Science, Technology, and American Diplomacy: Background and Issues for Congress

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Summary

Science and engineering activities have always been international. Scientists, engineers, and health professionals frequently communicate and cooperate with one another without regard to national boundaries. This report discusses international science and technology (S&T) diplomacy, instances when American leadership in S&T is used as a diplomatic tool to enhance another country's development and to improve understanding by other nations of U.S. values and ways of doing business. According to the National Research Council, five developmental challenges where S&T could play a role include child health and child survival, safe water, agricultural research to reduce hunger and poverty, micro-economic reform, and mitigation of natural disasters.

Title V of the Foreign Relations Authorization Act, FY1979 (P.L. 95-426) provides the current legislative guidance for U.S. international S&T policy. This act states that Department of State (DOS) is the lead federal agency in developing S&T agreements. The National Science and Technology Policy, Organization, and Priorities Act of 1976 (P.L. 94-282) states that the director of the White House Office of Science and Technology Policy (OSTP) is to advise the President on international S&T cooperation policies and the role of S&T considerations in foreign relations.

DOS sets the overall policy direction for U.S. international S&T diplomacy, and works with other federal agencies as needed. Within DOS, the Bureau of Oceans and International Environmental and Scientific Affairs (OES) coordinates international S&T activities. The Science and Technology Advisor to the Secretary of State (STAS) provides S&T advice to the Secretary and the director of the U.S. Agency for International Development (USAID). OSTP acts as a interagency liaison. A number of federal agencies that both sponsor research and use S&T in developing policy are involved in international S&T policy.

A fundamental question is why the United States should invest in international S&T diplomacy instead of domestic research and development (R&D) and science, technology, engineering, and mathematics education (STEM) activities, which are facing budget constraints. If Congress should decide that funding international S&T activities is important, agreeing on a policy goal beyond enhancing the country's development, such as improving U.S. relations with other countries, or enhancing popular opinion of the United States may help set priorities.

Policy options identified for Congress by expert committees who have assessed U.S. international S&T diplomacy efforts include ensuring a baseline of science, engineering, and technical (SET) literacy among all appropriate DOS personnel, increasing the presence overseas of personnel with significant SET expertise, and expanding the Department's engagement within global SET networks through exchanges, assistance, and joint research activities addressing key global issues. Other proposed actions include increasing USAID support that builds S&T capacity in developing countries, and orienting other departments and agencies S&T developing country programs to support the development priorities of the host countries. Another proposal would establish a new U.S. government organization, modeled on the Defense Advanced Research Projects Agency (DARPA) known for its risk-taking and innovation, called the "Development Applications Research Institute" (DARI) to develop and apply innovative technologies to development problems. In all of these efforts, Congress might wish to consider enhancing the prominence of the STAS, and coordination among S&T leaders at OES, STAS, and OSTP.

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Introduction

Scientists, engineers, and health professionals frequently communicate and cooperate with one another without regard to national boundaries. Dating back to the 1700s, Benjamin Franklin and Thomas Jefferson are thought of as the nation's first scientific diplomats.[1] Scientists and inventors themselves, they corresponded with colleagues and brought knowledge back from their visits to Europe to enhance the development and policies of the very young United States. Today, the United States serves the same role for other countries that are in the early stages of development or at a major point of transition. Congress is currently discussing how to maximize the effectiveness of these international science and technology (S&T) policy activities.[2]

This report provides an overview of current U.S. international S&T policy; describes the role of the Department of State (DOS), the White House Office of Science and Technology Policy (OSTP), the U.S. Agency for International Development (USAID), and other federal agencies; and discusses possible policy options for Congress. It focuses on international science and technology diplomacy, where American leadership in science and technology is used as a diplomatic tool to enhance another country's development and to improve understanding by other nations of U.S. values and ways of doing business. These efforts could focus on both enhancing a nation's science and technology (S&T) resources, as well as addressing developmental challenges where S&T could play a role. According to the National Research Council, five potential challenges include child health and child survival, safe water, agricultural research to reduce hunger and poverty, micro-economic reform, and mitigation of natural disasters.[3]

Overview of Current U.S. International Science and Technology (S&T) Policy

Title V of the Foreign Relations Authorization Act, Fiscal Year 1979 (P.L. 95-426, 22 U.S.C. 2656a - 22 U.S.C. 2656d, as amended) provides the current legislative guidance for U.S. international S&T policy, and made DOS the lead federal agency in developing S&T agreements.[4] In that act, Congress found that the consequences of modern S&T advances are of major significance in U.S. foreign policy—providing many problems and opportunities—meaning that its diplomacy workforce should have an appropriate level of knowledge of these

[1] Silvio A. Bedini, *Thomas Jefferson: Statesman of Science* (New York: Macmillian, 1990). I. Bernard Cohen, *Benjamin Franklin's Science* (Cambridge: Harvard University Press, 1996). Joyce E. Chaplin, *The First Scientific American: Benjamin Franklin and the Pursuit of Genius* (New York: Basic Books, 2007).

[2] See, for example, U.S. Congress, House Committee on Science and Technology, Subcommittee on Research and Science Education, *International Science and Technology Cooperation*, hearing, 110th Cong., 2nd sess., April 2, 2008, at http://science.house.gov/publications/hearings_markups_details.aspx?NewsID=2134.

[3] National Research Council, *The Fundamental Role of Science and Technology in International Development: An Imperative for the U.S. Agency for International Development* (Washington, DC: National Academy Press, 2006), at http://www.nap.edu/catalog.php?record_id=11583.

[4] According to DOS, science and technology agreements "establish frameworks to facilitate the exchange of scientific results, provide for protection and allocation of intellectual property rights and benefit sharing, facilitate access for researchers, address taxation issues, and respond to the complex set of issues associated with economic development, domestic security and regional stability." See State Department, "List of Umbrella S&T Agreements," at http://www.state.gov/g/oes/rls/fs/2006/77212.htm for more information.

topics. Further, it indicated that this workforce should conduct long-range planning to make effective use of S&T in international relations, and seek out and consult with public and private industrial, academic, and research institutions in the formulation, implementation, and evaluation of U.S. foreign policy.

The National Science and Technology Policy, Organization, and Priorities Act of 1976 (P.L. 94-282) states that the OSTP director is to advise the President on S&T considerations in foreign relations. Further, the OSTP director is to "assess and advise [the President] on policies for international cooperation in S&T which will advance the national and international objectives of the United States." The following sections discuss the international S&T activities of DOS, OSTP, USAID, and other federal agencies.

Department of State (DOS)

DOS sets the overall policy direction for U.S. international S&T diplomacy, and works with other federal agencies, as needed. In its May 2007 strategic plan, DOS and USAID identify the following key S&T diplomatic strategies:

- encourage science and technology cooperation to advance knowledge in areas related to water management;
- promote sharing of knowledge in the international scientific community that will enhance the efficiency and hasten the fruition of U.S. research efforts, and promote international scientific collaboration;
- strengthen major international collaborations on cutting-edge energy technology research and development in carbon sequestration, biofuels, clean coal power generation, as well as hydrogen, methane, and wind power;
- apply research including promotion of technological improvements to foster more sustainable natural resource use, conservation of biodiversity, and resilience to climate change impacts;
- support scientific and technological applications, including biotechnology, that harness new technology to raise agricultural productivity and provide a more stable, nutritious, and affordable food supply; and
- enhance outreach to key communities in the private sector.[5]

DOS uses a variety of tools to implement this strategy, such as formal bilateral S&T cooperation agreements that facilitate international collaboration by federal agencies; promotion and support of S&T entrepreneurs and innovators;[6] scientist and student exchanges; workshops, conferences,

[5] U.S. Department of State/U.S. Agency for International Development Strategic Plan, Fiscal Years 2007-2012: Transformational Democracy, May 7, 2007, available at http://www.usaid.gov/policy/coordination/stratplan_fy07-12.pdf.

[6] This report does not discuss issues related to the promotion and support of technological innovation such as export controls or technology, trade, and security issues. For more information on these issues, see CRS Report RL31832, *The Export Administration Act: Evolution, Provisions, and Debate*, by Ian F. Fergusson, and CRS Report RL32591, *U.S. Terms of Trade: Significance, Trends, and Policy*, by Craig K. Elwell.

and meetings; public-private partnerships; seed funding for scientific programs and innovation activities; and production of educational materials, including films, websites, posters, and cards.[7]

Within the State Department, the Bureau of Oceans and International Environmental and Scientific Affairs (OES) coordinates international S&T activities, and the Science and Technology Advisor (STAS) provides S&T advice to the Secretary of State, DOS staff, and the director of USAID. USAID is an independent federal government agency that, with guidance from DOS, supports developmental and U.S. strategic interests, among other duties.

Bureau of Oceans and International Environmental and Scientific Affairs (OES)

OES coordinates international S&T cooperative activities throughout the federal government.[8] Within OES is the Health, Space, and Science Directorate, which works with federal agencies on S&T policy issues.[9] In addition, some U.S. embassies have bilateral Environment, Science, Technology, and Health foreign service officers. Embassies may host their own country-specific activities such as joint research grants, junior scientist visit grants, events, and workshops. Some have a joint board that includes both scientists from the host country as well as government scientists to oversee these activities.[10] There are also "hubs" that focus on environmental issues on a regional basis.

Science and Technology Advisor to the Secretary of State (STAS)

Within the State Department, but distinct from the OES, is the Science and Technology Advisor to the Secretary of State (STAS).[11] The STAS acts as an advisor for both DOS and USAID. The goals of this office are to enhance the S&T literacy and capacity of DOS; build partnerships with the outside S&T community, within the U.S. government, with S&T partners abroad, and with foreign embassies in the United States; provide accurate S&T advice to DOS; and shape a global perspective on the emerging and "at the horizon" S&T developments anticipated to affect current and future U.S. foreign policy.[12]

[7] Jeff Miotke, Deputy Assistant Secretary for Science, Space, and Health, OES, DOS, Testimony before the House Committee on Science and Technology, Subcommittee on Research and Science Education, *International Science and Technology Cooperation*,110th Cong. 2nd sess., April 2, 2008, at http://democrats.science.house.gov/Media/File/Commdocs/hearings/2008/Research/2apr/Miotke_Testimony.pdf.

[8] For more information, see http://www.state.gov/g/oes/c20049.htm. The FY2008 budget estimate for OES is $31 million. See State Department FY2009 budget justification, available at http://www.state.gov/s/d/rm/rls/statecbj/2009/.

[9] According to the FY2009 State Department budget justification, the FY2008 budget estimate for this directorate is $4 million and includes 24 staff members.

[10] For an illustration, see http://egypt.usembassy.gov/usegypt/contacts.htm.

[11] For more information, see Nina Fedoroff, Science and Technology Adviser to the Secretary of State and the Administrator of USAID, Testimony before the House Committee on Science and Technology, Subcommittee on Research and Science Education, *International Science and Technology Cooperation*,110th Cong. 2nd sess., April 2, 2008, at http://democrats.science.house.gov/Media/File/Commdocs/hearings/2008/Research/2apr/Fedoroff_Testimony.pdf.

[12] For more information, see http://www.state.gov/g/stas/c6063.htm.

U.S. Agency for International Development (USAID)

USAID is an independent federal government agency with the goal of supporting transformational development, strengthening fragile states, supporting U.S. geostrategic interests, addressing transnational problems, and providing humanitarian relief.[13] Although independent, USAID's overall foreign policy guidance comes from the Secretary of State. At one time S&T had a major role at USAID. Today, however, S&T capacity, staffing, and funding, particularly in overseas missions, are far less than in the past.[14]

White House Office of Science and Technology Policy (OSTP) and the National Science and Technology Council (NSTC)

OSTP, a staff office within the Executive Office of the President (EOP), does not fund domestic or international programs. Rather, the Assistant to the Director for International Relations acts as a liaison: within the EOP, to organizations such as the National Security Council; with federal agencies, including DOS and the international offices of federal agencies such as the National Science Foundation; and with the science liaisons of foreign country embassies in the United States.[15] Within OSTP, the National Science and Technology Council (NSTC), currently established by Executive Order 12881, coordinates S&T policy across the federal government.[16]

Management of international S&T policy issues at OSTP and NSTC has varied among Presidential administrations.[17] During the Clinton Administration, OSTP had a Presidentially-appointed associate director whose primary focus was on international policy. This presidential appointee, along with a DOS presidential appointee, co-chaired a NSTC Committee on International Science, Engineering, and Technology (CISET) that addressed "international science cooperation as it related to foreign policy and the Nation's research and development (R&D) agenda."[18] In the George W. Bush Administration, rather than an OSTP political appointee focused on international issues, there is a staff member who serves as an assistant to the director

[13] U.S. Agency for International Development, *USAID Primer: What We Do and How We Do It*, January 2006, at http://www.usaid.gov/about_usaid/PDACG100.pdf.

[14] National Research Council, The Fundamental Role of Science and Technology in International Development: An Imperative for the U.S. Agency for International Development (Washington, DC: National Academy Press, 2006) at http://www.nap.edu/catalog.php?record_id=11583. Nina Fedoroff, Science and Technology Adviser to the Secretary of State and the Administrator of USAID, Testimony before the House Committee on Science and Technology, Subcommittee on Research and Science Education, International Science and Technology Cooperation,110th Cong. 2nd sess., April 2, 2008, at http://democrats.science.house.gov/Media/File/Commdocs/hearings/2008/Research/2apr/Fedoroff_Testimony.pdf.

[15] John H. Marburger, Director, OSTP, Testimony before the House Committee on Science and Technology, Subcommittee on Research and Science Education, *International Science and Technology Cooperation*, 110th Cong. 2nd sess., April 2, 2008, at http://democrats.science.house.gov/Media/File/Commdocs/hearings/2008/Research/2apr/Marburger_Testimony.pdf.

[16] National Science and Technology Council, at http://www.ostp.gov/cs/nstc.

[17] A Woodrow Wilson Center report identifies what they consider to be the best practices regarding OSTP and international S&T policy. For more information, see Jennifer Sue Bond, Mark Schaefer, David Rejeski, Rodney W. Nichols, *OSTP 2.0: Critical Upgrade: Enhancing Capacity for White House Science and Technology Policymaking: Recommendations for the Next President* (Washington, DC: Woodrow Wilson International Center for Scholars, June 2008) at http://wilsoncenter.org/news/docs/OSTP%20Paper1.pdf.

[18] National Science and Technology Council, *2000 Annual Report*, at http://www.ostp.gov/pdf/nstc_ar.pdf.

for international affairs.[19] Another difference is that rather than focusing an NSTC committee on overall international S&T policy, OSTP coordinates federal international S&T activities through NSTC committees that focus on a particular topic, like nanotechnology, or a specific country, like Brazil.[20]

Role of Other Federal Agencies and Nongovernmental Organizations

A number of federal agencies that both sponsor research and use S&T in developing policy are involved in international S&T policy. These include National Science Foundation (NSF), National Institutes of Health, Department of Energy, National Aeronautics and Space Administration (NASA), Department of Agriculture, Environmental Protection Agency, Department of Interior, and others.[21] Federal programs may be formal "top-down" activities focused on the agencies' mission and identified by agency leadership, or "bottom-up" activities identified by scientists and engineers. Examples of "Top-down" activities include the National Oceanic and Atmospheric Administration (NOAA)'s National Environmental Satellite, Data, and Information Service focused on Earth observation data exchange, or the National Institute for Science and Technology (NIST)'s development of uniform measurement standards for ethanol and biodiesel. "Bottom-up" activities often arise from proposals submitted in response to a specific solicitation or as part of a general solicitation for research in their field.[22]

Role of Congress

An April 2008 House Committee on Science and Technology Subcommittee on Research and Science Education hearing examined global and domestic benefits from cooperation in science and technology.[23] One fundamental question asked during the hearing was why the United States should support international science diplomacy rather than invest in domestic R&D. **Table 1** provides a summary of the Bush Administration's response.

For the United States to be competitive, according to Bush Administration witnesses, it needs to know where the frontier of science is occurring. As other countries increase their investment in higher education and R&D, the top science and engineering research and facilities may not be in the United States, but in other countries. This increases the importance of U.S. investment in

[19] John H. Marburger, Director, OSTP, Testimony before the House Committee on Science and Technology, Subcommittee on Research and Science Education, *International Science and Technology Cooperation*, 110th Cong. 2nd sess., April 2, 2008, at http://democrats.science.house.gov/Media/File/Commdocs/hearings/2008/Research/2apr/Marburger_Testimony.pdf.

[20] Ibid.

[21] A description of federal agency international S&T activities is provided in Jeff Miotke, Deputy Assistant Secretary for Science, Space, and Health, OES, DOS, Testimony before the House Committee on Science and Technology, Subcommittee on Research and Science Education, *International Science and Technology Cooperation*,110th Cong. 2nd sess., April 2, 2008, at http://democrats.science.house.gov/Media/File/Commdocs/hearings/2008/Research/2apr/Miotke_Testimony.pdf.

[22] Ibid.

[23] U.S. Congress, House Committee on Science and Technology, Subcommittee on Research and Science Education, *International Science and Technology Cooperation*, hearing, 110th Cong., 2nd sess., April 2, 2008, at http://science.house.gov/publications/hearings_markups_details.aspx?NewsID=2134.

international S&T diplomatic activities, said Bush Administration witnesses, including federal programs that support U.S. scientists' collaborations with foreign scientists, and access to the best research facilities in the world, as well as enhancing the international connections of U.S. science and engineering students and leaders. In addition, U.S. science and engineering higher education and research helps developing countries by enhancing their human resource capacity, and as a result, their ability to achieve long-term development. These international connections can be important, say Bush Administration witnesses, not just for those countries, but in helping the U.S. respond to global challenges such as infectious diseases such as avian flu. Further, according to a Bush Administration witness, international cooperative activities at their agency in almost all instances are conducted on a "no exchange of funds" basis with U.S. funding supporting U.S. scientists and engineers, not those in the cooperating country.[24]

Table 1. U.S. Objectives in International Research and Development Programs

1. To maintain and continually improve the quality of U.S. science by applying global standards of excellence. (Performing science to the highest standards)
2. To provide access by U.S. scientists to the frontiers of science without regard to national borders. (Access to the frontiers of science)
3. To increase the productivity of U.S. science through collaborations between U.S. scientists and the world's leading scientists, regardless of national origin. (Access to scientific talent)
4. To strengthen U.S. science through visits, exchanges, and immigration by outstanding scientists from other nations. (Augmentation of scientific human capital)
5. To increase U.S. national security and economic prosperity by fostering the improvement of conditions in other countries through increased technical capability. (Security through technology-based equity)
6. To accelerate the progress of science across a broader front than the U.S. may choose to pursue with its own resources. (Leveraging on foreign science capabilities)
7. To improve understanding by other nations of U.S. values and ways of doing business. (Science diplomacy)
8. To address U.S. interests of such global nature that the U.S. alone cannot satisfy them. (Global support for global scientific issues)
9. To discharge obligations negotiated in connection with treaties. (Science as a tradable asset)
10. To increase U.S. prestige and influence with other nations. (Science for glory)

Source: John Marburger, Director, Office of Science and Technology Policy, "National Science Board Hearing on International Science Partnerships," speech, May 11, 2006. John H. Marburger, Director, OSTP, Response to questions at House Committee on Science and Technology, Subcommittee on Research and Science Education, *International Science and Technology Cooperation*, 110th Cong. 2nd sess., April 2, 2008, at http://science.house.gov/publications/hearings_markups_details.aspx?NewsID=2134.

Some believe, however, that the United States should enhance its international science and technology activities. They believe that such investments are sometimes viewed by policymakers as either "giving away knowledge" or a "humanitarian luxury," when they actually could help all countries to reach common goals such as developing safe and reliable nuclear power, or enhancing all countries' economic development.[25] Others express concerns that although the

[24] Testimony and response to questions by John H. Marburger (OSTP), Arden Bement (NSF), Nina Fedoroff (STAS), Jeff Mitoke (DOS), and Michael O'Brien (NASA) at U.S. Congress, House Committee on Science and Technology, Subcommittee on Research and Science Education, *International Science and Technology Cooperation*, hearing, 110th Cong., 2nd sess., April 2, 2008, at http://science.house.gov/publications/hearings_markups_details.aspx?NewsID=2134. A transcript of the hearing is available from Congressional Quarterly.

[25] See, for example, Rodney W. Nichols, *US Science Office Must Promote Global Collaboration*, Science and (continued...)

United States has many programs to promote science and technology in the developing world, such programs have limited due to insufficient financial and human resources at DOS, AID, and OSTP that limit the ability of these agencies to achieve their mission.[26]

If Congress should decide that funding international S&T activities is important, agreeing on a policy goal beyond enhancing the country's development, such as improving U.S. relations with other countries, or enhancing popular opinion of the United States may help set priorities. Activities funded might differ depending on those priorities. For example, two possible goals might be (1) improving U.S. relations with the government of a country or in a region, or (2) raising popular opinion of the United States in that country or region. In the case of the first goal, activities might focus on enhancing the foreign government(s) decision-making based on science and engineering information or providing financial or technical aid to a country's science and engineering efforts. In the case of the second goal, activities might focus on a challenge more visible to the public, such as increasing access to water, enhancing agricultural productivity, or obtaining high quality STEM education.

Although the effectiveness of different S&T diplomatic initiatives has not been studied, the State Department contends that some key elements for success are finding areas or programs that (1) break new ground, sometimes in a neglected area of science or development; (2) are educationally and developmentally transformative; (3) address core developmental issues of poverty and human development; (4) promote sustainable uses of natural resources; (5) stimulate job creation and private sector investment; and (6) are collaborative projects with tangible results.[27]

Six broad categories of international S&T cooperative activities include (1) agreements; (2) research; (3) facilities and equipment; (4) academic opportunities from primary through post-secondary education; (5) meetings, dialogues, and visits; and (6) private sector activities (see **Table 2**). International S&T cooperative activities can be multinational, regional, or bilateral. A related question is who might best lead such efforts relative to the desired goal. Options include scientists, engineers, and health professionals at academic institutions, business and industry, and non-governmental organizations; scientists, engineers, and health professionals who work for the federal government; and S&T federal government leaders.

Expert committees which have assessed U.S. international S&T diplomacy efforts express concerns about (1) the lack of S&T expertise, presence, and global engagement at DOS, (2) a decline in support for S&T capacity at USAID, (3) a lack of coherent and integrated international S&T policy direction and federal coordination role at OSTP, and (4) insufficient technological research to respond to development challenges. The following sections discuss proposed recommendations to respond to these concerns.

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Development Network, October 31, 2008 at http://www.scidev.net/en/opinions/us-science-office-must-promote-global-collaboratio.html?utm_source=link&utm_medium=rss&utm_campaign=en_opinions.

[26] David Dickson, *The World's Poor Deserve Better U.S. Leadership*, Science and Development Network, October 31, 2008, at http://www.scidev.net/en/editorials/the-world-s-poor-deserve-better-us-leadership.html.

[27] Jeff Miotke, Deputy Assistant Secretary for Science, Space, and Health, OES, DOS, Testimony before the House Committee on Science and Technology, Subcommittee on Research and Science Education, *International Science and Technology Cooperation*,110th Cong. 2nd sess., April 2, 2008, at http://democrats.science.house.gov/Media/File/Commdocs/hearings/2008/Research/2apr/Miotke_Testimony.pdf.

Table 2. International Science and Technology Policy Mechanisms

Agreements

- Formal multinational, regional, and bilateral agreements between the U.S. government and the government of another country.
- Government-level bilateral agreements between a U.S. agency and a research agency of a foreign country that are related to a government-level agreement and provide additional details that define how each agency will cooperate.
- Agency-level bilateral agreements between a U.S. agency and a research agency of a foreign country that are not related to a government-level agreement.
- Agency-level multilateral agreements between a U.S. agency and research agencies of international organization and/or of two or more foreign countries.

Research

- Joint research sponsorship where a U.S. and foreign researcher, group of researchers, or institutions work together.
- Visiting foreign researchers who come to the United States, or U.S. researchers who visit the foreign country.
- Sponsorship of foreign researchers in early stage of their careers.
- Sponsorship of research conducted by a U.S. researcher in a foreign country or a researcher in the foreign country.

Education

- Fellowships, research assistantships, and traineeships.
- Undergraduate and graduate student exchange programs.
- Visiting foreign lecturers who come to the United States, or U.S. researchers who visit the foreign country.
- K-12 science, technology, engineering, and mathematics (STEM) curriculum development and teacher training, methods, and certification.
- Educational materials including films, websites, posters, and cards.

Meetings, Dialogues, and Guidance

- Meetings to exchange ideas.
- Workshops to learn about a science and technology topic.
- Guidance on the application of research and technology.
- Dialogues on how best to harmonize S&T regulatory activities.

Facility, Equipment, Data, and Information

- Facility utilization.
- Equipment provision and lending.
- Data and information measurement, provision, and exchange.

Private Sector

- Promotion and support of S&T entrepreneurs and innovators.
- Public-private partnerships.

Source: Congressional Research Service. Agreements section is based on General Accounting Office, *Federal Research: Information on Science and Technology International Agreements*, Report Number RCED-99-108, April 1999 at http://www.gao.gov/archive/1999/rc99108.pdf.

S&T Expertise, Presence, and Global Engagement at DOS

The report of the State Department Advisory Committee on Transformational Diplomacy, State Department in 2025 Working Group[28] recommends that the State Department expand its investment in Science, Engineering, and Technology (SET) expertise, presence, and global engagement. The report's specific recommendations include ensuring a baseline of SET literacy among all appropriate Department personnel, increasing the presence overseas of personnel with significant SET expertise, and expanding the Department's engagement within global SET networks through exchanges, assistance, and joint research activities addressing key global issues. In addition, the report recommends creating a closer connection between the roles of the Assistant Secretary for OES and the STAS to bring senior attention to the full range of SET challenges and opportunities facing the Department. For example, if the Assistant Secretary for OES is a scientist, that person could serve simultaneously as the Science and Technology Advisor to the Secretary of State. Otherwise, the STAS could become the Principal Deputy Assistant Secretary of State (PDAS) in OES.[29]

S&T Capacity at USAID

A National Research Council (NRC) report recommends Congress and others take action to reverse what they state is the decline in USAID support for building S&T capacity, and strengthen the capabilities of its leadership and program managers in Washington, DC, and in foreign countries on S&T issues. In addition, the report recommends that Congress encourage other departments and agencies to orient their S&T developing country programs to support the development priorities of the host countries, and that USAID take actions to enhance interagency coordination.[30]

International S&T Policy Direction and Federal Coordination at OSTP and NSTC

A National Science Board (NSB) report[31] recommends that the United States create a coherent and integrated international science and engineering strategy, balance U.S. foreign and R&D policy, and promote intellectual exchange. In addition, it recommends reestablishing the NSTC Committee on International Science, Engineering, and Technology, and appointing a high-level international S&T policy official in OSTP. Congress, according to NSB, should amend the Government Performance and Results Act to require Federal agencies to address international S&T partnerships. Further, Congress should direct the Department of Commerce, OSTP, DOS, and the Department of Homeland Security to balance U.S. security policies with international science and engineering (S&E) needs. The report also contends it is important to facilitate "brain

[28] State Department, *Advisory Committee on Transformational Diplomacy: Final report of the State Department in 2025 Working Group*, at http://www.state.gov/secretary/diplomacy/99774.htm.

[29] Ibid.

[30] National Research Council, *The Fundamental Role of Science and Technology in International Development: An Imperative for the U.S. Agency for International Development* (Washington, DC: National Academy Press, 2006), at http://www.nap.edu/catalog.php?record_id=11583.

[31] National Science Board, *International Science and Engineering Partnerships: A Priority for U.S. Foreign Policy and Our Nation's Innovation Enterprise*, NSB 08-4 (Arlington, VA: National Science Foundation, 2008), at http://www.nsf.gov/nsb/publications/2008/nsb084.pdf.

circulation" as opposed to "brain drain," by supporting study abroad opportunities for American students, streamlining the visa process for foreign scientists, engineers and students, and identifying and increasing the use of U.S. and international facilities for collaborative research.[32]

New Institute to Support Technology Research

The United States Commission on Helping to Enhance the Livelihood of People Around the Globe (HELP Commission) was charged in Section 637 of P.L. 108-199 (Consolidated Appropriations Act, 2004) to study, develop, and deliver to the President, Congress, and the Secretary of State actionable proposals to enhance and leverage the efficiency and effectiveness of U.S. foreign assistance to reduce poverty through sustained economic growth and self-sufficiency.[33] One study by several commissioners found the following characteristics of successful efforts:

- Ownership and initiative must be local;
- Partnership is the premise;
- Technology adaptation and adoption matter;
- Leaders and policy must drive toward self-reliance; and
- Continual information loops contribute to learning and adjustments.[34]

The study found that some of the most widely acknowledged foreign assistance successes have incorporated the application of technologies including the Green Revolution of the mid-20th century, which they state doubled food production in developing countries, and the presence today of Consultative Group on International Agricultural Research (CGIAR), a partnership of government, nongovernmental organizations, and businesses that support 15 international research centers to provide technical support. Other examples include bednets to reduce malaria, smallpox and polio vaccines, and "smart cards" that provide loans to businesses located in poor areas where no bank is available. The study also indicates that the scientific and technological capacity of developing countries is growing, such as the African Laser Center.

In its report, the Commission proposed the establishment of a new U.S. government organization, modeled on the Defense Advanced Research Projects Agency (DARPA) known for its risk-taking and innovation,[35] called the "Development Applications Research Institute"[36] (DARI). According to the Commission, DARI could "develop and apply innovative technologies to development problems in order to jumpstart research and development aimed at reducing global poverty," and its head could serve as the science advisor to the lead U.S. government official in charge of development policy. The Commission proposed that DARI focus on all relevant development

[32] Ibid.

[33] The HELP Commission, "Mission," webpage at http://www.helpcommission.gov/Mission/tabid/53/Default.aspx.

[34] Carol Adelman, Nicholas Eberstadt, Susan Raymond, and Melissa Griswold, *Foreign Assistance: What Works and What Doesn't with Recommendations for Future Improvements*, December 14, 2007 at http://www.helpcommission.gov/portals/0/HELP_WWWD.pdf.

[35] For more information on DARPA and other similar models, see CRS Report RL34497, *Advanced Research Projects Agency - Energy (ARPA-E): Background, Status, and Selected Issues for Congress*, by Deborah D. Stine.

[36] HELP Commission, *Beyond Assistance: The HELP Commission Report on Foreign Assistance Reform*, December 7, 2007 at http://www.helpcommission.gov/portals/0/Beyond%20Assistance_HELP_Commission_Report.pdf.

areas including agriculture, health, and education; carry out its work in partnership with development countries to spur the development of local R&D capabilities; and carefully structured to ensure accountability and performance. The cost of DARI, according to the Commission would be $50-100 million per year.

Additional Considerations

If Congress should decide to address the trends described above, additional financial resources and personnel with expertise in S&T may be necessary. If Congress is concerned about a lack of overall international S&T policy direction at OSTP or coordination among the White House and federal agencies as described by the reports above, possible actions include enhancing the prominence of the STAS, and coordination among, S&T leaders at OES, STAS, and OSTP. One option that takes into account all three reports is for the STAS to play a greater role in coordination by appointment to a high-level position within OES as well as chairing a revived CISET. If Congress decides to establish DARI, the STAS might also play a leadership role there as well.

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