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POLICY PERSPECTIVES

Navigating the Space between Research and Implementation in Conservation

Anne H. Toomey[1,2], Andrew T. Knight[3,4,5,6], & Jos Barlow[7,8]

[1] Department of Environmental Studies and Science, Pace University, New York, New York, USA
[2] Center for Biodiversity and Conservation, American Museum of Natural History, New York, New York, USA
[3] Department of Life Sciences, Imperial College London, Ascot, Berkshire, United Kingdom
[4] ARC Centre of Excellence in Environmental Decisions, The University of Queensland, Brisbane, Queensland, Australia
[5] Department of Botany, Nelson Mandela Metropolitan University, Port Elizabeth, South Africa
[6] The Silwood Group, London, United Kingdom
[7] Lancaster Environment Centre, Lancaster University, Lancaster, UK
[8] Museu Paraense Emilio Goeldi, Belém, Brazil

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Correspondence:
Andrew T. Knight, Department of Life Sciences, Imperial College London, Room W1.2, Kennedy Building, Silwood Park Campus, Buckhurst Road, Ascot, Berkshire SL5 7PY, UK.
E-mail: andrew.knight1@imperial.ac.uk

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Abstract

Recent scholarship in conservation biology has pointed to the existence of a "research-implementation" gap and has proposed various solutions for overcoming it. Some of these solutions, such as evidence-based conservation, are based on the assumption that the gap exists primarily because of a communication problem in getting reliable and needed technical information to decision makers. First, we identify conceptual weaknesses with this framing, supporting our arguments with decades of research in other fields of study. We then reconceptualize the gap as a series of crucial, productive spaces in which shared interests, value conflicts, and complex relations between scientists and publics can interact. Whereas synonyms for "gap" include words such as "chasm," "rift," or "breach," the word "space" is connected with words such as "arena," "capacity," and "place" and points to who and what already exists in a specific context. Finally, we offer ways forward for applying this new understanding in practice.

Introduction

In the mid-1980s, the Society for Conservation Biology (SCB) was established, promoting a new kind of science whose success would be measured by the degree to which it could help to sustain the health and diversity of the natural world (Meine *et al.* 2006). However, such potential came with a warning, and Soule (1986, p. 4) cautioned that the new "mission-driven" discipline could remain in the "mental world of academia" if its followers did not actively engage with "real-world" problems, circumstances, and experiences. Three decades later, this warning has developed into a "vigorous debate" about the "gap" between research and implementation in conservation, leading some to question whether the field has lost sight of its mission (Knight *et al.* 2008; Arlettaz *et al.* 2010). Much has been discussed and written about the gap, which has been described, rather generally, as a process by which "scientific information accumulates, but is not incorporated into management actions" (Matzek *et al.* 2014, p. 208).

The conceptualization of an issue greatly influences the ways in which it is perceived, framed, and bounded and hence the types of responses and solutions people create to address it (Nisbet & Scheulefe 2009; Newell *et al.* 2014). As such, conceptualizations reflect both how we "know" and the future knowledge that can be produced. While the literature on the research-implementation gap in the conservation sciences has focused on developing and promoting a litany of solutions for its "bridging"

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(e.g., evidence-based conservation, conservation evaluation, and science communication), very little effort has focused on whether the "gap" is an accurate description of the challenges we face. We argue that the way in which the research-implementation gap is conceptualized is a central but overlooked dimension within conservation science. Here, we: (1) offer a critique of current conceptualizations of the gap; (2) present an alternative framing that enables the identification of more carefully focused questions useful for improving our collective effectiveness; and (3) offer ways for applying this new understanding in practice.

The research-implementation gap as a linear model

From the early days of the SCB, the process for ensuring the persistence of nature was clearly framed: conservation scientists could, and should, be motivated by ethical concerns, but their work must be rooted in an objective "firm scientific basis" (Meine *et al.* 2006, p. 636). This requirement for problems to be quantitatively defined and their solutions founded upon science set the tone and trajectory for the evolution of conservation as a discipline. Currently, this often unstated perspective manifests as a belief that the world faces environmental problems best addressed by a self-selected group of experts (i.e., conservation scientists) providing evidence-based solutions to decision makers. Soule (1986, p.3) likened the operations of this process to "...a shuttle bus going back and forth, with a cargo of ideas, guidelines, and empirical results in one direction, and a cargo of issues, problems, criticism, constraints, and changed conditions in the other."

This conceptualization frames the relationship between research and practice as linear (Figure 1A–C): the influences of conservation problems proceed in one direction and the envisaged solutions—largely technical—proceed in another, emphasizing the role of conservation scientists as providing answers delivered as empirical information for "translation" into applied solutions by practitioners. This deficit-model of communication is supported by stronger calls for, and increasingly rapid advancement of, approaches promoting the primacy of quantitative scientific information, epitomized, for example, by the growth of evidence-based conservation as an approach to decision-making (Pullin *et al.* 2004; Adams & Sandbrook 2014; Walsh *et al.* 2014). Recent conservation science textbooks communicate and perpetuate this framing to students by emphasizing the importance that critical evidence syntheses, evaluations, and scientific consensus play in bridging the gap between scientists and practitioners (e.g., Macdonald & Willis 2013).

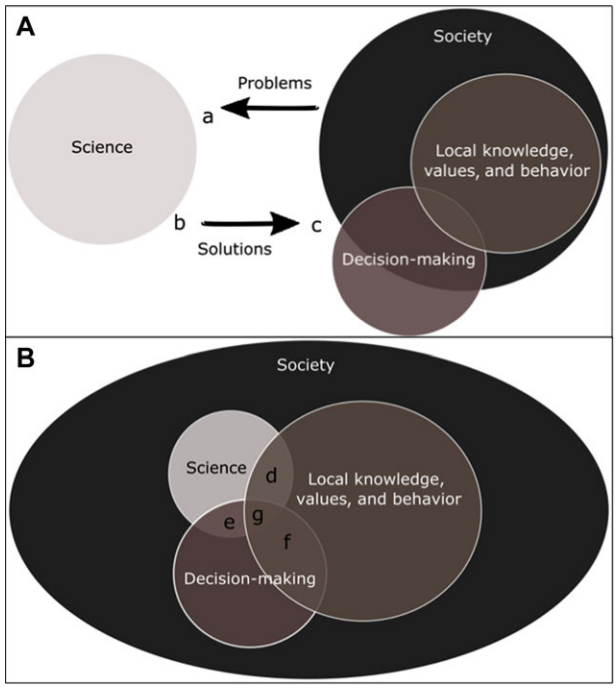

Figure 1 (A) The conventional conceptualization of research-implementation gaps in conservation: (a) in communicating societal concerns to science; (b) in translating scientific information to applicable recommendations; and (c) in disseminating scientific recommendations for policy-makers. (B) Research-implementation spaces: (d) public engagement in science, e.g., citizen science, (e) boundary work and organizations, (f) environmental activism, community-based conservation, (g) participatory action research, sustainability science.

However, the notion that larger quantities of evermore precise information inevitably lead to more effective outcomes in the "real-world" is refuted by well-established theories of human decision-making, such as value-action gap theory in social psychology and reflective practice theory in organizational management, along with contemporary understandings of the science–policy interface in communications and science and technology studies (Table 1). Scholars have convincingly shown that empirical "evidence" is only one factor (and often a minor one) influencing decision-making and change (Pielke 2007; Owens 2012). While the linear model depends upon the idea that science is a tool that enables the trained expert to uncover the "truth" about the universe (i.e., positivism), decades of science studies scholarship has demonstrated that "facts" are not perceived in the same way by different publics, but rather are filtered through existing beliefs, mental models, experiences, and concerns (Nisbet & Scheulefe 2009; Newell *et al.* 2014). Because of this, scientific information is unlikely to change the positions of stakeholders and decision makers

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Table 1 Conceptualizations from various fields of study of the ways in which knowledge and action interact

Fields of study	Relationship between knowledge and action
Behavioral psychology	There is a "value-action gap" between the proenvironmental attitudes that people hold and the behaviors that they are willing to enact in order to address environmental issues, which cannot be overcome simply by using an "information deficit" model of individual participation. This is because there are many practical social or institutional constraints that may prevent people from adopting proenvironmental action, regardless of their attitudes or intentions. Thus, information accuracy is neither a necessary nor sufficient condition for producing desired behavioral outcomes and may in fact be irrelevant to decision-making (Blake 1999).
Organizational learning	In situations of uncertainty, instability, uniqueness, and value conflict, reflection-in-action is crucial. Reflection-in-action is at the core of "professional artistry" and the best professionals rely more on "tacit knowledge" than "technical-rationality," which erroneously maintains that problems are solvable through the rigorous application of science (Schön 1983).
Programme evaluation	Evaluation is an action-oriented process for identifying stakeholder's values and goals, understanding programmes and policies, clarifying options, identifying improvements, and facilitating judgment and decision-making. It applies highly diverse systematic techniques, qualitative and quantitative tools, and sources of knowledge through collaborative processes to create opportunities for dialogue "spaces" that promote utility for intended users (Patton 1997).
Policy sciences	Diverse groups of stakeholders should be involved in problematic policy situations. In this context, science is viewed as a narrowly focused, value-laden, explicitly subjective (not objective) process, and in its traditional form, undemocratic given its typically top-down approach. Instead, multiple realities of situations exist that are partially socially constructed and operationalized through collaborative, explicitly negotiated, social processes (Clark 2002).
Science and technology studies	Western science is viewed as a local form of knowledge that privileges certain ways of viewing the world over others. Effective research is always embedded in a normative understanding of what are the correct questions. As such, it is not accurate or useful to see science as existing separately from social, cultural, and political processes of decision-making and action (Harding 2006).
Science communication	Research shows that, in the highly political environments in which many health and environmental issues are nested, scientific information will not be successful in swaying individuals holding factually incorrect beliefs, and may even reinforce those beliefs. As such, translation and dissemination of activities designed to supply more accurate "facts" is a relatively ineffective way to influence public judgments and decisions. Instead, there is a need to enhance civic capacities for discussing, debating, and participating in collective decision-making (Nisbet & Scheulefe 2009).
"Soft" systems thinking	The realization that "hard" reductionist thinking applied through highly quantitative tools is of limited utility for understanding and solving real-world problems led to the development of "soft" systems thinking. This field recognizes the necessity of incorporating multiple knowledge types, perspectives, and realities in decision-making, and hence the importance of structured debate as a "space" for identifying and implementing desirable and feasible change (Checkland 1984).

Note: Knowledge is typically seen to comprise subjectively held information (beliefs, values, experiences, and rules), not simply reductionist science. Linear "information-deficit" models of knowledge transfer from science to decision makers apply only in very specific contexts.

in complex value laden situations and may even reinforce competing interests and alternate interpretations (Sarewitz 2004; Pielke 2007). While exceptions exist in which the linear model of scientific communication seems to apply, in fact such cases demonstrate how scientific knowledge can synergize with existing societal concerns and political readiness. For example, Arlettaz *et al.* (2010) describe how the practical involvement of researchers in the implementation stage of a scientific study of the endangered hoopoe (*Upupa epops)* population in the Swiss Alps led it to its rapid recovery. While the knowledge used to determine appropriate conservation actions was evidence-based, the authors attribute social and political factors as being key to the project's success, citing "the tremendous support from regional authorities, and second, an incredible

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enthusiasm—after some initial skepticism—of the local farmers" (p. 839).

Unfortunately, such synergetic spaces of accord are uncommon for most environmental challenges. "Wicked problems" such as climate change and biodiversity loss are mired in debates fuelled by conflicting values regarding economics, social justice, and natural resources use. As a result, far from resolving discord, scientific information can further polarize debates around these issues (Pielke 2007; Nisbet & Scheulefe 2009).

In contrast to the linear model, research from various fields of study (Table 1) suggests that effective decision-making is based upon clear understandings of values, knowledge, rules, behaviors and actions, and the complex interactions between them. Such insights can assist in reconceptualizing and reframing our current understanding of the research-implementation gap by helping us envision impact as an ongoing emergent property of human-managed systems, one that manifests not only upon the completion of research, but also throughout the social and policy processes within which useful research is necessarily engaged and embedded (Clark 2002; Ascher *et al.* 2010; Jasanoff 2010).

From a "gap" to be bridged to "spaces" of interaction

Describing the challenge of research informing action as a "gap" suggests that there is something missing or lacking, and that there is a void that needs to be filled or a divide to be bridged (Van Kerkhoff & Lebel 2015). The concept of "space" more accurately describes that which exists between research and implementation, because it points to whom and what already exist in a specific context, conjures the excitement of discovery, and highlights the importance of values, ethics, institutions, and time. While synonyms for "gap" include words such as "chasm," "discontinuity," "rift," or "breach," the word "space" is connected with words such as "arena," "capacity," "leeway," and "place" and implies multiple dimensions. This conceptualization of the ways in which research and action coexist and interact in spaces also highlights the importance of entities and phenomena that emerge throughout the process of producing scientific knowledge—not just that of the end phase of disseminating or mainstreaming it. These include improvements in the number and utility of social interactions, attitudes, and institutional knowledge (Bottrill *et al.* 2012). Scientific research is a socioeconomic activity laden with power relations, cultural understandings (or misunderstandings), social interactions, and political consequences (Harding 2006; Jasanoff 2010). The extent to which local values, knowledge, and behaviors are acknowledged, understood, and given due recognition *during the process* of conducting research can have great bearing on whether or not the results of such research are accepted or rejected in a given political or cultural context (Toomey 2016).

This directly points to the importance of thinking about *who* is involved in the production of knowledge. As Roux *et al.* (2006) argue, knowledge is not a "thing" to be transferred, but rather a "process of relating that involves negotiation of meaning among partners" (p. 11). This necessitates a reconceptualization of the "gap" as series of interactive spaces (Figure 1d–g), emphasizing who operates within it, including those who live on the land where fieldwork takes place, the history of outsiders in that place, as well as consideration of present-day sociocultural relations and political context (Toomey 2016). In this sense, the idea of "space" requires a reconsideration of who has traditionally been included or excluded from decision-making, how and by whom research is conducted, and for what purposes (Harding 2006). Much existing research on the "gap" typically focusses on the knowledge available to, and applied by, "conservation practitioners" or "resource managers" (e.g., Pullin *et al.* 2004; Matzek *et al.* 2014; Walsh *et al.* 2014). The structure of such research implicitly applies a conceptualization of the interaction between research and action framed as a relationship between two self-defined stakeholder groups (scientists and conservation managers) that are connected through a unidirectional flow of scientific (and purportedly reliable) information. The voices, ideas, knowledges, and concerns of other types of stakeholders (e.g., farmers, indigenous and traditional communities, park guards, community activists, and teachers) are typically missing in such investigations (Smith *et al.* 2009).

In contrast, scholars in the fields of anthropology, ethnobiology, and political ecology have long examined the diverse ways people come to know and adapt to their environments, and more recently, the conservation social sciences have focused inquiry on the varied perceptions of the policies and practices of conservation itself (Bennett *et al.* 2016). Van Kerkhoff & Lebel's (2015) guest editorial in *Ecology and Society* presents case studies from across the world in which researchers engaged with other stakeholder groups with the aim to better connect the links between scientific knowledge, sociopolitical conditions, and environmental governance at multiple scales. They demonstrate the importance of understanding the diverse ways in which different groups negotiate the spaces between science and governance, and explain why prior experiences, preconceptions, and expectations of stakeholders can have important implications for the extent to which people are willing to participate in new collaborative research processes. Thus, promoting a

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notion of interconnectedness at the heart of the science–society relationship can help to promote the effective positioning of all stakeholders within policy and social processes aimed at ensuring the persistence of nature.

From a new way of knowing to a new way of doing

The conceptualization of the research-implementation gap currently dominant within conservation science provides a paradox that hinders both our individual and collective effectiveness. On the one hand, rhetoric expressed in peer-reviewed journals argues strongly for stakeholder collaboration; breaking down disciplinary barriers; integration of local, traditional, indigenous, and scientific knowledge systems; and "extra-academic" activities such as outreach work (Balmford & Cowling 2006). On the other hand, the prevailing dominance of the linear conceptualization used for translating research into action undermines these objectives and prescribes, a priori, how conservation professionals design and implement their research; how collaboration is framed, operationalized, and who is involved; which studies are published; and how impact is evaluated. The reconceptualization of the research-implementation gap as a space encourages conservation professionals and their partners to engage and collaborate and to more effectively identify and understand *for whom* and *what* knowledge is produced, and the diversity of ways that this can be achieved. Thus, we propose replacing the terminology of the "research-implementation *gap*" with that of "*research-implementation spaces*" (alternately, research-practice spaces or knowledge-action spaces) as a starting point for reconceptualizing the diversity of ways of knowing and doing.

Instead of a linear, knowledge deficit-based model of scientific impact, we envisage the embedding of conservation science into the collaborative social and decision processes comprising the spaces where policy scenarios and grassroots action play-out (*sensu* Clark 2002). This reframing recognizes that conservation is a social process that engages science, not a scientific process that engages society (Balmford & Cowling 2006; Adams & Sandbrook 2014). Urging a reconceptualization of the research-implementation gap as a series of crucial, productive spaces in which shared interests, value conflicts, and complex relations between conservation biologists and the public can interact is not merely a conceptual shift, but also a practical one. In moving forward, we point to two interconnected areas in which the conservation community can begin to make changes in how we operate as professionals: in the field and within our educational institutions.

In the field, conservation scientists can broaden their roles by creating spaces in which interested stakeholders (farmers, ranchers, communities, and hunters) can engage with research in a diversity of ways. This most fundamentally begins by identifying conservation challenges with stakeholders and collaboratively developing research plans. Collaborative research approaches, such as participatory action research (PAR)—a longstanding research approach in the social sciences that is characterized by a theory of change—can provide theories and methods for adapting research topics to those of direct relevance to people who live and work in a given region. In the conservation sciences, PAR philosophy and methods are often incorporated into biocultural approaches to conservation, which recognize and support the interplay between biological and sociocultural systems through locally grounded environmental research and action. For example, the Global Diversity Foundation (http://www.global-diversity.org) conducts community-led, environmental justice-oriented research in order to promote biological, agricultural, and cultural diversity around the world. One of their projects, "An integrated approach to plant conservation in the Moroccan High Atlas," works with partner communities to strengthen cultural practices of conservation and restore traditional water management systems for the protection of plant biodiversity and medicinal livelihoods in the Mediterranean.

To effectively create, facilitate, and participate in research-implementation spaces, conservation scientists require education and training that goes beyond scientific positivism for a reemphasis on the building of a wide spectrum of *conservation capacities* (see also "coproductive capacities," Van Kerkhoff & Lebel 2015). This requires a renewed focus on the types of thinking, skills, and resourcing needed to more effectively navigate such spaces, rather than a continuous insistence on producing the "best available evidence" to fill a "gap" (Pullin et al. 2004). For example, students studying conservation science should be trained in professional problem-solving skills (e.g., creative and critical thinking, active listening, programme evaluation, participatory planning methods, and systems thinking) and to be presented with important perspectives from disciplines that have traditionally been marginalized in conservation science, such as psychology, sociology, anthropology, and development studies (Bennett *et al.* 2016). In order to achieve this, environmental studies departments need to move beyond multidisciplinary (where faculty brings expertise from multiple fields but tends to stay within the boundaries of its disciplines) toward inter- and transdisciplinary, where shared goals and values at the departmental level (and a carefully constructed curriculum) can train students to seek out, understand, integrate, and apply

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different types of knowledge gained in their courses to problems in the real world (Clark *et al.* 2011). More determined efforts from university departments to partner with community-based organizations, environmental nonprofits, and other stakeholder groups for undergraduate and graduate research collaborations will do much to ensure that students are already inhabiting research-implementation spaces as part of their formal training.

Importantly, while the contexts in which *research-implementation spaces* will emerge are innumerable, conservation scientists can seek to better understand the scales, boundaries, interrelationships, perspectives, and ethical parameters through which they can be navigated. To ensure that they are transformative, there is a need for deep self-reflection by conservation professionals, both within our organizations and through our broader collaborations with other stakeholders. In so doing, we can begin to understand how our own limitations (e.g., our worldviews, cognitive biases, and fears) hinder our effectiveness. Having the courage to act with humility, question our own assumptions and worldviews, and trial and learn from what we believe to be more effective approaches will provide the prerequisite for moving beyond the safe notion of a "gap" toward the uncertainty and complexity inherent in the inhabiting of new spaces.

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