

Proposed Study on Integrated Nitrogen

Background

The U.S. Environmental Protection Agency (EPA or the Agency) Science Advisory Board (SAB or Board) Environmental Engineering Committee identified integrated nitrogen research and control strategies as an important issue facing the Agency. Subsequent discussions with the Agency and the chartered Board indicated that reactive nitrogen warranted attention. This proposal outlines the proposed study to be undertaken by the SAB Integrated Nitrogen Committee.

Biologically active, photochemically reactive, and radiatively active nitrogen compounds in the atmosphere, hydrosphere, and biosphere are collectively referred to as reactive nitrogen. Over the past few decades, human activities leading to the production of reactive nitrogen exceed that of natural terrestrial ecosystem production at the global scale. Scientific information suggests that reactive nitrogen is accumulating in the environment, and that nitrogen cycling through biogeochemical pathways has a variety of consequences including photochemical air pollution, reduced visibility, ecosystem fertilization, acidification and eutrophication, global warming and stratospheric ozone depletion. However, reactive nitrogen has also been responsible for dramatically improved food production. Therefore, the challenge for reactive nitrogen is to find ways to maximize its beneficial use, while simultaneously minimizing adverse environmental impacts. One way to approach this challenge is through the deliberate integration of reactive nitrogen research, management, and control strategies.

EPA has a number of ongoing nitrogen research and management activities regarding reactive nitrogen. Nitrogen oxides from fuel combustion, motor vehicles, utilities, and industrial processes are regulated by EPA's Office of Air and Radiation. Nitrogen compounds in surface and ground water, industrial and municipal discharges, and concentrated animal feeding concentrations are regulated by EPA's Office of Water. EPA's Office of Research and Development conducts nitrogen research to support environmental decisions made by various EPA programs and Regions. Additionally, EPA's Office of International Activities is working with the United Nations Environment Program to develop a Nitrogen Policy Workshop. EPA also works with other State and Federal Agencies regarding release, control, and human health and environmental impacts of reactive nitrogen. However, much of EPA's ongoing work is media specific (i.e., air, water, land).

Environmental research suggests that the management of reactive nitrogen should be viewed from a systems perspective and integrated across environmental media. As examples, urban air pollution from reactive nitrogen may contribute to water pollution; and extensive nitrogen loads in river basins may impact downstream coastal zones. Accordingly, linkages between reactive nitrogen induced environmental and human health effects need to be understood to improve reactive nitrogen research and risk management strategies. Yet, the fate, transport, and effects of reactive nitrogen are interconnected and occur across all environmental media. Accordingly, integrated

research and control strategies that consider such connections are necessary for optimal nitrogen management.

Objectives

Given its experience with EPA science, research and environmental programs, the SAB, through the Integrated Nitrogen Committee, is well positioned to evaluate current EPA activities regarding reactive nitrogen, and provide advice and recommendations to facilitate the development of integrated nitrogen research and control strategies. Accordingly, the Integrated Nitrogen Committee will evaluate EPA programs on reactive nitrogen, the current degree of coordination among programs, recommend improvements for research, and identify opportunities for integrated approaches to nitrogen management. To provide a basis for the advice and recommendations, the Committee will:

- (1) Identify and analyze, from a scientific perspective, the problems nitrogen presents in the environment and the links among them;
- (2) Evaluate the contribution an integrated nitrogen management strategy could make to environmental protection;
- (3) Identify additional risk management options for EPA's consideration; and
- (4) Make recommendations to EPA concerning improvements in nitrogen research to support risk reduction.

Committee findings, advice, and recommendations will be summarized in an SAB report to the Agency.

Preliminary Plan

To develop a report that captures the Committees findings, conclusions and recommendations the Committee will:

- (1) Organize and plan its work, develop a preliminary topical report outline, propose initial assignments and a schedule as needed;
- (2) Conduct fact-finding with EPA and Other Federal Agencies;
- (3) Provide opportunities for public comment;
- (4) Invite presentations from the larger scientific community if needed; and
- (5) Deliberate on the following questions to reach preliminary consensus.
 - What are the priorities for data collection and research necessary to provide effective nitrogen control?

- Do any nitrogen control activities exacerbate other nitrogen impacts?
 - How well can the influences of nitrogen control activities on secondary nitrogen impacts be quantified?
 - What are the research needs for integrated nitrogen management?
- (6) Capture that consensus in a draft report,
 - (7) Seek written comments from three to five external peer reviewers,
 - (8) Address the comments of the peer reviewers, revise, reach consensus on language and approve the Committee's draft report,
 - (9) Forward the draft report to the chartered Science Advisory Board for its quality review, and
 - (10) Make itself available for any further work or revisions resulting from the chartered Board's quality review.

The nitrogen cascade may be used to organize the fact-finding and the Committee's report. The Committee may request that speakers to address specific questions in their briefings. The briefings will first address nitrogen problems and the linkages between them, organized by N-related effect. EPA will be asked to identify its nitrogen related projects putting them into a logical order of discussion. EPA speakers will be given opportunities to comment on: how federal programs might share data across agencies; how federal programs may fit together; the degree to which integrated nitrogen management within and beyond EPA is constrained or catalyzed; and potential solutions to constraints that inhibit collaboration. Other Federal agencies may include USDA, NOAA, DOE, DOD, DOI, and NSF. The assistance of experts from countries with extensive experience in reactive nitrogen risk-management may be utilized.

The Committee will hold both face-to-face meetings and conference call meetings as needed. These will be public meetings announced in the Federal Register.

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