THE NATIONAL ACADEMY OF SCIENCES AND INTERNATIONAL SCIENCE AND TECHNOLOGY COOPERATION

Statement of

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Chairman Baird, Ranking Member Ehlers, and distinguished members of the Subcommittee, thank you for this opportunity to discuss international science, technology and health (STH) cooperation. I am Michael Clegg, Foreign Secretary of the National Academy of Sciences. The National Academy of Sciences, together with the Academy of Engineering and the Institute of Medicine, (collectively referred to as "The Academies") are non-governmental organizations whose members are elected on the basis of STH leadership.

The US Congress chartered the National Academy of Sciences in 1863 with the explicit mission of providing STH advice to the US Government when asked. Over the years, as the demand for advice expanded and as the US STH community grew in size and complexity, the National Research Council (NRC) was established to administer the advice function. Later the National Academy of Engineering (NAE) and the Institute of Medicine (IOM) were organized under the original charter of the National Academy of Sciences. Today's organization provides advice to government and the public on a wide variety of issues ranging from climate change to bacterial threats, from energy futures to emerging diseases, from food security to building effective science education programs, from challenges of mega cities to the control of weapons of mass destruction.

Why do the National Academies promote international science cooperation?

The Academies are engaged with counterpart STH communities around the world and have a long history of working with international partners in addressing the STH based challenges facing the world. From its inception in 1863, the US National Academy of Sciences has elected outstanding scientists from outside the United States as Foreign Associates, thus recognizing the important contributions of foreign scientists to progress in all fields. In today's world, science is increasingly trans-border and global in its conception, exploration, and application. It is thus in the vital interest of the US science community, and more broadly of US society, to maintain close linkages with science communities throughout the world. Because our organization includes the leadership of science from around the globe, we are uniquely positioned to promote international science cooperation and to facilitate the provision of scientific evidence to policy makers on a global basis. We are also uniquely positioned to use science as a means of building bridges between societies in conflict and as a means of facilitating international STH collaborations.

Science was a global activity long before the invention of the term "globalization" because the issues and challenges of STH programs are predominantly global in nature. The Academies often include foreign participants in our work, because access to foreign expertise is increasingly relevant for all US-based institutions. The inclusion of global dimensions improves the quality, depth, and accuracy of our studies and reports.

What are the specific goals of the Academies' international programs?

Based on our experience and capacity as an advisor to our own government and society, three broad themes of the Academies' international programs, have emerged: They are: (1) improving global sustainability and health. (2) Enhancing national and international security through increasing pathways of communication. And, (3) enhancing human and institutional capital as a route to economic development and equity. I will briefly describe several selected activities to illustrate the Academies' international programs relevant to these themes.

Improving global sustainability and health: The Academies have had a long engagement with international partners on issues of sustainability and health. One of the major global sustainability issues that demand international S&T cooperation is that of water resources. Many parts of the world, including parts of the United States, face uncertain water futures and it is imperative to develop S&T based solutions for water management issues. In this context, the NRC produced a comprehensive report, together with the Mexican Academy of Sciences, on the issues confronting the Mexico City water supply (*Mexico City's Water Supply: Improving the Outlook for Sustainability).* We have conducted joint workshops on ground water resources in the Yucatan, in the Middle East and in North Africa and we have produced a multilingual information resource on water and health.

A second issue that is particularly crucial at present is that of energy sources and management. The Academies partnered with the Chinese Academy of Sciences to produce a forward-looking report on energy futures in 2000 (*Cooperation in the Energy Futures of China and the United States)* and we have a continuing series of cooperative efforts with the Chinese Academy focused on energy related issues.

Often the Academies work with partners in regions of conflict thereby addressing an important scientific issue while also helping to create bridges of cooperation. Thus, for example, we have an ongoing program of cooperation with the academies of the Middle East. This effort began with cooperation on regional health challenges. It also included a project on water futures in the Jordan Valley, conducted jointly with the Israeli and Palestinian academies and the Higher Council of Jordan that resulted in the joint report entitled *Water for the Future: The West Bank and Gaza Strip, Israel, and Jordan.* This work has now matured into a series of joint activities that include projects on micronutrient deficiencies, water resources, renewable energy, pollution and land degradation and science education. An organization has been created to implement these programs provisionally named the "Association of Middle Eastern and US National Academies of Sciences". Our Academies also host a meeting for young and mid career scientists from Jordan, Israel, Palestine and the United States aimed at sharing research knowledge and framing joint solutions to common problems.

Why are the US Academies seen as effective conveners of activities in the Middle East? The principle answer is that the US scientific community is held in high esteem by all the societies of this conflicted region of the world. This respect for US science institutions is

based on a widespread admiration for American accomplishments in STH fields and it opens doors that might otherwise be closed.

Enhancing national and international security through increasing pathways of communication: Beginning in the early 1980s, the US National Academy of Sciences established a standing committee on International Security and Arms Control (CISAC) that worked with scientists in the Soviet Union and later in Russia on issues of nuclear stability, arms control and non-proliferation. The initial work was aimed at building mutual trust and respect, but ultimately this effort matured into a dialogue that was central to later arms reduction agreements. Current work with the Russian Academy focuses on topics such as international nuclear fuel cycle approaches, and the international nuclear security environment. Beyond cooperation with Russia, we convene dialogues in India on Indo-US cooperation in international security issues. We have a series of US-China engagements, one of the few sustained bilateral channels of non-governmental communication on international and regional security issues, with an important set of Chinese scientists, nuclear weapons experts, and policy analysts. We participate in international fora aimed at enhancing biosecurity, both with the international community and in a bilateral context with the Chinese Academy of Sciences.

Enhancing human and institutional capital as a route to economic development and equity: Over the past 15 years a global network of science academies has emerged and become an important venue for coordination among science academies around the world. The network, known as the InterAcademy Panel on International Issues (IAP), has provided a means to coordinate communications and actions with many partners simultaneously. The IAP has established programs on water futures, science education, biosecurity, natural hazards and disasters, and digital access to scientific information. Associations of Engineering and Medical Academies are also active, and cooperation among networks has been established. A second organization, called the InterAcademy Council (IAC) undertakes detailed studies on major global issues. An IAC report released on October 2007 analyzed the global energy transition, earlier reports address the problem of food security in Africa and the importance of women as an under utilized human resource in science. These reports are intended for high-level policy makers and their dissemination and implementation is being accomplished on a regional basis by networks of academies in Africa, the Americas and Asia. Our Academy played a crucial role in the creation of these networks.

Five years ago we initiated a program of institutional development, funded by the Bill and Melinda Gates Foundation, to build the capacity of African science academies to provide independent, evidence-based advice to their governments and countries, with an emphasis on health needs. The principal objectives of the initiative are to help the academies establish sound advisory processes and to foster and sustain a relationship between the academy and its government and nation such that the academy is regarded as a trusted source of excellent scientific advice.

The initiative supports a variety of activities at the national level. We work intensively with the science academies of Nigeria, South Africa, and Uganda and assist these

academies in hiring and training staff, developing infrastructure, and developing and testing different models for policy advice. In addition, we are providing more modest strategic planning grants to the African Academy of Sciences and to the academies of Senegal, Ghana, Kenya and Cameroon, and helping the African Academies to work together.

Partner academies have experimented with convening activities—forums, symposia, and workshops—to gather stakeholders from government, academia, industry, and non-governmental organizations for examination, illumination, and discussion of scientific and policy issues. A few examples of outputs from this work are:

- An influential consensus report of the Academy of Sciences of South Africa entitled, "*HIV/AIDS, TB and Nutrition: Scientific Inquiry into the Nutritional influences on Human Immunity with Special Reference to HIV Infection and Active TB in South Africa"* was released in August 2007. This report addresses a widespread controversy over the nation's AIDS policies, which have for many years emphasized the importance of good nutrition in the fight against poverty, a study committee of 15 multidisciplinary experts found that neither food nor food supplements, although important for many other reasons, are alternatives to drug therapy in treating those afflicted with HIV/AIDS.
- A Forum on Evidence-based Policy Making in Nigeria.
- The Uganda National Academy of Sciences has established a Forum on Health and Nutrition and has recently released its first major consensus report on *"Approaches to Assessing and Managing Malaria Vector Resistance to Insecticides"*.
- The Uganda National Academy of Sciences also recently hosted a workshop "*Promoting Biosafety and Biosecurity within the Life Sciences"*.
- A workshop report of the Academy of Sciences of South Africa on water research and management was released in 2007

Complementary to these activities at the national level, we convene annual conferences, joint learning sessions, and training activities—for networking and shared learning on evidence-based policy advice. The most recent annual conference, *Water and Health in Africa*, was held in Dakar, Senegal. Government officials from 12 African countries participated in the conference. The exchanges and experience from the conference discussions resulted in the drafting and signing of the *Declaration of Dakar*: a document that espouses the use of scientific evidence in policymaking through a process facilitated by science academies.

In the area of human resource development our Academy is an active participant in the IAP global program to improve the quality of science education. During the past year, these efforts have included an IAP sponsored meeting in London on the professional development of science teachers, work with the U.S.-Mexico Foundation for Science (FUMEC) on the fourth biennial international conference on science education—"Science and Well-Being … From Amazement to Citizenship"— held in Monterrey, Mexico, in November 2007, a leadership development conference in Nairobi, Kenya, for

teacher leaders from 10 African countries and work on the development of an evaluation framework for use in countries committed to improving science education.

What are the unique strengths of the Academies in fostering international science cooperation?

A unique strength of the National Academies in fostering international scientific cooperation is the high esteem accorded US science by the rest of the world. International polling reveals that attitudes towards US science are more positive than towards any other aspect of US society. This attitude is especially pronounced in Islamic countries. As noted elsewhere in this testimony, the Academies represent the leadership of US science and as such represent the human face of US scientific achievement. This enables engagement and cooperative work aimed at shared goals in all regions of the world. A second strength is that The Academies, and other non-governmental science organizations such as the AAAS, can mobilize the US scientific community on urgent issues.

Academies represent a scientific approach to problem-solving, achieving national economic goals, and peaceful competition. A major aspect of our international program is to strengthen education and training, and to empower science communities to be more effective in engaging national policy makers and the public, thereby transmitting this problem-solving ethic to other societies, especially in the developing world.

What are the limitations of the Academies in fostering international science cooperation?

The Academies do not make policy, but rather provide evidence, analysis and policy options based on our best understanding of science. This means that in most regards, the Academies occupy the role of advisors and not implementers. A second limitation is financial. Most of our international activities are financed by philanthropic foundations or from our own limited endowment pool. The financial base for international work is not adequate to the meet the many urgent needs and opportunities for constructive engagement.

How do you coordinate your efforts with the federal government and with those other organizations?

One important component of our interaction with the federal government is our direct advisory reports to the State Department and USAID on the role of STH in foreign policy and development assistance. In our own engagement with other countries, we operate within US laws and regulations, which involves communication with the federal government when required. But more importantly, the federal government is very aware that a successful American engagement with the world must involve many private sector and non-governmental players, and we receive much encouragement from the government in our international activities. One important program of US Embassies abroad is to sponsor extended visits to the US for key (often young) leaders from host countries, including many with interests in STH, and we meet regularly with these foreign visitors. Many US agencies, notably the Fogarty International Center at NIH, and

the NSF, but also DoE, EPA, and others, have active programs for, and interests in, international cooperation, and we have valuable interaction with them. With the support of the NSF, The National Academies provide US participation in the International Council for Science (ICSU), many international disciplinary unions, and IIASA.

Also, our interest in international STH cooperation and in capacity building around the world is similar to that of many non-governmental organizations in the US, notably the AAAS. Since these organizations also are led by outstanding American scientists, in many cases individuals involved in their leadership are current or past leaders of The National Academies, and cooperation is natural.

How might the federal government, either as a whole or specific to one or more agencies, take better advantage of science and the U.S. scientific community in pursuing its foreign policy goals and in helping to lead the world toward global solutions for global challenges such as water, climate, energy and infectious diseases?

The US federal government has great influence in the world owing to the scale of the US economy, and owing to the widely admired egalitarian ideals and aspirations of US society. This provides substantial leverage to achieve constructive solutions to global problems. Unfortunately, the US has not always made full use of these assets. Moreover, the US has allowed its investments in international STH to decline. Take investments through the US AID as an example. An Academies report published in 2006, and under taken at the request of the US AID Administrator, entitled "*The Fundamental Role of Science and Technology in International Development: An Imperative for the U.S. Agency for International Development"* found that STH competencies in US AID have declined substantially. The report made a series of recommendations on how to rebalance the US AID competencies in STH to increase the effectiveness of US AID programs.

The creation of the office of Science and Technology Advisor (STAS) for the Secretary of State is an important step forward, as is the recent appointment of the same individual as Science and Technology Advisor to the US AID Administrator. In its May 2007 strategic plan, the Department of State and USAID established an important set of realistic STH diplomatic strategies, however, these must be seen against inadequate (DOS) or inadequate and declining (US AID) STH capabilities. As noted in a recent Congressional Research Service report *("Science, Technology, and American Diplomacy: Background and Issues for Congress"*), implementation of these diplomatic strategies will require new investments in governmental capabilities, but implementation can also be accelerated by the effective use of non-governmental science organizations.

An important opportunity derives from the fact that many of the leaders of science in other parts of the world have had a significant experience with US research institutions as students or as research visitors. To cite one example, 40% of the faculty at Sharif University, Iran's premier science and technology institution, received training in the US. During a recent visit to Sharif University, the desire for an expanded engagement with all areas of US science was repeatedly emphasized to the US visiting delegation. This illustrates an experience that is reiterated in all parts of the world –many with direct knowledge of our country and its culture are willing partners for further engagement,

owing to positive feelings about their experiences with US science institutions specifically and with US society generally.

Regrettably the cadre of international scientists with direct knowledge of the US is declining, because broad based US Government programs for international fellowships have eroded greatly over the past two decades. The Academies report cited above found that there has been a ten-fold decline in the number of US AID-financed graduate students from developing countries at US universities. The report makes the strong recommendation that US AID revitalize its investments in human resources, by bringing its fellowship programs back to the scale of the 1980s. Based on historical experience, it is clear that a modest investment in fellowships will bring large returns in future generations.

Current visa policies are a further obstacle to scientific exchange. It is important to find an appropriate balance between legitimate national security concerns and other dimensions of our national interest. To quote from the recent CRS report cited above, "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", thus broader engagement is clearly in our national economic self interest. Moreover, other aspects of our national security depend on US international STH engagement, for example in responding to global emerging infectious diseases challenges such as HIV or SARS or avian flu.

The National Science Board (NSB) recently issued a report (*International Science and Engineering Partnerships: A Priority for U.S. Foreign Policy and Our Nation's Innovation Enterprise)* that touches many of the themes listed above, including that the US should create a coherent and integrated international science and engineering strategy, balance U.S. foreign and R&D policy, and promote intellectual exchange. These themes emphasizing the critical role of STH in US diplomacy are being reiterated in many fora including these hearings. It seems clear that the time is ripe to make fuller use of US STH assets in achieving national foreign policy goals.

Many of the dozens of federal agencies have core goals to which carefully chosen international cooperation could provide very valuable contributions, and these opportunities are becoming more important as scientific strength is more widely distributed, as economies globalize, and as challenges (related, for example, to aging populations, to water, to global health, to energy and climate change) are increasing understood to have commonalities and/or to require common action. But in general, federal agencies perceive that the option to support international activities is not very clear in their congressional guidance and mandate. Thus, it would be very useful for federal agencies to have congressional guidance that allows them to support and engage in high-value, innovative opportunities for international cooperation.

The points developed above do not speak directly to the question of addressing "global challenges such as water, climate, energy and infectious diseases", but rather address structural impediments to a more effective utilization of US STH assets to achieve national goals. We believe that structural reforms must be the fundamental first step. Once these are accomplished, it will be relatively straightforward to focus US STH

strengths, both through direct governmental programs and through the effective use of non-governmental science organizations, on global challenges of sustainability. As noted earlier in this testimony, much is already being done through the global network of academies (IAP) or with important bilateral partners (e.g. China, the Middle East) to focus on sustainability issues, but these efforts are modest compared to the scale of the problems that the world faces.

Thank you again for this opportunity to testify. I would be happy to address any questions the Subcommittee might have.