

Socioenvironmental Sustainability and Actionable Science

MARGARET A. PALMER

Stories of nature have been a common narrative tool to describe real and imagined human relationships with the natural world. Nearly 10 years ago, I wrote an essay that began with various stories, including a utopian tale in which “science is an essential element in enabling a future in which larger populations are supported without permanent damage to the planet’s living infrastructure. A balance is found between the need to use the world and the need to maintain functional ecosystems. [It would be] a future in which natural ecosystems are sustained while providing essential services to a human population that shows no signs of a decrease in growth.” I knew that for such a story to become a reality, changes in how researchers approach their work were required. As part of a visioning plan for the Ecological Society of America, I worked with a team to develop an action plan to enhance access to ecological knowledge; to stimulate more innovative, forward-looking research; and to build effective partnerships with natural resource managers (Palmer et al. 2005). Today, many of the authors of that plan call for even more changes, including new research frameworks, in order move toward a more sustainable world in which the health of ecosystems and human well-being are improved (Collins et al. 2011). Such frameworks are stimulating exciting new research, but I find myself thinking a great deal about the limits of that research in solving real-world problems. How much should we scientists really expect our work to influence policies in a way that leads to a more sustainable future?

Desperately seeking science in policy

Perhaps because of my particular research interests in the theory and

practice of ecological restoration, it has become increasingly obvious to me that policy and management decisions are about much more than science. This is why it is often hard to pinpoint the role that science has played in specific decisions. In a recent issue of *BioScience*, Beardsley (2011) began an essay with the statement “the political debate surrounding environmental issues is often sadly misinformed about pertinent facts.” That is true enough: the “facts” heard in the halls of legislators or at political stump speeches are often not based on the best science. Certainly, scientists should speak up to correct the record. But we must not assume that environmental problems will disappear if we just get the science right. Suppose all politicians had training in science sufficient to sort fact from fiction on environmental issues. Would we see difficult decisions being made that reduce impacts to the environment? I doubt it. Contrary to popular opinion, scientists have been translating their science for policymakers and the media at an increasingly rapid pace (Peters et al. 2008), yet I still hear my colleagues expressing frustration because their voices do not seem to be heard.

There are many explanations for why science may play only a small role in shaping environmental policy, not the least of which are competing objectives, such as short-term economic gains or special interests. However, there are other explanations that point toward the scientific community. First, more science, better science, and *then* effective communication may be the wrong sequence of events if scientists hope to influence policy. Although the ability of scientists to effectively communicate is important, it matters little if the science that is produced is not what is needed

or not in a form that is usable by policymakers. Continuing to discover then communicate is just not working.

A second explanation for why science is playing only a small role in shaping policy is that perhaps those who have been most engaged in trying to produce policy-relevant science are part of a scientific network that is far too narrow to tackle policy problems. Facts, figures, and future projections on the biophysical impacts of climate change or energy production have had far less of an effect on policy than many scientists had hoped they would (Kerr 2011). Science is only one of many factors that can influence policy, and it is we who must turn our attention to the relationship between our science questions or findings and those *other* factors—in particular, social outcomes and processes.

Actionable socioenvironmental science. It is time that we dramatically broaden the community of scholars who tackle environmental problems by going well beyond the natural sciences and even beyond the social science fields that are now within the collaborative comfort zone of environmental scientists (e.g., economics). This means figuring out how to collaborate across disciplines that use very different methods from those that most natural scientists are accustomed to, including, for example, branches of psychology or sociology. With this expanded group, we should then experiment with turning the tables and asking policymakers and policy influencers (e.g., business leaders, nongovernmental organizations) what they need from the scientific community. Or we could focus on identifying the pathways of a solution instead of the processes leading to the problems (Sarewitz and Kriebel 2010).

The research questions and the desired end products might be very different if they are codefined by a much broader array of scholars working together with policy groups at the outset. What might the work of environmental scientists look like if they were to filter out research questions that are directed at products unlikely to be compatible with the form or pace of changes in social norms, behaviors, or governance structures? What might the work of political scientists look like if they focused on the alignment of power structures and science-based prioritization schemes for conservation or restoration?

Does this research process—co-developing science questions with policy groups and commingling social- and natural-science perspectives to refine and then address the questions—imply that bottom-up, discovery-driven science is no longer needed? Absolutely not. As it was conceptualized for the new National Socio-Environmental Synthesis Center (SESYNC), the focus is on what *motivates* the priority questions or themes and *who is engaged* in the process of identifying those priorities. Within those priority themes, there remain fundamental and even disciplinary research problems that, together with applied and highly transdisciplinary research, can lead to scholarship that is one part of a more sustainable future.

This type of science can be called *actionable* because it has the potential to inform decisions (in government, business, and the household), to improve the design or implementation of public policies, or to influence public- or private-sector strategies,

planning and behaviors that affect the environment. I will avoid lapsing into a discussion of disciplinary semantics; however, just to be clear, use of the word *actionable* is not meant to connote legal actions of any kind. Instead, it is consistent with the verbiage used by many social scientists and nonprofit groups when referring to science that is motivated to serve society (e.g., Antonacopoulou 2009).

Moving out of our comfort zone? Is a research process motivated by the need for actionable science a radical departure from what environmental scientists are doing now? I think not. It is instead more like a jump forward on a path they started down long ago: moving from disciplinary work by natural scientists (e.g., ecologists) to multidisciplinary work by natural scientists (e.g., hydrologists and ecologists) to work by interdisciplinary teams that include particular types of social scientists (e.g., economists, land-use planners). That path is beginning to widen, in part because of programs like the Resilience Alliance and the National Science Foundation's Coupled Human and Natural Systems, which have encouraged even broader research teams that include, for example, anthropologists or political scientists working with geographers or ecologists. However, trying a new path in which the research process starts with policy needs instead of ending with them would be new indeed for most academic scholars.

How might research and its use change if that research begins with researchers and policymakers coidentifying environmental problems and

science needs? Is the universe of plausible research efforts narrowed or broadened by science focused on actionable solutions? In my experience, science designed from the ground up to affect the behavior and decisions of nonscientists focuses research in ways that can feel constraining at times but also empowering. Inevitably, it triggers new relationships among scientists, fosters new data and methods, and stimulates the most creative impulses of our research community.

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Margaret A. Palmer (mpalmer@sesync.org) is director of the National Socio-Environmental Synthesis Center (www.SESYNC.org) and professor of entomology at the University of Maryland, in College Park. She is also affiliated with the University of Maryland Center for Environmental Science in Solomons, MD.

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