



SUSTAINABILITY

and the

U.S. Environmental Protection Agency

The National Academies

The Academies

- **To advance science and technology**
- **To advise government and the nation**
 - On policy for advancing science, engineering and medicine
 - On applications of science, engineering, and medicine to policy issues

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

Over the years, Congress established the National Academy of Sciences in 1862 as a private, non-profit corporation. One of its members in the Academy was the first and only member to hold two key American scientific positions: the National Academy of Sciences and the National Academy of Engineering and the Institute of Medicine. It is giving the nation more resources and scientific leaders in the fields of technological and health innovation, including research, education, careers and reports. It's the National Academy of Sciences and of Technology.

Today, the responsibility for providing independent advice to the government is shared by both these organizations and the National Research Council. Each one has a history of the world's most knowledgeable scientific experts and other reports, research that help to solve together an important challenge to the National Academy of Sciences and the reports in some of the most important work of our time.



One of the first National Academies of Sciences studies was commissioned to design the preliminary of satellites in the 1950s.

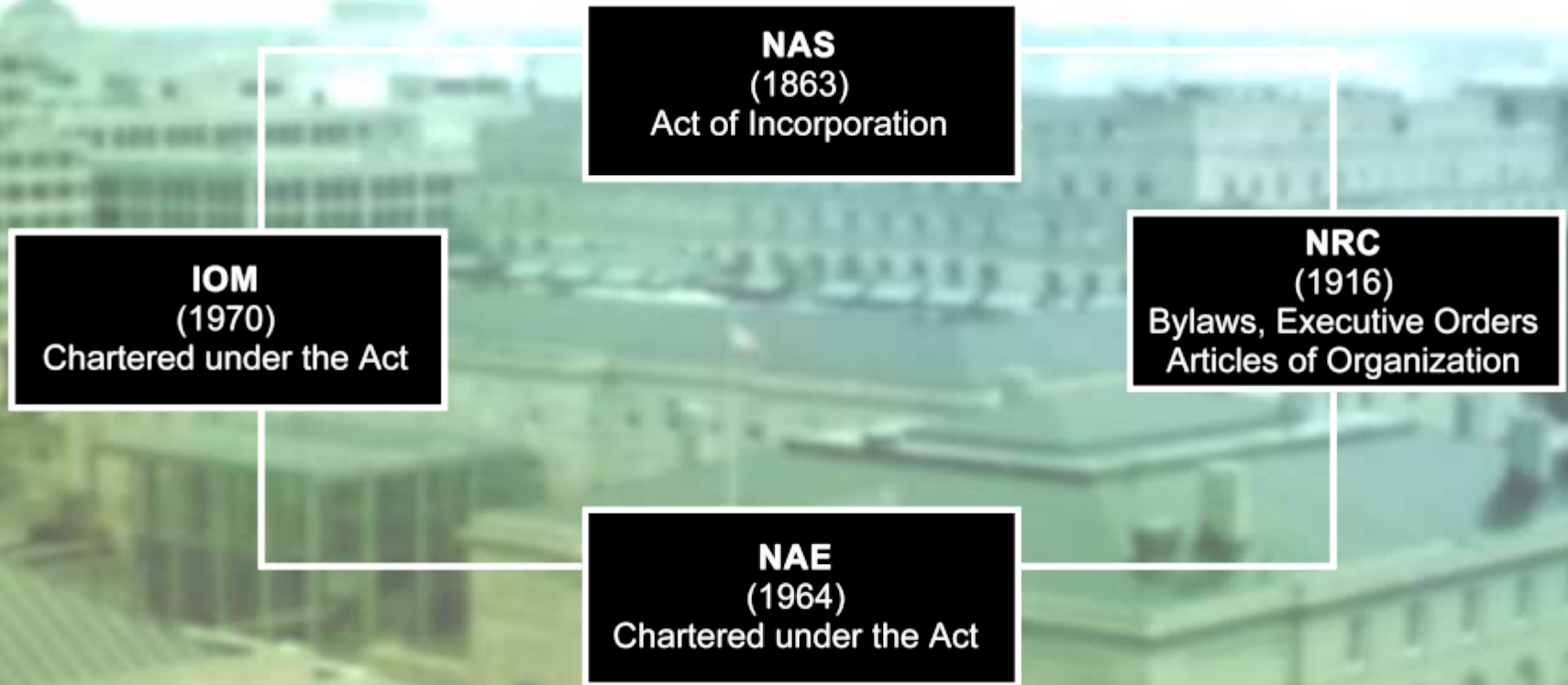
The National Research Council and the Institute of Medicine produce more than 200 reports each year using scientific evidence to make recommendations about many of the nation's most pressing issues. The audience for these recommendations are the nation's policymakers and the general public. Some examples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

These reports are increasingly influential, often catalyzing new federal policies or influencing state 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, to nearly all of these reports and events is provided through our Web site at www.nationalacademies.org.



The NAS, NAE, IOM & NRC



METHODS OF OPERATIONS

- **Consensus studies**
 - Balance and composition of committees
 - Report review
- **Convening activities**
 - Workshops
 - Roundtables
- **Operational programs**
 - Fellowships and associateships
 - Research and surveys
 - Education and training
 - Data banks

UNIQUE STRENGTHS

- Stature of Academies' memberships
- Ability to get the very best to serve
- “Pro Bono” nature of committee service
- Special relationship to government
- Quality assurance and control procedures – peer review
- Reputation for independence and objectivity

Science and Technology for Sustainability Program

Policy and Global Affairs Division

- Encourage the use of science and technology to achieve long-term sustainable development
- Goal: to contribute to sustainable improvements in human well-being by creating and strengthening the strategic connections between scientific research, technological development, and decision-making
- The program concentrates on activities with the following attributes:
 - Cross-cutting in nature, requiring expertise from multiple disciplines
 - Important both in the United States and internationally
 - Effectively addressed via cooperation among multiple sectors, including academia, government, industry, and NGOs

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 will answer 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?

Sustainability and the U.S. Environmental Protection Agency

- Develop a framework for EPA to solve complex environmental challenges through a more integrated, systems approach
- Similar to the 1983 NRC report Risk Assessment in the Federal Government
- Will define for EPA a recommended framework that will then be scaled up under the broader NRC study, Sustainability Linkages in the Federal Government (“Linkages”) to develop a decision framework to help all federal agencies examine the consequences, tradeoffs, synergies, and operational benefits of sustainability-oriented programs

Sustainability and the U.S. Environmental Protection Agency

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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, 1 of 2

- 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) component

Approach to Task, 2 of 2

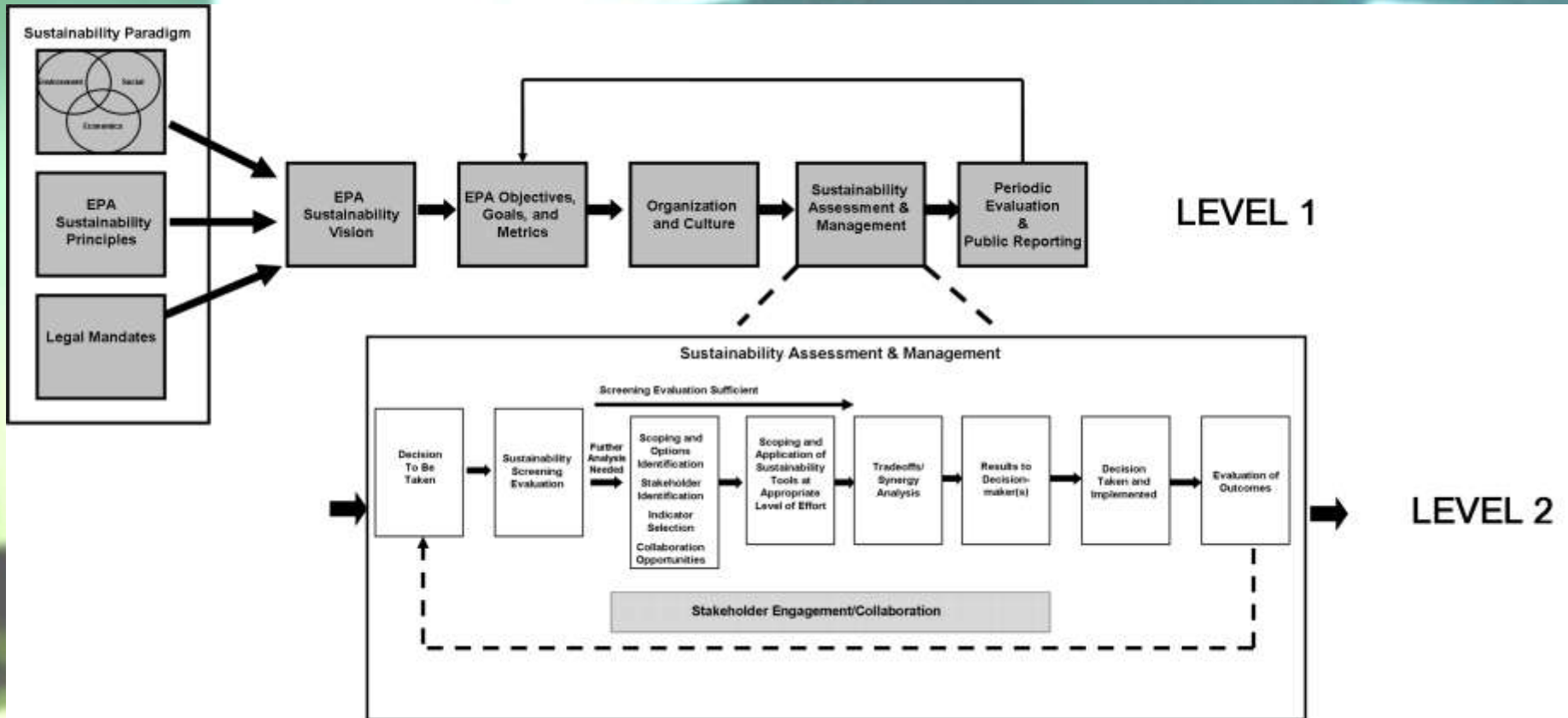
- The committee examined the benefits, where EPA has statutory authority and discretion in regulatory and non-regulatory programs, of building sustainability considerations into its administration of these statutes. Because EPA did not request that the committee address laws pertaining to EPA or to organizational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

Sustainability Framework

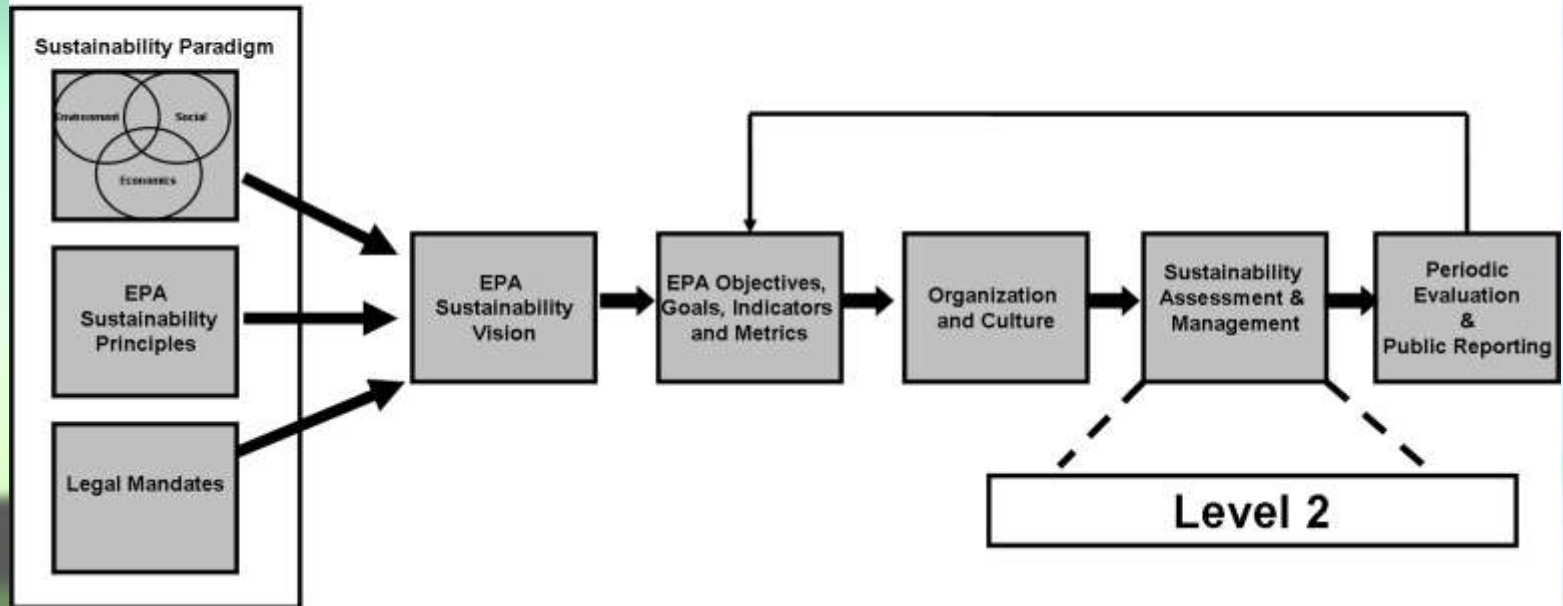
The committee developed the Sustainability Framework and the Sustainability Assessment and Management approach to provide guidance to EPA on incorporating sustainability into decision making.

The Sustainability Assessment and Management process is intended to be equally applicable to all types of issues, including human health and ecological risks.

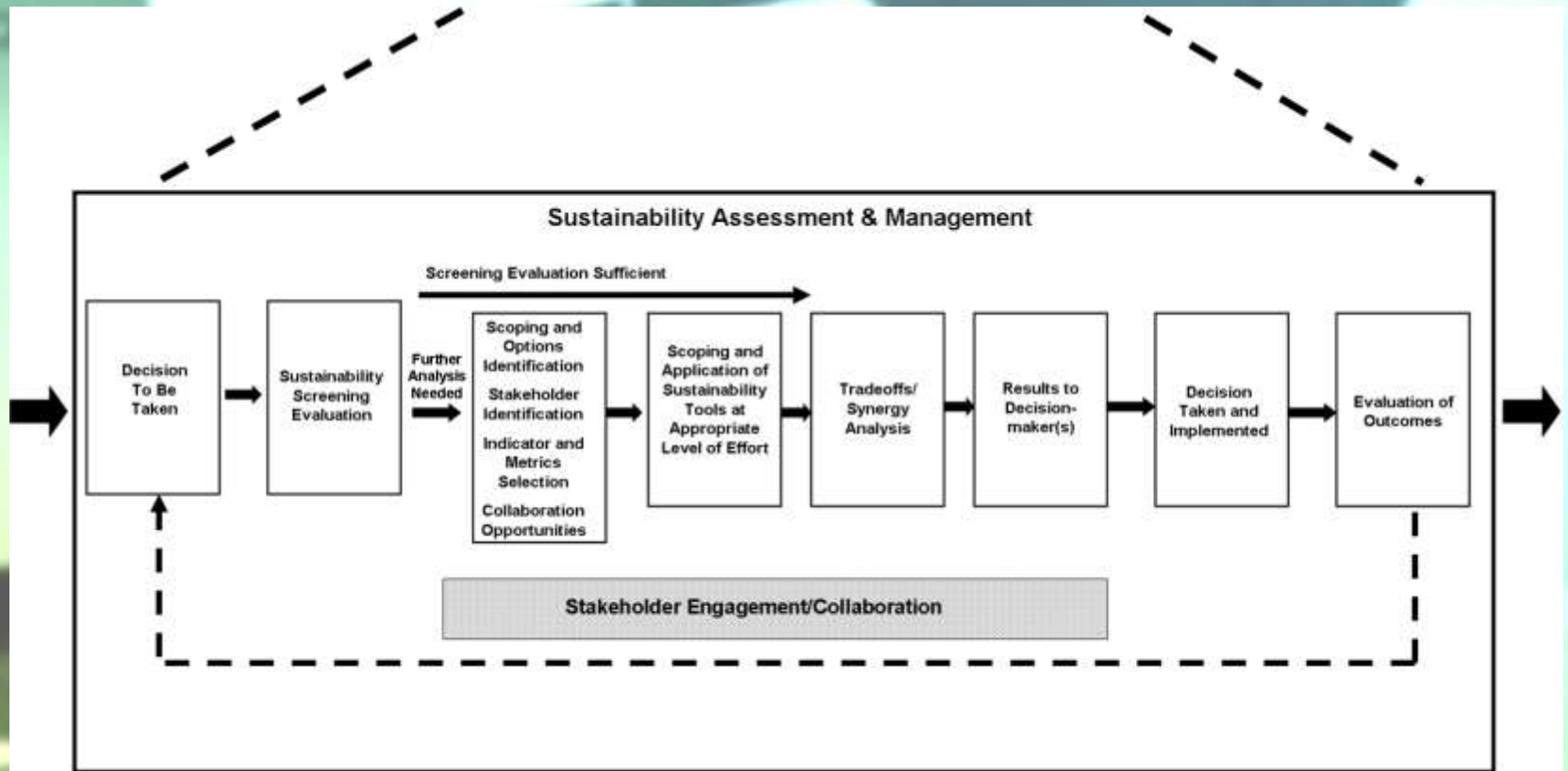
Sustainability Framework



Sustainability Framework Level 1



Sustainability Framework Level 2



What should be the operational framework for sustainability for EPA?

The committee recommends EPA adopt the comprehensive Sustainability Framework proposed in the preceding Figure.

The proposed Sustainability Framework requires a comprehensive approach including specific processes for incorporating sustainability into decisions and actions.

As part of the framework, EPA should incorporate into its decision making upfront consideration of sustainability options and analyses that cover the three sustainability domains (social, environmental, and economic), as well as trade-off considerations.

The framework was developed with the intent that EPA could apply it to any decision to which a need arose.

(Recommendation 3.1)

What scientific and analytical tools are needed to support the framework?

The committee recommends EPA develop a “sustainability toolbox” that includes a suite of tools for use in the Sustainability Assessment and Management approach.

Collectively, the suite of tools should have the ability to analyze present and future consequences of alternative decision options on the full range of social, environmental, and economic indicators.

Application of these tools, ranging from simple to complex, should have the capability for showing distributional impacts of alternative options with particular reference to vulnerable or disadvantaged groups and ecosystems. **(Recommendation 4.1)**

Examples of Tools

- Risk Assessment
- Life-Cycle Analysis
- 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
- Objective to maximize synergies and minimize adverse effects of conflicts
- 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
 - Models illustrated how predications could be used to analyze alternative conservation and management strategies
- 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 next 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.

How can the EPA decision making process rooted in the risk assessment/risk management (RA/RM) paradigm be integrated into this new sustainability framework?

The committee recommends EPA include risk assessment as a tool, when appropriate, as a key input in its sustainability decision making. **(Recommendation 5.1)**

Interface between Risk and Sustainability, 1 of 4

In keeping with the Red Book, the Committee separated risk assessment (RA) from risk management (RM)

Four step RA paradigm reaffirmed as a valuable tool for sustainability

Committee noted that RM used in two ways currently: a formal description of EPA's policies related to control of environmental risk and an informal term denoting any EPA approach to management of current or potential threat

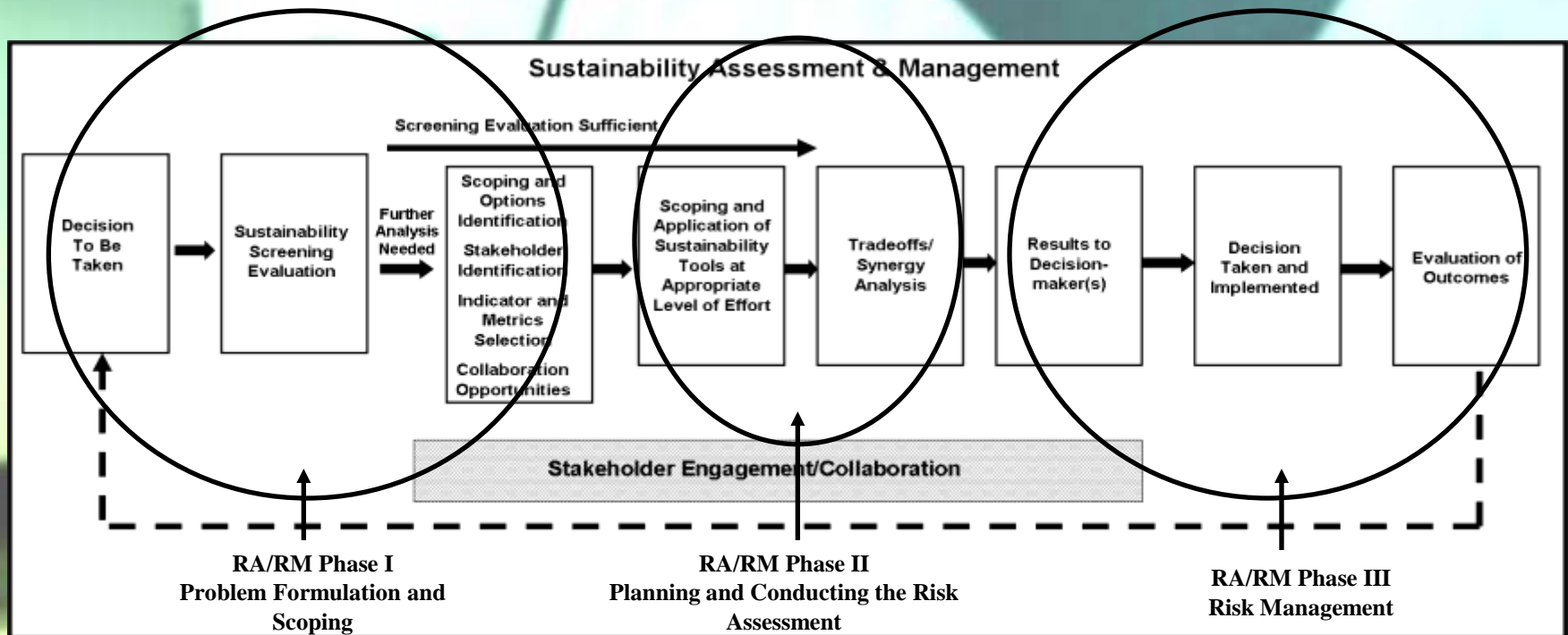
Sustainability goes beyond RM as sustainability is primarily concerned with maximizing benefit, while addressing risks of concern, rather than being an exercise focused mainly on achieving de minimis risk.

Interface between Risk and Sustainability, 2 of 4

The focus on de minimis risk sometimes includes risk-risk and risk-benefit trade-offs in management decisions but does not necessarily or typically encompass the social (including health), environmental, and economic pillars of sustainability.

Risk management does not fully encompass the sustainability paradigm in which the management of risk is perceived as an opportunity to maximize benefits while controlling environmental harm.

Interface between Risk and Sustainability, 3 of 4



Interface between Risk and Sustainability, 4 of 4

SAM and RA/RM Phase I

Problem formulation and scoping – stakeholder involvement

SAM and RA/RM Phase II

Planning and conducting assessments (including RA) to help discriminate policy options

Analysis (including trade-off/synergy) would address critical social, environmental and economic features associated with the different options

This stage could receive technical peer review and stakeholder comment

SAM and RA/RM Phase III

Decision-makers deliberate results, struggle with trade-offs, make decisions

What expertise is needed to support the framework? 1 of 2

The committee recommends that EPA hire multidisciplinary professionals who are proficient in many disciplines, who have experience in the development and implementation in the sustainability assessment tools described, and who have a working knowledge in all three pillars and their application to environmental issues.

The Agency should hire leaders and scientists including from outside sectors to aid the agency in shifting to a more cross-cutting mind set.

Although EPA has existing staff in all the main areas of sustainability-related fields, the agency should further facilitate collaboration among existing professional expertise to encourage dialogue and understanding of the various fields and work already being done within EPA.

(Recommendation 6.10)

What expertise is needed to support the framework? 2 of 2

The committee recommends EPA institute a focused program of change management to achieve the goal of incorporating sustainability into of all the agency's thinking, to foster agency-wide innovation, to optimize the social, environmental, and economic benefits of its decisions, and create a new culture among all EPA employees. **(Recommendation 6.1)**

Changing the Culture of the Agency

Effecting Cultural Change

- Foster change and innovation at all levels of EPA

- Learn from others

- Broaden disciplinary approaches toward understanding underlying processes

Research and Development

External Culture Change

Summary

- Overall management system framework for sustainability for the U.S. Environmental Protection Agency
- Approach driven by sustainability principles and goals and involves setting, meeting and reporting on measurable performance objectives
- Sustainability Management and Assessment (SAM) component incorporates sustainability into individual EPA decisions and actions

Sustainability and the USEPA Committee Members

- **Bernard Goldstein (IOM) (Chair)** - University of Pittsburgh
- **Leslie Carothers** – Environmental Law Institute
- **Terry Davies** – Resources for the Future
- **John Dernbach** – Widener University School of Law
- **Paul Gilman** – Covanta Energy Corporation
- **Neil Hawkins** – The Dow Chemical Company
- **Michael Kavanaugh (NAE)** – Geosyntec Consultants
- **Steve Polasky (NAS)** – University of Minnesota
- **Kenneth Ruffing** – Organisation for Economic Co-operation and Development (Retired)
- **Ted Russell** – Georgia Tech
- **Susanna Sutherland** – City of Knoxville
- **Lauren Zeise** – California Environmental Protection Agency

Sustainability Linkages in the Federal Government

Rationale

- Understanding the linkages between domains (energy, water, land, health, ecosystem services, non-renewable resources, etc.) is essential for the development of policies and programs supporting long term sustainability.
- These linkages form potential constraints to many key components of sustainability and are generally not considered in sustainability discussions or analyses. The policy implications of such linkages need to be explored and communicated to government agencies.

The Sustainability Silos of the U.S. Government

Environmental
quality (EPA)

Energy (DoE)

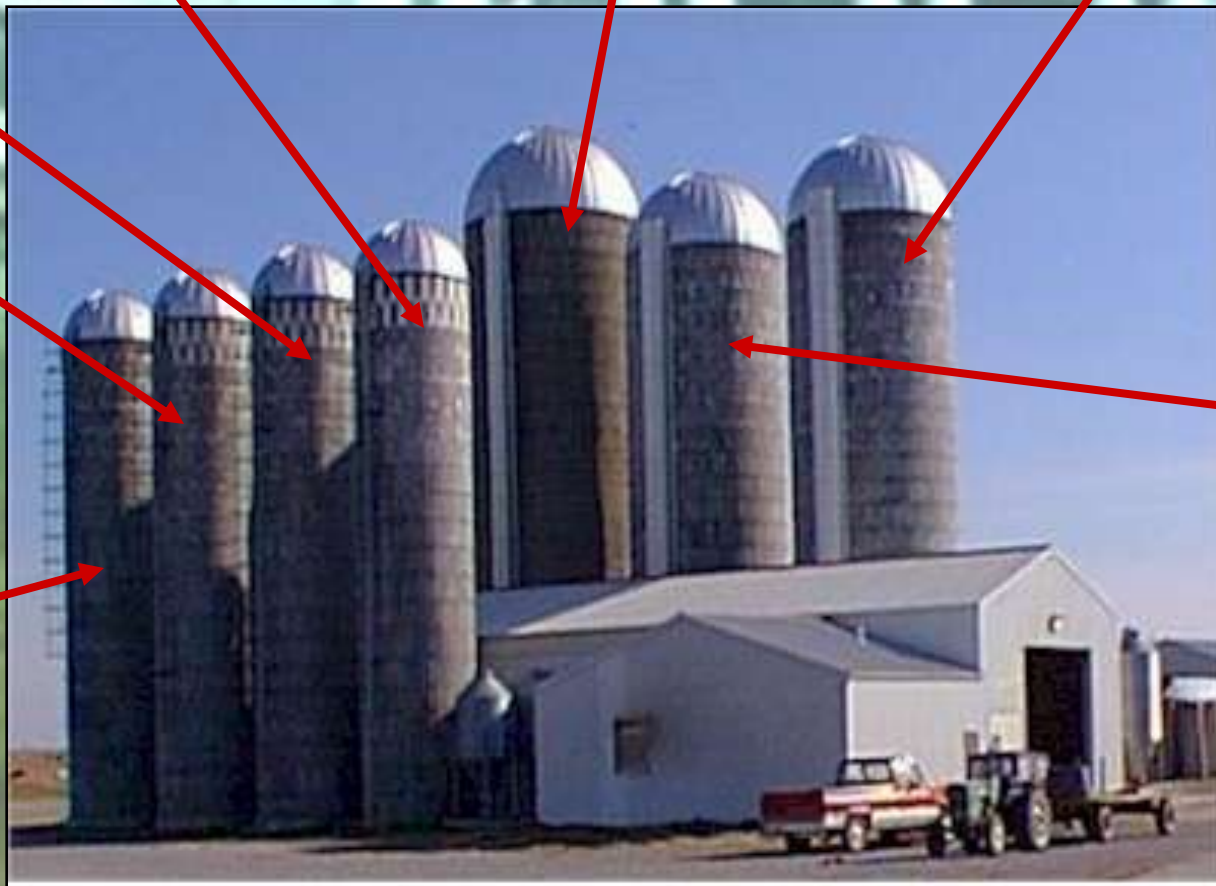
Food (DoA)

Land (DoI)

Health (DHHS)

Water
(NOAA)

Minerals
(USGS)



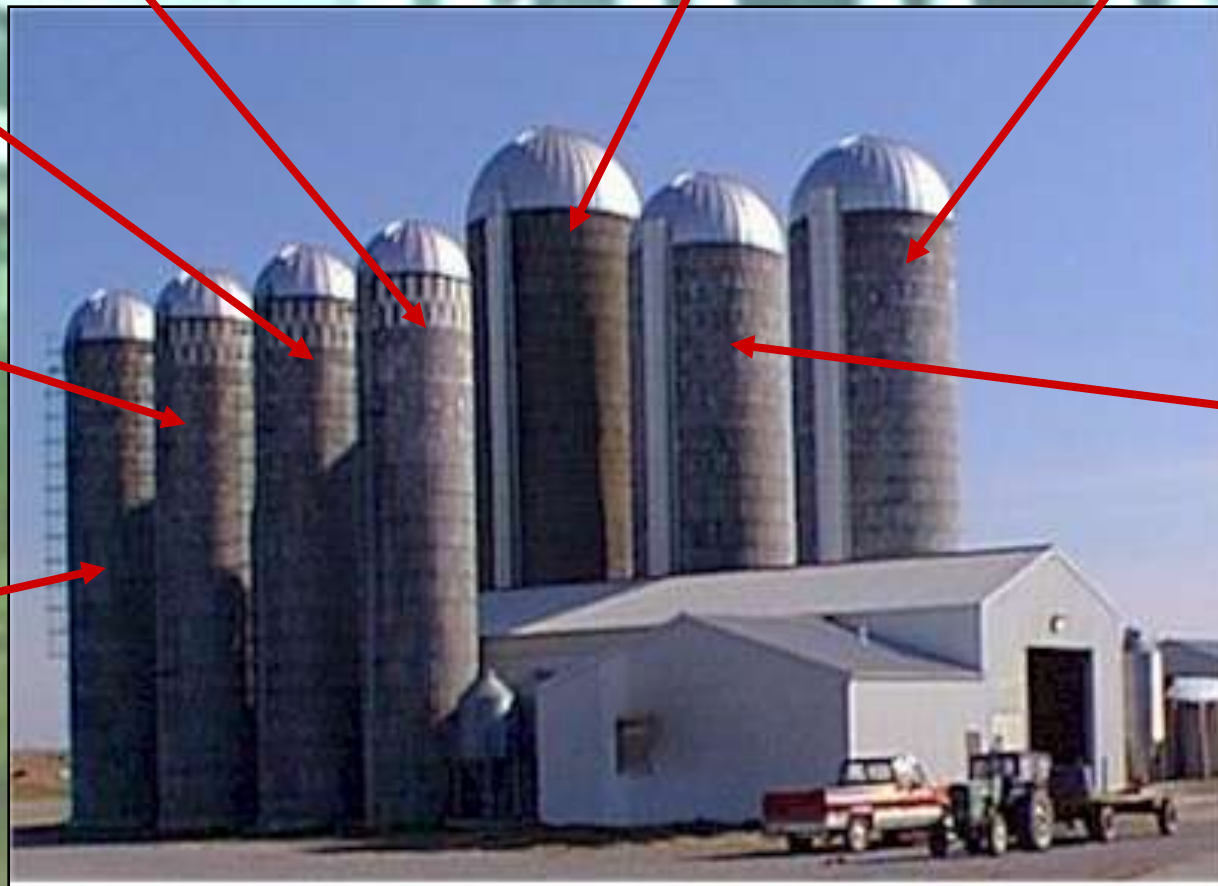
The Sustainability Silos of the Experts

Environmental
quality
(ecologists)

Energy (power
engrs., matl. sci.)

Food (crop
researchers)

Land use
(geographers)



Health
(medical
researchers)

Water
(hydrolo-
gists)

Minerals
(geologists)

Sustainability Linkages in the Federal Government

Objectives

- To identify and describe the most critical linkages between domains, with potential sustainability impacts highlighting temporal, geographic, and spatial differences.
- To develop an analytical framework for decisionmaking to assess the consequences, tradeoff/synergies of policy issues involving a systems approach to long term sustainability and decisions on sustainability-oriented programs. The framework will include social, economic and environmental dimensions of sustainability, highlighting certain dimensions that are sometimes left unaccounted for in cross media analyses.

Sustainability Linkages in the Federal Government

- After a series of briefings, information-gathering meetings, field visits, and a literature review, the committee will be able to:
 - Describe the major linkages and policies and programs that support long term sustainability
 - Identify gaps in terms of understanding these linkages as well as institutional impediments
 - Identify sustainability consequences (positive and negative) resulting from existing stove piped policies and programs
 - Explore options for assuring that key linkages identified in case studies are recognized and addressed as part of future policy decisions (For example, scaling up the EPA Sustainability Framework)

For additional information, please refer to:

Sustainability and the USEPA

PDF: www.nap.edu/catalog.php?record_id=13152

5 minute video: www.nas.edu/sustainability

Sustainability Linkages in the Federal Government

website:

<http://sites.nationalacademies.org/PGA/sustainability/linkages/index.htm>

US National Academies/National Research Council Sustainability Program

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