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Environment & Ecology PERSPECTIVE

How to translate knowledge to action at the needed scale

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Received: April 1, 2026; Accepted: August 27, 2026; Published Online: August 28, 2026; https://doi.org/10.59717/j.tiis.2026.100007

Citation: Chapman C., Dáttilo W., Fan P., et al. (2026). How to translate knowledge to action at the needed scale. *The Innovation Insights* **1**:100007.

As the urgency of environmental crises becomes increasingly clear, there is a growing need for effective action across public, private, and government sectors. However, how do we convert desires, pledges, and promises into action on the scale needed to stem environmental damage? We provide a perspective on key limits and amplifiers of effective action along the knowledge-to-action pathway and ways scientists can contribute to achieving the scale needed for change. We focus on how to disseminate knowledge and strategies for action to those who can mobilize it and how to build the tools to promote action. We consider actions to take when reliable facts are disregarded in favor of misinformation. Society must bring solutions to scale to meaningfully address environmental issues, in this process scientists have important roles to play in effective communication, networks, and using behavioural tools.

INTRODUCTION

It is increasingly evident that society is failing to act at the spatial scales and within the timeframe needed to deal with the environmental problems humanity has created. Here we examine the knowledge to action pathway to understand why we are failing. This pathway can be characterized as three broad steps: 1) generating new policy-relevant scientific understandings, 2) disseminating that knowledge to those who can mobilize it, and 3) building the tools that can promote action. Of these, generating knowledge is the most robust and scrutinized process. For example, a recent study found that in the last 20 years over 170,000 conservation journal articles were published[1]. Thus, we focus on key barriers and supports in the less robust parts of the pathway, disseminating scientific knowledge and developing actionable tools. These areas are where the scientific community can play stronger roles to make a substantial impact.

GETTING SCIENTIFIC KNOWLEDGE TO THOSE WHO CAN MOBILIZE CHANGE

One of the most significant barriers preventing knowledge from reaching those who can mediate change deals with developing effective two-way communication. This barrier is largely created and maintained by the academic incentive system. For example, obtaining an academic position, tenure, or promotion is largely dependent on publishing in academic journals. Thus, academic culture provides few incentives to communicate knowledge to the public or policy makers. In addition, different stakeholders use different types of information and communication styles. There is a strong tendency for scientists to make information available only in peer-reviewed journals, while practitioners rely on expert knowledge and traditional practices. A survey of researchers in 29 countries demonstrated that the largest fraction of respondents (34%) ranked scientists as the most important audience for their work, yet 85% viewed that journal articles were ineffective in promoting conservation[2].

One method to foster two way communication involves developing individuals and organizations that operate effectively at the boundary between producers and users of information. Such individuals or groups are skilled in communicating across domains and can prepare focused, timely summaries and deliver them to practitioners and policy makers in user-friendly fashions. They can then take questions back to the producers. These individuals or groups are variously called boundary spanners, bridgers, or evidence bridges. We will use the term 'bridgers'. Formalizing the role of the bridger represents a critical structural shift in how we approach translational ecology. Scientific societies and nonprofits can play important roles as bridgers, as can networks. Networks typically emerge based on common interests with hubs focused topically and/or regionally. When addressing large-scale environmental issues, small groups that produce knowledge at the local scale benefit from being networked with others. These small groups should involve regionally based scientists, local community members, and political figures involved in the co-production of knowledge. Such networks have been used successfully in the past to address pressing environmental concerns such as ozone layer depletion and acid rain and are increasingly harnessed to tackle climate change, and biodiversity loss.

Networks of funders can substantially amplify action at scale. For example, Forests, People, Climate is a collaborative network of philanthropic donors and civil society organizations that aim to significantly increase funding to end and reverse tropical deforestation. This group already has committed $400 million and aims to mobilize $1.2 billion over the next five years.

Figure 1 presents a stylized network structure. Each of the main types of participants (e.g., scientists, public, policy people) is represented by a number of small to large networks and individual agents whose voice are amplified by connecting to one or a few central hubs. These hubs could be formal bodies with substantial infrastructure and staff, or less formal entities. The role of bridgers is essential as these individuals or groups are needed to communicate among hubs and stakeholders. There will be individuals or groups that, in addition to communicating to main hubs, also communicate outside of their network. Charismatic figures or groups can play influential roles in communicating across stakeholders (e.g., the late Jane Goodall, David Attenborough, Greenpeace, Pew Research Centre).

However, even when the needed information in the hands of practitioners and policy makers, progress is often slow or nonexistent. One reason for this is that people's behaviour is influenced by more than information. Rather, decisions are often based on sociopsychological factors, such as self-control and the behaviour of others. For example, while it has become widely known that people are ingesting plastic and microplastics are found in many of our organs, the world is producing a staggering amount of plastic and production is growing at 8.3% a year, thus production will double in only nine years[3]. Such realities have led to research into new tools that promote action. Of course, even when sociopsychological factors lead people to adopt the needed behavioral change, structural factors can inhibit them from taking that action. For example, it is difficult to recycle if people have limited access to do so and only about 40% of Americans living in rural areas have access to curbside recycling.

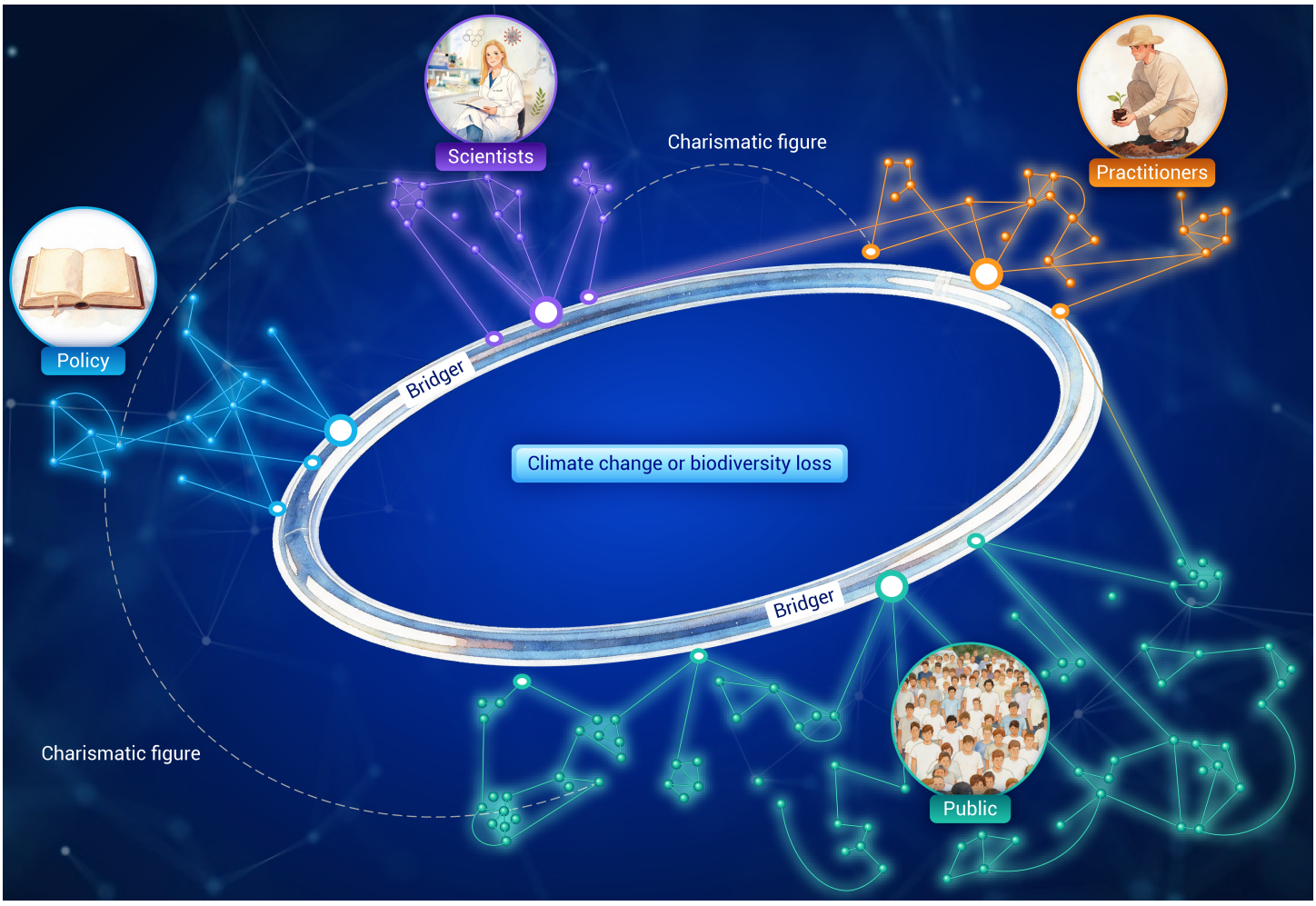

Figure 1. An idealized example of multiple stakeholder networks that could be linked to address a large-scale environmental problem

BUILDING THE TOOLS TO PROMOTE ACTION

Once relevant scientific knowledge has been generated and it has been effectively communicated to the relevant parties, the tools to build action must be available if gains are to happen. Both tools that operate from the top-down and bottom up are needed. We focus on the tools that scientists can most readily employ to drive change from the bottom up.

Environmental issues range widely in the scale and complexity of the interactions they involve. Climate change, for example, is a global challenge that requires top-down structural change through coordinated action by governments, businesses, and major financial actors. At the same time, solutions also depend on bottom-up action by individuals, such as consumer decisions about whether to purchase electric vehicles. For such individual actions to be effective at scale, they must be supported by structural changes led by governments and businesses. For example, electric vehicle purchases would be accelerated if policies were in place to ensure the availability of charging stations. Successful bottom-up initiatives do not just solve local problems; they serve as 'proof of concept'. By demonstrating that sustainable practices are viable and popular at a local scale provides the political capital required for governments to enact broader structural changes.

In contrast, a local issue involves a relatively smaller set of interactants. Involving local community members in designing and implementing solutions can improve program effectiveness and is widely considered the ethical approach. Co-production—the deliberate collaboration of people working toward shared goals—offers one way to scale action through many small, locally grounded conservation efforts.

Bottom-up responses to large-scale environmental problems often falter because individuals see their own actions as too small to matter. This perception is understandable: the average person in the United States emits about 17 metric tons of CO_2 each year, but that represents only about two-billionths of global annual emissions. By contrast, roughly 70% of emissions can be traced to products from approximately 100 fossil fuel companies and cement manufacturers[4]. Governments are often reluctant to enact policies perceived as burdensome, fearing electoral consequences, and they are also influenced by powerful groups that benefit from preserving the status quo.

Balmford and colleagues[5] recently argued that behavioural science offers valuable tools for addressing environmental issues. These tools have long been used to promote social change in areas such as smoking and adoption of solar-power. One common approach is nudging: altering the choice architecture, or decision environment, to encourage desired behaviours. For example, a nudge might change the placement of vegetarian options in cafeterias to encourage people to eat lower on the food chain.

There are several other useful tools emerging. Constructing informed scenarios about the future can help guide environmental strategies under uncertainty. Scenario building enables communities and organizations to consider what is unknown or beyond their control and to identify paths forward.

Another tool involves opening the Overton Window. This represents the range of ideas the public is willing to accept, with policies falling inside this window being considered acceptable and those falling outside it deemed unacceptable. For example, restrictions on wildlife trade became more politically acceptable after scientists highlighted the links between wildlife exploitation and zoonotic disease emergence, thus reframing conservation policy as a public health necessity. Scientists must play an important role in opening the Overton Window by providing the information needed to sway public opinion.

WHEN KNOWLEDGE FACES MISINFORMATION AND DENIAL

Disconnects between scientific and public knowledge are often fed by

misinformation. The National Academies reports a sharp increase in misinformation, linked to unregulated online platforms and cuts in news media[6]. For instance, in the United States (the largest cumulative carbon emitter) and Australia (the leading coal exporter), approximately one-third of people believe that climate change is not predominantly caused by human actions[7]. Similarly, denial regarding the biodiversity crisis and forest loss is increasing[8]. A notable example of politically motivated denial concerning forest loss is when President Bolsonaro of Brazil questioned data showing that 1,000 km^2 of rainforest was cleared in early July 2019, despite strong support for the data[9]. Often such misinformation is generated by corporations which are powerful lobbyists. Although countering misinformation is difficult, disseminating reliable knowledge to the public and to those able to mobilize it remains essential.

WAYS FORWARD

Society is failing to generate the collective action needed to address many of humanity's most pressing environmental challenges. Even when scientists view the need to stop environmentally damaging and health-threatening activities as self-evident, action often does not follow. For example, how can the annual use of 2.3 billion kg of pesticides, associated with 25 million cases of pesticide poisoning each year[10] be defended? Why not work hard to adopt better alternatives? We therefore close by highlighting three critical ways forward: 1) strengthen broad-scale communication, 2) use tools to build support among people already sympathetic to nature, and 3) form networks that amplify environmental messages, with bridgers playing central roles.

The main barrier to addressing environmental problems is not a lack of knowledge, but the psycho-social and socio-political factors that shape how these problems are communicated and acted on. A first step is to provide people with information they can use—especially locally relevant information—along with practical strategies they believe can make a difference. Academics must communicate not only the science of what has happened, but also the consequences of inaction, while actively countering misinformation. Scientists must view protecting scientific integrity not only as an educational responsibility, but also as a legal and institutional necessity and be ready to confront efforts to distort or eliminate data or weaken research infrastructure.

Our experience is that many people are sympathetic to the natural world. This positive view can be nurtured and research directed on how to do that should be a priority. Here, the wide application of behavioural science is a powerful tool to bring about change. We need to use these tools frequently and build better tools to influence large populations, governments, industries, and regulatory bodies as many of the pressing environmental issues require societal support, collective effort, and structural change.

Progress is often limited by our inability to scale up local solutions to the needed level or replicate successful local efforts. Because people tend to identify with small social groups, many collective actions begin at a local scale. To achieve broader impact, these efforts must be coordinated through networks of similar initiatives. Given the scale of many environmental challenges and the complex cultural contexts in which change must occur, diverse and robust networks that include bridgers are essential. Scientists can play significant roles in forming networks. Networks can be formed in a simple organic fashion, by intentionally linking labs with common research agendas. Key to a network having an impact at large scales, such as changing policy, will involve the broad communication of results, and the role of the bridgers is essential.

Scientists, traditionally, saw their role ended with knowledge generation, but the need for their contributions to other phases of the knowledge to action pathway has increased. We already have the appropriate knowledge required to start rectifying many environmental problems humanity has created, and some very useful tools and communication techniques are available to encourage action. We view that this is not the time to be paralyzed in hopelessness as that guarantees inaction, it is the time for scientists to engage in the effective ways at hand to generate what positive outcomes are possible. Since our future depends on these actions, let us get to it.

REFERENCES

1. Zhang L., Yang L., Chapman C. A., et al. (2023). Growing disparity in global conservation research capacity and its impact on biodiversity conservation. *One Earth* **6**:147–157. DOI:10.1016/j.oneear.2023.01.003
2. Shanley P. and López C. (2009). Out of the loop: why research rarely reaches policy makers and the public and what can be done. *Biotropica* **41**:535–544. DOI:10.1111/j.1744-7429.2009.00561.x
3. Gavigan J., Kefela T., Macadam-Somer I., et al. (2020). Synthetic microfiber emissions to land rival those to waterbodies and are growing. *PLOS ONE* **15**:e0237839. DOI:10.1371/journal.pone.0237839
4. Fragnière A. (2016). Climate change and individual duties. *Wiley Interdisciplinary Reviews: Climate Change* **7**:798–814. DOI:10.1002/wcc.422
5. Balmford A., Bradbury R. B., Bauer J. M., et al. (2021). Making more effective use of human behavioural science in conservation interventions. *Biol. Conserv.* **261**:109256. DOI:10.1016/j.biocon.2021.109256
6. National Academies of Sciences Engineering and Medicine (2024). Understanding and addressing misinformation about science. *National Academies Press*. DOI:10.17226/27894.
7. Hornsey M. J. and Lewandowsky S. (2022). A toolkit for understanding and addressing climate scepticism. *Nature Human Behaviour* **6**:1454–1464. DOI:10.1038/s41562-022-01463-y
8. Chapman C. A. and Peres C. A. (2026). Denial and misconceptions about tropical deforestation. *Bioscience*. DOI:10.1093/biosci/biaf210.
9. BBC (2019). Amazon deforestation: Brazil's Bolsonaro dismisses data as 'lies' *British Broadcasting Cooperation. https://www.bbc.com/news/world-latin-america-49052360.*
10. Hayes T. B. and Hansen M. (2017). From silent spring to silent night: agrochemicals and the anthropocene. *Elementa Science of the Anthropocene* **5**. DOI:10.1525/elementa.246.

FUNDING AND ACKNOWLEDGMENTS

CAC was supported by the Wilson Center and CAP by a Frontiers Planet Prize. We thank Andrew Balmford, Aaron Bernstein, Hillary Byerly, Peter Frumhoff, and Yin Yang for helpful ideas and comments.

AUTHOR CONTRIBUTIONS

CC and CH conceived the paper, CC wrote the original draft, and all authors contributed ideas and contributed to writing.

DECLARATION OF INTERESTS

The authors report no declarations of interest.

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