care
- Nutritious food

Chemical

- Arsenic
- Cadmium
- Lead
- Methylmercury
- Motor vehicle emissions
- Cigarette smoke
- Bisphenol A
- Ozone
- Benzene
- DDT

ABOUT THE NATIONAL ACADEMY OF SCIENCES

...the Academy shall, whenever requested by any department of the Government, investigate, examine, experiment and report upon any subject of science...

1862 Act of Incorporation, signed by Abraham Lincoln

With this work, Congress established the National Academy of Sciences in 1862 as a private, non-profit corporation. Given its membership in the Academy was that, and all members would have to be foreign or native-born, and to have distinguished themselves in the fields of Agriculture, Commerce, Engineering, and the Arts, Sciences, and Professions. We bring the latest news, research, and information leaders in the scientific, technological, and health communities, including members of the National Academy and members of National Academies of Science and Engineering.

Today, the responsibility for providing independent advice to the government is shared by these three organizations and the Government Research Council. Each year, members of the Academies conduct independent scientific inquiries and other reports, consider the best ways to solve together our most difficult problems, and advise the President, Congress, and the public on some of the most important and difficult issues of our time.



One of the first National Academies of Sciences studies was commissioned to improve the performance of cannons in our ships.

The National Research Council and the Institute of Medicine produce more than 200 reports each year using scientific evidence to make recommendations about many of the nation's most pressing issues. The audience for these recommendations are the report's policymakers and the general public. Some examples of reports are displayed on the panels to your left and right.

These reports are increasingly influential, often catalyzing new federal policies or initiating new improving existing programs. High standards and a reputation for independence and objectivity help to give the reports their unparalleled credibility, leading weight to their conclusions and recommendations.

In addition to writing these reports, we also publish scientific publications and popular books. And we have many events that bring together scientists, policymakers, and the public from the United States and abroad. Please be ready to share reports and news is provided through our Web site at www.nationalacademies.org.



These reports also have been used to improve the design of our ships.



Sustainability and the U.S. Environmental Protection Agency

- A committee under the Science and Technology for Sustainability Program conducted a study at the request of the U.S. Environmental Protection Agency's (EPA's) Office of Research and Development to help define efforts to incorporate sustainability concepts into agency programs
- This study builds on existing sustainability efforts in EPA by strengthening the analytic and scientific basis for sustainability as it applies to human health and environmental protection within the agency's decision-making process

Sustainability and the U.S. Environmental Protection Agency

The consensus report answers the following questions:

- What should be the operational framework for sustainability for EPA?
- What scientific and analytical tools are needed to support the framework?
- How can the EPA decision making process rooted in the risk assessment/risk management (RA/RM) paradigm be integrated into this new sustainability framework?
- What expertise is needed to support the framework?

Why Now?

- Current and emerging problems are more complex and challenging
- Sophisticated tools are becoming increasingly available to address these complex problems
- Sustainability is becoming a common approach to address broader economic, social and environmental issues
- Sustainability improves the competitiveness of the United States through consideration of economic and social issues in environmental protection

DEFINITION

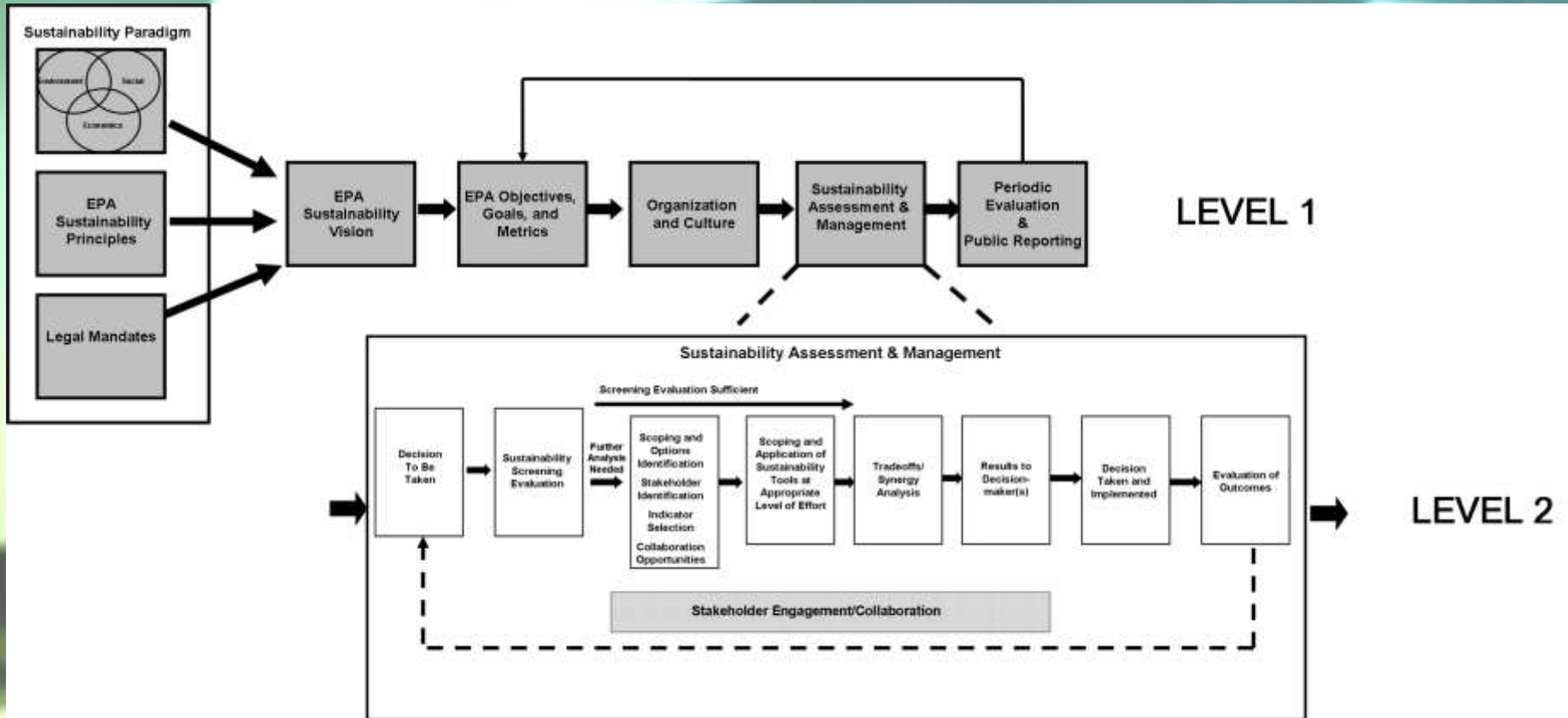
The committee did not devote significant time to defining sustainability. It noted that the description of environmental goals in the 1969 National Environmental Policy Act (NEPA) was fully consistent with sustainability. Support for these goals has been repetitively reaffirmed, including Executive Order 13514, where sustainability is defined as:

Sustainability: to create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations (NEPA 1969; Executive Order 13514, 2009).

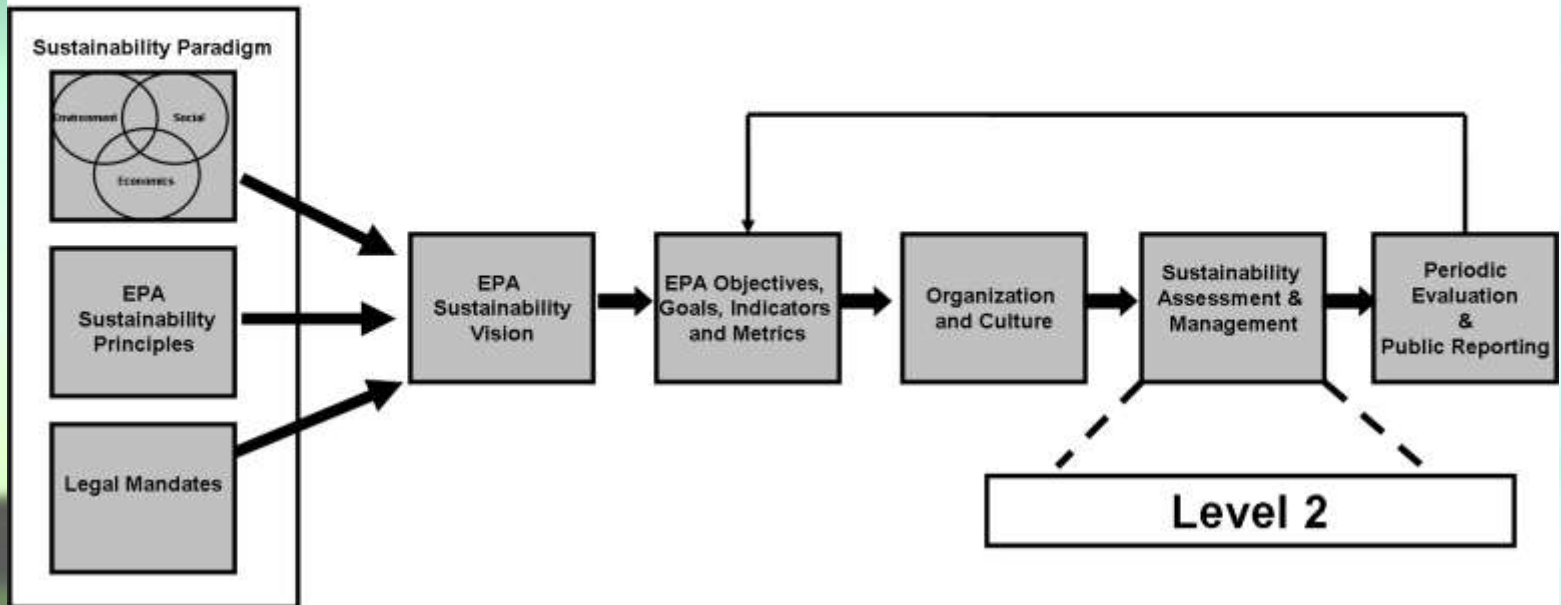
APPROACH TO TASK

- Sustainability is a Process and a Goal
- Staged and programmatic implementation – will lead to accelerated programs and to a growing body of agency successes and experiences with sustainability
- Sustainability Framework Level 1:
Components that define the agency-wide process
- Sustainability Framework Level 2: Elements of Sustainability Assessment and Management (SAM)

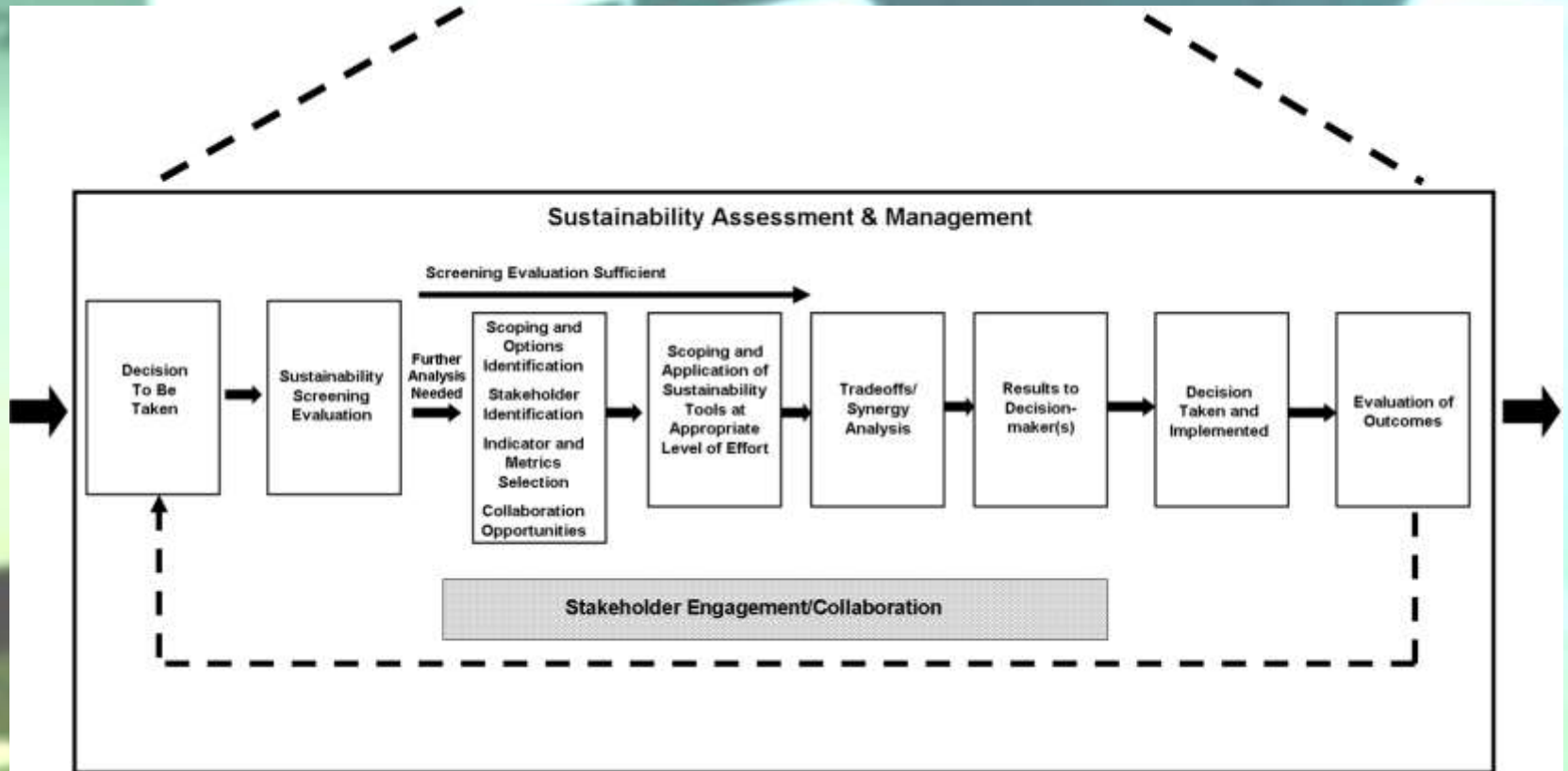
Sustainability Framework



Sustainability Framework Level 1



Sustainability Framework Level 2



EXAMPLES OF TOOLS

- Risk Assessment
- Life-Cycle Assessment
- Benefit-Cost Analysis
- Ecosystem Services Valuation
- Integrated Assessment Models
- Sustainability Impact Assessment
- Environmental Justice Tools
- Present and Future Scenario Tools

TRADEOFF AND SYNERGY ANALYSIS

- Tradeoff and synergy – key element of SAM
- The objective is to maximize synergies (social, environmental, and economic benefits of a decision) and to minimize the adverse effects of conflicts among the three pillars
- Important for EPA to establish a systematic way to analyze and quantify alternatives
 - e.g., spatially explicit models of multiple ecosystem services and biodiversity, Polasky, 2011
- Analysis can be used to identify new strategies that may improve results for key objectives

EXAMPLE OF A POSSIBLE TOOL

Gibson Guidelines for Approaching Tradeoff Analysis*

Trade-off decisions must not compromise the fundamental objective of net sustainability gain

- Maximum net gains
- Burden of argument on trade-off proponent
- Avoidance of significant adverse effects
- Protection of the future
- Explicit justification
- Open process

*Gibson, R. 2006. Sustainability assessment: Basic components of a practical approach. IAPA 24(3):170-182.

APPROACH TO TASK

The committee examined the benefits, where EPA has statutory authority and discretion in regulatory and non-regulatory programs, of building sustainability considerations into its administration of these statutes. Because EPA did not request that the committee address laws pertaining to EPA or to organizational and institutional aspects of the agency's operations, the committee did not examine these topics

SUMMARY

- EPA SHOULD SEEK WAYS TO MAXIMIZE BENEFIT WHILE MINIMIZING RISK

from:www.fractracker.org

