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BOSC REVIEW OF ROADMAP ANNUAL REPORTS

Background

Within the past year, EPA's Office of Research and Development (ORD) released its cross cutting Research Roadmaps (https://www.epa.gov/research/research-roadmaps) to describe current and facilitate future integrated ORD research across four prominent cross-cutting areas: Nitrogen and Co-Pollutants, Children's Environmental Health, Environmental Justice, and Climate Change. The cross-cutting Research Roadmaps are not stand-alone research programs; rather, they integrate research in these priority areas across ORD's six Strategic Research Action Plans (https://www.epa.gov/research/strategic-research-action-plans-2016-2019) developed by the six ORD National Research Programs: Air, Climate, and Energy (ACE); Chemical Safety for Sustainability (CSS); Human Health Risk Assessment (HHRA); Safe and Sustainable Water Resources (SSWR); Sustainable and Healthy Communities (SHC), and Homeland Security (HS). This integrative vision focuses ORD's investment on areas where EPA can play a significant leadership role and ensures that cross-cutting research is the foundation of sustainable decisions and actions in these four priority areas.

This first issue of the Annual Reports for each of the Research Roadmaps captures progress on research goals and activities during Fiscal Year 2016 (FY16; October 1, 2015 to September 30, 2016) in each of these four areas. The Annual Reports highlight successes and challenges of implementing an integrative approach to ORD's cross-cutting research. The Annual Reports also provide a preview of research activities in the upcoming fiscal year.

This document assesses two charge questions to the BOSC concerning the Annual Report of the Nitrogen & Co-pollutant Research Roadmap for FY16. By way of introduction, the Nitrogen & Co-pollutant Research Roadmap was created in response to the EPA's SAB Integrated Nitrogen Committee (INC) recommendations provided via the SAB (https://yosemite.epa.gov/sab/sabproduct.nsf/WebBOARD/INCSupplemental?OpenDocument)

The overall SAB recommendations in the 2011 report were: (1) the use of the nitrogen cycle as an essential framework to address the environmental loading of reactive nitrogen; (2) an integrated cross-media approach to more effectively manage reactive nitrogen; (3) and monitoring and research to support management of reactive nitrogen.

Of all the Roadmaps of EPA, this one is the oldest, and thus the most advanced. The annual report details extensive accomplishments in FY16 and lays out the plans for FY17.

This review focused on two charge questions, noted below together with the subcommittee's responses. Following that section, are additional comments from the subcommittee.

Charge Question and *Responses*:

In reviewing the cross-cutting Research Roadmap Annual Reports, please:

- Comment on progress towards successful integration and implementation as articulated in the related Roadmap. This may include, but is not limited to, the following:
    - Coordination across ORD's six National Research Programs;
      The coordination across ORD's six National Programs is both necessary and good.
    - Communication and outreach to partners and stakeholders; and
      The communication and outreach to partners and stakeholders is good. However, we need to consider the integration of N with P, S and sediments. Moreover, since nitrous oxide (N_2O) is a long lived reactive nitrogen compound and therefore its emission has global consequences primarily as a greenhouse gas, international partners and stakeholders can help facilitate in its mitigation.

    - Areas of innovation
        1. The One Biosphere Modeling Project is impressive. The two 2016 roadmap products sound like heavy lifts – very impressive.
        2. The example projects in the Ongoing Activities Across Research Programs are fantastic. They are not uniformly succinctly summarized as the material before it in the document, but that is fine.
        3. The Challenges are well summarized, point to specific needs, and appear to be achievable.
        4. *Increasing population has the potential for increasing Nr into the environment. While we have a good track record at decreasing NOx emissions via the CAA (and further efforts should be encouraged),, managing emissions of ammonia remains a challenge. While BMPs may be temporary short-term solution to such emissions, emerging engineered solution to managing emissions of ammonia needs to be examined (e.g. Enhanced use of controlled release of N using smart Nano systems and sensors).*
        5. *Improving ammonia emissions inventory especially from agricultural sources and biomass burning (which is on the increase) is crucial. Ammonia emissions development may be facilitated by the use of satellite technology which has the potential of enhanced spatial and temporal coverage.*
        6. *Partnering with USDA with targeted opportunity on ammonia related research is suggested.*
    - *More focused involvement of social scientists are a necessary condition to increase effective communication to the public with respect to their contribution to N pollution issues.*
- Provide suggestions for improving implementation of the roadmaps and research integration across the National Research Programs.

- Are there additional opportunities for implementation or integration not highlighted in the annual report?
    1. *Sustainability related issues (air, water, and soil) surrounding Nr needs to be explored.*
    2. *The two case studies discussed in the document are both related to water bodies. The document would be considerable enhanced if there were a case study related to the atmosphere.*
    3. *Can the use of social sciences and social media be utilized to influence food habits to mitigate emissions of reactive nitrogen?*
- Does “The Year Ahead section” adequately describe the next steps and short-term research areas and commitment?
    1. *Both the webinar to introduce research gaps and needs and the research integration summit (2016-2019) are good ideas. However, participation by other federal partners (USDA, USGS, etc.) should be continued.*