The background of the slide is a dark green, monochromatic image. The upper portion shows the steel truss structure of a suspension bridge, with vertical cables extending downwards. The lower portion shows a large, detailed illustration of a fish, possibly a salmon, with its scales and fins clearly visible. The overall aesthetic is technical and environmental.

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

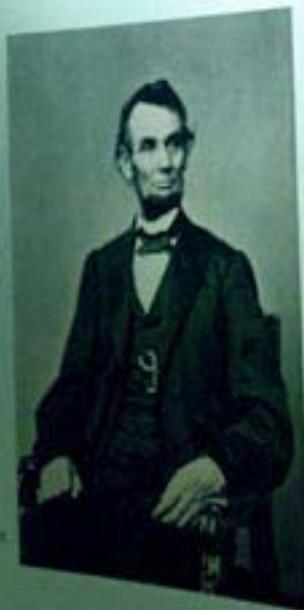
ABOUT THE NATIONAL ACADEMY OF SCIENCES

...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

With their work, Congress established the National Academy of Sciences in 1862 as a private, non-profit organization. Given its membership in the Academy was then, and still remains, a high honor for American scientists. Members of the National Academy of Sciences — and its sister organizations, the National Academy of Engineering and the Institute of Medicine — are among the nation's most respected and authoritative leaders in the scientific, technological, and health communities, including hundreds of Nobel Prize winners and recipients of National Medal of Science and of Technology.

To do the responsibility for providing independent advice to the government in matters of science, technology, and medicine is shared by three other organizations, and the National Research Council. Each one provides the world's most knowledgeable scientists, engineers, and other experts volunteer their time to work together in committees that advise the Executive Branch. Congress will be heard on some of the most important and difficult issues of our time.



One of the first National Academy of Sciences studies was commissioned to improve the performance of astronauts in space 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 nation's policymakers and the general public. Some examples of reports are displayed on the panels to your left and right.

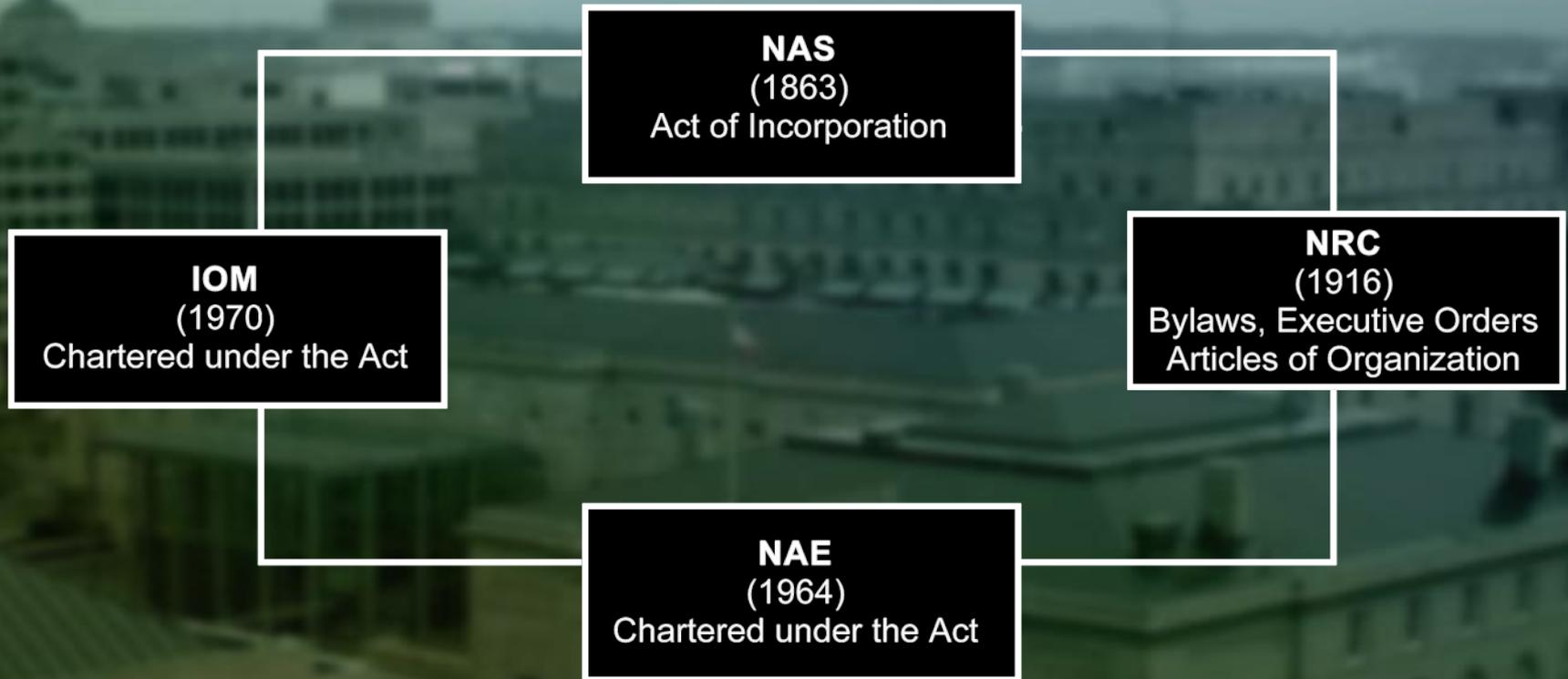
These reports are increasingly influential, often changing new federal policies or enhancing and improving existing programs. High standards and a reputation for independence and objectivity help to give the reports their unparalleled credibility, leading weight to their conclusions and recommendations.

In addition to writing these reports, we also publish scientific journals and popular books. And we have many events that bring together scientists, policymakers, and the public from the United States and abroad. Please see nearly all of these reports and events is provided through our Web site at www.nas.edu.



These reports have influenced the way that we think about science and technology.

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 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
- **Ted Russell** – Georgia Tech
- **Susanna Sutherland** – City of Knoxville
- **Lauren Zeise** – California Environmental Protection Agency

COMMITTEE PROCESS

- Study launched November 30, 2011
- 2 day meeting – December 14-15, 2010
- The committee heard EPA officials, state agencies, industry, universities, and non-governmental organizations during data gathering sessions
- 5 day meeting – February 7-11, 2011
- Weekly conference calls

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*
- Recommended framework will be scaled up under the broader NRC study, *Sustainability Linkages in the Federal Government*, that will begin in September 2011

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)

APPROACH TO TASK

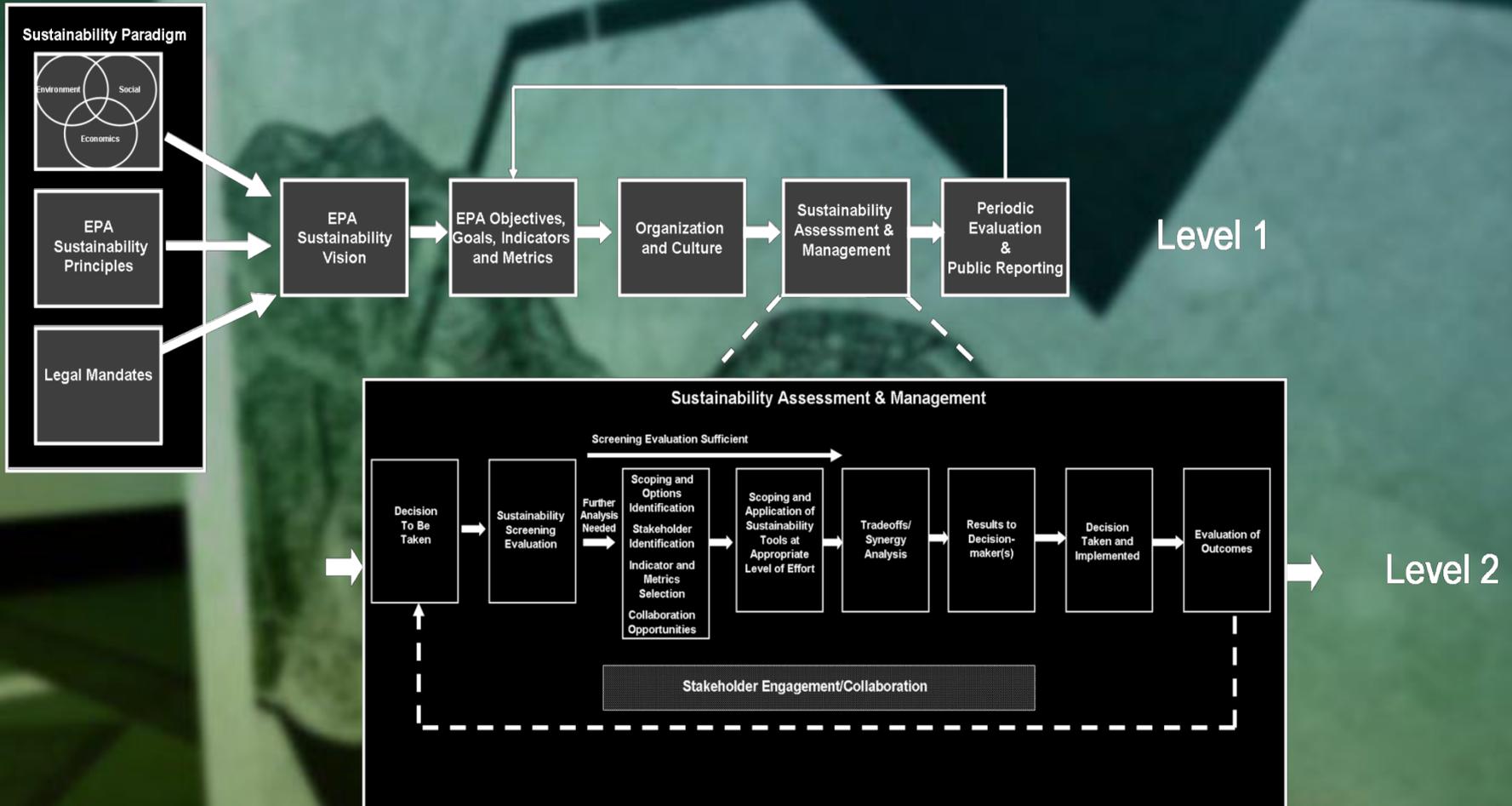
The committee examined the benefits, where EPA has statutory authority and discretion in regulatory and non-regulatory programs, of building sustainability considerations into its administration of these statutes. Because EPA did not request that the committee address laws pertaining to EPA or to organizational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

SUSTAINABILITY FRAMEWORK

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

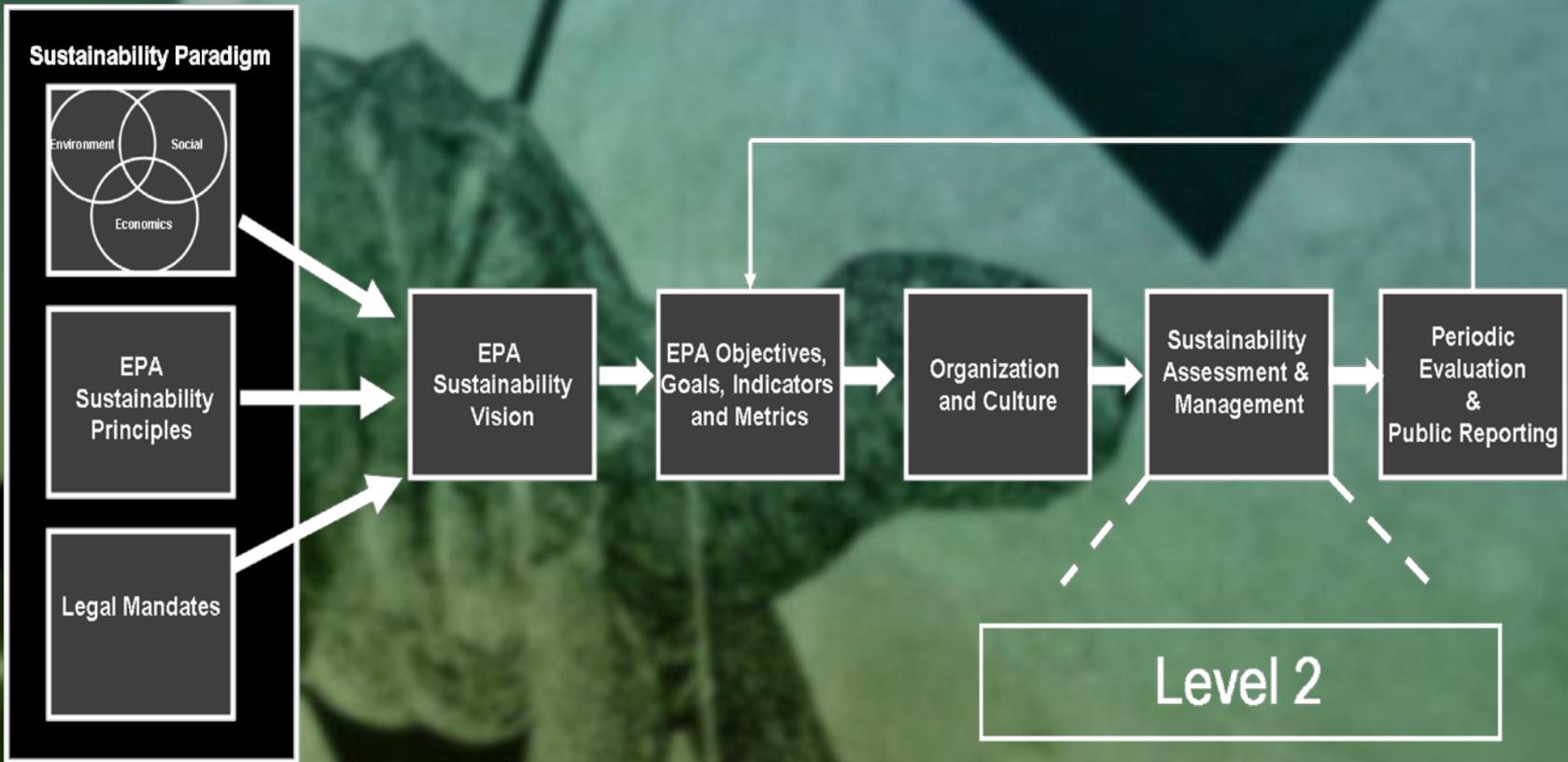
The Sustainability Assessment and Management process is intended to be equally applicable to human health, ecological risks and other challenges

SUSTAINABILITY FRAMEWORK



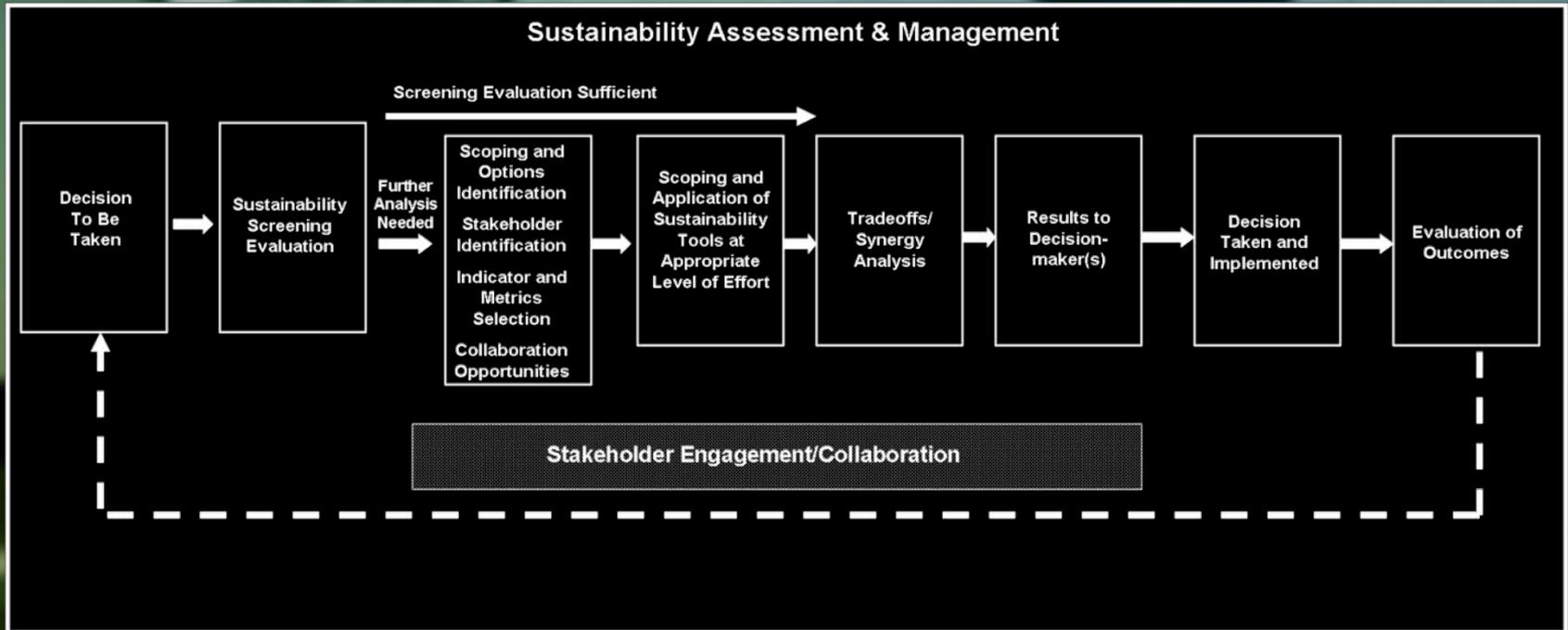
SUSTAINABILITY FRAMEWORK

Level 1



SUSTAINABILITY FRAMEWORK

Level 2



What should be the operational framework for sustainability for EPA?

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

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 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 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.

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 into its sustainability decision making (**Recommendation 5.1**)

Interface Between Risk and Sustainability

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

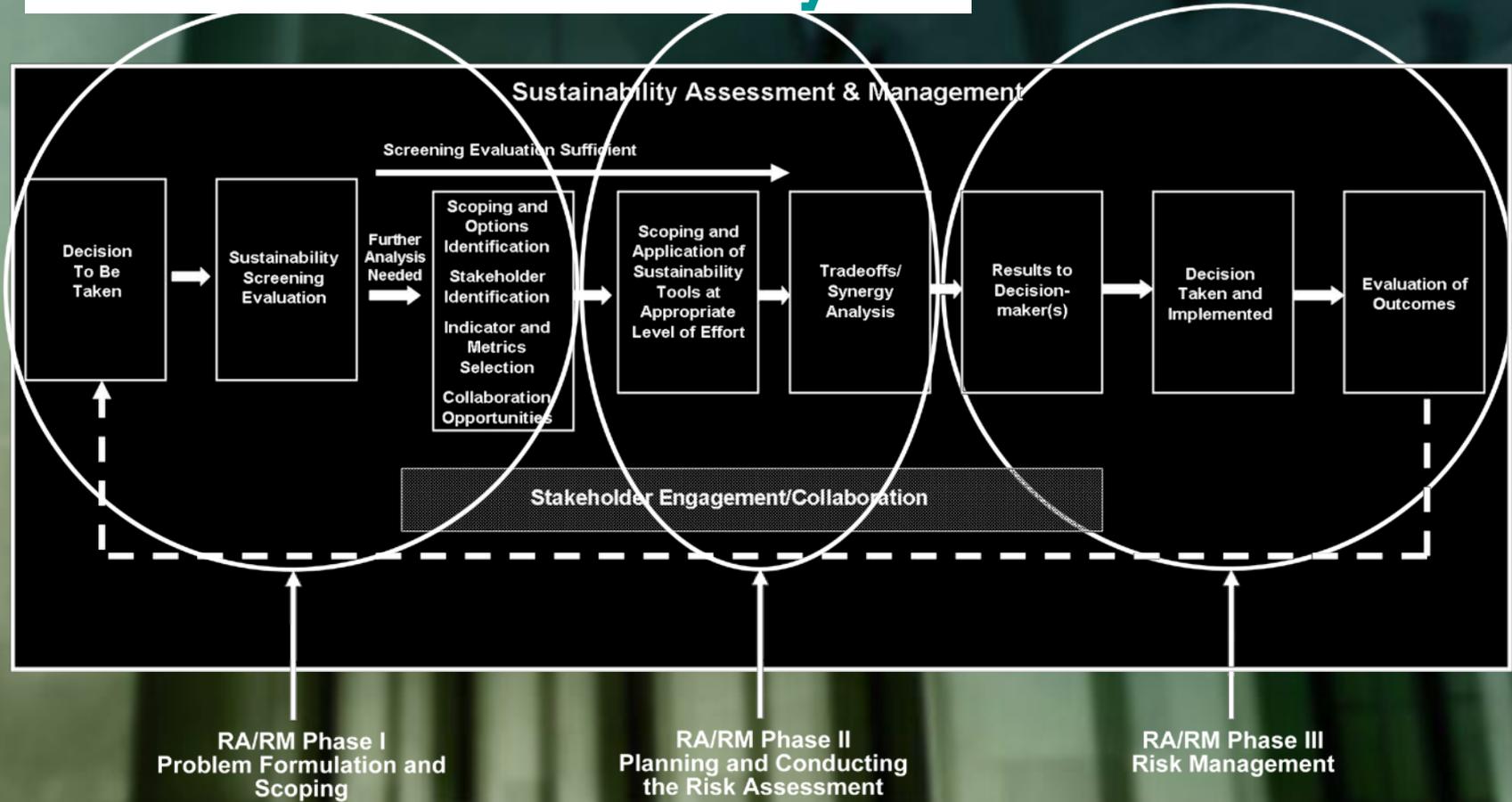
Sustainability goes beyond RM as sustainability is primarily concerned with maximizing benefit, while addressing risks of concern, rather than being an exercise focused mainly on achieving risk based standards.

Interface Between Risk and Sustainability

The focus on risk based standards 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



Interface Between Risk and Sustainability

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 consider results, struggle with trade-offs, make decisions

What expertise is needed to support the framework?

- The committee recommends that EPA hire multidisciplinary professionals 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 the main 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?

- EPA should institute a focused program of change management to achieve the goal of incorporating sustainability into all agency thinking to optimize the social, environmental, and economic benefits of its decisions, and create a new culture among all EPA employees

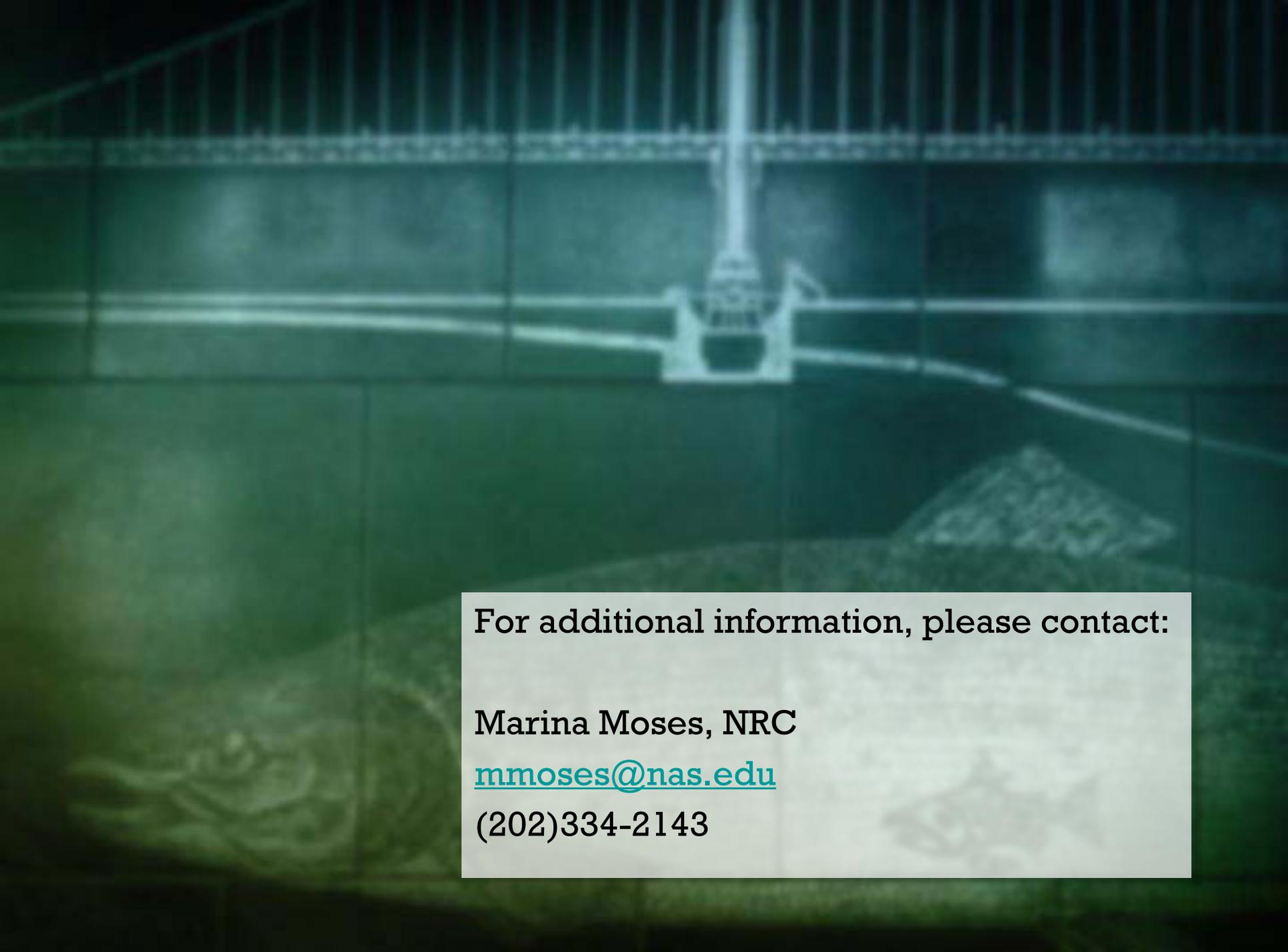
(Recommendation 6.1)

Changing the Culture of the Agency

- Foster change and innovation at all levels of EPA
- Learn from others and from what you are doing
- Broaden disciplinary approaches toward understanding underlying processes
- Consider longer term time horizons

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 Assessment and Management (SAM) component incorporates sustainability into individual EPA decisions and actions



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