Arctic Futures 2050; Advancing Arctic Observing in an Open Science/Policy meeting

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The U.S. Study of Environmental Arctic Change (SEARCH) in collaboration with partners will convene an open science and policy meeting in 2019. Like the SEARCH Open Science Meeting in 2003, the State of the Arctic Meeting in 2010, and the AON Open Science Meeting in 2015, *Arctic Futures 2050* is intended to identify future directions for Arctic observing and research. Like the previous meetings, *Arctic Futures 2050*, will bring together scientists to share the latest understanding and emerging science concerning environmental change in the Arctic. *Arctic Futures 2050*, however, will go further in identifying future research directions by expanding participation to include policy-makers. The goal is to inform policy with science, and doing so effectively will require lasting collaborations between researchers and policy-makers. Policy-makers will be active participants in the meeting to ensure that research intended to inform policy is framed and executed to maximize its utility. Active collaboration by scientists and policy makers will be required to identify and prioritize actionable research. This approach is part of a broader SEARCH initiative to establish a community of practice that can help guide and prioritize research directions.

The challenge of designing research to meet society's needs is not unique to the Arctic or environmental studies. Ioannidis (2016), for example, argued that in medicine, most clinical research fails to be useful "not because of its findings but because of its design."

A major design flaw identified by Ioannidis (2016) is a failure to involve patients in setting research agendas that align with patient priorities. Along similar lines, policy-makers have rarely been given the necessary context and involvement to guide research in directions most useful to policy development, review, and implementation.

Engaging policy-makers as active participants in *Arctic Futures 2050* will require building relationships with members of that community early in the planning process. Further, the participants in the 2019 open science and policy meeting will need well-defined goal posts for addressing policy needs. Those goals should be rigorously framed within the constraints of realistic assessments of governance and management activities. *Ad hoc* descriptions of such needs are unlikely to produce actionable science. In April 2018, SEARCH will convene a workshop in which Arctic researchers and policy makers will use scenarios to identify plausible futures and the science questions they will present for policy makers. The scenarios approach we use provides a formal approach to strategic planning used by industry (Bentham 2014; Cann 2010), military planners (Davis et al. 2007), conservation planners (Peterson et al. 2003), and Arctic communities responding to environmental change (Walsh et al. 2011; Lovecraft and Preston, 2017). The scenarios workshop will identify the science needed to inform policy in coming decades, which will help frame the themes of the *Arctic Futures 2050* Open Science/Policy Meeting.

The 2016 AOS conference statement encourages contributions to what is described as the "Business Case for Arctic Observing," which requires systematic means to assess "needed resources including infrastructure, instrumentation, human capacity, the pathways to financing, and a strategy for sustained financing" (2016, AOS Conference Statement). The Scenarios model provides an unique means for considering 'plausible futures' and the requisite future research needs, including sustained observing infrastructure. Such a future-oriented perspective has been missing from other systematic approaches to advance integrated and multi-purpose observing infrastructure. The April 2018 SEARCH scenarios workshop will generate input to the AOS 2018; in turn, we anticipate that the Observing Summit will help ensure observing needs are well addressed in the *Arctic Futures 2050* Open Science/Policy Meeting.

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