(Viewpoint)

Engagement at the Science-Policy Interface

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We recently had the opportunity to address some of our professional colleagues in environmental science and engineering, many of them members of the ES&T community, in a panel discussion on engagement at the science-policy interface. This stimulated us to reflect not only on the rewards and challenges of our own experiences in science policy but also on the divide between forefront research (where the emphasis is on open questions and active promotion of competing ideas) and the policy-science interface (where evidence-based decisions are ideally based on the synthesis of scientific knowledge).

We feel that it is critically important that scientists and engineers working at the research frontier consider the implications of their work for the science-policy interface. Researchers are increasingly asked to articulate the societal benefits of their work, as exemplified by the “broader impacts” criteria of the U.S. National Science Foundation. The science-policy interface is especially relevant for environmental scientists and engineers since our work is intimately linked to policy and regulation. This is reflected by the policy analysis category for papers in ES&T, which was established nearly two decades ago. Ideally, research in environmental science and engineering informs policy decisions at the outset, identifies and fills gaps in knowledge needed for decision-making, provides the technologies for implementation and examines impacts on the environment as well as the social and economic benefits of policy decisions.

Our own experiences in policy engagement include: serving on or chairing committees of the U.S. National Academies and Environmental Protection Agency, contributing to books produced by the National Research Council or strategic plans for State agencies, participating in fellowship programs that place scientists in Federal agencies and providing technical expertise for local and/or university-based projects that showcase integrated approaches for environmental improvement (see Table).

Many members of the panel audience, especially those at junior ranks, seemed to be unaware of the variety of opportunities for engagement at the science-policy interface. It is perhaps relevant that all the panelists were senior academics who are well established in their academic careers and

well past the hurdles of the tenure and promotion process. This parallels the preliminary findings in a recent survey of the engagement of University of Michigan faculty in public and political discourse that respondents were more senior than the general faculty population.¹

Colleagues interested in public and policy engagement can pursue their interests through various activities and will find many organizations and programs to support them (see Table). Each individual should consider carefully which type and level of engagement is most suitable for him or her, bearing in mind the following points:

- Time commitment. The time demands of engagement should not be underestimated. In some cases, the time commitment may be clear and fixed. When it is not, individuals should try to set their own boundaries in advance so as not to become overwhelmed somewhere in the middle of a commitment.
- Level of direct personal engagement. Some types of engagement involve much less personal contact with stakeholders than others. Although personal contact is often considered to be critical for effective work at the science-policy interface,² not everyone is comfortable in those settings. Many science and engineering professional societies now offer training opportunities for members to develop skills in such engagements.
- Adjustment to non-academic norms. The disparities between the time-frames and communication styles found in academics and politics are well-recognized.² Academic styles must be adapted for effective policy engagement. Political windows of opportunity tend to be short and can open suddenly – academics must be able to respond in a timely fashion. Communication styles must also be adjusted to the demands of non-experts who need to take action or advance policies without getting lost in the thickets of academic debates.³
- Need for patience and willingness to forgo attribution. Results of public and policy engagement can be slow in coming to fruition. Outcomes are often so incremental or diffuse that it may not be possible to identify the influence of individual contributions.⁴ This

attribution gap may come as a shock within an academic culture that is heavily influenced by H-indices and impact factors.

This last point highlights the importance of institutional attitudes toward engagement at the science-policy interface and the institutional incentives for (or against) such engagement. In the University of Michigan survey, 56% of respondents believed that such engagement was not valued by tenure committees. If engagement at the science-policy is considered valuable for junior faculty, then senior academics need to promote policies within their institutions that appropriately evaluate and support these activities. Junior faculty members may find it professionally advantageous to focus their policy activities on topics linked to application of their research.

In this context, it is also worthwhile to identify the benefits of engagement at the science-policy interface for research. Over 50% of respondents in the University of Michigan survey claimed that public and political engagement was a source of inspiration for their research and 70% found it to be applicable to their research. “Policy-relevant” research has always been a strong focus in environmental science and technology. Engagement at the science-policy interface (and with practice, in general) can allow researchers to identify research gaps and critical needs for scientific and technical advances and to chart a new course on the research frontier.

Researchers can play many different roles at the science-policy interface depending on their own interests, aptitudes and career stage as well as the level of societal interest in topics of their expertise. We encourage environmental researchers to consider how their engagement at the science-policy interface might support the development of effective local, regional, national and international policy.

Table. Types of engagement at the science-policy interface and their characteristics				
type of engagement	characteristics of engagement ^a			examples, references or other comments
	duration of time commitment	controllability of time commitment	level of personal exposure	
Generating products <ul style="list-style-type: none"> • Policy and science briefs for policy-makers • Editorials, guest columns, articles in non-technical publications, etc. • Websites, blogs and social media products • Large, cooperative products (edited books, strategic plans, etc.) 	short-term short-term long-term mid- to long-term	high high low low- to mid-range	low variable medium to high medium to high	See section 4.1 in the <i>Food Security Toolkit</i> ^b e.g., California WaterBlog ^c e.g., NRC books (http://www.nap.edu/); Minnesota Water Sustainability Framework ^d
Consulting and advising <ul style="list-style-type: none"> • For government agencies <ul style="list-style-type: none"> ➤ As full-time fellow ➤ Advisory board member • For NGO's or community organizations • For media • For industry or practitioners 	usually 1 year variable variable variable variable	low low- to mid-range low- to mid-range low- to mid-range low- to mid-range	medium to high medium to high medium to high medium to high low to medium	e.g., Jefferson Science Fellowships ^e ; AAAS provides an overview of fellowship opportunities ^f HYDRO-LOGIC ^g has compiled a list of relevant NGO's
Giving testimony, interviews, presentations for non-technical audiences etc.	variable	low	high	
Participating in cooperative projects, transdisciplinary or action research	variable	low- to mid-range	high	e.g., the Hamerschlag Hall Green Roof project at Carnegie Mellon University ^h and ReNUWit ⁱ See also Hering et al. (2012) ⁵
^a The characterization of engagements is necessarily subjective and may vary considerably within types. Individuals should make their own judgments regarding specific commitments. ^b http://www.fao.org/docrep/014/i2195e/i2195e00.htm ^c http://californiawaterblog.com/ ^d http://wrc.umn.edu/prod/groups/cfans/@pub/@cfans/@wrc/documents/asset/cfans_asset_292471.pdf ^e For information on the Jefferson Science Fellowships, see: http://sites.nationalacademies.org/pga/jefferson/index.htm ^f For an overview of fellowship opportunities, see: http://www.aaas.org/page/st-fellowship-program-areas ^g http://hydro-logic.blogspot.ch/p/ngonfp-and-professional-organizations.html ^h http://www.cmu.edu/environment/campus-green-design/green-roofs/hamerschlag-hall.html ⁱ http://www.renuwit.org/				

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