Connecting Scientists to Policy Around the World

Landscape Analysis of Mechanisms Around the World Engaging Scientists and Engineers in Policy

Executive Summary • February 2017

AAAS

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EXECUTIVE SUMMARY

As science and technology drive change in society, and society drives change in governance, there is an increasing need and demand for mechanisms that build relationships among scientists, engineers, and policymakers to support evidence-based policy and practice. In response to growing interest in establishing science policy fellowships and other methods to engage scientists in policy processes, the American Association for the Advancement of Science (AAAS), the world's largest membership-based general scientific society, conducted a landscape analysis of such activities around the world. Sponsored by the Gordon and Betty Moore Foundation, the 18-month effort affirmed global demand to strengthen connections between science and policy, highlighted factors for productive engagement of scientists in the policy sphere, identified more than 150 science-policy linkage mechanisms, and clarified criteria to support their success.

The project entailed a literature review, surveys, research on types of science-policy connection mechanisms, and individual and group consultations. Over the period of May 2015 through November 2016, information was gathered from nearly 200 science policy stakeholders in academia, government, nonprofit organizations, international organizations, and the private sector in nearly 50 countries across the globe.

This report employs the words "science" and "scientist" to cover all STEM fields—science (including social and behavioral sciences), technology, engineering, and mathematics. The emphasis of the landscape analysis is on immersive, experiential mechanisms that involve scientists directly in the policy environment, providing them opportunities to contribute to and learn about the science-policy interface.

The Need

The challenges that society faces at the local, national, regional, and international levels are becoming increasingly complex. Governments around the world tackle multifaceted problems that science and technology contribute to or can help address, including challenges related to energy, water and food resources, healthcare, employment and economic stability, infrastructure and communications, environmental sustainability, and security.

In September 2015, countries around the world adopted the United Nations' set of 17 Sustainable Development Goals to *"end poverty, protect the planet, and ensure prosperity for all."* Each goal has specific targets to be achieved over the next 15 years.[1] Due to the widespread and long-term impacts of policies addressing these highly transboundary and transdisciplinary issues, it is increasingly valuable for policymakers, lawmakers, and regulators to have access to the best available scientific and technical information as a critical input to establish priorities, make decisions, and develop and measure the effect of various policies and practices.

Yet information itself is not sufficient. Scientific articles, research reports, policy briefs, and other documents abound, but they often are not framed in language or a context easily accessible or useful to policymakers. Such materials may not be concise, targeted to specific situations, or provided in a timely manner to address urgent or emerging problems.

Even when such information is tailored for policy use, how scientific information is conveyed and by whom are critical factors.[2] Traditional avenues to communicate scientific and technical information and analyses to policymakers—in individual roles such as chief science advisors or through expert bodies such as national academies, advisory committees, and blue ribbon panels—are typically reserved for distinguished senior academics. However, the need for scientific and technical inputs exceeds what can be provided from panels of scientists tasked with discrete analyses, which are often generated over months and years. Scientific input to policymakers should be dynamic and continuous, provided by scientists who span various disciplines and career stages. Moreover, the scientists engaged with policymakers and in policy processes must view building trust as an essential part of their role.

A Typology of Immersive S&T Policy Connection Mechanisms

Globally, governments, universities, national academies, professional associations, advocacy organizations, and other stakeholders are striving to address this science-policy divide through different approaches. This international landscape analysis mapped immersive science-policy connection mechanisms in a typology of four primary models: (1) fellowships, (2) internships, (3) pairing schemes, and (4) government details and rotations. The mechanisms enable scientists across various career stages and disciplines to contribute to policy processes and build relationships with policymakers.

Targeted capacity-building initiatives including workshops and training programs also are growing at the national and international levels, covering topics such as science

communication, science advice to governments, and science diplomacy. Universities are introducing or expanding policy curricula and establishing graduate degrees that encompass science and policy. Networks of scientists and policymakers interested in crossing boundaries to engage in policy are flourishing. Although not considered immersive mechanisms, these are all important components of the broader international science policy landscape of activities. Some are also documented in this report.

The approaches reveal a diversity of strategies and formats that comprise the four general models targeting multiple branches of government—executive, legislative or parliamentary, and judicial. The mechanisms vary in scope, thematic and geographic focus, target audience, and duration. The chart below summarizes the four models. These are not mutually exclusive, as many mechanisms combine elements across the different models.

These four models utilize immersive methods of experiential learning that extend beyond theory to real world practice. Applying scientific knowledge and methods to policy processes requires communication and navigational skills not often acquired through formal scientific training and education. Immersive, relation-based mechanisms enable scientists to better understand the policy arena and how research can be applied to policy and societal questions and utilized within government policy realms.

Typology of Immersive S&T Policy Connection Mechanisms

Model	Target Group	Duration	Purpose
Fellowships	Graduate STEM students Early to mid-career scientists Policymakers	Typically 1 year or longer, full time	Learn ways science impacts policy Contribute unique skill sets and expertise to policymaking Establish contacts, foster relationships, build networks Increase comfort of policymakers in working with scientists Expose scientists to policy processes and culture Explore policy-related career paths Transition to civil service
Internships	Undergraduate to graduate STEM students Early-career STEM graduates	Generally 3 months to 1 year, full time	Learn ways science impacts policy Develop awareness of policy processes and culture Establish contacts, foster relationships, build networks Explore career options
Pairing Schemes	Early-career to senior scientists Policymakers	Typically 1–2 weeks per year	Improve mutual understanding Establish contacts, foster relationships, build networks
Details and Rotations	Early-career to senior scientists Civil servants	Generally 2–4 years, full time	Deepen understanding of policy processes and culture Contribute expertise to specific issues or projects Establish contacts, foster relationships, build networks Transition to civil service

These mechanisms also enable mutual learning, support cooperative projects and processes, and cultivate long-term relationships and collaborations that afford even broader outcomes and impact. Whereas establishing connections and fostering mutual understanding and trust are at the forefront of many mechanisms linking scientists to policymakers, the underlying structure and administration are critical to ensuring the efforts are sustainable over time and move beyond individual value to broader organizational and societal scope and benefit.

Factors That Support Science-Policy Linkages

The landscape analysis entailed researching and gathering perceptions on the criteria, conditions, and factors that support or impede linkages between scientists and policy in different parts of the world. It assembled and classified more than 150 connection mechanisms in the four broad models and investigated these to ascertain opportunities to guide enhancements of existing efforts and development of new initiatives.

Following is a summary of factors that influence successful science-policy engagement efforts. These were identified through the landscape analysis, gleaned from AAAS's decades of experience operating its Science & Technology Policy Fellowships in Washington, D.C., and also informed by the report *Elements of a Successful Science and Technology Policy Fellowship Program for State Legislatures*.[3]

Political/Institutional Support: Active champions are necessary within and outside government to build and maintain momentum for science-policy connections. A sense of ownership is important not only for the operating entity (if different from the host government office) but also for the participating government ministries, agencies, and parliamentary or legislative bodies that host the scientists. This is especially critical for long-term success when funding is provided from external sponsors.

Broader Impact: Successful efforts emphasize the opportunity for contribution of scientific knowledge to support policy development and implementation as well as professional development. Both afford long-term outcomes and broader impact for societal and organizational results as well as individual benefit. Leadership development, applied research, and individual career enhancement opportunities attract supporters, funders, and participants.

Sustainable Funding: Stable financial support is critical to develop and maintain mechanisms, solidify branding and reputation, and engage in evaluation to support continual enhancement. A diversity of internal and external funding sources reinforces the objective or non-partisan nature of the mechanisms. Sole-source government funding also has been successful in cases where the programs are not tied to a specific political party and are maintained through changes of government.

Meaningful Engagement: Participants contribute and gain the most from well-planned experiences that afford active engagement and interactions that cultivate deep learning. Targeting these experiences to the education level of the participant is important for taking full advantage of the knowledge and skills the participant brings. This enables more meaningful outputs and longer-term outcomes for the receiving policy entity, as well as broader social impact.

> *"It is critical for science to be engaged in the decision-making process more systematically, synthesized in ways that are relevant to current societal problems and challenges, and communicated to political leaders and societal groups in ways that are accessible and comprehensible.*
>
> The Future of Scientific Advice to the United Nations: A Summary Report to the Secretary-General of the United Nations from the Scientific Advisory Board, September 2016

Multi-Perspective Integration: Mechanisms that cultivate and synthesize multidisciplinary, multisector, and multi-stakeholder input are more comprehensive and robust in addressing complex challenges. Integration of STEM disciplines with perspectives from a range of constituencies facilitates broader systems-based thinking for realistic problem-solving that considers critical social, economic, political, and cultural contexts.

Incentives, Compensation, and Support: Creating incentives that acknowledge and reward civic and public engagement of scientists and engineers is critical, especially within academia. Policy-savvy academics can contribute significantly to their institutions through knowledge of government funding sources and strategy. The ability to target research proposals to government interests and needs, and to frame communications to policymakers to garner support by conveying how academic research and innovation contribute to local communities and the broader economy is imperative. For efforts involving longer-term investment of time and effort, adequate compensation and support for fellows, as well as flexibility and recognition in the academic career progression, are required to attract participants and enable their dedicated focus.

Appropriate Infrastructure: Sufficient organizational staffing and capacity are critical to operate well-run, efficient, and effective programming at the designated scale. Activities range from promoting to recruiting to selecting and placing participants, conducting orientation and professional development programming, facilitating participant networking, and managing relations with policy leaders and government ministries, departments, and offices. Depending on the political, legal, and cultural frameworks, in some instances a scientific nonprofit association or consortium may be the most effective organization to operate science-policy connection mechanisms. In other cases, academic institutions or government entities may be appropriate.

Measurable Value: To measure the contributions of science-policy engagement mechanisms, programs must track shorter-term outputs, as well as longer-term outcomes and impacts. This includes direct support for policy, developing S&T leadership capacity, and influencing continued engagement at the intersection of science and policy through participants' career choices and achievements.

Community: Strategies to foster a sense of community among participants in science policy activities and across mechanisms cultivate broader communication and flow of information, resource sharing, and collaborative activities for broader impact.

Recommendations

A common and primary theme throughout this project has been the need to engage and nurture a new generation of scientists around the world to meet current and future demand at the science-policy interface. The international landscape analysis concluded with an overarching recommendation to cultivate and network such boundary-spanning STEM leaders[4] who can engage successfully at the intersection of science and policy. A focus on communication, knowledge sharing and collaboration will help address both need and demand internationally.

Cultivate and network boundary-spanning STEM leaders around the world to engage at the science-policy interface.

- Establish more immersive science-policy engagement mechanisms to give scientists the tools to address complex societal challenges, especially in countries and regions where policymakers are not already well linked to the scientific community.
- Broaden the diversity of scientists and engineers engaging at the science-policy interface by expanding opportunities for and recruiting participants from underserved populations and geographic regions, as well as from a variety of disciplines, backgrounds, cultural perspectives, genders, and career stages.
- Create opportunities to network and forge connections among participants, alumni, funders, and administrators across communities to foster innovation and global collaboration.
- Establish general core competencies and outline sets of skills that empower boundary-spanning expertise in the S&T policy arena to support shared understanding and aims across different political and cultural environments.
- Expand and create trainings, courses, meetings, and networking opportunities to facilitate boundary-spanning learning and connections.
- Foster incentive structures within academia that reward science-policy engagement, outreach, mentoring, and other avenues of civic service.

Communicate the applications of science and how they serve society.

- Foster an ethos of civic engagement internationally by training STEM students on the ability and responsibility of science to help meet the needs of countries and citizens around the world.
- Increase training opportunities to researchers, faculty, and students for effective communication about science to non-scientific audiences, with an emphasis on translating the applications of research to spark innovation and solve problems, in ways that can be readily understood by the public and policymakers.
- Demonstrate opportunities for and the value of policy-related nonacademic career paths that provide meaningful avenues to communicate and apply science for society.

Facilitate knowledge sharing and collaboration.

- Facilitate the exchange of information about activities and mechanisms so that current efforts can benefit from other models and experiences, and to inspire the creation of new mechanisms informed by successful practices.
- Strengthen science diplomacy and advance regional and global cooperation on science and technology policy by cultivating connections among national, regional, and international science and policy stakeholders.
- Establish an online global science policy resource and networking hub to provide centralized access to information, tools and practices, case studies, lessons learned, training and funding opportunities, events, and science policy jobs and related news.

The recognition and involvement of stakeholders from academia, government, nonprofits, industry, and the funding community are all critical for ultimate success of these efforts to build more effective science-society connections.

The landscape analysis focused on the range of relationship-building mechanisms and pathways enabling direct interaction between scientists and policymakers—as opposed to the different ways scientific information flows into policymaking—and identified key criteria and factors supporting their success. The emphasis is on *people as connectors* in structures for individual and collective engagement. This report serves as a guide to enhance existing initiatives and to develop new mechanisms to bridge the divide between the scientific and policy communities worldwide.

A number of such contemporary activities are converging to contribute valuable inputs and advance collective effort around the world. For example, the International Network for Government Science Advice (INGSA) is leading an initiative to establish principles for providing ethical, transparent science advice that will provide a critical foundation for the science-policy interface internationally.[5] The Japan Science and Technology Agency has also been engaged in developing a "Code of Conduct for Scientists."[6]

The Evidence-Based Policymaking Collaborative, launched in September 2016, has developed principles for evidence-based policymaking and is creating tool kits, case studies, briefs, and a research clearinghouse to support policymakers, agency heads, and other leaders seeking to improve results in the public sector. A three-year project on scientific advice for global policymaking, launched in August 2016 by the InterAcademy Partnership in collaboration with the Institute for Advanced Study, specifically targets strengthening the science-policy interface with a focus on inputs to the United Nations.[7]

> *"Science has as its greatest purpose contribution to the benefit of all people and the planet. It is our civic duty to be engaged and support the integration of scientific evidence into national, regional, and global policymaking."*
>
> Rush Holt, CEO,
> American Association for the Advancement of Science

Finally, beyond the specific programs highlighted as case examples in this report, several new science policy fellowship programs have been launched or piloted since 2015 in Australia, Canada, India, and the United Kingdom. Argentina and Spain have communicated their intention to establish science policy fellowships in the near future.

This convergence of activity to inform policy and highlight the importance of the science-policy interface creates an ideal environment to advance a culture of international civic engagement for scientists. The moment is pivotal to cultivate a global force of boundary-spanning STEM leaders to help meet the needs of countries and citizens around the world.

The American Association for the Advancement of Science (AAAS) is the world's largest general scientific society and publisher of the *Science* family of journals (www.sciencemag.org). *Science* has the largest paid circulation of any peer-reviewed general science journal in the world. AAAS was founded in 1848 and includes nearly 250 affiliated societies and academies of sciences, serving 10 million individuals. The non-profit AAAS is open to all and fulfills its mission to "advance science and serve society" through initiatives in science policy, international programs, science education, public engagement, and more. For information about AAAS go to www.aaas.org.

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Endnotes

1 United Nations, "Sustainable Development Goals: 17 Goals to Transform Our World," http://www.un.org/sustainabledevelopment/sustainable-development-goals.

2 OECD, Scientific Advice for Policy Making: The Role and Responsibility of Expert Bodies and Individual Scientists, Science, Technology and Industry Policy Papers no. 21 (Paris: OECD Publishing, 2015), http://dx.doi.org/10.1787/5js33l1jcpwb-en.

3 California Council on Science & Technology, Elements of a Successful Science and Technology Policy Fellowship Program for State Legislatures (January 2016), http://fellows.ccst.us/documents/Elements_2016.pdf.

4 The Center for Creative Leadership defines "boundary-spanning leadership" as the capability to create direction, alignment and commitment across boundaries, fields, or sectors to achieve a higher vision or goal (Ernst & Yip, 2009). See: http://www.ccl.org/wp-content/uploads/2015/04/BoundarySpanningLeadership.pdf.

5 International Network for Government Science Advice, "Principles and Guidelines of Science Advice," http://www.ingsa.org/ingsa-news/principles-and-guidelines-of-science-advice-2/.

6 Center for Research and Development Strategy, "Toward the Establishment of Principles regarding the Roles and Responsibilities of Science and Government in Policy Making," Japan Science and Technology Agency, CRDS-FY2011-SP-09, 2012, https://www.jst.go.jp/crds/pdf/en/CRDS-FY2011-SP-09_EN.pdf.

7 See the InterAcademy Council website, http://interacademycouncil.net/24770/29587.aspx.